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RESPONSIVENESS SUMMARY FOR THE PHASE 1 REPORT

HUDSON RIVER PCB REASSESSMENT RI/FS

EPA WORK ASSIGNMENT NO. 013-2N84

JULY 1992

Region II

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY (ARCS)
FOR
HAZARDOUS WASTE REMEDIAL SERVICES

EPA Contract No. 68-S9-2001

TAMS Consultants, Inc.

and

Gradient Corporation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

JUL 13 1992

To All Interested Parties:

The U.S. Environmental Protection Agency (EPA) is pleased to release the Responsiveness Summary for the Phase 1 Report of the Reassessment Remedial Investigation and Feasibility Study for the Hudson River PCBs site.

This document contains EPA's responses to the numerous comments received on the Phase 1 Report. The Phase 1 Report was an interim report which compiled previously existing data and presented some preliminary findings based on those data. EPA is planning to conduct additional data collection and analyses, as described in the Phase 2 Work Plan released on June 5, 1992.

In order to give reviewers an opportunity to examine the Responsiveness Summary prior to submitting their comments on the Phase 2 Work Plan, the public comment period for the Phase 2 Work Plan has been extended to July 24, 1992.

If you have any questions regarding the Responsiveness Summary or the Reassessment in general, please contact Ann Rychlenski, of the External Programs Division, at (212) 264-7214.

Sincerely yours,

William McCabe

for Kathleen C. Callahan, Director
Emergency and Remedial Response Division

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PREFACE
RESPONSIVENESS SUMMARY
PHASE 1 REPORT
HUDSON RIVER PCB REASSESSMENT RI/FS

USEPA has prepared this Responsiveness Summary to the Phase 1 Report, Interim Characterization and Evaluation, for the Hudson River PCB Reassessment Remedial Investigation/Feasibility Study (RI/FS). It addresses comments received during review of the Phase 1 Report (August 1991). Although one Responsiveness Summary is typically prepared at the completion of an RI/FS and is a component of the Record of Decision, USEPA decided to prepare this Responsiveness Summary for Phase 1 of this three-phased RI/FS. These three phases are:

- Phase 1 - Interim Characterization and Evaluation (formerly called Preliminary Reassessment);
- Phase 2 - Further Characterization and Evaluation; and
- Phase 3 - Feasibility Study.

For this Reassessment, USEPA has established a Community Interaction Program (CIP) to elicit ongoing feedback through regular meetings and discussion and to facilitate review of and comment upon work plans and reports prepared during all three phases.

Because of the large number of CIP participants and associated costs of reproduction, the Phase 1 Report is incorporated by reference and is not reproduced herein. No revised Phase 1 Report will be published. The comment responses and revisions noted herein are considered to amend the Phase 1 Report. For complete coverage, the Phase 1 Report and this Responsiveness Summary must be used together.

The first part (first tab) of this three-part Responsiveness Summary is entitled Comment Directory. It describes the Phase 1 Report review and commenting process, explains the organization and format of comments and responses and contains a comment index or directory.

The second part (second tab), entitled Responses, contains the responses to all comments. Responses are grouped according to the section number of the Phase 1 Report to which they refer, e.g., responses to comments on Section A.2.1 of the Phase 1 Report are found in Section A.2.1 of the Responsiveness Summary. Additional information about how to locate responses to comments is contained in the Comment Directory.

Following the third tab are comment submissions on the Phase 1 Report, with coding to identify commentor and comment number, as further explained in the Comment Directory.

RESPONSIVENESS SUMMARY
PHASE 1 REPORT
INTERIM CHARACTERIZATION AND EVALUATION
HUDSON RIVER PCB REASSESSMENT RI/FS

CONTENTS

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Page

APPENDIX TO RESPONSIVENESS SUMMARY *
PHASE 1 REPORT
HUDSON RIVER PCB REASSESSMENT RI/FS

CONTENTS

GENERAL ELECTRIC

* Note: The Appendix in its entirety is separately bound and is available in the Information Repositories.

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COMMENT DIRECTORY TO PHASE 1 REPORT RESPONSIVENESS SUMMARY

This section documents and explains the commenting process and the organization of comments and responses in this document. Readers interested in finding responses to their comments may skip this section and go directly to the Comment Guide to the Comment Directory following page CD-11.

1. PHASE 1 REPORT COMMENTING PROCESS

1.1 Phase 1 Report Distribution

This Phase 1 Report, issued in August 1991, was distributed to federal and state agencies and officials, participants in the Community Interaction Program (CIP) and General Electric, as shown in Table 1. Distribution was made to approximately 100 agencies, groups and individuals. Copies of the Phase 1 Report were also made available for public review in sixteen Information Repositories, as shown in Table 2.

1.2 Review Period and Public Meetings

Review of and comment on the Phase 1 Report occurred during the period August 23, 1991 through October 25, 1991. During this period, USEPA sponsored an availability session to answer questions on September 5 at the Saratoga Springs City Center. For those unable to attend the session in person, a 1-800 telephone number was available. USEPA subsequently conducted two public meetings to present the results of Phase 1 and to respond to comments. These meetings were held in Poughkeepsie, NY at the Radisson Hotel and in Fort Edward, NY at the Durkee Hose Company on September 11 and 12, 1991, respectively. These meetings were conducted in accordance with USEPA's *Community Relations in Superfund: Handbook, Interim Version* (1988). Complete transcripts of these public meetings are available for public review at the Repositories listed in Table 2.

TABLE 1

DISTRIBUTION OF PHASE 1 REPORT

HUDSON RIVER PCB OVERSIGHT COMMITTEE MEMBERS

- USEPA ERRD Deputy Division Director (Chair)
- USEPA Project Manager
- USEPA Community Relations Coordinator, Chair of the Steering Committee
- NYSDEC Project Sponsor Group representative
- NYSDEC Division of Hazardous Waste Management representative
- National Oceanic and Atmospheric Administration (NOAA) representative
- Agency for Toxic Substances and Disease Registry (ATSDR) representative
- US Army Corps of Engineers representative
- NYSDOT representative
- USDOI representative
- NYSDOH representative
- GE representative
- Liaison Group Chairpeople
- Scientific and Technical Committee representative
- TAMS Project Manager

SCIENTIFIC AND TECHNICAL COMMITTEE MEMBERS

STEERING COMMITTEE MEMBERS

- USEPA Community Relations Coordinator (Chair)
- Governmental Liaison Group Chair and two Co-chairs
- Citizen Liaison Group Chair and two Co-chairs
- Agricultural Liaison Group Chair and two Co-chairs
- Environmental Liaison Group Chair and two Co-chairs
- USEPA Project Manager
- NYSDEC Technical representative
- NYSDEC Community Affairs representative

FEDERAL AND STATE REPRESENTATIVES

- The Hon. Daniel P. Moynihan
- The Hon. Alfonse M. D'Amato
- The Hon. Hamilton Fish
- The Hon. Gerald Solomon
- The Hon. Nita Lowey
- The Hon. Ronald B. Stafford

16 INFORMATION REPOSITORIES (see Table 2)

TABLE 2

INFORMATION REPOSITORIES

Adriance Memorial Library
93 Market Street
Poughkeepsie, NY 12601

Catskill Public Library
1 Franklin Street
Catskill, NY 12414

County Clerk's Office
Washington County Office Building
Upper Broadway
Fort Edward, NY 12828

Crandall Library
City Park
Glen Falls, NY 12801

Croton Free Library
171 Cleveland Drive
Croton-on-Hudson, NY 10520

Fort Edward Town Clerk's Office
Fort Edward Town Hall
118 Broadway
Fort Edward, NY 12828

New York State Library
CEC Empire State Plaza
Albany, NY 12230

New York State Department of
Environmental Conservation
Division of Hazardous Waste
Remediation
50 Wolf Road, Room 212
Albany, NY 12233

New York State Department of
Environmental Conservation
Region 3
21 South Putt Corners Road
New Paltz, NY 12561

New York State Department of
Environmental Conservation
Region 4
2176 Guilderland Avenue
Schenectady, NY 12406

New York State Department of
Environmental Conservation
Region 5
Route 86
Ray Brook, NY 12977

Office of the Supervisor of
Regional Public Affairs
New York State Department of
Environmental Conservation
Building 40 SUNY
Stony Brook, NY 11790-2356

Saratoga Springs Public Library
320 Broadway
Saratoga Springs, NY 12866

Troy Public Library
100 Second Street
Troy, NY 12180

US Environmental Protection Agency
Office of External Programs
26 Federal Plaza
New York, NY 10278

White Plains Public Library
100 Martine Avenue
White Plains, NY 10601

As stated in USEPA's letter transmitting the Phase 1 Report, all citizens were urged to participate in the Reassessment process and to join one of the Liaison Groups formed as part of the Community Interaction Program. USEPA requested that all comments, including those of Liaison Groups, be sent to USEPA.

1.3 Receipt of Comments

Comments on the Phase 1 Report were received in four ways: letters or other written submissions to USEPA; written statements delivered at the public meetings; oral statements made at the public meetings; and written statements sent as follow-up to USEPA after the public meeting, because the commentor did not have an opportunity to speak or chose not to do so. In many cases oral statements at the meetings were summaries or verbatim readings of written submissions.

All comments received on the Phase 1 Report have been recorded and are addressed in this Responsiveness Summary. Comments were received from approximately 60 commentors. Total comments numbered over 600.

1.4 Distribution of Responsiveness Summary

The Responsiveness Summary will be submitted to the Steering Committee, the Hudson River Oversight Committee, the Scientific and Technical Committee, NYSDEC and General Electric. This Responsiveness Summary has also been placed in the sixteen Information Repositories and is part of the Administrative Record.

2. ORGANIZATION OF PHASE 1 REPORT COMMENTS AND RESPONSES

2.1 Identification of Comments

Each submission commenting on the Phase 1 Report was assigned one of the following letter codes:

F - Federal agencies and officials;
S - State agencies and officials;
L - Local agencies and officials;
C - Community Interaction Program Committees and Liaison Groups;
P - Public Interest Groups and Individuals; and
G - General Electric.

The letter codes were assigned for the convenience of readers and to assist in the organization of this document; priority or special treatment was neither intended nor given in the responses to comments.

Once a letter code was assigned, each submission was then assigned a number, in the order that it was received and processed, such as F-1, F-2 and so on. Each different comment within a submission was assigned its separate sub-number. Thus, if a federal agency submission contained three different comments, they are designated as F-1.1, F-1.2, F-1.3.

Written comment submissions have been reprinted following the third tab of this document. The exception is a 335-page Commentary by General Electric (GE) and more than 700 pages of Appendices, which have not been reprinted in their entirety because of the volume of paper. The table of contents of the GE Commentary is reprinted along with notations of the comment numbers coded for each section. Appendices A, B and C of GE's Commentary, containing specific comments in a more limited number of pages, are reprinted. Appendices D through I of GE's Commentary are not reprinted; these Appendices are reference materials provided by GE and do not contain specific comments on the Phase 1 Report. The 335-page GE Commentary is appended to copies of the Responsiveness Summary that have been placed in the Repositories (see Table 2).

The alphanumeric code associated with each reprinted written submission is marked at the top right corner of the first page of the comment letter; the sub-numbers designating individual comments are marked in the margin, as shown in the sample letter on the following page. Comment submissions are reprinted in numerical order by letter code in the following order: F, S, L, C, P, and G. If an alphanumeric code appears to be missing, it was assigned to a commentor who made an oral presentation only at the public meeting.

Because of the length of the meeting transcripts and the fact that many oral comments were the same as or similar to written submissions, the transcripts are not reprinted in this Responsiveness Summary. Copies of these transcripts, showing coded comments, are appended to copies of the Responsiveness Summary that have been placed in the Repositories. All oral comments were coded and otherwise treated in the same manner as written comments.

In a few instances, a commentor may have more than one submission listed in the Comment Directory, because he/she made several submissions, sent letters different from oral statements or made oral statements substantively different from a written submission. If an individual spoke for a group and then wrote a letter in his/her own name (or vice-versa), the submissions were coded separately and each appears in the directory.

It was not always clear if a commentor intended to represent a CIP Committee or Liaison Group, was representing an interest group or was commenting as an individual. The reader is advised to examine both the C (CIP) category for the name of the CIP Committee or Liaison Group and the P (Public Interest Group or Individual) category for the specific name of an interest group or his/her own name.

2.2 Location of Responses to Comments

The Comment Directory, following this text, contains a complete listing of all commentors and comments. This directory allows readers to find responses to comments and provides several items of information.

SAMPLE

LETTER

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Ocean Resources Conservation and Assessment
Hazardous Materials Response and Assessment Division
Coastal Resources Coordination Branch
Room 3137-C
26 Federal Plaza
New York, New York 10278

F-3 Letter Code

November 4, 1991

Douglas Tomchuk, Project Manager
New York/Caribbean Superfund Branch II
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza
New York, NY 10278

Dear Mr. Tomchuk:

The National Oceanic and Atmospheric Administration (NOAA) has completed its review of the
Phase 1 Report for the Hudson River PCB Reassessment Remedial Investigation and Feasibility Study (RI/FS), entitled, "Interim Characterization and Evaluation", prepared by Tams Consultants, Inc., and Gradient Corporation, dated August 1991. The Phase 1 Report of this reassessment is an interim report which presents a comprehensive summary of all available data on the Hudson River and the polychlorinated biphenyls (PCBs) contaminated river sediments and analyses of that data. The purpose of this evaluation was to 1) provide as accurate a picture as possible of current levels of PCBs in the river and the changes in these levels since the 1970s; 2) identify needs for additional data; 3) allow a preliminary assessment of risks to human health and the environment posed by the PCBs in the river; and 4) make possible a preliminary assessment of potential remedies and treatment options for the PCB-contaminated sediments.

NOAA'S comments on the Phase 1 Report fall into several general classes:
(1) comments about the overall project; (2) comments about the ecological risk assessment (ERA) presented in the report; (3) comments about models and the framework for decision making; (4) comments about estimates of loadings; (5) comments about specific sections of the Phase 1 Report; and (6) comments about Phase 2B sampling.

(1) The Phase 1 Report does not adequately address risks to, and protection of, important natural resources in the Lower Hudson River below the Federal Dam at Troy, New York. 1 Comment Code #1 (F-3.1)

- The first column lists the names of commentors. Comments are grouped first by: F (Federal), S (State), L (Local), C (CIP), P (Public Interest Group or Individual) or G (General Electric). Within each of these groups, commentors' names are listed alphabetically.

- The second column identifies the alphanumeric comment code, e.g., F.1-1, assigned to each comment.

- The third column containing the notation P (Poughkeepsie) or FE (Fort Edward) identifies comments made at, delivered at or submitted in response to a public meeting.

- The fourth column identifies the location of the response by Phase 1 Report section number. For example, comments raised on Section A.2.1 of the Phase 1 Report can be found in the corresponding Section A.2.1 of the Responses, following the second tab of this document.

- The fifth, sixth and seventh columns list key words that describe the subject matter of each comment. Readers will find these key works helpful as a means to identify subjects of interest and related comments.

Responses are grouped and consolidated by section number in order that all responses to related comments appear together to help achieve consistency among the responses and for the convenience of the reader interested in responses to related or similar comments.

In many instances, several commentors commented on the same or very similar items. These comments are answered by one common response that addresses the common issue being raised. Thus, a comment is not necessarily answered by an individualized response.

In other cases, closely related but somewhat different comments pertaining to the same report section are made. Thus, a section number may contain more than one response.

2.3 Types of Responses

Responses to comments include the types described below.

- General Responses

  In some instances, comments were general and pertained to the Reassessment process or the Phase 1 Report overall rather than to a specific section of it. Responses to these comments are coded as General and appear at the very beginning of the Responses, under the heading General.

- Specific Responses to Comments

  These comments are answered in the Responses, grouped by section number of the Phase 1 Report to which they refer. A common response is provided when commentors question the same or very similar items. In some cases, commentors voiced opposite opinions about the same point, typically a controversial one, but both comments took issue with the same part of the Phase 1 Report. The rationale for the report's findings or resolution of the issue may also be contained in a common response addressing the conflicting nature of the comments and the controversy surrounding the issue.

- Reference to Phase 1 Report or Other Documents

  In some instances, the commentor may have overlooked a portion of the Phase 1 Report or other documents that would have provided the data or explanation sought by the commentor. This kind of response refers the reader to the appropriate source of more information.

- Responses to Comments on Executive Summary and Synopses

  These comments are answered in one of two ways. When a comment referencing the Executive Summary or a Synopsis was specific or technical or dealt with information contained in a specific section of the Phase 1 Report, it is addressed in this document under the appropriate technical section as identified in the Comment Directory. When the comment concerned the wording of the Executive Summary or Synopsis or dealt with the overall nature of either, it is addressed under the heading Executive Summary or the pertinent Synopsis, as appropriate. In all cases, the Comment Directory refers the reader to the location of the response.

- <u>Acknowledgement</u>

  Some commentors acknowledge receipt of the Phase 1 Report, offer assistance, express general support of or opposition to the Reassessment or state that they have no comment. This kind of comment is simply acknowledged.

- <u>Revisions</u>

  Revisions to the text, based upon a commentor's recommendation, are highlighted with shading. In some cases revisions are made based on internal review and are not responses to comments.

- <u>Additional References</u>

  Full citations are provided only for new references not previously listed in the References Section of the Phase 1 Report. These citations are given in footnotes on the page where the new reference occurs.

3. COMMENT DIRECTORY

A Comment Guide, a diagram illustrating how to find responses to comments, and the Comment Directory follow.

As stated in the preface to this Phase 1 Report Responsiveness Summary, this document does not reproduce the Phase 1 Report. Readers are urged to utilize this Responsiveness Summary in conjunction with the Phase 1 Report.

GUIDE TO COMMENT DIRECTORY

PHASE 1 REPORT RESPONSIVENESS SUMMARY

Step 1
Find name in Comment Directory.

Step 2
Obtain Comment Codes. Find coded comments reproduced following third tab. Oral only comments at public meetings are not reproduced.

Step 3
Find responses under second tab. Responses occur in the following order:

General
Executive Summary
Introduction
Part A
Part B
Part C
References
Glossary

Within any numbered section, responses coded general appear first.

Name grouped by:

F=Federal
S=State
L=Local
C=CIP
P=Public Interest Group or Individual
G=General Electric

then listed in alphabetical order

Comment Codes F-3.1 thru F-3.14 are all comments in submission F-3.

Public meetings:

FE=Fort Edward (9/12/91)
P=Poughkeepsie (9/11/91)
If blank, comments not associated with public meeting.

Location of responses to comments referencing Phase 1 Report Section Number

	Name/Agency	Comment Code	Public Meeting	Report Section
Example:	NOAA, Csulak	F-3.1		A.General

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COMMENT DIRECTORY
Federal

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	2	3
NOAA, Csulak	F- 3. 1		A.General	Resources	Species	Sed. Transport
	F- 3. 2		A.General	Risk Assessment	Ecological	Lower Hudson
	F- 3. 3		B.7.General	Data	Analysis	Medium
	F- 3. 4		A.General	Risk Assessment	Ecological	Lower Hudson
	F- 3. 5		A.General	Decision Making	Work Plan	Model
	F- 3. 6		B.4.1	Decision Making	Model	
	F- 3. 7		B.4.1	Model	Food Chain	
	F- 3. 8		A.2.5	Sources	Sewage	
	F- 3. 9		A.3.3.Gen	Upper Estuary	Sources	Resources
	F- 3.10		A.3.2	Water Column	Sediment	
	F- 3.11		A.3.3.2	Time Trend	Aroclor	Sources
	F- 3.12		B.7.4.Gen	Toxicity	Aroclor	Species
	F- 3.13		B.7.4.3	Water Quality	Standards	
	F- 3.14		A.General	Risk Assessment	Ecological	Lower Hudson
USDOI, Corin	F- 1. 1		B.7.General	Data	Analysis	Species
	F- 1. 2		A.3.3.2	Time Trend	Sources	Aroclor
	F- 1. 3		B.4.4.1	Fish	Aroclor	Time Trend
	F- 1. 4		Summary	Risk Assessment	Revision	Editorial
	F- 1. 5		B.7.4.Gen	Toxicity	Birds	
	F- 1. 6		B.7.5.1	Water Column	Toxicity	Risk Assessment
	F- 1. 7		B.7.5.2	Chironomids	Toxicity	Risk Assessment
	F- 1. 8		B.7.4.3	Sediment	Toxicity	EP
	F- 1. 9		B.7.5.3	Fish	Toxicity	Risk Assessment
	F- 1.10		B.7.General	Data	Analysis	Species
	F- 1.11		A.General	Risk Assessment	Ecological	Lower Hudson
USDOI, Patterson	F- 2. 1		B.7.General	Data	Analysis	Species
	F- 2. 2		A.General	Risk Assessment	Ecological	Lower Hudson
	F- 2. 3		A.3.3.2	Time Trend	Aroclor	Sources
	F- 2. 4		A.4.1.1	Thomann	Fish	Sources

COMMENT DIRECTORY
State

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	2	3
NYSDEC, Ports	S- 1. 1		C.4.4.1	Remediation	Bench Test	Sampling
	S- 1. 2		General	Sampling	Phase 2	
	S- 1. 3		A.2.2	Mass Balance	Loads	Sources
	S- 1. 4		A.3.3.Gen	Fish	Lipid	
	S- 1. 5		B.4.4.3	Fish	Water Column	Bioaccumulation
	S- 1. 6		A.Synopsis	Sediment	Sources	Core Dating
	S- 1. 7		A.3.3.2	Striped Bass	Exposure	Time Trend
	S- 1. 8		A.3.3.2	Sampling	Time Trend	
	S- 1. 9		A.3.3.2	Fish	RM153	
	S- 1.10		C.2	Remediation	CIP	
	S- 1.11		A.3.3.1	Sampling	Aroclor	Detection Limit
	S- 1.12		A.3.3.2	Striped Bass	Time Trend	Lipid
	S- 1.13		A.3.3.2	Half-life		
	S- 1.14		A.3.3.2	Time Trend	Aroclor	Sources
	S- 1.15		A.3.3.3	Bioaccumulation	Species	
	S- 1.16		A.3.3.2	Fish	RM153	
	S- 1.17		B.4.4.Gen	Model	Thomann	
	S- 1.18		A.1.3.7	Water Quality		
	S- 1.19		A.2.8	Revision	Numerical	
	S- 1.20		B.3.2.4	Sediment	Sampling	Congener
	S- 1.21		B.3.2.5	Sediment	Metals	
	S- 1.22		B.3.4.1	PCB Levels	Sampling	
	S- 1.23		B.3.4.1	Sampling	Aroclor	Detection Limit
	S- 1.24		B.3.5.1	Sampling	Qual. Assurance	
	S- 1.25		B.3.7.Gen	Qual. Assurance	Aroclor	Fish
	S- 1.26		B.3.7.2	Aroclor	Sediment	Water Column
	S- 1.27		B.3.7.1	Aroclor	Sediment	
	S- 1.28		B.4.4.1	Time Trend	Fish	PCB Levels
	S- 1.29		B.4.4.3	Bioaccumulation	Lipid	Fish
	S- 1.30		B.4.4.2	PCB Levels	Time Trend	
	S- 1.31		B.4.5	Loads	Water Column	Half-life
	S- 1.32		B.5.1	Model	Sed. Transport	
	S- 1.33		B.6.1	Upper Hudson	Use	
	S- 1.34		B.6.3.6	Sediment	Water Quality	Criteria
	S- 1.35		B.7.4.3	Sediment	Water Quality	Criteria
	S- 1.36		B.7.5.3	Species	Risk Assessment	Toxicity
	S- 1.37		B.3.3.3	Water Column	Sampling	Detection Limit
	S- 1.38		C.2	Water Quality	Standards	Objectives
	S- 1.39		B.7.4.3	Water Quality	Standards	
	S- 1.40		B.7.4.3	Sediment	Criteria	
	S- 1.41		B.7.5.2	Chironomids	Toxicity	Risk Assessment
	S- 1.42		B.7.5.6	Standards	Criteria	Risk Assessment
	S- 1.43		C.2	Water Quality	Standards	Objectives
	S- 1.44		C.3.3.Gen	ARARS	Standards	Water Quality
	S- 1.45		C.3.3.Gen	ARARS	Dredging	
	S- 1.46		C.4.2.2	Biodegradation	Remediation	
	S- 1.47		C.4.3	Dredging	Excavation	
NYSDOT, King	S- 2. 1		B.1.2.2	Navigation	Sediment	Dredging

COMMENT DIRECTORY
Local

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
Dutchess County EMS, Coller	L- 2. 1	P	General	CIP	Role	Lower Hudson
	L- 2. 2	P	C.2	Remediation		
Hyde Park Fire & Water, Buhler	L- 1. 1	P	C.2	Remediation	Water	
Stillwater, Town, Lilac	L- 3. 1	FE	C.4.2.Gen	Remediation	No Action	Biodegradation
	L- 3. 2	FE	B.6.2.4	Exposure	Absorption	Dermal
	L- 3. 3	FE	General	Fishery		
Stillwater, Village, Martin	L- 4. 1	FE	C.4.3	Remediation	Dredging	

COMMENT DIRECTORY
Community Interaction Program

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	2	3
Agricultural Liaison Group	C- 9. 1		Summary	Editorial		
	C- 9. 2		B.6.2.2	Fish Intake		
	C- 9. 3		B.6.2.2	Risk Assessment	Half-life	
	C- 9. 4		B.4.3.1	Water Column	PCB Levels	
	C- 9. 5		C.2	Remediation	Lower Hudson	Sources
	C- 9. 6		C.4.5	Remediation		
	C- 9. 7		B.6.3.4	Risk Assessment	Toxicity	
	C- 9. 8		C.4.5	Work Plan	Remediation	
	C- 9. 9		General	CIP	Role	Decision Making
Citizen Liaison Group	C- 1. 1		B.6.1	Data	Recency	
	C- 1. 2		B.6.3.4	Aroclor	Time Trend	Biodegradation
	C- 1. 3		B.6.2.2	Fish Intake	Non PCB Risk	
	C- 1. 4		B.4.4.1	Time Trend	PCB	
	C- 1. 5		B.6.3.4	Aroclor	Time Trend	Biodegradation
	C- 1. 6		C.2	Objectives	Medium	Contaminant
	C- 1. 7		General	Upper Hudson	Lower Hudson	Jurisdiction
	C- 1. 8		General	Decision Making	Authority	Appeal
	C- 1. 9		General	CIP	Role	
Environmental Liaison Group	C- 11. 1	FE	B.3.4.2	Fishing Ban	Chemicals	
	C- 11. 2	FE	B.6.4.6	Chemicals		
	C- 11. 3	FE	B.3.4.2	Chemicals		
Government Liaison Group	C- 10. 1	FE	General	CIP	Publicity	
	C- 10. 2	FE	B.6.3.5	Toxicity	Cancer Risk	
	C- 10. 3	FE	B.6.2.2	Fish Intake		
	C- 10. 4	FE	B.6.2.4	Exposure	Absorption	Swimming
	C- 10. 5	FE	B.6.3.2	Uncertainty		
	C- 10. 6	FE	B.6.2.4	Exposure	PCB Levels	
	C- 10. 7	FE	C.2	Remediation	No Action	
S&T Committee, Abramowicz	C- 7. 1		General	Analysis	Sampling	Phase 2
	C- 7. 2		A.3.1	Sources	Aroclor	
	C- 7. 3		B.4.3.2	Sed. Transport	Sources	T.I.Pool
	C- 7. 4		A.1.3.1	Water Quality		
	C- 7. 5		B.1.2.1	Water Quality		
	C- 7. 6		B.7.2.2	Water Quality		
	C- 7. 7		B.1.2.1	Metals	Water	
	C- 7. 8		B.3.2.5	Metals	Sediment	
	C- 7. 9		B.3.2.2	Sediment	PCB Levels	Kriging
	C- 7.10		B.3.2.4	Data	Sediment	Dechlorination
	C- 7.11		C.4.2.1	Dechlorination	Data	
	C- 7.12		C.4.1	Remediation	Biodegradation	
	C- 7.13		C.4.2.1	Dechlorination	Data	
	C- 7.14		C.4.2.2	Biodegradation		
	C- 7.15		C.4.2.3	Dechlorination		
	C- 7.16		C.4.4.1	Remediation	Technology	
	C- 7.17		C.4.4.2	Remediation	Technology	
	C- 7.18		C.4.4.3	Bioremediation	PCB Levels	
	C- 7.19		C.4.4.3	Bioremediation	In-situ	
	C- 7.20		C.4.4.1	Remediation	Technology	
	C- 7.21		B.7.General	Ecological	Risk Assessment	
S&T Committee, Aulenbach	C- 5. 1		B.6.2.4	Exposure	Swimming	Absorption
	C- 5. 2		B.5.4.Gen	Sed. Transport	Density	Particles
	C- 5. 3		B.6.4.2	Fish Intake	Cancer Risk	

COMMENT DIRECTORY
Community Interaction Program

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
S&T Committee, Aulenbach	C- 5. 4		A.3.1	Revision	Editorial	
	C- 5. 5		B.6.2.1	Exposure	Population	
	C- 5. 6		A.2.4	Revision	Numerical	
	C- 5. 7		A.2.8	Revision	Numerical	
	C- 5. 8		A.3.3.3	Revision	Editorial	
	C- 5. 9		B.1.4	Revision	Editorial	
	C- 5.10		B.3.5.2	Revision	Editorial	
	C- 5.11		B.3.1	Revision	Editorial	
	C- 5.12		B.3.7.2	Revision	Editorial	
	C- 5.13		B.3.7.3	Revision	Editorial	
	C- 5.14		B.4.2.2	Revision	Editorial	
	C- 5.15		B.4.3.2	Revision	Editorial	
	C- 5.16		B.4.3.2	Revision	Editorial	
	C- 5.17		B.5.3.4	Revision	Editorial	
	C- 5.18		B.5.3.4	Revision	Editorial	
	C- 5.19		B.5.3.5	Revision	Editorial	
	C- 5.20		B.5.4.1	Revision	Editorial	
	C- 5.21		B.6.3.1	Revision	Editorial	
	C- 5.22		B.6.4.6	Revision	Editorial	
	C- 5.23		B.7.2.1	Revision	Editorial	
	C- 5.24		B.7.2.2	Revision	Editorial	
	C- 5.25		B.7.2.2	Revision	Editorial	
	C- 5.26		B.7.2.2	Revision	Editorial	
	C- 5.27		B.7.2.2	Revision	Editorial	
	C- 5.28		C.4.4.1	Revision	Editorial	
	C- 5.29		C.5	Revision	Editorial	
	C- 5.30		C.6	Revision	Editorial	
S&T Committee, Bonner	C- 8. 1		A.2.2	Sources	Loads	Data
	C- 8. 2		B.3.1	Data	Public	
	C- 8. 3		General	Work Plan		
	C- 8. 4		A.2.2	Sources	Loads	
	C- 8. 5		A.2.2	Sources	Loads	
	C- 8. 6		B.4.2.2	Scour	Work Plan	
	C- 8. 7		B.4.3.2	Remnant Deposit	Sources	
	C- 8. 8		B.5.1	Sed. Transport	Model	Work Plan
	C- 8. 9		B.6.General	Risk Assessment	Work Plan	
	C- 8.10		B.7.5.3	Risk Assessment	Toxicity	
	C- 8.11		B.4.5	Sediment	Water	Species
	C- 8.12		General	Work Plan		
	C- 8.13		I.2	Remnant Deposit		
	C- 8.14		Glossary	Revision	Editorial	
	C- 8.15		I.3.2	Remnant Deposit		
	C- 8.16		A.2.2	Loads	Sources	
	C- 8.17		A.1.2.2	Tidal Current		
	C- 8.18		A.1.2.2	Flow		
	C- 8.19		A.1.2.2	Runoff		
	C- 8.20		A.1.2.3	Flow	Work Plan	
	C- 8.21		References	Editorial		
	C- 8.22		A.1.4.1	Organic Carbon		
	C- 8.23		A.1.4.2	Flow	Velocity	Work Plan
	C- 8.24		A.1.4.3	Plankton		
	C- 8.25		A.1.4.3	Plankton		

COMMENT DIRECTORY
Community Interaction Program

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
S&T Committee, Bonner	C- 8.26		A.2.2	Loads	Sources	
	C- 8.27		A.2.2	Loads	Sources	
	C- 8.28		A.2.2	Loads	Sources	Data
	C- 8.29		A.2.2	Sources	Data	
	C- 8.30		A.2.2	Loads	Sources	Flow
	C- 8.31		A.2.2	Loads	Editorial	
	C- 8.32		A.2.2	Loads	Editorial	
	C- 8.33		A.2.8	Revision	Numerical	
	C- 8.34		A.2.2	Loads	Sources	
	C- 8.35		A.3.1	Sediment	Time Trend	
	C- 8.36		A.2.2	Loads	Sources	
	C- 8.37		A.3.1	Core Dating	Sources	Aroclor
	C- 8.38		A.3.1	Water Column	PCB Levels	
	C- 8.39		A.3.1	Editorial		
	C- 8.40		A.3.2	Water Column	Flow	PCB Levels
	C- 8.41		A.3.1	Water Column	PCB Levels	
	C- 8.42		A.3.3.2	Fish	Aroclor	Sources
	C- 8.43		A.4.1.1	Thomann	Load	Time Trend
	C- 8.44		A.4.1.3	Thomann		
	C- 8.45		A.4.1.3	Partitioning	Water	Sediment
	C- 8.46		A.4.1.3	Core Dating	PCB Levels	Sources
	C- 8.47		A.1.3.8	Water		
	C- 8.48		B.3.1	Sediment	Data	
	C- 8.49		B.3.2.2	Sediment	Sampling	
	C- 8.50		B.3.2.2	Data	Organic Carbon	
	C- 8.51		B.3.3.1	Flow	Sampling	
	C- 8.52		B.3.3.3	Sampling		
	C- 8.53		B.3.5.1	Air	Sampling	
	C- 8.54		B.4.2.2	Sediment	Loads	Time Trend
	C- 8.55		B.4.3.1	Water Column	PCB Levels	
	C- 8.56		B.5.2	Sed. Transport	Flocculation	
	C- 8.57		B.5.2	Sed. Transport	Time Trend	T.I.Pool
	C- 8.58		B.5.3.4	Flow	Model	
	C- 8.59		B.5.3.5	Model	Prediction	
	C- 8.60		B.5.3.5	Model	Calibration	
	C- 8.61		B.5.4.1	Editorial		
	C- 8.62		B.5.4.1	Model	Bed Erosion	
S&T Committee, Bopp	C- 6. 1		I.2	Site		
	C- 6. 2		B.4.4.Gen	Flood		
	C- 6. 3		B.4.4.Gen	Flood		
	C- 6. 4		B.3.4.Gen	Flood		
	C- 6. 5		A.2.2	Mass Balance	Loads	Sources
	C- 6. 6		B.4.4.Gen	Model	Thomann	
	C- 6. 7		B.3.2.4	Sediment	Sampling	Congener
	C- 6. 8		B.3.2.5	Sediment	Metals	
	C- 6. 9		B.3.5.1	Sampling	Qual. Assurance	
	C- 6.10		B.3.7.2	Aroclor	Sediment	Water Column
	C- 6.11		B.3.7.1	Aroclor	Sediment	
	C- 6.12		B.4.4.2	Time Trend	Fish	PCB Levels
	C- 6.13		B.5.1	Model	Sed. Transport	
	C- 6.14		A.1.3.7	Water Quality		
	C- 6.15		A.2.8	Revision	Numerical	

COMMENT DIRECTORY
Community Interaction Program

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
S&T Committee, Bopp	C- 6.16		B.3.5.1	Revision	Editorial	
S&T Committee, Bush	C- 2. 1		A.3.3.2	Aroclor	Estuary	Shore
	C- 2. 2		B.3.3.4	Sources	Aroclor	
S&T Committee, Davis	C- 4. 1		B.6.2.2	Fishing Ban	Fish Intake	Risk Assessment
S&T Committee, Putman	C- 3. 1		B.4.2.2	Time Trend	Data	
	C- 3. 2		B.4.3.1	Time Trend	Flow	Sediment
	C- 3. 3		B.4.3.1	Sediment	Core Dating	Data
	C- 3. 4		B.4.3.1	Data	Consistency	Loads
	C- 3. 5		B.4.3.1	Loads	Time Trend	Analysis
	C- 3. 6		B.4.3.1	Remnant Deposit	Flow	Sediment
	C- 3. 7		B.4.3.2	Sediment	Fort Edward	Data
	C- 3. 8		B.5.4.Gen	Sed. Transport	Model	Difficulties
	C- 3. 9		B.6.3.4	Congener	Aroclor	Bioaccumulation

COMMENT DIRECTORY
Public Interest Group or Individual

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
ARCC Legis. Comm., McMillen	P- 16. 1	FE	C.4.2.Gen	Remediation	No Action	Biodegradation
Anero, Michael	P- 15. 1	P	B.3.1	Data	Public	
	P- 15. 2	P	General	CIP	Role	Decision Making
	P- 15. 3	P	C.2	Remediation	Fishery	Risk Assessment
	P- 15. 4	P	B.7.2.1	Species	Risk Assessment	
Anzevino, Jeffrey	P- 10. 1	P	C.2	Remediation	Fishery	Risk Assessment
	P- 10. 2	P	B.4.3.3	Sed. Transport	Loads	
Bloomstock, Ann	P- 33. 1	P	C.2	Remediation	Cost	
Buccellato, Paul	P- 8. 1	P	C.2	Remediation	Water	Cost
Burliuk, Ian	P- 11. 1	P	C.2	Remediation	Fishery	Risk Assessment
	P- 11. 2	P	C.4.2.Gen	Dechlorination	Biodegradation	
CEASE, Ruggi	P- 20. 1	FE	B.4.3.2	Loads	Remnant Deposit	Sampling
	P- 20. 2	FE	B.6.3.4	Toxicity	Aroclor	
	P- 20. 3	FE	B.6.2.2	Fish Intake		
	P- 20. 4	FE	B.6.2.2	Fish Intake	Fishing Ban	Risk Assessment
	P- 20. 5	FE	C.4.5	Landfilling		
	P- 20. 6	FE	C.2	Remediation	Dredging	
	P- 20. 7	FE	A.2.2	Sources	Loads	Sampling
Clearwater, Kent	P- 3. 1	P	Summary	Data	Misleading	
	P- 3. 2	P	A.2.2	Sources	Loads	Site
	P- 3. 3	P	A.3.3.2	Fish	Sources	Aroclor
	P- 3. 4	P	A.3.3.2	Striped Bass	Time Trend	PCB Levels
	P- 3. 5	P	A.4.1.1	Thomann	Peer Review	
	P- 3. 6	P	A.3.3.2	Striped Bass	PCB Levels	Thomann
	P- 3. 7	P	B.6.5	Risk Assessment	Fish Intake	Lower Hudson
	P- 3. 8	P	A.3.3.Gen	Fish	PCB Levels	Time Trend
	P- 3. 9	P	B.4.4.2	Time Trend	Fish	Flood
	P- 3.10	P	B.3Synopsis	Sources	Remediation	
	P- 3.11	P	B.4.2.1	Flood		
	P- 3.12	P	B.4.3.3	Sed. Transport	Loads	Flood
	P- 3.13	P	C.4.2.Gen	Dechlorination	Biodegradation	
	P- 3.14	P	C.4.2.Gen	Biodegradation	Dechlorination	Remediation
	P- 3.15	P	Summary	Data	Editorial	
	P- 19. 1	FE	C.2	Remediation	Fishery	Risk Assessment
Coffman, John	P- 18. 1	FE	C.4.2.Gen	Dechlorination	Biodegradation	Dredging
Eltiks, Don	P- 42. 1	P	A.1.3.8	Chemicals	Water	
Fed. Conservationists, LeLash	P- 13. 1	P	C.2	Remediation	Risk Assessment	
	P- 13. 2	P	B.4.3.3	Sed. Transport	Loads	
Gordon, David	P- 40. 1	P	C.2	Remediation	Dredging	
Grim, John	P- 14. 1	P	A.2.2	Sources	Aroclor	Work Plan
	P- 14. 2	P	B.4.4.3	Dechlorination	Bioaccumulation	Work Plan
	P- 14. 3	P	B.4.2.1	Flood	Scour	
	P- 14. 4	P	C.4.5	Remediation	Work Plan	
	P- 14. 5	P	C.2	Remediation		
	P- 14. 6	P	C.4.4.3	Remediation	Biodegradation	
Haight, Laura	P- 6. 1	P	C.2	Remediation	Dredging	
	P- 6. 2	P	General	CIP	Decision Making	Role
	P- 6. 3	P	C.4.4.3	Remediation	Biodegradation	
Hoffman, Ed	P- 30. 1	P	C.2	Remediation		
Industsie, Joan	P- 43. 1	P	C.2	Remediation		
Jahan-Parwar, Behrus	P- 21. 1	FE	B.6.3.2	Toxicity		
	P- 21. 2	FE	B.6.3.4	Toxicity	Congener	

COMMENT DIRECTORY
Public Interest Group or Individual

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
Kaplan, Steve	P- 31. 1	P	B.4.5	Time Trend	Fish	PCB Levels
	P- 31. 2	P	C.2	Remediation	Fishery	
Kendall, Andrea	P- 34. 1	P	B.6.4.6	Chemicals		
	P- 34. 2	P	A.1.3.8	Chemicals	Water	
Lake, Tom	P- 9. 1	P	C.2	Remediation	Fishery	Risk Assessment
	P- 23. 1	P	A.1.4.3	Species	Fish	Data
Lapownenta, Katherine	P- 22. 1	P	A.1.3.6	Water Quality	Sewage	
Locker, Bill	P- 39. 1	P	A.General	Resources	Species	Site
Magaleer, Brian	P- 36. 1	P	C.2	Remediation	Fishery	
McGill, Jane	P- 28. 1	P	A.1.3.8	Lower Hudson	Water Quality	
Miller, Bob	P- 27. 1	P	General	CIP	Role	Decision Making
Morrison, Joe	P- 38. 1	P	C.2	Remediation	Cost	Fishery
PCB Action Coalition, Bouvier	P- 12. 1	P	C.2	Remediation	Fishery	Risk Assessment
	P- 12. 2	P	A.General	Risk Assessment	Ecological	Lower Hudson
	P- 12. 3	P	General	CIP	Role	Lower Hudson
	P- 12. 4	P	General	Data	GE	
	P- 12. 5	P	B.4.3.3	Sed. Transport	Loads	Flood
	P- 12. 6	P	C.2	Remediation	Risk Assessment	Fishery
Page, Howard	P- 29. 1	P	General	CIP	Role	New Jersey
	P- 29. 2	P	C.2	Remediation	Dredging	
	P- 29. 3	P	A.2.2	Sources	Loads	
	P- 29. 4	P	B.2.2	Sources	PCB Levels	
	P- 29. 5	P	General	CIP	Role	Decision Making
Pesso, Mary	P- 24. 1	P	C.2	Remediation	Risk Assessment	
Powell, Jon	P- 7. 1	P	C.2	Remediation	Fishery	Fishing Ban
Samari	P- 32. 1	P	C.2	Remediation	Fishery	
Sanders, John	P- 17. 1	FE	B.4.2.1	Loads	Flood	
	P- 17. 2	FE	B.4.4.3	PCB Levels	Water Column	Fish
Scenic Hudson, Gelber	P- 2. 1	P	C.2	Remediation		
	P- 2. 2	P	B.4.3.3	Sed. Transport	Loads	Flood
	P- 2. 3	P	B.6.2.2	Fish Intake	Toxicity	
	P- 2. 4	P	C.2	Remediation	Fishery	
	P- 2. 5	P	C.2	Remediation	History	
	P- 2. 6	P	Summary	Data	Misleading	
	P- 2. 7	P	A.2.2	Aroclor	Sources	
	P- 2. 8	P	C.2	Remediation	Lower Hudson	Sources
	P- 2. 9	P	B.3.7.Gen	Aroclor	Dechlorination	
	P- 2.10	P	General	CIP	Decision Making	Role
	P- 2.11	P	General	CIP	Role	Lower Hudson
Scenic Hudson, Lee	P- 1. 1		C.2	Remediation	History	
	P- 1. 2		Summary	Data	Editorial	
	P- 1. 3		Summary	Data	Missing	
	P- 1. 4		B.6.5	Fish Intake	Fishing Ban	Lower Hudson
	P- 1. 5		C.2	Remediation	History	
	P- 1. 6		Summary	Data	Misleading	
	P- 1. 7		B.4.3.3	Sed. Transport	Loads	Flood
	P- 1. 8		B.3.7.Gen	Aroclor	Dechlorination	
	P- 1. 9		A.2.2	Sources	Loads	
	P- 1.10		A.3.3.1	Fish	Sampling	Site
	P- 1.11		C.2	Remediation	Lower Hudson	Sources
	P- 1.12		A.3.3.Gen	PCB Levels	Time Trend	Flood
	P- 1.13		A.3.3.Gen	Bioaccumulation	Fish	Water Column

COMMENT DIRECTORY
Public Interest Group or Individual

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
Scenic Hudson, Lee	P- 1.14		A.3.3.2	Half-life		
	P- 1.15		A.3.3.2	Fish	Sources	Aroclor
	P- 1.16		B.6.5	Risk Assessment	Fish Intake	Lower Hudson
	P- 1.17		B.3.2.2	Sediment	Sampling	Time Trend
	P- 1.18		B.4.3.3	Sed. Transport	Loads	Flood
	P- 1.19		B.4.3.1	Water Column	Sed. Transport	
	P- 1.20		B.4.3.2	Sed. Transport	Time Trend	
	P- 1.21		B.4.4.2	Time Trend	Fish	Flood
	P- 1.22		B.6.5	Fish Intake	Risk Assessment	Lower Hudson
	P- 1.23		B.7.General	Data	Analysis	Species
Shanatal, Gerald	P- 37. 1	P	C.2	Remediation	Dredging	
	P- 37. 2	P	A.1.3.8	Water	PCB Levels	
Sierra Club, Perls	P- 5. 1	P	B.4.3.3	Sed. Transport	Loads	
	P- 5. 2	P	C.2	Remediation	Fishery	Risk Assessment
	P- 5. 3	P	C.4.2.Gen	Dechlorination	Biodegradation	
Sinclair, Neil	P- 4. 1	P	C.2	Remediation	Risk Assessment	Fishery
Taglia, Vic	P- 25. 1	P	C.2	Remediation		
Walters, Bob	P- 26. 1	P	General	CIP	Role	Lower Hudson
	P- 26. 2	P	C.2	Remediation	Fishery	Risk Assessment
Zamillian, Robert	P- 35. 1	P	C.2	Remediation	Cost	
Zimmerman, Marianne	P- 41. 1	P	B.6.2.2	Fish Intake	Risk Assessment	

COMMENT DIRECTORY
General Electric

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	2	3
GE	G- 3. 1		C.4.2.Gen	Remediation	Dechlorination	Biodegradation
	G- 3. 2		I.2	Purpose		
	G- 3. 3		B.4.4.3	PCB Levels	Time Trend	
	G- 3. 4		B.6.3.4	Toxicity		
	G- 3. 5		C.4.2.Gen	Biodegradation		
	G- 3. 6		B.6.2.2	Fish Intake	Fishing	
	G- 3. 7		B.2.3	Sources		
	G- 3. 8		B.6.1	Remnant Deposit	PCB Levels	
	G- 3. 9		C.4.3	Remediation	Dredging	
	G- 3.10		B.7.General	Ecological	Risk Assessment	Dredging
	G- 3.11		C.4.5	Remediation	Dredging	
	G- 3.12		A.4.2	Thomann	Fish	PCB Levels
	G- 3.13		B.4.5	Fish	Sediment	Water Column
	G- 3.14		C.4.2.Gen	Biodegradation		
	G- 3.15		A.2.2	Sources	Loads	Estuary
	G- 3.16		A.3.3.2	PCB Levels	Sources	
	G- 3.17		General	Data	Work Plan	
	G- 3.18		General	CIP		
	G- 3.19		B.4.5	Model	Data	Analysis
	G- 3.20		B.4.2.1	Flood	Erosion	Sed. Transport
	G- 3.21		B.4.2.2	Sed. Transport	T.I.Pool	Sources
	G- 3.22		B.5.2	Sed. Transport	Model	
	G- 3.23		B.5.3.1	Model	Hydrodynamic	
	G- 3.24		B.5.4.1	Sed. Transport	Model	Streambed
	G- 3.25		B.5.4.2	Model	Sed. Transport	Streambed
	G- 3.26		B.5.2	Sed. Transport	Model	
	G- 3.27		B.5.4.1	Sed. Transport	Model	Streambed
	G- 3.28		B.5.4.1	Sed. Transport	Model	Data
	G- 3.29		A.3.1	Sediment	Core Dating	
	G- 3.30		B.4.3.2	Sed. Transport	Loads	T.I.Pool
	G- 3.31		B.4.4.1	Time Trend	PCB Levels	Congener
	G- 3.32		B.4.4.1	Water Column	PCB Levels	Time Trend
	G- 3.33		B.4.4.1	Fish	Time Trend	PCB Levels
	G- 3.34		A.3.3.Gen	PCB Levels	Time Trend	
	G- 3.35		B.6.3.4	Toxicity	Risk Assessment	
	G- 3.36		B.6.3.4	Toxicity	Congener	
	G- 3.37		B.6.3.4	Toxicity	Uncertainty	
	G- 3.38		B.6.3.4	Toxicity	Congener	
	G- 3.39		B.6.3.5	Epidemiology	Cancer Risk	
	G- 3.40		B.6.3.4	Toxicity	Congener	Cancer Risk
	G- 3.41		B.6.3.2	Toxicity	Non-Cancer Risk	
	G- 3.42		B.6.2.1	Exposure	Pathways	
	G- 3.43		B.6.2.2	Fish Intake		
	G- 3.44		B.6.3.4	Exposure	Sediment	
	G- 3.45		B.6.2.2	Fish Intake		
	G- 3.46		B.6.2.4	Exposure	Sediment	Water
	G- 3.47		B.6.3.4	Risk	Fish	Time Trend
	G- 3.48		B.7.General	Data	Analysis	Species
	G- 3.49		B.7.1	Data	Method	
	G- 3.50		B.7.2.Gen	Ecological	Data	
	G- 3.51		B.7.5.Gen	Data	Work Plan	
	G- 3.52		B.7.3.Gen	PCB Levels	Species	Site

COMMENT DIRECTORY
General Electric

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
GE	G- 3.53		B.7.4.Gen	Toxicity		
	G- 3.54		C.2	Remediation	Ecological	Risk
	G- 3.55		B.7.3.1	Exposure	Ecological	
	G- 3.56		B.7.3.2	Species	Ecological	Risk
	G- 3.57		B.7.3.3	Exposure	Risk	Quantification
	G- 3.58		B.7.4.Gen	Toxicity		
	G- 3.59		B.7.5.Gen	Risk		
	G- 3.60		B.7.5.3	Fish	Toxicity	Guidelines
	G- 3.61		B.7.5.4	Birds	Toxicity	Guidelines
	G- 3.62		B.7.5.5	Mink	Toxicity	Guidelines
	G- 3.63		B.7.4.3	Water	Guidelines	
	G- 3.64		B.7.4.3	Fish	Guidelines	
	G- 3.65		C.4.3	Remediation	Dredging	
	G- 3.66		B.7.General	Ecological	Risk Assessment	Dredging
	G- 3.67		C.4.3	Remediation	Dredging	
	G- 3.68		B.7.General	Ecological	Risk Assessment	Dredging
	G- 3.69		C.4.3	Dredging	Navigation	
	G- 3.70		B.6.General	Human Health	Risk	Dredging
	G- 3.71		C.3.2.2	ARARS	Dredging	Jurisdiction
	G- 3.72		C.4.2.1	Dechlorination	Data	
	G- 3.73		C.4.2.2	Dechlorination	Aerobic	
	G- 3.74		C.4.2.Gen	Biodegradation	Data	
	G- 3.75		C.4.2.3	Dechlorination	Data	
	G- 3.76		C.4.4.3	Remediation	Biodegradation	
	G- 3.77		A.2.2	Sources	Loads	Data
	G- 3.78		A.2.2	Core Dating	Sources	
	G- 3.79		A.3.3.2	PCB Levels	Sources	
	G- 3.80		A.4.1.4	Striped Bass	Food Chain	Thomann
	G- 3.81		A.3.3.2	Fish	Sources	Aroclor
	G- 3.82		A.2.2	Sources	Loads	
	G- 3.83		A.2.3	Sources	Loads	Sewage
	G- 3.84		A.2.3	Sources	Loads	Tributaries
	G- 3.85		A.2.7	Sources	Loads	Leachate
	G- 3.86		A.2.5	Sources	Loads	CSO
	G- 3.87		A.2.6	Sources	Loads	Air
	G- 3.88		B.4.3.3	Sed. Transport	Mass	Loads
	G- 3.89		B.2.1	Sources	Loads	
	G- 3.90		A.2.2	Sources	Data	Work Plan
	G- 3.91		General	Work Plan	Objectives	
	G- 3.92		B.6.4.Gen	Risk		
	G- 3.93		C.4.3	Remediation	Dredging	
	G- 3.94		C.4.2.Gen	Dechlorination	PCB Levels	Biodegradation
	G- 3.95		A.2.2	Sed. Transport	Mass	Loads
	G- 3.96		B.4.1	Model	PCB Levels	
GE, Abramowicz	G- 2. 1	FE	C.4.2.Gen	Biodegradation		
GE, Appendix A (p. 1-32)	G- 4. 1		B.2.1	Sources	Upper Hudson	
	G- 4. 2		Summary	Dam	Fort Edward	
	G- 4. 3		A.3.3.1	Fishing Ban	Striped Bass	
	G- 4. 4		A.2.2	Sources	Loads	
	G- 4. 5		A.3.1	Sources	Sediment	Time Trend
	G- 4. 6		B.6.3.4	Toxicity	Cancer Risk	
	G- 4. 7		B.6.3.2	Toxicity	Non-Cancer Risk	

COMMENT DIRECTORY
General Electric

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
GE, Appendix A (p. 1-32)	G- 4. 8		General	Sampling	Phase 2	
	G- 4. 9		General	Work Plan	Phase 1	
	G- 4.10		I.2	Site	Remnant Deposit	
	G- 4.11		I.3.1	Sources		
	G- 4.12		I.3.2	Flood		
	G- 4.13		A.2.2	Sources	Loads	
	G- 4.14		A.1.1.2	Precipitation	Time Trend	
	G- 4.15		References	Editorial	Revision	
	G- 4.16		A.1.4.3	Fish	Abiotic Factors	
	G- 4.17		A.1.4.3	Revision	Numerical	
	G- 4.18		A.2.1	Congener		
	G- 4.19		A.2.2	Sources	Loads	
	G- 4.20		A.3.1	Sources	Sediment	Time Trend
	G- 4.21		B.3.2.3	Sediment	Core Dating	
	G- 4.22		A.2.4	Revision	Numerical	
	G- 4.23		A.2.6	Sources	Loads	Atmosphere
	G- 4.24		A.2.8	Revision	Numerical	
	G- 4.25		A.3.1	Sources	Sediment	Time Trend
	G- 4.26		A.3.1	Core Dating	Sediment	Time Trend
	G- 4.27		A.3.1	Core Dating	Sources	
	G- 4.28		A.3.2	Water Column	PCB Levels	
	G- 4.29		A.3.3.1	Fishing Ban	Striped Bass	
	G- 4.30		B.3.1	Data	Public	
	G- 4.31		A.3.3.1	Fish	Sampling	
	G- 4.32		A.3.3.1	Fish	Aroclor	Detection Limit
	G- 4.33		A.3.3.2	Striped Bass	Sources	PCB Levels
	G- 4.34		A.3.3.1	Aroclor	Detection Limit	
	G- 4.35		A.3.3.1	Fish	Sampling	
	G- 4.36		A.3.3.2	Striped Bass	Aroclor	PCB Levels
	G- 4.37		B.1.2.1	Water Quality		
	G- 4.38		B.1.2.2	Water	Use	
	G- 4.39		B.1.2.2	Water	Navigation	
	G- 4.40		B.2.1	Sources	Upper Hudson	
	G- 4.41		B.3.1	Data	Qual. Assurance	Public
	G- 4.42		B.3.1	Data		
	G- 4.43		B.3.1	Sediment	Data	Detection Limit
	G- 4.44		B.3.2.1	Sediment	PCB Levels	
	G- 4.45		B.3.2.2	Sediment	PCB Levels	T.I.Pool
	G- 4.46		B.3.2.3	Sediment	Core Dating	
	G- 4.47		B.3.2.4	Data	Revision	
	G- 4.48		B.3.2.5	Metals	Sediment	
	G- 4.49		B.3.1	Data	Public	
	G- 4.50		B.3.3.1	Flood	Remnant Deposit	
	G- 4.51		B.3.3.3	Data	Sediment	Water Column
	G- 4.52		B.3.3.3	Data	Water Column	
	G- 4.53		B.3.3.3	Water Column	Detection Limit	
	G- 4.54		B.3.3.3	Data	Water Column	Analysis
	G- 4.55		B.3.3.3	Water Column	Sources	Loads
	G- 4.56		B.4.3.1	Water Column	PCB Levels	Time Trend
	G- 4.57		B.3.3.3	Data	Water Column	Analysis
	G- 4.58		B.3.3.4	Water Column	PCB Levels	Navigation
	G- 4.59		B.3.3.4	Water Column	Biodegradation	Congener

COMMENT DIRECTORY
General Electric

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
GE, Appendix A (p. 1-32)	G- 4.60		B.3.1	Data	Public	
	G- 4.61		B.3.4.Gen	Flood		
	G- 4.62		B.3.1	Data	Public	
	G- 4.63		B.3.4.1	Fish	PCB Levels	Analysis
	G- 4.64		B.6.2.2	Fish Intake	PCB Levels	Exposure
	G- 4.65		B.3.4.3	Chironomids	Congener	
	G- 4.66		B.3.5.1	Air	Data	
	G- 4.67		B.3.5.1	Air	Data	Analysis
	G- 4.68		B.3.5.1	Air	Water	
	G- 4.69		B.3.5.2	Plants	PCB Levels	
	G- 4.70		B.3.7.1	Aroclor	Data	
	G- 4.71		B.3.7.Gen	Aroclor	Qual. Assurance	
	G- 4.72		B.4.1	Model	Food Chain	
	G- 4.73		B.4.2.1	Flood		
	G- 4.74		B.4.2.2	Sediment	Sed. Transport	
	G- 4.75		B.4.2.2	Sediment	Sed. Transport	Time Trend
	G- 4.76		B.4.3.1	Sed. Transport	Dredging	
	G- 4.77		B.4.3.1	Flood		
	G- 4.78		B.4.3.2	Sed. Transport	PCB Levels	
	G- 4.79		B.4.5	Model	Data	Analysis
	G- 4.80		B.4.3.3	Sed. Transport	Upper Hudson	Lower Hudson
	G- 4.81		B.4.3.3	Sources	Sediment	Time Trend
	G- 4.82		B.4.4.Gen	PCB Levels	Time Trend	Remediation
	G- 4.83		B.4.4.Gen	PCB Levels	Time Trend	Dredging
	G- 4.84		B.4.4.2	PCB Levels	Time Trend	Risk Assessment
	G- 4.85		B.4.4.1	PCB Levels	Fish	Analysis
	G- 4.86		B.4.4.3	PCB Levels	Bioaccumulation	Aroclor
GE, Appendix A (p. 33-48)	G- 5. 1		General	Data	Qual. Assurance	Phase 2
	G- 5. 2		B.4.5	PCB Levels	Time Trend	
	G- 5. 3		B.5.2	Sed. Transport	Scour	T.I.Pool
	G- 5. 4		B.6.1	Site	PCB Levels	Risk Assessment
	G- 5. 5		B.6.2.2	Fishing	Fish Intake	Site
	G- 5. 6		B.6.2.2	Fishing Ban	Remediation	
	G- 5. 7		B.6.2.2	Fish Intake	PCB Levels	Exposure
	G- 5. 8		B.4.4.1	PCB Levels	Fish	Analysis
	G- 5. 9		B.6.2.2	Data	Breast Milk	
	G- 5.10		B.6.2.4	Sediment	Exposure	
	G- 5.11		B.6.2.4	Sediment	Exposure	Data
	G- 5.12		B.6.2.4	Exposure	Sediment	Intake
	G- 5.13		B.6.2.4	Exposure	Water Column	Dermal
	G- 5.14		B.6.3.4	Toxicity	Congener	
	G- 5.15		B.6.3.5	Fish	Toxicity	Aroclor
	G- 5.16		B.6.3.4	Toxicity	Cancer Risk	
	G- 5.17		B.6.4.6	Toxicity	Data	Public
	G- 5.18		B.6.4.6	Toxicity	Risk	Uncertainty
	G- 5.19		B.6.5	Risk Assessment	Human Health	Lower Hudson
	G- 5.20		B.7.2.1	Ecological	Data	
	G- 5.21		B.7.2.2	Ecological	Species	
	G- 5.22		B.7.2.2	Water Quality		
	G- 5.23		B.7.3.3	Species	Data	Exposure
	G- 5.24		B.7.4.Gen	Toxicity	Species	Risk
	G- 5.25		C.1	Remediation	Data	Phase 2

COMMENT DIRECTORY
General Electric

NAME/AGENCY	COMMENT CODE	PUBLIC MEETING	REPORT SECTION	KEY WORDS 1	KEY WORDS 2	KEY WORDS 3
GE, Appendix A (p. 33-48)	G- 5.26		C.2	Remediation	Objectives	
	G- 5.27		C.2	Remediation	No Action	Dredging
	G- 5.28		C.3.3.Gen	ARARS		
	G- 5.29		C.4.1	Remediation	Capping	
	G- 5.30		C.4.3	Dredging	Data	
	G- 5.31		C.4.3	Dredging	Feasibility	
	G- 5.32		C.4.4.Gen	Remediation	Data	Objectives
	G- 5.33		C.4.4.1	Remediation	Landfilling	Incineration
	G- 5.34		C.4.4.1	Remediation	Objectives	Technology
	G- 5.35		C.4.4.1	Technology		
	G- 5.36		C.4.4.1	Technology	References	Data
	G- 5.37		C.4.4.1	Technology	Feasibility	
	G- 5.38		C.4.4.1	Technology	Feasibility	
	G- 5.39		C.4.4.1	Technology	References	Data
	G- 5.40		C.4.4.1	Technology	Feasibility	
	G- 5.41		C.4.4.2	Incineration	Metals	
	G- 5.42		C.4.4.2	Incineration	Standards	
	G- 5.43		C.4.4.2	Incineration	Loads	Public
	G- 5.44		C.4.4.2	Incineration	Standards	
	G- 5.45		C.4.4.2	Incineration	Transport	Standards
	G- 5.46		C.4.4.2	Incineration	Feasibility	
	G- 5.47		C.4.4.3	ARARS		
	G- 5.48		C.4.4.3	Data	Work Plan	Bioremediation
	G- 5.49		C.4.5	Disposal		
	G- 5.50		C.4.5	Landfilling	Dredging	Standards
	G- 5.51		C.6	Remediation	Site	Objectives
	G- 5.52		C.6	Dredging	Data	
	G- 5.53		C.6	Disposal		
	G- 5.54		C.7	Bioremediation	Data	Work Plan
	G- 5.55		C.7	Bench Test		
	G- 5.56		References	Revision	Editorial	
	G- 5.57		General	Data	Public	CIP
GE, Appendix B	G- 6. 1		B.3.7.3	Data	Aroclor	Analysis
	G- 6. 2		B.3.2.4	Data	Revision	
GE, Appendix C	G- 7. 1		C.3.3.Gen	Standards	Qual. Assurance	
GE, Haggard	G- 1. 1	FE	B.4.4.1	PCB Levels	Time Trend	
	G- 1. 2	FE	A.4.2	Thomann	Fish	PCB Levels
	G- 1. 3	FE	A.2.2	Sources	Loads	Estuary
	G- 1. 4	FE	B.6.3.4	Toxicity	Congener	
	G- 1. 5	FE	C.4.2.Gen	Biodegradation		
	G- 1. 6	FE	I.3.2	Remediation	Remnant Deposit	
	G- 1. 7	FE	C.4.3	Remediation	Dredging	

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RESPONSES

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RESPONSES TO GENERAL COMMENTS ON PHASE 1

Responded to here are comments of a general nature that concern the overall Reassessment process or the entire Phase 1 Report, but do not pertain to a specific section of the Phase 1 Report.

Response to C-10.1

Regarding the scope of media publicity for the Community Interaction Program (CIP) meetings at Fort Edward on September 12, 1991, USEPA notes that many newspapers, radio stations and television stations (27 in all) in the towns from Fort Edward to Troy were sent press releases announcing the September 12 meeting as well as the public availability session held on September 5, 1991 in Saratoga Springs. USEPA has no control over how the media choose to publicize events such as a public meeting.

Response to G-3.18

The three-phased approach to the Reassessment was established so that CIP participants and other interested organizations would have intermediate points within the Reassessment to review USEPA's work. USEPA has been fair and reasonable in affording individuals and organizations time to comment on project plans. In addition, USEPA held meetings over the course of the Phase 1 work to discuss technical matters. USEPA believes that it is most suitable to receive technical input following submission of a written document. USEPA will continue to utilize this approach throughout the Reassessment. USEPA allowed a 60-day comment period for the Phase 1 Report, which is 30 days more than normally provided on most Superfund sites.

Response to C-1.9, P-15.2, P-6.2, P-27.1, P-29.5, P-2.10

The CIP has been set up by USEPA because public comment is important in the decision-making process. USEPA also invited interested scientists to serve on the CIP Scientific and Technical Committee. The committee is not an advisory committee; rather, it reviews technical approaches and documents provided by USEPA's team for the Reassessment.

In March 1992, USEPA made some modifications and clarifications to the manner in which the Committee functions. USEPA selected Dr. William Nicholson of the Mount Sinai Medical Center to facilitate the Committee's meetings. With Dr. Nicholson as a facilitator, the need for a committee member to serve as chair has been obviated. Committee recommendations are now presented by the facilitator, in writing, to the chair of the Hudson River PCB Oversight Committee, based on the discussions and written comments of the Scientific and Technical Committee members. These recommendations include dissenting and/or minority positions. These actions were undertaken to enhance the ability of the Scientific and Technical Committee members to contribute to the Reassessment process and eliminate controversy or concern over leadership. The Committee, it should be emphasized, is not an independent peer review board; USEPA remains the final decision-maker in the Reassessment process.

USEPA has no jurisdiction over GE's publications and encourages participants in the CIP to submit articles to USEPA's publication, "River Voices."

<u>Response to C-8.3, C-8.12</u>

It is USEPA's intent to complete the remedial investigation portion of the Reassessment in Phase 2. The Fall 1991 schedule has not been met; sampling will begin in Spring 1992.

<u>Response to C-1.7, C-1.8, C-9.9, L-2.1, P-12.3, P-2.11, P-29.1, P-26.1</u>

The USEPA Regional Administrator for Region II is the final decision-maker for the Hudson River PCB Reassessment. NYSDEC's position on their Project Action Plan schedule was published with the January 21, 1992 Hudson River Oversight Committee meeting minutes. The CIP was established by USEPA because the agency wants to receive public comment throughout the Reassessment process. USEPA believes that it is conducting the Reassessment in an objective and open manner. USEPA will continue to choose the location of the community meetings in a fair and reasonable manner, and attempts to hold these meetings in central and convenient locations to all parties. It is USEPA's intent to hold meetings at locations along the Hudson in New York State but not in New Jersey.

Response to G-4.8, G-4.9

Comments on the Phase 1 Work Plan are available in the Administrative Record file. A Responsiveness Summary containing comments and responses to the Phase 1 Work Plan - Review Copy will be compiled. As Phase 1 has been completed, USEPA sees no need to issue a final work plan for that phase of work.

USEPA has announced that it will not seek comments on the Phase 2A Sampling Plan prior to initiation of the work. The Scientific and Technical Committee members provided useful comments and input to the sampling activities presented in the Phase 2A Plan. In addition, GE submitted comments to USEPA regarding the Phase 2A Sampling Plan, which have been considered by USEPA and its consultants.

Response to G-5.1, G-5.57

A Quality Assurance Project Plan was established for the sampling activities specified in the Phase 2A Sampling Plan and approved by USEPA's technical staff. The data quality objectives for the program have been specified therein. Historic data have been used in the Phase 1 Report, which presents a discussion (B.3.7.2) on the quality and limitations of the historic data. It is beyond the scope of the Community Interaction Program to establish a central library of all sources and information used for the project. Documents that have been and will be prepared as part of the Reassessment are held at 16 repositories (see Table 2 under the first tab).

Response to G-3.17

An objective in preparing the Phase 1 Report was to provide participants in the CIP with project information early on in the process. USEPA has received comments on the findings presented in the Phase 1 document, is responding to them in this Responsiveness Summary, and has incorporated comments in the Phase 2 Work Plan as appropriate.

USEPA has discussed elsewhere in this Responsiveness Summary the specific seven items listed. USEPA considers the Phase 1 Report to be of high technical quality and believes that it meets the objectives outlined in the Scope of Work and the Phase 1 Work Plan.

Response to G-3.91

USEPA believes that the Phase 1 Report presents data in a scientifically responsible manner and intends to complete the Reassessment in a similar manner. USEPA has responded to GE's commentary on the Phase 1 Report more specifically elsewhere in this Responsiveness Summary, as listed in the Comment Directory.

Response to P-12.4

The purpose of Phase 1 was to collect all available information to determine what additional data would need to be collected and evaluated so that USEPA could complete its Reassessment. In this process USEPA did not rely heavily on GE's data.

Response to S-1.2, C-7.1

The Phase 1 Report does not make recommendations from the data analyzed in Phase 1. The Phase 1 results and comments will be used to formulate an approach for sampling, analysis and other studies in Phases 2 and 3.

Response to L-3.3

USEPA understands that NYSDOH is currently assessing a catch and release fishing program for the Upper Hudson. New York State emphasizes, however, that such a program would not obviate the need for remediation of PCB-contaminated sediments.

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RESPONSES TO COMMENTS ON EXECUTIVE SUMMARY

Comments addressing specific or technical points in the Executive Summary are answered in the appropriate section referencing the main report. Responded to here are comments dealing with editorial revisions or recommendations and concerns about the overall nature of the Executive Summary. Revisions are shaded to indicate the revised word or phrase.

Response to C-9.1, P-3.1, P-3.15, P-2.6, P-1.2, P-1.3, P-1.6

The Executive Summary was intended to provide a short and broad overview of the Phase 1 Report. Each Synopsis was intended to serve as a guide to the sections following it. USEPA recognizes the interest of CIP committee members and others to have more detailed information than that provided in the Executive Summary but at a less technical level than contained in the main report. USEPA also acknowledges the suggestion that in future reports, pertinent charts and tables be included either in the Summary or in the Synopses.

Various commentors have interpreted the information presented in the Executive Summary as not only broad, as intended, but misleading, as not intended. Because the Phase 1 document is lengthy and contains an abundance of technical data amassed over the past 15 years, a conscious attempt was made to highlight any new information, new analyses or possible new interpretations that had not been previously reported. To the extent that the Executive Summary or Synopses have provoked comment in this regard, they have served the purpose of alerting interest groups, CIP committees and others to the potential new implications of the Phase 1 review of existing data. To the extent that readers have found the Executive Summary or Synopses misleading, USEPA regrets this critique and will attempt to satisfy the needs for both brevity and specificity in future document summaries and synopses.

It was not the intent of the background section of the Executive Summary or the Introduction to the Phase 1 Report to review exhaustively the history of prior USEPA or New York State decisions regarding PCBs in the Hudson River. This information is publicly available, both in prior documents as well as documents prepared for this Reassessment, e.g. the CIP Plan, copies of which are available in the information repositories (see Table 2, under the first tab).

Review of the Phase 1 Report was conducted by the consultant's in-house Advisory Board and by scientists and expert staff both within Region 2 and throughout USEPA.

USEPA recognizes the economic and sociocultural impacts associated with the loss of commercial and recreational fishing. Because economic and sociocultural impacts per se were not the subject of the Phase 1 Report, they were not addressed in the Executive Summary.

<u>*Response to G-4.2*</u>

The sentence on page E-1, second paragraph of the Phase 1 Report, regarding removal of the Fort Edward Dam was not intended to imply that the dam belonged to GE, nor that GE removed it.

<u>*Response to F-1.4*</u>

Revise second sentence under Interim Ecological Risk Assessment on page E-12 of the Phase 1 Report to read: Data are currently insufficient to allow a quantitative ecological risk assessment.

I. RESPONSES TO COMMENTS ON INTRODUCTION

I.1 Purpose of Phase 1 Report

No comments are responded to in this section.

I.2 Purpose of Reassessment RI/FS

Response to C-8.13, G-4.10, C-6.1

The remnant area is defined in general as the area from Bakers Falls to Rogers Island. The sediments between Hudson Falls and Rogers Island have always been considered within the project limits and the Phase 1 Report is consistent on the project boundaries. The NPL site extends to the Battery in New York Harbor. The Reassessment, however, is for the No Action decision regarding the river sediments between Hudson Falls and Federal Dam at Troy.

Response to G-3.2

USEPA will make the appropriate decision for remediation based on a comparative analysis of nine criteria as required by the National Contingency Plan (NCP). If the results of these analyses reveal that there is a solution to the PCB problem in the Upper Hudson that is more appropriate than the previous No Action decision, in light of the requirements of CERCLA and the NCP, then USEPA will select this alternative, even though there may have been no change in site conditions.

I.3 Site History

I.3.1 Prior to 1980

Response to G-4.11

Revise second sentence of the first paragraph of Section I.3.1 on page I-3 of the Phase 1 Report to read: According to General Electric (GE), a GE capacitor manufacturing plant located in Fort Edward, New York began to use PCBs in 1946. Also, according to GE, a GE plant located in Hudson Falls, New York began the use of PCBs in 1952 (Brown, Jr. *et. al*., 1984).

I.3.2 Post 1980

Response to C-8.15, G-1.6

Remnant Area 1 is located in the center of the river just downstream from Bakers Falls. It is partly visible at normal river levels. This remnant deposit was not capped and may still be providing a source of PCBs into the water column and downstream sediments.

Response to G-4.12

The remnant deposits behind the former Thompson Island Dam became available to scour after the removal of the dam in 1973. A large amount of movement of these contaminated sediments occurred in 1973, particularly movement into the Thompson Island Pool. Past analysis of dated sediment cores at Lamont-Doherty suggests that a PCB contamination signal associated with 1973 is observable all the way downstream to New York Harbor. Additional mobilization of significant amounts of sediment-bound PCBs appears to have occurred during flood events of 1976, 1979 and 1983, with the last response being the weakest. The language in the Phase 1 Report was not meant to imply that the movement of PCBs in these events was greater than that of 1973.

I.4 Guide to Phase 1 Report

No comments are responded to in this section.

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RESPONSES TO COMMENTS ON PART A: LOWER HUDSON CHARACTERIZATION

SYNOPSIS PART A (Sections A.1 through A.4)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report. Responded to here are comments dealing with editorial revisions or recommendations and concerns of a more general nature.

Response to S-1.6

Revise third sentence of fourth paragraph in Synopsis Part A of the Phase 1 Report to read: Sediment cores in the New York metropolitan area also indicate that sediment is being influenced by loading from New York metropolitan area inputs. The historical sediment record indicates that Upper River sources have provided the dominant inputs to this portion of the river until recently. The Lower Hudson sources in the New York metropolitan area are now estimated to be on the same order as the Upper Hudson inputs.

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A. GENERAL

Response to F-1.11, F-2.2, F-3.1, F-3.2, F-3.4, F-3.5, F-3.14, P-12.2, P-39.1

The Phase 1 Work Plan stated that an ecological risk assessment would be performed only for the Upper Hudson in that phase. The ecological risk assessment outline by NOAA for the Lower Hudson will be reviewed and evaluated for Phase 2. The next phase will not include investigations to determine the sources (footprint) of PCBs in fish of the Lower Hudson. Historical and current NYSDEC fish data will be utilized. USEPA does not plan to conduct fish sampling in this Reassessment. An approach for determining the effects of remedial actions in the Upper Hudson on PCB levels in fish is presented in the Phase 2 Work Plan.

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A.1 Physical Site Characteristics

A.1.1 Hudson River Basin Characteristics

A.1.1.1 Drainage Areas

No comments are responded to in this section.

A.1.1.2 Climate

Response to G-4.14

Cyclic trends or lack of trends in rainfall have been discussed among climatologists for many years. The data presented do suggest a cyclic pattern. It is correct to note that the mid-1970s represented an unusually high period of rainfall. Comparable maxima occurred about 80 years prior in the 1890s and about 150 years prior in the 1820s.

A.1.2 Hydrology

A.1.2.1 Physical Characteristics

No comments are responded to in this section.

A.1.2.2 Freshwater Flow and Tributary Inputs

Response to C-8.17

Typical maximum tidal velocities in the Lower Hudson vary from location to location, because of the geometry of the river bed. In the saline portion of the estuary, the maximum tidal velocity is about two knots (1 m/s) with a typical tidal displacement of six miles.

Response to C-8.18

Mean monthly spring flow is five to seven times the mean monthly flow throughout the rest of the year. For water year 1962 (Figure A.1-2), the mean monthly flow for March was about 35,000 cfs (990 in m^3/s).

Response to C-8.19

Clarification of the last sentence in the second paragraph on page A.1-5 follows. The periodic flow pattern monitored at the Federal Dam at Troy is only part of the total freshwater flow pattern of the Lower Hudson. Added to the flow at Troy are the contributions from the other tributaries to the Lower Hudson, as explained in the third paragraph on page A.1-5 and in Figures A.1-3a and A.1-3b.

A.1.2.3 Circulation

Response to C-8.20

Circulation of the Lower Hudson on a quantitative basis will be considered in Phase 2, as needed and appropriate. Additional information is available in the literature cited in Section A.1.2.3, *e.g.*, Deck (1981) and Garvey (1990), and the following:

- Stedfast, D.A., 1982. *Flow Model of the Hudson Estuary from Albany to New Hamberg, New York*. USGS/WRI 81-55.
- Abood, K.A., 1977. *Evaluation of Circulation in Partially Stratified Estuaries as Typified by the Hudson River*. Ph.D. Thesis, Rutgers University, NJ.

A.1.3 Water Quality

A.1.3.1 Overview

Response to C-7.4

Quoted excerpts on the general water quality condition within the Hudson River were taken directly from NYSDEC (1990) and pertain specifically to the Lower and not the Upper Hudson. The text does not mention that water quality has improved steadily, but suggests that an overall improvement in water quality in recent years is linked to the construction of new sewage treatment plants and the upgrading of older facilities. Furthermore, it was also noted that there were still many segments of the Lower Hudson with water quality problems.

A.1.3.2 Salinity

A.1.3.3 Temperature

A.1.3.4 Dissolved Oxygen

A.1.3.5 Turbidity and pH

No comments are responded to in above Sections A.1.3.2 through A.1.3.5.

A.1.3.6 Municipal Wastewater Discharges

Response to P-22.1

There are many concerns regarding municipal wastewater discharges and public water supplies. These concerns will be considered in the Reassessment only with respect to potential PCB loadings, as the Reassessment is focused on PCB contamination in the Hudson River.

A.1.3.7 Phosphates and Nitrates

Response to S-1.18, C-6.14

The general discussion of phosphate and nitrate levels in the Lower Hudson was included as one indication of water quality. The estimates of phosphates and nitrates were taken directly from a variety of primary sources (Deck, 1981; Deck and Bopp, 1984; Garvey, 1990). The inclusion of phosphate and nitrate levels as well as salinity, dissolved oxygen, temperature, turbidity, pH and municipal wastewater discharges helps to characterize the overall water quality in the Lower Hudson. Similar elements of water quality have been addressed in other reviews of the Lower Hudson by Moran and Limburg (1986) and Cooper *et al.* (1988).

A.1.3.8 Classification and Use

Response to C-8.47

Lower Hudson withdrawals for public drinking water supply are listed in Table A.1-2 and on page A.1-11 of the Phase 1 Report.

Response to P-42.1, P-37.2, P-34.2, P-28.1

PCBs were and continue to be the focus of the Reassessment. A brief summary of water quality was presented for the Hudson; metals and several other synthetic organics in sediments are summarized in the Phase 1 Report (Section B.3.2.5).

The Waterford Treatment Plant study results are also presented in the Phase 1 Report. No PCBs are present above detection limits at the Waterford Treatment Plant. If historic PCB data are available for Poughkeepsie, they will be reviewed. Based on the historic USGS monitoring of the Lower Hudson (see A.3.2 in the Phase 1 Report), which shows that the Lower Hudson PCB water column levels are lower than those at Waterford, it is unlikely that PCBs pose a threat to drinking water at the present.

A.1.4 Aquatic Resources in the Lower Hudson

A.1.4.1 Conceptual Framework

<u>Response to C-8.22</u>

Although the efficiency of organic carbon utilization in the Hudson River is not clear, direct grazing of particulate carbon in the water column and grazing on particulate carbon incorporated in the sediments constitute a food resource for invertebrate populations (Gladden *et al*., 1986). As studies of most riverine systems indicate, more organic carbon may be in the dissolved rather than the particulate form. Since there are few data on which to base site-specific conclusions regarding the exact ratio of DOC/POC in the Hudson River, the DOC/POC questions remain unanswered. The carbon discussion centered on the relative importance of autochthonous versus allochthonous sources and the speculation that additional transformation steps via a dissolved carbon route may indicate that less energy is transferred to consumers compared to a direct grazing particulate carbon route.

A.1.4.2 Physical Constraints

<u>Response to C-8.23</u>

The proposed plans for Phase 2 do not include velocity measurements in the Lower Hudson. These measurements might be required if sediment scour and resuspension were being analyzed in this portion of the Hudson, but this level of investigation in the Lower Hudson is beyond the scope of the Reassessment.

A.1.4.3 Trophic Components in the Lower Hudson

Response to G-4.17

Revise second sentence in second paragraph on page A.1-24 of the Phase 1 Report to read: Some 66 native, freshwater residents... occur in the freshwater tidal areas with less than 0.3 parts per thousand (<0.3 ppt) salinity.

Response to C-8.24, C-8.25, G-4.16

There are many reasons for the large spatial and temporal variations in aquatic biota in the Lower Hudson River. For example, temperature, salinity, flow patterns and light intensity have been shown to influence species composition and productivity of phytoplankton populations. In addition, phytoplankton populations tend to concentrate in low-flushing, shallow regions. Although the exact fate of freshwater plankton populations between the middle and lower reaches remains unknown, more marine phytoplankton dominate the lower reaches (River Mile < 25), brackish water species dominate the middle reaches (River Mile 25-50), and freshwater species dominate the upper reaches (River Mile >50).

In addition to salinity, temperature, flow patterns and light intensity, aquatic biota may also be limited by dissolved oxygen concentrations. Definitive studies, however, correlating overall shifts in community composition to changes in dissolved oxygen are not available. Data that are available indicate that river flow is the largest single factor affecting most fish populations in the Lower Hudson River (Gladden *et al.*, 1988). It is recognized that changes in river flow may mediate changes in salinity and dissolved oxygen, but the overall pattern discussed is one based on spatial, temporal and trophic partitioning.

Response to P-23.1

The 140 species of resident and migrant fish cited were taken from a list of fish species compiled by Beebe and Savidge in 1988 in a study of fish species composition and distribution in the Hudson River estuary. The Phase 1 Report listed those species collected and/or reported in the Hudson River estuary in order to develop an overview of the fish populations specifically within the Lower Hudson. It is recognized that the entire Hudson from the source to River Mile 0, including the Mohawk subsystem, has 201 species (Smith and Lake, 1990).

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A.2 Sources of PCB Contamination

A.2.1 Description of PCBs

Response to G-4.18

With respect to contradictory information concerning octanol water partition coefficients and Henry's Law constants for PCBs on a homologue or congener basis, the information in the literature is not so much contradictory as it is representative of the degree of uncertainty associated with measuring octanol water partition coefficients and Henry's Law constants for sparingly soluble compounds. Mackay *et al.* (1992)[1] have recently published a compilation of physical/chemical properties of PCBs on a congener basis. This information will be used to provide a framework for assessing the transport and fate of PCBs in the Hudson.

A.2.2 Lower Hudson PCB Loadings

Revise last sentence of first paragraph on page A.2-3 of the Phase 1 Report to read: These additional PCB sources... currently originating upriver (Bopp and Simpson, 1989).

Response to P-1.9, P-2.7, P-3.2, P-14.1, P-20.7, P-29.3

Part of the scope of the Phase 1 investigation was to address the impact of the current Upper Hudson River PCB loading on the Lower Hudson. The discussions on the sources to the Lower Hudson are intended to examine the current Upper Hudson contribution in the context of other loadings so that the effects of any proposed remediation can be assessed for the Lower Hudson. With respect to remediation, historic contamination in the Lower Hudson derived from

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[1] Mackay, D., W.Y. Shiu, and K.C. Ma. 1992. *Illustrated Handbook of Physical-Chemical Properties and Environmental Fate for Organic Chemicals, Volume I: Monoaromatic Hydrocarbons, Chlorobenzenes, and PCBs*. Lewis Publishers Inc., Chelsea, MI.

the Upper Hudson will not be addressed. The examination of historic trends in the Lower Hudson will, however, aid in the estimation of the impact of the current Upper Hudson load, assuming trends exhibited in the past continue.

If a remediation for the Upper Hudson River is proposed, then it must be expected to improve conditions in the Hudson with respect to PCBs. To the extent that the Upper Hudson PCB load is not found to be important in portions of the Lower Hudson based on the data presented and subsequent investigation in Phase 2, remediation of sediments in the Upper Hudson River may not be justified on the basis of these Lower Hudson River portions alone.

One way to assess the importance of the Upper Hudson loading to the Lower Hudson is to assess all other loadings on an individual basis. However, this approach would require an exhaustive search of all potential PCB loads and is not necessary, given the scope of this Reassessment. Instead, the Phase 2 investigation will attempt to examine the Upper Hudson's contribution relative to the total of all other loads to the Lower Hudson. USEPA plans to sample various media from the Hudson, specifically sediments and water in the Upper Hudson and sediment only in the Lower Hudson, which integrate the impacts of all loadings. Based on historic studies that show the Upper Hudson source to have a relatively unique PCB congener mixture, or fingerprint, it should be possible to examine the relative contribution of the Upper Hudson source in sediment or water samples. In this manner, the relative impact of the Upper Hudson can be examined without necessarily determining the contributions of all other sources.

This examination will be performed on a congener-specific basis rather than the Aroclor basis done historically. The congener-specific method provides more information for the purposes of source identification and avoids the ambiguity of Aroclor designation. Aroclor identification is difficult in environmental samples, because environmental processes tend to alter the original congener mixture once it is released to the environment.

Response to C-8.1, C-8.4, C-8.5, C-8.16, C-8.26, C-8.27, C-8.28, C-8.29, C-8.30, C-8.31, C-8.32, C-8.34, C-8.36

The loadings of PCBs to the Lower Hudson were defined simply as inputs, without any consideration of losses via advection at the Battery, storage in sediments or other processes. Net loading or storage is the difference between the input and output fluxes, but this net effect was not considered in the Phase 1 Report. This balance will be examined as needed in Phase 2 to evaluate the impact of remedial alternatives on the Lower Hudson. It is the intention of the Phase 2 investigation to define further the importance of the PCB loading from the Upper Hudson relative to the other PCB loads to the Lower Hudson.

In the discussion of other PCB loading categories for the Lower Hudson, the loading from the Upper Hudson was inadvertently not presented in comparable units. The estimates of PCB loads to the Lower Hudson were made for various years between 1980 and 1990. The load from the Upper Hudson for this period ranged from 5.9 lb/day in 1980 to 0.85 lb/day in 1988, with the most recent load estimated at 1.3 lb/day in 1989, based on the data analysis presented in Part B of the Phase 1 Report. All other values are presented on a consistent unit basis.

The calculation of percent contributions is not appropriate for the data presented in Table A.2-2 of the Phase 1 Report, for several reasons. Primarily, the numbers in the table have too broad a range and are too crudely based to make a percent contribution calculation meaningful. Secondly, the estimates are made for various years throughout the 1980s, so that a consistent percent contribution basis cannot be made for any given year. Thirdly, the only actual evidence of the existence of these sources is from sediment samples collected in 1986, which suggest the combined total of all non-Upper Hudson sources at the Battery to be about equal to the Upper Hudson source. Samples dated around 1980 show the combined contributions from the Lower Hudson to be even less important during that time. These data are discussed in Section A.3.1.

The uncertainties associated with the various loading estimates are discussed in the appropriate sections contained within Section A.2, specifically Sections A.2.3 to A.2.8 of the Phase 1 Report. Because of the dispersed nature of these loadings, they are difficult to determine directly. If their contributions to the total river loading are important, *i.e.*, if they are comparable to that of the Upper Hudson source, then tidal stirring and mixing should ensure that their contributions are recorded in the sediments in broad areas of the river. Contributions important on only a very local scale will not be seen in the cores collected in or near the main part of the channel. As such, these local loadings must be relatively small.

There are many potential sources to the Lower Hudson. Estimates of their loadings have wide ranges and are based on model calculations constrained by a minimum number of actual measurements. Illegal discharge and spills are by their nature very difficult to quantify. These various individual contributions represent locally important inputs. Nevertheless, the best data available on their combined input suggest that they represent, in total, a PCB loading about equal to that of the Upper Hudson source.

<u>Response to C-6.5, S-1.3</u>

The mass balance approach will be used whenever practical in future reports. This approach serves to keep the various loads in perspective and focuses attention on uncertainties.

<u>Response to G-1.3, G-3.15, G-3.77, G-3.78, G-3.82, G-3.90, G-3.95, G-4.4, G-4.19</u>

The comments listed above fall into these basic categories.

- USEPA did not go far enough in their examination of PCB sources or potentially responsible parties for the Hudson River;
- USEPA did not indicate what steps will be taken to address data deficiencies; and

- The PCB distribution in the Lower Hudson can be explained best by a multiple source-minimal transport model.

With respect to PCB loadings, part of the scope of the Phase 1 investigation was to address the impact of the current Upper Hudson River PCB loading on the Lower Hudson. The first response to comments at Section A.2.2 deals with these questions.

In response to steps to be taken to address data deficiencies, the Phase 1 Report was not intended to serve as a work plan. The Phase 2 Work Plan, which addresses data requirements, was issued to CIP participants for review and comment on June 5, 1992.

With respect to explaining PCB distribution by a multiple source/minimal movement model of PCB transport, various historic Hudson River studies conducted by the USEPA, NYSDEC and the Lamont-Doherty Geological Observatory (LDGO), as well as recent studies commissioned by GE on sediment PCB levels, are cited. With the exception of the studies by LDGO, none of the referenced studies considered sediment deposition history, *i.e.*, none of the other studies had any indication of the year or years of sediment accumulation represented by the samples collected. This lack of information on deposition history greatly reduces the amount of information to be gleaned from the data on PCB transport, deposition or additional sources, as explained below.

In the sampling program conducted by Harza over much of the Hudson, each location was sampled from 0 to 6 inches (15 cm). The work by LDGO has indicated that deposition rates throughout much of the Lower Hudson range from much less than 0.2 cm/yr to 2 cm/yr. In the New York Harbor near the Battery, the deposition rate can be as high as 20 cm/yr. Assuming that time-dependent variations in PCB levels in sediments laid down over the past 40 years are similar to either the commentor's or LDGO's input scenario, the approximate PCB levels in three samples will vary as described below, if all three were subject to the same PCB input over time, but had deposition rates at 0.2, 1.0 and 20 cm/yr. At the location where the deposition rate is 0.2 cm/yr, a 15 cm sample collects the last 75 years of deposition, effectively combines the entire 40-year PCB deposition history into one sample and then dilutes the PCB concentration in the sediments by a factor of two with the clean underlying sediment. At the 1 cm/yr sample, the last 15 years of sediment deposition are examined as one sample. Because this time interval contains sediments fairly close to the maximum, the PCB levels are highest of the three samples. At the 20 cm/yr site, the 15 cm sample examines the last nine months of deposition and the lowest PCB levels are obtained, since current deposition concentrations are much less than one half of the mean sediment concentration over the last 40 years. On the basis of the samples alone, one might conclude that the 1 cm/yr location was most contaminated and the 20 cm/yr location was least contaminated. On the basis of total PCB mass per unit area, however, the 20 cm/yr location was the most contaminated as a result of thickness of contaminated sediments (approximately 800 cm). The 0.2 cm/yr location was the least contaminated, since only a relatively thin veneer (approximately 8 cm) of contaminated sediments existed there.

This sort of error in sample collection and interpretation can lead to a conclusion that areas of high deposition (typically 2 cm/yr) in the Lower Hudson are hot spots and can seem to support a multiple source-minimal movement model, when instead the levels in these regions can be explained by examining the sediment accumulation rates. This kind of error can also lead to a conclusion that no evidence can be seen for dilution of a single source as expected in a single source model, because no downstream gradient is evident. Nevertheless, the core data presented by LDGO (see Figure A.3-1) show that a roughly 50-fold dilution takes place across any dated sediment interval in comparing cores between Albany and the Battery. Thus, when time of deposition is considered, the downstream gradient is evident.

Local variations in the homologue make-up of PCBs in the sediments may appear to support a multiple source theory, using the 0 to 6 inch samples as evidence. Although the presence of important Lower Hudson loadings is not disputed, two points are clear: 1) without dated sediments, it is impossible to estimate the size or importance of the loadings responsible for the unique homologue mixtures; and 2) the homologue patterns in the dated cores taken throughout the Hudson, as found in the literature, strongly indicate a unique single fingerprint, which can be found throughout the Hudson sediments both between cores and within a single core. To explain such an occurrence in the multiple source-minimal movement model would require that all river sources have identical homologue mixtures, which is a highly unlikely scenario.

Although the comments suggest that high resolution coring techniques used by LDGO can show that the PCB maximum in the Lower Hudson occurs before 1971 and, therefore, is not a result of the Fort Edward Dam removal, this supposition requires a much greater resolution of the core layers than the authors of the analysis were willing to concede. In nearly all cores measured by LDGO, the 1971 second Cesium-137 maximum associated with the 1971 releases by Indian Point and the PCB maximum coincide, largely because the core section resolution is such that layers corresponding to the 1971 to 1974 period are combined into one sample. In the Foundry Cove (River Mile 53.8) core where the PCB maximum precedes the Cesium-137 maximum, the uncertainty of the time of the Cesium-137 maximum is great, because of the proximity of the core location to the salt front (the northernmost extent of any Indian Point influence) and the fact that the location is two tidal excursions above Indian Point. Thus, transport of Cesium-137 to that core location is not as simple as for points downstream of Indian Point, and the appearance of the cesium maximum is not clearly tied to 1971.

The paper by Oliver *et al.* (1989) is cited in comments to show a PCB maximum in Lake Ontario sediments in 1967 to 1971. In fact, additional work by LDGO on Newark, Raritan and Jamaica Bays all show a mid- to late-1960s PCB maximum by the same dating techniques used to establish the Hudson River PCB maximum in the early 1970s (Bopp and Simpson, 1984). These studies by LDGO also show the homologue mixtures in these bays to be distinctly different from anything found in the Hudson. On the basis of the variety of homologue mixtures seen in these bays, it would be reasonable to conclude that the homologue mixtures in the Hudson could not be as consistent as that shown by LDGO, if multiple sources were as important as suggested.

Several explanations of data differing greatly from those in the Phase 1 Report are suggested in the comments. These explanations are summarized and responded to below.

- Several sediment sampling surveys are cited. These surveys failed to consider local variations in sediment deposition rates. Conclusions based on those data are, therefore, considered questionable.

- Other sediment studies and PCB production records are cited to support the contention that the PCB maximum seen in dated Lower Hudson River cores is pre-1971 and not related to the removal of the Fort Edward Dam. Studies by LDGO, however, show a mid- to late-1960s PCB maximum in three adjacent bays to the Hudson by the same dating technique that places the Hudson's sediment PCB maximum in the early 1970s.

- The sediment survey data are cited to show the lack of a downstream decrease in sediment PCB levels to support a multiple source model. Nevertheless, dated cores throughout the Hudson show a 50-fold decrease in PCB concentration for sediment layers of comparable age.

- LDGO data in a core at Foundry Cove (River Mile 53.8) are cited to show a PCB maximum before the Cesium-137 maximum associated with 1971. In this core, however, the control on the cesium data is poor, because the core was located near the salt front, 12 miles upstream from the cesium source. All other dated cores from the Lower Hudson either show a PCB maximum after the 1971 cesium maximum or lack sufficient resolution to resolve the 1971 cesium maximum from the early 1970s PCB maximum.

- Lower Hudson hot spots are defined in the comments, based on surveys that employed grab sampling. Locally high deposition rates and a consistent homologue fingerprint, however, strongly support a single upriver scenario.

- Data showing homologue mixtures from sediment samples taken in near shore environments in industrial river reaches are cited to support the theory of multiple sources. Although USEPA does not dispute the presence of multiple sources, the absence of these mixtures in dated cores collected away from shore show that, except in New York Harbor, a single source, single homologue fingerprint, is all that is required to explain the mean river PCB distribution. In the harbor area, the presence of additional sources can be seen in the homologue mixtures in recent sediments. Recent estimates based on dated sediment cores suggest that the upriver source represents about half of the total input to the harbor area.

Response to G-4.13

EPA's statement in the Phase 1 Report is correct as written. The only substantive measurements that can be used to define the PCB contribution from the Upper Hudson to the total Lower Hudson loading are the high resolution core samples collected by Bopp and Simpson (Bopp and Simpson, 1989). These samples indicate that the sediment contamination resulting from the homologues associated with the Upper Hudson loading represents about half of the total sediment contamination in the saline portion of the estuary. From these samples, it can reasonably be inferred that the Upper Hudson contributes about half of the PCB loading to this portion of the Hudson, and that the remaining half is derived from other loads that input to the Lower Hudson directly. The model presented by Thomann *et al.* (1989), discussed in Sections A.4 and B.4, represents a substantial effort but does not represent a definitive study of Lower Hudson fluxes. Specifically, the loading estimates for various sources used by Thomann *et al.* are poorly based and have a large degree of uncertainty, as discussed in Sections A.2.2 to A.2.8. These estimates are far too poor to be used to constrain the loading from the Upper Hudson. The possibility that the estimate used by Thomann *et al.* for the Upper Hudson loading may be 90 percent too large does not serve to decrease the estimate of the relative impact of the Upper Hudson on the Lower Hudson. This is because many of the important fluxes estimated by Thomann *et al.* have uncertainties far greater, at 500 to 1,000 percent.

A.2.3 Sewage Effluent Discharges

Response to G-3.83, G-3.84

Sewage effluent and tributaries have been sources of PCBs to the Hudson River, as stated in the Phase 1 Report. The scope of the Phase 1 Report and the Reassessment for the Lower Hudson, however, is to examine the current relative contribution of the Upper Hudson PCB loading relative to the other loads to the Lower Hudson (not historic loads). Historic data is interesting additional information, but is not considered essential to the discussion in these sections. The Phase 2 investigation will include: sampling on two major tributaries to the Upper Hudson to define further their contributions; an examination of historic discharge records (specifically, SPDES permits) for additional relevant information; and additional sampling by USEPA's Water Division.

A.2.4 Tributary Contributions

Response to G-4.22 and C-5.6

Revise last sentence in the paragraph describing tributary contributions on page A.2-4 of the Phase 1 Report to read: These estimates would collectively yield a range of approximately 0.2 lb/day (0.1 kg/day) to 2.3 lb/day (1 kg/day) for the Lower Hudson tributaries.

A.2.5 Combined Sewer/Storm Water and Storm Water Outfalls

Response to F-3.8

USEPA recognizes that the data given in these sections is old relative to current conditions. It is correct to note that these fluxes will have likely decreased substantially since the period for which they were estimated. For this reason, these fluxes were not summed in the discussion in Section A.2.2 of the Phase 1 Report.

Response to G-3.86

There is a lack of data on combined sewer/stormwater and storm water outfalls. USEPA intends to continue to look for information pertinent to this potential loading category in Phase 2.

A.2.6 Atmospheric Deposition

Response to G-4.23, G-3.87

The quality of the estimates of atmospheric deposition is, indeed, poor. Although the magnitude of the atmospheric loading to the Hudson will be further examined in Phase 2, no direct measurements will be made and no field samples will be collected. Refer also to responses in Section A.2.2, Comments G-1.3 to G-4.19.

A.2.7 Landfill Leachates

Response to G-3.85

The quality of the estimates on landfill leachate is poor. Although magnitude of the leachate source will be further examined in Phase 2, no direct measurements will be made and no field samples will be collected. Refer also to responses in Section A.2.2, Comments G-1.3 to G-4.19.

A.2.8 Other Sources of PCBs

Response to C-8.33, C-5.7, S-1.19, C-6.15 and G-4.24

Revise the last sentence in the first paragraph of this subsection on page A.2-6 of the Phase 1 Report to read: However, ... the allowable daily average PCB concentration is 1.0 ppb (μg/L) with a daily maximum of 2.0 ppb. See also Response to C-6.16 in Section B.3.5.1.

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A.3 Nature and Extent of Contamination

A.3.1 Sediments

Figure A.3-1 is revised to change the legend for River Miles 143.4 and 188.5, which was inadvertently reversed. The revised figure is reproduced on the next page.

Response to C-5.4

Revise third sentence of third paragraph on page A.3-3 of the Phase 1 Report to read: As of 1986... inputs were accumulating with higher PCB levels than those found farther upstream....

Response to C-8.35

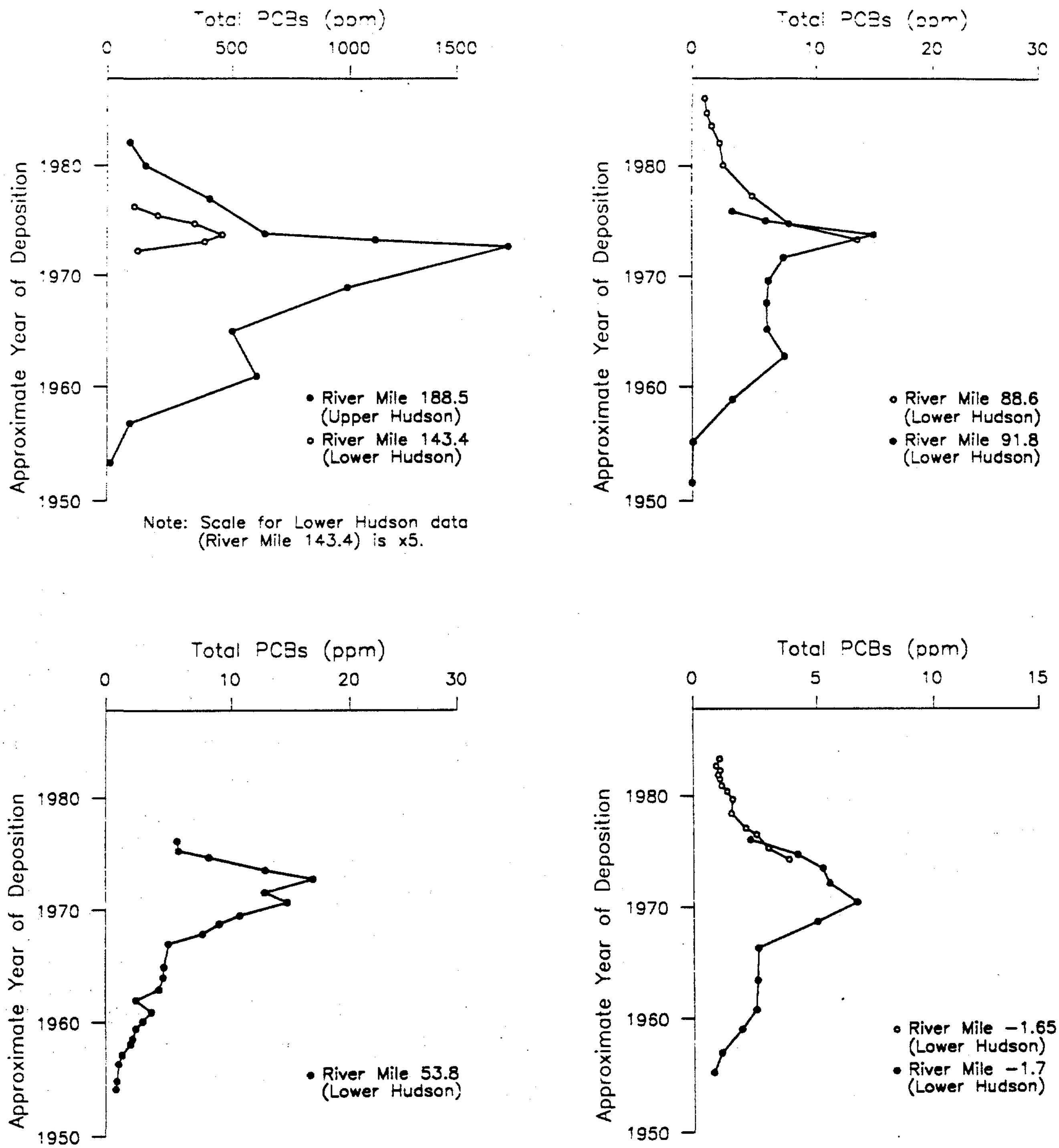
The change in the sediment record after approximately 1977 may be attributed to a change from the major scour event associated with the Fort Edward Dam removal to that of reworking of the scoured sediments in other regions of the river, as noted in the Phase 1 Report. Alternatively, the system may be viewed as responding in an exponential decay manner (see Figure A.3-3 of the Phase 1 Report) without a marked change in the controlling mechanism.

Response to C-8.37

The data presented in Figure A.3-2 of the Phase 1 Report were obtained from Bopp and Simpson (1989). The cores from River Mile 91.8, collected in 1977, and from River Mile 88.6, collected in 1986, differ in time but come from the same general region of the Hudson, a zone of high deposition near Kingston, NY in the Lower Hudson. As shown in Figure A.3-2 and in Figure A.3-1, the agreement for the two cores is excellent for the overlapping areas. These data permit an extended view of the sediment record in this area. Because this location is free from intrusion by saline waters, it is also free of any contamination carried by the saline water, such as additional PCB loadings

REVISED FIGURE A.3.1

Total PCB Levels in Dated Hudson River Sediment Cores by River Mile



Note: Scale for Lower Hudson data (River Mile 143.4) is x5.

Source: Bopp and Simpson. (1989).

believed to occur in the New York metropolitan area. Thus, the river circulation in this area is such that the cores simply represent the sum of any PCB loads which may originate in the Kingston area or farther upstream, most importantly the Upper Hudson source. The pattern of the homologues exhibited in the cores forms part of a homologue fingerprint for the upriver sources.

In a similar fashion, two cores were collected just south of the Battery in New York Harbor. Because these cores also overlap well, they permit an examination of the sediment record in this area of the Hudson. At this location, the combined sum of the upriver sources and those in the New York metropolitan area should be recorded by the sediments. As shown in Figure A.3-2, the patterns of the individual highly chlorinated homologues are quite different at the two locations, *i.e.*, hepta and octachlorobiphenyls at River Miles 88.6 and 91.8 vs hepta and octachlorobiphenyls at River Miles -1.65 and -1.7. These differing patterns are indicative of at least one additional source in the Lower Hudson with more of the higher chlorinated homologue than the upriver source.

Response to C-8.38, C-8.41

The PCB concentrations discussed on page E-8 of the Phase 1 Report represent whole water analyses done by the USGS, reported on a unit volume basis. The data presented on page A.3-4 and in Table A.3-2 represent PCB concentrations measured in the sediments from core tops and on suspended matter collected from the water column. These analyses are performed and reported on a unit mass basis. To obtain a water concentration from the suspended matter concentration, it is necessary to multiply the PCB concentration on suspended matter by the concentration of total suspended solids in the water column. To this product, a measurement of the dissolved phase PCB concentration must be added in order to obtain a value that can be compared to the USGS measurements.

For the purposes of comparison in Table A.3-2, the measurements reported are directly comparable, since they both represent PCB concentration in sediments, either on the river bottom or suspended in the water column.

The value of 0.5 mg/kg represents the asymptotic value of the sediment PCB level trend in New York Harbor with time, and not the most recently measured sediment levels. These levels are 0.8 mg/kg at Kingston (RM 88.6) and 1.5 mg/kg near the Battery (RM 1.7).

Response to C-8.39

K_D values given are unitless.

Response to G-4.5, G-4.20, G-4.25, G-4.26, G-3.29

The decline in PCB-levels in sediments since 1977 may be partially attributed to the decrease in PCB use since the mid-1970s.

Additional information responding to these comments is supplied in the response to comments in Section A.2.2 (G-1.3... G-4.19), which includes a discussion of the LDGO sediment core at River Mile 53.8, Foundry Cove.

With respect to questions concerning the use of dated sediment cores to estimate the time frame of sediment deposition and associated contaminants, dating techniques of the Lamont-Doherty Geological Observatory have been employed extensively throughout the world in lakes, oceans and estuarine environments. The Hudson River, characterized by a tidal estuarine region below Federal Dam and lake-like environments in the dam pools of the Upper Hudson, has been demonstrated to produce sediment core records that yield the radionuclide patterns seen in sediment cores collected throughout the northern hemisphere. The acceptance of this technique by the scientific community is widespread, as evidenced by the large number of articles published in referenced journals, which include several articles by Drs. Bopp and Simpson. On this basis, there is no need to convene a panel to perform a critical analysis of the technique.

As noted in Oliver *et al.* (1989) and by Bopp and Simpson in their work, every core collected will not necessarily produce a record suitable for detailed interpretation. This concern is recognized in all sedimentary environments, not simply in the Hudson River, because of local variations in depositional environments. Thus, in the selection of cores for analysis, some interpretation consistent with the known radionuclide input history must be applied.

In the cores collected by LDGO, the resolution of the sediment cores is limited to an uncertainty of ±2 years because of anticipated variations in sediment deposition and the inherent uncertainty in sediment layer collection. The data presented in Figures A.3-1 and B.3-6 of the Phase 1 Report show the same time scale. The relationship between any data point and its approximate year of deposition is the same in both figures. While the dating of sediment cores is subject to some interpretation, their interpretation in the Phase 1 Report is consistent with the level of uncertainty given above. The contention that the PCB maximum predates the 1971 cesium maximum implies a level of precision greater than can actually be obtained in the core record discussed.

There are four substantiations, found in dated cores throughout the Hudson, for the conclusion in the Phase 1 Report that the 1973 Fort Edward Dam removal resulted in a maximum PCB concentration.

- In each core, a dated PCB maximum occurs in the early 1970s, around 1973.
- The PCBs levels in dated cores steadily decrease downstream from Albany, across all sediment layers of equal age, to the New York Harbor, as would be expected from a single upriver source that was steadily diluted downstream, with a secondary source in the NYC metropolitan area.
- Sediment homologue levels are generally consistent both down a core and among core layers of comparable age. This finding suggests a dominant single source with the possibility of other minor sources that change over time.
- The deposition history of PCBs seen in Hudson River cores is not consistent with that of other regional water bodies (see A.2.2 response to comments G-1.3 to G-4.19). The Hudson maximum occurs 5 to 10 years later.

The ability of sediment cores to record relative water column conditions is supported by the data presented in Table A.3-2, which compares sediment core tops with water column suspended matter PCB levels. The agreement shown is well within the measurement uncertainty. In addition, researchers, including those at LDGO, have demonstrated a consistent relationship between suspended matter and dissolved phase PCBs, a finding that further supports the link between sediments and the water column.

In general, the statements concerning PCB sources and transport made in Section A.3.1 of the Phase 1 Report are either those concluded by the referenced author or are considered sufficiently general and sufficiently well supported by existing data that they are correct as stated and do not imply that the General Electric facilities were the only source of PCBs to the Hudson. These statements will be subject to review on a limited basis in light of additional data to be collected in Phase 2.

<u>Response to G-4.27</u>

The presence of higher chlorinated homologues in the sediments corresponding to the 1950s and early 1960s is consistent with the known use of higher chlorinated Aroclors by General Electric during this period. There may, however, also have been additional sources of these homologues to the Hudson.

<u>Response to C-7.2</u>

Additions of Aroclor 1242 to the Lower Hudson will probably be difficult to separate from the PCB mixture originating in the Upper Hudson. To separate sources, a mass balance approach may be necessary, if such separation is required in Phase 2 data interpretation.

A.3.2 Water

Response to C-8.40

Water column concentration downstream of the confluence of the Upper Hudson River and the Mohawk River is simply the flow-weighted average of their PCB concentrations. The point of the discussion in Section A.3.2 of the Phase 1 Report is to illustrate the absence of significant PCB loads to the Lower Hudson originating between the confluence and the station at Castleton. Thus, the sewage effluent and other potential sources in that area do not appear to be important to the PCB load to the Lower Hudson.

Response to G-4.28, F-3.10

The ability to link suspended matter and surficial sediment is based on the following. The similarity of PCB concentration trends in the sediment cores of the Hudson River and in the water column is quite strong. All trends exhibit an exponential decay response with a half life of three to four years. The ability to link sediments directly to suspended matter is demonstrated in the data in Table A.3-2 of the Phase 1 Report. Lastly, the link is intuitively straightforward, since recent sediments must be put in place largely by water-borne transport in high deposition, quiescent areas where slumping or other mass movements of sediments is unlikely. The calculations presented on pages A.3-6 and A.3-7 of the Phase 1 Report are based on these assumptions. The level of interpretation of these data is consistent with the uncertainties associated with the data and does not require further analysis.

A.3.3 Fish

General

Response to F-3.9

The division of the Hudson River into various study areas or zones based on tidal/non-tidal regimes, habitats considered to be of special importance, and spawning areas for anadromous fish is currently under consideration for Phase 2. Final selection of the study areas will, in part, be based on assessment of sensitive areas, proximity to historic sources and increased likelihood of exposure.

Response to G-3.34

There is no doubt that PCB concentrations in Lower Hudson River fish have declined significantly since 1974-78. The decline occurred primarily between 1977 and 1982. If one examines only the post-1982 data, it is not at all clear that there is any steady downward trend. Because of the exhibited pattern of strong declines, followed by weak or no declines, an exponential decay model can be fit to the Lower Hudson fish data, characterized by a half life. This measure is merely a convenient summary statistical parameter, which at this stage has no physical basis.

Response to P-3.8, P-1.12, P-1.13

The discussion of the measured decline in PCB levels presented in the body of the Phase 1 Report and summarized in the Executive Summary was not intended to suggest that the PCB levels in the most recently available samples are acceptable. The preliminary risk assessment results indicated a possible health risk attributable to consumption of fish with PCBs.

The projected 30-year average PCB concentration in fish did not consider possible resuspension of PCBs in sediments. There was no intent to suggest that resuspension was unlikely. An evaluation of the potential impacts of such an event will be undertaken in Phase 2. PCB bioaccumulation will be examined in conjunction with this analysis. See also B.4.4.1 responses.

Response to S-1.4

Doubt is expressed regarding the Phase 1 Report statement (Executive Summary page E-6) that potential human exposure to PCBs through consumption of Lower Hudson fish would be lower than exposure through consumption of Upper Hudson fish. Although higher lipid content in Lower Hudson fish may yield wet-weight PCB concentrations above the PCB levels in some Upper Hudson fish, the comparison in the report was based on wet-weight results that showed generally lower PCB levels in Lower versus Upper Hudson Fish.

A.3.3.1 Overview of Previous Monitoring Programs

Response to G-4.31, G-4.32, G-4.34, G-4.35, S-1.11, P-1.10

Section B.2.3 in the Phase 1 Report discusses other PCB sources to the Upper Hudson. It is USEPA's understanding that fish were sampled in both 1987 and 1988, as reported in Table A.3-5.

Clarification regarding the lowered detection limits for all Aroclors in 1987, not just Aroclor 1221, is noted.

The 1990 fish data were unavailable for the Phase 1 evaluation. They will be reviewed during Phase 2.

Response to G-4.3, G-4.29

Although fish conservation motives may be an additional reason to close a segment of a fishery, most sources would acknowledge that the closure of the commercial striped bass fishery in the Hudson River would not have taken place were it not for elevated PCB levels found in striped bass by the NYSDEC.

A.3.3.2 Striped Bass

Response to P-3.6, S-1.12

Trends in striped bass PCB burdens from 1987 to 1988 are not clear cut. Average total PCBs in striped bass in the lower estuary increased from 1987 to 1988, when measured on a wet weight basis (Table A.3-5). When examined on a mass PCB per mass fish lipid basis, concentrations declined over the same period (Figure A.3-4). This finding implies that the 1988 samples had a higher average fat concentration. Wet-weight measurements are most appropriate for the assessment of human health risks. Lipid-based measurements, however, are thought to be more appropriate for examining trends over time, as they eliminate some of the causes of random variability found in the wet-weight estimates of PCB burden. Fish lipid content correlates with PCB levels, as shown in Section B.4 of the Phase 1 Report; this correlation will be presented in Phase 2.

Response to G-3.16, G-3.79, G-3.81, G-4.33, G.4-36, C-8.42, F-3.11, F-2.3, P-3.3, S-1.7, S-1.8, S-1.9, P-1.15, F-1.2, P-3.4

The Phase 1 Report presents a discussion of the historical magnitude of PCB loads from the Upper to the Lower Hudson as well as a discussion of other possible PCB sources. Comments regarding "implied" evaluations in the report and the suggestion of USEPA's "apparent approval" of results of other researchers are the conclusions of the commentors and are not based on statements in the Phase 1 Report.

Commentary on the life-cycle of striped bass could be useful in further phases of the Reassessment. The hypothesis that "migratory fish farther north in the River will generally have higher PCB levels as a function of residence time rather than as a function of higher ambient PCB concentrations..." is one of several hypotheses that may be examined.

The Phase 1 Report discusses trends in the Aroclor components in fish and the Aroclors in the water column and sediments. It is correct to note that it is premature to draw definitive conclusions from these Aroclor data concerning exact sources of the PCBs observed in fish. The report presents work by others (Bopp and Simpson), including the relative Aroclor composition in fish and possible influences of New York City metropolitan area PCB inputs. These preliminary hypotheses will be examined further in the Reassessment. Differential fate and bioaccumulation will be examined.

The Synopsis discussion of declining PCB levels in striped bass may have been misleading, because no time-period was given. The discussion in A.3.3.2 clearly defines the time period and indicates that the decline is less apparent in recent years. (See also responses to G-3.34 at A.3.3.)

As noted in the comments, a significant database for both the marine and resident Lower Hudson fish exists.

As noted in the comments, River Mile 153 is the Lower Hudson. These data were summarized with the Upper Hudson discussion, because PCB levels in these fish tend to track with the PCB levels measured around Green Island. It is agreed that this approach may require some rethinking.

Congener analyses planned for Phase 2 and a continued review of previously published studies that used congener analyses, *e.g.*, Bush *et al.* (1989), are expected to provide additional information on the Upper versus Lower River origin of PCBs in fish. This type of information should help determine whether higher chlorinated congeners in fish are a consequence of inputs from the Lower Hudson or the result of differential fate or persistence.

Response to S-1.13, P-1.14

Half-life as used in the Phase 1 Report refers to the time period over which the chemical concentration is reduced to half of its initial, or starting point, concentration. Thus, a decline in concentration from 100 ppm to 50 ppm over the time-span of one year corresponds to a half-life of one year. The terminology can be misconstrued, but it also provides a convenient, and commonly used, means of describing the rate of PCB decline based on the historical monitoring record.

Response to S-1.14, S-1.16, C-2.1

The Phase 1 Report did not intend to present a final understanding or conclusion as to the bioaccumulation of PCBs in fish and the origin of the PCBs in the fish. The statement in the report that New York metropolitan area contributes to the PCB burden in Lower Hudson fish is suggested by others and appears to be borne out by the data. This observation, however, does not diminish the fact that PCBs from the Upper Hudson also bioaccumulate in the Lower Hudson fish and that mechanisms, such as differential partitioning of higher chlorinated congeners and loss of lower chlorinated congeners upon transport in the river, are factors leading to the observed distribution of higher chlorinated congeners in Lower Hudson fish. The division of the discussion into Upper versus Lower, as compared to a division between resident and migratory fish species, may have caused some confusion in the presentation and interpretation of the data.

As is discussed in detail in the Phase 2 Work Plan and Sampling Plan, USEPA will conduct congener-specific analysis of PCBs in water and sediment samples collected during Phase 2 and in historical, archived samples. This work is intended to help better define the composition of PCBs, *e.g.*, those with higher versus lower chlorinated congeners, in water and sediment. Because much of the existing PCB database is reported on an Aroclor basis, comparing the degree of chlorination in the PCBs found in sediment, water and fish can be difficult. This difficulty should be avoided with congener-specific analytical results, which provide a much better "fingerprint" of the congeners, hence the degree of chlorination, than has been available for the bulk of existing data. These congener data, together with an analysis of existing congener data in fish, *e.g.* Bush *et al.* (1989), should help identify better both the origin and differential bioaccumulation of PCBs in the Hudson.

A.3.3.3 Other Migrant/Marine Species

Response to C-5.8

Revise the first sentence of the fourth paragraph on page A.3-12 of the Phase 1 Report to read: A relatively long time series... is available...

Response to S-1.15

Revise last sentence on page A.3-12 of the Phase 1 Report to read: The shad show substantially lower bioaccumulation than striped bass, reflecting their short residence time in the estuary and the lack of feeding during spawning.

A.3.3.4 Resident Freshwater Species

No comments are responded to in this section.

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A.4 Review of Lower Hudson PCB Mathematical Model

A.4.1 Thomann Model

A.4.1.1 Overview

Response to F-2.4

Assessment of the "relative level of responsibility for PCB contamination" in striped bass in the Lower Hudson presents a difficult problem. Cumulative total source identification also may not be a particularly helpful way to look at the present situation. The problem is difficult, because striped bass are migratory and spend only a portion of their life cycle in the Hudson estuary. While in the estuary they may be exposed to PCBs from at least four general source categories: on-going PCB inputs from the Upper Hudson; Upper Hudson-derived PCBs stored in estuarine sediments; on-going PCB inputs from Lower Hudson sources; and Lower Hudson-derived PCBs stored in the sediments. The Phase 1 Report evaluated the relative magnitude of the Upper River loads compared to the approximate loads into the Lower Hudson, as estimated by others.

Response to P-3.5, C-8.43

Regarding objections to "use" of Thomann's model of PCB dynamics, the Phase 1 Report described and critiqued this model, but did not use or endorse it. Similarly, the estimates of loading presented on page A.4-2 of the Phase 1 Report are those of Thomann *et al*. (1989).

A.4.1.2 Mass Transport Estimates

No comments are responded to in this section.

A.4.1.3 Geochemical Processes

Response to C-8.44, C-8.45, C-8.46

Gas exchange across the air-liquid interface is not usually thought of as a geochemical process, as noted by a commentor.

The use of a constant gas exchange coefficient will underestimate the gas exchange loss of lower chlorinated congeners and overestimate the gas exchange loss for highly chlorinated congeners. The lack of consideration of additional gas exchange resistance will overestimate the gas exchange loss for all congeners, with the overestimate increasing with the degree of chlorination.

Information on the potential over-prediction of sediment-water K_D values by theoretical methods noted by Bopp *et al.* (1985) was introduced to point out that attempts to estimate total PCB load from sediment concentrations alone may introduce a bias. A quantitative assessment of the difference has not been made at this time.

A.4.1.4 Ecological Parameters

Response to G-3.80

This section of the Phase 1 Report discusses the Thomann *et al.* striped bass model, which models food intake as the main avenue of PCB uptake. A distinction should be made between the mechanism of PCB uptake and empirical relationships observed between PCB levels in fish and the ambient environment. Empirical relationships (or models) may provide just as valid an approach to evaluating PCB uptake in fish as food web models, which are limited by the data available to calibrate them, notwithstanding the fact that even detailed food web models are simplifications of the ecosystem.

A.4.2 Simulations Relevant to Upper Hudson Remediation

<u>Response to G.3-12, G-1.2</u>

Thomann's model simulations suggested that remediation in the Upper Hudson would likely have a negligible effect on the return of PCB burdens in the Lower Hudson striped bass population to acceptable levels. As pointed out in the Phase 1 Report, there are certain potential limitations in the assumptions made for this model (Section A.4.1), which may require reassessment of their conclusion.

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RESPONSES TO COMMENTS ON PART B: UPPER HUDSON CHARACTERIZATION

SYNOPSIS (Section B.1)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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B.1 Physical Site Characteristics

B.1.1 Hydrology

No comments are responded to in this section.

B.1.2 Water Quality and Use

B.1.2.1 Water Quality

<u>Response to C-7.5</u>

The water quality at both Fort Edward and Schuylerville was rated as poor according to the cited RIBS document (NYSDEC, 1990). The RIBS effort rated six main parameters/media as indicated in Table B.1-1 of the Phase 1 Report in order to arrive at a qualitative evaluation of overall water quality conditions. These included but are not limited to the fish advisory designations.

<u>Response to C-7.7</u>

The sediment levels in 1987 and 1988 as measured by the NYSDEC under the RIBS program found only lead and mercury above background, although background levels were not identified. In Brown *et al.* (1988b), the authors indicate that these metals plus cadmium and chromium occurred above background criteria in samples collected in 1984. Presumably, there are differences in background criteria and possibly minor sediment metal losses, which may account for the inconsistency of these reports.

<u>Response to G-4.37</u>

USEPA's assessment of Upper Hudson River water quality in the Phase 1 Report was based on documents available from NYSDEC, including the Biennial Report, RIBS (December 1990); Section 304(l) and 305(b) (1990); and the 1988 Priority Water Problems lists. The Appendices of the RIBS report, which include raw data for water column, macroinvertebrates, toxicity testing and stream flow were not available for inclusion in the Phase 1 Report. Thus, the review of the RIBS program in the Phase 1 Report did not include an evaluation of the data in the Appendices but was based on NYSDEC's narrative of the results. It should be noted that the summary presented in the Phase 1 Report was not limited solely to PCBs.

The results of the RIBS study at the Waterford station on the Hudson River should have been included in the Phase 1 Report. The Waterford site (at the Route 4 bridge) is the most downstream station on the main stem of the Upper Hudson. This reach is classified as Class A with primary uses of transportation and recreation (except fishing) as well as a public water supply for the Town of Waterford, which treats the intake. Parameters of concern in the water column include cadmium, copper, lead, phenol, and total and fecal coliform. According to the RIBS document, the water quality in this segment of the river is rated as "very poor."

B.1.2.2 Use

<u>Response to S-2.1</u>

According to the New York State Constitution, the New York State Department of Transportation (NYSDOT) is required to maintain the Upper Hudson River and Champlain Canal as a navigable waterway. Routine dredging is required to provide for uniformity in the width and depth of the channels in which sediments have accumulated. Dredging has occurred since the Barge Canal's opening in 1825. Because of PCB-contaminated sediments, there has been no channel maintenance dredging by NYSDOT on the Hudson River/Champlain Canal in the area from Waterford to Fort Edward since 1984.

<u>Response to G-4.38</u>

Comments regarding water treatment at the three Upper Hudson public water intakes are noted. These three communities treat the intake water, a fact not stated in the Phase 1 Report. A detailed explanation of the treatment systems and monitoring data is, however, not warranted.

NYSDEC and NYSDOH were the references for the statement that the river water is also used for domestic (watering lawns and gardens) and agricultural purposes (irrigating crops). While these agencies had neither surveys nor records on the withdrawal of water for irrigation, they believe that this type of water withdrawal occurs, but is not extensive.

Response to G-4.39

The Phase 1 Report addressed past trends in commercial and recreational traffic on the Upper Hudson River and Champlain Canal and referenced Malcolm Pirnie (1984). That study showed a steady decline in recreation use (pleasure crafts) on the Champlain Canal from 1967-1981. NYSDOT will be contacted in Phase 2 or 3 to determine current trends in both commercial and recreational use, as appropriate to the needs of the Reassessment.

B.1.3 Population and Land Use

No comments are responded to in this section.

B.1.4 Fisheries

Response to C-5.9

Revise fourth sentence in last paragraph on page B.1-10 of the Phase 1 Report to read: A total of 46 species... was found.

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SYNOPSIS (Section B.2)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report. Responded to here are comments dealing with editorial recommendations or concerns of a more general nature.

Revise first sentence of first paragraph of Phase 1 Report Synopsis B.2 to read: It has been reported that GE used PCBs at the Fort Edward plant from 1946 to 1977 and at the Hudson Falls plant from 1952 to 1977 (B.2.1).

Revise sentence of third paragraph of Synopsis B.2 to read: Other potential sources of PCBs to the Upper Hudson (B.2.3) are discussed.

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B.2 Sources of PCB Contamination

B.2.1 GE Discharges (To 1977)

The first sentence in the first paragraph of Section B.2.1 of the Phase 1 Report should be revised to read: According to General Electric (GE), the GE capacitor manufacturing plant located in Fort Edward, New York began to use PCBs in 1946, and the plant located in Hudson Falls, New York began the use of PCBs in 1952. GE has stated that both plants discontinued their use in 1977.

Response to G-4.1, G.4-40

An upper bound estimate of GE discharges for the period 1957-1975 is given as 1.3 million pounds on page E-1 of the Phase 1 Report. This figure is by no means firm, as quantities were not monitored during most of the time in which GE discharged PCBs to the river. The estimate of 1.3 million pounds is given by Sanders (1989), based on anecdotal evidence of plant releases of about 1 percent or less of total PCB consumption. The actual amount of release during this period likely ranged between 200,000 and 1,300,000 pounds.

Response to G-3.89

In the Phase 1 Report, the inventory of sources of PCB contamination to the Upper Hudson other than GE is admittedly incomplete. Insofar as remedial actions under consideration are concerned with PCB-contaminated sediments already in the river, the initial ownership of these PCBs will have little impact on the choice of a remedial alternative. Nevertheless, as stated in Responses at A.2.2, the evidence does not support a multiple source-minimal movement model and, instead, indicates a single dominant loading.

B.2.2 Current Permitted Discharges

Response to P.29-4

Permitted PCB discharges into the Upper Hudson are shown in Table B.2-1 of the Phase 1 Report. Effluent limitations and monitoring schedules are summarized, but not all the monitoring data in the SPDES reports are tabulated.

B.2.3 Other Sources

Response to G.3-7

The comment is made that Superfund baseline risk should include only the risks posed by the site that USEPA intends to remedy - "in this case, the sediments of the Upper Hudson River" - and claims that the Phase 1 Report incorrectly combines risks posed by all PCBs in the Hudson River, "including PCBs discharged by other sources." It is reasonable to assume that PCBs in resident Upper Hudson fish result from the water and sediment in the river, which are within the site boundaries.

SYNOPSIS (Section B.3)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report. Responded to here are comments dealing with editorial recommendations or concerns of a more general nature.

Response to P-3.10

Information concerning Upper Hudson PCB sources, other than the River itself, is discussed at B.2.3 and B.6.2.3.

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B.3 Nature and Extent of Contamination

B.3.1 Overview of Sources and Database

Response to C-5.11

Revise first sentence in second paragraph on page B.3-3 of the Phase 1 Report to read: Selecting a sample ID... and locating the same ID... show either the Aroclor results for....

Revise second sentence in the same paragraph to read: Additional information... is contained....

Response to P-15.1, C-8.2, C-8.48, G-4.30, G-4.41, G-4.49, G-4.60, G-4.62

The TAMS/Gradient Phase 1 database will be available in Phase 2. NYSDOH data on PCB levels in the water column can be obtained from that Agency.

Paradox is the software package used to create the Phase 1 database. The database is user friendly to those individuals familiar with databases in general.

Response to G-4.42, G-4.43

Table B.3-1 of the Phase 1 Report does not reference all of the information reviewed in Phase 1. Citations listed in the comments not covered in Phase 1 may be reviewed. USEPA will separately request the detection limit information offered.

B.3.2 Sediment

B.3.2.1 1976-1978 NYSDEC Sampling

Response to G-4.44

Revise second sentence in third paragraph on page B.3-6 of the Phase 1 Report to read: The 1984 Thompson Island Pool survey... revised the designation to a series of 14 polygons containing PCBs greater than 50 ppm.

B.3.2.2 1984 NYSDEC Sampling

Response to G-4.45

It is correct to note that the sample data presented in Table B.3-5 of the Phase 1 Report do not include the screened sediment samples that were not analyzed by gas chromatography (GC) and that their inclusion would lower the mean levels. The purpose of the table was not simply to examine mean levels but to examine the types of Aroclor present and their relative contribution to the total PCB levels. The screened samples that were not analyzed by GC could not be included in this analysis, as they do not have information on Aroclor type.

Response to P-1.17

The movement of sediments in the Upper Hudson is only one of several explanations given in the Phase 1 Report, Section B.3.2, concerning the heterogeneity of sediment PCB levels in the Upper Hudson. In view of the sediment history of the Upper Hudson, particularly the Thompson Island Pool, in light of the removal of the Fort Edward Dam, it is highly likely that large scale sediment movement has occurred extensively in the pool, particularly between the two NYSDEC surveys. This movement would not result in the movement of an entire hot spot en masse but rather its dispersion to other zones of greater sediment stability. This process may have much to do with the differences between the 1977-78 and 1984 surveys.

The likelihood of small scale heterogeneities with large PCB concentration differences in the sediments of the Thompson Island Pool is, however, not precluded. This phenomenon is also comparably responsible for the differences between the two surveys.

These concerns suggest that extensive sampling of the entire Thompson Island Pool may not be the most useful approach to assessing its contaminant distribution.

Response to C-7.9

Estimates of PCB mass in the Thompson Island Pool are rendered difficult by the presence of a high degree of spatial heterogeneity. Geostatistical (kriging) analysis may be of use to resolve this problem. Plans for kriging are outlined in the Phase 2 Work Plan.

Response to C-8.49, C-8.50

The sediment results discussed in this section are based on data received from NYSDEC. Organic carbon in sediments is a parameter that will be measured in Phase 2.

B.3.2.3 Lamont-Doherty Geological Observatory Investigations

Response to G-4.21, G-4.46

The River Mile 188.5 core has been interpreted by Drs. Bopp and Simpson in a manner consistent with their general interpretation of sediments throughout the Hudson, with the appearance of Cesium-137 in the core assigned to 1954 and the maximum level assigned to 1963. To assign the cesium maximum to 1973 would require that the core not contain any evidence of the 1963 maximum and that the core's Cesium-137 pattern, which fairly closely mimics that of other cores, be produced by a process completely different from that found in cores collected both upstream and downstream of this location. This scenario is unlikely. In addition, the maximum seen in Cesium-137 and the maximum seen in PCB concentration are separated by about 8 cm within the core. Such a separation is highly unlikely under the scenario proposed by the commentor, whereby both maxima were created by the same event, *i.e.*, the 1973 dam removal. The more likely scenario is that the two maxima were created by separate events, as interpreted by Bopp *et al*. (1985), consistent with the Cesium-137 and PCB deposition patterns seen throughout the Hudson.

As evidenced by all of the sediment cores, PCB transport from the Upper to the Lower Hudson took place continuously from the 1950s onward. Although the USEPA does not contest the presence of other sources, the current evidence, viewed in total, strongly points to the Fort Edward area as the most significant historic source to the Hudson. Phase 2 sampling and analysis will further refine the information to reach sufficient conclusions.

The occurrence of biodegradation in the Upper Hudson undoubtedly has resulted in some loss of PCB mass from the sediments. The extent of this loss is confounded by sediment heterogeneity and it is unclear that further study of the Thompson Island Pool by gross sampling could resolve this or is even necessary. As noted by the commentor, the occurrence of anaerobic dechlorination was reported by Dr. J. Brown of General Electric (Brown *et al*., 1984) prior to the reference cited in this section (Bopp *et al*., 1985).

B.3.2.4 Other Studies

<u>Response to G-6.2, C-7.10</u>

It is difficult to compare directly PCB results analyzed with different laboratory methods. The comparison provided in the report was essentially qualitative, simply demonstrating that, despite the comments' references to natural dechlorination, PCBs continue to be measured at significant levels in the Upper Hudson sediments. USEPA will continue to examine the sediment data and come to an independent conclusion on evidence of dechlorination.

As noted in the Responses to S-1.20, C-6.7 and G.4-47 below, there was an inconsistency in the summary of GE's data (Table B-3.8 of the Phase 1 Report). A corrected table is included in this Responsiveness Summary. Other PCB data from the 1984 survey were evaluated for evidence of PCB dechlorination. USEPA considered it premature, however, to come to any firm conclusion before examining the data more thoroughly in Phase 2 and also exploring alternate hypotheses.

Response to S-1.20, C-6.7, G-4.47

Phase 2 will involve more extensive analysis of sediment data collected by GE in 1990. This analysis will be done in conjunction with analysis of the results of the Phase 2 sediment sampling effort. Analysis on a congener basis will help to resolve issues regarding biodegradation.

As noted at public meetings on the Phase 1 Report, there were errors present in Table B.3-8, reporting GE's 1990 sediment data, as included in the Phase 1 Report. A corrected version of this table follows on the next page.

B.3.2.5 Other Chemicals in Sediments

Response to G-4.48

USEPA recognizes the presence of metals in sediments and their impact on remedial evaluations.

Response to S-1.21, C-6.8, C-7.8

Although PCBs are the focus of the Reassessment, information regarding the metals in sediments, *e.g.*, comparison of these levels with relevant toxicity assessment endpoints or guidelines, will be presented in either Phase 2 or 3. There was no intent to examine these chemicals in detail.

Table B.3-8 (Revised 3/4/92)
Total PCBs in Sediments - GE's 1990 Study
and Comparison to Earlier Studies

Core Section Summary
(PCB Concentrations in ppm)

Hot Spot#/ GE #	Approx. River Mile	N	Min	Max	Arith. Mean	Median
5/H-7	193	150	0.0	729	40	3
6/4	192	8	1.7	142	51	20
14/5 & 18	190	23	0.3	730	114	39
16/6	189	9	2.9	142	68	57
18/7	188.5	11	11.3	915	251	143
19/8	188.5	10	3.8	1,328	217	23
28/9	185.5	9	0.0	79	14	1
31/10	184.5	7	0.2	25	5	2
36/11	169.5	29	0.2	157	27	10
39/12	163.5	9	3.6	99	25	20
40/13	163.5	9	2.9	94	36	28

NOTES: N is the number of core sections.
Core section PCB concentrations are those reported -- not depth weighted.

Summaries by Core and/or Grab Samples
(Depth-Weighted PCB Concentrations in ppm)

Hot Spot#/ GE #	Approx. River Mile	GE 1990 Mean	GE 1990 Samples	MPI 1978 Mean	MPI 1978 Samples	USEPA 1983 Mean	USEPA 1983 Samples
5/H-7	193	36.1	[62]	62	[6]	30	[3]
6/4	192	70.3	[3]	69	[17]	55	[7]
14/5 & 18	190	130.6	[8]	279	[20]	32	[11]
16/6	189	79.1	[3]	380	[12]	46	[4]
18/7	188.5	240.5	[3]	94	[9]	17	[11]
19/8	188.5	171.6	[3]	83	[1]		
28/9	185.5	9.1	[3]	109	[18]	23	[4]
31/10	184.5	7.6	[3]	516	[3]		
36/11	169.5	32.3	[8]	51	[11]		
39/12	163.5	28.4	[3]	161	[3]		
40/13	163.5	45.3	[3]	62	[1]		

NOTES: Sample numbers in brackets are number of core or grab samples -- cores were depth averaged.

Sources:

GE 1990 data provided by GE at meeting with USEPA on Feb. 28, 1991.

MPI 1978 data summary taken from Phase 1 Engineering Report Dredging of Contaminated Hot Spots, Upper Hudson River, New York, December 1978.

USEPA 1983 data taken from NUS (1984) Feasibility Study.

B.3.2.6 Discussion

No comments are responded to in this section.

B.3.3 Surface Water Monitoring

B.3.3.1 USGS Flow Records

Response to G-4.50

The wording in sentence three of the first paragraph on page B.3-19 in the Phase 1 Report is revised to read: This record reveals the presence of several major flood events, which are expected to have been associated with erosion of the remnant deposits.

Response to C-8.51

At least one dye study was performed in the 1970s.

B.3.3.2 Suspended Sediments Monitoring

No comments are responded to in this section.

B.3.3.3 USGS PCB Monitoring

Response to G-4.51, G-4.52, G-4.53, G-4.54

The number of suspended sediment versus sediment load samples varies, because sediment load was only calculated when both suspended sediment and flow were measured.

The last sentence in the third paragraph of B.3.3.3 is revised to read: Water samples collected by the USGS for water year 1990 were given to

NYSDEC for PCB analyses but the PCB results were not available for the Phase 1 Report.

USGS sample and analytical methods are discussed in Sections B.3.3.3 and B.3.7.2. The detection limit was always considered to be 0.01 µg/L (not 0.01 mg/L). The practical quantitation limit was reported by Bopp *et al.* (1985) to be 0.1 µg/L.

Table B.3-11 of the Phase 1 Report contains arithmetic means. The data can be fit to a log normal distribution. The Phase 1 Report details the method of correcting the mean calculations to account for non-detects and changing detection limits. The standard deviations in the table include non-detects at the detection limit.

<u>Response to G-4.57, G.4-55</u>

In Table B.3-12 of the Phase 1 Report, the Adjusted Maximum Likelihood and Log-Probit methods report minimum variance unbiased estimates of arithmetic means, obtained under the assumption that the underlying distribution is log-normal. These are not geometric means.

Risk analysis for drinking water is based on means estimated from recent observations. There is a good probability that such an analysis over-estimates the average exposure concentrations for the next thirty years. Nevertheless, evidence for a continued steady decline of PCB levels into the future is somewhat tenuous and open to argument. Analysis using current average levels is likely to be more conservative.

The most recent USGS data will be obtained for analysis during Phase 2.

Response to C-8.52

The dilution associated with the Hoosic (and Mohawk) River and the reduction in PCB concentration were in general agreement with the dilution calculation.

Response to S-1.37

It is agreed that detection limits for available sampling data of the water column are above the NYS standard of 0.001 µg/L.

B.3.3.4 Other Sources of Water Column Data

Response to G-4.59, C-2.2

There are difficulties in attempting to infer PCB homologue composition from packed column data. For this reason, Phase 2 sampling efforts will rely primarily on capillary column analyses.

The conclusion, based on packed column quasi-homologue analysis, that "little or no release of PCBs from the anaerobic sediments was occurring on a substantive basis in comparison to the mixing and resuspension of the surficial sediments" is that of Bopp *et al.* (1985) and not of USEPA. Phase 2 sampling will enable a closer look at this problem.

Dr. Brian Bush noted that his recent work with multiplate samples suggests that congeners deriving from both Aroclor 1242 and Aroclor 1254 continue to be emitted in the Upper Hudson.

Response to G-4.58

The statement on page B.3-26 that summer water samples showed higher water concentrations, "accounted for by boat traffic and increased use of locks," is the speculation of Bopp *et al.* (1985) and not of USEPA.

B.3.4 Fish and Other Aquatic Biota

General

Response to C-6.4, G-4.61

The reference on page B.3-29 of the Phase 1 Report to "abnormally low spring floods of the 1980s" is misleading. No major flood events (greater than 20-year recurrence interval) were observed in the 1980s and in certain years, *e.g.*, 1985, 1988 and 1989, no daily flows in excess of 20,000 cfs were observed at Fort Edward. On May 2, 1983, however, a flow of 32,600 cfs was reported at Fort Edward, which was in excess of the estimated 10-year recurrence interval daily flow.

B.3.4.1 Fish Sampling

Response to S-1.22

Sediment sampling will be performed during Phase 2 above the dam at Bakers Falls.

Response to S-1.23

The Aroclor detection limit change is noted.

Response to G-4.63

Arithmetic sample mean PCB levels are reported in Table B.3-15 of the Phase 1 Report. The rationale for averaging all Upper Hudson fish is provided in the preliminary human health risk assessment (Phase 1 Report, Section B.6).

B.3.4.2 Other Chemicals In Fish

<u>Response to C-11.1, C-11.3</u>

Other chemicals that have been measured in fish from the Hudson are presented in Section B.3.4.2 for information purposes. PCBs are the focus of the Reassessment. Additional information regarding the toxicity or guidelines for these other chemicals will be provided in future phases.

B.3.4.3 NYSDOH Macroinvertebrate Studies

<u>Response to G-4.65</u>

The Phase 1 Report presents a plausible hypothesis. Revise the last sentence of the second paragraph on page B.3-39 to read: Another factor... is that the higher chlorinated congeners were present in the water but below detection limits.

B.3.5 PCB Concentrations in Air and Plants

B.3.5.1 Air

<u>Response to C-6.16</u>

Revise last sentence of second paragraph on page B.3-43 of the Phase 1 Report to read: Warren *et al*. (1985) determined Henry's law constants... which are directly applicable to conditions found in the Hudson.

<u>Response to S-1.24, C-6.9</u>

There are important QA/QC considerations regarding results of early air monitoring. Original lab data were not available for QA/QC review at the time of the Phase 1 Report preparation.

Response to C-8.53, G-4.66, G-4.67

The purpose of Section B.3.5.1 in the Phase 1 Report was to examine the limited air monitoring data. If the vertical gradient is to be quantified, a more complete evaluation of volatilization will be performed.

The air data collected in 1986 and 1987 were provided by NYSDEC. The NYS ambient air monitoring provides results for both rural and urban/industrialized areas and a yardstick against which to assess levels in the Upper Hudson area. GE's baseline monitoring study contained a background location, which presumably was intended as an unbiased location.

Response to G-4.68

There are many important considerations involved in modeling volatilization of PCBs from the Hudson River. Past efforts have not addressed this question satisfactorily. While the important work of Bopp (1983) is discussed, USEPA will not utilize his results unaltered as a quantitative model. The detailed suggestions provided in the comments on the question of volatilization modeling are valuable input for Phase 2.

B.3.5.2 PCB Uptake By Plants

Response to C-5.10

Revise last sentence on page B.3-44 of the Phase 1 Report to read: The lowest PCB concentrations were found in samples farthest (230m) from the source...

Response to G-4.69

The discussion in the Phase 1 Report states several of the observations reported by Bush *et al.* (1986) and also cites the results showing

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PCBs volatilized from the plants to the atmosphere. The commentor may have overlooked the Phase 1 Report's discussion of the Shane and Bush (1989) study.

B.3.6 Other Media

No comments are responded to in this section.

B.3.7 Adequacy of PCB and Aroclor Measurement

General

Response to S-1.25

Comments regarding the usefulness of Section B.3.7 in the Phase 1 Report and the lack of previous availability of congener analyses are noted.

Response to G-4.71

USEPA guidance requires that the quality of historical data be determined prior to its use in a remedial investigation. Quality control data were generated as part of the Hudson River Fish Monitoring Project, as indicated on page B.3-58 of the Phase 1 Report. Summary data provided by NYSDEC were used to assess data quality. Data reviewed were sufficient to establish overall quality of the method of analysis, but not "every piece of data employed by USEPA," as requested in the comment. The review in the Phase 1 Report is consistent with the Phase 1 Work Plan, which stated that the objective was to review the overall data quality of the available monitoring record, but not to perform in-depth sample-by-sample QA/QC review.

Response to P-1.8, P-2.9

A general understanding of the complexity and uncertainty involved in measuring and quantifying PCBs and distinguishing higher versus lower chlorinated congeners is important to evaluating historical PCB data. Comparison of PCB levels in sediments, water and fish, all of which may be measured using somewhat different laboratory techniques with different methods of comparing to Aroclor standards, is confounded by the very real uncertainties presented by the measurement methods. These measured PCB levels in the Hudson have been, and will continue to be, used to deduce the transfer of PCBs from sediments into water and the food chain. It was not USEPA's intent to discredit PCB measurement methods and the historical data. Insofar as a clear understanding of the observed PCB record will be crucial to the management decision for the site, there must be a clear recognition of possible limitations in the measurement methods used to quantify historical PCB levels in the River.

B.3.7.1 Overview

<u>Response to C-6.11, S-1.27</u>

There is a discrepancy between information contained in the table on page B.3-50 and the text found on page B.3-55 in the Phase 1 Report. In the 1984 sediment survey, Aroclor 1242 levels were originally estimated using the method of Webb and McCall and later recalculated, based on the detector response for three peaks that were consistently identified in the samples -- peaks 28, 47, and 58. The text describes the initial procedure used to quantitate Aroclor 1242 levels, while the table indicates the peaks used to recalculate Aroclor 1242 levels.

<u>Response to G-4.70</u>

The table on page B.3-50 of the Phase 1 Report contains the major data sets where PCBs were quantitated based on peaks identified using the method of Webb and McCall. As described in the report's text on page B.3-60, quantitation of PCBs in water column data generated by the USGS was based on comparison to the area of all peaks for an Aroclor standard and as such is not suitable for inclusion in the table. The data generated by the USGS are discussed in the text.

B.3.7.2 Discussion of Data Quality Assurance

Response to C-5.12

Revise first sentence in second paragraph on page B.3-57 of the Phase 1 Report to read: In addition to ... events just discussed, several other sediment surveys have been conducted.

Response to C-6.10, S-1.26

It is correct to note the potential for underestimation of total PCBs as a result of inadequate quantitation of mono and dichlorbiphenyls. The magnitude of such an underestimation is, however, difficult to assess, since lower chlorinated PCBs were rarely detected in early studies.

B.3.7.3 Summary

Response to C-5.13

Revise second sentence in first paragraph of this subsection on page B.3-61 of the Phase 1 Report to read: Several methods have been devised...

Response to G.6-1

The value of the historical database is somewhat constrained by reliance on packed column Aroclor equivalent analyses. Capillary column congener-specific analysis is certainly more informative and will be employed in the Phase 2 analytical program. Despite their limitations, the Aroclor-equivalent analyses do provide valuable information and constitute the major part of the available database. Because this information is not as precise as would be obtained by congener-specific methods, further consideration will be given to how results obtained by different analytical methods can be related or compared.

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SYNOPSIS (Section B.4)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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B.4 Data Synthesis and Evaluation of Trends

B.4.1 Phase 1 Objectives

<u>Response to G-3.96</u>

A meaningful assessment of remedial alternatives requires a quantitative assessment and prediction of future conditions. It is not appropriate to characterize the Phase 1 Report as merely a "qualitative" investigation. Quantitative predictions focused on the needs of the Reassessment will be performed during Phase 2.

<u>Response to F-3.6, F-3.7, G-4.72</u>

The questions posed and the conceptual framework offered in the Phase 1 report were put forth as an aid to manage and focus data evaluation. Admittedly they simplify a complex system. It was not the intent of Phase 1 to provide a detailed assessment linking PCBs in sediments with detailed food web modeling. The conceptual framework will be refined in the context of exploring new data and using models as necessary and appropriate decision-making tools.

B.4.2 Flood Flow and Sediment Transport

B.4.2.1 Flood Frequency Analysis

<u>Response to P-17.1, P-14.3</u>

The presentation of the time series of Upper Hudson daily average flows (Phase 1 Report, Figure B.3-7) emphasized flood events of 1976, 1979 and 1983, rather than events of 1973-4, when much of the material formerly behind the Fort Edward Dam was translocated. While there was no intention of ignoring this period, no suspended sediment or PCB monitoring data is available from these years. The spring flood in 1976 (maximum 39,340 cfs daily flow) was more than

60 percent greater than any flow observed in 1973-1975 and also greater than any flood observed since.

If a major flood with significant erosion potential occurs during the course of the Reassessment, USEPA would hope to obtain data for before and after events to measure effects on PCB hot spots.

Response to P-3.11, G-3.20, G-4.73

The Phase 1 Report concluded that previously reported estimates of the magnitude of the 100-year flood in the Thompson Island Pool were apparently too large. A realistic estimate of the probability of erosion of contaminated sediments in the Thompson Island Pool will need to take this finding into account. Interpretation of erodibility will be made during Phase 2. This interpretation will, of necessity, need to be made in probabilistic terms, in order to account for uncertainties inherent in the analysis.

There is a discrepancy in the Phase 1 Report between page B.4-3 (reporting estimated daily flood flows at Hudson below Sacandaga) and Table B.4-1 (reporting estimated flood flows at Fort Edward), as the table shows slightly lower flows at the downstream station. This situation is the opposite of what would be expected from the increase in drainage area from Sacandaga to Fort Edward. A spreadsheet error resulted in a slight underestimation of the flows modeled from the Log Pearson Type III distributions in Table B.4-1, but did not effect the earlier calculation reported on page B.4-3. A corrected version of Table B.4-1 is provided on the following page.

The corrected numbers are somewhat higher than those estimated previously by TAMS/Gradient, *i.e.*, the estimate of the 25-year recurrence peak flow is 5 percent greater. Revised daily flood flows estimated for Fort Edward are slightly greater than those estimated for the Hudson River below Sacandaga, as expected. Nevertheless, the estimates are still well below the estimates developed by FEMA, which assumed that the Sacandaga River would contribute a constant 8,000 cfs of flow to the Hudson River during peak events.

Table B.4-1
(Corrected 3/2/92)
Flood Recurrence Intervals at Fort Edward

Recurrence Interval (years)	Peak Flow[a] 1930-1990 data (cfs)	Daily Ave. Flow[a] 1930-1990 data (cfs)	Peak Flow FEMA (1984) (cfs)
5	30,090	28,653	
10	34,526	32,801	38,800
25	39,848	37,741	
50	43,636	41,233	48,300
100	47,293	44,585	52,400
500	55,471	52,019	62,200

Water year 1930-1976 flows at Fort Edward estimated from peak and daily flows in the Hudson River at Hadley and daily average flows in the Sacandaga River at Stewarts Bridge; post 1976 flows at Fort Edward have been measured at Rogers Island.

[a]Estimated using a Log-Pearson Type III extreme value distribution (USGS, 1982).

Revision of the values in Table B.4-1 does not alter the conclusion that the previous analysis of erodibility in the Thompson Island Pool (Zimmie, 1985) significantly overestimated the magnitude of likely flood events. In addition to the overestimation inherent in the flows reported by FEMA, flows used in the previous study were also inflated by mistaken application of FEMA (1982) estimates of peak discharges below Fort Miller (see page B.4-7 of the Phase 1 Report) to the Thompson Island Pool. Using the recalculated values, the 100-year recurrence peak flood flow estimate used by Zimmie (1985) for the Thompson Island Pool overestimated the most likely value by about 12,000 (rather than 14,000) cfs. This number represents an overestimation of approximately 25 percent and uses for the 100-year flood a value that appears to be in excess of the 500-year recurrence flood.

To reflect these changes, the second paragraph on page B.4-7 is revised to read:

- Using the TAMS/Gradient peak flood calculations at Fort Edward, peak discharges for the 10 and 100-year events in the Thompson Island Pool, upstream of the confluence with Moses Kill, would be 37,300 and 51,000 cfs respectively. Discharges modeled by Zimmie may have overestimated the 100-year peak discharge in the Thompson Island Pool by about 12,000 cfs and, indeed, were in excess of the expected 500-year peak discharge, using values computed for this study and presented in *revised* Table B.4-1.

While past attempts to estimate erodibility in the Thompson Island Pool using the model HEC-6 also appear flawed because of this model's inability to account for cohesive sediment transport, no conclusions regarding erodibility were drawn in Phase 1.

B.4.2.2 Suspended Sediment Discharge

<u>Response to C-5.14</u>

Revise third sentence on page B.4-10 of the Phase 1 Report to read: Breakpoints... also appear farther downstream...

<u>Response to C-8.6, C-8.54, C-3.1, G.3-21</u>

The possibility of scour of buried contaminated sediments in the Thompson Island pool is important to the assessment of remedial alternatives. PCBs buried at sufficient depth may be largely decoupled, at present, from the food chain. If the buried sediments can be remobilized by erosion, a significant impact on PCB levels in biota might result. The Phase 1 Report contained preliminary investigations of some modeling alternatives to assess sediment scourability. The Phase 2 Work Plan proposes methods of analysis to address this problem. Relevant geophysical work has been coordinated as part of the Phase 2A Sampling Plan and is also presented in the Phase 2 Work Plan.

Suspended sediment data available at the time of the Phase 1 Report were insufficient to develop a detailed picture of sediment loading and responses in the Upper Hudson, particularly the Thompson Island Pool. Only a limited number of point measurements were available, rather than continuous monitoring, and no suspended sediment monitoring was conducted in the area of the Thompson Island Dam. Plots of suspended sediment load versus discharge do not reveal any simple, clear relationship, except to show that sediment load often increases with discharge. Among several factors that can account for this result, one is variation in timing of the measurement, *e.g.*, on the rising or falling limb of the flood; another is that instream measurements, which integrate a variety of upstream phenomena, including both overland washoff and instream scour, do not directly measure instream scour in the vicinity of the monitoring station. There are presently no data available to differentiate between the portion of the suspended sediment load resulting from bed erosion and the portion derived from the tributary wash load.

The sediment load data in the Upper Hudson do appear to show a weak downward trend with time; perhaps this trend is a reflection of re-equilibration of the channel after removal of the Fort Edward Dam in 1973. While the comment is made that the trend can be investigated only after normalizing the loading to discharge, this normalization is, indeed, made implicitly through the inclusion of both discharge and time as independent variables in the multiple regression analysis of trend in suspended sediment concentration (see page B.4-11 of the Phase 1 Report). It is uncertain, however, whether this trend is genuine or a mathematical artifact, resulting from nonlinear response to discharge combined with the fact that higher observed discharges tended to be grouped in the first half of the time series. Direct visual comparison of sediment load measurements and flows at Fort Edward by readers of the Phase 1 Report was hindered by the inadvertent use of differing time axes in Figures B.4-8 and B.4-11.

Response to G.4-74, G.4-75

Page B.4-7 of the Phase 1 Report states that "the natural rate of sediment transport in the Upper Hudson River is relatively low compared to many other eastern North American rivers of similar size..." This statement reflects the general nature of sediment yield from non-urbanized watersheds in the northeast.

Page B.4-8 of the Phase 1 Report states that after removal of the Fort Edward Dam, "it was later determined that these sediments contained large amounts of PCBs." According to available information, no tests for PCBs were conducted in the sediments behind the dam prior to its removal and none are reported by Malcolm Pirnie (1975). PCB analyses of this sediment that might have been made prior to 1973 could not be addressed in the Phase 1 Report, unless they were reported.

Page B.4-10 of the Phase 1 Report states that average suspended sediment levels declined "as the river gradually recovered to a more equilibrium level and the remnant remediation was completed." Remnant deposit remediation was not *completed* until 1991 and suspended sediment data have not been obtained subsequent to completion.

B.4.3 PCBs in the Water Column and Mass Discharge

B.4.3.1 PCB-Discharge Relationships

Response to G-4.76

Care must be taken when discussing sediment stability. The third paragraph on page B.4-12 of the Phase 1 Report, therefore, stated that destabilization *may* have exacerbated erosion of contaminated sediments, with emphasis on the word "may."

Response to C-8.55

Regression analysis on the correlation of PCB concentrations and other measured variables was essentially exploratory analysis; the choice of regressors was constrained by available monitoring data. Because of the observation of a possible bimodal relationship between concentration and flow, both flow and the inverse of flow were considered as variables.

Response to C-3.2, C-3.3, C-3.5, C-3.6, P-1.19, G-4.56

Findings in the Phase 1 Report regarding sediment and PCB flux strongly suggest a declining role over time for PCB loading by scour of the Thompson Island Pool hot spots. The role of desorption from these sediments is also time-variable, as PCB levels in exposed sediment have likely declined over time. A significant portion of the PCB load appears to have been present in recent years by the time flow reaches Thompson Island, a finding that may indicate continued input from the remnant deposit areas or other source areas. While speculations on the possible mechanisms and history involved can be made, the Phase 1 Report did not include such speculation, because additional data to be collected in Phase 2 will support firmer conclusions.

Radionuclide dated sediment cores provide a most important data source to analyze the changing roles of scour and desorption. The number of cores for the Upper Hudson that could be dated was, however, limited at the time of the Phase 1 Report. Most dated cores available for the whole river system were collected prior to 1978, *i.e.* at just about the same time regular monitoring began in other media. In Phase 2, USEPA will attempt to obtain and analyze a representative selection of current cores that can be dated for both the Upper and Lower Hudson. These cores should allow presentation of a more detailed and accurate picture of the history of sediment scour and transport from the hot spot and remnant deposit areas. Additionally, congener-specific analyses of water samples will help to identify the origin of PCBs in specific reaches.

Finally, Phase 1 has attempted to identify the existing trends in historical data, without bias or preconceptions. Phase 1 was not intended to render final judgments on the future course or continuation of these trends. Such evaluations, including the possibility of a reversal of the observed decline in PCB concentrations in water, will be made in Phase 2.

Response to C-3.4

PCB concentrations at Fort Edward shown on Figure B.4-10 of the Phase 1 Report did not appear to match those shown on Figure B.4-12. The horizontal axis in Figure B.4-12 was inadvertently labeled incorrectly. This figure actually shows PCB concentrations vs. *instantaneous* discharge estimates, rather than daily flows. As a result, several points for which no instantaneous discharge estimates were available were omitted from B.4-12, but appear in B.4-10. A corrected version of Figure B.4-12, showing concentrations plotted against *daily* flows, follows on the next page.

In the same series of figures in the Phase 1 Report, Figure B.4-13 plots PCB concentrations at Schuylerville versus daily flows, as estimated from proration of daily flows at Fort Edward. Figures B.4-14 and B.4-15 plot concentrations at Stillwater and Waterford versus daily flows measured at those locations.

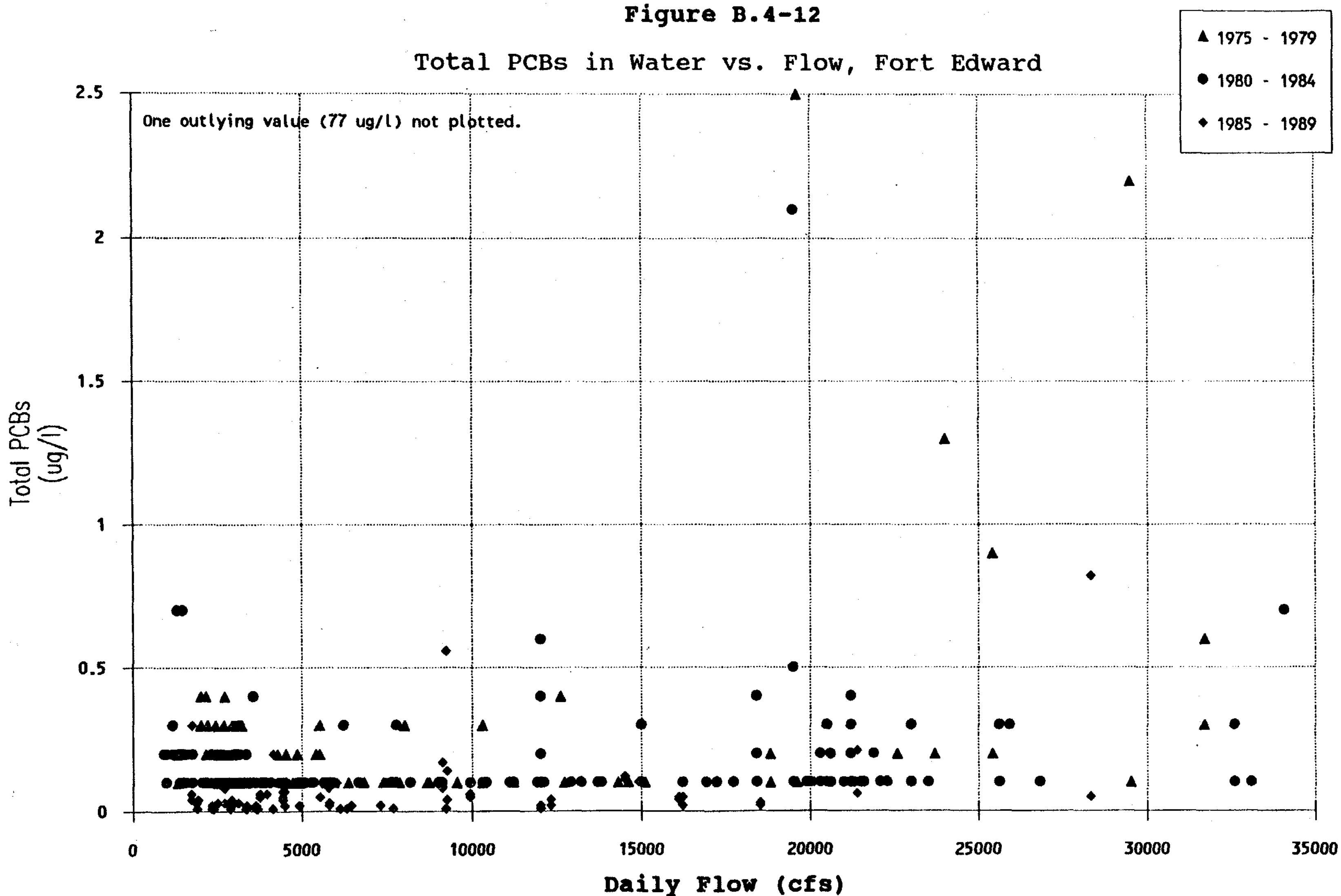
Response to G-4.77

Page B.4-17 of the Phase 1 Report states that "Major proportions of the yearly load may be transported during a few brief flood events." Emphasis should be on the word "*may*." This wording was not intended to imply that this situation is always the case. Nevertheless, a major part of the load does often seem to be transported during a limited amount of time, even if concentration and flow are not strongly correlated. (See, for instance, the detailed analysis of 1983 flows and loads in Bopp *et al*., 1985.) This occurrence increases the difficulty of obtaining accurate estimates of loading.

Response to C-9.4

Dr. Richard Bopp, a member of the Scientific and Technical Committee, has been a valuable resource to the team performing the Reassessment.

Figure B.4-12



(updated 3/4/92)

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B.4.3.2 Mass Transport Estimates

Response to C-5.15

Revise third sentence in third paragraph on page B.4-23 of the Phase 1 Report to read: In general, the error bounds are quite large for years in which there was a significant number of scouring flows...

Response to C-5.16

Revise fourth sentence in second paragraph on page B.4-24 of the Phase 1 Report to read: The only significant spring flood event... did produce an apparent gain from Fort Edward and Schuylerville and farther downstream.

Response to C-8.7, C-3.7, G-3.30, C-7.3, G-4.78, P-20.1

At least a significant part of the PCB load in recent years appears to be present already in the water column by Thompson Island; admittedly, however, the Phase 1 Report shows that PCB loads are relatively constant moving downstream. It has not been proved that PCBs at one location are identical to those at another, although this inference is reasonable.

Resolution of the role of inputs from the hot spots, from sources above Thompson Island, including the remnant deposits, and from other potential sources, will be important in the evaluation of remedial alternatives. Results regarding the relative role of the hot spots obtained in Phase 1 are only tentative, because of the relative sparsity of the data collected prior to 1991 and the difficulty in estimating mass transport rates from point measurements. The latter problem may be particularly important at Thompson Island (Route 196 Bridge), where samples taken from the two different channels often show highly different PCB concentrations. Additionally, PCB concentrations may vary significantly over the course of a flood event.

Planned in Phase 2 are studies to discern the relative input from the Thompson Island Pool, remnant deposit areas and other source areas. Containment of the remnants has been completed recently. GE has been conducting environmental monitoring in this area, including congener-specific water column analyses. These results, together with additional monitoring proposed for Phase 2, should enable evaluation of the importance of the remnant deposit area as a continuing source.

Comments suggest that the statistical method used to estimate annual PCB flux past Waterford has a high degree of uncertainty and should be replaced by a modeling approach. A model with an appropriate temporal scale may be useful to understanding PCB transport, but a model will not necessarily reduce the degree of uncertainty. The performance of the model, even insofar as it provides an accurate representation of reality, will be limited by the accuracy of the data available for calibration.

<u>Response to P-1.20</u>

Reduction in rates of PCB mass transport since the late 1970s may, indeed, represent a gradual depletion of the source material made available by the removal of the dam at Fort Edward. The commentor noted "there has been little decrease in the sediment load (*sic*) in the last few years." We assume that this comment was intended to refer to "...little decrease in <u>PCB</u> load in the last few years." Lack of a dramatic and continuing decline in loading is an obvious inference from Figure B.4-20 and Table B.4-4. For instance, the estimated load past Waterford in 1989 (210 kg) is larger than that estimated for either 1988 or 1985; however, it was less than half of that estimated for 1987. Post-1989 data available for Phase 2 should further clarify current trends in PCB loads.

B.4.3.3 Discussion of Mass Transport from Upper to Lower River

<u>Response to P-3.12, P-2.2, P-1.7, P-1.18, P-5.1, P-10.2, P-13.2, P-12.5</u>

Analysis of available suspended sediment and PCB monitoring data suggests that the magnitude of response of sediments in the Thompson Island Pool to floods has declined over time, representing the gradual re-equilibration of the channel, following the massive release of sediments after removal of the Fort Edward Dam in 1973. Since 1983 only relatively minor responses of PCB load to spring floods have been observed. It is also true that the years since 1983 have not experienced particularly large flood events. The average annual transport of PCBs past Waterford is estimated at between 140 and 460 kilograms (289 to 950 pounds) of PCBs per year for the 1985-1989 period, not 2000 pounds per year as cited frequently in comments (see Table B.4-4 of the Phase 1 Report). This estimate represents a substantial reduction of the rate of transport to the Lower Hudson observed through 1979, yet still provides a significant loading.

<u>Response to G-4.80, G-3.88, G-4.81</u>

Page B.4-26, third paragraph, of the Phase 1 Report presents the estimates of PCB load made by past authors and not the current estimates of USEPA or the TAMS/Gradient team. These estimates should not be dismissed out of hand, but will be critically reviewed in the Reassessment.

Similarly, the estimates of PCB loading presented on page A.4-2 of the Phase 1 Report are those of Thomann *et al*. (1989) and not those of USEPA or the TAMS/Gradient team. Thomann *et al*. estimated loading from the Upper to Lower Hudson at 3 lb/day as of 1987 (not 0.3 lb/day, as implied in the comments). The TAMS/Gradient estimate of loading from the Upper to Lower River as of 1987 is approximately 1.3 lb/day (see Table B.4-4 of the Phase 1 Report). The relative magnitude of ongoing Upper Hudson loading compared to sources already present or continuing to discharge to the Lower Hudson will be considered in evaluating the potential benefits of Upper Hudson remediation on the Lower Hudson.

Page B.4-28 of the Phase 1 Report does not state that radionuclide dating of sediment cores allows an exact dating of the PCB peak at 1973. Instead, it states that "cores suggest...peak concentrations *circa* 1973..." The temporal resolution of the radionuclide dating method is insufficient to identify a date to an accuracy of more than plus or minus several years.

B.4.4 Analysis of PCBs in Fish

General

Response to G-4.82

The last sentence in the first paragraph of Section B.4.4 on page B.4-30 of the Phase 1 Report is deleted. USEPA has not prejudged the need for a remedy or the effectiveness of a remedy in Phase 1; an analysis of remedial options will be made in Phase 3.

Response to C-6.2, C-6.3

The Phase 1 Report contains several inadvertent inconsistencies of terminology in referring to the sequence of spring floods observed in the 1970s and 1980s. In the period 1973-1990, daily average flows in excess of 30,000 cfs were observed only three times at Fort Edward. In decreasing order of magnitude, these were: 39,340 cfs on April 2, 1976 (estimated by proration from the Hudson below Sacandaga River), 32,600 cfs on May 2, 1983, and 31,700 cfs on April 29, 1979. The statement on page B.4-31 of the Phase 1 Report that there "have not been any major flood erosion events since 1976" is imprecise. Nevertheless, flows have not yet been matched in the subsequent record.

Response to G-4.83

Channel dredging occurred near Fort Edward in 1974-1979. However, the timing of maximum channel dredging is not clearly associated with the maximum observed PCB burdens in fish in the Upper Hudson. Maximum dredge volumes were removed from the area around Lock 7 and Fort Edward in 1974 (351,000 cubic yards) and 1979 (66,930 cubic yards) as stated on page B.4-12. The 1979 dredging may be associated with the high water column PCB loads below Fort Edward observed in that year (Figure B.4-19). Observed PCB burdens in Upper Hudson fish for data commencing in 1975, however, generally suggest peak levels circa 1977.

Response to S-1.17, C-6.6

At present it does not appear to be either feasible or appropriate to develop a detailed food web model of PCB bioaccumulation in Upper Hudson resident fish. Difficulties in application of the Thomann model to the Lower Hudson (Section A.4) have been pointed out. There are less data available for ecosystem dynamics in the Upper Hudson than for the Lower Hudson.

B.4.4.1 Evaluation of Time Trends

Response to C-1.4, S-1.28

The Phase 1 Report did not draw any final conclusions as to when "the river would clean itself," although certain trends seem evident. Phase 1 was an interim characterization carried out to assemble available data and identify additional data needs. After collection of additional data in Phase 2, the rate of natural cleaning of the system will be assessed for the evaluation of the No Action alternative.

In the Phase 1 analysis, non-parametric tests of trend to fish PCB burdens and water column PCB concentrations were applied. The trend tests are one way of empirically evaluating, without imposition of any preconceived explanations for the trend, the observed declines in PCBs in fish and water. No physical mechanism for the trend is assumed or implied. Further, no attempt was made to account for a possible structural change in conditions between conditions before and after 1978/1979.

Response to G-3.31, G-3.32, G-1.1

The Phase 1 Report examined the historical PCB trends in water and fish; these trends are as reliable as the conditions (flow regime, sediment scour redeposition history, etc.) under which the monitoring was performed. The hypothesis offered in the report is that under conditions of generally higher flows than the *generally* low flows historically observed in the 1980s, it is possible that such higher flow conditions *could* alter the rates of PCB decline. A single flood flow during 1983 should not be construed as causing generally higher flows during an extended period of time and does not contradict the hypothesis. Future congener-specific sampling will address the issue of the relative dissipation rates of higher versus lower chlorinated biphenyls in the river sediments. This evaluation, coupled with an assessment of sediment scourability, should provide further information which will be used to refine or alter the hypothesis presented in the Phase 1 Report.

Response to F-1.3

It is correct to note that the half-life term as used in the Phase 1 Report does not indicate any physical mechanism for the declining trend, such as metabolism. Half-lives for Aroclor 1016 and Aroclor 1254, representing generally lower- versus higher-chlorinated PCBs respectively, were examined in the Phase 1 Report. The computed half-lives for these two Aroclor components differ as discussed in the report. Half-lives were used as empirical, descriptive measures of past PCB trends in the Hudson. More work is required to assess the fate of lower and higher chlorinated congeners in sediments, water and fish.

Response to G-3.33, G-4.85, G-5.8

The Phase 1 Report notes that the arithmetic mean lipid-based Aroclor 1254 levels show a slight increase from 1981-1988. Comments note that on a log-mean basis the levels, perhaps, decrease. This observation simply illustrates that there appears to have been little significant change in the lipid-based Aroclor 1254 levels in fish over this period.

The Monte Carlo analysis was based on a log normal PCB concentration in fish as indicated by the regression equation given on page B.4-35 of the Phase 1 Report. A 95 percent upper confidence bound on the arithmetic mean was calculated for purposes of the preliminary human health risk assessment. The result would change little if the 95 percent upper confidence limit on the geometric mean were calculated.

B.4.4.2 Projected PCB Concentrations in Fish

Response to G-4.84

The risk to human health is based on total PCB levels in fish. Background concentrations in fish will not be removed from the actual values to assess human health risk.

Response to S-1.30, C-6.12, P-3.9, P-1.21

Projection of the 30-year average concentration in fish was based on an exponential decline model fit to observed concentrations in fish from 1979 to 1988. This model predicts a continuing, although, low rate of decline into the future. Several comments noted that it is difficult to detect any definite trend in the most recent data. Were one to use these data only, an exponential curve could not readily be fit. The question may be resolved when post-1988 fish analyses, not available for Phase 1, are evaluated and as a better understanding of the correlation between PCB levels in fish and those in water and sediment is obtained.

The projection purposely does not include the possible effects of flood resuspension of contaminated sediments in the Thompson Island Pool. The estimate was intended to be used in calculating baseline risks, given the continuation of current conditions and trends. The possibility of resuspension of buried PCBs is an important question which will require detailed analysis in Phase 2.

B.4.4.3 Relation Between PCB Concentrations in Fish and Water

Response to G-3.3, S-1.5

The fish and sediment data show an historical decline in PCB levels. Recent NYSDEC data have been supplied to TAMS/Gradient and are being reviewed.

The bioaccumulation factor (BAF) was calculated on a lipid-based PCB concentration in fish. The lipid adjustment tends to normalize differences between individual samples. This is not incorrect, although it is true that one would need to account for this lipid adjustment in any calculations using the BAF.

Response to S-1.29

The Phase 1 Report presents PCB concentrations in fish on both a wet-weight and lipid basis. Presentation of the data on a lipid basis provides a firmer basis of comparison among species, among locations and among years. PCBs have low solubilities in water, but high solubilities in fat (lipids) and concentrate in fatty tissues. If two fish were exposed to identical environmental concentrations but had differing lipid contents, one would expect to see a divergence in wet-weight concentrations, while lipid-based concentrations should be more similar. It is well established in the literature that normalizing to a lipid basis helps to reduce sample to sample variability in observed fish concentrations of PCBs and other lipophilic contaminants (see Niimi, 1983). Lipid-based concentrations have been previously used by NYSDEC for comparative purposes (Sloan and Armstrong, 1980). BAFs are thus also best compared on a lipid concentration basis.

Response to P-17.2, G-4.86

In response to the Phase 1 Report's presentation of the correlation observed between summer average water concentrations and PCB burdens in fish, it was suggested that such a method could be used to estimate an acceptable target water column concentration corresponding to a target level in fish. This method is commonly used to set cleanup goals. Nevertheless, it may be necessary to assess the joint relationship between PCB levels in fish and levels in *both* water and sediment.

Figures B.4-27 through 29 of the Phase 1 Report show that much of the strength of the correlation between water concentrations and lipid-based PCB burdens in fish is attributable to observations in 1979-1981. While later observations do not contradict the hypothesized relationship, that is a situation in which both fish and water concentrations have remained relatively constant.

Response to P-14.2

Concerning the recommendation for tissue accumulation bioassays *in situ* with test fish and other organisms at various points in the river from the Battery to above Fort Edward, this comment is appreciated and was considered for Phase 2. Bioassays, however, are not planned for the Phase 2 program. Trace PCB levels are also identified through the analysis of free-ranging fish, but the latter present the inconvenient tendency not to stay in one place.

B.4.5 Summary

Response to C-8.11

During Phase 2, analysis of transfer of PCBs among compartments in the Hudson River system will be further developed. As identified in Phase 1, an understanding of the relationship between PCB levels in sediments and biota and between PCB levels in sediments and the water column is of particular concern. Analysis of these topics was incomplete in Phase 1, because of lack of data regarding sediment concentrations concurrent with measurements in water and fish. Phase 2 will include work to sample and analyze high resolution cores, which give information on historical suspended sediment trends, and low resolution sediment sampling to determine the current status of PCBs in the sediments.

Response to S-1.31, P-31.1, G-5.2

Rates of decline of PCB concentrations in media and fish are characterized as fitting an exponential curve, with a specified half-life. This characterization reflects the fact that concentrations generally declined rapidly from 1978-1980 and have subsequently declined less rapidly, or, in some cases, not at all. Use of an exponential decline representation was not intended to imply the future continuation of a specific pattern. The intent was not to claim any causal basis for an exponential decline, but to show that some of the observations can be conveniently summarized in this way.

PCB concentrations in water *appear* to have declined exponentially since 1978, with a half-life of about three years, but the causal mechanism has not been explicitly identified. A different physical mechanism should apply after about 1979, because of depletion of the most readily scourable PCB-contaminated sediments. Yet, even the loads since 1980 do appear to have shown a gradual decline, interrupted by year-to-year anomalies. The concept of an exponential decline is a convenient mathematical simplification, without any demonstrated, direct physical basis. Further analysis in Phase 2 is expected to provide a better reflection of physical reality.

The thirty-year projected average concentrations in fish implicitly include the half-lives for each Aroclor in both largemouth bass and brown bullhead, as the projection is based on a log regression. Neither method used in the Phase 1 Report to predict future average concentrations of PCBs in fish would be considered to represent a worst-case analysis. Additional methods of evaluating long-term trends will be examined in Phase 2.

Response to G-3.13, G-3.19, G-4.79

The apprehensions expressed in these comments appear to be conceptually unfounded and reflect a basic misunderstanding of the purpose of the Phase 1 Report, entitled "Interim Characterization and Evaluation." The report was distributed with a cover letter from Kathleen C. Callahan, Director of Emergency and Remedial Response Division of USEPA Region II, stating that "The Phase 1 Report...is an interim report which presents the compilation of existing data and analyses of that data. Based on the conclusions of the Phase 1 study, additional data will be required to more fully characterize the impact of the contamination on the River. A Phase 2 study will be performed to achieve this task. During Phase 2, USEPA will conduct the data collection and analyses needed for site characterization."

The stated purpose of Phase 1 has been to collect and organize the available data, conduct preliminary analyses, identify data gaps, and generally set the stage for Phase 2. Any quantitative modeling will be performed Phase 2.

Although a quantitative basis will likely help USEPA choose among remedial options, the mandate of the Reassessment is necessarily focused on those specific aspects of the Hudson River system that are relevant to such a choice. USEPA expects to provide a detailed quantitative assessment of relevant aspects of the system, but not of all aspects. Some topics, although of scientific interest, are not essential to the decision-making process.

The limited modeling efforts discussed in the Phase 1 Report were undertaken for the purpose of exploratory data analysis. The Phase 2 Work Plan describes the quantitative modeling proposed for development and use during the Reassessment.

Comments provided detailed suggestions on the possible form an "integrated quantitative framework" might assume. They will be further evaluated during Phase 2 of the Reassessment.

SYNOPSIS (Section B.5)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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B.5 Sediment Transport Modeling

B.5.1 Overview

Response to S-1.32, C-6.13

The intent of initiating modeling in Phase 1 was to determine limitations and assess potential efficacy for the remainder of the Reassessment. The Phase 2 Work Plan will present an alternative approach to sediment transport modeling and scourability assessment. TAMS utilized similar models for the Indus River in Pakistan to predict sedimentation behind one of the largest earth embankment dams in the world.

Response to C-8.8

Phase 1 involved initial hydraulic and sediment transport model testing to assess whether detailed modeling is feasible and appropriate. Testing of a sediment model in Phase 1 revealed a number of problems with data availability, as well as theoretical treatment of cohesive sediments, and indicated the limitations of such an approach. Specific, focused needs regarding sediment transport modeling have been identified as appropriate for Phase 2 of the Reassessment. This approach will emphasize both long-term mass balance processes and the assessment of potential for scour of buried contaminated sediments. Such an approach will require a detailed analysis of erosion potential, but may not require detailed sediment *transport* modeling.

B.5.2 Previous Modeling Studies

Response to C-8.56, C-8.57, G-3.22, G-3.26, G-5.3

Page B.5-5 of the Phase 1 Report erroneously implied that sediment transport models that do not address cohesive sediment would necessarily overpredict deposition rates for cohesive sediments. The direction of bias would depend on the manner of calibration. For instance, flocculation generally increases settling rates over what would be predicted for the same particles prior to flocculation.

The HEC-6 modeling undertaken by Zimmie (1985) applies to the bed configuration deduced from the bathymetric survey undertaken by Raytheon in 1982. The report was republished in 1988, as indicated in the Phase 1 Report.

The HEC-6 model has significant limitations in its applicability to the Thompson Island Pool. Most notably, the model is not suited to addressing the behavior of cohesive sediments.

As noted in the Phase 1 Report, models have been developed for the simulation of cohesive sediment transport, *e.g.*, Gailani *et al*. 1991. It appears that such models could be used to provide a reasonable description of short-term (event-based) cohesive sediment transport in the Thompson Island Pool. Modeling, however, must be designed to provide information at temporal and spatial scales appropriate to the decision criteria for the Reassessment, and will be implemented in Phase 2.

B.5.3 Hydrodynamic Model Description

B.5.3.1 Use of WASP4 Family of Models

<u>Response to G.3-23</u>

As an aid to data analysis, the Phase 1 Report included exploratory hydrodynamic modeling of flows in the Thompson Island Pool, using the model DYNHYD5. Modeling in Phase 1 was for exploratory purposes only and does not represent a final choice to drive remedial decision-making.

The "quasi-two-dimensional" link node structure of DYNHYD5 is limited in its ability to represent lateral variability in the flow field. Any model of natural phenomena, no matter how complex, represents a simplification of reality.

Choice of a scale for spatial discretization in modeling must include consideration of the questions to be addressed and the availability of necessary data.

B.5.3.2 Governing Equations

No comments are responded to in this section.

B.5.3.3 Model Implementation

No comments are responded to in this section.

B.5.3.4 Model Setup for Thompson Island Pool

Response to C-5.17

Revise last sentence in first paragraph on page B.5-16 of the Phase 1 Report to read: Altogether 65 nodes and 108 links were used.

Response to C-5.18

Revise fourth sentence in second paragraph on page B.5-16 of the Phase 1 Report to read: Areas were then [delete be] determined by a Thiessen polygon method.

Response to C-8.58

Concerning objections to the use of one-dimensional modeling of the Thompson Island Pool, it should be emphasized that the one-dimensional applications were intended only for preliminary calibration purposes and initial investigation of the data. A revised approach to modeling needs for the Thompson Island Pool is presented in the Phase 2 Work Plan.

B.5.3.5 Model Calibration

Response to C-5.19

Revise second sentence in second paragraph on page B.5-18 to read: A reasonable fit... is provided, considering that: 1) only daily average flows... were used as inputs...

Response to C-8.59, C-8.60

A plot of predictions versus observations for preliminary calibration of the hydraulic model is shown in Figure B.5-3 of the Phase 1 Report. Modeling in Phase 1 was envisioned as data exploration, rather than a final product. As noted in the report, additional calibration would be pursued for any hydrodynamic modeling used in Phase 2.

B.5.4 Sediment Transport Model

General

Response to C-3.8, C-5.2

Concerning reservations about the appropriateness to the Hudson River of the sediment transport modeling techniques discussed in the Phase 1 Report, it is agreed that the model did not take into account specific characteristics of cohesive organic sediments, such as flocculation and variable relationships between density and particle size. The methods discussed may well not be adequate to assess erodibility potential of Thompson Island hot spots nor to model the massive translocation of sediment into and through the Thompson Island Pool during 1973-1976. In Phase 2, a different approach will be proposed to resolve the question of hot spot erodibility. This approach will rely on empirical evidence, including geophysical data, core stratigraphy and testing of critical shear stress, rather than sediment transport modeling.

B.5.4.1 Streambed Erosion and Deposition

Response to C-5.20

Revise next to last sentence on page B.5-21 to read: This sequence... is summarized in a matrix...

Response to C-8.61, C-8.62, G-3.24, G-3.27

The Phase 1 Report involved a limited and preliminary modeling effort, involving the hydrodynamic model DYNHYD5 and the sediment transport model STREAM. Although perhaps not expressed with sufficient clarity in the report, the role of modeling during Phase 1 was that of an exploratory, data analysis tool. Modeling was initiated concurrent with assembly and analysis of data for the dual purpose of aiding in analysis of data and testing the applicability and feasibility of various modeling techniques. As noted in the Phase 1 Report's Executive Summary (page E-10): "A basic modeling framework has been developed in conjunction with the analysis of available data in order to determine the type and extent of modeling that may later be appropriate and feasible."

Models employed in Phase 1 should not be taken to be the models chosen for analysis of remedial options. Rather, they represent preliminary applications to assist in choosing an appropriate modeling strategy in Phase 2.

The sediment transport model STREAM, as presently constituted, is not designed to handle cohesive sediment transport. Nevertheless, it was appropriate in Phase 1 to investigate application of simpler, non-cohesive models. Attempts to calibrate this model to events in the Thompson Island pool had not been completed at the time of the Phase 1 Report publication. Neither this nor any other model will be used as a basis for decisions, unless an adequate representation of field data can be achieved.

The conceptualization of bed erosion discussed in Phase 1 may not be appropriate to organic sediments present in the Thompson Island Pool. This conceptualization is not expected to be used in Phase 2 work.

The notation employed in Equation 19 of the Phase 1 Report (p.B.5-20) is non-standard, as noted.

Response to G-3.28

In connection with discussion of appropriate sediment modeling techniques, suggestions were presented for additional data requirements. Identification of data needs is strongly dependent on the modeling strategy taken and are proposed in the Phase 2 Work Plan.

B.5.4.2 Streambank Erosion

Response to G.3-25

The erosion sub-model's emphasis on streambank erosion is of limited applicability to the Thompson Island Pool.

B.5.4.3 Initial Calibration Efforts

No comments are responded to in this section.

B.5.5 Summary

No comments are responded to in this section.

SYNOPSIS (Section B.6)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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B.6 Preliminary Human Health Risk Assessment

General

Response to G-3.70

There are health and safety risks associated with most construction activities. USEPA will evaluate health and safety risks in Phase 3 and would require stringent controls during construction to ensure that human health and safety is monitored and that appropriate standards are met.

Response to C-8.9

This comment about the risk assessment framework could not be answered, as the topic is not sufficiently defined.

B.6.1 Phase 1 Objectives

Response to S-1.33

The Phase 1 Report evaluates potential risks to individuals exposed to PCBs originating from the Hudson River. The present use scenario considers potential risks to residents living along the river and engaging in regular recreational activities on the river, including fishing. USEPA guidance does not allow consideration of the effect of institutional controls, such as fishing bans, on site risks. Therefore, exposure parameters used in the risk assessment are consistent with unrestricted use of the Hudson and reflect both potential present use as well as future scenarios.

Response to C-1.1

As noted on page B.6-2 of the Phase 1 Report, the Reassessment is an on-going process and any new data regarding PCB concentrations or studies regarding the toxicity of PCBs will be incorporated into the risk assessment, as such studies are accepted by USEPA through a scientific review process before completion of the RI/FS.

Response to G-5.4, G-3.8

In the Reassessment, USEPA is addressing the possible remediation of PCBs in the sediments in the Upper Hudson. The effects of background PCB levels will be considered in assessing the appropriateness of remedial alternatives. There does not appear to be an inconsistency between the scope of the risk assessment and the scope of the project as presented on page I-1 of the Phase 1 Report. The final risk assessment will be based on the concentrations found in various environmental media from Hudson Falls to the Federal Dam at Troy. Phase 2 sampling will obtain pertinent data in the reach between Fenimore Bridge and Rogers Island, which will be included in the final risk assessment.

B.6.2 Exposure Assessment

B.6.2.1 Introduction

Response to C-5.5, G-3.42

The population of concern in the evaluation of the Upper Hudson River consists of *all* inhabitants of the towns, cities and rural areas surrounding the river. As Figure B.6-1 of the Phase 1 Report shows, the risk assessment uses established USEPA methodologies to evaluate all the potential pathways by which these residents are potentially exposed to PCBs originating from the Hudson River. Although not all of the potential pathways were quantitatively evaluated for potential risk, the quantitative risk assessment did assess risks from pathways other than fish ingestion. The risk assessment is intended to evaluate the risks to all residents in the vicinity, not only those individuals who ingest fish. Subsequent phases of the Reassessment will attempt to incorporate new or more site-specific information to tailor and update the human health risk assessment.

B.6.2.2 Dietary Intake

<u>Response to G-3.6, G-3.43, G-5.5, C-1.3, C-4.1, C-9.2, C-10.3, P-20.3</u>

The Phase 1 Report used a value for fish consumption that is recommended by the USEPA as an appropriate estimate of average intake of fish by recreational anglers. As part of Phase 2, USEPA anticipates performing an evaluation of the assumed fish consumption rate to determine whether there is a more appropriate, site-specific or region-specific value that could be used in future assessments.

With respect to the effects of cooking on PCB levels in fish, USEPA's review of scientific literature has identified several studies which reported an actual increase in PCB levels. Zabik *et al.* (1982) reported a 36 percent increase for deep fried carp, a 33 percent increase for charbroiled carp and a 13 percent increase for poached carp. Smith *et al.* (1973)[1] reported a 1.3 percent increase for poached chinook salmon. Trotter *et al.* (1989)[2] reported an 8 percent increase for PCB levels in baked bluefish. Increases in PCB concentrations could occur in fish with cooking depending on weight loss of samples with cooking and the basis upon which data are reported, *e.g.* mg/kg wet weight. This does not necessarily imply an increase in total quantity of PCBs in each sample. These and other studies about the effects of cooking show considerable variation in results, both increases and decreases depending upon species, cooking method and portions of fish sampled. These sources support the decision in Phase 1 not to assume either an increase or decrease in PCB concentrations.

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[1] Smith, W. E., K. Funk, and M. E. Zabik. 1973. Effects of Cooking on Concentrations of PCB and DDT Compounds in Chinook (*Oncorhynchus tshawytscha*) and Coho (*O. kisutch*) Salmon from Lake Michigan. *J. Fish Res. Bd. Canada* 30:702-706.

[2] Trotter, W. J., P. E. Corneliussen, R. R. Laski, and J. J. Vannelli. 1989. Levels of Polychlorinated Biphenyls in Bluefish Before and After Cooking. *J. Assoc. Off. Anal. Chem.* 72:501-503.

Response to G-5.6, P-2.3, P-20.4

The Phase 1 Report assumes, for the purpose of determining potential exposures through fish ingestion, that no fishing ban is in effect. This assumption is made to characterize adequately exposures that may occur under baseline conditions. It is supported by research that indicates individuals may fish in spite of a known fishing ban, as well as by data from NYSDEC that indicates that the Upper Hudson is still a popular fishing destination. This assumption is also consistent with current USEPA risk assessment methodologies, which recommend that risks be evaluated assuming the absence of institutional controls such as a fishing ban. The discussion was not intended to document the number of individuals who do fish the Upper Hudson, nor to evaluate the efficacy of the fishing ban as a remedial alternative. Should such an evaluation be required, it will be investigated in subsequent phases of the Reassessment.

Response to G-3.45, G-5.7, C-9.3, 6-4.64

The exposure point concentration for PCBs from consumption of fish was evaluated for two scenarios: 1) the most recent concentration data (1986-1988) to represent current exposure concentrations; and 2) 30-year average concentrations, estimated by assuming an exponential rate of decline in fish tissue concentrations from 1991 to 2020. These exposure point concentrations are upper confidence limits of the arithmetic mean and are not adjusted to account for species-specific PCB data. In subsequent phases, USEPA anticipates evaluating the available consumption and fish tissue concentration data to address whether such considerations significantly affect the estimated human exposures incurred through fish consumption. USEPA will investigate further the 30-year average extrapolated concentrations and update these predictions with available new data to determine appropriate extrapolated exposure point concentrations.

Response to G-5.9, P-41.1

As new data regarding any pathway of human exposure to PCBs from the Hudson River, *e.g.*, breast milk, etc., become available, they will be reviewed for their relevance and applicability to the assessment of exposures incurred by the populations of concern in this assessment. Subsequent phases of the Reassessment will then incorporate the new information and alter exposure and risk estimates, as appropriate.

B.6.2.3 Inhalation Exposures

No comments are responded to in this section.

B.6.2.4 Recreational Exposures

Response to G-3.46, G-5.13

Should the estimated exposures to PCBs through recreational exposures scenarios, *e.g.*, swimming, sediment ingestion, etc., have been significant, then closer scrutiny and time-trend adjustment may have been warranted.

Response to G-5.10, G-5.11, G-5.12, C-10.6

The skin adherence factor used in the Phase 1 Report applied to the adherence rate to skin of sediments along the bank of the river when individuals engaged in shoreline activity. For this reason, sediments were assumed to adhere only to legs, feet, arms and hands.

The assumed sediment ingestion rate for young children is based on studies of Binder *et al.* (1986)[3] and Clausing *et al.* (1987)[4]. From these studies, an estimate of 200 mg/d is suggested as an average daily soil ingestion value (USEPA Exposure Factor Handbook, 1989). For the purposes of the Phase 1 Report, these soil ingestion exposures were assumed to occur during a child's play along the banks of the river, following hand-to-mouth activity with sediment-laden hands and toys.

As discussed on page B.6-18 of the Phase 1 Report, selection of a best estimate of exposure concentration for sediments was difficult because of the nature of the available data. Data from the 1984 Thompson Island Pool survey were used, because they are the most recent. In subsequent phases of the Reassessment, USEPA could evaluate exposures for different reaches and areas along the river, but it would appear that this would be purely an academic exercise, since based on the data evaluated in the Phase 1 Report, the risk from sediment exposure is within USEPA's acceptable range.

Response to C-10.4

The Phase 1 Report assumes that over the course of one day-long recreational visit to the Hudson River, an individual will be in contact with the water for 2.6 hours and that during those 2.6 hours PCBs will be absorbed across the skin as a consequence of the concentration gradient and the permeability of skin to PCBs. The USEPA's Superfund Public Health Evaluation Manual recommends the use of 2.6 hours per day, based on information available from the Bureau of Outdoor Recreation.

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[3] Binder, S., Sokal, D., Maughan, D. 1986. Estimating soil ingestion: the use of tracer elements in estimating the amount of soil ingested by young children. *Archives of Environmental Health* 41(6):341-345.

[4] Clausing, P., Brunkreef, B. Van Winjnen, J.H. 1987. A method for estimating soil ingestion by children. *International Archives of Occupational and Environmental Health* (W. Germany) 59(1):73-82.

Response to C-5.1

Revise the second sentence in the third paragraph on page B.6-22 of the Phase 1 Report to read: Over the assumed 30-year duration... the chronic daily intake (CDI) of PCBs from direct contact with Hudson River water is calculated to be 2.6 x 10^{-8} mg/kg-day.

Response to L-3.2

While there is little information regarding the specific uptake of PCBs across skin, dermal uptake of PCBs can be estimated using the limited information on PCBs as well as information on compounds that are structurally similar to PCBs, such as tetrachloro-dibenzo-p-dioxin (TCDD). A relevant review of information regarding dermal uptake of PCBs and TCDD is provided in USEPA's *Dermal Absorption of Dioxins and PCBs from Soil* (1989), which discusses absorption of PCBs across human skin, as well as absorption of PCBs and TCDD across animal skin.

B.6.3 Toxicity Assessment

B.6.3.1 Introduction

Response to C-5.21

Revise last sentence in second paragraph on page B.6-23 of the Phase 1 Report to read: In contrast, RfDs... assume...

B.6.3.2 Noncarcinogenic Effects

Response to G-3.41, P-21.1, G-4.7, C-10.5

The Phase 1 Report uses an Interim Reference Dose (RfD) for determining potential non-cancer health effects. The value used (1 x 10^{-4} mg/kg-d) is based on a study conducted in Rhesus monkeys where the group exposed to

PCBs in food were found to have offspring with statistically significant lower birth weights. This interim RfD was used during Phase 1 only after lengthy review by Region II USEPA staff as well as review from the USEPA Environmental Criteria Assessment Office (ECAO). ECAO is currently in the process of evaluating the evidence of non-cancer endpoints of toxicity for PCBs. Subsequent phases of the Reassessment will incorporate new toxicity values, if they are available at that time.

Refer to Section B.6.3.2 of the Phase 1 Report for a discussion of neuromuscular and developmental effects that have been reported as a result of exposure to PCBs. It is anticipated that the ECAO will consider such data in its current evaluation of an RfD for PCBs.

USEPA uses uncertainty factors to address situations where available data on the toxicology of a chemical are insufficient to derive exposure levels that are unlikely to have any adverse effects in humans. For example, if a chemical has been tested in an animal species, one cannot assume that the dose to the animal, which did not cause any effects, will also not cause adverse effects in humans. There is considerable variability between animal and human response to certain chemicals. For some chemicals, humans are able to tolerate the same dose as the animal species studied. For other chemicals, however, humans have been shown to be ten or 100 or even 1000 times more sensitive than an animal species. Consequently, when human data are unavailable, USEPA uses uncertainty factors in deriving standards to protect public health. Although the scientific community generally agrees that this method is not ideal, it is currently understood to be the best available method. The uncertainty factor approach is not necessarily a worst-case approach. Uncertainty factors used by USEPA are generally protective for most, but not all, potential situations.

B.6.3.3 Carcinogenic Effects

No comments are responded to in this section.

B.6.3.4 Toxicity of Specific PCB Congeners

Response to G-3.4, G-3.35, G-3.36, G-3.37, G-3.38, G-3.40, G-3.44, G-3.47, G-4.6, G-5.14, G-5.16, C-9.7, C-1.2, C-1.5, P-20.2, P-21.2, C-3.9, G-1.4

PCBs found in Hudson River sediments and water column have a chemical profile that is generally less chlorinated than Aroclor 1260, the commercial mixture on which the USEPA cancer risk estimate is based. There is not currently, however, a consensus in the scientific community that the lesser chlorinated PCBs are always less toxic than Aroclor 1260. For example, preliminary evidence from recent studies indicates that certain lower chlorinated PCBs may be more potent than the higher chlorinated PCBs in terms of causing nervous system effects. Because studies to date do not provide a good quantitative indication of the potential toxicity and carcinogenicity of many PCB mixtures, it is not possible to develop quantitative standards for these mixtures. Consequently, under current methodologies developed by the USEPA, all mixtures of PCBs are evaluated using the same toxicity criteria. It is assumed that these criteria provide adequate protection for exposure to any mixture of specific congeners. Until there is adequate evidence that this approach is not appropriate and new evidence is evaluated and confirmed by USEPA, assessments conducted in Region II will continue to use this approach. The Cancer Slope Factor (CSF) of 7.7 $(mg/kg\text{-}d)^{-1}$ will continue to be used by Region II in evaluating the potential carcinogenic risks posed by human exposure to PCBs, until this value is updated by USEPA.

Because fish differentially bioaccumulate PCB congeners, the chemical profile of PCBs in fish is not identical to that of any commercial PCB mixture (Aroclor). This fact supports USEPA's decision not to use Aroclor-specific toxicity information in evaluating human exposures to PCBs via consumption of fish.

USEPA is evaluating new carcinogenicity data, such as those made available in the IEHR reanalysis, which became available subsequent to preparation of the Phase 1 Report. If this evaluation results in a revision of the CSF, then the updated value will be used in subsequent phases of the Reassessment. While USEPA has considered the possibility of evaluating the carcinogenicity of PCBs on a Toxicity Equivalency Factor (TEF) approach, the agency has concluded that application of TEFs to PCBs is not as straightforward as in the case of dioxins and furans and that at this time PCBs are not amenable to a TEF approach for toxicity assessment.[5]

B.6.3.5 Epidemiological Studies

<u>Response to G-5.15</u>

As discussed on page B.6-34 of the Phase 1 Report, the FDA and USEPA methodologies for evaluating risk from exposure to PCBs do differ. This difference cannot be fully elucidated without further information from the FDA, but is a result of differences in the approaches used by the two agencies in determining a Carcinogenic Slope Factor for PCBs, the target population to be protected, *e.g.*, local anglers versus consumption of fish in interstate commerce, and the mandates under which the agencies operate.

<u>Response to G-3.39, C-10.2</u>

As noted in the Phase 1 Report, the epidemiological evidence for adverse effects of PCBs in humans is inconclusive. Despite the limitations of the epidemiological studies conducted to date (low statistical power and confounding exposures), several of the studies do point to an association between exposure to PCBs and certain cancers or other adverse effects. In conjunction with evidence of carcinogenic and other adverse effects from animal studies, the human epidemiological evidence provides support for the theory that PCB exposure may cause certain cancers and other adverse effects in humans.

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[5] USEPA. 1991. *Workshop Report on Toxicity Equivalency Factors for Polychlorinated Biphenyl Congeners*. Risk Assessment Forum. EPA/625/3-91/020.

The summary of epidemiological evidence in the Phase 1 Report is intended to be neither a thorough review nor an exhaustive critique of studies performed on PCBs to date, but was meant to provide a brief overview of available studies. USEPA bases its quantification of human risk resulting from PCB exposure on evidence from animal studies. The limited evidence available from the human studies is not critical to USEPA's determination that PCBs may cause adverse effects in humans and influences neither USEPA's quantitative assessment of the carcinogenicity of PCBs nor the estimated level at which PCB exposure may cause non-cancer effects.

At least one epidemiological study not included in Table B.6-7 of the Phase 1 Report has been performed. The results of this study, a component of a doctoral thesis completed by Philip R. Taylor at the Harvard School of Public Health in 1988, have not been published in any other format to date. During Phase 2, findings of the Taylor study will be incorporated as appropriate. Reporting of any epidemiological study does not imply that USEPA has reviewed or accepted its findings.

The Phase 1 Report did not include an appropriate caveat, which will be included in Phase 2, concerning discussion of the Yusho poisoning incident, *i.e.*, effects seen in individuals who had ingested rice oil contaminated with PCBs and polychlorinated dibenzofurans (PCDFs) are generally attributed to the PCDF exposure rather than the PCB exposure.

Table B.6-7 of the Phase 1 Report summarizes the Sinks *et al.* study of workers at a capacitor manufacturing facility. Although this study did not find a significant excess of deaths from cancer of the brain and nervous system in PCB-exposed workers, it did find a significant association between estimated cumulative PCB exposure and mortality from cancer of the brain. This association is considered to be a statistically significant finding for brain cancer.

B.6.3.6 Other Health-Based Regulatory Limits or Guidelines

Response to S-1.34

Discussion of USEPA guidance regarding proposed action levels for PCB-contaminated freshwater sediments in the Phase 1 Report (page B.6-35) is part of a section that reviews established regulations and guidelines for PCBs in various media and makes no attempt to project ways in which these standards should be applied to the Hudson River or in later phases of the Reassessment.

B.6.4 Risk Characterization

General

Response to G-3.92

In subsequent phases of the Reassessment, USEPA anticipates tailoring the factors accounted for in the preliminary human health risk assessment to generate a more detailed site-specific evaluation and estimates.

B.6.4.1 Definition

No comments are responded to in this section.

B.6.4.2 Dietary Intake

Response to C-5.3

The cancer risk estimates provided in the Phase 1 Report are probabilistic estimates for a population exposed under the assumed scenarios. No attempt has been made to approximate the actual number of individuals in the Upper Hudson River area who would be impacted, *i.e.*, who are exposed at this level.

B.6.4.3 Inhalation Exposures

No comments are responded to in this section.

B.6.4.4 Recreational Exposures

No comments are responded to in this section.

B.6.4.5 Risk Characterization Compared to Human Studies

No comments are responded to in this section.

B.6.4.6 Analysis of Uncertainties

Response to C-5.22

Revise last sentence in first paragraph on page B.6-45 of the Phase 1 Report to read: Figure B.6-1 summarizes potential exposure pathways...

Response to G-5.17

Administrative record comments are not part of this Responsiveness Summary. USEPA sponsored a meeting on human health risk assessment issues on February 4, 1992.

Response to G-5.18, P-34.1, C-11.2

An objective of the Reassessment is to evaluate the impact of PCBs in the Hudson River. For this reason, the human health risk assessment is similarly limited to the evaluation of exposures and risks from PCBs in the river system. The uncertainty analysis was intended to indicate that uncertainties that could result in an overestimate or underestimate of exposures and risks exist. Underestimates can arise from not considering other contaminants in the system; overestimates can arise in attempts to be conservative, *i.e.*, health-protective.

B.6.5 Lower Hudson Discussion

Response to G-5.19, P-3.7, P-1.4, P-1.16, P-1.22

As discussed on page B.6-45 of the Phase 1 Report, USEPA acknowledges that the available data are insufficient to conduct a thorough, quantitative assessment of exposures and risks from exposure to PCBs along the Lower Hudson. The Phase 2 Work Plan recommends evaluating potential exposures and the associated risks resulting from river-borne PCBs in the freshwater section of the Lower Hudson River (if data are available to do so). Emphasis will be on fish-consumption and water-consumption pathways. USEPA will attempt to better characterize the relative magnitude of the Upper Hudson source compared to other sources. At the present time, there are no plans to evaluate potential exposures and the associated risks in the salt-water portion of the Lower Hudson River, because of the PCB input from the NY metropolitan area and the mixing that occurs in the river below Poughkeepsie.

SYNOPSIS (Section B.7)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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B.7 Interim Ecological Risk Assessment

General

Response to G-3.48, F-3.3, P-1.23, F-1.1, F-1.10, F-2.1, C-7.21

While some comments suggested that the Phase 1 Report did render final conclusions, other comments suggested that it should have done so and, in particular, should have concluded that substantial ecological risk is present.

The Phase 1 Report does not offer final conclusions. To the contrary, the Phase 1 Report states that further evaluation in future phases is needed. Nor was available data sufficient for the Phase 1 Report to conclude that there is substantial risk of injury in the Upper Hudson ecosystem. The data presented were generally conservative, *i.e.*, toxicity endpoints given in the report were in some cases the lowest values observed in the scientific literature. Subsequent investigations will include the results of more studies and evaluation of additional agency guidelines from which a range of toxicity assessment endpoints can be derived. Without completing this more detailed evaluation, it was inappropriate in the Phase 1 Report to come to final conclusions regarding ecological risk.

No evaluation of ecological harm caused by large scale dredging was evaluated, because that assessment will be done as pertinent to any dredging alternatives in subsequent phases of the Reassessment.

Response to G-3.10, G-3.66, G-3.68

Although the 1984 ROD specifically rejected bank-to-bank dredging as an appropriate remedy based on adverse environmental impacts, relevant dredging alternatives will be further evaluated in subsequent phases of the Reassessment. If dredging passes the screening, a comprehensive evaluation of ecological risks, impacts and benefits resulting from dredging will be undertaken in Phase 3.

B.7.1 Phase 1 Objectives

<u>Response to G-3.49</u>

Although the ecosystem concept is inherent in ecological theory, the presence of this concept as one means of understanding ecological relationships does not necessarily imply, nor does USEPA guidance state, that an assessment of potential ecological risk or harm can be conducted using *only* the ecosystem as the smallest unit of assessment. While page B.7-19 of the Phase 1 Report states that the data are inadequate to adopt an ecosystem approach, such an approach is not the only way to derive ecological relationships. The approach adopted in the interim ecological risk assessment, using indicator species and toxicity assessment, is commonly used at CERCLA sites and will be expanded in Phase 2.

B.7.2 Ecosystem Description

General

<u>Response to G-3.50</u>

Based on initial findings in the Phase 1 Report, there appear to be few reports directly linking PCBs with measured ecological effects. USEPA will continue to examine published reports for this information. Field sampling and other investigations will be conducted to further evaluate cause and effect relationships of PCBs on biota in the river.

B.7.2.1 Terrestrial Habitats

<u>Response to C-5.23</u>

Revise first sentence under Threatened and Endangered Species on page B.7-5 of the Phase 1 Report to read: Several species ... are listed...

Response to P-15.4

The variety of terrestrial habitats and diversity of wildlife present in the Upper Hudson Valley are discussed in this section. To the extent data were available, risks to wildlife from PCB exposure are documented at B.7.5.4 and B.7.5.5 of the Phase 1 Report.

Response to G-5.20

The description of terrestrial habitats differs to some extent from Plate B.1-4. Plate B.1-4 was intended to provide an overall description of land use, not habitats per se. To provide consistency, the wording of the first sentence in Section B.7.2.1 of the Phase 1 Report on page B.7-2 is revised to read: The terrestrial ecosystem is largely characterized as agricultural land use (croplands and pastures) with some forested areas (Plate B.1-4). The forested areas include mixed deciduous, deciduous, coniferous and seasonally or permanently flooded evergreen stands.

The importance of various regional habitats, including wetlands, will be examined in Phase 2.

B.7.2.2 Aquatic Ecosystem

Response to C-5.24

Revise third sentence of second paragraph on page B.7-7 of the Phase 1 Report to read: Their presence indicates...

Response to C-5.25

Revise second sentence in third paragraph on page B.7-7 of the Phase 1 Report to read: Many sewage treatment facilities have been upgraded...

Response to C-5.26

Revise first sentence in second paragraph on page B.7-14 of the Phase 1 Report to read: Numerous studies have attempted to categorize the fisheries...

Response to C-5.27

Revise first sentence in second paragraph on page B.7-16 of the Phase 1 Report to read: Several studies... have concluded...

Response to G-5.22, C-7.6

Designations of non-impacted, slightly impacted, moderately impacted and severely impacted overall water quality are derived directly from the EPT (total number of species of mayflies, stoneflies and caddisflies) as used by Bode *et al.* (1991). An analysis of the EPT from 1972 to 1988 indicates an improvement from severely/moderately impacted water quality to slightly impacted water quality within the Fort Edward to Federal Dam section of the Upper Hudson. Although EPT is currently utilized by the NYSDEC to determine overall stream water quality, it does not reflect the possible influence of other contaminants such as PCBs. An evaluation of other water quality parameters in addition to EPT will be investigated in Phase 2.

Response to G-5.21

Juvenile fish may have dietary preferences different from those of adults. The trophic partitioning and dietary preferences of yellow perch and bluegill were taken directly from Table 2.3 in Moran and Limburg (1986). Since that source did not partition feeding behavior into various age classes, errors in dietary preferences could not be ascertained. Data on food preferences of representative fish in various age classes will be further examined during Phase 2.

B.7.3 PCB Exposure Assessment

General

Response to G-3.52

The most recent available NYSDEC data for PCBs in fish were used in the Phase 1 Report. Although considered "historical," the data were as recent as 1988 for PCBs in fish. The phased Reassessment was specifically designed to allow a flexible approach and provide the means to update the evaluation with new data as they become available. NYSDEC 1990 data on striped bass, published in December 1991 subsequent to the Phase 1 Report, will be reviewed. It is anticipated that NYSDEC will provide 1990 data on resident fish species as well as 1991 and 1992 data on fish sampling results.

It is premature to conclude that a continuous PCB decline exists, as can be seen in the year-to-year fluctuations in PCB levels shown in the Phase 1 Report.

B.7.3.1 Exposure Pathways

Response to G-3.55

The Phase 1 Report adopted an approach consistent with available data and USEPA guidelines. Site-specific PCB data from which to evaluate exposure point PCB concentrations were used where available. These exposure point concentrations were extrapolated as appropriate where this procedure was considered reasonable to assess relative exposure levels.

B.7.3.2 Identification of Indicator Species

Response to G-3.56

During Phase 2, ecological risks resulting from PCBs in the Hudson River will be further investigated. The selection of ecological receptors or indicator species will include species associated with different habitats and trophic groups in order to represent a cross-section of these different habitats and groups.

Selection of ecological receptors will be based on availability and reliability/quality of applicable toxicological literature. Every effort will be made to include species from lists provided by state and federal agencies, as well as USEPA guidance (USEPA, 1991)[1], which states that focus should be placed on a limited number of receptors in order to develop a "reasonable and practical evaluation."

B.7.3.3 Exposure Quantification

Response to G-3.57, G-5.23

PCB concentration in sediment in Table B.7-1 is 66.2 ppm; its computation is given on page B.7-24. Additional information and scientific literature with respect to proposed ecological guidelines for limits of PCB concentrations in birds and mammals will be reviewed and provided in Phase 2 (see also related response at B.7.3.1.).

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[1] USEPA. 1991. "Eco Update Intermittent Bulletin" 1:2. Office of Emergency and Remedial Response, Hazardous Site Evaluation Division, Washington D.C. December 1990. EPA 9345.0-051.

B.7.4 Toxicity Assessment

General

Response to G.5-24, G-3.53, G-3.58, F-3.12, F-1.5

The Phase 1 Report identified toxicity assessment endpoints consistent with USEPA guidance for ecological risk assessment. This hazard assessment will be expanded in the Phase 2 ecological risk evaluation.

References to differential bioaccumulation of coplanar PCBs will be reviewed in Phase 2.

Additional information is recognized to be available regarding acute versus chronic PCB toxicity, as noted for birds. This and similar information will be evaluated in Phase 2, which will include research and evaluation of additional information regarding PCB toxicity to indicator species. In Phase 2, other indicator species may be selected or more information examined or collected for those species selected as indicators in Phase 1.

B.7.4.1 Types of Toxicity

No comments are responded to in this section.

B.7.4.2 Toxicity Literature Review

No comments are responded to in this section.

B.7.4.3 Proposed Criteria and Guidelines

Response to G-3.63, G-3.64, F-3.13, S-1.35, S-1.39, S-1.40, F-1.8

The Phase 1 Report discussed the AWQC as a criterion developed by USEPA for the protection of the environment. While scientific debate may exist over the AWQC, it was not part of the scope of the Reassessment to redefine the AWQC.

The equilibrium partitioning (EP) approach to calculating pore water concentrations and comparing these with ambient water quality criteria is one approach evaluated by USEPA and other regulatory agencies for establishing sediment quality criteria. An example sediment Aroclor 1254 concentration calculated with this approach is given on page B.7-40. There is, however, no universal agreement that the EP method should be adopted. In Phase 2, an analysis of PCB levels in the water column and bioaccumulation in fish will be conducted using partitioning and fugacity methods which are contained within the equilibrium partitioning method developed by the Office of Water (1991), and methods published by Di Toro *et al*. (1991). These approaches will be supplemented by an analysis of possible non-equilibrium between PCBs in surface sediments and PCBs in the water column.

A distinction between *standards* and *criteria* is made in the Phase 1 Report. Criteria such as the AWQC are often applied as ARARs. USEPA and NYSDEC will continue to coordinate with respect to ambient water quality standards and criteria. Information provided by NYSDEC regarding the NYS Codes of Rules and Regulations is appreciated. A discussion of NYSDEC sediment criteria will be included in subsequent phases.

Delete the first sentence on page B.7-38 of the Phase 1 Report. Revise the second sentence to read: A number of federal and state agencies... have developed *criteria* and *guidelines* or standards for assessing environmental thresholds.

Revise last sentence in first paragraph on page B.7-39 of the Phase 1 Report to read: The New York State Water Quality Standard is established at 0.001 µg/L.

B.7.5 Risk Characterization

General

Response to G-3.59, G-3.51

Although site-specific data for both exposure and toxicity assessment would be optimal for risk characterization, the lack of one or both does not preclude examination of potential baseline risks when other relevant scientific information or methods exist from which to extrapolate the relative magnitude of potential risks. The results of the Phase 1 interim risk characterization, using available site data and scientific literature, provide needed information to target those areas where more detailed investigation may be necessary to characterize potential ecological risks.

Isolating the effects of PCBs when they occur with mixtures of other chemicals is agreed to be difficult, given available data and the state of the art/science of ecological risk assessment.

B.7.5.1 Ambient Water

Response to F-1.6

With respect to the water column (and all other aspects), the intent of the Phase 1 Report was to be objective and to avoid premature conclusions. More information must be reviewed and site-specific data may be needed before ecological risk as a result of PCBs is quantified.

Revise second sentence of third paragraph on page B.7-42 of the Phase 1 Report to read: These ambient levels...are from 30 to 60 times greater than the more conservative New York State water quality standard...

B.7.5.2 Sediment

Response to S-1.41, F.-1.7

USEPA agrees that it is premature to conclude that PCBs have had no adverse effects on chironomids and other biota.

B.7.5.3 Fish

Response to G-3.60, C-8.10, S-1.36, F-1.9

Examination of toxicity endpoints (mortality, growth rate, biochemical response, etc.) is needed prior to interpretation and application to site-specific evaluations. An expanded assessment of the scientific literature and toxicity endpoints will be conducted in future phases of the Reassessment.

Kim *et al*. examined specific biological response to contaminants and specifically stated that the observed abnormalities in bullhead could not necessarily be attributed to PCBs. Published papers and other extensive reviews of the Hudson River were examined; researchers and agency personnel actively investigating the Hudson were interviewed. The citations offered in the comments will also be reviewed and a continued search will be made for additional reports and studies concerning the ecological impact of PCBs in the Hudson River.

The 0.4 ppm USFWS guideline is a conservative fish tissue guideline based on trout as a sensitive species. A broader range of toxicity assessment endpoints and guidelines will be presented as the Reassessment continues (see also the response under B.7 General).

B.7.5.4 Fish-Eating Birds

Response to G-3.61

There may be multiple interpretations of scientific information regarding PCB toxicity. The 0.4 ppm PCB level in chickens was not presented as the appropriate guideline for risk. A variety of studies were discussed in Section B.7.5.4 of the Phase 1 Report, with toxicity endpoints for birds ranging from 0.4 ppm up to 80 ppm. Table B.7.2 presents an even wider range of toxicity assessment endpoints and Table B.7.3 presents guidelines suggested by various agencies.

B.7.5.5 Mammals

Response to G-3.62

Information presented in the comment regarding PCB toxicity to mammals (mink) will be evaluated. The Phase 1 Report presented toxicity information reported in the scientific literature as well as information used by USEPA, NYSDEC, and USFWS to develop guidelines for the protection of sensitive species. During the following phases, investigations will expand upon this evaluation.

B.7.5.6 Summary

Response to S-1.42

NYS standards and criteria will be reviewed and included in subsequent phases.

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RESPONSES TO COMMENTS ON PART C: PHASE 1 FEASIBILITY STUDY

SYNOPSIS PART C (Sections C.1 through C.7)

Comments addressing specific or technical points in the Synopsis are answered in the appropriate section referencing the main report.

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C. PHASE 1 FEASIBILITY STUDY

C.1 Introduction

Response to G-5.25

The objective of initiating a Feasibility Study in Phase 1 was to identify to participants in the Community Interaction Program the potential clean-up technologies for Upper Hudson River sediments. The public has commented on the Phase 1 Feasibility Study and will be able to comment on the entire Feasibility Study to be completed in Phase 3. The efficacy of a complex model is uncertain, but during Phase 2 USEPA will develop methodologies to predict PCB levels in fish for various remedial actions. The Upper Hudson is not considered a unique environment for dredging, even at the shorelines, and has been dredged by NYSDOT for many years.

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C.2 Remedial Objectives and Response Actions

Response to G-5.26

USEPA will define the remedial action objectives once the site characterization is completed.

Response to: P-1.1, P-1.5, P-2.1, P-2.4, P-2.5, P-4.1, P-5.2, P-6.1, P-7.1, P-8.1, P-9.1, P-10.1, P-11.1, P-12.1, P-12.6, P-13.1, P-14.5, P-15.3, P-19.1, P-24.1, P-25.1, P-26.2, P-29.2, P-30.1, P-31.2, P-32.1, P-33.1, P-35.1, P-36.1, P-37.1, P-38.1, P-40.1, P-43.1, L-1.1, L-2.2

USEPA acknowledges the multiple concerns that public interest groups and citizens have in urging remediation of Hudson River PCBs. Among these concerns are: loss of the Hudson River fishery as an economic resource; impact on the river as a natural resource; and impacts on human health as a result of consumption of Hudson River fish, effects of PCBs on drinking water, or other exposures. USEPA will continue to characterize the nature and extent of contamination during Phase 2 of the Reassessment and will evaluate remedial alternatives, culminating in the Phase 3 Feasibility Study. It is premature, however, to conclude that dredging is the most desirable or effective means of remediation.

In response to the many comments calling for immediate or expedited action to clean up Hudson River PCBs, USEPA wishes to emphasize that it has made the commitment to reassess the 1984 No Action decision. During the Reassessment, the scientific review and analysis of data will require time and care, including extensive community input in order to come to a final decision. As stated in the public meetings held to receive comment on the Phase 1 Report, NYSDEC requested in July 1989 that USEPA revisit its 1984 Record of Decision. In December 1989, USEPA determined that a comprehensive Reassessment was appropriate in light of NYSDEC's request and other reasons stated in Section I.2 of the Phase 1 Report. (More detailed historical information is available in the Community Relations

Plan, available in the Repositories listed in Table 2 of the Comment Directory. This information is also reviewed by various commentors whose submissions are reproduced in this document. For example, see P-1 and P-2 commentary by Scenic Hudson and P-12 commentary from PCB Action Coalition.)

With respect to comments concerning the responsibility of General Electric to pay for remediation, USEPA believes that GE may be held liable under the Superfund law for remedial and other costs at the site.

Response to S-1.10, S-1.38, S-1.43, C-9.5, C-1.6, P-2.8, P-1.11

USEPA will perform work regarding general loading categories of PCBs into the Lower and Upper Hudson River as is necessary to evaluate remedial alternatives for Upper Hudson River sediments. Remedial action objectives and goals will be established after the characterization is completed, along with an assessment of chemical-specific ARARs. The presence of other sources of PCBs in the river does not relieve GE from liability under CERCLA. The State may suggest to the various chairpersons that the cleanup goals of the Reassessment be discussed at CIP meetings if it feels that this point remains unclear to the participants.

Response to G-5.27

Alternatives for further analysis will be developed in Phase 3. The No Action alternative is defined to include institutional controls. This terminology may appear misleading, but presumably should not be so when fully explained and developed in Phase 3.

Response to P-20.6, C-10.7

It is premature to conclude that dredging should not be considered as a remedial action or is unnecessary. (See also responses at C-4.3.) Modeling performed in Phase 2 will be performed to determine the effects of dredging on fish and water quality.

Response to G-3.54

The ecological information generated from the Phase 2 ecological risk assessment will help guide the development and screening of remedial alternatives. The ecological impacts of the selected remedial alternatives will then be addressed during subsequent phases of the Reassessment. If dredging is retained as a remedial alternative throughout the Feasibility Study process, then an impact evaluation will be conducted.

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C.3 Potentially Applicable or Relevant and Appropriate Requirements (ARARs)

C.3.1 Definition of ARARs

No comments are responded to in this section.

C.3.2 Development of ARARs

C.3.2.1 Chemical-Specific ARARs

No comments are responded to in this section.

C.3.2.2 Location-Specific ARARs

<u>Response to G-3.71</u>

Concerns regarding dredging will be presented in any discussions regarding implementability of a dredging alternative in Phase 3. USEPA will also consider other alternatives for detailed evaluation in Phase 3.

C.3.2.3 Action-Specific ARARs

No comments are responded to in this section.

C.3.3 Statutes and Regulations

General

<u>Response to G-7.1, S-1.44, S-1.45, G-5.28</u>

NYSDEC is expected to provide USEPA with a complete list of state ARARs and TBCs (To Be Considered) prior to USEPA's performing the Feasibility Study in Phase 3. In the Phase 1 Report, USEPA presents only potential ARARs, because it was not considered appropriate to evaluate their applicability during Phase 1. This evaluation will occur during Phases 2 and 3.

C.3.3.1 Federal Statutes and Regulations

No comments are responded to in this section.

C.3.3.2 New York State Statutes and Regulations

No comments are responded to in this section.

C.4 Technology and Process Identification

C.4.1 Containment

Response to G-5.29, C-7.12

Section C.6 and Figure C.6-1 of the Phase 1 Report state that capping as a remedial technology has been retained for further analysis in Phase 2. Delete from page C.4-1 the sentence: Capping may increase anaerobic activity and has been used as a component of bioremediation programs.

C.4.2 Natural PCB Biodegradation in Sediments

General

Response to P-3.13, P-3.14, P-5.3, P-11.2, P-16.1, P-18.1, L-3.1

Remedial technologies presented in Part C of the Phase 1 Report will be systematically analyzed during Phase 3 in accordance with the procedures set forth in the National Contingency Plan and USEPA CERCLA guidance documents. Analyses will be performed on archived and new sediment samples during Phase 2 to determine the efficacy of natural degradation processes as part of assessing the No Action alternative in Phase 3.

Response to G-1.5, G-2.1, G-3.1, G-3.5, G-3.14, G-3.94

As indicated in the Phase 1 Report (Section C.4.2), USEPA recognizes that there is evidence to suggest that biological dechlorination and degradation of PCBs is likely occurring in the Upper Hudson River. USEPA also recognizes the potential importance of biological processes and the need for greater understanding of how this process affects PCBs in the Hudson River. Presently the spatial extent to which and rate at which PCBs may be biologically degrading in the Hudson is not clear.

Response to G.3-74

Natural biodegradation in sediments is discussed on pages C.4-2 through C.4-7 of the Phase 1 Report, not on a single page (C.4-2) as the comment suggests. Quensen *et al*. (1988) and Brown Jr. *et al*. (1987a) are both cited on page C.4-5.

C.4.2.1 Aroclor Patterns

Response to C-7.11, C-7.13, G-3.72

USEPA's consultants have reviewed the data referenced in the comments and will evaluate them in more detail. The comments present interpretations and conclusions from these data as fact. While these data appear to support the occurrence of dechlorination, the extent and rate of this dechlorination are open to interpretation, as stated in the Phase 1 Report.

C.4.2.2 Aerobic Biodegradation of PCBs

Response to C.7.14

The statement on page C.4-3 (first paragraph, second to last sentence) of the Phase 1 Report that an environmental sample containing an aerobically biodegraded Aroclor mixture would be expected to show Pattern A was intended to be a summary statement made in the context of describing Brown *et al.'s* reasons for attributing this pattern to aerobic biodegradation. It was not meant to imply that Pattern A will always be observed when aerobic biodegradation of an Aroclor has occurred. This sentence is revised to read: Thus, Pattern A could be the result of aerobic biodegradation processes in which the lesser chlorinated congeners are reduced in concentration relative to the more chlorinated congeners.

Section C.4.2.2 of the Phase 1 Report does not state that a 2,3-dioxygenase cannot degrade mono- and dichlorobiphenyls. The sentence in the second paragraph of page C.4-4 reading "They note, however, that the rate of Aroclor 1221 and 1016 disappearance reflects the disappearance of congeners that can be degraded by a 2,3-dioxygenase; the degradation of other mono- and dichlorocongeners is likely slower..." is revised to read: that can be most rapidly degraded by a 2,3-dioxygenase; the degradation of other congeners is likely slower...

Response to G-3.73

USEPA will consider the results of GE's aerobic biodegradation field experiments and other research efforts in Phase 2. See also response to Comments G-3.1, G-3.5, G-3.14 and G-3.94 at C.4.2.

Hypotheses regarding possible combined effects of diffusion, a scouring event and aerobic biodegradation are recognized as an optimistic projection of the possible future fate of PCBs in the Hudson River. Other future scenarios are also possible.

Response to S-1.46

An examination of PCB degradation products is required to determine whether these chemical products are environmentally harmful. A more detailed examination of PCB dechlorination will take place in subsequent phases of the Reassessment.

C.4.2.3 Anaerobic Dechlorination

Response to C-7.15, G-3.75

The intent in this section was to emphasize laboratory evidence of anaerobic biodegradation specific to the Hudson River.

Brown Jr. *et al.'s* hypothesis that anaerobic dechlorination was occurring in the Hudson River is supported by the laboratory work cited. Bopp *et al.* (1985) were not cited in this section, as their work did not provide such laboratory confirmation. While Bopp *et al.* provide observations regarding the distribution (patterns) of congeners in sediments, no data are provided to support the hypothesis that the patterns result from biodegradation.

Other references and researchers cited in the comments on this section were not included in the report as their work pertains to other chlorinated compounds or locations other than the Hudson.

Revise third sentence of first full paragraph on page C.4-6 of the Phase 1 Report to read: Chen *et al.* (1988) found no evidence of... mineralization...

Revise fourth sentence of first full paragraph on page C.4-6 to read: Rhee *et al.* (1989) detected... The *in situ* incubation conducted by these researchers took place during the months of November through June *and* the sediments were incubated at a depth of 1 meter. It cannot be concluded, however, that dechlorination would have been observed in this experiment, had it been conducted during a different seven months.

Additional research by Rhee (Rhee and Bush, 1990) in which dechlorination of PCBs by microorganisms cultured from Hudson River sediments is observed, is cited on page C.4-5 of the Phase 1 Report.

C.4.3 Removal Technologies

<u>Response to L-4.1</u>

USEPA acknowledges the preference of the Village of Stillwater, as evidenced by submission of the Village's resolution of February 12, 1990, that no dredging of the Hudson River be performed by New York State. This preference is shared by other towns and groups submitting comments on the Phase 1 Report, but is also opposed by others who strongly support dredging.

Response to G-3.93, G-3.67

New information provided by geophysical studies and other field studies not performed for the 1984 Feasibility Study may lead to different conclusions about dredging from those reached in 1984. The Phase 1 Report was not intended to be a comprehensive Feasibility Study that evaluated the various technologies and alternatives. Ecological impacts of dredging and practical impediments will be evaluated in Phase 3.

Response to G-5.30

A geophysical testing program, including sediment coring, is part of the Phase 2 Work Plan for the Reassessment. Information obtained from results of this program, such as grain size and the river's bathymetry along with published data, will be utilized in further study of the issue of fugitive sediment releases from dredging. Other relevant aspects of dredging will also be studied.

Response to G-5.31, G-3.69

The discussion relating the history of channel maintenance dredging of the river was not stated as proof that dredging for all purposes at all locations in the river was feasible. All reasonable alternatives are being considered in the early stages of the Feasibility Study, including those considered by NYSDEC.

Response to S-1.47

It was not the intent of the Phase 1 Report to dismiss excavation techniques. Excavation techniques will be studied further in subsequent phases of the Reassessment, including rerouting of the river or dug excavation techniques.

Response to G-3.9, G-3.65, G-1.7

The Phase 1 Report states that fugitive sediment releases from dredging equipment will be evaluated in subsequent phases, using published reports. The evaluation will be presented in the Phase 3 Feasibility Study as it pertains to specific alternatives. The environmental effects of dredging are dependent on the lateral and vertical extent of dredging, the extent of which has not determined by USEPA in Phase 1. The extent of removal will be based on the remedial action objectives to be formulated by USEPA during the Feasibility Study in Phase 3. As mentioned by GE, a detailed study of parameters, such as sediment characteristics, topography, water depth and contaminant depth, is needed to determine the effectiveness and feasibility of dredging contaminated sediments. These parameters will be determined in Phase 2 as explained in the Phase 2 Work Plan.

C.4.4 Treatment Technologies

General

Response to G-5.32

Remedial action objectives were not established in Phase 1, which is the reason for not eliminating any technologies from further consideration.

C.4.4.1 Physical and Chemical Treatment Technologies

Response to S-1.1

At this time, EPA does not plan to conduct treatability studies as part of the Reassessment. USEPA will evaluate the findings from bench-scale tests performed on PCB-contaminated sediments at other Superfund sites.

Response to G-5.34

Regarding selection of technology, latitude for design, treatment levels and specifics thereof, it is premature to address this comment until after the Feasibility Study is completed.

Response to C.5-28

Revise last sentence of last paragraph on page C.4-8 of the Phase 1 Report to read: In this section, a range of physical and chemical treatment technologies, [delete and], their general applicability... and level of development are presented.

Response to G-5.33

Examples of sites where thermal treatment has been or is being used include: the Bridgeport Rental and Oil Services site in Logan Township, NJ, which has treatment of PCB-contaminated sediment; the Sydney Mine Site in Hillsboro County, FL, where there is treatment of contaminated sediment with PCBs not present; and the Westinghouse site in Bloomington, Indiana, which has a consent decree to incinerate PCB-contaminated sediment. In addition, the Swanson River site in Alaska has involved processing over 85,000 tons of wet, silty PCB-contaminated soil and has processed slurry clay and sludge in other successful work. Contaminated sediment from hot spots will be incinerated with confined disposal at the New Bedford Harbor remediation site. In addition, there are approximately seven landfills across the country that are permitted under TSCA to accept PCB-contaminated waste. Another example of a site where dredging, treatment and landfilling of PCB sediments has been selected is the GM Massena (New York) site (50,000 cubic yards).

Response to G-5.35

Case studies at various sites have been evaluated and referenced throughout the investigation as appropriate. The intention of using the referenced listing of literature was to provide a history of the Hudson River site itself; the New Bedford site was also referenced.

Response to G-5.36, G-5.39

References will be made available during the Reassessment process. A SITE report is available on propane extraction.

Response to G-5.37, G-5.38, G-5.40, C-7.20

The same extraction efficiency would not occur for sediments with lower amounts of PCB. Higher extraction efficiencies are more easily obtained with material having higher concentrations of PCBs. Remedial action objectives will be determined by USEPA, subsequent to completion of Phase 2. Alternatives were not precluded solely because they were ruled out at other sites. Particle size information will be collected from sediments in Phase 2 to evaluate the LEEP process as well as other processes.

Response to C-7.16

Revise second sentence of second paragraph on page C.4-13 of the Phase 1 Report, discussing the B.E.S.T. Solvent Extraction Process, to read: PCB removal efficiencies of above 97 percent were achieved...

C.4.4.2 Thermal Treatment Technologies

Response to G-5.41

A dry scrubber would be a component of an incineration system and serves as the form of emission control for the system. Heavy metals, as well as residual organics and acid gases, would be removed from the gas stream by the dry scrubber. Options for disposal of residuals will consider the mobility of metals.

Response to G-5.42, G-5.44

The 2 ppm requirement is a technology-based performance standard under TSCA, based on standard detection limits. (See USEPA's August 15, 1990 Guidance on Remedial Actions for Superfund Sites with PCB Contamination, page 13.) Regarding TSCA regulations and treatment of sediments, EPA did not state in Section C.4.4.2 of the Phase 1 Report that incineration is the only acceptable disposal method under TSCA for PCB-contaminated sediments such as those in the Hudson River.

Response to G-5.45

Whether or not ease of transport of the fluidized bed incinerator will be important for this project cannot yet be determined. Nevertheless, the main reason for rejecting the fluidized bed incinerator at this time is that it does not sufficiently destroy PCBs. The fluidized bed incinerator is not strictly comparable to the circulating bed incinerator. While both systems operate at low temperatures, the gas residence time of the conventional fluidized bed incinerator is two to six seconds, whereas the residence time for the circulating fluidized bed incinerator approaches 60 seconds, allowing for the destruction of PCBs. The technology favors dewatering of sediments, since it is not practical to incinerate sediment that has not been dewatered, as the cost to heat large volumes of water to such temperatures would be prohibitive.

Information from Ogden Environmental Services of San Diego, California, manufacturers of the circulating bed incinerator, states that the unit has been shown to destroy PCBs at temperatures below 1,600°F. USEPA has accepted use of the lower temperatures at the Swanson River PCB remediation site in Alaska. TSCA provisions are discussed in response to G-5.42 and G-5.44 above.

Response to G-5.43

The sediment load will be estimated in subsequent phases of the Reassessment. A probable maximum load that one unit will treat is 25 tons of sediment per hour. Opposition to incineration is likely to be categorical and not necessarily affected by the number of units necessary.

Other than the removal of large objects (cobbles, timbers, old tires, etc.), it is unnecessary to separate the sediment into differing size fractions prior to incineration. As discussed in Section C.6 of the Phase 1 Report, dewatering operations have not yet been evaluated, but will be addressed in subsequent phases of the Reassessment.

Response to G-5.46

Because of the nature of the conveyor furnace incineration system, sediment would drip off the metal conveyor belt before entering the furnace if its moisture content were too high. Thus, dewatering of the sediment is necessary prior to incineration. As stated in the Phase 1 Report, the conveyor furnace system has been adapted for treatment of trace organics with the use of an afterburner operating at temperatures higher than those of the basic unit.

Response to C-7.17

The third sentence of the second paragraph on page C.4-18 is revised to read: In a restricted oxygen atmosphere (pyrolysis), however, the PCBs may be encouraged to form other compounds, such as dibenzofurans, which are considered more toxic than PCBs.

C.4.4.3 Biological Treatment Technologies

Response to P-6.3

USEPA can not control GE's public relations activities. During this Reassessment, USEPA will review and evaluate bioremediation literature deemed scientifically acceptable.

Response to P-14.6, G-5.47, G-5.48

The efficacy of bioremediation will be evaluated in Phase 2 by laboratory studies on new and archived sediment samples, and also in Phase 3. USEPA will evaluate the information provided by GE as well as other organizations on bioremediation for this Reassessment. USEPA and New York State have not decided on ARARs in Phase 1, but, instead, the Phase 1 Report presents potential ARARs (see Table C.3-3 of Phase 1 Report). This list will be revised in subsequent phases.

Response to C-7.18, C-7.19, G-3.76

Additional research is necessary before a determination could be made that full-scale, bioremediation of PCBs in Hudson River sediments would be effective and feasible.

Section C.4.4.3 of the Phase 1 Report accurately states that organisms like H850 have not been shown to mineralize PCBs. Bedard and Haberl (1990) have provided evidence that 3-chlorobenzoic acid is degraded by H850 and LB400. Yet, they also report that for LB400 and H850 in metabolic studies using 3,4,2'- and 2,4' chlorinated biphenyls (CBs), "80 percent of the degraded 3,4,2'-CB and 90 to 100 percent of the degraded 2,4'-CB were recovered as 3,4-CBA (chlorobenzoic acid) and 4-CBA, respectively." USEPA maintains that "bioremediation of highly chlorinated congeners and the products of aerobic PCB biodegradation will, therefore, require a consortium of microbes that can degrade these compounds as well (page C.4-26 of the Phase 1 Report)." This statement is consistent with the comment that other organisms are capable of degrading the monochlorinated benzoates.

The list of *optimal* conditions is not misrepresented in this section nor is the list meant to imply that biodegradation can not take place under conditions less than optimal. Rates of biodegradation taking place under the "natural" conditions present in the Hudson River have not been determined.

Ortho dechlorination by microbes cultured from Hudson River sediments has *not* been observed. Therefore, USEPA maintains that in the Hudson River "this bioremedial solution may provide little reduction in total molar concentration of PCBs."

One commentor indicated that claims by DETOX of aerobic degradation of Aroclor 1260 have been discredited within the scientific community. As noted on page C.4-26, at the time of the Phase 1 Report, claims by DETOX regarding their degradation of Aroclor 1260 could not be verified or reviewed because DETOX considered the details of their degradation process proprietary. The fourth sentence in the first paragraph on page C.4-26 is revised to state: DETOX Industries claim... rather than DETOX Industries indicate...

Discussion of bioremediation projects at other sites, especially those being "considered" or "planned," those involving chemicals other than PCBs, and those involving sites much different from the Hudson River were beyond the intended scope of the Phase 1 Report.

C.4.5 Disposal Technologies

Response to G-5.49

As discussed in Section C.6 and shown on Figure C.6-1 of the report, subaqueous, *in situ* confinement (and treatment), different from in-river disposal, continues to be retained for further analysis.

Response to G-3.11, G-5.50, P-20.5, C-9.6, C-9.8, P-14.4

Results of Phase 2 field testing will yield information needed to study further disposal technologies, including landfilling, for their specific application to the Upper Hudson River.

All remedial alternatives including landfilling will be discussed in Phase 3. USEPA will continue to incorporate the results of the New Bedford Harbor Study and other studies in future phases of this Reassessment.

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C.5 Innovative Treatment Technologies (USEPA SITE Program)

Response to C-5.29

Revise first sentence of second paragraph on page C.5-2 of the Phase 1 Report to read: A group... has emerged....

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C.6 Initial Screening of Technologies

Response to C-5.30

Revise fourth sentence of second paragraph on page C.6-1 of the Phase 1 Report to read: A wide range ... is available...

Response to G-5.52

A geophysical program and sediment sampling program will be conducted as part of Phase 2 of the Reassessment. Information obtained from the field testing, such as results of a grain size analysis and the bathymetry of the river rock outcrop and boulder locations, will be utilized to evaluate types of dredging equipment.

Response to G-5.53

Although the Phase 1 Report does not consider in detail the issue of subaqueous disposal, subaqueous confinement and *in situ* treatment technologies continue to be retained for further analysis.

Response to G-5.51

The Record of Decision states that capping of the remnants is not intended to eliminate low levels of release of PCBs into the Hudson River. Phase 2 field investigations will attempt to determine source areas other than sediment sources, including the remnant deposit area. However, excavation of the capped remnant deposits will not be considered in this Reassessment. Before any remedial options are screened beyond the initial stage, remedial action objectives will be specified. Information relied upon is presented in the References to the Phase 1 Report. References will be made available during the Reassessment process.

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C.7 Treatability Studies

Response to G-5.54, G-5.55

USEPA appreciates the words of caution concerning overseeing vendors or corporations who have vested interests in showing that their technologies have application. USEPA will not perform biological testing in this Reassessment and will utilize published scientific data and the sediment data analyzed in Phase 2 to assess this remedial option. USEPA will review the GE Hudson River Research Study data in Phase 2 and incorporate the results into subsequent phases, as appropriate.

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RESPONSES TO COMMENTS ON REFERENCES

Response to C-8.21, G-4.15, G-5.56

The references listed in the Phase 1 Report represent the vast majority of all references used. Citations were included in the text as deemed appropriate. It is acknowledged that references to works by the same author or organization/agency in the same year were not always differentiated. Revision of these ambiguous references and corresponding citations in the text was not considered an efficient use of resources at this time for the Phase 1 Report. Because the Phase 1 reference list will serve as the basis for subsequent reports, this list will be modified to correct ambiguities, such that they should not occur in subsequent reports. If there is any particular instance where a reader wishes to clarify an ambiguous citation to a reference in the Phase 1 Report, he/she is welcome to make a specific request.

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RESPONSES TO COMMENTS ON GLOSSARY

Response to C-8.14

NUS refers to the name of the corporation performing the 1984 Feasibility Study and was not included in the glossary, as it is considered not to require further definition.

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COMMENTS

FEDERAL

10.4427

F-1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
100 Grange Place
Room 202
Cortland, New York 13045

CONFIRMATION COPY

October 29, 1991

Mr. Douglas Tomchuk
Project Manager
U.S. Environmental Protection Agency
26 Federal Plaza, Room 747
New York, New York 10278

Dear Mr. Tomchuk:

The following comments pertain to the August, 1991 "*Phase 1 Report - Review Copy, Interim Characterization and Evaluation: Hudson River PCB Reassessment RI/FS.*" This letter is intended to assist in subsequent project planning and does not constitute the report of the Secretary of the Interior on the project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The consultant seems to have done a thorough job of summarizing the vast amount of information that exists on this site. However, we are disturbed by the overall tone of the report, which tends to detract from the significance of General Electric as a source of PCBs in the Hudson River and place emphasis on downstream sources. Also, the interim ecological assessment for the Upper Hudson manipulates certain data in such a way as to downplay the toxicity of PCBs and minimize the threats posed to fish and wildlife from PCB contamination. 1

Examples of our specific concerns are discussed below:

- Page E-6. The report implies a relationship between the highly chlorinated PCB mixtures detected in striped bass of the Lower Hudson River and sources of highly chlorinated PCB mixtures from the New York City metropolitan area. This argument appears speculative, especially when there is no mention of the possible contributions of Upper Hudson River PCBs to striped bass in the Lower Hudson River. 2

- Page E-9. The statement concerning the half-life of PCBs in fish is misleading. According to Lech and Peterson (1983), very little metabolism of PCBs occurs in fish. The lower chlorinated PCB congeners are less persistent, but even some of the lower chlorinated congeners may persist in certain species which do not readily transform these congeners. The lower levels of PCB that are being detected in fish now versus ten years ago may be due to lower PCB levels in the physical environment and not due to biodegradation processes being performed by the fish. 3

- Page E-12. The statement is made that "Data are currently insufficient to justify a quantitative risk assessment." We recommend that the word "allow" or "facilitate" be used instead of "justify". Certainly, there should be no contention that because 4 there is a lack of toxicity data, toxicity does not need to be evaluated. The appropriate data should be collected.

5 • Page B.7-36. It is stated that birds may exhibit a high degree of initial resistance to PCB toxicity. It should be clarified that this statement applies to acute toxicity only. A number of studies have indicated that sublethal toxic affects may occur within a fairly short time frame. For example, Eisler (1986) cites a study in which mourning doves were fed various levels of Aroclor 1254 for a six week period. Doves fed 10 parts per million (ppm) suffered from various reproductive impairments. This section of the report also fails to cite other data from Eisler (1986) showing chronic toxicity to various bird species at levels of 5 - 40 ppm PCB in the diet.

6 • Page B.7-42. The report states that "..although the water column PCB levels may be somewhat elevated above AWQC values, toxicological data in the literature do not corroborate an imminent harm to algal, macroinvertebrate, insect and fish species from direct contact with PCBs in water." While we do not dispute the accuracy of this statement, we consider it to be an inappropriate manipulation of the facts. The AWQC (Ambient Water Quality Criterion) is established based on all probable routes of uptake of PCBs by aquatic organisms, and not just the organism's exposure from the water column. Therefore, it is inappropriate to compare the AWQC with toxicity studies based on water column exposure only. Also, the USEPA Criteria Document for PCBs (1980) indicates that the AWQC of 0.014 μg/l is probably too high because it is based on laboratory derived bioconcentration factors. Field studies apparently produce factors at least ten times higher for fishes.

7 • Page B.7-43. It is implied that since chironomid species are considered sensitive to PCBs but appear to be increasing in abundance in the river, that perhaps the PCB contamination in sediment is not as bad as one might assume. The report fails to offer alternate reasons for the increase in chironomids, such as improved water quality as a result of upgraded sewage treatment facilities or better control of industrial discharges.

8 • Page B.7-43. The equilibrium partitioning approach is no longer considered appropriate for estimating sediment toxicity for PCBs.

9 • Page B.7-44. The report discusses a U.S. Fish and Wildlife Service guideline of 0.4 ppm PCBs in fish tissues for the protection of fish. Although the report states that the levels detected in Upper Hudson River fish exceed this value, the validity of the guideline is questioned because it is based on toxicity to trout, and trout are not a major species in the Upper Hudson site vicinity. The guideline is proposed to provide protection for the most sensitive species tested to date. There may be similarly sensitive (or more sensitive) species within the Hudson River for which no toxicity data exists. Consequently, it is appropriate to use this value to ensure adequate consideration of all fish species.

10 We do not dispute any of the facts presented in this report. However, we feel that some pertinent data and analyses have been omitted, and that conclusions have been proposed that minimize the threat to biota in the Upper Hudson River.

The report should stress that, based on existing toxicological information, the levels of PCBs detected in various matrices in the Upper Hudson River are likely to cause adverse impacts to a variety of fish and wildlife resources. Concentrations of PCBs continue to violate the USEPA Ambient Water Quality Criterion for the protection of freshwater aquatic life. Levels of PCBs detected in fish from the Hudson River are comparable to levels that have proven harmful to certain fish species in laboratory studies, causing reproductive impairment and low survivability of fry (Eisler, 1986). Studies also support the argument that certain bird species that consume fish from the Upper Hudson River may experience disruptions in growth, reproduction, metabolism and behavior (Eisler, 1986).

The data presented in the Phase I Report indicate that levels of PCBs in the Lower Hudson River are sufficient to cause toxicity to certain organisms. We request that USEPA re-evaluate their decision not to perform an ecological risk assessment in the Lower Hudson River. 11

We appreciate the opportunity to participate on the Scientific and Technical Committee and to provide comments on this document. If you wish to discuss these comments, please feel free to contact Anne Secord of my staff at (607) 753-9334.

Sincerely,

Leonard P. Corin
Field Supervisor

Literature Cited

Eisler, R. 1986. Polychlorinated Biphenyl Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. U.S. Fish and Wildlife Service Biol. Rept. 85(1.7). 72 pp.

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U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria for Polychlorinated Biphenyls. Office of Health and Environmental Assessment, Cincinnati, OH. EPA 440/5-80-068.

cc: Dr. Daniel Abramowicz, GE, Schenectady, NY
Dr. Richard Bopp, NYSDEC, Albany, NY
Mr. William Patterson, DOI, Boston, MA
Hon. Gerald Solomon

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United States Department of the Interior

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ER 85/543

October 28, 1991

Mr. Douglas Tomchuk
Hudson River PCBs Site Project Manager
Region II - Room 747
26 Federal Plaza
New York, New York 10278

Dear Mr. Tomchuk:

As a representative of the Department of the Interior on the Oversight Committee for this project, I would like to provide comments on the Phase 1 Report - Review Copy, Interim Characterization and Evaluation: Hudson River PCB Reassessment RI/FS. This process represents a complex and extensive undertaking, and we welcome the opportunity to provide our input. 1

Our comments also supplement those that you will receive from the Department's U.S. Fish and Wildlife Service (Service), who are represented on the Scientific and Technical Committee. We support their comments, including their concerns that the tone of the Phase 1 Report seems to downplay the threats posed to fish and wildlife from PCB contamination. We also concur with the request by the Service, and the National Oceanic and Atmospheric Administration, that an ecological risk assessment be undertaken for the Lower Hudson. 2

The comments that we have at this time pertain to Part A of the document, "Lower Hudson Characterization." We are concerned that the available data, which we do not necessarily dispute, is presented in a manner strongly suggesting that the recent, persisting levels of PCBs in the Lower Hudson River fish and sediments, are due to New York City metropolitan area inputs rather than Upper Hudson/General Electric (GE) sources. While this is a hypothesis worthy of testing, it is not a conclusion that can as yet be reached. 3

This argument is introduced by the authors on page E-6, with further development in section A.3. Citing the results of tissue analysis on Lower Hudson striped bass (Table A.3-6), the authors note that while the concentrations of both the PCB congeners Aroclor 1254 and Aroclor 1016 have decreased since 1977/1978, Aroclor 1016 has decreased at a faster rate, the ratio of Aroclor 1254 to 1016 has increased, and Aroclor 1254 appears to be persisting. The significance of this finding is that Aroclor 1254 was previously associated with use by GE in the Upper Hudson during early years of production; as suggested on page E-6, evidence of new, non GE inputs originating in the Lower Hudson will be a factor in determining the appropriateness of potential remedial efforts.

The authors construct a relationship between Aroclor 1254 levels in striped bass tissue, and NYC metropolitan PCB inputs, based primarily on the following: 1) a time series of total PCB levels estimated in the Lower Hudson sediments; 2) the finding that in 1986, PCBs in sediments attributed to NYC metropolitan inputs were of similar magnitude to those originating upriver (Bopp and Simpson, 1989; page A.3-3); 3) minimal influence of degradation on Aroclor patterns in the Lower Hudson; and, 4) importantly, the authors' conclusion that recently increasing ratios of highly chlorinated PCB peaks in sediments (Bopp et al., 1982; page A.3-4), "may" indicate the presence of Aroclor 1254.

It appears speculative to conclude that the study by Bopp et al. indicates the presence of Aroclor 1254. The authors do not show how they reached this interpretation. Unless the basis for their conclusion can be adequately described, including limiting assumptions, it should be deleted, or rephrased as a hypothesis to be tested in Phase 2.

Second, the authors have not provided supporting documentation for the implied correlation between relative concentrations of specific congeners in sediments and in fish tissue.

Third, the discussion is lacking by not including a comparison with tissue samples from fish collected above the salt front. Yet, information is presented elsewhere in the report that would seem relevant: On page B.3-29 (section B.3-4) levels of Aroclor 1016 in Upper Hudson fish are also found to be decreasing while higher chlorinated congeners, such as 1254, persist. On page B.3-34, the following statement is made:

> "Another possible explanation for the shift from Aroclor 1016 dominance to Aroclor 1254 in recent years is that the lower chlorinated congeners were more rapidly released and dissipated in the late 1970s and early 1980s, whereas the higher chlorinated congeners have tended to bioaccumulate more and are less rapidly released by fish."

Moreover, Figure B.3-15 illustrates the trends in Aroclor 1254 and 1016 in fish tissue from river mile 175, including the increasing ratio of Aroclor 1254 to 1016, and the relatively persistent levels of Aroclor 1254 since 1982. This phenomena may be occurring in the presence of biodegradation.

Similarly, our attention is also called to the citation of Thomann et al. (1989), who estimates that only 10% of the PCB levels in striped bass in the Lower Hudson river are due to Upper Hudson sources. This is one of the very few statements where a relative level of responsibility for PCB contamination in the Lower Hudson is directly attributed to Upper Hudson inputs. As such, it is a particularly important conclusion and should be accompanied by appropriate supporting documentation.

To summarize, we recognize that attempting to characterize PCB inputs in the Lower or Upper Hudson River is a complex and difficult undertaking. However, we believe that to suggest that remedial efforts in the Upper Hudson will have minimal effect in the Lower Hudson, is premature, and is not supported by the data as presented.

Thank you for considering our comments. If you have any questions please do not hesitate to contact me or Andrew Raddant at (617) 565-6856.

Sincerely,

William Patterson

William Patterson
Regional Environmental Officer

cc:
Anne Secord, FWS/Cortland
Frank Csulak, NOAA/NY

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Ocean Resources Conservation and Assessment
Hazardous Materials Response and Assessment Division
Coastal Resources Coordination Branch
Room 3137-C
26 Federal Plaza
New York, New York 10278

F-3

November 4, 1991

Douglas Tomchuk, Project Manager
New York/Caribbean Superfund Branch II
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza
New York, NY 10278

Dear Mr. Tomchuk:

The National Oceanic and Atmospheric Administration (NOAA) has completed its review of the
Phase 1 Report for the Hudson River PCB Reassessment Remedial Investigation and Feasibility Study (RI/FS), entitled, "Interim Characterization and Evaluation", prepared by Tams Consultants, Inc., and Gradient Corporation, dated August 1991. The Phase 1 Report of this reassessment is an interim report which presents a comprehensive summary of all available data on the Hudson River and the polychlorinated biphenyls (PCBs) contaminated river sediments and analyses of that data. The purpose of this evaluation was to 1) provide as accurate a picture as possible of current levels of PCBs in the river and the changes in these levels since the 1970s; 2) identify needs for additional data; 3) allow a preliminary assessment of risks to human health and the environment posed by the PCBs in the river; and 4) make possible a preliminary assessment of potential remedies and treatment options for the PCB-contaminated sediments.

NOAA'S comments on the Phase 1 Report fall into several general classes:
(1) comments about the overall project; (2) comments about the ecological risk assessment (ERA) presented in the report; (3) comments about models and the framework for decision making; (4) comments about estimates of loadings; (5) comments about specific sections of the Phase 1 Report; and (6) comments about Phase 2B sampling.

(1) The Phase 1 Report does not adequately address risks to, and protection of, important natural resources in the Lower Hudson River below the Federal Dam at Troy, New York. 1

The 150 miles of the Hudson River estuary below the Federal Dam provides critical and/or sensitive habitat for numerous aquatic and terrestrial resources. Anadromous, marine and brackish water species use the estuary for spawning, egg, larval, and juvenile development, and adult habitat. Important anadromous fish in the Hudson River include striped bass, American shad, blueback herring, alewife, rainbow smelt, white perch and shortnose and Atlantic sturgeon. The Hudson River component of the striped bass population represents approximately 60% of the total East Coast fishery extending from North Carolina to Maine. It dominates the commercial and recreational striped bass fishery from New Jersey to Massachusetts. Blue crab are found in the Lower Hudson in significant numbers. Several of these resources access the upper river by using the lock system from Troy, New York and moving to habitat or spawning sites northward of the dam. The ecological importance of the Lower Hudson has led NOAA and the State of New York to establish four National Estuary Research Reserves along the its reaches.

Many of these resources have been, or may be, adversely affected by the PCBs transported from the upper to the lower river. In addition, the estimated 85,000 kg of PCBs that remain in the sediments of the Lower Hudson is mostly the result of transport from the
2 Upper Hudson (Bopp and Simpson, 1989). The National Contingency Plan (NCP) and Superfund Admendments and Reauthorization Act (SARA) require EPA to review the remedial action action every five years if hazardous substances remain on a site above levels that pose potential threats to human and environmental receptors. The NCP requires that "Superfund remedies will be protective of environmental organisms and ecosystems and defines the purpose of a Remedial Investigation baseline risk assessment as an evaluation of "whether the site poses a current or potential threat to human health and the environment in the absence of any remedial action". The EPA Risk Assessment Guidance for Superfund, Volume II. Environmental Evaluation Manual (EPA/540/1-89/001), states that "ecological assessment of hazardous waste sites is an essential element in determining overall risk and protecting public health, welfare, and the environment". The natural resource trustee agencies, including NOAA , Department of the Interior (DOI), and New York State Department of Environmental Conservation (NYSDEC) are in agreement that decisions regarding future remedial actions, including the continuation of the interim no-action alternative in the lower river, must be based on a comprehensive ecological assessment in order to establish (properly document) the demonstrable (current) and potential risks to natural resources from the presence of PCBs.

At EPA's request, NOAA , in consultation with DOI and NYSDCE, prepared an outline for an Ecological Risk Assessment (ERA) EPA to be incorporated as part of EPA's Reassessment RI/FS. The intent of the ERA is to provide the information necessary for the Reassessment RI/FS and for the decision-making process concerning the appropriate remedy. The ERA outline submitted to EPA on September 5, 1991, includes: a) a basic inventory of the current status of the aquatic and terrestrial habitats and species at risk in the Hudson River; b) identification of the potential exposures to ecological receptors; and c) an evaluation of the measured and predicted effects on those habitats and species associated with the PCB releases and exposures (characterization of ecological risk in the absence of remedial action). The ecological evaluation will focus on the effects of PCBs released by the General Electric Company (GE). Elements of the ERA, particularly contaminant fate and transport analysis, would overlap with the human health evaluation and should be integrated with the human health evaluation studies. NOAA encourages EPA to follow the ERA outline provided to them.

The Lower Hudson River is the habitat of greater importance to NOAA trust resources. The descriptive characterization included in the Phase 1 Report is a preliminary step, but it is not adequate for evaluation of the Lower Hudson River. EPA's reassessment needs to be full in scope and executed without prejudgments or arbitrary limitations on the geographic scope. For potential remedial alternatives (including no- action) to be analyzed effectively, an ecological risk assessment (ERA) of the Lower Hudson needs to be conducted to establish target cleanup levels and potential benefits of meeting these target cleanup levels. Alternative remedial actions could then be investigated to meet these levels in the most cost-effective way.

The reassessment project needs to investigate all areas of potential contamination, then limit its scope based on documented absence of contamination and conduct a full evaluation on what remains. This process would typically begin with a review of general literature and specific information about an area for subsequent preparation of an ERA based on existing information—as was done for the Upper River—and to identify additional information that must be gathered. Then, a field investigation would be conducted to collect needed additional information. This process for the lower river was not even begun in Phase 1.

Section 2.1.5 of the Scope of Work, dated December 1990, stated "Human health and ecological risks will be evaluated in this phase [Phase 1] of the work using only existing data (*i.e.*, a 'baseline risk assessment'). Assessments for the Upper Hudson River and for the lower river will be performed separately". The plan for an ERA for the lower river was dropped from the Phase 1 Work Plan (dated January 1991).

3 (2) The ERA prepared for the Upper Hudson River was a good initial endeavor. In conjunction with the section describing the nature and extent of contamination, it presented a compendium of information on distribution of, and exposure to PCBs, in the upper river and an evaluation of toxicity of PCBs by a review of the toxicological literature. As the report pointed out (p. B.7-1), it is not easy to make sense of environmental data collected with a variety of methods and for a variety of programs with different objectives.

While individual sections of the ERA - on the nature and extent of contamination, on the literature review of toxicity, and on proposed ecological guidelines covered their respective topics adequately, there was very little transfer from one section to the next. In particular, the section on proposed ecological guidelines could have been written in the absence of the other two. The values selected for incorporation into these guidelines were relatively conservative (*e.g.*, 0.014 µg/liter, the chronic freshwater ambient water quality criterion (U.S. EPA 1986), for surface freshwater; 0.4 µg/g body tissue, a criterion proposed by Eisler (1986) for protection of fish, but they were by and large from the general ecological literature. The report stated that a histopathological study by Kim *et al.* (1989) of bile-duct hyperplasia (abnormal cell growth) was the only known study of responses of Upper Hudson River fish to contamination in the river. If this is true, then the literature-derived values proposed are probably all that can be expected to be developed without collecting site-specific information.

The Phase 1 Report recognized that there was insufficient information to prepare a comprehensive ERA (Synopsis of Section B.7). The concluding sentence of the ERA stated that "Future phases of the reassessment will address data limitations and better define ecological risks due to PCBs in the River". This indicates a recognition on the part of the reassessment project that adequate resources will need to be allocated to gathering ecological data in the next phase of the project.

The synopsis of the interim ecological risk assessment stated that "it is premature to conclude whether ecological risks specifically attributable to PCB contamination from the Upper Hudson River exist". However, all four of the environmental media that were examined exceeded the guideline values used for evaluation, two of them by an order of magnitude or more. Based on these proposed guidelines and criteria, the conclusion that biota dependent on the Upper Hudson River ecosystem are at substantial risk of injury would be warranted.

Moreover, the reassessment also needs to include an ERA for the lower portion of the river. The quotient method, described by Barnthouse and co-workers (1986), would be an appropriate approach. In this procedure, values for concentrations of PCBs measured in environmental media are divided by guideline values. Quotients obtained this way that are less than 0.1 are considered to be of no concern; between 0.1 and 10, to be of possible concern; and greater than 10, to be of probable concern (U.S. EPA 1988). The proposed ecological guidelines presented in Table B.7-3 of the report could serve as guideline values for this assessment. The environmental media that should be evaluated include surface water, sediments, and body burden of organisms in the aquatic habitat. (Note: this method is similar to that used in section B.7.4.3 "Proposed Criteria and Guidelines", but the full quotient method is a more formal and more highly organized approach). In order to provide meaningful results, the lower river should be divided into at least 3 separate reaches to describe the level of risk associated with the different sections of the Lower Hudson. 4

(3) The framework for making decisions in the course of the project is not at all clear. Several project elements were described in preparative phases of the project (*e.g.*, the Scope of Work for the project or the Phase 1 Work Plan). But these were not subsequently developed. Nor has there been any functional substitution for these elements or any explanation of how the absence of these elements will be compensated. In particular, the management model purported to be used for making decisions in the course of the project has undergone such a drastic evolution during its development that it is barely recognizable. Further, its role in the project has declined with nothing to replace it. Nor has there been a revision to the Scope of Work for the overall project to account for such a change. 5

The first indication of such a framework was in the description of Task 2.1.3 in the Scope of Work on reviewing and potentially adapting the PCB bioaccumulation model developed by Thomann *et al.* (1989). The task included an analysis of each component of the model, running the model with different assumptions, identification of areas neglected or inadequately treated by the Thomann model, and development of methods of applying the model to resident populations in the *lower* river.

This concept was refined in Task 2 of the Phase 1 Work Plan on the evaluation of bioaccumulation of PCBs in fish and the food web, which included an explicit process for developing a management framework. This framework (management model) included three submodels on receptor uptake, ambient exposure, and transport potential. The task described several elements in developing the model, including statistical analyses of existing ecological data to determine site-specific bioconcentration and bioaccumulation factors, a review of basic physical and chemical principles, and consideration of current scientific research on mechanisms of uptake and accumulation of PCBs by aquatic species. It also described four specific subtasks: (a) testing the statistical significance of bioconcentration and bioaccumulation factors and determining the usefulness of these relationships in predicting PCB trends; (b) estimating PCB attenuation rate ("time constant") in sediments and fish; (c) analyze links among compartments of model in a quantitative way; and (d) developing a framework for uptake, distribution, and transport of PCBs in sediments, water, and biota. In the transfer of this topic from Scope of Work to Work Plan, however, the focus was shifted from addressing at least some specific concerns in the lower river to evaluating the upper river *exclusively*.

6 The outcome of this management model approach is described in Section B.4 of the Phase 1 Report. The only link to its previous conceptualization in the Work Plan, however, is Figure B.4-1 of the report entitled, "Conceptual Reassessment Framework". This figure was renamed from Figure 1 of the Work Plan, where it was titled "Hudson River Management Model Components". What started out as a comprehensive framework for active decision-making for the whole project became only a scheme for analyzing data with no decision points. It is true that the framework and procedure as originally proposed was exceedingly ambitious, and it was probably inevitable that the scope of the task was trimmed back somewhat. But no alternative framework has been proposed or reviewed. There needs to be some structure to guide decision-making in the reassessment project.

7 One of the limitations of the model proposed in the reassessment project (Figure B.4-1 "Conceptual Reassessment Framework") is its treatment of the biological components of the ecosystem. The model is highly directional in its structure: alterations in the distribution of PCBs in sediments affects ambient PCB levels in sediments and the water column and these levels produce changes in PCB levels in biota. Within the biological portion of the model, the "food web" affects "target fish", though dissolved PCBs and PCBs associated with sediments have mixed interactions on the biological components. The biological component of the riverine ecosystem is much more interactive than

directional, and it is much more complex than the two levels used to represent it in the model. A typical riverine ecosystem is comprised of at least seven biological components: detritus, plants, detritivores, herbivores, omnivores, carnivores, and predators. As a generalization, these components form two chains (detritus—detritivores—omnivores—predators and plants—herbivores—carnivores—predators), though links from plants and herbivores to omnivores and from omnivores to carnivores are also important.

While the directionality of the model is appealing in its logic and useful as an intuitive tool, it may be a fallacious construction. It is similarly logical to view the trophic dynamics of a riverine system (*i.e.*, how food flows through a biological community in a river) as comprising physical and chemical components (light, depth, nutrients), plants (primary producers), herbivores (primary consumers or secondary producers) and upper trophic levels. But riverine systems respond to manipulation of the upper trophic levels by altering the entire biological community, including herbivores and plants (Power, 1990). While it would be possible to identify all "target fish" as predators and thereby have a directional link from the "food web", representing the food web as a single "black box" is an oversimplification. To model flow of a contaminants through such a biological system, the system should have the appropriate trophic description.

(4) The report (Sections A.2.2 - 2.5) uses contemporary data for estimating the loading of PCBs from the Upper Hudson River to the lower river, but uses estimates of concentrations of PCBs in discharges of sewage effluent that are at least a decade old. The amount of PCBs in sewage effluent would have been expected to decrease substantially in the intervening decade, and use of an estimate of that age could substantially overestimate the PCB contribution from that source. 8

(5) Specific comments

A.3-3 There is considerable emphasis in the report on the potential significance of other sources of PCBs to the Lower Hudson, particularly inputs from the NYC metropolitan area. This conclusion is only justified if the Lower Hudson is considered as a single compartment. Effects of input from the NYC area would be expected to diminish rapidly with distance upriver and presumably would have little, if any, effect on resources above the salt front. There may be data in the database that could be used to evaluate this question. For the purposes of the reassessment, it would be useful to divide the Lower Hudson into at least 3 9 separate sections (e.g., based on salinity regimes or resource assemblages) to address issues concerning the extent of contamination, contributions from different sources, and levels in biota.

10 A.3-6 EPA should justify its assumption that PCB levels in the water column suspended matter are equal to the PCB levels found in surface sediment samples.

11 A.3-11 The report attributes the significance of lack of decline in the Aroclor 1254 component in striped bass to sewage inputs of higher chlorinated PCBs in New York City area. This conclusion may not be justified, since fish from the Upper Hudson also show no decline in higher chlorinated PCBs that have been measured as Aroclor 1254. An alternative explanation would be the differential accumulation of the penta- and hexachlorobiphenyls, which are major components of Aroclor 1254, compared with the lower chlorinated homologues found in Aroclor 1016 (Eisler, 1986).

12 B.7-31 The report qualifies the discussion of coplanar PCBs by stating "Although coplanar PCBs are constituents of Aroclor mixtures in minute quantities". It should also be pointed out that differential accumulation of the highly toxic coplanar PCBs in aquatic biota has been reported, which may result in an enrichment of coplanar PCB concentrations in biota (Kannan et al. 1989; Smith et al. 1990). This may have important implications for the evaluation of risk to biota and human populations.

13 B.7-38 In section B.7.4.3, the report states that, "there exists no promulgated standards for PCBs in surface water ...." , however, on page C.3-9 ambient water quality standards are listed for surface water in the Upper and Lower River for both human life and aquatic life. This apparent conflict needs to be resolved.

14 (6) Preliminary Recommendations for Phase 2 sampling

a. Our primary concern is that resources in the Lower Hudson are being affected by the levels of PCBs in the sediments of the Lower Hudson as well as the loading from the Upper Hudson and other sources. An ecological risk assessment is needed to provide a realistic basis for making decisions on PCB levels in sediments that would be protective of natural resources and for evaluating alternatives in the Feasibility Study. The Lower Hudson should be considered in several geographical compartments for purposes of data evaluation.

b. NOAA, with the State of New York, has established four National Estuarine Research Reserves along the Hudson River. These areas, which are of unique ecological importance, are located at Stockport flats, Tivoli Bay, the Iona Marshes and Piermont. Each of these sites accumulate fine-grained river sediments and have been the subject of sediment studies. There was no mention of these areas in the Phase 1 Report.

There are also a number of reaches that accumulate sediments washed down the Hudson by all stages of flow. Federal maintenance dredging is periodically carried out in these reaches. One of particular concern is the Albany Turning Basin, which accumulates approximately 30 centimeters of sediment per year and is used by anadromous species found in the river as a feeding, spawning and nursery area. The Federally endangered shortnose sturgeon is a prominent member of that community.

Allowing continued down-river migration of PCBs may be affecting these resources. By sampling sediments at the five sites, the cumulative impacts of PCB loading can be determined. Applying the partitioning coefficients of PCB/lipid/total carbon relationships which is currently being explored by the EPA's Environmental Research Laboratory located in Narragansett, Rhode Island may assist in determining the extent of the threat to lower river resources.

c. The shortnose sturgeon is a Federally endangered species that is known to inhabit the Hudson River from the mouth of the river to the dam at Troy, New York. The sturgeon spawns in an area located immediately below the Troy Dam. Juvenile habitat extends downstream to the salt wedge. Foraging and overwintering adults use habitats throughout the river that are rich in benthic infauna. In addition, foraging adults can easily pass through the lock systems that make the upper river navigable above Troy.

The entire range of the shortnose sturgeon in the Hudson River can be found within the Hudson River PCB site, and the benthic life history of this species puts it at particular risk of encountering PCBs in the surface sediments and infaunal organisms. Therefore, Phase

II should include an in-depth analysis of the impacts of PCBs on the shortnose sturgeon, in addition to analyzing the impacts of the potential remedial alternative(s) on this species.

d. It is important to understand the mechanism for contamination of aquatic resources, since the PCB levels in fish provide a major part of the foundation for both the human health and ecological risk evaluations. It is not sufficient to define loading by itself. The reported bimodal relationship between river flow and water PCB concentrations suggests that it will be difficult to derive tissue levels from estimates of PCB loading.

According to Bopp and Simpson (1989), 85,000 kg of PCBs remain in the sediments of the Lower Hudson. Most of this was derived from the Upper Hudson. The very slow level of decline of Aroclor 1254 levels in fish tissue indicates that residual sediment contamination may be playing a significant role in determining future PCB levels in fish. Sediment cores are useful for examining historical trends in PCB levels, but cannot be used to characterize the distribution of residual contamination. No effort has been made to characterize the distribution of this residual contamination or to determine if there are areas with highly elevated concentrations. What is the potential impact of this residual contamination on resources?

e. Analysis of water samples is difficult due to the very low concentrations that need to be measured and the extreme variability with time and under different flow conditions. The use of model lipid bags in the freshwater reaches and caged blue mussels (i.e., *Mytilus edulis*) in the more saline reaches to concentrate PCBs in the water column for analysis and to integrate PCB concentrations in water over time could assist in estimating the contribution of particular additional sources, like tributaries or discharges (Huckins et al., 1990). The bags and mussels could be deployed in the particular flow of interest, as well as upstream and downstream in the river where the flow enters. These passive sampling devices could prove particularly useful in estimating relative exposures of aquatic organisms to PCBs in the water column.

f. Phase 2 sampling should include additional characterization of levels of PCBs in Lower Hudson sediment and biota. Appropriate receptor species and life history stages should be identified by the ecological risk assessment. Biota samples should include whole body analysis in addition to the analysis of muscle tissue conducted for human health risk assessment. Methods of analysis for PCB determinations should be similar for all media.

Congener-specific PCB analysis is recommended in order to get the maximum information on fate and transport processes and potential risk to biota and human health.

NOAA strongly recommends that the following issues be addressed during the Phase 2B sampling:

a. The endangered shortnose sturgeon may be presently affected by PCBs in violation of the Endangered Species Act. EPA needs to assess the current impact of PCB contamination and the potential impact(s) of any proposed remedial alternative on the species.

b. The fish stocks utilizing the Hudson River are carrying a potential contaminant load throughout their range. In the case of striped bass, the Hudson River stock has become the primary source of this species ranging from North Carolina to Maine. There is currently little information on the effects of the PCB contamination on the striped bass population or on the user public.

c. Habitats throughout the entire length of the Hudson River, especially the National Estuarine Research Reserves, may be adversely affected by the accumulation of PCB contaminated sediments.

Thank you for providing NOAA with the opportunity to review and provide comments on the Phase 1 Report. NOAA looks forward to working with EPA on the development of a Phase 2 Work Plan that will include an ERA for the Lower Hudson River.

Sincerely,

Frank G. Csulak

Frank G. Csulak
Coastal Resource Coordinator

cc: A. Fritz, NOAA/CRCB
A. Geidt, NOAA/OGC
G. Kinter, NOAA/DAC
D. Beach, NOAANMFS
M. Ludwig, NOAA/NMFS

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New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 7010

Thomas C. Jorling
Commissioner

OCT 25 1991

Telex

Mr. Douglas Tomchuk
US Environmental
Protection Agency
Region II
26 Federal Plaza
New York, NY 10278

Dear Mr. Tomchuk:

RE: Hudson River PCB Reassessment
Site No.: 5-46-031

Listed below are comments on the Phase 1 Report "Interim Characterization and Evaluation, Hudson River PCB Reassessment RI/FS" dated August 1991. In general we were pleased with the thoroughness of the existing data reported. However, we feel strongly that conclusions on the report should have identified data gaps in existing data and justified the additional sampling which is planned for Phase 2. The Phase 2 Work Plan must make conclusions from the existing data and identify the gaps in the data which will be filled by the additional sampling. The additional information gained in Phase 2 should also focus on the necessary information needed to properly and thoroughly evaluate remedial alternatives in the feasibility study. For example, we recommend taking sufficient samples now for proposed bench-scale testing of the KOH PEG, B.E.S.T., LEEP and Propane technologies. By performing this task now pilot scale testing can be performed during the Spring and Summer of 1992 to allow that information to be included in the feasibility study's detailed evaluation of alternatives. 1

We still continue to have technical reservations about the modeling effort for this project. My letter dated March 21, 1991 is enclosed because we still insist that General Comment Number 2 is important and should be addressed before the modeling work proceeds forward and in the responsiveness summary. We would be interested in discussing your consultant's approach and current direction.

The comments on Phase 1 are:

Phase I Report Comments
Executive Summary, Introduction,
Section A: Lower Hudson River Characterization

2 1. USEPA and their consultant need to make a comprehensive analysis data and draw conclusions and recommendations from the existing data. The conclusions will form the basis for gathering new data and provide a basis for discussions in the various committees and Liaison Groups. At a minimum this must be included in the Phase 2 Work Plan because it will provide the justification for additional sampling. USEPA must begin to formulate the questions that need to be answered in the feasibility study.

3 2. We strongly recommend that PCB mass balances and approximate budgets should be dealt with in a single section in future reports, focusing on how estimates were derived, assessing the uncertainties, and attempting to place constraints on important fluxes using mass balance considerations. For example, estimates of total PCB inputs from GE range over a factor of five - if it is not possible to use mass balance arguments to narrow this range, that should be explained in detail. On page A.2-2, the 1973 PCB flux from the Upper Hudson River was estimated at 5,000 kg, page A.4-2 implies a flux of 24,000 kg during that year. Even if a mass balance approach does not significantly lower such uncertainties, it would focus attention on areas where additional study might be useful and better define the level of uncertainty that is likely to persist in estimating the mass balance relationships in the river.

4 3. In the second paragraph on page E-3, second sentence is not necessarily true because lipid content in some species is much greater in the lower river compared to the same species in the upper river (i.e. above the federal dam at Troy). Consequently, the concentrations on a wet weight basis are actually greater below the dam than in sections above the dam.

5 4. On page E-9, third bullet re: lipid (fatty) content compared to PCB in the water column, it is apparent that the authors are unfamiliar with bioaccumulation factor as a concept. Normally, it is not the ratio of concentrations in water and those in lipid. Rather it is usually expressed as concentration in water vs. concentration in organism/tissue on a wet weight basis. The concentration in lipid material (i.e. ug PCB/g-lipid) can be utilized to describe spatial/temporal relationships and to understand environmental partitioning.

6 5. Section A, the fourth paragraph on the synopsis of the Lower Hudson Characterization should be revised. The third sentence should read "Sediment cores also indicate that sediment is being influenced by loading from the New York City Metropolitan inputs. The historical sediment records

indicate that Upper River sources have provided the dominant inputs to this portion of the river until recently. The Lower River Sources in the New York City Metropolitain Area are now estimated to be on the same order as the Upper River inputs."

6. Same section, Synopsis Section A, fourth paragraph, re: declines in striped bass. Over what time interval is the decline involved? What about recent years? What was the significance? This is a misleading statement especially since the physical aspects associated with exposure have changed over the years. In the last sentence this is a misleading statement also, since resident species have been sampled in the lower Hudson (i.e. largemouth bass and brown bullhead) and formed a substantial component of the trend monitoring. The lumping of data into the two categories is misleading (i.e. Upper vs. Lower) and presents an artificial distortion of the data developed since 1977. Perhaps a better approach, at least for fish, would be to use striped bass as an anadromous indicator and the other species as resident indicators for spatial and temporal characteristics. River-mile 153 is <u>not</u> in the Upper Hudson River. This is a problem in the presentation of many of the figures and tables. 7 8 9

7. The Lower Hudson River evaluation should be independent of the Upper Hudson River. Both sections are contaminated but the Upper is what should be considered for clean-up regardless of what occurs in the Lower portion. This seems to be an area which requires further discussion in the various liasion groups and committees. 10

8. Page A.3-9, paragraph three - The selection of the three "Aroclors" was done primarily to reflect degrees of PCB chlorination in tissue samples under packed-column chromatographic conditions in use at the time the current monitoring efforts were begun in 1977. In recent years capillary column and congeneric-specific analyses have been precluded largely due to analytical costs. Detection limits at the contract laboratory were changed for all three "Aroclors" to 0.05 ppm in 1987. 11

(12) 9. Page A.3-11 paragraph two, first sentence. Presenting PCB data on striped bass on a lipid-basis may not provide a logical basis for trend evaluation if there is no consistent relationship between PCB and lipid. These associations by year should be presented.

(13) 10. Page A.3-11, third paragraph - The term "half-life" needs explanation. It is a confusing concept to most people since it is not a radiological decay but rather a representation of environmental disappearance for whatever reason(s). Comments from some attendees at the recent public meetings regard this use of half-life as a kind of mathematical voodoo. Environmental half-life is a valuable tool, but it needs proper introduction.

(14) 11. Page A.3-11, fourth paragraph - There is perhaps an inappropriate conclusion inherent in the last sentence since with time the lighter chlorinated, more mobile, volatile components tend to be eliminated from the residues leaving the more highly chlorinated, persistent components estimated as "Aroclor 1254". In other contaminated systems such as Lake Ontario and Nassau Lake in Rensselaer County, PCB's described as "Aroclor 1260" have become more prevalent or to predominate.

(15) 12. Page A.3-12, last sentence - Shad may not accumulate much PCB not only due to their short residence time but also they are not feeding during their spawning period.

(16) 13. Page A.3-13, last sentence - The characterization of Upper vs. Lower Hudson River portions is somewhat confusing since the Lower River resident species are discussed as part of the Upper River patterns. It may have been clearer if the dichotomy was based upon (a) striped bass and (b) other species.

(17) 14. Section A.4 - reviews the Thomann model pointing out the complexities and several problems with the formulation and assumptions. It does not, however, address the central question - Will the reassessment require that such a model be developed for the upper Hudson? If the answer is yes, EPA should clearly present both its reasons and specific plans for model development.

(18) 15. Some final minor comments - The discussion of nitrate in the lower Hudson (p. A.1-10) is not completely accurate (is it
(19) necessary at all?). On p. A.2-6 change "(mg/l") to "ug/l)" and on page 3.3.43 change "formed" to "found".

Section B: Upper Hudson Characterization

(20) 16. Page B 3-13 - refers to some fairly extensive sediment sampling conducted by GE in 1990. Is a detailed review/presentation of this data anticipated? The total PCB data presented in Table B 3-8 are quite interesting. A close look at congener patterns is indicated.

17. Page B 3-14 - reports mean lead and cadmium levels in upper Hudson sediments that are about an order of magnitude greater than found in pre-industrial sediments. Except for the mention that standard leaching tests suggest that the metals are not readily leachable, the implications of this contamination are not discussed. Can EPA provide comment or guidance? 21

18. Page B.3-30, paragraph three - Concentrations observed above Bakers Falls is not surprising since the Hudson Falls discharge was physically located above the dam at Baker Falls. This area should be sampled during Phase 2 of the project. 22

19. Page B.3-32, paragraph four - A sentence should be inserted after ".....0.1 ppm." In 1987, the detection limit was lowered to 0.05 ppm for each Aroclor. 23

20. Page 3-40 - Air Monitoring - The only discussion of replicate sample analysis or other QA/QC involves GE's sampling or analytical problems suggests at least some evaluation of the QA/QC associated with earlier studies. 24

21. Section B.3.7 - Adequacy of PCB and Aroclor Measurement (Pages B.3-48 to B.3-63) - Overall, this discussion was interesting and informative and provides a needed perspective on analytical methodology. However, at least for fish, the Aroclor method of presentation was intended to reflect the array of PCB found in biota as a generalization for the degrees of chlorination determined in the samples. In 1977, when fish monitoring was implemented, congeneric methods were not available. Costwise, these analytical procedures are still prohibitive. Given adequate resources, it is agreed that congener-specific analyses are preferable. 25

22. Section B.3.7 - Adequacy of PCB and Aroclor Measurement - The potential for underestimation of total PCBs in upper Hudson sediment and water column samples could be much greater than suggested here. The components most likely to have been significantly underestimated in the DEC sediment surveys and USGS water column monitoring are mono and dichlorobiphonyls. These suspicious are based on J.F. Brown Jr. et al. 1984, Bopp et al. 1984 & 1985, and GE's recent review of the packed column chromotograms from the 1984 sediment survey. This topic should be discussed in more detail at the STC meeting. 26

The table on page B 3-50 appears to have some inaccuracies. The text indicates that in the 1984 sediment survey, Versar used all of the Webb & McCall peaks with retention times between 21 and 84 to quantify Arochlor 1242 levels, while the table reports that only peaks with retention times of 28, 47 & 58 were used. The table also reports that Bopp et 27 al. 1985 "Analyzed for Total PCBs as Sum of Peaks 28-174". This is misleading as Bopp et al. went to great lengths to explain that the sum represented a total of the predominantly tri through hexachlorinated components that were quantified. In addition, they cited examples where mono and dichlorobiphenyls (not routinely quantified in that study) comprised about 50% of the total PCBs in a sediment sample and dichlorobiphenyls made up 15 to 50% of the total PCBs in water samples.

28 23. Page B.4-32, paragraph two - The Mann Kendall Trend Test (includes Table B.4-5) is inappropriately employed since it considers the entire time series (1975-1988). Conditions in the river changed drastically which probably affected bioaccumulation and artificially influenced trends. Such changes included the elimination of discharges, and simultaneous limited remedial measures conducted in 1977 and 1978. Prior to 1977 the laboratories used did not include the laboratory that has performed most of the analyses since that time. If one were to truly evaluate trend under relatively constant physical conditions, the interval 1980 to present is perhaps more appropriate which followed the major apparent decline between 1977 and 1980.

29 24. Discussion of lipid-based BAF's, e.g. on pages B.4-39, 40 and 42, and E-9, should be expanded to include the basis and rationale for this association. It is intuitively obvious why this is being done and why it is possible. However, has anyone introduced this concept in the literature? Where has it been used before? It appears to be a useful construct but references are needed.

30 25. Page B 4-42 - It is not clear whether the projection of thirty-year average PCB concentrations in fish used the entire historical data base or only the more recent fish data. In the former case, the projection may not adequately model the fact that the "rate of decline has been very low in recent years". This would result in an underestimation of the thirty-year average PCB concentration.

31 26. On page B.4-41 (summary point 2-fourth bullet): If the physical environment is altered, i.e. by shutting off a contaminant discharge, does the same half life apply after such an event? It seems as though a separate description is in order for the latter interval which in this case for the Hudson River is 1980 or 1981 to 1988.

32 27. Section B.5 - Sediment Transport Modeling - We are not convinced of the predictive value of such a model. A model can be developed to fit the calibration data and yield outputs that match simple intuitions, beyond that, we remain relatively skeptical. Perhaps TAMS or EPA could provide detailed examples of past successes of complex sediment/contaminant transport models.

28. On page B.6-2, paragraph 1 - To assume that "future use" will be the same as "present use" is inherently fallacious. One purpose of a clean-up is to allow the Hudson River to be usable again. 33

29. Page B.6-35, last paragraph begins to discuss the establishment of PCB Sediment Criteria from partitioning calculations. The report should discuss the organic content of the Hudson River sediments and present the overall procedure to make the calculations. The NYSDEC Division of Fish and Wildlife have disagreed with using the 0.014 mg/l water concentration, but instead uses 0.001 mg/l. This lower PCB concentration would yield differences in sediment cleanup goals. Both calculations should be made and presented. The cleanup goals derived from these calculations will need to be used in the feasibility study. 34

These same issues should be brought out and explained in Section B.7.5.2. 35

30. Section B.7 - Synopsis-Interim Ecological Risk Assessment, paragraph 4 - Other studies have been published that indicate potential adverse ecological effects in the Hudson River, e.g. Foley et al. 1988, and Stone and Oknoniewski 1983. Full citations and references are available upon your request. 36

31. Pages B, 3-20 through B, 3-28 - discusses surface water column concentrations of PCBs. Most sampling was done at detection limits that are above the 0.001 ug/l NYS promulgated enforceable standard. Nonetheless, the data discussed shows that detectable concentrations occur in the 0.01-0.01 ug/l range and are estimated through probit analysis to have full year average PCB concentrations on the order of 0.05 ug/l at Fort Edward and drop to approximately 0.03 ug/l at Waterford. All these water column concentrations exceed the NYS promulgated standard of 0.001 ug/l. 37

This document does not include a discussion on the exceedances of NYS water quality standards. Such a discussion needs to appear in the document. The feasibility study will need to discuss the remedial alternatives necessary to achieve the standards and set up remedial goals. 38

32. Page B 7-38 - It is stated that there "...exist no promulgated standards for PCBs in surface waters..." That statement is false. Title 6 of the New York Codes of Rules and Regulations at Part 703 lists the surface water standard as 0.001 ug/l. 39

33. Page B 7-39 - It is stated that the "...New York State Ambient Water Quality Guidance Criterion is established at 0.001 ug/l..." for PCBs. That statement is incorrect.

The stated 0.001 ug/l value is a fully promulgated and enforceable NYS regulation which appears at 6 New York Code of Rules and Regulations Part 703 and is a value which is based on protection of aquatic life.

40 34. Page B 7-39 - The section on Sediment Quality Guidelines lists various sources for criteria or guidelines for PCBs in sediments. Lacking from the discussion are the Sediment Criteria - December 1989 which were developed by the NYSDEC Division of Fish and Wildlife. Mention of these criteria should be made in this section.

35. Page B 7-42 - Again, the New York State Water Quality Criterion is listed as 0.001 ug/l.

41 36. Page B 7-43 - Section B 7.5.2 on sediments suggests that chironomid populations are not being inhibited by PCBs in the Hudson River because chironomid species "...appear to be increasing in abundance in the river." The suggestion of chironomid populations not being affected by PCBs is speculative since there is no control of what the populations would be in the Hudson River without PCBs. There can be other confounding factors which could cause the increase of chironomids in the Hudson River even in the presence of inhibiting amounts of PCBs.

42 37. Page B 7-46 - Section B.7.5.6 the Summary needs to be changed to show that the Hudson River surface water concentrations of PCBs exceed NYS standards. Also, the summary should indicate that the Division of Fish and Wildlife sediment criteria of 0.6 - 0.06 pb for a cancer risk are exceeded as well as the 10-100 ppb criteria for the protection of wildlife.

Section C: Phase 1 Feasibility Study

43 38. Page C 2-1 - It is stated that it "...is apparent from preliminary assessments that the impact of PCBs on aquatic life and consumers of aquatic life will drive the clean-up of the site".

In addition to those impacts, it is necessary to include achievement of the NYS promulgated surface water standard as a possible cleanup goal.

44 39. Page C 3-8 - The discussion of New York Water Classification and Quality Standards appears to be using out of date regulations. The more recent regulations 6NYCRR Part 700-705 with an effective date of September 1, 1991 should be referenced. (copy enclosed).

45 40. Page C 3-10 - It is stated that "Dredging and filling of navigable waters of the state must be done pursuant to

...(Article 24 of the ECL) and any other applicable law. Article 24 regulates dredging and filling of wetlands. Article 15 of the ECL regulates the excavation and fill of the navigable waters of the state. Article 15 should be included in the discussion of NYS Statutes Section C.3.3.2.

41. Page C 4-3 - In Section C.4.2.2 on aerobic biodegradation of PCBs there is minimal discussion of the products of aerobic degradation. Such a discussion is needed since it is possible that degradation products could be more environmentally harmful than PCBs. 46

42. Page C 4-7, Section C.4.3 - discusses removal technologies for PCB containing sediments. Excavation techniques are outrightly dismissed without giving any reasons and dredging is the only removal method considered. Consideration should be given to rerouting the river as well as evaluating using coffer dams to work in the dry. These techniques seem to be especially applicable to the section above the federal dam at Troy. 47

Sincerely,

Raymond E. Lupe
for

William T. Ports, P.E.
Environmental Engineer 2
Bureau of Central Remedial Action
Division of Hazardous Waste Remediation

Enclosure

cc: C. Peterson
M. Hauptman
R. Montione

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S-2 John M King
NYSDOT
518-457-6345
10/22/91

THE OPERATION AND MAINTENANCE OF THE BARGE CANAL IS MANDATED IN ARTICLE XV OF THE CONSTITUTION OF THE STATE OF NEW YORK.

SECTION 86 OF THE CANAL LAW OF THE STATE OF NEW YORK GIVES THE COMMISSIONER OF TRANSPORTATION AUTHORITY TO "PRESCRIBE AND ENFORCE RULES AND REGULATIONS..GOVERNING NAVIGATION ON THE CANALS...". 1

TITLE 17, CHAPTER II, SECTION 15.2 OF THE RULES AND REGULATION GIVE THE DIMENSIONS OF THE CANAL WHICH ARE TO BE MAINTAINED.

The PCB contaminated sediments have caused us not to comply with our duties in the Champlain Canal portion of the Barge Canal. More specifically, the canal channel below Ft Edward has between 275,000 and 300,000 cubic yards of refill that can not be dredged because of the PCB contamination. This has caused many complications.

Below lock C-4, there is only a 9 foot draft instead of the mandated 12 foot draft. In past years the barges have plowed their way through the yearly refill as best they could. The refill has recently become so wide, the barges can no longer push the sediments. This has limited the amount of draft, thus cargo the barges can carry. This is having a very negative effect on the commercial traffic on the canal and is rapidly approaching effecting the recreational traffic (fixed keel sail boats). The Champlain Canal is mandated to support traffic with a 12 foot draft. The PCB contamination is prohibiting this.

South of the Northumberland Bridge, the land cut canal enters the Hudson River and becomes a canalized river. This intersection with the canalized river was designed at a flat angle so the vessels had a gradual transition into the currents of the canalized river. There is now a large PCB contaminated shoal at the intersection that has forced the northbound vessels to perpendicularly enter the canalized river from the land cut. Since the build up of the shoal, the Northumberland Bridge pier has been struck twice by the Mobil Champlain and thus the bridge was closed.

There are many other areas in the canal that have PCB contaminated refill in it that we can not dredge to maintain the dimensions of the canal. The two listed above are the two most restrictive locations. The NO ACTION ALTERNATIVE does not address this problem. Contaminated sediments are continually settling out in our canal and are increasingly restricting our canal.

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LOCAL

10.4463

L-1

1

I am James E. Buhler of the Hyde Park Fire and Water District. The District is a potential user of the Hudson River for its source of drinking water. It is concerned that any action to be taken by EPA on the cleanup of PCBs from the river should consider the affects on the present and potential entities that use Hudson River for its source of water.

James E Buhler
Office Mgr.

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L-2

Dutchess County
Environmental Management Council

P O Box 259
Farm & Home Center, Millbrook, N Y 12545
(914) 677-3488

TO: Constantine Sidamon-Eristoff, Director EPA Region 2

FROM: Norene Coller, Chairman
Dutchess County Environmental Management Council (EMC)

RE: EPA Hudson River PCB Hearing

DATE: September 11, 1991

The Dutchess County EMC, which represents Conservation Advisory Commissions and interested citizens from across the county, views the Hudson River as a magnificent ecological, cultural, and recreational asset. For communities along the estuarine system, it is among the most significant reference points for quality of life.

We ask you to recognize that contamination of the resource by PCB's has implications for the entire Hudson River. We request that the EPA reconsider the question of public input and provide hearing opportunities for affected communities south of Poughkeepsie. 1

The Council looks forward to a decision on the reassessment of contamination under Superfund which will result in the implementation of a clean-up program to restore the quality of the Hudson River. 2

Thank you.

Norene D Coller

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L-3

Town of Stillwater

P.O. Box 700
Stillwater, N.Y.
12170

1788

Site of the Turning Point of the American Revolution

HUDSON RIVER MEETING
FORT EDWARD - 9/12/91

COMMENTS BY: PAUL F. LILAC, SUPERVISOR, TOWN OF STILLWA'

MY NAME IS PAUL LILAC. I AM SUPERVISOR OF THE TOWN OF STILLWATER, SARATOGA COUNTY. LET ME START BY SAYING THAT I HAVE BEEN VERY PLEASED AND HONORED TO HAVE SERVED AS VICE-CHAIRMAN OF THE GOVERNMENTAL LIASON COMMITTEE FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

I AM NOT TOTALLY SURPRISED BY THE PHASE I REPORT, BUT I AM SOMEWHAT DISMAYED WITH THE U.S. EPA'S RECOMMENDATION TO CONTINUE THE BAN ON FISHIN(IN THE UPPER HUDSON RIVER FROM FORT EDWARD TO THE FEDERAL DAM IN TROY. IT IS NOT MY INTENTION HERE, TONIGHT, TO USE ANY BIG, TECHNICAL, AND FANCY WORDS TO GET MY POINT ACROSS! INSTEAD, I'M GOING TO USE SOMETHING I WISH THE TECHNICAL PEOPLE WOULD USE ONCE IN AWHILE, AND THAT IS "COMMON SENSE"!

QUOTING FROM THE "SYNOPSIS OF THE DATA SYNTHESIS AND EVALUATION OF TRENDS" OF THE PHASE ONE REPORT, IT SAYS, "AMONG THE QUESTIONS STILL TO BE ANSWERED ARE WHETHER THE PCB LEVELS WILL CONTINUE THEIR OBSERVED 1
DECLINE AND WHAT SPECIFIC CONDITIONS WOULD ALTER THEIR DECLINE." THE REPORT GOES ON TO SAY THAT, WITH SPECIFIC REFERENCE TO THE PCB LEVELS IN FISH IN THE UPPER HUDSON HAVE "APPEAR TO HAVE DECLINED IN RECENT YEARS." THERE IS NO QUESTION THAT PCB'S BIODEGRADE NATURALLY! THERE IS NO QUESTI THAT THE HUDSON RIVER, AND SPECIFICALLY THE UPPER HUDSON, IS MUCH CLEANER NOW THAN IT WAS SEVERAL YEARS AGO! THERE IS SUFFICIENT DOCUMENTATION THA THE PCB LEVELS IN HUDSON RIVER FISH HAVE DECREASED!

FURTHERMORE, IT IS ABSOLUTELY FACT THAT PCB'S CANNOT BE TRANSMITTED THROUGH THE SKIN! IT IS ALSO A FACT THAT THE NYS DEPT. OF ENVIRONMENTAL CONSERVATION, ABOUT THREE YEARS AGO, FOLLOWING THE NECESSARY PUBLIC HEARI OPENED A "CATCH & RELEASE" FISHING PROGRAM IN ONONDAGA LAKE, WITH ITS WEL DOCUMENTED MURCURY CONTENT IN THAT LAKE! DEC, AT THE SAME TIME, KEPT THE TOTAL FISHING BAN IN THE UPPER HUDSON RIVER. I ARGUED THE INCONSISTENCY

COMMENTS BY SUPERVISOR LILAC (continued)

3 THESE DECISIONS AT THAT TIME, AND I POINT IT OUT AT THIS MEETING TONIGHT BECAUSE I STRONGLY BELIEVE THAT THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY SHOULD TAKE A FAVORABLE POSITION ON RECREATIONAL FISHING IN THE UPPER HUDSON!

I REPRESENT HERE, THIS EVENING, THE TOWN OF STILLWATER, AND THE TOWN BOARD HAS REAFFIRMED ITS STRONG OPPOSITION TO DEC'S DREDGING PROPOSAL, AND REMAINS UNANIMOUSLY IN FAVOR OF A "CATCH & RELEASE" FISHING PROGRAM! I ALSO REPRESENT THE SARATOGA COUNTY BOARD OF SUPERVISORS AND 180,000 RESIDEN OF SARATOGA COUNTY! OUR COUNTY BOARD HAS TAKEN THE UNANIMOUS POSITION OF OPPOSING THE DREDGING, AND FAVORING A RECREATIONAL "CATCH & RELEASE" FISHIN PROGRAM IN THE UPPER HUDSON FROM FORT EDWARD TO THE FEDERAL DAM IN TROY!

LADIES AND GENTLEMEN, ARE WE LESS HONEST ALONG THE HUDSON THAN ARE THE PEOPLE OF THE ONONDAGA LAKE AREA? IF WE CATCH THE FISH, WE CAN ALSO RELEASE IT! I ALSO FIND IT VERY HARD TO BELIEVE THAT THESE FISH, WITH PCI LEVELS TO HIGH FOR HUMAN CONSUMPTION, KNOW ENOUGH TO STOP AT THE FEDERAL DAM IN TROY, THEN TURN AROUND AND HEAD NORTH AGAIN! YET, PEOPLE CAN FISH SOUTH OF THE DAM? DOES THAT MAKE SENSE? OF COURSE NOT!

I SUBMIT TO YOU THAT, AGAIN, PCB'S CANNOT BE TRANSMITTED THROUGH THE SKIN, AND SPORT FISHERMEN SHOULD BE ABLE TO FULLY UTILIZE THE BEAUTIFUL HUDSON RIVER! WE CAN DRINK THE WATER! WE CAN SWIM IN THE WATER! YET WE CAN'T CATCH A FISH AND THROW IT BACK!

ON BEHALF OF ALL OF THE PEOPLE WHO LIVE ON THE BANKS OF THE HUDSON, AND ALL OF THE PEOPLE OF THE UPPER NEW YORK STATE REGION, I URGE YOU TO ADVISE THE NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION TO FORGET TH DREDGING AND ALLOW THE RIVER TO CLEANSE ITSELF, WHICH IT IS NOW DOING! AL INFORM THE DEC THAT THE UNITED STATES EVIRONMENTAL PROTECTION AGENCY FAVOR A "CATCH & RELEASE" FISHING PROGRAM IN THE UPPER HUDSON RIVER!

THANK YOU, AND I ANTICIPATE YOUR FAVORABLE RESPONSE!

Paul F. Lilac

L-4

VILLAGE OF STILLWATER

INCORPORATED 1816

STILLWATER, NEW YORK

John Herrick, Mayor

EXCERPT FROM FEBRUARY 12, 1990 REGULAR MEETING OF STILLWATER VILLAGE BOARD OF TRUSTEES

MOTION: A resolution be drafted with notice that we are against the State dredging the Hudson River for removal of PCBs, and sent to our Congressman, Senator and Assemblyman. 1

Motion made by: Trustee M. Hanehan; seconded by Trustee F. Hanehan

Roll Call Vote: Mayor Rathbun - Aye
Trustee M. Hanehan - Aye
Trustee J. Herrick - Aye
Trustee F. Hanehan - Aye
(Trustee E. Martin - Absent from meeting)

MOTION CARRIED: 4-0.

I, Cathy L. Yankowski, Village Clerk/Treasurer for the Village of Stillwater, do hereby certify that the above is a true and actual excerpt of a Resolution duly adopted by the Village Board of Trustees of the Village of Stillwater on February 12, 1990.

Cathy L. Yankowski

Cathy L. Yankowski, Village Clerk/Treasurer

Submitted with oral meeting comments.

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ACTION PROGRAM

C-1

October 25, 1991

Douglas Tomchuk
HR PCBs Site Project Mgr.
US EPA
Region II - Room 747
26 Federal Plaza
New York NY 10278

Dear Doug;

Attached are comments concerning the Phase 1 Report and the other topics we spoke of at the 10/16 Steering Committee Meeting.

As I ahven't heard form any other citizens and our Oversite Committee Meeting the other night left much unexplained, I will submit our comments as they stood on 10/16/91.

Thanks again, I look foward to our next meeting.

Sincerely,

Judy Schmidt-Dean
Chair
Citizens Laison Group

attach./9

CITIZEN LAISON GROUP ~~Worksheet~~
Judy Schmidt-Dean
Oct. 16, 1991
Steering Committee Meeting

The CLG met on Oct. 9 to discuss the results of Phase I, a list of attendees is attached.

1 One of our main concernswas ofcourse the Risk Assessment. It is ironic to us that the most understandable aspect of this study is [redacted] also[redacted] the most subjective and disputable. Because it alone is the reason for the study, it must be continually re-evaluated as new data emerges. The Phase I assumptions may be the standard at Superfund Sitesand EPA Policy, but we ask that Phase II deal honestly and objectively with any new data collected. One example is the much discussed chlorination levels of PCB's -

2 If the PCB's found in the HR have a lower chlorination level than the national standard, and if biodegredation is taking place, then obviously the Risk Assessment must be adjusted. This is not only a matter of Good Science, but plain old common sense. Please keep

3 the Risks in persepctive with those we live daily, ie., cigarette smoke, and especially when considering the ingestion of HR fish. The figures given in Phase I are incredibly high.

Some individual observations were made by members also - Amoung them:

4 John Coffman felt that nowhere in the report did you make it clear when and if the river would clean itself and from this he must assume that the HR will never clean itself and therefore needs to be cleaned up. He also noted that you showed the disappearance of PCB's from the river was graphically diminishing geometrically instead of arthimatically which gives lie to the information that GE is giving us and that they are overstating their findings.

5 Eleanor Brown has already stated her opinions in "River Voices" and would like them noted as such. A copy is attached.

6 Jim Behan, our CO-Chair is concerned with the absence of Remedial ACtion Objectives. I will read his memo, a copy of which is attached.

We also discussed a few issues that have never been made completely clear to us involving jurisdiction on the river. - Who claims ownership of the River and riverbed?? State or Fed?? Who, S or F. acutally has the last word on decision making?? 7

A 3.2 million dollar job was recently awarded to a firm by NYS to study Site 10 - Is DEC undermining the EPA Study? Does the State have to comply with EPAs final assessment and reccomendations?? What about the Army Corps of Eng?? We kidded at a previous meeting about an EPA "God" who will make the final determination based on the report, do we understand correctly that it is the Director of Region II? We worry about the possibility of a decision based on politics and not on science. Is there an appeal process to a Director's decision? 8

Lastly, we're sure that you're aware of a letter that Congressman Solomon has sent to constituents along the river. - Read it - It is a serious accusation and one that must be answered before we go any further. Does the CIP really matter?? Each member of the CIP has his and her own reasons for participating in this Reassessment. By our written and verbal statements and comments these reasons are surely apparent to you by now. We have no secrets or hidden agendas. Our guestion is - Do you? 9

10/9/91 a.t. Meeting

1 Judy Dean
2 Ennio Ruggi
3 Jim Behan
4 Ellen Ruggi
5 Katie [illegible]
6 V.J. GARLANDA
7 Vern [illegible]
8 Bill Crane [illegible]
9 John Coffman
10 Elaine D'[illegible]
11 Pam Butler

Eleanor F. Brown
1479 Dean St.
Schenectady, NY 12309

October 11, 1991

Judy Schmidt-Dean
1 Ferry St.
Schuylerville, NY 12871

Dear Judy:

When we talked the other day you asked for comments. Here's mine:

I agree with your thought that the <u>risk assessment</u> is the crux of the matter. What <u>is</u> the risk--what is this stuff really likely <u>to</u> do to us, (a) as is; (b) dug up?

I also think the editorial in <u>Science</u> (July 26, '91) that was circulated to us is very relevant to EPA's present reassessment, and I trust the Agency will consider it thoughtfully.

I trust I'll make your next meeting--

Sincerely,

Eleanor

[redacted]

[redacted]

10.4477

LETTERS TO THE EDITOR

1. Agricultural Liaison Group Report From The Chairman

by: Tom Borden

For those of you who don't know me, I'm Tom Borden. I manage a dairy and fruit farm that I co-own with my father, two brothers, and a cousin in the town of Easton in Washington County. I have three children, ages 8 to 20 months. I am also currently Vice-President of Washington County Farm Bureau. My interest in this PCB project is that of a desire to learn more about our regulatory agencies, especially the USEPA and NYDEC, and to encourage an accountability to their actions. Hopefully we can influence a practical and realistic conclusion to this issue.

After attending meetings with other members of our group, I find we all share many of the same impressions of this project. I have had phone calls from a few members asking about the progress of the project and when our next meeting will be. I'm afraid delays in the release of the Phase 1 Report made followup meetings of our group seem unnecessary. This report is expected to be a huge volume and I will only have 3 copies to share (others are available at repositories). Anyone who wishes to study one, should let me know and I will try to accommodate as many as possible. We will have a meeting during the comment period for this report.

Briefly, to report on some of my activities:

Meetings of both the Steering Committee and the Oversight Committee have been held which have basically been organizational and have allowed the input that our group developed at our February meeting in Schuylerville. I submitted written comments at both meetings. I have copies of these comments which I can share with anyone interested.

Chairmen of the Liaison Groups were invited to attend a meeting of the Scientific and Technical Committee in May. This was interesting as members of TAMS Consultants gave some preliminary results of their Phase 1 work. Hopefully a similar meeting will be held for all of our liaison group members so that everyone can have the chance to hear basic results of the Phase 1 work. The biggest point to me was that the half-life of PCBs in the water in the upper Hudson seems to be 3 to 3½ years - in other words, the concentration decreases by HALF EVERY 3 TO 3½ YEARS. Also a study of species of aquatic life in the Hudson appears to be very similar to those present in a similar study done in the 1930s.

On July 9, I attended GE's press conference and briefing at which they gave the results of their studies and their progress with studying biodegradation of PCBs. Most of you probably received GE's "Riverwatch" newsletter that described their findings. The PCBs have changed and the level in the water is decreasing. They also found the PCBs to have a 3-year half-life. We also visited their test site in the Hudson where they will study factors that may affect the rate of this biodegradation process. Their test platform is impressive - and expensive. It should give some interesting insight into how helpful treating PCBs with special bacteria to enhance biodegradation may be.

Apparently the Phase 1 report has been delayed most recently due to controversy over the Risk Assessment Statement that the EPA will announce as part of this report. Stating "risk" is a tricky business. Scientists recognize that there is "risk" associated with every part of our lives but stating it statistically makes any activity seem more "dangerous" to the general population. Last winter I was handed an article from "Livestock Weekly". It reported on risk analysis done by the US Bureau of Land Management as part of an environmental impact statement. A chemical would be considered a "high risk" if it gave a one-in-a-million chance of cancer in a "typical lifetime" of exposure. Interestingly, a single X-ray givs a seven-in-a-million chance of cancer. To look at it another way, how long does it take to accumulate a one-in-a-million risk of dying in "typical" living from more common causes?

Cause of death	*Length of time*
vehicle accident	1.5 days
a fall	6 days
drowning	10 days
fire	13 days
firearm accident	1 month
electrocution	2 months
tornado or flood	20 months
lightning	2 years
animal bite/insect sting	4 years

OR quickest yet: SMOKE TWO CIGARETTES!!

Nobody wants to add needless risk to our lives but I think it is important that we keep "risks" in perspective.

2. Three Questions

At the July 16 meeting of the combined Reassessment Liaison Groups, several pertinent questions were raised by members. Three of them in particular seemed to go to the heart of the rationale for the reassessment project. Although the EPA spokesman that evening provided partial information in answer, in my opinion the answers were not completely enlightening. I

continued on page 3

3. Whose Reassessment Is It?

by: Cara Lee

Environmental Director, ***Scenic Hudson***

Not long after EPA began to reassess the problem of PCBs in the Hudson River, the General Electric Company began to publish a newsletter. The masthead on their new publication reads "RIVER WATCH; A Report on EPA's Reassessment of the Hudson River." As any reader of "River Voices" knows, GE is the "Potential Responsible Party" - Superfund-ese for the polluter - responsible for the severe PCB pollution that continues to disperse throughout the Hudson River ecosystem. GE's position is that it would be best to leave the PCBs in the upper Hudson River bottom. Their new newsletter attempts to use EPA's reassessment as a foil for their position.

"River Watch" articles misrepresent facts regarding health risks associated with PCBs, conditions in the Hudson River and applicability of GE's research on the existing contamination problem. For example, the lead article in the current issue states that PCB levels in upper Hudson River water have declined significantly. The article fails to mention that despite these declines, PCBs remain the sole contaminant that exceeds FDA levels or other guidelines in the Upper Hudson. The article also fails to mention EPA's acknowledgement that trends showing declines in the water column are inferred from an incomplete series of measurements, based on relatively few samples that may not reflect rapid changes in river flow.

GE goes on to report that EPA found significant declines in PCB levels in upper Hudson fish. The article overlooks that the greatest reduction was due to the initial ban on dumping PCBs and that there has been no statistically significant decline since 1981.

The Hudson River has many distinctions. Unfortunate among them is that it is considered by many to be the worst case of PCB contamination in the country, and the most studied. Despite the plethora of information, GE's selective use of available facts would lead many readers of their newsletter to believe that EPA's research indicates that the problem of PCBs in the Hudson has been exaggerated and is now self-remedying.

GE's use of misinformation raises questions about what purpose their newsletter serves. It is important that the public be given sound information in a comprehensive way so that people can participate in the decision-making process. It is disingenuous, however, for GE to claim that "River Watch" is "keeping the community informed about the PCB situation in the Hudson River." The newsletter is propaganda that best serves GE's interests, not the public's interests. While GE has the constitutional right to print whatever they want about their work and their opinions, it would be responsible to acknowledge it for what it is, rather than exploiting EPA's credibility with the public. Otherwise, this disinformation campaign seems intentionally designed to subvert EPA's public reassessment process.

Questions *continued from page 2*

am concerned that EPA share more fully with its Liaison Group members some answers or elaboration on these questions that were brought up on July 16:

1. *Different Types of PCBs.* One question asked was whether EPA was taking into account the varying effects of different types of PCBs. The EPA spokesman said that EPA "as an agency" recognizes PCBs only as a single substance and insists on regulating them as such.

It seems a valid question to ask why EPA has made this choice. There is scientific evidence, as the EPA spokesman agreed that evening, that PCBs with different levels of chlorine have different toxic effects. A recent issue of **Science** (the journal of the American Association for the Advancement of Science; July 26 issue) has an editorial by the former editor of the publication that says "From the standpoint of health effects there is no justification to base regulations of all PCBs on tests with Arochlor 1260." Yet, to the best of my understanding, PCBs with the high level of chlorine contained in Arochlor 1260 have never been found in the Upper Hudson.

EPA's Phase 1 Work Plan mentions (page 2-11) that the Agency is evaluating the future possibility of making distinctions in its risk assessment between the various PCB types. I think Liaison Group members would like to know more about EPA's progress in this program and its relevance to what we will read in the Phase 1 report.

2. *Old vs. New Data.* Some people expressed concern over the fact that EPA will not be including some of the presently available data in the conclusions of its Phase 1 report. The EPA spokesman indicated that

continued on page 4

Questions *continued from page 3*

the agency had to draw the line somewhere--but I think that answer left people wondering how accurate and timely the Phase 1 report is going to be if it fails to give us all the information that's now available.

It would be helpful if EPA would tell us what trends are indicated by the newer studies as those results become available, and tell us also how and when the agency plans to incorporate the newer data into the ongoing reassessment work.

3. *Risk Assessment.* EPA proposes to include a risk assessment in its Phase 1 report--a single number for the entire Upper Hudson. A questioner wanted to know how this would be possible when concentrations of PCBs have been so variable in different segments of the river.

I gather that "risk" equals a "worst-case" estimate of the number of cancer deaths to be expected per unit of population, given a certain concentration of PCBs present. I realize that this whole subject of risk, and the way you put a number on it, is extremely complicated; but I would ask EPA to translate any assessment it makes into terms that we can understand easily, and to be sure we also learn the probable accuracy and the degree of scientific acceptance of the way that number is calculated. As the questioner mentioned, there's the problem of which section of the river the risk figure is going to apply to. As he mentioned also, there is a real possibility of public misinterpretation of the risk figure EPA assigns to the river. This seems very likely; especially if the figure is based on data that are not complete, and based only on the most toxic form of PCB, not on the types that actually exist in the Upper Hudson.

--Eleanor F. Brown
Citizens Liaison Group

(Enclosed with this letter was a reprint of the referenced editorial from Science which had to be omitted due to space limitations.)

Editor's Response to "Three Questions"

The editor believes that several points in your letter require clarification within this publication. However, we urge Liaison Group members to use the many avenues of communication open to them to get answers to questions such as these.

1. As has been stated by EPA on many occasions, all PCBs are regulated as if they contained 60 percent chlorine. This is based on historical toxicological work performed by various researchers. On July 1, 1991, a General Electric-sponsored study which concluded that PCBs can and should be regulated by Arochlor mixture, was submitted to EPA. EPA is reviewing this report to determine its acceptability. The Phase 1 Report relfects the current, scientifically acceptable values for PCB toxicity.

2. EPA has included all available data in its Phase 1 Report. To the extent that new pertinent valid data becomes available during subsequent phases of the study (for example, the results of the 1990 sampling of fish in the Hudson River, which results are expected to be available in December 1991), EPA will consider such new data.

3. The Phase 1 Report explains the assumptions used for the preliminary risk assessment. The risk assessment does not yield a single value for risk, nor does it convey a "worst case" scenario. It calculates the number of increased cancer incidents expected, given certain exposure scenarios. The methods and numbers used are scientifically acceptable and employed at Superfund sites nationally. The assumptions are consistent with current regulations and policies which require the use of reasonable maximum exposure scenarios.

Get Involved!

TO JOIN A LIAISON GROUP

CONTACT:

Ann Rychlenski
Community Relations Coordinator
USEPA Region 2
26 Federal Plaza
New York, New York 10278

(212) 264-7214

MEMORANDUM

TO: Judy Dean, Citizen Liaison Group Chair

FROM: Jim Behan Jim

DATE: 10/10/91

SUBJECT: HRPCB Reassessment Phase 1 Report

As promised at last night's liaison group meeting, I am providing my brief comments on the subject report.

Generally, I think that the report is comprehensive and well written, a good example of a Phase 1 RI/FS report. Conspicuous by their absence, however, are the remedial action objectives that I expected to see in Section C.2.

The Synopsis of Sections C.1 through C.7 promises an explanation of remedial objectives(RO) in Section C.2; this Section treats the subject very lightly. The RO should be medium- and contaminant-specific, and should be defined clearly but broadly enough so that a range of remedial alternatives can be generated for achieving the RO. Failing this, Section C.2 should explain how and when the RO will be formulated and how they will be used to guide the RI/FS process.

Without succinct RO the process has no target to shoot for; that target should be of considerable interest to all liaison group members and their constituents.

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To Judy Dean	From Jim Behan
Co.	Co.
Dept.	Phone # 458 1313
Fax # 639 4073	Fax # 458 2472

GERALD B. SOLOMON
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RULES COMMITTEE
RANKING REPUBLICAN

MEMBER
HOUSE TASK FORCE ON
CHILD CARE, DRUGS,
EDUCATION AND THE ELDERLY

ASSISTANT FLOOR WHIP

October 9, 1991

Judy Schmidt-Dean
1 Ferry Street
Schuylerville, New York 12871

Dear Judy:

As you know the EPA has organized a Community Interaction Program (CIP) to encourage community participation in the Hudson River PCB dilemma. The CIP was set up to serve as a liason between the various interest groups in the Hudson Valley and the EPA Region II Office.

I am concerned, however, that this program is really nothing more than a cover that the EPA has used in an attempt to publicly legitimize its decisions. While they state that the Liason Groups contribute valuable knowledge and are influential, the truth of the matter is that the EPA acts totally independently while publicly crediting the CIP with an inflated level of influence.

It is clear that the role of the CIP Liason Groups must be defined for the public by the EPA. Either the CIP acts as an influential evaluative body or they are merely a pro forma discussion group with little or no authority. In the interest of the public, I am calling on you to critically evaluate your role in the decision making process.

I would appreciate your comments and concerns on this important issue prior to the Steering Committee meeting on October 16. Please feel free to contact me either in Washington or in any of my district offices.

Sincerely,

GERALD B. SOLOMON
Member of Congress

GBS:tm

10.4482

School of Public Health

Department of Environmental Health & Toxicology

University at Albany, State University of New York
New York State Department of Health

Telephone: (518) 473-7553
FAX: (518) 474-8590

Mr Douglas Tomchuck,
Hudson River PCB Site Project Manager,
USEPA Region II - Room 747
26 Federal Plaza, NY NY 10278

September 3th 1991

Dear Mr Tomchuck,

I have two comments on the Phase I Report both regarding the presence of PCB congeners derived from Aroclor 1254.

Our 1989 paper on striped bass (attached, Fig 7) shows clearly that congeners which are derived from Aroclors 1254 and 1260 are present in fish all the way from Fort Edward to Mantauk Point. (GE is known to have used Aroclor 1260 as well as Aroclor 1254). The Long Island Sound fish do not for the most part show Hudson River characteristics and have fairly low PCB levels, however the fish from the Atlantic Shore and the estuary are clearly polluted from PCB derived from above the Troy dam. 1

Our 1987 paper in a sediment transect (attached) shows clearly that Aroclors 1242 and 1254 were precipitated out in the mile point 188.5 core simultaneously with 137 Cs. This can only be explained by continual dissolution from a source of PCB which contains both 1242 and 1254 which judging by material trapped on multiplates this year as far south as Pougkeepsie is still emitting congeners derived from both Aroclor mixtures. Hopefully this source can be expeditiously identified and removed. 2

Sincerely yours,

Brian Bush

Brian Bush Ph D
Associate Professor

Wadsworth Center for Laboratories & Research, Room E271, Empire State Plaza, Albany, New York 12201—0509

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September 18, 1991

TO: Mr. Douglas Tomchuk
USEPA - Region II
FAX: 212-264-7611

FROM: George W. Putman
Member, STC

Via this FAX is a copy of my comments on the Phase I, Hudson River Report, that have been furnished to Chairman Abramowicz. In respect to time constraints, I have directed my comments at the area with which I have the most familiarity by virtue of past participation and background, viz river discharge, sediment transport, and PCB loading relations with time.

I wish to compliment the authors of the Report for their effort in compiling, organizing, displaying, and reviewing the quality of the large amount of existing data presented.

I can be reached at (518) 442-4466 or 372-4632 if there are any questions prior to the September 24 meeting.

G. W. Putman, EPA Hudson River Technical Committee

Comments on Phase I Report
Re: River discharge - Sediment Transport - PCB loading relations

1 The data of Figs. B.4-4 to 9 do not support much more of a conclusion than sediment loading commonly increases with discharge. Without normalizing the loading to discharge, there is no basis for concluding that suspended sediment levels show a time trend (p. B.4-10). Zimmie's "sills" (p. B.4-9) may exist as a flood peak event only, outlined by maximum sediment loads at given discharge. Obviously much lower loadings exist at the same discharge and are more common, with no simple relationship evident. Is there a data problem due to the timing of sampling after the peak discharge, and depth integration of suspended sediment?

2 I do not think the April 1979 event significantly eroded the Thompson Island pool as contrasted to the 1976 event and the remnant deposits in either event. Flood event maximum PCB concentrations at Ft. Edward in 1979, 1983, and 1987 equal or exceed all but one (data point) for the same events at Schuylerville (too little data for 1977; Fig. B.4-10). I think the apparent downstream loading increase reflects low flow desorption equilibration effects, i.e. the flow path through the remnant deposits is short compared to the 5-1/2 mile Thompson Island pool, and 11 mile reach to Schuylerville.

However, by 1983-84 PCB levels in the (exposed) sediment in this pool had declined to a point where little PCB was added by desorption at low flow. At high flow the situation is reversed, with sediment eroded from the remnant deposits being transported downstream as (1) immediate PCB loading, and (2) as a future desorption PCB source from "new" sediment, but with decreasing flux with time.

3 Significant naturally scoured sediment PCB loadings derived directly from the Thompson Island pool "hot spots" is not suggested for any flood event by the record of radionuclide "stratigraphy" in reported analyses of sediment cores, or the record of changes in river transect bottom topography with time (NAI and others, referred to in the 1987 Ft. Edward E.I.S. references; channel dredging effects excluded). This is especially true for sediment indicated to

be older than 1973, which contains the bulk of the PCB hot spot mass. However, possible disturbed or scoured/redeposited sediment is not reflected in the core (segmented) analyses of record, and is an item that needs to be examined, as I suggested, for Phase II.

Other points

Figures B.4-10 and B.4-12. High flow - Total PCB in water (USGS) points do not match. In particular the 1979 high PCB loadings for Ft. Edward (B.4-10; > 2 ppb PCB) do not appear on Figure B.4-12. Figure B.4-12 lacks the parabolic (low to high discharge) envelope of the other plots (noted early on by Tofflemier, et al.) and apparently reflects only the high discharge portion (p. B.4-14). 4

p. B.4-15. A decline of PCB loading with time at low flow is more likely a reflection of (a) decrease in exposed area of contaminated sediment available for desorption, (b) decrease in average PCB concentration of such sediment in all reaches - due to losses by prior desorption and burial under cleaner, newer sediment. This can be checked by congener-specific PCB analyses from present and past low flow water samples (if the latter exist). 5

p. B.4-15 Last paragraph - Exactly! Remnant Deposits 6

A basic problem in many review interpretations of the Thompson Island pool PCB loading is that annual sediment contributions from the remnant deposits have not been resolved from the pre-1973, and buried, hot spot bearing sediments. The Phase I Report in discussing PCB loading (p. B.4-23), for example, makes a reasonable conclusion for 1983 at Ft. Edward, and is on target, top of page B. 4-26, but does not see any inconsistency in the data of earlier years.

There may be a Ft. Edward sampling point problem arising from a non-uniform PCB and sediment distribution close to the remnant deposits, and also how samples from the east and west channels were composited in reported results. As an example, note the following data (USGS water year 1987) for the flood event of April 1-2, 1987: 7

10.4487

Station/Date	Discharge	Sediment Discharge Rate	Water Column PCB concentration	Equivalent Total (mass) PCB discharge rate of Hudson River
Waterford, April 2	38,600 ft.^{3}/s	95.1 Kg/s	0.11 μg/L	0.12 gm/s
Stillwater, April 1-2	35,100	157	0.15	0.15
Schuylerville, April 1	31,200	74	0.21	0.186
Ft. Edward, April 1	27,800	49	0.82	0.65
	27,800	53.5	0.05	--

The Ft. Edward samples were taken 5 minutes apart. Whether the spread in PCB values reflects separate sample points or variation at one point, the implications for PCB-sediment concentrations, PCB vs. flow and year, and mass transport estimates at Ft. Edward are obvious. In the above data it can be further noted that the Ft. Edward sampling was done somewhat after the peak flow, that for Schuylerville and Stillwater was approximately coincident, and Waterford was a day late from peak discharge. Detailed sampling for a single flood event (Barnes, U.S.G.S.) shows that the water column PCB concentrations commonly decline much more rapidly than does discharge rate after the flood peak, i.e. producing much of the scatter in total PCBs in water at high discharge (daily flow basis).

Flood Event Modelling

8 I have considerable reservation about using the indicated sediment transport modelling to estimate the erosion/scour potential of high discharge events for this reevaluation action. This reservation does not pertain to the effort itself, but to the significance or weight to be attached to modelling results as a basis for an evaluation of flood event PCB hazard in the Hudson. Some of the questions which lead to my reservation are:

a) Neither the flow velocity or the sediment properties are inherently uniformly distributed in any model cell or node. Flow velocity decreases via frictional drag with the bottom and banks; sediment character can vary in three dimensions. Perhaps the velocity distribution can be handled by a coefficient term in each cell (e.g. roughness?), but the nature of the sediment variation is yet to be determined.

b) Suspended sediment concentrations in reality are not uniform across the selected flow cross sections, and bed load transport (and interference) effects are not part of the sediment erosion/deposition paradigm.

c) Sediment deposition under flood event velocity does not follow Stokes Law in the bed load transport zone.

d) It is not clear whether or how the modelling will handle the input boundary condition of bed load + suspended sediment entering the Thompson Island pool during flood, or how this will be determined.

e) The sequential-iterative mode of calculation can lead to accumulated errors; careful calibration to sediment/bed parameter constraints mid stream and at the exit point is required, and it is not clear how this will be done.

f) It is not clear how confidence limits or an error assessment is to be made on models results.

g) During high discharge events an overall flow velocity of 25 mi/day in the Thompson Island pool is scaled to a discharge of 20,000 ft^3/sec. at Waterford, and discharge of 45,000 ft^3/sec. would correspond to an approximate 50 mi/day flow velocity if the linear relationship at lower discharges holds (NYSDEC data, extrapolated from U.S.G.S.). These overall velocities are 2-4 cm/sec, which in experimental work is not a range to suggest much sediment transport capacity or entrainment potential for normal sediments (Fine grained bedded sediments have higher cohesion and are not eroded).

Wood chips, sawdust, and organic pulp, of course, are not normal components, but neither are they represented proportionately in the bulk of Thompson Island pool sediments older than 1973. Other factors in sediment transport can, of course, be invoked, but the point is that these must all be recognized and evaluated.

h) If significant sediment scour in high discharge events occurs, it will not be limited to the Thompson Island pool and can be looked for generally in the sediment-radionuclide stratigraphy as eroded/truncated/disrupted bedding, "armor" layer winnowing, and other features. Deposition/erosion in the Thompson Island pool during the 1976 event is complicated by heavy sediment loading from the remnant deposits (The volume of this loading has been estimated), but an event of this magnitude will also be recorded in reaches below the Thompson Island pool if scour is of widespread significance. In short, sedimentation features and a sediment budget for the event of record itself can be used for a qualitative answer to the question of potential scour at high discharge.

Health Risk Assessment

9 The preliminary human health risk assessment, which is primarily a matter of fish consumption, is hampered by (1) a lack of congener specific characterization of the PCB in Hudson River fish; (2) an assumption of Aroclor 1260 as the PCB standard for health risk assessment of fish ingestion. While studies in progress suggest that mono- and dichlor PCBs may represent more specific neuro toxicity than previously believed, the concentrations involved are approximately 10^5 greater than those of present Hudson River water. Further, these congeners have low bioaccumulation factors and have not been reported as significant in analyses of fish; an obvious point to check.

C-4

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Attorney General

JAMES A. SEVINSKY
Assistant Attorney General in Charge
Environmental Protection Bureau

(212) 341-2482

September 18, 1991

Douglas Tomchuk
USEPA
26 Federal Plaza
New York, NY 10278

Re: Hudson River PCB Reassessment - Phase I RI Report

Dear Doug:

I have received and reviewed the Phase I report on the Hudson River reevaluation. My only comment at this time is on the Risk Assessment aspect of the Report.

The executive summary points out that PCBs in fish in the Hudson River represent unacceptable cancer and non-cancer risks. The summary further notes that a fishing ban is in effect, giving the impression that the fish contamination has no real impact on the public and the risk posed by the contamination can be ignored. However, the text of the Report states that fishing bans and recommendations against consumption of fish are regularly ignored. The baseline Risk Assessment is designed to estimate the risk posed by conditions as they exist. As such, it must be assumed that contaminated fish are consumed. While a ban on fishing may be an institutional option to be considered as part of an interim remedial response, such a ban does not represent an effective barrier to consumption. I believe that the assumption of consumption which was utilized in the Risk Assessment performed for the purposed of Phase I was proper and recommend that such an assumption be carried through the entire RI/FS procedure as far as baseline risk is concerned. 1

I look forward to discussing this further at the next meeting of the Scientific and Technical Committee. If you have any questions feel free to give me a call.

Very truly yours,

John Davis GD

JOHN DAVIS
Environmental Scientist

cc: Dr. Richard Bopp, NYSDEC
Dr. Daniel Abronowitz, GE
Gordon Johnson, NYSDOL

le:hudson.ltr

DONALD B. AULENBACH, PHD, P.E.

24 VALENCIA LANE
CLIFTON PARK, NY 12065

October 15, 1991

Dr. Daniel Abramowicz
Biological Science Labratory
General Electric Company
Schenectady, NY 12301-0008

Dear Dan:

I have finally finished going over the Phase 1 Report for the Hudson River PCB Reassessment RI/FS. I am enclosing a copy of each page on which I have made a comment.

Most of my comments are editorial. They replace further (in addition) with farther (distance), and keep the verbs singular with nouns such as A total, A few, A number. A few specific comments must be noted.

On page B.6-22 is given an equation for absorption due to swimming. Then at the bottom of the page the daily intake due to sediments is calculated. I believe the word should be swimming. 1

Page B.5-19 discusses sediment transport. Although I am not an export on sediment transport, it seems to me the density or specific gravity of the particles should have an impact on transport, not just the particle size. 2

Finally, an important calculation can be made with the data on the hazard from fish consumption as shown on page B.6-4. Since fish consumption appears to be the prime concern with PCB's in the Hudson River, an evaluation of its potential impact is essential. Using round numbers, approximately 27,000 indivuduals fish the Hudson River. Of these, 38%, or about 10,000 fish above the Troy dam. My estimate is that the majority of these individuals fish in the sporting areas upstream of Glens Falls. Using a conservative estimate that 50% of these 10,000 individuals fish in the PCB contaminated area between the Troy dam and Hudson Falls, we are now down to 5,000 potentially impacted individuals. The report assumes that all these individuals eat the fish from this area for 30 years. I consider this overly conservative; my estimate is more like 10%, which takes into account the many infrequent anglers who fish in this area for sport and do not consume the fish. This brings the impacted population down to about 500. Even at the very conservative probable cancer risk of 2/100, this would bring the total possible individuals contracting cancer to 10. This is haardly a massive impact, an most likely would not even be detectable above the normal cancer rate. In industry, higher tolerance levels are assigned due to the small number of individuals impacted. That seems to be the case here, also. Thus 3 it may be concluded that the worst concern, consumption of fish, is only a minor impact.

Thank you for this opportunity to convey these thoughts to you. I have now started reviewing the Phase 2A Report.

Sincerely,

Don

Donald B. Aulenbach, PhD, P.E.

cc:Douglas Tomchuk

be similar throughout the entire Hudson. When the sediments at River Miles -1.65 and -1.7 are examined, however, it is clear that the homologue variations with time are quite different from those at River Miles 88.6 and 91.8. The downriver cores show maximum values roughly 10 to 15 years later than those collected above the salt front. In addition, the absolute concentrations of these homologues are higher down river. Based on the preceding data, Bopp and Simpson (1989) conclude that an additional source or sources of highly chlorinated PCBs must be located in the lower portion of the Lower Hudson.

Figure A.3-3, an expanded view of the cores at River Miles 88.6 and -1.65, offers additional supporting evidence for the importance of the NYC metropolitan area as a source of PCBs (Bopp and Simpson, 1989). The results for the sediments at River Mile 88.6 show an exponential decrease in the sediment PCB concentration from 1973 to about 1986. The curve appears to be asymptotic to zero with the PCB concentration of annually deposited sediments decreasing by a factor of two every 3.5 years. This finding suggests that the annual loading of PCBs to this part of the river is decreasing at the same rate. The general decrease in sediment PCB concentrations with time is consistent with the decrease in PCB concentrations recorded at the USGS Upper Hudson monitoring stations.

The results for the sediment core at River Mile -1.65 represent sediments accumulating in upper New York Bay, where the influence of both upriver and NYC metropolitan area inputs should be seen. As seen in Figure A.3-3, the PCB trend with time appears to have the same exponential decay rate as the upriver core, but is asymptotic to 0.5 mg/kg instead of zero. As of 1986, it appears that sediments influenced by the NYC metropolitan area inputs were accumulating with higher PCB levels than those found ~~fu~~rther upstream beyond the influence of the metropolitan region. Based on the absolute concentrations in the sediments at these two coring locations, Bopp and Simpson (1989) also concluded that the NYC metropolitan area related inputs in 1986 were of similar magnitude to those originating upriver. NYCDEP (1987) records of PCB levels indicate that Lower Hudson River stations from the New York-Bronx County Line to the Narrows had an average concentration of 0.488 mg/kg from 1983 to 1987, which is comparable to the Bopp and Simpson (1989) 0.5 mg/kg asymptote. 4

Concentrations of PCBs in Hudson River water have been evaluated and discussed in Section B.3. For reasons described in that section and to be consistent with current USEPA guidance on determination of exposure concentration (USEPA 1989b), this exposure assessment uses the 95th percent confidence limit value of the adjusted log normal maximum likelihood estimate of the mean value. Since the concentration of PCBs in water at Fort Edward is consistently higher than for other sampled locations, data from that location were selected for use in the exposure assessment. Specifically, the exposure concentration of 0.06 µg/l is incorporated into the exposure calculations.

The dose of PCBs absorbed through the skin from direct contact with Hudson River water is calculated as follows (USEPA, 1989b):

$$\text{Absorbed Dose (mg/kg/day)} = \frac{CW \times CF \times SA \times K_p \times DE \times EF \times ED}{BW \times AT}$$

where

CW = PCB Concentration in Water (0.06 ug/l)
CF = Conversion Factor (10^{-3} l/cm^3)
SA = Skin Surface Area Available for Contact (100%, or 6,880, 13,100 and 18,150 cm^2 for ages 1-6, 7-18 and adults, respectively)
K_p = Chemical-Specific Dermal Permeability Constant (3.2×10^{-2} cm/hr)
DE = Duration of Event (2.6 hr/day)
EF = Exposure Frequency (7 days/year for ages 1-6 and adults; 24 days/year for ages 7-18)
ED = Exposure Duration (30 years)
BW = Body Weight (15, 42, and 70 kg for ages 1-6, 7-18 and adults, respectively)
AT = Averaging Time (70 years x 365 days/year).

Under these assumptions, annual average daily exposure to PCBs resulting from dermal absorption is calculated to be 4.4×10^{-8} mg/kg-d, 1.0×10^{-7} mg/kg-d, and 2.5×10^{-8} mg/kg-d for young children, older children, and adults, respectively. Over the assumed 30-year duration of residence near the Hudson River and a 70 year lifetime, the chronic daily intake (CDI) of PCBs from ? sediments is calculated to be 2.6×10^{-8} mg/kg-d. These values are listed in Tables B.6-5 and B.6-6.

swimming?

groups, based on the particle size distributions with each group represented by an average diameter. Each sediment group is considered individually and the total response is determined by adding responses of all the groups.

Sediment Transport Capacity

The sediment transport capacity of a flow may be expressed as a function of the flow parameters, such as depth and velocity and the particle size. There are many sediment transport formulas available today; a review of these is given by Vanoni (1975) and evaluations of some are made by Alonso *et al.* (1981). Such formulas are directly applicable when modeling the transport of uniform sediment; they are not directly applicable for simulating transport of nonuniform sediment.

A given flow has a characteristic capacity for transporting different sediment size groups; sediment transport capacity is calculated separately for each particle size group. Thus, as the transport capacity for each size group is calculated, transport capacity for the remaining size groups is reduced. A variable called the residual transport capacity accounts for this incremental transport capacity calculation:

$$T_{ri} = T_i \Omega \tag{17}$$

$$\Omega = 1 - \sum_{j=1}^{N} \frac{C_j}{T_j} \tag{18}$$

where

T_{ri} = the residual transport capacity for size group i;

T_i = the sediment transport capacity for group i;

C_j = the volumetric concentration of sediment group j; and

N = the total number of sediment size groups considered in the simulation.

Density?

Several gaps in the available information emerged during the process of quantifying an exposure dose and precluded a thorough, quantitative exposure assessment for some exposure pathways. Concentration data for PCBs in some of the media of concern were either non-existent, out of date, or of questionable applicability. In addition to data limitations, several pathways cannot be quantitatively assessed, because they are not considered complete at this time. Rather than calculating exposures (and associated risks) from data of questionable relevance, it is considered more appropriate to point out the limitations and suggest possible means of acquiring better, more relevant data. The potential exposure pathways considered in this analysis and the type of evaluation performed for each pathway are summarized in the tabulation on the following page.

B.6.2.2 Dietary Intake

Fish Consumption

Because fish effectively bioaccumulate PCBs, fish provide a pathway, frequently the predominant pathway, for human exposures to PCBs. Studies conducted on Michigan residents established that those who regularly ate Lake Michigan fish had serum PCB levels up to 30 times greater than those who did not eat these fish (Humphrey, 1987). Data on PCBs in Hudson River fish, discussed in Section B.3, clearly indicate that fish consumption can result in human exposures to PCBs.

Recent studies (NYSDEC, 1990) indicate that the Hudson River continues to draw a significant number of anglers. Estimates are that 26,870 (±3,440) individuals fish the Hudson River for a total of 232,110 (±51,310) angler days. Over 38 percent of these individuals claim to fish the Upper Hudson (section north of Federal Dam at Troy) for an estimated 87,060 (±22,090) angler days along

≈ 235 anglers/d

.38 x 27000 = 10,000 individuals
est 50% above FE Dam = 5,000 indiv
if 10% consume fish for 30 yrs = 500 individuals
@ cancer risk of 2/100 = 10 cancers

10.4498

exposures via each pathway was estimated in a two step process, considering both contaminant concentration and human exposures.

Contaminant concentrations in each of the environmental media of concern (*e.g.*, water, sediments, air, *etc.*) are determined at relevant receptor points. Determination of media of concern is based on analyses of mechanisms of contaminant release from the site and environmental fate and transport as well as consideration of locations and mechanisms of human contact with site contaminants.

As suggested in USEPA's recent Risk Assessment Guidance for Superfund (1989b), "reasonable maximum" individual exposure concentrations are calculated to the extent appropriate. Geographic variations in environmental concentrations are considered in determining appropriate exposure point concentrations. Duration of exposure and the likelihood of exposure pathways occurring are also evaluated.

Human exposures to PCBs are quantified using the environmental concentrations together with estimates of media intake. These scenarios, under which exposures are evaluated, include assumptions regarding physiological parameters, such as body weights, media intake rates, such as soil ingestion rates, and activity patterns, such as frequency of contact at the site. In some instances, standard exposure assumptions are included in the assessment. For example, throughout this assessment, a 30-year duration of residence in the Hudson River area, and a 70-year lifespan are incorporated into exposure calculations, based on recent USEPA guidance (USEPA, 1989a). Similarly, a lifetime average body weight of 70 kg is assumed. In other cases, assumptions are tailored to site-specific conditions as appropriate.

The population of concern in the evaluation of the Upper Hudson River consists of the inhabitants of the towns, cities, and rural areas surrounding the River. Exposure by these populations to PCBs present along the river and to PCBs that have migrated from the River could occur via a number of potential pathways, as illustrated in Figure B.6-1. 5

fish-consuming

a PCB loading for 1980 conditions of 3 lb/day (1.4 kg/day). All of the above estimates would collectively yield a range of PCB loadings of approximately 3 lb/day (1.4 kg/day) to 4.6 lb/day (2.1 kg/day) for sewage effluent discharges.

A.2.4 Tributary Contributions

Estimates of PCB loadings from tributaries to the Lower Hudson can all be characterized as poor. Although flow and suspended matter measurements exist for most major tributaries, there are essentially no measurements of PCB concentrations in the tributary flow. Tributary PCB loadings to the Lower Hudson were estimated by Mueller *et al.* (1982) and Thomann *et al.* (1989), based on literature data and USGS flow and suspended matter measurements. PCB loadings for the Lower Hudson in 1980 estimated by Thomann *et al.* (1989) were 2.3 lb/day (1 kg/day), using a mean tributary PCB concentration of 0.05 µg/l. Based on sediment data collected for the Passaic, Raritan, Hackensack, Elizabeth and Rahway Rivers, Mueller *et al.* (1982) estimated that tributary concentrations were an order of magnitude lower. These estimates would collectively yield a range of PCB loadings of approximately 0.2 lb/day (~~1~~ 0.1 kg/day) to 2.3 lb/day (1 kg/day) for the Lower Hudson tributaries.

A.2.5 Combined Sewer/Storm Water and Storm Water Outfalls

Combined sewer-storm water drainage systems in the NYC metropolitan area have long been a source of pollutants to the Lower Hudson. Overflow occurs after rainfall events and results in the release of diluted, untreated sewage directly to the river. In addition, effluent from storm water collection systems, draining residential and industrial areas, also reaches the Lower Hudson untreated. Estimates of flow via these pathways are based on modeling efforts with relatively little field data. Mueller *et al.* (1982) and Thomann *et al.* (1989) estimate respectively that storm water runoff and combined sewer outfalls contribute about 2 lb/day (1 kg/day) to 3 lb/day (1.4 kg/day).

Island Sound (Mueller *et al.*, 1982). Although the load to the Lower Hudson itself was not developed, it is expected that it would represent about half of the total landfill leachate load.

A.2.8 Other Sources of PCBs

There are five facilities with SPDES permits that may provide additional sources of PCBs, to the Lower Hudson (NYSDEC, March 7, 1991 list of facilities with SPDES permits). Four of these (Carlyle Piermont Corporation, IBM East Fishkill Facility, Norlite Corporation and Columbia Corporation) are currently permitted to discharge PCBs within the Lower Hudson River Basin, but not directly to the Lower Hudson River. The fifth permitted facility, Metro-North Commuter Railroad North Harmon Shops in Westchester County, discharges PCBs directly into the Lower Hudson River. Because estimates of flow are not available, the PCB loading to the Lower Hudson cannot be ascertained. However, according to the SPDES permit, the allowable daily average PCB concentration is 1.0 ppb (~~mg~~ µg/l) with a daily maximum of 2.0 ppb. 7

There may be additional incidental releases of PCBs to the Lower Hudson as a result of accidental spills and illegal dumping activities. The extent and total PCB loading of these releases to the Lower Hudson River remain unknown.

A.3.3.3 Other Migrant/Marine Species

Other migrant/marine species monitored in significant numbers, but not sampled since 1985/1986, include American eel (*Anguilla rostrata*), American shad (*Alosa sapidissima*), Atlantic tomcod (*Microgadus tomcod*), alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*).

In general, a correlation is expected between lipid content of fish and the concentration of PCBs, because of the lipophilic nature of the compound. An exception to this rule is the American shad where a significant correlation between total lipid and total PCBs was found in only one of 20 sample sets. There may be a lack of correlation for shad, because shad are transient in the estuary or do not feed there. For other migrant species including alewife, blueback herring and rainbow smelt, PCBs appear to accumulate at a rate related to body size, *i.e.* surface area to volume ratio (Sloan and Armstrong, 1980). PCB concentrations in marine species such as Atlantic tomcod, immature bluefish, Atlantic sturgeon and American eel are reported as showing significant correlations with lipid content, but not with length.

For the years from 1978 through 1981, a significant decrease in PCB concentrations in fish was observed for all species, but "most of the decline in PCB concentrations of migrant/marine species has been primarily due to the reduction of Aroclor 1016" (Sloan and Armstrong, 1980). The average percent decline in Aroclor 1016 calculated over those years was 42 percent, compared to five percent Aroclor 1254.

8 A relatively long time series of observations for a few migrant/marine species in the estuary ~~are~~ is available at the Tappan Zee Bridge (River Mile 27). Trends in lipid-based PCB concentrations at this location are shown in Figure A.3-6 for striped bass and American shad, with 95 percent confidence limits on the arithmetic means. This data set from the lower estuary does not show the sharp drop off in PCB concentrations from 1978 to 1980 typical of the complete Lower Hudson data set. The shad show substantially lower bioaccumulation than the striped bass, reflecting their short residence in the estuary.

species listed by Lane (1970), the fishing from Lock No. 1 to Hudson Falls was still considered poor, because of the overall low standing crop of fish and low numbers of adult fish compared to juveniles (Shupp, 1975). The reported preponderance of juvenile fish was similar to data from the 1933 and 1970 surveys. Sheppard (1976) indicated that "...some unknown factor is causing the exodus or demise of the mature segment of certain fish populations including the rock bass, pumpkinseed, yellow perch, walleye and chain pickerel." NYSDEC (R. Sloan, per. comm., 1991) has recently observed a greatly diminished number of both pumpkinseed and yellow perch populations during routine PCB assessments of resident fish in the Upper Hudson (Fort Edward to Federal Dam).

Since 1975, NYSDEC has continued to collect fish between Federal Dam and Fort Edward as part of their ongoing assessment and monitoring of PCB levels in fish flesh. The principal species collected and analyzed within this reach have been the brown bullhead, goldfish, largemouth bass, pumpkinseed and yellow perch. Because of the demise of the yellow perch and goldfish, current collection efforts have focused on the brown bullhead, common carp and largemouth bass (R. Sloan, per. comm.).

One of the most extensive fishery surveys since the 1933 survey was conducted approximately eight years ago by Makarewicz (1983). He surveyed 85 stations along the entire length of the Hudson between Federal Dam and Whitehall 9
as part of the New York State Barge Canal Maintenance Dredging Program 1985-1995 for NYSDOT (Malcolm Pirnie, 1984b). The sampling stations included nine sampling reaches from Federal Dam to Fort Edward. A total of 46 species, including four migratory species (American eel, blueback herring, sea lamprey and striped bass), ~~were~~ was found. Of the 42 resident freshwater species, the panfish ere the most prevalent (40 percent); demersal fish were second in abundance (22 percent); forage fish were the third most abundant group (14 percent); and game fish had the lowest relative abundance (9 percent). Dominant panfish members were bluegill, pumpkinseed, rock bass and yellow perch; demersal dominants were black bullhead and brown bullhead, common carp and white sucker; forage dominants were golden shiner, spotfin shiner and spottail shiner; and game fish dominants were

Edward/Hudson Falls vicinity. Their research evaluated PCB levels in trembling aspen along easterly transects from the Fort Edward dump, the Buoy 212 dredge spoil site, and a riffle area near Lock 6 (Tofflemire *et al.*, 1981). PCB measurements in aspen leaves ranged from 180 mg/kg at the dump, decreasing to 0.15 mg/kg at a distance of 820 meters from the dump. A similar declining trend was reported for the Buoy 212 dredge spoil site and the riffle area.

From 1978-1980, total background PCB concentrations were measured in goldenrod and trembling aspen within Washington and Saratoga Counties and were found to be decreasing with time (Buckley, 1983). Average PCB concentrations in goldenrod decreased from 0.32 mg/kg (ppm dry weight) in 1978 to 0.18 mg/kg in 1980, whereas average PCB levels in trembling aspen decreased from 0.12 mg/kg in 1978 to 0.07 mg/kg in 1980. Also in Washington and Saratoga counties, background levels of total PCBs were measured in crops such as hay, corn, timothy grass, perennial rye, brome grass, and orchard grass. Average total PCB background concentrations ranged from 0.02 mg/kg (corn/silage) to 0.12 mg/kg (brome grass/hay), as shown in Table B.3-22.

In September 1979, total PCB concentrations were measured in aspen, sumac and goldenrod at five sites located at various distances (<1,200 m) and directions from the Patterson Road PCB dump in Fort Miller, New York (Buckley, 1982). PCB levels in aspen ranged from 0.1 mg/kg to 58.2 mg/kg. PCB levels in sumac suggested similar PCB uptake, with concentrations ranging from 0.11 mg/kg to 68.6 mg/kg. Measurements for goldenrod ((0.26 mg/kg to 182 mg/kg) showed approximately twice the rate of PCB uptake at the same sites as the aspen and sumac measurements. This result suggests that PCB uptake by vegetation may be species-dependent.

10 During September 1980, vapor-phase PCB accumulation in vegetation was measured in the leaves of two varieties of sumac near an abandoned PCB dump in the Fort Edward/Hudson Falls area (Buckley and Tofflemire, 1983). The data, shown in Table B.3-22, demonstrate PCB concentrations higher than background levels with PCB concentrations ranging from 0.97 mg/kg to 5.2 mg/kg. The lowest PCB concentrations were found in samples ~~fu~~ a rthest (230m) from the source, whereas

Database Table Example: Sample Information Table

Sample ID	Type	M/D/YR	River Mile	Feet fr. West Bank	Northing (ft)	Easting (ft)	Sampler	Water Depth (ft)	Elev. (ft)	Ref	Agency
30000	Grab	5/21/77	168.8	330.0	1071755	685695	100			2	O'Brien & Gere
30016	Core	3/18/77	188.4	100.0	1163740	698970	100	5.8	119.6	1	O'Brien & Gere
30032	Core	3/18/77	183.4	60.0	1140410	669040	100	2.2	102.4	1	O'Brien & Gere

Core samples in the Sample table are linked with the Core Section table, which identifies the length of each core sample section and the depth beneath the river bottom, *i.e.*, the depth of sample penetration for the top and bottom of each section.

Sediment Database Example: Core Section Table

Sample ID	Core Section No.	Bottom of Section (in.)	Top of Section (in.)
30016	1	1	0
30016	2	2	1
⋮			
30016	12	12	11
30032	1	1	0
⋮			
30032	9	9	8

11

Selecting a sample ID from the Core Sample and Section tables and locating the same ID in the Chemical data table show~~s~~ either the Aroclor results for an entire grab sample or section by section results for core samples. Additional information describing analytical measurement methods, *i.e.*, extraction method, is ~~are~~ contained in the database as available. The Chemical data table also contains non-PCB chemical data, such as metals analyses (not shown here), where available.

average normalized peak areas for the same peaks in an Aroclor 1242 standard. The average normalized peak areas for peak 28 are approximately equal in extracts and standard. This finding suggests that using these peaks will tend to overestimate Aroclor 1242 levels to a greater extent in a weathered sample compared to a standard Aroclor 1242 mixture. This factor may account for the 40 percent higher Aroclor 1242 estimates obtained by M. P. Brown *et al*. (1988b) using a revised Webb and McCall procedure compared to the initial estimates obtained by Versar using the standard Webb and McCall procedure. It is not known to what extent this overestimation may offset the underestimation in Aroclor 1254 levels due to interference from the internal standard.

Other Sediment Data

12

In addition to the two major sediment sampling events just discussed, ~~a number of~~ other sediment surveys have been conducted. In 1983, the USEPA collected 66 sediment samples from the Upper Hudson River. These data were summarized in Volume 1 of the Feasibility Study for the Hudson River PCBs Site published by NUS (1984). Two different methodologies were employed to quantitate Aroclor concentrations. If the sample appeared to be characterized by a single Aroclor, then the sum of the areas of all PCB peaks was used to calculate the Aroclor concentration. If more than one Aroclor appeared to be present in the sample, then the Webb and McCall method was used.

Using the sum of the areas of all PCB peaks to quantitate a single Aroclor mixture will likely overestimate total PCBs present, if the sample is enriched in more highly chlorinated PCBs. This procedure will underestimate total PCBs present, if the sample is enriched in lesser chlorinated PCBs, because of the relative ECD response factors for lower and higher chlorinated PCBs. As mentioned earlier, the Webb and McCall procedure provides the best estimate of total PCBs in weathered samples.

In another study, sixty-five core sections were collected from the Upper Hudson River, extracted and analyzed for PCBs by Bopp *et al*. (1985), at the Lamont Doherty Geological Observatory. Total PCBs were quantitated using the quantitation to specific Aroclors not given.

The uncertainty introduced by the use of the entire sample peak area to calculate the total PCB concentration in the USGS samples will vary to the degree that the elution profile does not match the standard profiles. It is not clear how great an error a 60 percent match will introduce, but it is clear that the error will increase the more the sample pattern is shifted to the lower chlorinated congeners peaks relative to the standard.

Concentrations were reported uncorrected for incomplete extraction. Schroeder and Barnes, however, contend that extraction efficiency is high (>80 percent) for Hudson River water, because the river is relatively low in suspended sediment and dissolved organic carbon concentrations. Extraction efficiency may, however, be an issue for periods of high suspended sediment.

B.3.7.3 Summary

13

PCB concentrations in Hudson River sediment, water and fish samples have been reported as Aroclors, despite the fact that heavily weathered samples may bear little resemblance to original Aroclor mixtures. A number of methods ~~have~~ h. been devised to quantitate PCBs as Aroclors and considerable variation exists between the methods. Most methods tend to overpredict total PCBs present in the sample.

Sediment Survey (1977-1978)

- PCB extraction efficiencies were on the order of 80 percent which leads to an underprediction of total PCBs.
- Aroclor 1242 levels were likely overestimated by basing quantitation on peaks containing congeners also found in Aroclor 1254; Aroclor 1254 levels were likely overestimated by basing quantitation on peaks containing congeners also found in Aroclor 1242.
- Lower chlorinated PCBs (Aroclor 1221) were rarely detected.
- Higher chlorinated PCBs (Aroclor 1260) were not quantitated.
- Summing aroclors may have led to an overprediction of total PCB con-

(14) river. At Fort Edward, the sill appears to extend to about 10,000-12,000 cfs (283-340 m^3/sec). At Schuylerville, the relationship is not as clear, perhaps, because the station is just below the confluence with Batten Kill. Breakpoints in the sediment response also appear further downstream at Stillwater and Waterford, with an apparent increase to a range around 19,000 cfs by Waterford.

The destabilization of the channel following the removal of the Fort Edward Dam in 1973 suggests that a decline in average suspended sediment levels was to have been expected as the river gradually recovered to a more equilibrium condition and the remnant remediation was completed. Time trends of observed sediment load at Fort Edward and Schuylerville, shown in Figures B.4-8 and B.4-9, suggest a decline over time, particularly at Schuylerville. Although high sediment loads typically occur during spring flood periods, greater sediment load is shown for the moderate floods of 1981-1982 than for the major floods of 1979 and 1983. It could be that a limited sampling schedule missed the sediment transport peak during the major flood years. Between 1984 and 1989, daily average flows greater than 28,000 cfs occurred only in spring 1987 and a clear sediment load peak is evident in response to this event.

Empirical Trend Analysis

Time trends in suspended sediment concentration, corrected for discharge, can be examined through multiple regression relating total suspended sediment concentration (TSS) to discharge and year to better understand sediment transport relationships. A log transformation of concentration is necessary to stabilize the residual variance. Models can then be fit in the following form:

$$LN\ (TSS + 1) = \alpha + (\beta_1 \times Q) + (\beta_2 \times Yr)$$

where TSS is the sediment concentration (mg/l), Q is the measured or estimated instantaneous discharge (cfs) and Yr is the years since 1900. (Because a log transformation is used for TSS, a "1" is added to TSS, to handle zeros in the for the regression equations earlier in this section are used, except in the case of Waterford where the figure proposed by Schroeder and Barnes (1983) is used, *i.e.*, 21,000 cfs at Waterford. Log-space parameters for each flow regime were calculated and used to determine adjusted arithmetic parameters by the equations given above. These were then weighted by the actual number of scouring and non-scouring flow days observed in a given year to obtain the corrected mean. The variances were also weighted and pooled. Non-detects among the concentration observations are included in the load calculations as one-half the concentration detection limit times the flow.

Annual PCB load estimates using the corrected and uncorrected mean methods are summarized in Table B.4-4. In general, the corrected mean method yields lower estimates of PCB load than use of average annual PCB concentration multiplied by average annual flow, particularly in the earlier years. For instance, in 1983 the uncorrected mean estimates of loads past Fort Edward and Waterford are 4200 and 3900 kg, respectively, whereas the corrected mean estimates are 1700 and 980 kg.

15

Total mass of PCBs transported per year at all monitoring stations, except for the short run at Fort Miller, is plotted in Figure B.4-19. Figures B.4-20 and B.4-21 provide the 95 percent confidence intervals on the load calculations for Waterford and Fort Edward, respectively. In general, the error bounds are quite large for years in which there ~~were~~ was a significant number of scouring flows, due to the high variability of PCB loads in these flows.

A number of interesting inferences can be drawn from the plots of annual PCB loads. For the early years, through 1979, it is clear that there was a substantial gain in PCB load over the length of the Thompson Island Pool, reflected in the differences between loads at Fort Edward and downstream stations. This regime seems to have been altered by the significant flood of April 1979 (34,000 cfs at Rogers Island), which may have removed much of the readily erodible PCB-contaminated sediment in the Thompson Island Pool. For 1980 through 1982 the load gain from Fort Edward downstream is less dramatic, with annual loads at Stillwater (see Figure B.4-21) about twice those at Fort

Edward (an increase in the range of 300 to 800 kg/yr). The spring flood in 1983 (35,200 cfs) was even greater than that of 1979 and PCB loads increased sharply during this year. Loads since 1983 have continued a downward trend, with only a moderate increase shown for the high flow in 1987.

After 1983, there appears to have been little or no gain in annual PCB load between Fort Edward and downstream stations. This finding suggests that, at least for the flows experienced in this period, the Thompson Island Pool has not contributed any significant increase to the PCB load above the load already present upstream at Rogers Island, presumably because most of the easily erodible contaminated sediments were removed by earlier floods. That period, however, was
16 one of lower than average spring floods. The only significant spring flood event from 1984-1989 was that of 1987, which did produce an apparent gain from Fort Edward to Schuylerville and f~~u~~arther downstream. Regardless of whether sediment scour has been less during this period, it appears that a significant PCB load is in the river upstream of the hot spot areas (see Figure B.4-19).

For the observations at Waterford, average PCB concentrations are lower, due to dilution, and flows higher than those at stations upstream. Nevertheless, the annual PCB load estimated at Waterford very closely tracks that estimated for Stillwater and Schuylerville (Figure B.4-19). Evidently there is no significant difference in load between Schuylerville (the first station with a long-term record downstream of Thompson Island Pool) and Waterford (the last station before Federal Dam), implying that most PCBs mobilized in the Upper Hudson are transported through to the Lower Hudson. These observations fit with the relative annual water-column PCB concentrations (see B.3). The contributing watershed area at Waterford (4,611 square miles) is 1.6 times that at Fort Edward (2,817 square miles) and 1.3 times that at Schuylerville (3,440 square miles). If the load is simply throughput from Fort Edward past Waterford, then concentrations should decline, by dilution, as the inverse ratio of the contributing area. That is, concentrations at Waterford should be 77 percent of those at Schuylerville and 63 percent of those at Fort Edward. The estimated current (1986-1989) annual (full year) average concentrations (Table B.3-12) imply that concentrations at Waterford are 81 percent of those at Schuylerville and 62 associated with each subsection on a transect. These yield the schematic arrangement shown in Figure B.5-1, where the nodes are numbered beginning with Node 1 at River Mile 188.5, which is the *downstream* end of the Thompson Island Pool. The cross-section river mile designations, which correspond to the upstream end of a given section, are those used by Zimmie. Links between the nodes were drawn primarily in the orthogonal directions. Diagonal links were judged necessary only when a significant change in cross-sectional area of the subsections made crossflow appear important. Altogether ~~A total of~~ 65 nodes and 108 links were used. 17

The model nodes were plotted with a Geographic Information System (GIS) program. Lengths of each link, angles of the connecting channels and surface areas associated with each node were calculated using the GIS. Node surface areas were calculated by assigning a false-position Voronoi point associated with each node, located so that the boundaries between transect subsections would fall in the desired position. Areas were then ~~be~~ determined by a Thiessen polygon method. The resulting nodal area discretization is shown in Figure B.5-2. For the one-dimensional implementation, all parallel nodes located on the same transect were collapsed into a single node, for a total of 32. 18

B.5.3.5 Model Calibration

Daily average flow monitoring is available from the USGS monitoring station at Fort Edward, upstream of Rogers Island. These measurements provide the upstream flow inputs, or boundary condition, for the hydrodynamic model; peakflow data as well as daily averages may be necessary to match flood flow patterns. For this initial implementation, no other inflows were modeled, although minor tributaries such as Moses Kill and Snook Kill do contribute a small amount of (unmonitored) inflow to the Thompson Island Pool. The Thompson Island Dam acts as a weir and a weir equation was used to calculate the flow across the Dam. (The parameter "*m*" in the weir equation is used as a calibration parameter.)

next three lower nodes, 0.028 in the node below that, and 0.029 in the remaining nodes down to the Thompson Island Dam. In addition, the weir discharge parameter was set to 3.36 to fine tune stage elevations in the lower end of the pool.

19 Comparison of predicted and measured stage observations for the flood period and for the subsequent declining limb of the flood is shown in Figure B.5-3. A reasonable fit (usually within a tenth of a meter) is provided, considering that: 1) only daily average flows and not full hydrographs were used as inputs; and 2) there may be noticeable differences in stage between the main channel and barge canal gauges during extreme floods.

Additional calibration of the hydrodynamic model is expected in Phase 2, depending on the data needs of the sediment model.

B.5.4 Sediment Transport Model

The sediment transport model STREAM (Borah *et al*., 1982a; Borah and Bordoloi, 1989a, 1989b, 1991) is used here to simulate bed and bank scour, sediment deposition and resuspension, and sediment transport for the Thompson Island Pool. Spatial and temporal variations of the flow conditions and hydraulic parameters are obtained from the output of DYNHYD5, described in the previous section, and provide the hydraulic parameters, *e.g.*, flow, velocity, *etc.*, needed for the sediment model.

B.5.4.1 Streambed Erosion and Deposition

The amount of sediment transported in, deposited in or eroded from an alluvial stream bed is the result of imbalances between sediment transport capacity of the flow and the incoming sediment. Such an imbalance is determined by considering local conservation of mass. During an erosion condition, particle entrainment occurs, if the particles on the bed surface are transportable with the existing flow conditions. Otherwise the particles remain on the bed surface as part of an armor layer. These processes are simulated using the algorithms discussed in the subsections below. The sediment is divided into small size until the flow achieves equilibrium. Under such conditions, the following expression is used to compute the active layer thickness:

$$\tau_n = \frac{d_{85}}{0.15\ (1-\lambda)} \tag{20}$$

in which τ_n = the thickness of active layer under non-armoring conditions; and d_{85} = the sediment size under which 85 percent particles are finer.

In general, Equation (19) is used only if $d_L < d_{85}$; otherwise Equation (20) is used. This equation was based on model testing by Borah and Bordoloi (1989a) on Little and Mayer's (1972) experimental data.

Bed Erosion

Particle entrainment from an active layer is simulated using an ordering procedure. In this procedure, it is assumed that entrainment begins with materials from the first (smallest size) sediment group exposed at the surface. Next, materials from the second (next larger size) group, which were already exposed or newly exposed at the surface due to entrainment of the materials from the first group, may then entrain. This entrainment may be followed immediately by the entrainment of additional particles from the first group, which become exposed after removal of the particles from the second group. Next, materials from the third group may entrain followed by the materials from first and second groups, which were directly underneath those third group materials, and then the first group materials, which were underneath these second group materials. This sequence of material entrainment for the number of size groups N ~~are~~ is summarized 20
in a matrix called the entrainment frequency matrix. The elements of this matrix are obtained from the following expressions:

$$F_{ij} = 2^{i-j-1}, \quad for\ j<i \tag{21}$$

$$F_{ij} = 1, \qquad for\ j=i \tag{22}$$

B.6.3 Toxicity Assessment

B.6.3.1 Introduction

PCBs generally have low acute toxicity but are of public health concern due to their persistence in the environment, the potential to bioaccumulate in animal and human tissues, and their potential for chronic or delayed toxicity. The major target organs of PCB toxicity are the liver and the skin. Occupational exposures to relatively high concentrations of PCBs have resulted in changes in serum levels of liver enzymes and skin effects such as chloracne (ATSDR, 1987). In individuals who accidentally consumed PCBs in contaminated rice oil in Japan (Yusho patients), routine liver function tests were abnormal. PCBs have also been shown to cause some developmental effects and neurological effects in Yusho patients, occupationally exposed individuals, and in individuals exposed via the consumption of contaminated fish.

USEPA has developed several sets of toxicity values to provide quantitative estimates of the potency of chemicals and resultant toxic effects. The reference dose (RfD) and the cancer slope factor (CSF) are the toxicological values of relevance for this assessment. The RfD and the CSF are fundamentally different in their assumptions of the relationship between dose and response. For carcinogenic effects, it is assumed that there is no threshold below which no 21 effect will occur. Some risk, however small, is associated with every level of exposure. In contrast, RfDs for non-carcinogenic effects assume that there is a threshold dose below which there will be no deleterious effect.

Verified RfDs and CSFs are available on USEPA's Integrated Risk Information System (IRIS). These toxicity values and other health risk assessment information are included in IRIS after a comprehensive review of chronic toxicity data by work groups of USEPA scientists. Verified RfDs and CSFs are considered to be the most reliable basis for estimating noncarcinogenic and carcinogenic risks resulting from chronic chemical exposures. If toxicity values are not available for the chemicals of concern in IRIS, EPA's secondary source known as the Health Effects Assessment Summary Tables (HEAST) may be reviewed. This is advisory issued by the NYSDOH or are unaware of it. Second, the risks associated with some potential pathways of exposure were not quantified in this assessment due to inadequate data. Preliminary analysis indicates that risks might be 22 associated with these other pathways and that further data are needed to derive a total risk across all exposure pathways. ~~Table~~ Fig B.6-1 summarizes potential exposure pathways, including those for which quantitative risk assessments were not performed.

B.6.5 Lower Hudson Discussion

The extent of area encompassed by the Lower Hudson River and estuary and the volume of data that would be required to conduct a quantitative exposure and risk assessment for this area combine to make such an effort difficult to accomplish with the available data. Issues such as potential PCB exposure differences in the fresh versus salt water portions of the Lower Hudson, including assessing the impacts of metropolitan and industrial sources of PCBs, will have an important bearing on a risk assessment for the Lower Hudson. At this time, data for the Lower Hudson are sufficient to provide only some general comparisons with the preliminary risk assessment for the Upper Hudson.

- Fish have been sampled extensively at various locations in the fresh and salt water portions of the Lower Hudson. PCBs transported from the Upper to Lower Hudson contribute to the PCBs found in the freshwater fish population of the Lower Hudson. A comparison of the concentrations of PCBs in the fish from this freshwater portion of the Lower Hudson indicate that overall concentrations in the Lower Hudson are slightly below those in fish from the Upper Hudson, but they are on the same order of magnitude. Therefore, risks associated with human consumption of these fish -- assuming exposure patterns are similar for the Upper and Lower Hudson -- would be similar to the risks associated with consumption of fish from the Upper Hudson.

- The available data on PCBs in river water from the Lower Hudson are both fragmentary and out of date. The data available are limited to a few samples collected between 1978 and 1981 (Schroeder and Barnes, 1983). These data are not adequate to characterize possible exposures that might occur via river contact.

wood turtle, smooth green snake, eastern ribbon snake and the rare timber rattlesnake.

Threatened and Endangered Species

23

~~A number of~~ Species found in the Upper Hudson River Valley ~~are~~ listed by New York State as endangered, threatened or species of special concern (Buffington, 1991). ~~These protected species~~ are named below by category.

Endangered
- Bald Eagle*
- Peregrine Falcon*
- Shortnose Sturgeon*
- Bog Turtle

Threatened
- Mud Sunfish
- Osprey
- Timber Rattlesnake
- Red-shouldered Hawk
- Northern Harrier

Special Concern
- Least Bittern
- Cooper's Hawk
- Black Rail
- Upland Sandpiper
- Common Barn Owl
- Common Nighthawk
- Henslow's Sparrow
- Grasshopper Sparrow
- Vesper Sparrow
- New England Cottontail
- Small-footed Bat
- Southern Leopard Frog
- Spotted Salamander
- Banded Sunfish
- Blackchin Shiner

*Also considered endangered under federal regulations.

> tributaries of the Upper Hudson River such as Battenkill...In colonial times, sturgeon were abundant in this stretch of the Hudson. ...Striped bass, too, came in numbers...Nowadays, a stray striper or shad may work its way through the lock system, but they are markedly rare above Troy. The most conspicuous fishes are strangers--black bass... and carp...
>
> If quoted, use (sic)
>
> In the canalized Hudson, especially where the river slows, the aquatic insects differ from those in the rushing river of the Adirondacks. There ~~are~~ in certain clean coves and backwaters, a profusion of dragonflies and damselflies.. There presence indicates, by rough rule of thumb, whether or not the water ~~is~~ badly polluted. Alas, the canalized Hudson probably does not have as many dragonflies as it did in times of the past. This stretch of the river has been greatly despoiled and disfigured by pollution, much of which is from pulp and paper mills...thick, gray mats of pulp wastes...drift downstream, where they sink and pile up against dams. ...Instead of dragonflies and fishes...one may find..."index organisms"...sludge worms,...leeches,..and rattail maggots. (24)

From the time Boyle's book was published in 1969 to the present, positive changes in the Upper Hudson have taken place. ~~A number of~~ Many sewage treatment facilities have been upgraded and industrial discharges are more stringently regulated (Shupp, 1975). (25)

Earlier in this document (see A.1), the conceptual framework of an aquatic food chain for the Hudson was presented. Because PCBs bioaccumulate through the food chain, that approach is also used here to provide a foundation for evaluating the ecological exposure and risks posed by PCBs in the Upper Hudson ecosystem. Where necessary, information from the previous discussion is summarized briefly.

Conceptual Ecosystem Framework

Recent evaluations of the Hudson River ecosystem by Limburg *et al.* (1986) and Gladden *et al.* (1988) discuss the four major categories of organic resources in the aquatic ecosystem:

- primary producers -- phytoplankton, periphyton and macrophytes;
- detritus -- particulate organic matter and associated microbial biomass;

Caddisfly larvae
Cheumatopsyche
Chimarra
Hydropsyche
Neureclipsis

Mayfly larvae
Baetis
Stenonema

Flatworms (Platyhelminthes)
Undetermined

Analogous to the 1977 study, the RIBS 1987-1988 biological samples revealed that caddisflies (10 species), mayflies (8 species) and stoneflies (1 species) are present within the Fort Edward to Waterford region of the Upper Hudson. The continued presence of these pollution intolerant (sensitive) groups suggests that water quality improvements have occurred in the Upper Hudson since 1972.

26 **Fish**

Numerous ~~A number of~~ studies have attempted to categorize the fisheries within the 40-mile stretch of the Upper Hudson between Federal Dam and Fort Edward. (Refer to B.1.4 for a more detailed review of relevant fisheries surveys.) Historical surveys by Greeley and Bishop (1933) and recent surveys (Makarewicz, 1983; Malcolm Pirnie, 1984b; Green, 1985) indicate rather diverse fish fauna. The vast majority of species are year-round residents. Although some anadromous species such as American shad, alewife, blueback herring and striped bass may be present in the Upper Hudson, the construction of the Federal Dam and Champlain Canal has essentially blocked major upstream spawning migrations.

The diversity of freshwater residents in the Upper Hudson is indicative of the varied habitats that occur in this section of the Hudson. The wide variation in habitats expands spatial heterogeneity and results in a quite complex fishery resource. For example, Makarewicz (1983) surveyed nine different habitats within the Fort Edward to Federal Dam section of the Upper Hudson.

All the major qualitative studies reviewed indicate that the fish species historically present in the Upper Hudson continue to reside in the Fort Edward to Troy reaches.

Summary of Aquatic Ecosystem

Several ~~A number of~~ studies (see reviews by Wetzel, 1975 and Mann, 1975) have concluded that various autochthonous primary production inputs (phytoplankton, periphyton and macrophytes) make important contributions to aquatic food webs. Unfortunately, the paucity of data in the Upper Hudson makes it impossible to determine the relative contribution of the various primary producers. Furthermore, contributions of allochthonous carbon from upstream areas and the surrounding watershed are not known, but may be more refractory in nature and of reduced or limited nutritional value compared to the autochthonous sources. Whatever the relative sources of organic carbon, data reviewed for the Upper Hudson indicate that the system is capable of supporting diverse fish fauna. 27

Many species of fish living in river systems can exploit a variety of food resources, including invertebrates, detritus and other fish (Weinstein, 1977, Moran and Limburg, 1986 and Gladden *et al.*, 1988). Although no fish studies in the Federal Dam/Fort Edward region of the Upper Hudson have included routine analyses of stomach contents, many resident species seem to have diverse and opportunistic feeding habits (Malcolm Pirnie, 1984b). The exploitation of various resources by fish populations may lead to a pattern of trophic partitioning, as exemplified by the dietary preferences (Moran and Limburg, 1986 and Gladden *et al.*, 1988) listed below.

Zooplankton
- Emerald shiner
- Tessellated darter
- Spottail shiner

Benthic/Detrital
- Common carp
- Goldfish
- Eastern silvery minnow
- Golden shiner

Results of recent field studies conducted by the US Army Corps of Engineers Waterways Experiment Station indicated that the cutterhead dredge was the most successful in limiting sediment resuspension into the water column, followed by the hopper and clamshell dredges. Modifications such as overflow prevention or use of an enclosed bucket may improve resuspension characteristics of the hopper and clamshell dredges. Specialty dredges were also tested (the modified dustpan and matchbox dredges) and compared with the cutterhead. No reduction in sediment resuspension was found with use of the specialty dredges.

Historically, contaminated sediments were removed from the river during NYSDOT's routine channel maintenance dredging. As the river's PCB problem became better understood, remedial alternatives, including bank-to-bank dredging of the river, full-scale dredging of the 40 PCB hot spots in the river and reduced-scale dredging of the most contaminated hot spots, were considered. Due to limited funding under the Clean Water Act, a reduced-scale dredging program had been recommended by the USEPA and the NYSDEC in earlier studies. The NYSDEC currently has an Action Plan for site remediation that incudes dredging and encapsulation of river sediments at an upland site in proximity to the river (Site 10).

C.4.4 Treatment Technologies

C.4.4.1 Physical and Chemical Treatment Technologies

Evaluation

28 To date, incineration and disposal in landfills are the most widely practiced and permitted methods for management of PCB-contaminated soils and sediment. However, other technologies have now emerged and are considered technically and economically feasible alternatives to incineration and landfilling in certain circumstances. In this section, a range of physical and chemical treatment technologies and their general applicability to the Hudson River site and level of development ~~are~~ is presented.

The process has been developed at production levels and has been applied to treating PCB-contaminated soil at Wide Beach, New York and PCB-contaminated sediment at Waukegan Harbor, Illinois. SoilTech's pilot demonstration unit has a nominal capacity of five tons per hour; a commercial transportable unit has a capacity of ten tons per hour. The latter is currently being used in treating 21,000 tons of PCB-contaminated soils at the Wide Beach, NY Superfund site. The SoilTech system is retained here for further analyses and bench-scale testing.

~~A group of~~ Chemical fixation technologies that immobilize contaminants 29
within the waste that have emerged through the USEPA SITE Program~~. These technologies~~ involve mixing waste material with settling agents to enhance the physical properties of the waste. Numerous commercial settling agents have been tested. These agents either eliminate free water from the waste or alter the chemical form of the contaminants to make them resistant to leaching.

A bench-scale study of solidification/stabilization as a treatment technology for New Bedford Harbor sediments was conducted by the US Army Corp of Engineers (1989). Composite sediment samples were processed with various dosages of settling agent formulations, including Portland cement, Portland cement with Firmax proprietary additive and a Silicate Technology Corporation (STC) proprietary additive. Batch leaching tests showed that the leachability of PCBs was reduced by factors of 10 to 100. Costs for treating New Bedford Harbor sediments using the tested agents have been estimated at $100 per ton. While the solidification/stabilization approaches offer potential low cost treatment options, data on the long-term aging effects of the stabilized/solidified matrix should be developed further.

Recently, USEPA's Risk Reduction Engineering Laboratory (RREL) in Cincinnati initiated a project with RMC Environmental of West Plains, Missouri to conduct controlled experiments on PCB-contaminated soils. The experiments were conducted to investigate declining concentrations of PCB over time, which were observed at contaminated sites that were stabilized through the addition of lime and other alkaline materials. The study has been recently published and will be reviewed.

C.6 Initial Screening of Technologies

While no particular technology has been removed from further consideration for subsequent phases, it is possible at this initial screening stage to render some judgments concerning remedial options, based upon their applicability and current level of development. Data upon which the initial screening was based were obtained from numerous sources, including reports for other Superfund sites, USEPA's technology assessment documents and direct communications with equipment manufacturers. Results of this initial screening effort are illustrated as Figure C.6-1.

30 Several technologies associated with particular response actions were not screened in this preliminary reassessment. These include methods to excavate remnant deposits, if necessary. In addition, technologies applicable to treating water resulting from sediment dewatering operations have not yet been evaluated. A wide range of well-proven, commercially viable technologies ~~are~~ is available to treat effluent from dewatering operations. These will be evaluated in subsequent phases.

Mechanical, hydraulic and specialty dredging systems or conventional excavation methods are available to remove contaminated sediments. While hydraulic systems have been preferred at other Superfund sites and have been shown to minimize sediment resuspension during removal operations, these systems result in the need to handle significant quantities of by-product water and tend to be most cost-effective for dredging relatively large quantities of sediment. Thus, the three generic dredging systems have been retained for further assessment, when additional information on materials characteristics and quantities will become available.

Should a decision be made to remediate the Hudson River site by removing some or all its contaminated bottom materials, it would be necessary either to landfill the removed materials or to treat those materials and landfill the treated residuals. Physical, chemical, biological and thermal processes or technologies are available to treat PCB-contaminated solids. Of the large range of treatment alternatives available, those considered to be either commercially

C-6

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

DATE: September 20, 1991

TO: Dr. Daniel Abramowicz, Chair, Science & Technical Committee

FROM: Richard Bopp, NYSDEC

RE: Hudson River PCB Reassessment RI/FS Phase 1 Report

My general comments on the Phase 1 Report are as follows:

1) On page I-2, it is revealed that the "Superfund site itself, however, extends to the Battery in New York Harbor". What are the implications of this statement? 1

2) p. I-3 refers to the "large spring floods in 1976 and 1983"; 2 p. B.4-31 informs us that there "have not been any major flood erosion events since 1976". 3 Page B.3-29 mentions the "abnormally low spring floods of the 1980s", while the TAMS analysis indicates that the 1980s included one spring flood that exceeded the once-in-ten-year-daily-average flow (1983) and two that exceeded the once-in-five-year flow (1983 & 1987). 4 I expected a more consistent and quantitative analysis of river flow during the period covered by monitoring data.

3) PCB mass balances and approximate budgets should be dealt with in a single section, focusing on how estimates were derived, assessing the uncertainties, and attempting to place constraints on important fluxes using mass balance considerations. 5 For example, estimates of total PCB inputs from GE range over a factor of five - if it is not possible to use mass balance arguments to narrow this range, that should be explained in detail. On page A.2-2, the 1973 PCB flux from the upper Hudson was estimated at 5,000 kg; page A.4-2 implies a flux of 24,000 kg during that year.

Even if a mass balance approach does not significantly lower such uncertainties, it would focus attention on areas where additional study might be useful and better define the level of uncertainty that is likely to persist.

4) Section A.4 reviews the Thomann model pointing out the 6

complexities and several problems with the formulation and assumptions. It does not, however, address the central question- Will the reassessment require that such a model be developed for the upper Hudson? If the answer is yes, EPA should clearly present both its reasons and specific plans for model development.

7 5) Page B.3-13 refers to some fairly extensive sediment sampling conducted by GE in 1990. Is a detailed review/presentation of this data anticipated? The total PCB data presented in Table B.3-8 are quite interesting. A close look at congener patterns is indicated.

8 6) Page B.3-14 reports mean lead and cadmium levels in upper Hudson sediments that are about an order of magnitude greater than found in pre-industrial sediments. Except for the mention that standard leaching tests suggest that the metals are not readily leachable, the implications of this contamination are not discussed. Can EPA provide comment or guidance?

9 7) P. B.3-40 - Air Monitoring - The only discussion of replicate sample analysis or other QA/QC involves GE's sampling at the remnant sites. The suggestion of very significant sampling or analytical problems suggests at least some evaluation of the QA/QC associated with earlier studies.

10 8) Section B.3-7 - Adequacy of PCB and Aroclor Measurement - I believe that the potential for underestimation of total PCBs in upper Hudson sediment and water column samples is much greater than suggested here. The components most likely to have been significantly underestimated in the DEC sediment surveys and USGS water column monitoring are mono and dichlorobiphenyls. My suspicions are based on J.F. Brown Jr. et al. 1984, Bopp et al. 1984 & 1985, and GE's recent review of the packed column chromtograms from the 1984 sediment survey. This topic should be discussed in more detail at the STC meeting.

11 The table on page B.3-50 appears to have some inaccuracies. The text indicates that in the 1984 sediment survey, Versar used all of the Webb & McCall peaks with retention times between 21 and 84 to quantify Aroclor 1242 levels, while the table reports that only peaks with retention times of 28, 47 & 58 were used. The table also reports that Bopp et al. 1985 "Analyzed for Total PCBs as Sum of Peaks 28-174". This is misleading as Bopp et al. went to great lengths to explain that the sum represented a total of the predominantly tri through hexachlorinated components that were quantified. In addition, they cited examples where mono and dichlorobiphenyls (not routinely quantified in that study) comprised about 50% of the total PCBs in a sediment sample and dichlorobiphenyls made up 15 to 50% of the total PCBs in water samples.

12 9) Page B.4-42 - It is not clear whether the projection of

thirty-year average PCB concentrations in fish used the entire historical data base or only the more recent fish data. In the former case, the projection may not adequately model the fact that the "rate of decline has been very low in recent years". This would result in an underestimation of the thirty-year average PCB concentration.

10) Section B.5 - Sediment Transport Modeling - I am not 13
convinced of the predictive value of such a model. I am certain that a model can be developed to fit the calibration data and yield outputs that match simple intuitions, beyond that, I remain skeptical. Perhaps TAMS or EPA could provide detailed examples of past successes of complex sediment/contaminant transport models.

11) Some final minor comments - The discussion of nitrate in the 14
lower Hudson (p. A.1-10) is not completely accurate (is it 15
necessary at all?). On p. A.2-6 change "(mg/l") to "(ug/l)" and
on p. 3.3-43 change "formed" to "found". 16

cc: I. Carcich
D. Tomchuck, USEPA-Region II

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GE Corporate Research
and Development

C-7

Building K1, Room 3B19
September 23, 1991

7072

TO: Doug Tomchuk
EPA Region II

FROM: Daniel A. Abramowicz
Chairman
Scientific and Technical Committee

SUBJECT: Phase I EPA Report of RI/FS

Enclosed are my comments on the Phase I report on the Interim Characterization and Evaluation of the Hudson River PCB Reassessment. I have included general comments, as well as a more detailed analysis of the sections devoted to treatment feasibility (C.4 through C.7)

Daniel A. Abramowicz

\daa

General Issues:

1 In general, EPA and TAMS did a credible job in gathering the large volume of information displayed in the Phase I report. The report demonstrates a significant effort to be objective in listing all of the data gathered over the last fifteen years. This objectivity also represents one of the greatest weaknesses of the Phase I report. In general, data is supplied without any information concerning the quality or validity of the results. As such, the report becomes a "laundry list" of findings from many different organizations, without any rating or evaluation by the agency. The impact of this lack of analysis is an inability to determine directions for additional information that may be necessary or to critically address the report.

2 In the report, it is generally recognized that there exist sources of more highly chlorinated PCBs in the NYC area (page E-6; section A.3.1, page A.3-3), but no realization that it is therefore quite likely that even greater sources of Aroclor 1242 may exist from the same region. The likelihood of potentially significant contribution of even lightly chlorinated PCBs is based upon historical records of total PCB usage, demonstrating that approximately 70% of PCB usage involved Aroclor 1242-like PCBs.

3 The report recognizes (page E-8; section B.4.3.2) that the Thompson Island (TI) Pool is no longer contributing PCBs to the water column. Therefore the source of the background level PCBs in the water column must be a different source further upstream. This implies that any remediation of the TI pool would have no benefit on PCB levels in the river. Such a result may represent a fundamental change in the view of the Upper Hudson, with important implications for remedial actions already under consideration, although the connection with the potential lack of benefit from remediation of this area is not made.

4 The report is inconsistent in the definition of water quality for the Upper Hudson River. Section A.1.3.1 describes it as improving steadily; section A.1.4.3 (page A.1-28) describes the river as containing "one of the most diverse fisheries found throughout Atlantic coastal systems"; section B.1.2.1 rates the
5 Upper Hudson water quality as poor, based on a circular argument about the fishing ban; section B.1.4 (page B.1-13) stating that the "Upper Hudson River between the Federal Dam and Fort Edward can
6 support a diverse and high quality fishery resource", and a "qualitative improvement within the past twenty years"; section B.7.2.2 (page B.7-18) stating a slightly impacted system and "an increased representation of more pollution intolerant (sensitive) groups" in the Upper Hudson. Again the agency makes no attempt to evaluate the various reports to determine the actual water quality in the river.

The report is inconsistent in the contaminants listed as "above background" in sediments by the NYS DEC in section B.1.2.1 (only lead and mercury) and section B.3.2.5 where M. Brown reports high levels of lead, cadmium, chromium, and mercury. 7 8

Extreme variation in PCB spatial distribution (page E-7; section B.3.2.1, 1976 sampling; section B.3.2.2, page B.3-11, 1984 sampling; section B.3.2.4, 1983 USEPA study) is recognized in the report. There is, though, no mention of krieging statistics familiar to the contractors that could provide better estimates. 9

The data GE provided to demonstrate widespread dechlorination in the Upper Hudson River has not been recognized or acknowledged. In addition, this data is mistakenly represented (Table B.3-8; e.g. states that for 150 samples from the H7 site, min = 0.1 ppm, max = 2,118 ppm, and a mean of 118 ppm; the data show min = 0.02 ppm, max = 730 ppm, and a mean of 40.1 ppm). 10

Biodegradation (Sections C.4 through C.7)

In technical terms, this section may be the weakest part of the document. Poor, discredited studies are given equal weight with well designed, confirmed results. In addition, there is no mention of the widespread, pervasive dechlorination that is known to exist throughout the Upper Hudson River. The EPA acknowledges in this document that dechlorination is a possible, and even likely, explanation for the congener redistribution in the Upper Hudson (page C.4-6), but the extent of the transformation is not documented. The data provided by GE to demonstrate widespread dechlorination (reanalysis of the NYS DEC 1984 data, GE 1990 survey of less dechlorinated sites, GE 1990 survey of H7 site) was not evaluated for that purpose. 11

In section C.4.1, it is stated that capping may increase anaerobic activity. I don't think that is true, as sediments are naturally quite anaerobic. Moreover, it is unnecessary in the Upper Hudson where dechlorination has already extensively occurred. 12

In section C.4.2, the data GE provided on widespread dechlorination in the Upper Hudson is noticeably absent. In addition, anaerobic dechlorination is mentioned as only one possible explanation for the unusual Aroclor patterns in the Upper Hudson (section C.4.2.1). 13

In section C.4.2.2, it is stated that aerobic degradation in environmental samples will display Pattern A. This is not true in the Upper Hudson, where extensive anaerobic dechlorination has so dramatically shifted the congener distribution that subsequent aerobic degradation would not resemble Pattern A. In fact, it will be difficult to demonstrated aerobic degradation in dechlorinated sediments from the congener pattern alone, as the three major PCB congeners that remain can all be aerobically degraded.

14 In section C.4.2.2, it is mistakenly stated that a 2,3-dioxygenase cannot degrade mono- and dichlorobiphenyls. All mono- and dichlorobiphenyls can be degraded by a 2,3-dioxygenase; no 3,4-dioxygenase is required.

15 In section C.4.2.3, confirmation of dechlorination with Hudson River sediments first observed in Tiedje's lab fails to mention Bopp's sampling of the Upper Hudson where dechlorination was found in every sample (mentioned on page B.3-12), Woods (Oregon State University), Reeves (Oak Ridge National Laboratory), or Celgene (Warren, NJ). In addition, EPA's own research laboratory in Gulf Breeze has begun dechlorination research. The widespread environmental dechlorination of chlorinated organics is also not mentioned in the report (Parsons, Univ. Amsterdam, PCDDs and PCDFs; Beurskens, Institute of Inland Water Mgt., PCP and chlorinated benzenes; Suflita, Univ. Oklahoma, pesticides; Neilson, Swedish Env. Res. Inst., chlorinated phenols in Baltic sediments; Brown, GE, PCBs in river sediments; Lake, EPA-Narraganset, PCBs in marine sediments).

In section C.4.2.3 (page C.4-6), the use of the term biodegradation in Chen _et al._ should be mineralization, per the EPA's definition in C.4.4.3 (page C.4-25).

In section C.4.2.3 (page C.4-6) the report states the Rhee _et al._ (1990, should be 1989) result where no dechlorination was observed in Moreau sediments _in situ_ for seven months. The comments neglects to mention that the experiment covered a time period (Nov-June) where environmental temperatures are too low to detect significant dechlorination. The same experiment in the summer-fall months would have probably been successful. The report therefore suggests that _in situ_ dechlorination will not be possible, ignoring Rhee's later confirmation of our results and the mountain of evidence demonstrating that natural _in situ_ dechlorination has already occurred on a wide scale.

16 In section C.4.4.1 (page C.4-13), the calculated extraction efficiencies for the B.E.S.T. process are incorrect. Using the residual values given, extraction efficiencies with three extraction stages are above 97%.

17 In section C.4.4.2 (page C.4-18), it is incorrectly stated that PCBs can be converted to dioxins, whereas dibenzofurans are the partial oxidation product from PCBs.

18 In section C.4.4.3, the report states that PCBs pose greater challenges to bioremediation than other contaminants (e.g. petroleum products). In fact, PCBs and petroleum products are very similar in terms of there biodegradation potential (both are complex mixtures of hydrophobic compounds, both can be degraded by

organisms found commonly in the environment, in each case the higher molecular weight material is more difficult to degrade, and widespread environmental degradation of petroleum products and PCBs are documented). In spite of these similarities, oils are considered easy to bioremediate in the report, while PCBs pose "greater challenges". In addition, it is incorrectly stated that successful PCB bioremediation requires the identification of a microbial population capable of degrading a large number of different PCB congeners. In the Upper Hudson River (the subject of the current study), natural anaerobic dechlorination to a few lightly chlorinated PCBs has removed this requirement.

In section C.4.4.3 (page C.4-26), the report states that organisms like H850 cannot mineralize PCBs and therefore accumulate chlorobenzoates. In fact, H850 and LB400 can metabolize lightly chlorinated benzoates (Bedard and Haberl, Microb. Ecol., 20, 87-102, 1990). Primarily monochlorinated benzoates would be formed as intermediates in the degradation of the lightly chlorinated PCBs currently found in the Upper Hudson. In addition, many other organisms capable of degrading these monochlorinated benzoates are present in environmental samples.

In section C.4.4.3 (page C.4-27), optimal conditions for anaerobic activity with Hudson River sediments are listed. This summary fails to mention that none of the listed amendments (inhibitors, high PCB concentrations, inorganic nutrients, supplemental carbon source, or elevated temperatures) are necessary for PCB dechlorination. In fact, sediments with **no amendments at environmental temperatures** will dechlorinate PCBs with rates nearly as great as the optimal conditions described. The report's description mistakenly implies that anaerobic PCB dechlorination requires a very narrow set of controlled conditions to be effective. This is disproven by the widespread natural dechlorination occurring in the Upper Hudson River and ignored by the report.

In section C.4.4.3 (page C.4-28ff), it is accurately mentioned that in situ anaerobic dechlorination could be easily accomplished, but it would not reduce the total molar PCB concentration. No mention is given to the promising ortho dechlorination recently discovered that may overcome this limitation (Van Dort and Bedard, Appl. Env. Microb. 57, 1576-1578, 1991) **or** to the significant detoxification demonstrated by meta and para removal alone (Quensen et al., GE Report, 1990). Moreover, the report fails to mention the dramatic effect this widespread dechlorination would have on the bioaccumulation of PCBs. The less chlorinated PCBs are significantly less hydrophobic and are metabolized and/or cleared from fish and humans much more readily than the more highly chlorinated congeners. This fact may have important implications on the risk assessment of PCBs for the Upper Hudson, although this connection is not made. 19

On the same page, the EPA fails to mention that anaerobic conditions would be difficult to maintain during dredging operations, especially the cutterhead hydraulic pipeline dredge where large volumes of oxygenated water must be removed with the sediments. Moreover, the report fails to mention the rapid progress of bioremediation, as evidenced by Ecova's recent completion of the largest bioremediation cleanup to date (Genetic Engineering News, September 20, 1991).

In section C.4.4.3 (page C.4-31), the report mentions results from a DETOX study that have been discredited by the scientific community. Their work on aerobic Aroclor 1260 degradation is also referred to in the report on page C.4-26, although the report itself states on page C.4-26 that "no aerobic strain has shown the ability to degrade Aroclor 1260"

20 In section C.7, the report states that propane extraction is being brought forward for further consideration, although this technology was ruled out for remediation of New Bedford Harbor sediments (page C.4-16).

21 There is no mention of the negative ecological and environmental impacts of large scale sediment removal. This is a critical parameter that is not acknowledged in this report.

Ecova Corp., General Electric Move Bioremediation Technology Forward

Ecova Corp. (Redmond, WA) completed the nation's largest planned bioremediation cleanup of soil containing petroleum hydrocarbons. The project took place at a former 40-acre Unocal tank farm site near Torrance, CA where more than 300,000 cubic yards of soil were cleaned up. The soil was part of a bunker oil reservoir which operated at the site for about 50 years.

Ecova officials say their process reduced petroleum contamination by up to 94%, from levels as high as 15,000 ppm to average levels of less than 1,000 ppm. At the conclusion of the project, the soil met California Regional Water Quality Control Board standards, allowing redevelopment of the land into a shopping center and light industrial park.

The project involved the design of 27 acres of land treatment units (LTUs) to process the huge quantities of soil and the use of an onsite mobile laboratory to facilitate process monitoring of the bioremediation program. The lab analyzed up to 300 samples per day during peak periods of production. Bill Mahaffey, vp of technical development at Ecova, says the total project took 16 months to complete, with more than 35,000 samples analyzed during the remedial program.

Dominant Isolate

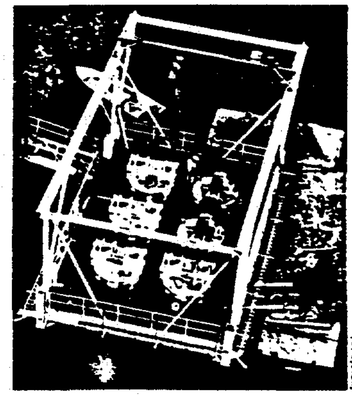
In addition to soil chemistry, the mobile lab supported the nutrient program and monitored biological activity in the LTU. During the treatment program, the evaluations identified the presence of a dominant aerobic organism possessing the ability to metabolize a wide range of hydrocarbon compounds.

"Dr. Jeff Compeau, project scientist, Bill Cavanaugh, research associate, and the rest of our team showed that the predominant isolate was actually a mixed population of organ isms that produced an orange mu coid colony," Mahaffey tells GEN "It looks like there are tw pseudomonads, an acinetobacter an possibly a xanthobacter involved."

He adds that the isolate was abl to grow on hydraulic fluid as a car bon energy source.

The cost of the remedial effort wa $45 per cubic yard, according t Ecova. Offsite disposal to a landfi would have cost between $60 an $300 per cubic yard and would hav required more than 50,000 dump truck to transport the contaminated soil.

"We had three goals for this proj ect," says Ecova principal Joh Cioffi. "First, we wanted to demon strate the successful application c bioremediation in the field. Second we wanted efficient site operations t effect bottom-line savings for Uno cal. And, finally, we wanted to ad here to an ambitious timeline."



General Electric scientists are conducting field tests to determine the feasibility of bioremediating polychlorinated biphenyls (PCBs) in New York's Hudson River. The researchers are using six cylindrical caissons to evaluate the ability of aerobic bacteria to break apart PCB molecules previously dechlorinated by anarobes. The experiment marks the first of its type to be tested in a river environment.

PCB Remediation

In another development, research ers from the General Electric Co (GE) began first-of-a-kind field test to determine the feasibility of accel erating the natural breakdown c polychlorinated biphenyls (PCBs) i New York State's Hudson River.

The experiment, initiated earl last month, will last for about l weeks. The test site is three mile south of Fort Edward at a locatio where river sediments contain rela tively high levels of PCBs and bio degradation has been demonstrate to be under way.

"To our knowledge, this is the fir sequential biodegradation process t be tested in a river," says Dr. Danie A. Abramowicz, manager of th GEN R&D Center's Environmenta Technology Program in Schenec tady, NY. "We hope to determine i the accelerated PCB biodegradatio techniques demonstrated in the lab oratory have potential to work in th environment."

Dr. Abramowicz notes that th company will also obtain data on th rate at which PCB biodegradation i naturally occurring in the river. H emphasizes, however, that the test are not designed to demonstrate practical approach for large-scal river cleanup. Future programs wi address this application.

Two-stage Process

The GE tests involve the secon stage of a two-stage bioremediatio process that makes use of both anaer obic and aerobic bacteria. In the fir stage, anaerobes dechlorinate th PCB molecules, making them acces sible to attack by aerobes that com plete the biodegradation proces The aerobes break apart the lightl chlorinated PCB molecules, thu eliminating them altogether.

Only the aerobic step is being use in the tests because many types o anerobic bacteria in the river hav already extensively dechlorinate the PCBs naturally, according to Di Abramowicz. He notes that PCI mixtures found in Upper Hudso sediments 20 years ago contained a average of 3.5 chlorines per PCI molecule compared to an average o only two chlorines today. A recen reanalysis of Upper Hudson sedi ment samples collected in 198 shows that PCBs in more than 709 of the samples have undergone ex tensive biodegradation, he adds.

For the tests, GE installed six cy lindrical caissons, which are sixtee feet long by six feet in diameter. Th caissons stand on end next to on another and are driven five feet int the sediment. All tests are being per formed within these structures to as sure complete containment.

The caissons are equipped wit stirrers for mixing the sediment within them. This is done to aerat the material for attack by the aerobe that live near the surface of the sedi ment where the oxygen and nutrient they need to survive are present.

10.4533

EPA's BAC Highlights the Use of Bioremediation

The Environmental Protection Agency's Bioremediation Action Committee (BAC) reported on recent developments regarding bioremediation at the "Second EPA-Industry Meeting on Environmental Applications of Biotechnology" in Washington, DC.

An earlier EPA-industry meeting, held in February 1990, led to formation of the BAC, whose purpose is to provide a focal point for evaluating progress on facilitating the use of bioremediation and to furnish a forum for those engaged in bioremediation efforts.

Dr. John Skinner, Deputy Assistant Administrator of EPA's Office of Research and Development (ORD), chairs BAC. Several BAC subcommittees have been formed that consist of representatives from industry, government and academia and a chair who reports to the full committee.

The Protocols Subcommittee, chaired by Dr. Edgar Berkey of the National Environmental Technology Applications Corporation (NETAC), is developing methods for testing the effectiveness and safety of bioremediation products as a remedial technology for oil spills and hazardous waste cleanups. It also plans to establish a Bioremediation Products Evaluation Center (BPEC). Accomplishments to date include the production of a five-tiered framework for oil spill protocol methods, development of an oil spill protocol methods manual and a solicitation for microbial products by which to validate these methods.

BPEC is to be an internationally recognized resource for bioremediation product or process evaluation, development, application and support. BPEC will provide independent, consistent and low-cost testing of oil spill bioremediation products utilizing protocols developed by the NETAC Panel and ORD laboratories. This independent testing laboratory will use NETAC Panel protocol methods, test oil spill bioremediation products, compile test results and product information.

Uniform Data

The benefits of such a program are: 1) uniform, reliable data are provided with complete QA/QC, 2) a test facility is created with the support of industry, 3) efficacy/safety data can be rapidly developed and 4) certification/audit programs of other laboratories are avoided.

James Solyst of the National Governors' Association (NGA) chairs the Data/Information Subcommittee which will increase the states' awareness of the advantages of bioremediation and describe actions states can take to encourage its use. NGA has prepared an "In Brief" that presents case studies of bioremediation for a Superfund site in Texas, feasibility studies funded by California and Montana to examine pesticide-contaminated sites, and two underground storage tank cleanups in Delaware.

Additionally, this subcommittee is interested in bioremediation information that can illustrate the capacity for bioremediation on a site-specific basis. An effort is underway to augment the currently existing data in ORD's Alternative Treatment Technology Information Center (ATTIC), a retrieval network that provides technical information on innovative treatment methods for hazardous waste and other contaminants. ATTIC provides site remediation managers with information for making effective decisions on cleanup alternatives. ATTIC is particularly interested in information such as initial and final contamination concentrations, number of samples and technique used for determining the concentrations, estimated volume of contaminated material remediated, the cause of contamination, estimated time and cost of cleanup.

Interim Guidance

The Subcommittee on National Bioremediation Spill Response was established to investigate the potential for bioremediation to be utilized as a spill response technique. The subcommittee is chaired by Stephen Luftig, Director of Emergency Response Division, Office of Emergency and Remedial Response. Its goals are to provide interim guidance on the use of bioremediation in spill response, to use the interim guidance in a pilot project in which a bioremediation spill response plan is developed for a specific location, and to explore the long-term development of bioremediation spill response capabilities within the existing mechanisms of the National Response Team and the Regional Response Teams.

To date, the subcommittee has developed and issued interim guidelines for preparing bioremediation spill response plans, initiated a pilot bioremediation spill response plan for the Texas Gulf Coast and made draft interim guidelines available to the U.S. Coast Guard advisory team in Saudi Arabia. The subcommittee plans to complete the bioremediation pilot plan for the Texas Gulf Coast and to assist Regional Response Teams in developing bioremediation spill response plans for other parts of the U.S.

To accomplish its goal of identifying priority needs for advancing bioremediation technologies, the Research Subcommittee, chaired by Dr. Martin Alexander of Cornell University, proposed four major areas for research: determining factors governing the availability of compounds for bioremediation and devising ways to increase their availability for destruction; improving the design of processes for bioremediation; overcoming problems associated with scaleup from lab systems to field operations; and developing novel bioremediation processes.

An industry representative BAC, Paul Gabriel of SEA C... tants Inc. (Cambridge, MA), a... gineering and architectural firm, believes that the primary benefit of the BAC's activities is that EPA's involvement has legitimized the technology. Gabriel points out that the infrastructure of the BAC, with its many subcommittees and work groups within subcommittees, is an indication of the magnitude and complexity of the issues. Gabriel thinks that the future for bioremediation is bright and that BAC is assisting in enhancing its acceptance.

—Katherine Devine, president of DEVO Enterprises, Inc., a Washington, DC-based environmental consulting firm.

In one caisson equipped with a 1 rpm mixture control plow, researchers added small amounts of nutrients, such as nitrogen and phosphorous, to stimulate the activity of aerobic PCB-degrading bacteria already present. A second caisson is also equipped with a 1 rpm plow, but fewer nutrients were added to the mixture.

The scientists added a combination of nutrients and a high concentration of a naturally-occurring microorganism (H850) to a third caisson (with plow). This aerobe (*Alcaligenes eutrophus*), which has been proficient at degrading PCBs in the laboratory, was isolated from Hudson River sediments found near the test site. A fourth caisson, equipped with a high mix propeller agitator, also received H850.

Sediments in two of the caissons (one with a plow and one with an agitator) did not receive any additives to provide a basis for comparison with the biodegradation activity that is taking place within the other caissons. ■

10.4534

C-8

TEXAS A&M UNIVERSITY
CIVIL
Department of Civil Engineering • Texas A&M University • College Station, TX 77843 3136 • 409/845-7435 • FAX 409/845-6156

October 25, 1991

Douglas Tomcuk
U.S. Environmental Protection Agency
Region II
New York, NY

Dear Doug:

Enclosed are a few comments concerning the Phase I report. I am sorry these have taken so long, but it seems as though I just couldn't get my head above water these last couple of weeks.

As you may recall, my primary concern was with the section of text dealing with Lower Hudson loading. I have made some changes on Table A.2 (the Lower Hudson loading summary table), which I have enclosed for your review. I would recommend your adding a paragraph, summarizing the situation, at the end of the Lower Hudson loading section. This would be a good place to address data reliability and discuss data needs for the future exposure assessment. 1

Sincerely,

James S Bonner

James S. Bonner, Ph.D.
Assistant Professor

JSB/lss
Enclosures

Summary of Non-Point Source Loads to the Lower Hudson River
Current 1990

Current PCB Sources to Lower Hudson only	Load Estimates (kg/yr)	% of Total	Reliability
Tributaries	33.2 - 381.6	1 - 17	
Sewage	497.2 - 763.2	22 - 34	
Combined Sewer/Storm Water Outfalls and Storm Water Outfalls	331.8 - 497.2	15 - 22	
Atmospheric Decompisition	0 - 83.0	0 - 4	
Landfill Leachate	0 - 116.1	0 - 5	
Upper Hudson (Total)	400	18	
Total (All Sources)	1262.2 - 2241.1	56 - 100	

Upper Hudson Contributions as a Function of Time	Load Estimates (kg)	% of Total
1977 - 1989	15,000	8
1946 - 1989	178,000	100

Historical Contributions from all Sources (1946 - 1989)	Load Estimates (kg)	% of Total
Upper Hudson	178,000	66
Tributaries and Urban Runoff	54,000	20
Municipal	32,000	12
Atmospheric	5400	2
Total	270,000	

Pg E-3	computerized data base - open to the public	2
Pg E-4	Phase 2 - will complete characterization. Is this correct or will same characterization take place in P-3?	3
Pg E-5	Lower Hudson loading--could you be more specific?	4
Pg E-6	Lower Hudson loading from Upper. I don't agree with loading from the Upper Hudson has nothing to do with the diffusive loads in the Lower.	5
	It is simply what fluxes the Hudson at Fort Edward Dam.	
	Loading to the Lower Hudson is what fluxes at the Battery - what fluxes at Fort Edwarrd Dam.	
Pg E-7	Sediment scour-listed as of prime importance--is this reflected PL-2 plan.	6
Pg E-8 - E-9	Remnant deposits--more background needed specific to these deposits.	7
Pg E-9	Phase 2 - expected to provide info on remnant deposits--is this objective worked in?	
Pg E-10	Sediment transport modeling referance	8
	Is this worked into Phase II plan?	
Pg E-10	References- add creditability	9
Pg E-11	Risk assessment framework P2 ??	
Pg E-12	One report out of how many?	10
Pg E-13 P-2	Transfer mechanism in Ph 2--is this worked into the plan?	11
Pg E-13 last paragraph	Why Fall 1991?	12

Intro

Pg I-2 - last paragraph	What is the remnant area?	13
Pg I-3 paragraph 3	NUS not in glossary	14
Pg I-5 paragraph 2	No in-place containment was required for site 1 (I or Intro). What this not the site that was scoured away. Get student to find this.	15

Lower Hudson

16	Synopsis paragraph 3	loading similar--let's get a handle on this
17	Pg A 1-5, first paragraph	maximum tidal current (?) (more info)
18	Pg A 1-5, second paragraph	spring surge of what factor (5-7)
19	Pg A 1-5	P-2- last sentence ??
20	Pg A 1-6	It would be nice to discuss circulation quantitatively. (i.e., dispersion coefficient; (1) is data available to do this?; (2) if not, is it planned for Phase II (Ph-2)?
21	Pg A-17	There are multiple NYSDEC 1990 references - I suggest that where this occurs 1990[a] 1990[b] or something like this.
22	Pg A 1-15, paragraph 3	The question DOC/POC ratio needs to be answered. DOC is important from energy point of view, but is also important from PCT transport.
23	Pg A-16	It looks like little is known about velocity in Lower Hudson. Are we going to increase study in Phase 2?
24	Pg A-18, paragraph 2	What happens to freshswater plankton between middle and lower reaches? Are they settling or, _____, ______, etc. What?
25	Pg A-17, last paragraph	August productivity explained later. Where?
		Maximum loading Lower Hudson

Lower Hudson Loading

26	Pg A 2-2, second paragraph	TAMS loading

Total Historic Loading

Pg A 2-2, third paragraph	Last sentence--what is the basis for statement? If 1400 kg/yr came from lower Hudson sources 27
Pg A 2-3, first paragraph	First sentence--load historically dominated by Upper Hudson sources.
Pg A 2-3, second paragraph	Last sentence--dispersed anturee of sources may indicate that you are not detecting all sources. This should be stated. 28 Unit mismatch in Table A 2-2 is a shame. <u>Report all units consistently!!</u> Put on Upper Hudson contribution Historic load; recent times load; current load. % contribution total <u>kg/yr</u> Report values in Table A 2-2 in text, discuss reliance and uncertainty!!
Pg A 2-3	Units use the same <u>kg/hr</u>. 29
Pg A 2-4, first paragraph	First paragraph--add sentence comparing Upper Hudson flows. % contribution 30
Pg A 2-4	kg/yr % contribution 31
Pg A 2-5	kg/yr % contribution 32
Pg 1.0	ppb --> is not mg/l mg/l 33
Pg A 2-6	Summary paragraph need that compares all loads 34 first paragraph, last sentence
Pg A 3-2	Actually the rate of decrease (i.e., the slope of sediment lines decreased about 1977). 35

	*Pg A 3-2, paragraph 2	lost sentence
		Back to Historical Loads; they are comparable.
36	Pg A 3-2-A 3-4	Some of these conclusions need to be mentioned in the loading section.
37	Pg A 3-2, last paragraph	Second sentence - more explanations and references.
	Pg A 3-2, last paragraph	Expand in general.
38	Pg A 3-4 and Pg G-8	w column (PCBSS) 1.8 mg/kg Why 1.8 mg/kg in H_2O and 0.5 mg/kg in sediment Discuss add sentence Biodegradation or due to non-settleable matter
39	Pg A 3-5, first paragraph	Units on (ko) dimensionless
40	Pg A 3-5, last paragraph	What is the basis for sentence 2? $C = \frac{QC_{hu} + QC_{m}}{QT}$ st st mass balance at confluence
41	Pg A 3-6	last two sentences These sentences seem to counterdict 0.5 mg/kg as your PTO talked of earlier
42	Pg A 3-11	last sentence - concentration to also stated in loading section
43	Pg 4-2	third paragraph - <u>Loading again</u> 46% in 1980 decline in Lower is slower Must be greater 46% in 1990
44	Pg A 4.1.3	Geochemical processes Environmental processes e.g., gas exchange is not geochemical, etc.
45	Pg A 4-5	2nd paragraph. Did Ko change to Kd--average Kd--how much different?

How much will it overestimate. Is this significant?

Pg A 3-5 — K_o --> K_D--looks like o--font change on page A 4-5

Pg A 3-5 — second and third sentences--lost paragraph. Resulting overestiate or underestimate. Add sentence at end of paragraph. estuarine total misrepresentation 46
air water exchange
1. oxygen transfer assumption
2. one PCG type assumption
3. resistance

Lower Hudson synopsis and following text--Are there any towns in Lower Hudson who draw H_2O from river? 47

Upper river, Pg B 3-2, paragraph 2--Is this data available? 48

Pg BB 3-9 — This represents all samples taken. 49

Paragraphs 3 & 4 — Does not represent history.
no data in here--volatile--i.e., if PCB OC was never low; i.e., [PCB] a better predictor of OC. 50

Pg B 3-19 — USGS flow no dye studies 51

Pg B 3-32 — Do you do dilution calculations? 52
paragraphs 1 and 2

Pg B 3-41
last sentence — second paragraph--Which was was the gradient? 53

Fig. B 4-8 54

Fig. B 4-11
Can they be plotted with the same time scale axis?

Pg B 4-14, last paragraph — What is the basis for the variables in the regression analysis? 55

Size distribution data is missing. This may help correlation. Will this be a part of Ph II

Note: Andy, let's do an inverse problem approach.

Pg B 5-5 — paragraph 1, last sentence
with rates of deposition less than would be expected. Floc generally increases settling rate. 56

Pg B 5-5, paragraph 2 — Is Timmie 1985 report available-- Z ????? results applied to what time period. 57

58	Pg B 5-14	Why after all the discussion on lateral variation, are you going to use 1D instead of 2D?
59	Pg B 5-18	What about a figure of model prediction versus observation.
60	Pg B 5-17	Is .2 calibration at two-line adequate?
61	Pg B 5-20	τ --> thickness is a bad choice τ --> usually shear stress
62	Pg B 5-21	Bed erosion is not an ordering process, it's an explosive threshold.

Table B 3-8 was misrepresentative

EPA HUDSON RIVER PCB REASSESSMENT
AGRICULTURAL LIAISON GROUP
REPORT TO HUDSON RIVER OVERSIGHT COMMITTEE
October 22, 1991

Our committee met on October 15, 1991 at the Saratoga Town Office Building in Schuylerville, NY, at 7:30 PM.

Although much time was spent addressing the recently reported news of DEC's intention to continue site evaluation of Site 10 in Fort Edward for PCB sediment encapsulation, I will first discuss reactions to the Phase 1 Report as this was the main intent of our meeting.

We were pleased to see that TAMS has seemed to make an honest attempt to view this large amount of data and that some adjustments were made to correct for previous "biases". Flow rates was an example, where it was noted that the previously held view of a "100 year" flood was more like that of a "500 year" flood.

It was suggested that the Phase 1 Report was too bulky for most members of the committee to thoroughly review. Realizing that this document was not necessarily intended for the average person to review, we suggest that future phase reports for communtiy interaction group review contain only the synopsis-like forwards of the Phase 1 Report and conclusions drawn from the information contained in that section. Some of the most pertinent charts and tables should also be included. This would provide a document with much more information than the Executive Summary we were presented with but much, much less than the entire report. Our members also feel strongly that ALL members of the committees should receive copies of such a document. If the EPA really wants a good evaluation of progress from our committee, we must have more copies of a more readable report to consider. 1

Basically the results of the Phase 1 Report were a relief. It seems like mostly "good news". Some questions were raised on the risk assessment, particularly on the assumed levels of consumption of Hudson River fish. These seemed extraordinarily high. We honestly feel these levels need to be corrected significantly downward. 2 In addition, have these risk evaluations included a projected decrease in PCB levels as indicated by the currently noted 3 1/2 year half-life? 3

One of our members attended a seminar at RPI recently which addressed water contaminants. He was much impressed by Dr. Richard Bopp's presentation and feels that his work should be given great weight in consideration of this PCB issue. 4

It was also noted that the scope of this project has been stated to be cleannup of the upper Hudson River, but that great attention seems to be given to Lower Hudson affect. If in fact cleanup of the Lower Hudson becomes a major consideration, than our group feels that ALL other sources of

5 PCB contamination must be identified. Residents along the Lower Hudson need to know how much total affect on PCB concentration will be made by remediation of Upper Hudson sediments. The levels indicated in the Phase 1 Report would seem to indicate that "cleanup" of Upper Hudson sediments would indeed have little affect on Lower Hudson contamination. This will have to be quantified realistically to resolve this issue between Upper and Lower Hudson residents.

With over 100 known customers of Monsanto PCBs alone in the Hudson River watershed and with chlorination of various municipal sewage discharges, we know the Lower River contamination is complicated.

We also would expect to see the consequences of
6 remediation techniques, including dredging and encapsulating
the sediments, to be thoroughly addressed in the following phases. Projected costs of such projects should also be included.

7 It is our understanding that the EPA is currently conducting a dioxcin risk review which includes PCBs. We would hope to see the results of such a current review included in risk evaluations of this project.

8 It was also suggested that the New Bedford project in Rhode Island may give information pertinent to this project.

Most of the concerns raised in our meeting related to finding out that DEC plans to continue its site review in Fort Edward. Our committee is wondering if our views make any difference at all. Is the decision already made and is
9 this whole community interaction and reassessment just an
expensive way to drag out announcing a predetermined result? If the EPA is operating in good faith, then can DEC carry out the dredging project in spite of a different EPA decision? The members of this committee do not want to waste their time or effort "spinning their wheels". Answers to these questions must come soon to prevent discouragement in this whole reasssessment process.

Clearly DEC's credibility has been greatly compromised. After requesting EPA's reassessment and then not even waiting for a decision to begin spending millions of dollars on an "assumed" project, we have good reason to doubt their open-mindedness. I think we will need assurance directly from EPA's regional administrator that EPA does not also hold DEC's biases.

Sincerely,

Thomas A. Borden

Thomas A. Borden
Chairman, Ag Liaison Group

C-10 and C-11

These commentors delivered oral comments at the Fort Edward Public Meeting; comments are not reproduced here.

Copies of the public meeting transcripts, showing coded comments, are appended to copies of the Responsiveness Summary that have been placed in the Information Repositories (see Table 2 of the Comment Directory in this document).

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PUBLIC INTEREST GROUPS
AND INDIVIDUALS

10.4547

SCENIC HUDSON INC
1963 1991

P-1

October 28, 1991

Mr. Douglas Tomchuk
Ms. Ann Rychlenski
Region II, US EPA
26 Federal Plaza
New York, NY 10278

Re: Hudson River Assessment Phase I Report

Dear Mr. Tomchuk and Ms. Rychlenski:

Enclosed are additional comments on the Executive Summary and Synopses of the Phase I Report. A copy has been mailed to your office today as well.

We urge you, once again, to plan to rewrite and re-issue the Executive Summary and Synopses, as they do not adequately reflect the severity of the problems of PCBs in the Hudson River estuarine system. We recognize that these sections are critical parts of the record that's being built to support a Superfund decision. As currently drafted, these sections do not adequately or correctly summarize existing conditions and thus do not serve the interests of natural resource and public health protection for people along the Hudson River.

Under a separate cover we plan to send you a marked-up copy of the Synopses indicating statements that are misleading or inaccurate.

If you have questions about our comments, please call at your earliest convenience.

Sincerely,

Cara Lee

Cara Lee
Environmental Director

/gm
Enclosures

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Scenic Hudson's Comments on the Phase I Report Interim Characterization and Evaluation

Hudson River PCB Reassessment Remedial Investigation/Feasibility Study prepared for US EPA Region II

October 25, 1991

Introduction

Scenic Hudson has supported a Hudson River PCB clean-up since the problem was first brought to the public's attention in the 1970's. To further that goal, Scenic Hudson has taken a number of actions, including, but not limited to: 1

* Scenic Hudson received party status in the New York State Industrial Hazardous Waste Facility Siting Board Hearings in 1986-1987. Expert testimony and witnesses supported the case for clean-up.

* Scenic Hudson was party in the law suit brought against EPA to regain $20 million in Clean Water Act funds that had been appropriated by Congress for PCB clean-up of the Hudson.

* Scenic Hudson has been a member of the Hudson River PCB Settlement Advisory Committee since 1985.

Scenic Hudson is concerned that information presented in the Executive Summary and the Synopses of the Phase I document, which by their abbreviated nature are the portions most likely to be read by the public, does not adequately portray the severity and magnitude of PCB contamination in the Hudson River. 2

Also a number of facts that have been left out are essential for understanding the context of the Reassessment. Moreover, a number of conclusive statements are made without adequate explanation or discussion, thereby misleading readers who are not intimately familiar with the details.

We have addressed individual sections of the Executive Summary, and have provided a "marked-up" copy of the Synopses, indicating our concerns regarding that portion of the text.

Scenic Hudson urges that the Executive Summary and the Synopses of the Phase I Report be rewritten to better represent the scope and nature of the Hudson River PCB problem. A Responsiveness Summary is insufficient as it will allow the seriously flawed presentation in the Synopses and Executive Summary to remain "on the record" as a primary source for decision makers.

I. <u>Information Missing from Executive Summary</u> 3

Background

The addition of the following important and relevant information to the Background Section of the Executive Summary presents a more complete characterization of the magnitude and severity of PCB contamination in the Hudson River. Certain facts on the history of prior decisions regarding remediation are critical and must be included to put the current status in proper perspective.

1) PCB contamination of the Hudson River is on EPA's National Priority list of Superfund sites. It is ranked 107th in a list of over 800 sites. The Hudson is ranked 5th on New York State's list of Superfund sites.

10.4550

2) The Hudson River has been characterized as both the most studied and worst case of PCB contamination in the country. Nothing in the summary indicates the comparative significance of the Hudson River PCB problem.

3) The loss of the striped bass fishery on the Hudson has had both economic and cultural impacts. An estimate of the economic losses in New York due to recreational and commercial fishery closure was 38.6 million in 1987 dollars. (Testimony of Bruce Schupp, Chief of DEC's Bureau of Fisheries, before the New York State Industrial Hazardous Facility Siting Board, 1987.) A rough calculation of total economic loss since the PCB regulations went into effect yields a figure of more than $400 million in 1987 dollars. This economic impact and natural resource loss is never mentioned in the summary.

A time-honored way of life, part of the "living history" of the Hudson may be lost forever with the sustained closures of the commercial fishery. The closure of the fisheries has had a measurable effect on fisherman's income and quality of life. Many striped bass fishermen could not switch to fishing for other species because it required the purchase of expensive gear and existing intense competition for those species. Thus, many abandoned commercial fishing and turned to service related work with low skill and income potential. (Testimony of several fishermen before the Hazardous Waste Facility Siting Board, 1987.)

4 4) In addition to the fishing ban on the upper Hudson which is referenced in the summary, there are health advisories on the consumption of all species of Hudson River fish, throughout the lower Hudson, indicating the public health impacts.

5 5) There have been several recent important regulatory decisions based on extensive testimony and research regarding the severity of Hudson River PCB contamination.

* In 1988, the conclusion reached in the Recommended Decision and Hearing Report by Administrative Law Judge (ALJ) Louis following the Industrial Hazardous Waste Facility Siting Board Hearing found that "substantial environmental benefits would be derived from the (Department of Environmental Conservation's) proposed Project with either few or relatively minor adverse environmental impacts." It also found that "the "no action" alternative including the biodegradation of concentrated PCBs, could not provide sufficient overall assurances that the PCB contaminate would not re-enter the water column."

* In January 1989, in its final decision, a majority of the New York State Siting Board determined that the project was necessary and in the public interest, although it did not approve the proposed disposal site, (Site G.) As of the same date, Department of Environmental Conservation Commissioner Jorling directed the Project Sponsor Group

within DEC to proceed with the development of a revised project using another disposal site (Site 10.)

6) The 1984 Record of Decision and the Current Reassessment:

Several factors pertaining to EPA's 1984 Record of Decision provide context important to the current Reassessment and should be summarized in the Phase I review, along with the other reasons that are given for Reassessment.

* EPA's 1984 Record of Decision incorrectly used an approximation of 5 parts per million (ppm) for the FDA tolerance level for PCBs in fish, though the standard had already been lowered to 2 ppm.

* The 1984 ROD concluded that cost-effective technology was not available to mitigate the damage to public health and the environment by the PCB contamination of the riverbed.

  Since that time, dredging to remove PCB laden sediments has been chosen as the preferred remedial alternative at other Superfund sites with PCB contaminated sediments.

* The Superfund Amendments and Reauthorization Act of 1986 (SARA) (Cercla S. 121 (b) (1)) states a preference for remedial actions "which permanently and significantly reduce the volume, toxicity or mobility of hazardous wastes." Additionally, SARA emphasizes protection of public health, and specifically mentions damage to natural resources which may affect the human food chain. This emphasis is certainly pertinent to the resources of the Hudson River.

II. Misleading Statements/Conclusions presented in Executive Summary 6

1) Background

The second paragraph of the Background section of the Executive Summary characterizes the release of PCB contaminated sediments as a historical event. In fact, the scour and release of PCB laden sediments from the upper River is a dynamic and on-going process. It is not a one-time occurrence related only to floods that followed the removal of the dam at Fort Edward in 1973, as implied. 7

New York State DEC documentation reports that "a single runoff event that occurred during the Spring of 1983 accounted for a 50 percent increase in annual PCB transport from the Upper Hudson River over the prior year." The Executive Summary should reflect the on-going desemination of contamination which is occurring.

2) Measuring and Reporting PCBs in Environmental Samples 8

Scenic Hudson disputes that "an understanding of chemical complexity" is necessary in order to assess PCB contamination. PCBs are regulated as a class of chemicals as suspected carcinogens, and must be managed as such.

In addition to the physical processes that occur after PCB discharge, thermal and physical processes also occurred prior to discharge which altered their chemical composition. Analyses of these processes can only serve to confound reaching a management decision, and serves to side-track the decision-making process. This section inappropriately raises questions that go beyond the scope of a manageable reassessment.

3) **Lower Hudson Characterization**

9 The discussion of other sources of PCBs in the lower Hudson is over-emphasized, relative to the known source of PCB laden sediments in the upper Hudson that is the subject of the Reassessment.

10 The analysis of 1990 New York State fish sampling indicates a declining gradient of PCB contamination from the Troy dam to New York Harbor, thus reflecting that Hudson River fish are receiving the most significant PCB inputs from the upper Hudson.

11 The existence of other sources of PCBs in both the lower Hudson and the upper Hudson is not being disputed, in fact it is agreed upon within the scientific community that other sources exist. There is also recognition that they are poorly documented and difficult to remediate, a fact which should be reflected in the Executive Summary. The presence of other PCBs in no way alleviates GE from its potential clean-up responsibilities under Superfund and has been used to cloud the issues the Reassessment must address.

12 The overall characterization of a decline of PCB levels in sediment, water and fish in the lower Hudson without indication that these trends can and have been reversed by higher flow in the River misrepresents the dynamic nature of PCB deposition, and the on-going nature of the problem. This characterization again minimizes the problem.

13 Though levels of PCBs in the water column have temporarily declined, acceptable PCB levels in the water column continue to yield unacceptable PCB levels in Hudson River fish, due to the process of biomagnification. This is a critical factor that has been overlooked in the Executive Summary, again a portrayal which minimizes the contamination scenario in the Hudson River.

14 The term "half-life" is misleading because it implies that there is a finite amount of PCBs in a stable system, which will presumably decrease exponentially over time, eventually approaching 0. However, the simplicity of this first order model renders it inaccurate for the Hudson River, a dynamic system. Approximately 2 tons of PCB laden sediments wash over the Troy dam each year into the lower Hudson, providing a long-term supply of contamination. This terminology should be dropped from the summary.

15 The summary states that "previous investigations that have

suggested that PCBs in striped bass of the Lower Hudson are dominated by the highly chlorinated PCB mixtures." In fact, a preferential uptake of highly chlorinated PCBs and preferential excretion of lower chlorinated PCBs by Striped Bass may be responsible. Thus, what may be an unfounded relationship is implied between highly chlorinated PCBs that were discharged in the New York City area and those found in lower Hudson Striped Bass. This is another case of information presented in a misleading way in the Executive Summary. In this case, the characterization minimizes the significance of GE's pollution.

The discussion of the "comparative and qualitative" risk assessment for the consumption of lower Hudson fish should be restated so that it does not minimize the risk associated with consuming lower Hudson River fish. According to the New York State Department of Health, the risk for consumption of Lower Hudson fish is unacceptable, thus the risk for the consumption of upper Hudson fish is even higher. 16

4) Upper Hudson Characterization

Sediment

The upper Hudson sediment characterization states that shifting sediments confound the comparison of sampling results at a given location over time and that too few samples have been taken to determine trends in PCB levels. 17

This portrayal of sediment dynamics is oversimplified and could easily be misinterpreted as "musical sediments" in which Hot Spot A migrates 20 miles to Hot Spot B. It is more likley that sediments will be heterogeneous over short distances, and that PCB concentrations are related to the type of deposit. For instance, pockets of fine-grained silt would tend to exhibit high concentrations of PCBs.

The suggestion that there are "too few samples" is a subjective determination about how much sampling is necessary in order to draw conclusions about the system. Sampling could be conducted ad-infinitum and not lead to any management decision.

The magnitude of the 100 year-flood may be overestimated, but this does not lessen the threat of more frequent flood events of lesser magnitude, which have already had measureable effects on sediment transport. (See Background.) 18

Water

Reference to the potential for reversal of the decline in PCB concentrations in the water column must be included in order to portray the current status in the proper perspective. 19

The finding that "Mass transport of PCBs....has declined from the late 1970's to recent years" is a reflection of 20 the removal of the dam at Fort Edward and sequential movement of PCBs downstream.

While there is a discussion of the lack of increase in the transport of the mass load from Fort Edward to Waterford, it should be emphasized that there has been little decrease in the sediment load in the last few years.

<u>Fish</u>

21 Again, there is no mention that the natural occurrence of a flood event in the upper River would have an affect on the noted "declines" of PCB levels in fish.

5) **Preliminary Human Health Risk Assessment**

22 The statement "...there appear to be unacceptable potential cancer and non-cancer risks associated with regular ingestion of fish from the Upper Hudson River" should be modified to include the lower Hudson as well.

6) **Interim Ecological Risk Assessment**

23 The summary states that "data are currently insufficient to justify a quantitative ecological risk assessment." However, it does not mention that the tolerance level for PCBs in fish-eating wildlife including birds of prey, otter, and mink is .1 ppm, significantly lower than the FDA tolerance level for humans. In a recently released report, the New York State Department of Environmental Conservation notes that "Even in the face of declines, contaminant conditions remain severe. Aquatic and terrestrial communities are at considerable risk. These conditions will likely persist long after (PCB) concentrations are deemed suitable for humans."

This additional information should be included in the Executive Summary and seems to justify a quantitative ecological risk assessment.

SCENIC HUDSON INC
9 VASSAR STREET · POUGHKEEPSIE, NY · 12601 (914) 473-4440

P-2

Scenic Hudson's Comments on The Phase I Report
Interim Characterization and Evaluation

Hudson River PCB Reassessment
Remedial Investigation/Feasibility Study
prepared for U.S. EPA Region II

Radisson Hotel
Poughkeepsie, NY

September 11, 1991

Prepared by:

Beth Gelber
Environmental Associate

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Good evening Ms. Rychlenski, Mr. Tomchuck, and concerned citizens of the Hudson Valley. My name is Beth Gelber. I represent Scenic Hudson, a regional environmental organization based here in Poughkeepsie, dedicated to the protection of the Hudson River and its natural, scenic, and recreational resources.

Scenic Hudson has been an advocate for the removal of PCBs from the river for over a decade. We welcome the chance to inform EPA and the public about some of our major concerns with EPA's Hudson River PCB Superfund Reassessment Process and specifically with the Phase I Report at this time.

PCBs in the Hudson River

1 Hudson Valley residents live with a history of stalled action on the clean-up of the Hudson River. The passage of time has not diminished the need for decisive action directed at managing the serious contamination problem that exists. Some half a million pounds of PCBs were released into the Upper Hudson over a 30 year period ending in 1976. 2 Now at least one ton per year is steadily being released from upriver sediments. Once deposited in the lower Hudson ecosystem, theses PCBs are essentially irretrievable.

It has been estimated that a sufficient "supply" of PCBs remains in the Upper Hudson to sustain the current level of contamination for at least 200 years. Not only are existing levels unacceptable, but there is a considerable risk that PCB levels throughout the estuary could dramatically increase if a major flood event occurs. A single runoff event that occurred during the Spring of 1983 accounted for a 50% increase in annual PCB transport from the upper Hudson over the prior year.

3 PCBs are a family of compounds that are suspected of causing cancer. New epidemiological studies show that they cause serious neurological damage. They migrate from contaminated soil and water, accumulating in greater amounts as they move up the food chain in fish, animals, and humans. Despite health advisories on the ingestion of Hudson River fish, they continue to be caught and eaten, providing the primary pathway for toxic exposure to humans.

4 The ban on commercial fishing of striped bass, a resident species particularly affected by PCB laden sediments in its habitat, has resulted in huge economic losses estimated at $40 million per year. But more than dollars have been lost as a result of PCBs. The commercial fishing industry on the Hudson has been virtually decimated, and with it part of the living history of the Hudson River.

Remedial technologies for the removal, containment, and treatment of PCBs have been chosen, tested, and proven effective by EPA at Superfund sites in Massachusetts, Wisconsin, Michigan, and the St. Lawrence River in New York.

Surely the Hudson River deserves equal treatment by EPA, especially in light of the magnitude of the problem here. Despite the new questions and findings that are raised in EPA's document, we think the bottom line has not changed - an unacceptable amount of PCBs continue to be washed over the Troy dam annually and contaminate the Hudson estuary. A sound plan already exists for remediation and should be the focus of EPA's reevaluation.

EPA's Phase 1 Report

The purpose of EPA's Superfund Reassessment Process is to arrive at a decision about whether to take remedial action on the Hudson and to pursue GE to cover the costs of clean-up.

The Phase I Report is intended as a review of existing information since the extent and impacts of PCB contamination in the Hudson River have been studied and documented for almost two decades.

5 Within the last decade, three separate reviews, two by the state and one by EPA, determined that removal of PCBs by dredging would provide substantial environmental benefits with either few or relatively minor adverse impacts. As recently as 1989, the State Hazardous Waste Facility Siting Board determined that there was a "public necessity" to dredge the contaminated Hot Spots. EPA should carefully consider the documentation supporting these prior decisions in its current Reassessment Phase.

We've had a short amount of time to review the document, but in our initial review we are troubled by two aspects of the report generally. One is that the document was intended as a review of existing information but in fact presents a number of new findings as conclusions that are highly questionable.

Misleading Conclusions

6 EPA's consultants have attempted to present detailed and complex information to the public in an accessible format through the Executive Summary and the Synopsis for each Chapter of the Phase 1 Report; we are concerned that the conclusions presented in the Synopses are misleading in their simplicity.

Broad and conclusive statements are made in the synopses on the condition of PCBs in the Hudson that are simplistic and have been stripped of important qualifiers and caveats. They are largely based on the use of new analytical models that have not been subjected to rigorous review by technical experts. It is inappropriate and premature for the report to present these conclusions without this type of review, as they will ultimately be factored into EPA's decision, and remain uncontested in the public's eye.

One member of the scientific community commented that information presented as fact in the Synopsis is merely "an interpretation of estimation and extrapolation." The text of the document supplies the caveats that characterize the uncertainty of these predictions and estimates.

New Questions

Secondly, the document raises a number of new questions that we do not think serve the purpose of reaching a final decision about Hudson River PCB management and could lead EPA down long and unproductive paths.

In particular, a number of questions have been raised in the document, that only GE is interested in having answered. For example, the Synopsis states that the lower Hudson was <u>historically</u> dominated by PCB inputs from the upper Hudson, but has also been influenced by other sources of PCBs. 7

While there may be other sources of PCBs, they are poorly documented and there is no plan for how they can be remedied. Furthermore, the presence of other sources of PCBs in the lower Hudson in no way alleviates GE's responsibility for discharging up to 3 million pounds of the toxic pollutant that now most restricts full use and enjoyment of the River's resources. 8

It has also been suggested that "congener specific" studies will be necessary to "better understand the exchange of PCBs between sediment, water, and fish" before a decision on remediation can be reached. This scientific hair-splitting to determine what type of PCB is present becomes tedious when one realizes that there are 209 PCB congeners that were mixed in different percentages in a variety of commercially prepared Aroclors. Thermal, chemical, and physical changes occurred when these mixtures were discharged by GE some 30 years ago or more. We see this request for chemical blueprinting as an attempt by GE to divert EPA's limited resources on scientific pursuits that will only serve to keep the clock ticking and put off a final decision. 9

We continue to be troubled by the fact that GE serves as Chair of the Scientific and Technical Advisory Committee for EPA's Reassessment. This is an impropriety considering GE's special interest in the outcome of the decision-making 10 process.

Public Outreach

11 There are two aspects of EPA's public outreach effort that we wish to address. We have stressed from the outset that the problem of PCB contamination is one that effects residents throughout the Hudson River corridor, yet public outreach efforts to date have focused on the upper Hudson. Original mailing lists for public information were limited to the Albany area and north. Today's public hearing represents the southernmost one scheduled. Since the document includes a characterization of the Lower Hudson, public hearings should be held for citizens from the lower estuary.

Secondly, we support the establishment of a Lower Hudson River Advisory sub-committee that would reflect down river environmental interests, to complement the existing Environmental Liasion Group which is comprised mostly of upriver interests.

Summary

In summary, we urge EPA to avoid becoming sidetracked and delayed by unwarranted additional studies and move swiftly towards choosing an appropriate set of remedial actions, with GE shouldering its share of the clean-up costs. It is our hope that the remaining phases of the review are focussed, action-oriented and executed quickly.

P-3

COMMENTS ON THE PHASE 1 REPORT FOR THE HUDSON RIVER PCB REASSESSMENT REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)

ENTITLED INTERIM CHARACTERIZATION AND EVALUATION

Public Hearing

Poughkeepsie, New York

September 11, 1991

INTRODUCTION

I am Donald Kent, Environmental Associate at the Hudson River Sloop Clearwater. Clearwater is a not-for-profit environmental education and advocacy organization whose mission is to restore and protect the Hudson River and its watershed through informed citizen action.

We have reviewed the Environmental Protection Agency's Phase 1 Report intended to be a review of existing information concerning the PCB contamination of the Hudson River. We commend the EPA for holding this hearing in Poughkeepsie and we recognize the magnitude of these problems. However, we are concerned that the information presented in the Executive Summary and in the various section synopses lacks a more complete explanation of the facts resulting in broad, misleading statements which tend to minimize the overall PCB problem. Clearwater is concerned that these statements may be perceived as fact by interested citizens and decision makers who are unable to plow through extensive data. We offer the following comments. 1

LOWER HUDSON CHARACTERIZATION:

After our review of the document we remain concerned that the EPA has not adequately characterized the impact on the Lower Hudson from the downstream transport of PCBs originating from the "hot spots" of contaminated sediment located in a forty mile reach of the river from Fort Edward to the Troy Dam. 2

The report states that the Lower Hudson, below the Troy Dam, was historically dominated by PCB inputs from the Upper Hudson, but has also been influenced by other "Lower Hudson sources which have been estimated to contribute PCB inputs of similar magnitude to current loads from the Upper Hudson." While there may be other sources of PCBs in the estuary, they are "poorly" documented and there is no discussion here, for example, to characterize concentrations, specific geographic locations, or bioavailability. Downriver sources in no way diminish the need to remove the PCBs upriver for which GE, as the polluter, is responsible. Assuming the loading estimates are correct, General Electrics PCBs are still responsible for 50% of the loading to the Lower Hudson. It would be more appropriate for the EPA to assess the impacts of the upriver sources on the Lower Hudson, rather than cloud the issue with these highly speculative Lower Hudson sources.

3 The Executive Summary stresses the "significance" of the investigations which suggest that "the PCBs in the striped bass are dominated by the highly chlorinated PCB mixtures that may have originated from Lower Hudson sources." Such a statement is very misleading without an explanation of the widely accepted fact that the higher chlorinated PCBs are more readily bioaccumulated and, therefore, are more likely to be found in the striped bass regardless of the source.

4 The report states that PCB levels in striped bass have declined since 1978 but fails to mention that the rate of decline has leveled off or stabilized, resulting in no statistically significant decline in striped bass PCB concentrations since 1981. This stabilization is a result of the 1977 ban on discharges of PCBs at GE plants, as well as the reworking and subsequent settling out of the PCB contaminated sediment after the removal of a dam at Fort Edward. Therefore, Clearwater believes that it would be inappropriate to forecast trends by comparing any of the current data to that of 1980 and earlier.

5 We question the EPA's use of Robert Thomann's model of PCB dynamics in the Lower Hudson. This document, which is based on numerous assumptions used to extrapolate questionable estimates, must be subject to the careful scrutiny of peer review by an independent body before any decision can be made to accept it as a viable model for transport, bioaccumulation or predictive capability. 6 Furthermore, the Thomann model is based on a decline in the striped bass PCB concentrations which show a low point in 1987. The inclusion of DEC's 1988 striped bass data showing an increase in PCB concentrations would certainly modify the conclusions made by Thomann.

7 While Clearwater is pleased to see that the EPA intends to complete a health risk assessment for both the cancer and the non-cancer effects of PCB exposure, we are concerned that this risk assessment does not include the Lower Hudson. Although PCB levels in the Lower Hudson are not as high as those found in the Upper Hudson, concentrations in many fish species are well above FDA levels and the fish from the Lower Hudson includes a much greater number of individuals potentially at risk. We urge you to consider risk assessment of the entire geographic scope of the PCB contamination originating upriver.

UPPER HUDSON CHARACTERIZATION:

The executive summary states on page E-9 that the "median PCB levels in fish have declined from levels ranging from 3 to 143 ppm, measured in the late 1970's to current levels ranging from 1 to 30 ppm. The average PCB level for all fish sampled in the Upper Hudson from 1986 to 1988 is approximately 12 ppm." These statements imply that the problem is going away but there is no reference to the fact that the PCB concentrations in fish are well above the FDA's tolerance standard of 2 ppm. Additionally, the time-trend regression equations used to obtain an approximate estimate of the total PCB levels in fish over the next 30 years fails to consider such factors as resuspension of contaminated sediment as a result of major flood events which could reverse this trend. (8) (9)

The synopsis which introduces the discussion on the nature and extent of the contamination implies that there are other Upper Hudson sources of PCBs but provides no estimate regarding the extent of these other inputs or information about their origins. Regardless of the impact from these other possible inputs, they in no way diminish the need to remove the well-known Hudson River sources commonly referred to as the "hot spots." (10)

Another example of how the Executive Summary and various synopses present information in a misleading fashion is the claim that the previous "flood frequency investigations may have overestimated the magnitude of the 100-year flood." A statement such as this, without explanation, implies that the magnitude of the problem is not as great as previously thought when, in fact, the speculation of future events based on the extrapolation of estimates in and of itself contains a large degree of uncertainty. Even if previous estimates have been overestimated, the actual measurement of a single run-off event in the spring of 1983 accounted for a 50% increase in the annual PCB transport from the Upper Hudson River over the prior year. The reality of the situation is that with or without floods the material located in the hot spots continues to be transported downstream at a rate of over 2,000 pounds per year. Given that an estimated 400,000 pounds remain in those hot spots above the Troy Dam, there exists a 200 year supply of time-release contamination. The Upper Hudson is a hazardous waste site of the worst kind because it continues to release a substantial quantity of toxic contamination into a dynamic river system on a regular basis. (11) (12)

As for biodechlorination, we continue to be extremely skeptical, at best, about the science-by-press-release nature of the experiments that the polluter is now pursuing in the river. GE hopes to convince EPA and the public that biodegradation offers a better solution to the problem then dredging. However, GE has not been able to quantify the rate of natural (in river) (13) (14) biodegradation or determine how quickly this process can be made to occur.

Although PCBs may be dechlorinating in the river the rate at which this occurs does not appear to be great enough to be considered an effective remedy. Current experiments attempting to accelerate dechlorination leave unanswered the important question of how this approach could be translated into a full-scale clean-up. Developing a scheme to implement accelerated in-river biodegradation may do more harm then good as it is likely to require the addition of bacteria, nutrients, oxygen and warmer temperatures into the river ecosystem. Furthermore, current research has linked the lower chlorinated end products of PCB dechlorination with neurotoxic health effects. It is Clearwater's position that the PCB "hot spots" be removed from the river and placed into a temporary containment facility where conditions effecting the breakdown of PCB can be controlled.

CONCLUSION:

15 The EPA has reached some new conclusions about the status of PCBs in the Hudson based on the use of new models. These conclusions as presented in the Executive Summary and Synopsis imply that the problem is going away or has been exaggerated in the past. It is inappropriate and premature for the report to present these conclusions without this type of review, as they will ultimately be factored into EPA's decision.

On behalf of Clearwater, I thank you for the opportunity to present these comments.

Respectfully submitted by Donald Kent

Donald P. Kent

TO:
Mr. Douglas Tomchuk
Hudson River PCBs Site Project Manager
U.S. Environmental Protection Agency
Region II - Room 747
26 Federal Plaza
New York, NY 10278

P-4

23 Miller Hill Drive
LaGrangeville, N.Y. 12540
September 11, 1991

Environmental Protection Agency (EPA) Region 2

Gentlemen/Ladies:

On behalf of the Hudson East District of the United Methodist Church (representing 62 churches on the east side of the Hudson River), I would encourage the EPA to do everything possible to expedite the cleanup of PCB chemicals from the Hudson. (1)

In 1989, the New York Conference of the United Methodist Church passed a resolution calling for a boycott on the purchace of any products made by General Electric Corporation. That resolution is still in effect because GE has not yet met the United Methodist's standard for corporate citizenship...it is an outlaw corporation.'.

In 1979 the EPA banned the use of PCB's because the chemical caused liver cancer . That was 12 years ago, yet our Hudson Valley People drink Hudson River water which contains PCB's. The laying of cable and other such activities stir up the PCB's lying on the river bottom.

Montgomery Livingston (1816-1855) great nephew of a sighner of the Declaration of Independence, was one of the first of the Hudson River Painters. Two of his sketches were, " Fishing on the Hudson River", and "Detail of Fisherman". Sadly, today one reads in the 1990-91 & 92 New York State Fishing Regulations Guide, "EAT NONE " pertaining to ten different species of fishes, including largemouth bass. It is high time to get on with the restoration of our quality of life on the Hudson to that of the last century.

Very truly yours,

Neil A Sinclair

Neil A. Sinclair
Chairperson for Church & Society
Hudson East Districh,
United Methodist Church

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SIERRA CLUB
MID-HUDSON GROUP
BOX 1012, POUGHKEEPSIE, NEW YORK 12602

P-5

September 11, 1991

To: The Environmental Protection Agency

I'd like to begin by thanking the EPA for its decision to have a meeting at a location where concerned citizens of the lower Hudson like us can participate. We, the MidHudson Group of the Sierra Club, which includes 1700 members in Ulster and Dutchess counties, want to express our dissatisfaction and frustration that the problem of PCB contamination has been allowed to persist for almost two decades. Meanwhile, an estimated average of one ton of dangerous PCB's leaks southward each year from their source 1
spot above the Troy Dam, polluting the river, harming wildlife, damaging the fishing industry, and creating a potential health and safety hazard. And nothing has been done to correct the problem and clean up the river.

In addition, the threat that flooding could release even larger quantities of PCB's into the river is like a 2
ticking time bomb that all of the industry assurances in the world cannot mitigate. What especially frustrating is that solutions are available. Technologies like suction dredging have proven effective in cleaning up other similar contamination sites. Obviously, the cost of such a cleanup effort has served as a deterrent for GE who has tried everything it can to avoid ~~liability~~ accountability. GE has probably spent more money on research than it would have cost to clean up the PCB's in the first place. Claims that PCB's are naturally biodegrading in the river have yet to be proven 3
and even if biodegradation were taking place, whether naturally or artificially induced, more damage would occur in the meantime, more PCB's would be spread. The problem is smaller today only because so much of the PCB's have already drifted into the lower Hudson estuary where they cannot be recovered. Further delay will only allow these dangerous trends to continue. Claims that there are other sources of PCB contamination are irrelevant unless they can be identified and cleaned up. They cannot divert us from wanting this site cleaned up.

The members of the MidHudson Sierra Club urge the EPA to end the shameful delay and force GE to clean up the river now. We're proud of our river. We feel the Hudson is our area's greatest natural resource and we would like to keep it that way, protected from the PCB threat. We will continue to voice our interest regarding this matter.

Jeff Perls
Conservation Co-Chair
Mid Hudson Sierra Club

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Laura Haight
8 Fox Terrace
Poughkeepsie, NY 12603

TESTIMONY BEFORE THE EPA ON THE HUDSON RIVER PCB CLEAN-UP

September 11, 1991

Good evening. My name is Laura Haight, and I am here as a citizen of Dutchess County, a tax-payer of New York State, and as a lover of the Hudson River.

First of all, I would like to thank the EPA for holding this hearing, and for its decision to reconsider taking action on what is considered by many to be the Hudson River's worst existing contamination problem, and a serious public health threat that has gone unaddressed for far too long.

Since PCBs are continuously being scoured out of "hot spots" upriver and flowing downstream into the estuary at an alarming rate, I urge the EPA to take immediate action to correct this problem. You can make this possible by ordering a Superfund clean-up of the PCBs, and by making G.E., not the tax-payers, pay for the cost of cleaning up the mess it made. 1

Clearwater, Scenic Hudson and other groups have had the opportunity to review the EPA's reports and provide detailed technical comments on the need for the PCB clean-up and how that should best be achieved. I support their position that the best solution at this time is to dredge the PCB-contaminated sediments from the river bottom, and to use available technology after removal to permanently destroy the PCBs.

My comments, therefore, will focus on the broader issue of environmental justice. I am saddened, but not surprised, that 15 years have gone by since G.E. was ordered to stop dumping PCBs into the Hudson, and yet, despite exhaustive studies showing that a clean-up is both necessary and technologically achievable, no concrete action has been taken to clean up the river. PCB clean-ups have begun in other waterways which are far less contaminated than the Hudson, and where the problem was discovered much later. The difference: G.E. was not the culprit.

A company the size of G.E. can afford to be responsible. In its April 29, 1991 issue, Forbes magazine listed G.E. as the most powerful corporation in the United States, based on sales, profits, assets and market value. Last year G.E. realized profits of $4.3 billion dollars. On a rather different list, G.E. also ranks Number 1, after the U.S. government, for creating the most Superfund hazardous waste sites in the country (51 at last count). Clearly, G.E. has found that it is more profitable and expedient to be irresponsible with its pollution practices.

G.E. employs a lobbying office in Washington, DC with over 150 staff dedicated to influencing the U.S. government to take actions favorable to G.E.'s interests. 150 staff -- that's larger than the entire U.S. Senate! G.E.'s role as one of the nation's three largest military manufacturers buys it even more political clout. And its cracker-jack team of P.R. professionals are able to spew out slick ad campaigns saying "G.E. brings good things to life" despite the company's miserable record of toxic and radioactive contamination at its facilities around the country.

G.E.'s contamination of the Hudson River is no exception. Numerous attempts have been made to derail the PCB clean-up project: and these attempts have come from the very top. In a 1980 amendment to the Clean Water Act, Congress appropriated $20 million for a Hudson River PCB Reclamation Demonstration Project.

Two years later, under the scandal-ridden administration of Anne Burford-Gorsuch, the EPA refused to release these funds because it claimed that "Superfund" money was available -- and then turned around and blocked the use of Superfund money for the project! Clearwater, the DEC, and other environmental groups had to sue EPA to retain the CWA funds for the cleanup project. They won -- but the funds were never spent for this pilot project because of the inability to obtain the necessary permits.

More recently, last December Congressman Gerald Solomon sent a letter to his buddy John Sununu in the White House, describing the PCB clean-up as an "environmentally-useless public works program" that would "help Governor Coumo [sic] politically", and criticized EPA Region II for "not working for Bill Reilly or George Bush or in the best interests of the environment" when it reopened the Superfund decision. One of Gerry Solomon's most valued constituents, of course, is G.E., which has contributed substantially to his political campaigns over the years.

I am raising these issues because I am concerned about G.E.'s very influential role in the EPA's decision-making process. G.E. is co-chair of EPA's Science and Technology Committee set up to review alternative clean-up technologies for the Hudson's PCBs. GE also has the audacity to publish a newsletter called "River Watch" designed to educate the public, as if GE were a disinterested party. The EPA is relying heavily upon G.E.'s data in its review of bioremediation as a clean-up alternative. While the laboratory work may show promise, the scientific community has been openly skeptical of G.E.'s hypotheses. This concern is enhanced by the fact that G.E.'s p.r. team continues to send preliminary test results to the press and politicians before the data is sent out to other scientists for peer review.

2

3

While G.E.'s claims of having spent $25 million in bioremediation research at first impressed me, I thought about it for a while and realized that this amount is a mere 5% of the estimated $500 million cost of dredging the PCBs from the Hudson River. If G.E. has figured anything out in its years of indiscriminate fouling of our land, waters, and skies, it's how to cut costs and turn a profit.

Around the country, EPA's failure to aggressively use its enforcement powers under Superfund to make polluters pay has unfairly shifted the burden of pollution clean-up to tax-payers. When EPA compromises with polluters, protection of public health and the environment is often sacrificed in the interest of cost savings. Indeed, a 1989 study prepared by the U.S. Office of Technology Assessment found that when the EPA seeks to obtain settlements with responsible parties, it selects clean-up methods that are substantially less stringent than clean-ups chosen for "government-funded" sites, and which are often based on speculative technologies. The study states that the involvement of polluters in shaping clean-up decisions "gives an unfair advantage to responsible parties over affected communities." Hence my concern about G.E.'s involvement in EPA's Superfund review process.

I, for one, think that the government has dragged its heels for too long in making a decision to clean up the Hudson. The EPA is already behind schedule in its Superfund review process. The longer we wait, the more PCBs flow over the dam at Troy, to the tune of one metric ton per year. We know the PCBs are there, and on the move. We know who dumped them. We know that commercial fishermen have lost their livelihoods, that innocent people are being exposed to a severe health risk, and that wildlife have suffered untold damage because of G.E.'s PCBs. We have sacrificed whole forests in order to print exhaustive studies about the problem. The technology is there. G.E. has the money. All we lack is a government with the guts to make G.E. pay for cleaning up the mess it made, and to do it in the most environmentally sound manner possible. I urge the EPA to make the tough decision to require that the PCBs be dredged from the Hudson, using the safest technology, and to make that decision now rather than later.

Thank you very much for the opportunity to express my concerns.

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Jon Powell
Po Box 279
Round Top, N.Y.
12473

P-7

1

I am a Commercial Fisherman AND environmental Educator. For the last 20 years we have heard all the talk of PCB's in the Hudson River and what <u>to</u> do and what <u>not</u> to do About it: ONE Fact has not been Lost throughout all the political and Environmenta rederick. It is that PCB'S are not a naturally occuring chemical in the river and that man put PCB's there and never had the right to do it in the first place.

It is no longer an issue of politics or policy. It is an issue of what is Right and wrong. It was wrong for G.E. to dump a chemical in the river. It is wrong for anybody to dump any chemical in any River!!!

PCB'S more than any other chemical waste has had the greatest and most far reaching effects on the Hudson River. It is not a Local problem to the north, it has affected this river the full Length of it's course, all the way to Long Island Sound.

It has effected the way people percieve this body of water, not only in the state but throughout the country!

10.4576

Because of G.E.'s mindless act of dumping PCB's indescriminately in the Hudson, they have created a chain of effects that has had both economic and social ramifications far more reaching than can be covered in this short statement.

As a commercial fisherman on the Hudson River I will speak specifically how PCB's have affected me. I came into the fishery about 7 years ago. because I love working on the river and to me there is no better way of making a living other than teaching other people about the river. But there is a cloud that hangs over this fishery. We have been forced by the spectrum of PCBS down to a very short season. Taken away from us has been a year-round fishery for stripper, bullhead, eel, herring, shad, ~~and~~ Atlantic ~~carp~~. sturgeon and carp. We have seen a strong viable fishery reduced to a few species of fish which we can sell, mainly shad, sturgeon and herring. We have seen the numbers of fishermen dwindle to a hardy few, mostly older men, which means that a way of

Life, heritage and tradition is dying with them. In this day and age of High TECH. it is a Shame that the tradition of handing down a skill, and trade to the next generation is being Lost. This type of pollution has sped up this type of Loss not only ~~Hear~~ but in other fisheries as well.

all of the fish I mentioned are in abundance now in the river. With the need for Strong Local food sources, our increasing dependance on foreign fish sources and the fact that the Hudson is one of the healthiest and most productive Estuarine Systems in the world it is a crime that because of PCB's this total resource can not be tapped and USED to its fullest.

My Son is eleven years old. He has been fishing with me on my boat since he was five. He Love it! He wants to be a fisherman and I feel he has a right ~~and~~ to. and have every opportunity to work on this body of water and make a living at it! But it can only be a dream unless we remedy the problem.

With the fast paced changing Technologies and the new types of Removal techniques, there is no reason not to remove and reclaim the P.C.B's from the Hudson River. In light of all the facts I urge you to move without reserve to eliminate the last great BLOTCH on this great Resource.

One further comment I'd like to make so you can fully grasp from pure economic standpoint what has been lost. If the fish I mentioned previously in this statement were all sellable it is not unfeasible that a fisherman could make up to $70,000/year. and not affect fish populations. This is because of the ~~[illegible]~~ diversity in valuable fish.

September 11, 1991

Mr. Constantine Sidamon-Eristoff
Regional Administrator
Region 2 EPA
26 Federal Plaza
New York, New York 10278

Re: Hudson River Clean-Up

Dear Mr. Sidamon-Eristoff: (1)

I write to you as a life time resident of Poughkeepsie and a concerned citizen of the Hudson Valley Community. You are here in Poughkeepsie to hear testimony from area residents concerning the future of the Hudson River. My message to you is simple: Do not, under any circumstances, let the past repeat itself. The contamination and pollution by industry, municipalities and individuals should not be tolerated ever again. Further, the Hudson River should be cleaned of all industrial waste now. The clean-up should be accomplished with great care so that the process of toxic-waste removal does not stir-up these pollutants and cause further contamination.

The Hudson River is particularily important to the residents of my city. You see, we drink its water. You can imagine how unnerving it is for city residents to read and hear of the wanton pollution of our river's waters by the rank carelessness of others. The EPA must educate the users of our river from its place of origin in the north to the City of New York that there are a substantial number of New York residents who require a clean river. Those who violate your laws and regulations should be held accountable. Nothing less is acceptable to us.

The EPA should assure that the cost of the rivers clean-up is born by those who polluted it. It has been reported that the clean-up cost will be upwards of $280 million dollars and that one of the major polluters, General Electric, settled its problem with the EPA for $3 million. We cannot accept that. It seems to me that a more equitable solution would have been to have required General Electric to perform an orderly and safe clean-up of the mess it made. After all, if your neighbor dumped garbage in your yard would you want $5.00 of his money or would you want him to clean your yard to the condition it was before he made the mess? Perhaps my view is too simplistic for either the federal government to see or too costly for General Electric to accept. But, I think you have my point.

One final thought, please don't be a stranger to Poughkeepsie. Your office is just a short drive away along the Hudson. Include us as well as our sister cities of Beacon, Newburgh and Kingston in your future consideration of our river. Its clean waters are a thing of beauty to all who see it, a source of life to the animals and fish that live in it and our drinking water. We are all counting on you to administer an orderly clean-up of it and to assure through education and regulation enforcement that the past doesn't repeat itself.

Sincerely,

Paul Buccellato

PAUL BUCCELLATO

TOM LAKE
3 STEINHAUS LANE
WAPPINGERS FALLS,
NEW YORK, NY 12590

IX-11, 1991

CONSTANTINE SIDAMON-ERISTOFF
REGIONAL ADMINISTRATOR - REGION 2
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
26 FEDERAL PLAZA
NEW YORK, NY 10278

SUBJECT: PCBs (HUDSON RIVER): TESTIMONY @ EPA HEARING, POUGHKEEPSIE-NY

1

I have been associated with commercial fishing operations on the Hudson River for 21 years, and have been a licenced shad fisherman for the past six years.

Our commercial season on the Hudson runs from approximately April 1st through the end of May; two months, 9 weeks, minus the storms that keep us on shore, minus the 'escapement period', those 36 hours each Friday and Saturday when all commerial efforts must cease. From those nine weeks we get about 30 days in which to set our nets, take American shad, and go about the process of selling our catch.

There was a time when shad season pretty much coincided with a commercial striped bass season. The presence of PCBs in the river has eliminated that fishery, as well as American eel, white perch, and white catfish.

TOM LAKE

IX-11, 1991

The **AMERICAN SHAD**, referred to as the QUEEN OF THE HUDSON by the New York State Department of State, is a seasonally available species. In April and May, New York City's Fulton Market is inundated with shad from the Delaware and Hudson rivers. The sellers try to convince the buyers that all of the shad are from the Delaware, or the Connecticut River. They would like to sell their fish, and they know what the buyer would like to hear. Local Hudson Valley markets are no different. Our shad are sold along with black sea bass from Rhode Island and lobster from Cape Cod, with no attempt made to designate the origin of our fish.

Over the past dozen years, repeated tests have shown that the American shad's metabolism does not seem to 'take up' PCBs. The American shad has been given a clean bill of health, by the New York State Department of Health. Why then do we make up stories about the origin of our shad in the marketplace? Why do commercial fishermen have to hide the truth?

I help conduct a series of ten "shad bakes" on the Hudson River each spring, with the Hudson River Foundation, from Manhattan to Troy, Hudson River mile 1 to 154. At these programs we serve smoked shad, pickled shad, and baked (planked) shad, a traditional event that has its origin in colonial days. Many participants are interested, but decline the 'taste' of shad. They tell us that they have heard that the fish in the Hudson River are poisoned. They often cannot remember which fish, but to be safe, they will have none. Guilt by association.

TOM LAKE

IX-11, 1991

Selling Hudson River American shad is an adventure. Each time you pull your nets, you realize that there is a reasonable chance that you will be unable to sell your catch. And if you can, its origin may have to be concealed.

The New York State Department of Health has issued advisories regarding the consumption of certain Hudson River fish. American shad is not among them. Either is the Atlantic sturgeon, another important Hudson River commercial species. The presence of PCBs in the tidal Hudson has had far-reaching effects, not only on those fish directly affected, but on other species, whose only crime is sharing the same watercourse.

The Hudson Valley consumer is wary of anything that has its origin in the Hudson River: fish, blue crabs, drinking water, beaches for swimming. This attitude comes as a direct result of the introduction of PCBs into the estuary, and the resulting 15 years of negative publicity.

I help conduct a series of six "blue crab festivals" on the Hudson River each fall, also with the Hudson River Foundation, from Manhattan to Bear Mountain State Park. Many attendees arrive convinced that blue crabs are poisoned with PCBs. Most are convinced otherwise by the time they leave. A considerable number of Hudson River blue crabs are sold at Fulton Market each year. However, if you visit the market, you will find them being offered as 'Maryland blue crabs'. Although seemingly unaffected by PCBs, the Hudson River blue crab suffers the same fate. Guilt by association.

TOM LAKE

IX-11, 1991

The effect of PCBs on the Hudson estuary goes well beyond fish and crabs. PCBs have become the major stimulus in the public's attitude towards the river. If the fish are poisoned, the water unsafe, perhaps the river is beyond repair. Perhaps developers should take possession of the shoreline, reduce wetlands to parking lots and mini-malls. Children's impressions are reinforced by the attitudes of adults, which often ranges from skepticism, to absolute disdain for the river. That is a situation from which the Hudson will struggle to recover for many years to come. There is a direct correlation between the biological viability of the Hudson, and the attitudes of those who live, work, and play along the river.

Public uncertainty about shad, sturgeon, and blue crab make the commercial marketplace a charade. Public opinion on the edibility of striped bass has been damaged beyond repair in my lifetime. At least one-half to two-thirds of the historical Hudson River commercial fishing potential has been eliminated by the introduction of PCBs.

There was a time, before PCBs, when we could go to our local fish market and see Hudson River striped bass and American eels. That was a time when someone could go to the banks of the Hudson, and catch their dinner. Just when the Hudson was emerging from a century of sewage and commercial abuse, General Electric endowed our river with a lifetime supply of toxins. It doesn't have to be a lifetime.

TOM LAKE

IX-11, 1991

People have been born, will live, and will die, never having seen the Hudson River as anything more than a poisoned waterway. I have the opportunity to talk to school children in the Hudson Valley, who have always associated the aquatic life of the Hudson River, with PCBs. To them, life in the Hudson is synonomous with a poison.

PCBs have become a wedge between the people of the valley and their river. We have allowed a natural system to loose its balance. This is a crime against life, which we have a chance to correct. We have an opportunity for restoration of not only the biological balance of the estuary, but also the social values and responsibilities.

I fully support the effort to hold General Electric fully financially accountable for the cleanup of PCBs in the Hudson, given the overwelming financial and social damage their negligence has incurred on the river.

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106 Pancake Hollow Road
Highland, New York 12528
September 11, 1991

Mr. Constantine Sidamon-Eristoff
Regional Administrator
Region 2 EPA
26 Federal Plaza
New York, NY 10278

Dear Mr. Sidamon-Eristoff:

Having recently relocated back to the Hudson Valley after a 20 year absence, I am pleased to see the Hudson River's water quality seems to have improved. The Hudson has withstood years of abuse and is coming back, thanks to the concerted efforts of hundreds of individuals and organizations. Despite these efforts, however, an ominous threat remains. Hundreds of thousands of pounds of PCBs lie in the sediment of the Upper Hudson, above the Troy Dam, threatening the vitality of the River and the health of the people of its Valley.

Since I live downstream from the contaminated site, and enjoy the recreational amenities of the Hudson River, I am extremely concerned about this issue. PCBs have been identified as probable carcinogens and have been linked with reproductive and nervous system disorders and birth defects in humans. PCBs have entered the food chain of the Hudson and so highly contaminated the fish in our River that Health Department officials have warned us to limit consumption of fish taken from the Hudson. 1

PCBs continue to wash over the Troy Dam and spread through the estuary at a rate estimated at between 2,000 and 5,000 pounds annually. In addition, these contaminated sediments can potentially be washed over the dam in larger quantities in the event of a major storm. 2

I urge the Environmental Protection Agency to order an immediate and complete cleanup of the PCB contaminated sediments of the Upper Hudson. Once removed, the sediments should be contained and the PCBs destroyed. Finally, the expense of this cleanup should be borne by the polluter--General Electric.

Thank you for providing this opportunity to comment on this issue.

Very truly yours,

Jeffrey Anzevino

Jeffrey Anzevino

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P-11

September 11, 1991
Ian Burliuk, Owner
North River Fish Company
Susquehanna Tpke.
Durham, N.Y. 12422

Dear Sir: 1

I'm writing you today to urge the EPA to continue it's efforts to include the upper Hudson River in the Superfund and to go forth quickly with dredging and encapsulation of PCB hot spots.

As I have been a commercial fisherman for nearly 20 years, most of my comments will address PCB impacts on fishing, others can and have brought focus to the many sides of this issue. Commercial fishing on the Hudson, with a history of better than 300 years, has in this century been crippled by excessive pollution. With the focusing of public attention by pioneering environmental groups like the Clearwater and the passage of the Federal Clean Water Act of 1972, federal, state, and local organizations clean up efforts have resulted in vastly improved water quality. Over a billion dollars has been spent since 1966 on municipal and industrial waste treatment*, and yet over 500,000 pounds of PCB contaminants remain in the Hudson. The eating of contaminated fish is the most potent form of human exposure to PCBs, levels being some 4,ooo times higher than breathing or drinking risks.

Since findings in 1976 indicating high levels of PCB contaminate levels in certain fish, severe restrictions were placed on commercial fisheries on the tidal portion of the Hudson, the Troy dam south to the Battery. Fisherman lost major portions of their income and seasons with the ban on sale of striped bass, eel and other species. Now employed ashore for most of the year fishermen find it difficult to return to the river for a short spring shad run where a good year might only just cover time and expenses. Fewer than 50 fishermen remain of several hundred not long ago.

Shad, crab and other remaining fisheries face stiff market resistance, fostered by the stigma of PCB contaminates and State Health Department advisories against eating river fish. To try to explain to potential buyers at seafood shows, regional wholesale markets or even local restaurants that your fish are unaffected by PCBs is to dwell on a negetive, seldom a sales tactic which brings high prices or even orders. Fish sold outside the river valley are often quickly relabeled as comming from other waters.

*Hudson Valley alone

The renewal of important fisheries in the Hudson would stimulate seafood business throughout the entire Northeast. Fulton Market, in N.Y.C. would certainly benefit from the addition of stripped bass to it's dealings. My own business's gross stock could easily double or triple even without the additional employees and boats that would follow a lifting of restrictions on sale of bass other fish.

I have long felt that the Hudson has the potential to be the finest small boat fishery on the east coast once free of the shadow of PCB contaminates. Healthy stocks, strong market demand and proximity to markets ensure that commercial fleet would prosper.

The Hudson is a spawning ground for anadromous fish, shad, stripped bass, herring and others, important to the entire mid Atlantic seaboard. Ocean finfish such as bluefish spend time in the lower estuary and in time accumulate elevated PCB levels. The river is a significant part of the Atlantic flyway, waterfowl are likewise exposed to PCB contamination.

Recreational fisherman are also exposed to PCBs, the number of citations issues for fishing above the troy dam has always been high. Hook and line fisherman in the mid Hudson region continue to eat stripped bass, bullheads and other fish with elevated PCB levels. New York City estimates that 81,000 of it's residents fish it's shoreline and consume their catch.

I can't help but think that if dredging and encapsulation had gone ahead rapidly in the 1980's that I might be fishing for stripped bass today rather than writing this letter. The EPA has moved to restore waterways in MA., IL., WI., CT., and the St. Lawrence. Is the Hudson too polluted or not worth the effort? I think not, the river valley is again being recognized as the natural wonder it is, it's beauty an inspiration to a school of painting, it's waters capable of being both rich with fish and commerce.

2 The EPA should not be put off from it's task by red tape or dirversions thrown its way. Biodegradion is not working, there has not been a significant drop in PCBs since 1981. The slow natural decomposition of the aroclor 1254 component of PCBs ensures that without dredging and encapsulation a fully rehabilitated river will never be a reality. Over a half million pounds of PCBs dumped over a 31 year period leaves the polluter, General Electric with an obligation to restore the river valley.

The EPA can now narrow it's eyes, view the Hudson north of the Troy dam as a backwater away from America's mainstream, not worthy of the time and expense of a clean-up or provide the leadership to restore a river that has been called America's

Rhine, that has been a birthplace for the arts, commerce and industry, and that has been described as a natural wonder since the earliest of times when our nation had such an abundance of nature.

Dredging and encapsulation are viable, the cost of inaction is greatest, the environmental benefits easily out weigh the costs involved.

Sincerely,

Ian Burliuk

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JOINT STATEMENT
presented at
EPA HUDSON RIVER PCB HEARING
Poughkeepsie, New York
September 11, 1991

My name is Sonia Bouvier. I work for Hudson River Sloop Clearwater, Inc., a nonprofit environmental education and advocacy organization dedicated to the protection and restoration of the Hudson River. I am submitting the following statement as a representative of a coalition of twenty other concerned groups and organizations.

General Electric's dumping of over 500,000 pounds of PCBs into the Hudson River from 1946 until 1977 has had extensive social, public health, environmental and economic consequences. PCBs are the single contaminant which most limits our use and enjoyment of the Hudson River. The spread of PCBs throughout the river and its food chain has created one of the most extensive hazardous waste problems in the nation.

Commercial closures and limitations of recreational fisheries due to PCB contamination of Hudson River fish have caused thousands of fishermen to lose their jobs and has resulted in an estimated annual loss of $40 million to New York's economy.

Consumption of PCB contaminated fish from the river poses a serious threat to public health as it is the most potent route of human exposure to PCBs. From Fort Edward to the Troy Dam, there is a ban on all fishing due to PCB contamination. South of the Troy Dam, the New York State Department of Health has advised us to "Eat none" of ten species of fish including American eels, Largemouth bass, White catfish and Striped bass. Unfortunately, many recreational anglers are unaware of existing health advisories, and continue to eat contaminated fish exposing themselves and their families to dangerous levels of PCBs, increasing their risk of cancer, liver dysfunction, reproductive disorders and other health problems.

The EPA's current reassessment of the Hudson River PCB contamination under Superfund is important for three reasons:

First, the EPA may decide to rectify the public health threat posed by consumption of PCB contaminated fish, an action which is long overdue. Second, the Environmental Protection Agency can decide to hold General Electric, the polluter, responsible by paying clean-up costs. Finally, the 1

EPA must move to restore the Hudson River, consistent with its decisions for PCB-contaminated waterways in Massachusetts, Illinois, Wisconsin, Connecticut and on the St. Lawrence River in New York.

Unfortunately, the EPA's current reassessment falls short
2 in a number of ways. Although the impacts of PCB
contamination are felt up and down the river, on Long Island
and beyond, the EPA's reassessment has had no meaningful
review of the impacts of the upper Hudson's contamination on
the estuary below the Troy dam, thereby lowering the stakes
of a clean-up from the outset. In addition, the
participation of downriver interests has been hindered by the
3 fact that EPA has failed to hold any public meetings south
of Poughkeepsie.

EPA's work plan for its reassessment relied heavily on
4 information and analysis provided by General Electric. This
is an unacceptable bias, given that General Electric has
clearly stated its opposition to any remediation involving
dredging.

Despite the urgent need for a decision on the fate of the Hudson, EPA is now a year behind schedule on the reassessment.

While we've waited and continue to wait for test results,
5 reassessments and decisions, an estimated 2,000 to 5,000
pounds of PCBs wash over the Troy Dam and spread throughout
the estuary every year. At any time, a major flood could
scour remaining PCB contaminated sediments, forever washing
them out of our reach.

Threats to public health will remain and economic losses
6 will be felt until PCBs in fish decline. PCBs in striped
bass remain well above the FDA tolerance level of 2ppm.
Unfortunately, PCB levels in striped bass have not undergone
a statistically significant decline in a consistent manner
since 1981.

The evidence shows that the only way to bring about a reduction of PCB levels in fish is to reduce the level of PCB contamination in river sediment. The possibility of dredging PCB contaminated sediments in the Hudson river has been thoroughly explored and studied. Both the Environmental Protection Agency and the New York State Department of Environmental Conservation have previously completed reviews which have stated that dredging would provide substantial environmental benefits with few and relatively minor adverse impacts. Dredging is the only proven method of remediation that has been successfully implemented at other PCB sites. Dredging has been chosen by the EPA as a preferred remediation alternative at five other Superfund sites. The Hudson River deserves equal treatment.

Signed,

American Littoral Society

Citizen's Campaign for the Environment

Citizens Environmental Coalition

Sarah Clark of the Environmental Defense Fund

Environmental Planning Lobby

Max Feinstone, Environmental Commission, Township of Rochester, Ulster County

Ferry Sloops, Inc.

Patty Hotchkiss, Westchester County Legislator

Hudson River Sloop Clearwater, Inc.

Sandra Kissam of SPARC

Warren McKeon of Hudson River Environmental Society

Monmouth County Friends of Clearwater

Everett Nack, Commercial Fisherman

Natural Resources Defense Council

New Jersey Environmental Federation

Orange Environment

George Pataki, New York State Assemblymember, Westchester/Putnam

Scenic Hudson, Inc.

Staten Island Friends of Clearwater

Walkabout Clearwater

At this point, I would like to take this opportunity to present ~~11,433~~ 11,531 signatures on the following petition:

TO EPA REGION 2 DIRECTOR CONSTANTINE SIDAMON-ERISTOFF:

The General Electric Co., prior to 1977, dumped over 500,00 pounds of PCBs, a toxic chemical, into the upper Hudson River. To this day, PCBs continue to spread throughout the river system and the food chain it supports. PCB contamination has prevented full use and enjoyment of the Hudson River, and causes a threat to public health and economic loss due to contamination of Hudson River fish.

Therefore we, the undersigned, urge you to take action under the Federal Superfund Program to ensure the prompt and comprehensive removal of PCB contaminated sediments from the Hudson River, and the treatment of those sediments before disposal to destroy the PCBs. Further, we urge you to ensure that G.E., as the responsible party, pays for the clean-up program.

The many organizations and individuals who have signed on to this statement, as well as the more than eleven thousand people who have added their named to this petition are representative of the widespread and deep public concern about the PCB contamination of the Hudson River. These people are depending of the Environmental Protection Agency to take action to protect the health and well-being of the public, as well as the environment. Clearly, a second "No action" decision by the Environmental Protection Agency would be unacceptable.

Thank you for this opportunity to present our concerns.
Respectfully submitted,

Sonia Bouvier
For the PCB Action Coalition

FEDERATED CONSERVATIONISTS OF WESTCHESTER COUNTY, INC. **P-13**
Dedicated to environmental planning and education for the preservation of our natural resources.
Natural Science Bldg., State University of New York, Purchase, New York 10577 (914) 251-6888

September 12, 1991

Mr.Doug Tomchuk, Project Manager
Hudson River PCB Reassessment
EPA, Region 2
26 Federal Plaza
New York, NY 10278

Dear Mr. Tomchuk:

Federated Conservationists of Westchester County, Inc. (FCWC), a coalition of 65 environmental organizations and several hundred individual members, was an intervenor in the 1975 DEC proceeding to stop General Electric's continuing pollution of the Hudson River with PCBs. On behalf of FCWC's Board of Directors and membership, I am writing to say we are dismayed with the continuing lack of action on the cleanup of PCBs. 1

It has been more than a dozen years since General Electric ceased dumping this dangerous waste product into the Hudson River, one of our nation's great natural resources. Now the time for research has passed, and the time for action is past due. Since many pounds (one to five thousand according to last night's meeting) of PCBs continue to pour over Troy Dam yearly and find their way into the lower Hudson and into the bodies of fish that migrate to the Long Island Sound and beyond, each year spent studying the matter only increases the spread of the material and the difficulty of its remediation. It is incredible that your agency plans to continue its research at least until 1993 before any action is taken. While we are clearly anxious that the lower Hudson (our "backyard") is included in the cleanup, perhaps, at the very least, some of the clearly identifiable hot spots in the upper Hudson can be dredged now and an open-ended tab could be kept for GE to pay. I am sure this is not how your enabling legislation reads, nor how the process works, but to continue to allow the downflow of these chemicals while this endless study proceeds simply does not make sense. 2

Additionally, FCWC urges that immediate dredging of Hudson River PCB contaminated areas begin because 1) the serious public health threat of PCBs persists, and new research points to hitherto undiscovered hazards (as we learned last night, many individuals consume contaminated fish in spite of warnings; also, the plight of Hudson River fishermen and the fishing industry deserves attention); 2) the efficacy of PCBs' in situ biodegradability as researched by GE is scientifically unproven; 3) technologies currently exist that offer several alternatives to the disposal of PCB contaminated sediments; and 4) clearly GE should pay the lion's share of cleanup costs.

I am sure you were as impressed as I with the number of individuals present at last night's meeting and with the content of their comments. This issue clearly affects Hudson Valley residents in many ways, and we know that PCB contamination continues to spread far beyond the river. Therefore, FCWC encourages the EPA to begin the restoration of the vitality of our magnificent Hudson River immediately.

Sincerely,

Gudrun Le Lash

Gudrun LeLash
Executive Director

GL/bl

cc: Ann Rychlenski

JOHN S. GRIM
1 KERR RD.
RHINEBECK, N.Y. 12572

P-14

September 23, 1991

Ann Rychlenski
Community Relations Coordinator
United States EPA - Region II
Jacob J. Javits Federal Bldg. - 26 Federal Plaza
New York, NY 10278

Dear Ms. Rychlenski,

I attended the public hearing on the Hudson River Reassessment Phase I Report on September 11, 1991 at Poughkeepsie. For the record, I have the following statement and comments to make relative to the PCBs in the Hudson River.

Before any action is taken to clean up the PCBs in the river, I would like to see the following accomplished:

1. Identify all sources of PCBs as to Arochlor and quantity. That would include sources via each major tributary, rain, air and incoming tidal waters at the mouth of the river. 1

2. Perform tissue accumulation bioassays in situ with test fish and other organisms at various points in the river from the Battery to above Ft. Edward to identify minute amounts of PCBs that do not show up in an analysis of a water sample but do accumulate in fish tissue. This would also indicate the rate of natural PCB detoxification that exists, if any, as one proceeds up or down the river. 2

3. In case a major flood occurs, conduct a series of analyses of samples taken during and after the peak flows to determine the amount of PCB erosion from the "hot spots" between Ft. Edward and Troy.

4. Where PCB encapsulation has been conducted on other streams, evaluate the success of such operations on the streams and around the encapsulated area. Include such information in any future reports to the public. 4

5. When the discussions and investigations of the PCBs in the river are completed, draw up a plan for the elimination of all the sources of PCBs and a time schedule for it to be accomplished. 5

As to the PCB deposits below Ft. Edward, and regardless as to their first being dredged and removed, I am requesting that the PCBs in those deposits be detoxified by one means or another. Encapsulating the deposits without detoxification constitutes producing a problem to solve a problem; much like digging a hole to fill a hole.

6 If GE thinks they can detoxify the PCBs in place, let them first conduct an on-site demonstration that shows their plan is both effective and practical. If it proves to be successful, it would be preferable to a dredging-encapsulation procedure.

There seems to be a lot of differences in opinions on the entire subject of PCBs and how to eliminate them from the environment. Emotions have camouflaged the facts. Its up to the EPA to separate the two. It may also be necessary for additional investigation and testing before any definitive action can be recommended. I am all for it.

Sincerely yours,

John S. Grim

John S. Grim
Aquatic Biologist

Sept 12, 1991

Dear Ms Rychlenski,

I was happy to be in attendance at the meeting at the Radison hotel in Poughkeepsie. As a matter of public record I wish to enter the written comments in this letter as I did not speak at the meeting.

First I am angered at the attempt by the Environmental Protection Agency to spread total disinformation on some facts. For example your committee member George Pavlou made a ~~m~~ false statement and said that the reason the EPA did not release the Data Bank information on Phase I studies was because the information was stored in a software package called Paradox! He further stated that the Paradox Software was not user friendly and that is the reason EPA has not realeased the information stored in Paradox on your Disks!

Well that statement is a ~~lie~~ misleading because Paradox is very user friendly, as I

(over)

1

can attest to. I have only a high school formal education and I was taught to use Paradox on my job at Metro North Rail Road. I attended a few basic courses on IBM Personal computer & Basic DOS and learned the Paradox Relational Data Base Management System in a short time. So I wish to Refute that statement by the EPA.

It is typical of the Reagan Bush disinformation campaign and double speak through the government agencies such as EPA who mimic the Reagan Bush stonewalling tactics. Also I

(2) resent your intimacy in the form of having a General Electric Scientist sit on your committee. Apparently your conciences can not be jogged to do the upright thing by your fellow citizens!

I have no idea what religion any of you are but apparently it has not taught you sound moral conduct as you prostitute yourselves with the corporate polluter General Electric.

(next page)

I will tell you a passage of the Bible does indicate that the creator is very angry at those who are ruining this planet, the works of his hand! The scripture reads as follows "I will bring to ruin, those ruining the earth."

So I urge you + your colleagues to expunge yourself of the influence of General Electric if not then at least give equal representation to concerned environmental groups + concerned citizens!

As far as your continuing to study the problems of PCB, I feel that you have more than adequate information of accumulated Data of 15 years since after the PCB discharges by General Electric Corp into the Hudson River! The time is now for EPA to use all power at its command to force General Electric to Pay for the full cleanup effort and subsequent remedial operations to neutralize the PCB. The PCB's should go back to G.E Property and monitered progress on neutralization of the dangerous (over)

3

10.4604

PCBs.

I get the impression the EPA is trying to speak over our heads as if the public is not able to understand the concepts you espouse! This simply is not true as the general public has been made very enlightened ~~by~~ on a wide array of pollution problems and their ensuing health risks!

There are several aspects which have not been considered and a full economic impact study has never been made by the loss of the fisheries + other associated losses. You have not

(4) made known the fact that many other wild life has to drink and use Hudson river water such a diversity of species as ducks, geese, foxes, turtles, muskrats, racoons, weasels, deer, partridge, hawks, herons, gulls and many other wildlife are also users of the river and may very well suffer for generations from PCBS!!!

This is a tradgedy of great magnitude and the bigger tradgedy

(next page)

is that you who have a public charge to protect our air and water are indifferent to the public interest, you are worried only of your own selfish economic condition and do not rock the boat lest you lose your job. But remember that you & everyone suffer for this shortsighted thinking by the long term environmental degradation and consequential loss of health and ~~to~~ economic ~~losses~~ which weaken the overall community state and nation!

Whatever your allegiance is one fact remains Pollution affects all living things on earth and no one escapes the wrath of ignorance or callousness towards your fellow citizens!

In Conclussion I am telling you people that I as a tax payer & property owner and concerned citizen, Do your Job by enforcing the law against General Electric who is wholly responsible for the PCBS in the Hudson River.

(Over)

We all live down stream and we are all suffering the consequences of the Criminal Actions of General Electric. They (General Electric) is a socially irresponsible corporation and must be brought to answer to the full measure of the law. Justice must be done Now, not after more study!

Respectfully

Michael T. Cuneo
RSD 4 Scarsdale Rd
Carmel N.Y. 10512

P-16

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September 26, 1991

Doug Tomchuk, Project Manager
U.S. EPA Region 2
Jacob K. Javits Federal Bldg.
New York, NY 10278

RE: Hudson River PCB Reassessment

Dear Mr. Tomchuk:

I am writing in my capacity as Chairman of the Legislative Committee for the Adirondack Regional Chambers of Commerce which represents 1500 business firms in Warren, Washington and northern Saratoga counties.

I was in attendance at the public meeting held in Fort Edward on September 12, 1991, on the Phase 1 Report. Unfortunately, I had to depart prior to having an opportunity to speak.

I had previously attended the public meeting held in Saratoga Springs on December 13, 1990, at which time I presented the resolution adopted by the Board of Directors opposing dredging of the Hudson River, a copy of which I am enclosing.

Since the December meeting, the Adirondack Regional Chambers of Commerce has received no information which would cause it to change its position in opposition to dredging and supporting work in the continued development of a natural biodegradation process. Furthermore, nothing I heard at the public meeting in Fort Edward would cause a change in that position and indeed, almost everything I heard would reinforce it. 1

Although I personally believe that the information generated by the Phase 1 Report would be sufficient to make a sound business judgment to continue the no action alternative, I recognize the bureaucratic need to continue the process as originally planned.

The Adirondack Regional Chambers of Commerce will continue to keep informed on all developments and looks forward to a final report determining that dredging is not a proper solution.

I would appreciate this letter being made a part of the record of the September 12 meeting. Thank you very much.

Sincerely yours,

Robert S McMillen

Robert S. McMillen

RSM/fl
Enc.

ARCC

DATE: DECEMBER 13, 1990

RESOLUTION REGARDING
THE EPA's PLAN CONCERNING PCB's IN THE HUDSON RIVER

WHEREAS the Environmental Protection Agency is involved in a Hudson River reassessment in order to determine what action may be necessary and appropriate relative to the presence of PCB's (polychlorinated biphenyls), and

WHEREAS in the past the EPA has studied the river and recommended no action as being the best course to follow, and

WHEREAS there exist possibilities that new discoveries of a biological nature developed by General Electric Company and confirmed by independent sources could reduce PCB's in the Hudson River by using a naturally occurring biodegradation process, and

WHEREAS an application has been made by General Electric Company seeking permission to demonstrate the likelihood of success of this method, and

WHEREAS dredging, as currently proposed, would create a broad range of problems including PCB sediment disruption, hindrances to commercial and recreational boat traffic and shoreline erosion, it is hereby

RESOLVED that the Adirondack Regional Chambers of Commerce, representing 1500 business firms in Warren, Washington and northern Saratoga Counties, is opposed to the dredging of the Hudson River until all other avenues (including biodegradation processes) are investigated, and it is further

RESOLVED that the ARCC urges the State of New York and the Environmental Protection Agency to reject the proposed dredging process and to work collaboratively with General Electric Company and any other interested parties to develop a natural biodegradation process.

ACCREDITED
CHAMBER OF COMMERCE
CHAMBER OF COMMERCE OF THE UNITED STATES

136 Warren Street, Glens Falls, New York 12801 • (518) 798-1761

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P-17 through P-43

These commentors delivered oral comments at the Fort Edward or the Poughkeepsie Public Meeting; comments are not reproduced here.

Copies of the public meeting transcripts, showing coded comments, are appended to copies of the Responsiveness Summary that have been placed in the Information Repositories (see Table 2 of the Comment Directory in this document).

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10.4614

presented by [illegible] Haggard.

Statement
by the
General Electric Co.

Prepared for U.S. Environmental Protection Agency
Public Meetings on Hudson River Reassessment Project
September 11 and 12, 1991

General Electric Co. is pleased to have this opportunity to comment on the Phase I report of the Hudson River Reassessment Project. GE has consistently urged the Environmental Protection Agency (EPA) to use the best scientific methods and their best judgment in conducting the reassessment. This is necessary for a fair and complete understanding of all the environmental disadvantages and all the environmental benefits connected with taking any remedial action in the Hudson. Only by understanding all of these factors will the best decision be made.

It is important to note that the current reassessment follows EPA's 1984 review of the Hudson River. At that time, the agency declared dredging was not appropriate but that other actions, such as the sampling of drinking water and the capping of remnant deposits in the upper river, were necessary.

What has happened since 1984 is significant. The EPA-recommended actions now have been taken. More important, new data presented in the Phase I report and from other sources indicate that EPA's 1984 decision was correct. For example, it is clear now that there have been steady improvements in the health of the Hudson River. Additionally, data on the types of PCBs present show that the PCBs in the lower river are predominantly from lower-river sources, not the upper river. In fact, tidal flows are causing PCBs from the New York metropolitan area to move upstream toward Poughkeepsie. Finally, recent scientific investigations show that the PCBs present in the upper Hudson River have a much lower toxicity than originally thought.

Despite these encouraging findings, misconceptions about the river have persisted. GE would like to address these misconceptions and myths:

MYTH #1: The condition of the Hudson River is not improving.

1

In fact, the Hudson River is showing steadily improving conditions. PCBs in the water column have declined substantially. From Fort Edward to Waterford, the average water column concentration of PCBs has been found to be well below the drinking water standard. At Waterford and Poughkeepsie, communities that draw drinking water from the Hudson, no PCBs were detectable in the drinking water. In fact, the water supplies are meeting health standards even before treatment.

The upper Hudson today supports fish populations that are nearly as diverse and balanced as in the 1930s. The lower Hudson continues to be one of the most diverse fisheries on the Atlantic Coast.

2

The concentrations of PCBs in fish in both the upper and lower river have decreased dramatically since the 1970s. In June 1989, an independent report for the Hudson River Foundation -- the Thomann Report -- predicted that the reopening of the lower-river commercial fishery would be possible within a few years as lower Hudson River fish begin to show PCB concentrations below the Food and Drug Administration level.

Furthermore, EPA, in its 1984 Record of Decision, found a "decreasing threat to public health and the environment." Since 1984, according to the current Phase I report, PCB concentrations in the water column of both the upper and lower Hudson have declined significantly (Page B.4-16) The Phase I report also acknowledges that PCB concentrations in fish are not rising and, in fact, that "PCB levels in all fish species appear to have declined in recent years." (B.4-30).

MYTH #2: All of the PCBs in the lower river originated in the upper river. 3

The majority of PCBs found today in the lower river do not come from the upper river. The Phase I report recognizes that PCBs are being discharged into the lower river from a host of sources in the New York metropolitan area. These additional PCB sources are important to consider since the higher chlorinated PCBs from New York metropolitan area sources appear to be the dominant ones currently found in the fish in the lower Hudson. (A.3-11) Tidal flow would cause not only salt water but also PCBs to move upstream toward Poughkeepsie from the New York metropolitan area.

Other investigators, including academic institutions, have found that PCBs concentrations in the sediments do not steadily decline from the upper river to the lower river, as one might expect if the upper river were the single source. All along the river are found occasional high levels of PCBs, indicating local sources associated with municipal and industrial discharges. These PCBs generally are not the type that were used by GE at the Hudson Falls and Fort Edward plants, evidence that again points to local sources.

Moreover, the kinds of PCBs and other chemicals found in fish in the lower river are the higher chlorinated forms, which are different from the ones found in the upper river. PCBs and other chemicals found in the migratory species of fish, such as striped bass, appear to have come *not* from the Hudson River, but from outside waterways, such as New York Harbor and Long Island Sound.

4 ***MYTH #3: PCBs have been shown to be highly toxic.***

Scientists are now re-evaluating the potential toxicity of PCBs. New information shows PCBs pose much lower risks to public health and the environment than originally thought.

Recent scientific information supplied to EPA by an independent research organization showed that different types of PCBs have different toxicity. In particular, PCBs with lower amounts of chlorine, similar to the ones that were used by GE at Hudson Falls and Fort Edward, were not shown in laboratory tests to cause cancer. EPA uses these tests to determine if a chemical should be treated as a carcinogen.

Other researchers have come to similar conclusions. For instance, Dr. Edward Burger, director of the Institute for Health Policy Analysis, wrote in an article published last year in *Daedalus: The Journal of the American Academy of Arts and Sciences:*

"PCBs are described as cancer-causing agents, yet no scientific evidence justifies this reputation."

5 ***MYTH #4: PCBs persist in the environment and therefore are dangerous.***

PCBs break down naturally. They do not persist in the environment, as was once believed. They are broken down naturally by organisms that live in the river. GE reviewed 1,000 sediment sample results obtained by the Department of Environmental Conservation in 1984 in the Fort Edward area. In 70 percent of the samples, significant biodegradation was found. Evidence of some biodegradation was presented in 90 percent of the samples. PCBs mixtures found in upper Hudson sediments 20 years ago had an average of 3.5 chlorines per PCB molecule. Today, the PCBs in those sediments have only two chlorines per molecule, which is further evidence that the existing anaerobic bacteria in the river have extensively dechlorinated PCBs. GE scientists have demonstrated in the laboratory techniques to accelerate the biodegradation of PCBs. This summer, the company has been conducting a first-of-its-kind, in-river experiment to gather data on the rate at which PCB biodegradation can be accelerated in nature.

6 ***MYTH #5: Nothing has been done about PCBs in the Hudson.***

Significant steps have been taken since 1984 to promote improvements in the river's condition. Since 1984, GE has spent $15 million capping the remnant deposit sites, the places where PCBs collected along river banks, near Moreau. By some estimates, the capping process alone has reduced transport of PCBs by more than 30 percent. In addition, GE has continued a major, nationally recognized research effort into PCBs and has committed to spending $50 million on projects at our own facilities and at a half-dozen university centers. This summer, GE began an experiment in the Hudson River to further document the rate at which PCBs break down naturally in the river. We have constructed a $2-million research station in the upper Hudson, where we are testing biodegradation data developed during years of laboratory work.

MYTH #6: Dredging will solve the river's problems. 7

The natural recovery process is the best answer for the river. Dredging will cause ecological harm and community disruption and will not significantly accelerate improvements in the river's condition. EPA's 1984 Record of Decision emphasized the potential harm from dredging and rejected dredging as an appropriate remedy. EPA said "bank-to-bank dredging would be environmentally devastating to the river ecosystem and cannot be considered to adequately protect the environment." Even if the negative impacts of dredging could be eliminated, EPA determined that disposal of the contaminated sediments would not be practical or cost-effective. EPA noted that dredging just the "hot spots" would have a limited impact on water column concentrations of PCBs. Any positive impact would depend on the extent to which the PCBs could be controlled. EPA concluded that the "technology and methodology of (hot spot) dredging in a dynamic, riverine environment is unproven and uncertain." (1984 ROD, Page 7)

EPA also reasoned that any form of dredging would require construction of a landfill near the dredging site, but said "the likelihood of such a site being available in the near future is highly questionable." (1984 ROD, Page 8)

Dredging would require the removal of thousands of tons of sediment, mainly along shorelines where PCBs have collected, in the very areas where fish propagate, vegetation grows and the ecosystem is supported. Dredging would disturb the fish population and remove plants, dramatically disrupting the healthy ecosystem that now exists in the river.

Nothing in the current Phase I report suggests that dredging technology has advanced since 1984 to mitigate or eliminate the harms that EPA said dredging posed. The Phase I report fails to discuss the significant adverse consequences of dredging, especially harm to the ecology of the river and long-term disruption of the community.

With respect to the lower river, local sources of PCBs appear to be the problem. Dredging of upper-river sediments would have little or no impact on lower-river sediments. To impact the PCB problem in the lower river will require that lower-river sources be controlled.

Conclusion

Based on information EPA has presented in the Phase I report and other studies, it is apparent EPA's 1984 decision was correct. The data collected since 1984 documents the continued improvement in conditions in the river. The recently completed capping of remnant deposits should have a measurable impact on river quality. Additionally, the new scientific evidence on the lower toxicity of PCBs and the occurrence of widespread natural biodegradation reinforce EPA's 1984 decision.

It is also apparent that PCBs in the lower Hudson River are not derived from the upper Hudson but rather from local sources within the lower Hudson River Valley. The data presented by EPA do not show that dredging technologies have improved nor that impacts due to dredging have been significantly reduced. The lack of benefits from dredging, particularly in the lower river, point to natural restoration as the appropriate remedy.

This commentor delivered oral comments at the Fort Edward Public Meeting; comments are not reproduced here.

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The 335-page General Electric commentary (G-3) is not reprinted here. The table of contents of G-3 is reprinted following this page along with notations of the comment numbers coded for each section. Appendices A (coded as G-4 and G-5), B (coded as G-6), and C (coded as G-7) of GE's commentary are reprinted in this volume following the table of contents for G-3.

The full 335-page GE commentary, showing coded comments, can be found in the Appendix to the Responsiveness Summary, which has been placed in the Information Repositories (see Table 2 of the Comment Directory in this document).

Appendices D through I of GE's "Appendices to Comments" (Oct. 24, 1991) are not reprinted; these Appendices are reference materials provided by GE and do not contain specific comments on the Phase 1 Report. The index to GE's Appendices A through I can be found in the Appendix to this Responsiveness Summary.

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G-3

COMMENTS OF THE GENERAL ELECTRIC COMPANY ON EPA'S PHASE 1 REPORT

TABLE OF CONTENTS

10.4625

Comment #s Appear in Sections of G-3 as noted below:

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APPENDIX A
SPECIFIC PAGE BY PAGE COMMENTS

Executive Summary

Pg. E-1, par. 1: EPA cites an upper bound of GE discharges of 1.3 million pounds. To GE knowledge there is not any reliable information to support the use of this number in this or any other document. EPA should carefully review all data presented to it. 1

Pg. E-1, par. 2: The discussion of the Fort Edward Dam implies that the dam was a GE dam and the removal was done by GE. The report should clarify that this was not the case. 2

Pg E-1, par. 3: The discussion of the commercial fishing ban on the taking of striped bass fails to mention the conservation reason for the ban as well as the fact the majority of the PCBs in the striped bass do not originate from within the Hudson River. 3

Pg. E-5, par. 3: EPA's conclusion that the historical loading to the Lower Hudson was dominated by those from the Upper Hudson is an assumption proposed by others and accepted by EPA without critical evaluation. As discussed in these comments, the data does not in fact support such a conclusion. 4

Pg. E-5, par. 4: EPA states that the PCB deposition in the Lower Hudson occurred around 1973, implying that this coincides with the removal of the Fort Edward Dam. The actual data from the lower river does not support this and, in fact, show that the maxima in PCB concentration may have, in fact, occurred in 1971, two years prior to the dam removal. The PCB maxima in the sediments is not inconsistent with the national use patterns and data obtained from other rivers. This and other significant information point directly to other dischargers as being important. 5

Pg. E-10, par. 3: The EPA's assessment of the carcinogenic potency of PCBs is based on out dated information. This information has been supplied to EPA and must be considered as part of this reassessment. 6

E-10, par. 3: EPA Region II points to emerging evidence on neurological or developmental effects of PCBs. GE is unaware of any thorough evaluation of the published data on these topics being done by EPA. It is premature for EPA to conclude such effects occur due to PCB exposure. 7

Pg. E-13, par. 3: GE urges EPA not to move forward, at this time, with the data collection proposed in the Phase 2A sampling plan. GE's comments on that document are included here by reference. GE, also, would like to express the concern that EPA has not allowed public comment on the Phase 2A sampling plan. 8

Section I - Introduction

9 Pg. I-1, par. 2: Many months ago EPA asked for comment on the January 1991 review copy of the Phase 1 work plan for the Reassessment Remedial Investigation and Feasibility Study (RRI/FS). To date, EPA has not made available to GE a response to comments or a final work plan. GE formally requests that EPA make all comments received available to GE and that EPA issue a final work plan.

10 Pg. I-2, par. 3: EPA states that the reassessment is being performed for the river bottom sediments from Hudson Falls to the Federal Dam in Troy. In a number of places in the Phase 1 Report, EPA seems to ignore this definition and to expand the scope. Specifically, EPA baseline risk assessment includes the risks posed by PCBs from the sources above Rogers Island. Additionally, EPA is including excavation technologies that may have application to removing the remnant deposits in the initial screening of technologies. EPA needs to stay within the scope of the defined project. GE believes the EPA should allow GE to determine the impacts of the EPA mandated remedy of the remnant deposits on the rest of the river. GE believes monies expended by EPA to study the remnants area in a way that duplicates work GE is required to perform will not be recoverable by EPA from GE.

11 Pg. I-3, par. 1: Both GE plants did not begin using PCBs in 1946. The source of information relied upon for making the statements about the history should be identified.

12 Pg. I-3, par. 2: EPA states that particularly large quantities of PCB were released downstream during spring floods of 1976 and 1983. Records prepared by the NYDEC and reported in the main body of GE comments show that the majority of sediment moved into the Thompson Island Pool in 1973. Lesser amounts moved during the spring of 1974 and lesser amounts during the spring of 1976. The USGS monitoring data indicates some increase above the prior year occurred during the spring of 1984 but nothing like the magnitude of sediment movement that occurred right after the dam was removed. It is also important to note that the vast majority of sediment were trapped behind the dams a short distance downstream of the dam that was removed (limited movement).

Section A - Lower Hudson Characterization

13 Synopsis, par. 3: The statement made that PCB loads form the lower river sources are of the same magnitude as those form the Upper Hudson River is misleading. The most recent analysis prepared by Thomann, et al. (1989) shows that the vast majority (78%) of PCBs are coming from lower river sources. EPA states (pg. 4-28) that Thomann's estimate of upper river loading may be over-estimated by 90%. This would indicate that Thomann's estimate that 78% of the PCBs in the lower river are from the lower river is probably much greater. EPA appears to have contradictory

information in the report. The statement needs to be revised.

Pg. A. 1-3, par. 2: The presence of a cyclic trend is not obvious in the precipitation data presented in figure A.1.1. A more interesting and relevant observation from this data is that the period of the mid-1970's, experienced the highest sustained precipitation in the entire record and at that period of time the precipitation was not typical. 14

Pg. A.1-12: The reference to NYDOT in December of 1984 is not in the references section of the report. 15

Pg. A.1-12 to A.1-1-28, Section A.1.4 (Aquatic Resources of the Lower Hudson): Salinity and dissolved oxygen (DO) are well documented water quality parameters that influence the distribution of aquatic biota. Salinity effects are acknowledged. DO is not discussed. Additionally, the abundance of the fish populations are presented as being principally dependent on abundance of food. Although food availability is important, abiotic factors (temperature, salinity and DO) are also important. EPA should review data on thermal and DO impacts on the distribution and abundance of aquatic biota to present a balanced treatment of the topic. 16

Pg. A.1-24, par. 2: 3 parts per thousand salinity is equal to 3 ppt, not 0.3 ppt. 17

Pg. A.2-2, par 2: The section on the physical and chemical properties of PCBs needs to be greatly expanded. EPA needs to compile on a homolog (and possibly on a congener basis) the octonal-water portion coefficients and Henry's Law constants. In the literature there is contradictory information on these types of parameters. A critical analysis of this information for this project, to help understand the processes affecting PCBs in the Hudson, is necessary. 18

Pg. A.2.2, par. 2: EPA's estimation of PCB load to the lower river from the upper river is greatly flawed. 19 As discussed in Section 6.0 of GE's comments, the rise of PCBs levels in the sediments over time follow a national trend in PCB use. Additionally, the sediment record, as analyzed at Foundry Cove in the lower river, shows a peak in PCB concentration that corresponds to the peak in cesium level which is in 1971. This is 2 years before the dam at Fort Edward was removed. 20

Additionally, GE believes the core sample analyzed by Dr. Bopp from mile point 188.5 is misinterpreted. The core from mile point 188.5, shows low levels of PCBs in the sediment at depth. 21 In shallower sections of the core there is an abrupt increase in PCB and cesium level. This has been interpreted by Dr. Bopp and Dr. Simpson as showing a build up to a peak (corresponding to the 1973 dam release). This interpretation assumes that the sedimentation rate in the core was constant with time. This is clearly not in keeping with the facts. After the dam was removed, significant volumes of sediment were transported into the Thompson Island Pool. A more plausible interpretation of the core is that prior to 1973, there were very low levels of PCBs moving past the dam that were removed. This is shown by the low levels of PCBs found in the core at depth. At this same depth, the cesium 137 level is detectable indicating that the deposits occurred after 1954. The abrupt increase in PCB and cesium 137 level occurred in the fall of 1973 (dam removal) and continued through the spring of 1976. The important finding is that prior to the dam removal the transport of particle bound PCB was probably very small. Therefore. contribution to the lower river by the upper river prior to 1973 was probably very small.

EPA's suggestion that the sediment cores confirm that peaks of PCB contamination in the lower river occurred in 1973 is not confirmed by the data. Additionally, prior to 1973 the data do not show that significant PCBs were being transported down stream. The NYDEC sediment data collected in 1977 also shows that the deposit wedge of sediment released during the breaching of the dam in 1973 extended only 20 or so miles down stream of the breached dam. EPA must review all data being relied upon and also must begin looking for the other obvious sources of PCBs in the Hudson River system.

By EPA's own estimate, from 1977 to 1989 approximately 15,000 kilograms of PCBs were transported from the Upper Hudson River to the Lower Hudson River. Even if this estimate is greatly increased to account for the period of time between 1973 to 1977, the numbers still do not show that the Upper Hudson was the major source implied by EPA and others. The discrepancy between this estimate and the estimates of others that show greater amounts of PCBs in the Lower Hudson River sediments is another significant indication that the Upper Hudson River is not the major PCB source to the lower river. It is also significant that by EPA's own admission, the input from the upper river is known with more certainty than the other inputs. The information presented indicates the other sources were and continue to be significant.

22 Pg. A.2-4, apr. 2: 0.2 lbs/day equals approximately 0.1 kg/day, not 1.0 kg/day.

23 Pg. A.2-5, Section A.2.6 (Atmospheric Deposition): The discussion on atmospheric deposition of PCB in the Phase 1 Report does not adequately characterize the total atmospheric flux of PCB to the Lower Hudson River. Atmospheric transport and deposition is a complex process which is difficult to quantify. Therefore, extreme caution must be used when applying empirical data from remote sources or limited data from local sources to estimate atmospheric PCB loading. The Phase 1 Report fails to account for the elevated atmospheric concentrations of PCB near urban centers which has been measured to be 5 to 10 times higher than in rural areas (Eisenreich

et al., 1981; Doskey and Andren, 1981). It also relies on estimates from Thomannn et al. (1989) which do not appear to include PCB flux due to dry deposition. Recent data suggests that PCB associated with coarse particles contribute significantly to the total PCB dry deposition flux and that this flux is much greater in urban areas than in nonurban areas (Holsen et al., 1991).

There are no reports of direct measurement of atmospheric deposition of PCB to the Lower Hudson River. Direct measurement would provide the best means of determining the fraction of the total downstream load represented by atmospheric deposition. In the absence of direct measurements, models which incorporate the most recent findings regarding the different forms of atmospheric PCB flux should be utilized.

Considering the lack of direct measurements of Lower Hudson River deposition and recent data underscoring the significance of particulate PCB flux in urban areas, it is evident that EPA estimates of PCB loading based on empirical models of atmospheric PCB deposition are inadequate. Atmospheric flux to the Lower Hudson River is not characterized well enough to estimate the importance of this source.

Pg, A.2-6, par. 2: 1.0 ppb equals 1.0 ug/l, not 1.0 mg/l. 24

Pg. A.3.1, par. 2: EPA relies heavily on the work of the researchers of Lamont-Doherty Geological Observatory and has proposed funding for them to continue past research efforts for this project (see EPA Phase 2A work plan). In theory the use of radioisotope markers would be useful in establishing absolute dates and then to correlate the dates with events and PCB levels. However, as the published work by the Lamont-Doherty Observatory shows, the vast number of cores do not yield information that is
readily interpretable. For those that do, great care in 25
interpreting the results needs to be exercised. As an example is the core obtained from Foundry Cove in the Lower Hudson River. This core shows two peaks in cesium 137 content. The first peak is attributed to the maxima in atmospheric fallout that occurred worldwide in 1963. The second peak is attributed to releases from the nuclear reactor at Indian Point. While GE is still researching the date the second peak occurred, we do have serious concerns with the date of the first peak. While the peak in atmospheric discharge may have occurred in 1963, the peak in river sediments should actually lag behind this by a couple of years while the particles deposited by atmospheric deposition, in the basin are translocated downstream. This shift in the peak to years after 1963 has been documented in Great Lake sediments (Oliver, et al., 1989). Until this is understood the only absolute dates that can reasonably be assigned to the cesium data would be the 1971 data (source is localized and basin lag would not apply) and the 1954 date in which cesium 137 first appeared, and of course the date

which the core was obtained.

EPA also needs to carefully review those interpretations presented that make arbitrary assignments to time based on the PCB level. The 1977 NYSDEC survey indicates that there is a deposition wedge of PCB that extends approximately 20 miles downstream of the dam. This indicates there was not mass movement of PCBs to the lower river on sediment particles in 1973. However, it is assumed by the Lamont-Doherty researches that this mass movement did occur and they arbitrary assigned the peak in PCB in the core from Foundry Cove as occurring in 1973. The actual data form the cesium information demonstrates that the peak actually occurred in 1971.

The Lamont-Doherty work also has limited application to extrapolating any estimates of PCB values to any location other than the cores examined. As is seen in the data supplied in section 6.0 of GE's comments, the point measurements vary by over an order of magnitude in a small distance. This is not unusual for a river system for a contaminant like PCBs, particularly given the following:

1. PCB preferentially bind to fine grained particle

2. The shear stresses vary on a small scale in the river due to local variations in flow velocity

3. There are probably numerous local sources causing great spatial variation.

Therefore, any attempt to take a measurement of sediment must account for all these factors. While a particle of sediment suspended in the water is related (possibly in a very complex way) to the PCB level in the water column, particles are sorted to some extent by size during the sedimentation process so an area of extremely low shear stress will accumulate finer material with higher PCB content, while depositional areas subject to higher stresses will preferentially deposit larger particles that probably have lower amounts of PCBs. Therefore, attempts to back calculate PCB levels in the water column based on sediment measurement are potentially very inaccurate.

EPA must carefully evaluate the techniques that have been applied by others and to objectively evaluate the interpretations that can be made. In fact, EPA should convene a peer review group to evaluate the data generated by Lamont-Doherty Geological Observatory prior to collecting additional core samples.

26 Pg. A.3-2: Par 2: On Figure A.3-1, EPA presents an interpretation without any apparent attempt to review the underlying data. A person not familiar with what is going on could be mislead into concluding that the figure presents raw data. As will be seen, the assigned dates used as substitutes for the actual raw data

measurement of depth are subject to interpretation.

As an example, when the data were first published in 1985, the graphic display showed a significant PCB increase in 1963 and the peak in 1974. The results are also presented in a 1989 report by Bopp and Simpson (Contaminated Marine Sediments -- Assessment and Remediation: National Academy of Sciences). In the 1989 report, the same data are present on a different time scale. The first increase in PCB level is shown occurring in 1960 and then the peak in PCB concentration is shown in 1973. The fixing of this date appears completely arbitrary and is based on the assumption that the peak corresponds to the dam removal. This change in data presentation and the lack of correspondence to other data calls in serious questions the validity of assumptions derived from this core. GE is very concerned that EPA is not performing a detailed, critical evaluation of this information. EPA has in its possession the information showing these discrepancies. This is even illustrated in the EPA Phase 1 Report. In Figure A.3-1 data on one time scale from the core taken at mile point 188.5 is given. In Figure B.3-6, the same core is shown with a different time scale. GE again requests that EPA not perform additional work along these lines until a detailed critique and review is performed by the EPA.

1. Core from mile point 188.5 - The results of this core were presented in a report dated June 30, 1985 submitted by Bopp et al. to the NYSDEC (Report Number NYS-C00708). The cesium data from Table IV of the report shows that the bottom portion of the core contains detectable levels of cesium in the bottom with low levels of PCB (less than 2 parts per million). There is than an abrupt increase in cesium level and PCB. This abrupt rise in PCB is attributed to the removal of the dam in 1973. The deposition rate during this period was undoubtedly significantly greater than prior to the upstream dam being removed. The most plausible explanation of circumstances from this core is that low levels of PCB transport occurred in the 1960's. After the dam was taken out, a significant amount of sediment was transported into the Thompson Island Pool. This fits with all available data.

2. Core from mile point 53.8: This location is from Foundry Cove, and has been published in a number of articles. This location is within the saltwedge and would be greatly influenced by down stream sources. In an article published by Bopp et al. (1982) Figure 6 clearly shows that the peak in PCB concentration is in approximately 1970 to 1971. This date was set by the 1971 peak in radionuclides related to a known release from a local nuclear power plant. The most obvious conclusion is the peak in PCB content occurred before the dam in Fort

Edward was removed.

3. Core from mile point 88.6: The data from this core is only available to GE in report by Bopp and Simpson (1989). The data presents PCB by year instead of by depth. The cesium data is not presented. Due to the problems noted with other interpretations, the actual raw data should be obtained and reviewed. GE requests EPA make this date available to GE.

4. Core from mile point 91.8: In this core the cesium 137 values in the lower part of the core are not reported (54-40 centimeters). The PCB values are very low in this section of core. An abrupt peak in cesium occurs at 24-28 centimeters and than shows a fairly steady level until the core was collected in 1977. The peak in cesium is reported as being 1963. The PCB levels increase to a peak of 28.8 parts per million. This peak is arbitrarily selected as occurring in 1973 to coincide with the removal of the dam. There is no independent data that can be used to show that this approach (i.e. PCB peak equals 1973) is valid in this part of the river. It is not known if this area had ever been dredged, had constant sedimentation rates (or nearly constant), etc. This arbitrary use of assigning the PCB peak to 1973 also does not fit what was believed to be a 3 year period (until the 1976 flood) of significant sediment movement within the Upper Hudson River.

5. Cored from mile points -1.65 and -1.7: The data from these core is only presented in the paper by Bopp and Simpson (1989) and the raw uninterpreted cesium data is not present. EPA should obtain and review this data and make it available to GE and others for review. The data as presented in the EPA figure shows a significant peak in 1970, well before the removal of the Fort Edward Dam.

From the data, and the fact that out of the cores obtained (in excess of 35), only a small number (4?) have any utility arises a serious concern about the viability of the techniques and also any reliance placed upon it by EPA. EPA should convene a peer review group to evaluate the data generated by the Lamont-Doherty Geological Observatory prior to collecting additional core samples.

Pg. A.3-2, par. 2: EPA states, with out any supporting information, that the increase in PCB content of the sediments from what they believe is 1954 to 1970 as being due to GE. GE requests specific data relied upon to come to such a conclusion. The increase in PCB in the sediment, as well as the apparent decrease in chlorination level, as well as the nation peak usage patterns shows that the other numerous, significant PCB sources that EPA continues to refuse to investigate, are just as likely a cause.

Pg. A.3-2, par 2: EPA states that dam removal is seen in all the cores of the lower Hudson as a peak in PCB values corresponding to 1973. As discussed above, the peak in cores in the lower Hudson occurred before 1973. The peak in PCB value has been assumed by many to correlate to the removal of the dam at Fort Edward. There is no independent data that shows this to be the cause in the lower river. At best, the work by the Lamont-Doherty Geological Observatory gives evidence showing the peak actually occurred before the dam was removed. This, combined with the data from the upper river showing that prior to the dam removal in the Thompson Island Pool the PCB concentrations in the sediments immediately below the Fort Edward Dam were very low, shows that the theory that the PCBs in the lower river are mainly from the upper river is unsupportable.

Pg. A.3-2, par 2: EPA attributes the decline in PCBs since 1977 to the reworking of the sediments released from behind the dam at Fort Edward and also to the discontinued use by GE. While this may be a theory that could be tested, the data presented does not prove this to be the case. The data also shows nationwide declines that have occurred due to the limitations on use placed upon PCBs.

Pg. A.3-2, par 3: GE agrees that the data indicates the presence of PCB sources other than those from the upper river.

Pg. A.3-2, par. 3: EPA concludes from the data presented in Figure A.3-1, that not only did higher chlorinated congeners in the cores come from the upper river but they also come from the GE plant and also match discharge records. This is pure speculation and not supported by the evidence. This conclusion is based on data from two cores in a 200 mile stretch of a river that has been industrialized for over 100 years. GE requests that EPA remove this statement from the document. 27

Pg. A.3-6, par. 2: EPA appears to agree that one could estimate the water column concentration of PCBs by simply looking at the concentration of PCBs in the sediments. This technique employs numerous assumptions, not the least of which is knowing the time history of deposition. If EPA accepts this approach as valid, GE believes a more through discussion and analysis is warranted. 28

Pg. A.3-7, par. 2: EPA seemed to accept without question the opinion that the reason the striped bass fishery is closed is due to the presence of PCBs. EPA needs to perform a thorough analysis of this issue and will find that fish conservation motives have long been an important consideration in setting fishing restrictions. 29

Pg. A.3-8, par 1: It is indicated that the EPA has the results of PCB analysis of fish from the NYDEC in a data base. GE requests that this data be made available to ensure the data base supplied to GE by the NYDEC is the same data base being employed by EPA. 30

31 Pg. A.3-8, par. 1: The citation to the Nadea and Davis report of 1974 is interesting since it concludes that there were other sources of Aroclor 1016 upstream of Fort Edward and that GE was not the sole source of PCB contamination. EPA should consider this information in the areas where GE is alone singled out by EPA as being responsible for the PCBs in the Upper (and Lower) Hudson River.

32 Pg. A.3.8, par. 3: The conclusions given in this paragraph are not attributed to anyone. Where did this information come from and can GE get access to it for our review?

33 Pg. A.3-9, par. 2: GE is concerned with the assessment that the PCBs in the striped bass caught in the river during spring migration bear little resemblance to PCBs found in the location the fish were caught (i.e. sediment, water, or food). EPA needs to evaluate the information presented by GE in the main body of these comments that show the importance of PCB sources outside of the river where these migratory fish obtain the majority of there PCB body burden.

34 Pg. A.3-9, par. 3: The Sloan et al. (1988) report mentions that not only was the detection limit for Aroclor 1221 changed but also that for all the measured Aroclors. The Phase 1 Report should be modified to reflect this.

35 Pg. A.3.9, par. 4: In the next to the last sentence of the paragraph the date should refer to 1987 instead of 1988. It is our understanding the results were reported in 1988.

36 Figure A.3.4: The decline in PCB in the striped bass is very apparent in this figure. It also shows that the increase in PCB in the fish in the early 1980's was due to primarily Aroclor 1254. This rise of PCB has been reported in the early 1980's in a number of places and appear to be due to a source of PCBs with a chlorination levels higher than those present in the sediments in the upper river.

Pg. A.3-10, par. 1: The fourth sentence states that the levels of Aroclor 1016 were relatively constant between 1983 and 1987. However, the April 1987 report from Sloan et al. reflects that the levels of Aroclor 1016 were also declining. The report should be modified to reflect this fact.

<u>Section B - Upper Hudson Characterization</u>

37 Pg. B.1-3 to B.1-4, Section B.1.2.1 (Water Quality): The EPA Phase 1 Report discusses the results of the 1987-1988 Rotating Intensive Basin Studies (RIBS) Report (NYSDEC, 1990, Phase 1 Report, pages B.1-3 and B.1.4). Portions of the RIBS Report summarize the results of surface water monitoring of the Hudson River. The Phase 1 Report's discussion of the "parameters of concern" identified in

the RIBS Report lists copper and iron as the only constituents "detected at elevated concentrations with sufficient frequency to be considered parameters of concern." (Page B.1-4). However, the RIBS Report identifies cadmium, copper, iron, lead, phenol, total coliform and fecal coliform as "parameters of concern" at concentrations exceeding criteria.

The identification of these additional "parameters of concern" in the Hudson River indicates that PCBs are not the only compounds impacting water quality in the Hudson River. Should a large scale program focusing on the removal of PCBs from the Hudson River be implemented, the presence of these non-PCB parameters in the Upper Hudson River as residuals could represent a condition where the overall water quality of the Upper Hudson River has not improved significantly.

A summary and discussion of the RIBS document, including the results of our review of the RIBS data, is presented below.

The RIBS program incorporates water column, bottom sediment, macroinvertebrate and fish monitoring to produce an integrated approach to the assessment of ambient water quality in New York State. The 17 drainage basins in New York State were divided into three basin groupings which were each intensively monitored for two year. As such, during a six year period, all basins are monitored and the cycle is repeated every seventh year. Water quality is evaluated based on a comparison of detected contaminant concentrations with assessment criteria for 20 parameters presented in the document. These 20 parameters were selected because they have standards and/or guidance values and have been consistently detected above their analytical reporting levels during previous studies. Due to analytical variability, different sampling/analytical methods, and differences in criteria specifications and analytical reports, water quality is evaluated based on a relative degree of adherence to standards, rather than a precise quantification. The following table presents the assessment criteria used in the RIBS program (NYSDEC, 1990).

RIBS ASSESSMENT CRITERIA

PARAMETER	CRITERIA				
Water Temperature	> 25° C				
pH	< 6.5 or > 8.5				
Dissolved Oxygen	< 5.0 mg/l				
Phenol	< 1.0 ug/l				
Dissolved Solids	> 500 mg/l				
Ammonia	> 0.164 mg/l*				
Total Coliform	median > 2400/100ml 20% > 5000/100ml				
Fecal Coliform	Geometric Mean > 200/100ml				
Trichlorethylene	> 1.0 ug/l				
Chloroform	> 1.0 ug/l				
1,1,1-Trichloroethane	> 1.0 ug/l				
Aluminum	> 100 ug/l				
Mercury	> 0.2 ug/l				
Zinc	> 30 ug/l				
Iron	> 300 ug/l				
Manganese	>300 ug/l				
Hardness as $CaCO_3$	10-40	50-77	80-102	120	185
Cadmium**	≥ 1	≥ 1	> 1.3	> 1.3	> 1.5
Copper**	> 1	> 7	> 11	> 13	> 20
Lead**	≥ 5	≥ 5	≥ 5	> 3.7	> 7.0
Nickel**	> 40	> 68	> 90	> 108	> 150

* This value represents worst case conditions for pH and temperature. Any reported ammonia value which exceeded this screening criteria was compared to a computed criteria for the actual reported pH and temperature on that date.

** Assessment criteria based on standards that are hardness dependent.

Under the RIBS program, a parameter which exceeds its assessment criteria more than 15 percent of the time is considered a "parameter of concern." The identification of "parameters of concern" is used to focus attention on these parameters in other media sampled to evaluate specific impacts. "Parameters of concern" were identified in each of the five locations on the Upper Hudson River including Corinth, Fort Edward, Schuylerville, and Waterford. Results from each of these monitoring locations are discussed below.

Hudson River at Waterford - The RIBS document identified cadmium, copper, lead, phenol, total coliform, and fecal coliform as "parameters of concern" in the water column at Waterford. The Phase 1 Report does not discuss this location or the identified contaminants in its discussion of water quality and the RIBS document (Phase 1 Report, pages B.1.2-B.1.5). A review of the analytical data generated during the RIBS program indicates that aluminum and iron also qualify as "parameters of concern" as they were detected above the assessment criteria 89 percent and 44 percent of the time, respectively. It should also be noted that the assessment criteria for manganese at 300 ug/l is well above the federal MCL of 50 ug/l. Using 50 ug/l as an assessment criteria could include manganese as a "parameter of concern" for Waterford due to its detection at or above 50 ug/l 38 per cent of the time monitored.

Hudson River at Schuylerville - The RIBS document identified copper and iron as "parameters of concern" in the water column in Schuylerville. This fact is accurately presented in the Phase 1 Report. However, a review of the analytical data generated during the RIBS program indicates that phenols (22% excedance), total coliform (79% excedance), aluminum (56%), cadmium (25%), and lead (19%) would also qualify as "parameters of concern" at Schuylerville.

Hudson River at Fort Edward - The Phase 1 Report correctly summarized the RIBS document which identified copper as a "parameter of concern" at Fort Edward. However, the RIBS data indicate that total coliform (100%), fecal coliform (100%), aluminum (38%), cadmium (29%), and lead (29%) would also qualify as "parameters of concern" at Fort Edward.

Hudson River at Corinth - The Phase 1 Report acknowledges that copper was found in water column samples from the Hudson River at Corinth. The RIBS document identifies copper and lead as "parameters of concern". The RIBS data also indicate that aluminum (22%) and cadmium (21%) qualify as "parameters of concern" at Corinth.

Hudson River at North Creek - The Phase 1 Report acknowledges that copper was found in water column samples from the Hudson River at North Creek. However, the RIBS document identifies cadmium, copper and lead as "parameters of concern". Moreover, the RIBS data indicate that aluminum (56%) qualified as a "parameter of concern" at North Creek.

Conclusions - The RIBS Program (NYSDEC, 1990) has provided data that indicates the presence of cadmium, copper, lead, total coliform, fecal coliform, aluminum, manganese, iron, and phenols at concentrations and frequencies which qualify them as "parameters of concern". Several of these parameters were also present in background water column samples collected from the Upper Hudson River at Corinth and North Creek. It is recommended that the data generated by the RIBS Program on the parameters, other than PCB, which were detected at concentrations exceeding regulatory criteria be reevaluated to determine their significance to Upper Hudson River water quality and that this be factored into the RRI/FS.

38 Pg. B.1-5, Section B.1.2.2: The Phase 1 Report discusses the use of Hudson River water as a raw source for public drinking water. The report states (Phase 1 Report, page B.1-5):

> **The Hudson River is used as a source for public water supplies (municipal and institutional drinking water) in sections of the river classified as Class AA or A. Along the Upper Hudson, three communities draw directly Hudson River water.**

Although this statement is accurate, it should be noted that: 1) two of these three communities are located upstream of the regions of the river considered as the site for EPA's Reassessment RI/FS, and 2) raw water from the Hudson River is treated in municipal water treatment plants before it is distributed to the public. Monitoring data from Hudson River water treatment plants indicates that the treatments are very efficient (up to 98 percent removal) at removing PCB from raw Hudson River water. In addition, although the raw water is treated, the average raw water PCB concentrations have been below the federal MCL of 0.5 ppb and the NYSDOH action level of 0.1 ppb since September 1983 (Metcalf and Eddy, 1990). Both of these factors should be discussed and referenced in order to provide a balanced perspective on the implications of the uses of Hudson River water as a drinking water source by these three communities.

Drinking Water Use

Queensbury and Winebrook Hills - The three communities which draw Hudson River water for public water supply are the Town of Waterford in Saratoga County, the Town of Queensbury in Warren County, and the Winebrook Hills Water District in Essex County. The intakes for Queensbury and Winebrook Hills are located upstream of Glens Falls. According to the Phase 1 Report, the USGS monitoring station of Glens Falls provided upstream background levels of PCB in the Hudson River from 1977 - 1983. Of 45 observations for total PCB, only two had detectable levels of PCB.

These observations occurred on December 5, 1978 and September 28, 1990 and were both reported at 0.1 ug/l. Referencing the fact that these two communities' water intakes are upstream of Glens Falls would clarify that users of water from these facilities do not have the potential to ingest sediment-borne PCB which may have originated downstream of Glens Falls. However, it is significant to note that the water treatment plants for Queensbury and Winebrook Hills, although upstream of PCB contamination, also utilize coagulation/filtration treatments, which have been demonstrated to effectively remove waterborne PCB (O'Brien & Gere, 1981).

Waterford - The Waterford water treatment plant (Waterford WTP) is the closest downstream public water source to Glens Falls. The Waterford WTP utilizes a coagulation/filtration treatment process which is typically used to treat surface water for drinking water supplies. The coagulation/filtration treatment works via the following steps (AWWA, 1971):

1. a coagulant is mixed with raw water;
2. the coagulant de-stabilizes the particulate material and also forms a precipitate (floc);
3. the floc is mixed to increase the size of the floc particles;
4. the floc is settled and the resulting sludge is withdrawn; and
5. the supernatant is filtered to remove any floc that did not settle.

Since PCB absorb strongly to solids such as sediments (log K^{OC} values from 4.40 to 7.64 [USEPA, 1983]), effective removal of particulates results in removal of a majority of the PCB. The efficiency of coagulation/filtration treatment technologies in removing PCB from Hudson River water was studied by O'Brien and Gere in 1981 as part of a report prepared for NYSDEC entitled "Hudson River Water Treatability Study" (O'Brien & Gere,1981). The study included a series of bench scale jar tests to evaluate optimum conditions for coagulation of Hudson River water. Coagulant, additive, and pH were varied in the tests to evaluate the removal of particulates and turbidity. Results of the bench tests indicated that removal efficiencies could reach 99 percent by regulating the process variables discussed above, but that 90 percent removals by the coagulation/filtration method represent the highest reduction consistently achievable in existing water treatment plants due to the degree of control required to meet changing raw water conditions.

The conditions that gave the best removals of turbidity and particulates in the study (alum coagulant at a dose of 30 to 40 mg/l at a pH of 6.9), similar to the conditions found at the Waterford WTP, appeared to be providing sufficient treatment with the coagulant type and dosages in use at the time of the study.

The results of the 1981 bench scale study are supported by monitoring results at the Waterford WTP. Based on raw water and finished water PCB monitoring at the Waterford WTP between 1975 and 1983, the Waterford WTP averaged an 86 percent removal rate for PCB (USEPA), 1987). These data verify the ability of the coagulation/filtration treatment to efficiently remove PCB in practice.

Action Levels and Standards - Irrespective of the ability of current water treatment practices to effectively remove PCB, monitoring of Hudson River surface water has shown that it meets the NYSDOH established action level for PCB of 0.1 ug/l. PCB concentrations in the Hudson River have been regularly monitored since as early as 1975 by various programs under the USGS, the Waterford Water Works, and NYSDOH. As given in the Phase 1 Report, the highest PCB concentrations in the water column since 1985 were detected at Fort Edward, where the upper 95th percent confidence interval on the adjusted mean is 0.06 ppb. Based solely on PCB concentrations, this water would be an acceptable drinking water source, even without treatment, according to the NYSDOH established action level of 0.1 ppb. NYSDOH has used the National Academy of Science value of 0.16 ug/l PCB to set the action level of 0.1 up/l PCB.

The overall NYSDOH guideline for PCB drinking water is 1 ug/l (NYSDEC, 1986). At or above a PCB concentration of 0.1 ug/l, additional monitoring is triggered and steps are taken to reduce the PCB concentration to below 0.1 ug/l. Drinking water with a PCB concentration at or above 1 ug/l is considered by NYSDOH unfit for human consumption.

There are currently no federal or state drinking water standards for PCB. However, on July 30, 1992 a federal Maximum Contaminant Level (MCL) of 0.5 ug/l will be established for PCB drinking water (40 CFR 141.61). An MCL is defined as the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. Therefore, detected concentrations of PCB in the Upper Hudson River have been below the established enforceable standards and criteria since 1983. It is, therefore, suggested that reference to this fact be added into section B.1.2.2, to provide a frame of reference to the statement that the Hudson River is used as a source of drinking water.

The Phase 1 Report states (Section B.1.2.2, page B.1-5):

Hudson River water is also used for domestic (watering lawns and gardens) and agricultural purposes (irrigating crops).

The source or basis for the statement that there are domestic and agricultural uses of the Hudson River was not provided. Personal communications with County and State Health Departments and NYSDEC indicated that there are few residences or agricultural lands adjacent to the Hudson River which would rely on the Hudson River for water supply. It should also be noted that Upper Hudson River water has consistently been below regulatory limits for PCB since 1983 (Metcalf and Eddy, 1990). Therefore, the use of Hudson River water for residential gardens or agricultural irrigation would not impact crop or garden food quality. This statement should be made as a frame of reference for evaluating the implications of the irrigation and agricultural uses of the Hudson River.

Although Upper Hudson River water is used as a drinking water source, the water is treated at municipal water treatment plants by methodologies which have demonstrated efficiency in the removal of PCB. Irrespective of the treatment, recent Upper Hudson River water monitoring data for PCB indicates the levels of PCB have consistently been below the federal MCL of 0.5 ug/l and at or below the NYSDOH action level of 0.1 ppb with an estimated mean PCB concentration of 0.6 ug/l. Furthermore, this data indicates that the use of Hudson River water for domestic uses other than drinking does not pose a significant route for human exposure.

It is recommended that, when discussing the uses of the Hudson River as a source of drinking water or irrigation, the Phase 1 Report reference the following facts:

- Municipal water uses of the Hudson River include treatment by coagulation/precipitation which is effective at removing PCB.
- Raw surface water from the Hudson River meets NYSDOH drinking water guidelines of 0.1 ug/l PCB.

Pg. B.1-7, par 1: EPA states that the barge canal has experienced a decline in recreational use. This is factually incorrect. The attached figure, derived from NY Department of Transportation records (NY DOT, 1989), clearly show an increasing use of the barge canal for recreation use. 39

Pg. B.2-1: The estimates of PCB discharges by GE as given by EPA and others are very speculative. This is particularly true of those that assume all PCBs in the Upper and Lower Hudson River came from the GE Plants in Fort Edward and Hudson Falls. Additionally, the use of only production records of PCB purchase records do not, by themselves provide useful information on actual discharges. One also has to consider the significant changes in production and waste generation processes that occurred over time. EPA should not 40 employ the 1.3 million pound figure since it is not based on a reliable estimating technique.

41 Pg. B.3-1, Section B.3.1 (Overview of Sources and Data Base): The explanation of the electronic data base developed by EPA to manage the extensive data available on the Hudson River System is useful. A further explanation of EPA's review of the data input to ensure that transcription errors did not occur would also be useful. Additionally, GE requests that EPA make available to GE and others a copy of data files in electronic format as well as make available copies of all the original hard copy files of the data (i.e. reports , laboratory data sheets, etc.).

42 Pg. B.3-1, par. 2: EPA did not consider the following publically available data (as presented in Table B.3-1):

1. 1975 report by the Division of Pure Waters (NY) on the PCB content of sediment, water and effluent. This report contains data on approximately 15 sediment samples from the Upper Hudson River and 15 sediment samples from tributaties. Additionally, PCB measurements are reported for a number of potential PCB dischargers (Sprague Electric, Glens Falls Landfill, Glens Falls Portland Cement, Saratoga Board Mill, Galente Company, and the Jard Company.)

2. The 1983 Gahagen & Bryant Probing Report. Although this report does not contain PCB analysis of sediments, it does provide information on sediment textures and bed elevations.

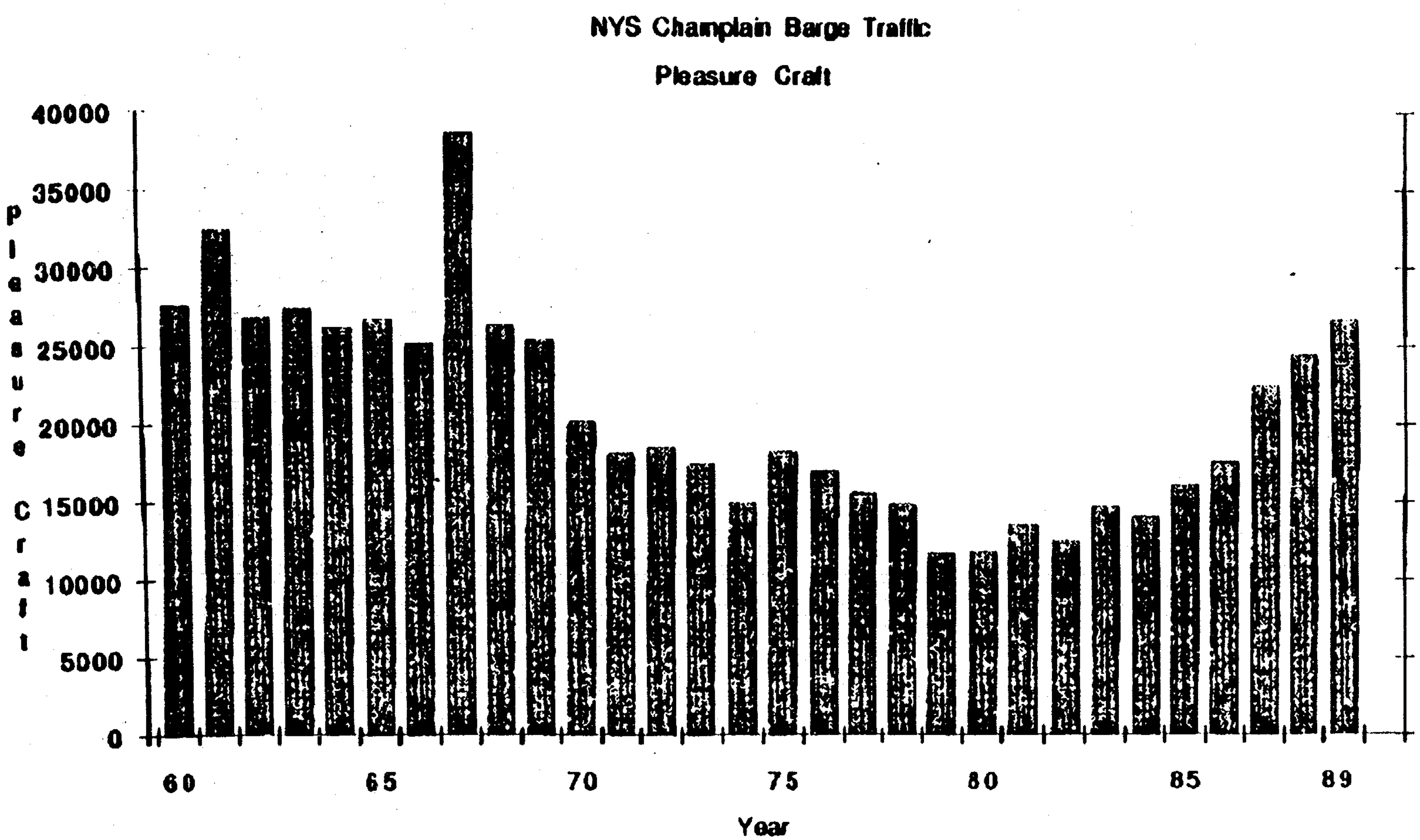
3. A 1989 report by NYDOT by Long Lake Energy Corporation that found that the maximum concentration at "Hot Spot" 34 (Northumberland Dam) to be 10 parts per million instead of the 500 parts per million reported in 1977.

4. As part of the RCRA Closure and Corrective Action permit, Ciba Geigy has generated a significant amount of information on sediment and fish contamination above Fort Edward.

43 Pg. B.3-5, par. 4: EPA reports they do not have detection limits for the 1976-1978 sediment samples. GE has this data and would be glad to share it with EPA if it is so desired.

44 Pg. B.3-6, par. 3: The statement concerning the NYDEC designation of 100 polygons containing PCBs greater than 50 parts per million of PCBs is not correct. The NYDEC defined 138 polygons in the Thompson Island Pool. Of this number, only 14 had an average PCB concentration (as defind by the NYDEC) greater than 50 parts per million. The text should be corrected.

45 Pg. B.3-9, par. 2: EPA's approach for calculating average PCB concentations in the sediment from the 1984 data greatly overestimated the PCB levels. In the 1984 data, all samples were


NYS Champlain Barge Traffic
Pleasure Craft
Pleasure Craft
40000
35000
30000
25000
20000
15000
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screened by mass spectrometer, a semi-quantitative technique used to classify sediments into four ranges, less than 10 parts per million (ppm), 10 - 50 ppm, 50 - 100 ppm, and greater than 100 ppm. Many of the samples that were "cold" (less than 10 ppm), were never analyzed by the more precise gas chromatograhic techniques. DEC's screening technique precludes direct comparison of the two data sets. However, it is clear that not including these "cold" samples in the analysis of average concentrations will elevate the calculated averages. The EPA ignored the results from over 400 grab samples and 600 cores. Even if the data points screened as being less than 10 ppm are conservatively assigned a value of 5 ppm (one half the detection limit) the calculated average will be cut nearly in half (approximately 25 ppm).

Pg. B.3-12, par 1: As discussed earlier, the use of radionuclied dating of sediments form the Upper Hudson River have not yielded conclusive results. Furthermore, it is clear that EPA must perform a through review of the data presented by the Lamont-Doherty Geological Observatory researchers. The interpretation of the data presented in Figure B.3.6 is far from unambiguous. When the raw data is reviewed in context of other data it can clearly show that prior to the dam being removed (early to late 1960's when cesium 137 was present) the amount of PCB in the sediment from above the Fort Edward Dam was fairly small indicting PCB discharges where being effectively contained behind the dam. After the dam was removed, a large amount of sediment moved very quickly (non-uniform sedimentation rate) into the Thompson Island Pool. The best marker for the 1973 date is not the peak PCB level, but rather the point of sharp increase from low to high PCB content. This conclusion is much different from that offered by EPA, NYDEC, or Lamont-Doherty. 46

Pg. B.3-12, par. 2: GE concurs with the presence of highly altered PCB due to biological degradation in the Upper River. In fact, it was not Bopp who first reported this, but rather John Brown from GE's Corporate Research and Development Center. Additionally, what is probably more significant, is that the vast majority of sediments in the Upper Hudson River have had significant amounts of chlorine removed and this alone may account for the mass reduction seen between the 1977 and 1984 sediment surveys. This will require much further analysis to confirm. The extent of anaerobic dechlorination is described in the main portion of GE comments.

Pg. B.3-14, par. 2: The interpretation of the data provided by GE as presented in Table B.3-8 is incorrect. EPA admitted this deficiency at a recent public meeting. A revised table needs to be made available to GE and others. Additionally, EPA needs to revise the text that derived erroneous conclusions from the misinterpreted data in the table. 47

Pg. B.3-15, par. 1: While a limited number of tests have been performed on metals leachability, the presence of the metals in the sediments may make any proposed treatment and disposal more 48 complicated. Additionally, while it is thought the metals may not be readily leachable, if the reason for this is the presence of highly organic matrix under reducing conditions, than if treatment to destroy PCBs also changes these conditions, these metals may become more readily available. It is also intersting to note that the "parameters of concern" defined in the RIB's program includes a number of the metals seen in elevated levels in the sediment.

49 Pg. B.3-17, par. 2: With respect to discrepancies in the data base, GE agrees that this does present some limitations to interpretation and use. To better understand why the data base employed by EPA does not match that discussed in the literature, GE requests access to the data base being utilized by EPA.

50 Pg. B.3-19, par. 1: EPA states that several major flood events were associated with the mass erosion of the remnant deposits. What information does EPA have to show there was mass erosion and that this coincided with flood events?

51 Pg. B.3-20, par. 4: In Table B.3-10, EPA presents summary statistics on the suspended sediments measurements made in the Upper Hudson River by the U.S. Geological Survey. There is a difference between the number of measurements of the suspended sediment concentration and the number of sediment load data points. An explanation as to why this is would be helpful.

52 Pg. B.3-20, par. 3: Why is the data prepared by the U.S. Geological Survey, a sister federal government agency, available to the NYDEC yet not the EPA?

53 Pg. B.3-21, par. 3: The detection limit of the U.S. Geological Survey's PCB analytical method is reported as changing from 0.1 milligrams per liter to 0.01 milligrams per liter in 1984. Is this a result due to a change in the sample preparation, analytical techniques or quantitation method or some combination of the above? Does EPA have a written description of any of the analytical or sampling methods employed by the U.S. Geological Survey? Have these been evaluated to see if they are "acceptable"?

54 Pg. B.3-21, par. 5: In Table B.3-11, the average PCB values for the water column monitoring stations are calculated. Is this an arithmetic average? In environmental samples, many parameters are found to be log-normally distributed, in which case the geometric mean is a better measure of central tendency. Did EPA determine the distribution of the PCB values to see if they were normally distributed? Is the reported standard deviation based on the nondetects reported at the detection limit or as being one half the detection limit?

55 Pg. B.3-22, par. 1: The observation that the water column data suggests that there may be little loss (or addition) of PCB during transit in the Upper Hudson River is important. If this is

generally the case, then the importance of the source of PCBs between the Fort Edward monitoring station and the Glens Falls monitoring station becomes the focus point of the investigation. EPA should make every attempt to obtain the most recent monitoring data from the U.S. Geological Survey as this is the only information available on the water column monitoring since the EPA mandated remnants remedy occurred. If EPA is not going to do this, is EPA going to collect water column samples on a routine basis for a period sufficient to monitor the variation over a complete cycle of high to low flows (one year?)? The importance of this PCB source is apparent in the data shown in Table B.3-12.

Pg. B.3-23, par. 1: EPA poses a question on whether there has been any genuine trend in PCB loading to water over time, or whether the apparent year to year trends are due to actual variability in the hydrolog. All the data presented by EPA demonstrate that there has been a significant reduction in PCB level and load in the river over time. Why EPA would think this is not genuine is not known. There is a downward trend over time in the PCB water column values. 56

Pg. B.3-23, par. 4: Are the reported means geometric means (i.e. based on an assumption of a log-normal distribution)? 57

Pg. B.3-23, par. 4: In Table B.3-12, it appears as if the mean values were calculated using data from 1986 to 1989. According to EPA, one purpose of calculating the current year mean is as an input parameter to the risk assessment. GE believes this method greatly overestimates the PCB values that will be present over the period of potential exposure (the next thirty years). A more appropriate method is to note the obvious decline in PCB levels in the water column and to project the values out over the next thirty years, using something like an exponential decay function.

Pg. B.3-26, par. 4: EPA is attributing the higher PCB levels seen in the summer to the presence of boat traffic and the increased use of locks. EPA believes that this causes an increase in suspended sediment load and therefore PCB level. Does EPA really believe this to be the cause and has the suspended sediment measurements from low flow periods been evaluated to see if this theory is supported by data? 58

Pg. B.3-27, par. 1: The theory presented that little or no PCBs are being release from the sediment anaerobic zone is based upon the reconstruction of PCB homologs from packed column analysis. While this is an interesting theory, it is also possible that PCBs, if released from the anaerobic zone into the aerobic zone, may be undergoing complete biological destruction since they will contain predominately mono and di PCBs. Additionally, GE believes the old data being relied upon for reaching such important conclusions should be replaced with data from capillary column GC-ECD that is collected using appropriate sample handling and preservation techniques. 59

60 Pg. B.3-27, par. 3: GE request that EPA make available to it the referenced data that was given to EPA from the NYDOH on PCB levels in the water column samples.

61 Pg. B.3-29, par. 1: It is claimed that the spring flows during the 1980's were abnormally low. What data is the basis for this conclusion? Is this a qualitative statement that should rather indicate that the peak flows in the 1980,s are lower than those seen during the 1970's. By all indications the peak flows in the 1970's were abnormally high (see Figure B.3-7). Does this indicate that the flows in the 1980's are actually normal?

62 Pg. B.3-19, par. 4: GE requests that EPA provide access to the fish data base being employed (electronic form). GE believes it has the same information (supplied by Ron Sloan of the NYDEC) yet GE is not able to match some of the results presented by EPA.

63 Pg. B.3-33, par. 2: EPA reports the mean level of PCB from all fish in the Upper Hudson River from the years 1986-1988. Did EPA employ a mean assuming that the population (as weighted by population) is normally distributed? Is a geometric mean a better measure of central tendency in this case? Is it also reasonable to average all the fish in the data base (1986-1988) which may include a large number of fish species that will not be preferentially consumed if caught or that may not be representative of the actual distribution (as weighted by population) of the fish species in the river?

64 Pg. B.3-33, par. 2: EPA's use of a constant PCB value for fish in a risk assessment that assumes that exposure will occur over a thirty year period is outrageous. All the data presented by EPA and an analysis of the physical, chemical and biological processes taking place in the river clearly shows that a significant downward trend in PCB concentration should be employed for such an assessment.

65 Pg. B.3-39, par. 3: It appears that EPA may have misstated the explanation for the absence of lower chlorinated congeners in the chironomid and the absence of the higher chlorinated congeners in the water. The statement on the last sentence of the paragraph should read that the higher chlorinated congener were present in concentrations below detection limits.

66 Pg. B.3-41, par. 3 and 4: Reference is made to air data generated jointly by USEPA and NYDEC in 1987. Reference is also made to other air monitoring events conducted by the NYDEC in 1987, yet specific data is not supplied. Specific reference is not included in the references cited section to these investigations so GE is unable to review the cited information. GE requests that this data be made available to GE and others.

Pg. B.3-42, par. 2: EPA cites data from a state wide PCB air monitoring program and compares it to the local data generated over time in the Fort Edward area and concludes that the maximum concentrations are higher in the Fort Edward area. Are the data sets comparable in technique of collection? Did the state wide samples focus on potential local sources or on general ambient air quality? Were samples from Fort Edward biased to attempt to maximize the PCB concentration levels detected? 67

Pg. B.3-42 to B.3-43: The Phase 1 Report discusses the potential for volatilization of PCB to the air in the Lower Hudson River by citing a study on PCB transport performed by Bopp (1983). The Phase 1 Report, EPA states (Phase 1 Report, page B.3-43): 68

> For low chlorinated homologues (di- and trichlorobiphenyls), Bopp (1983) estimates that about 40 percent is lost, because of gas exchange, as a given parcel or water travels from Troy to Poughkeepsie. For the tetra- and pentachlorobiphenyls 10 to 20 percent is lost as a result of gas exchange.

Volatilization in the Hudson River is controlled by a number of factors, many of which were not taken into account by Bopp (1983) in verifying his model-driven estimate. Because of competing sinks and sources, it is likely that volatilization of PCB from the Hudson does not occur as stated in the Phase 1 Report. A qualifying statement regarding the referenced estimate should be provided in the Phase 1 Report for the following reasons:

- The values for the physiochemical constants utilized in the formula for volatilization by Bopp (1983) were derived solely on a theoretical basis and could not be verified by measurement of those constants.

- Transport of water and suspended sediment in the Hudson River was assumed by Bopp (1983) to take place according to "plug flow" and did not consider interactions between the water column and deposited sediments.

- Seasonal variations in temperature, wind and flow rates, sediment type, PCB levels and sediment load, as well as physical, chemical or biological degradative processes were not considered in the generation of the estimate.

- The model was verified using water column data only, collected at two locations at one point in time, and did not consider verifying assumptions through measurement of PCB in deposited sediments at the two locations.

- Bopp states in the paper that he does not intend for his proposed model to be used as a quantitative measure of mass flux.

Bopp adopted the gas exchange model developed by Liss and Slater (1974) to describe PCB flux associated with the Hudson River. He rearranged and simplified the equation and utilized predictive equations to determine input variables in order to develop an equation for a homolog-specific gas exchange constant computed as a function of Henry's Law constants, film thickness, and diffusion coefficients. The procedures used to generate these parameters are described below.

Henry's Law constants were computed by grouping PCB congeners according to degree of chlorination as estimated by the elution order of major chromatogram peaks. The activity coefficients were then estimated for each peak by means of graphical interpolation based on the number of chlorine atoms and the estimated activity of the Aroclor mixture. Vapor pressure was calculated using a theorized linear extrapolation of vapor pressure over the number of chlorine molecules.

Diffusion coefficients were computed theoretically using a Wilke Chang (1955) equation, modified for aqueous solutions by Hayduk and Laudie (1974). A boundard layer thickness of 1.8 x 10^{-2}cm for water in the Hudson River was assumed as per Emerson (1975), while a gaseous boundard layer thickness of 1 cm was assumed based on an evaporation model proposed by Sverdrup (Defant, 1961).

Utilizing the above described theoretical equations and estimates and the Liss and Slater (1974) equation, Bopp generated a half-life equation for homolog-specific PCB volatilization taking in to consideration: 1) an estimate of the mass of suspended matter, 2) an estimate of the average depth of the river, 3) a sediment/water distribution coefficient calculated by analyzing PCB in two samples of filtered and unfiltered Hudson River water, and , 4) the gas exchange constant for each chromatogram peak as calculated via the previously estimated physicochemical constants.

The resultant values generated by the equation were "verified" over the stretch of the Hudson from Poughkeepsie to Troy, New York. First, an estimate of residence time was developed based on calculated water transit times between Poughkeepsie and Troy. Predicted values for each homolog at Poughkeepsie were then generated for each homolog based on the concentrations at Troy and the half-life equation. The predicted water column concentrations at Poughkeepsie based on the equation for volatilization half-life were then compared against unfiltered water column samples collected at Poughkeepsie. Reduction in PCB concentrations from Troy to Poughkeepsie were assumed to be losses strictly due to volatilization after adjusting for particle settling.

Bopp reported that the model produced good agreement between predicted losses of lower chlorinated PCB and the observed difference between upstream and downstream samples in lower chlorinated PCB. The model predicted lower losses among higher chlorinated homologs due to the greater affinity of higher congeners for suspended matter, thus making lower congeners available for volatilization. Sampling results indicated that the magnitude of losses in PCB concentrations by homolog, as predicted by the model, were inversely proportional to the degree of chlorination.

The model described and utilized by Bopp (1983) to generate the PCB volatilization estimated has a number of possible shortcomings which could lead to inaccurate predications. They are primarily related to a high reliance on theoretically derived input variables (versus measure verified data), the reliance on only two points of surface water data and the disregard of factors which influence volatilization. These factors are described in the following text.

In verifying his model, Bopp treats the water between Troy and Poughkeepsie as a "plug" of water which receives no dilution from tributaries, runoff or recharge, and does not gain, lose or recycle sediment. The model does not consider the existence of additional sources of flow and sediment between sampling locations. If inputs to the Hudson River of water and suspended matter between Troy and Poughkeepsie contained PCB, estimates of volatilization of PCB from the River would be biased low. Conversely, if water and suspended matter contributed to the River between Troy and Poughkeepsie contained lower concentrations of PCB, estimates of volatilization from the River would be biased high.

One of the assumptions inherent in the model is that the residence time of suspended matter equals hydraulic residence time. This is not appropriate because suspended matter is continually deposited and scoured to and from the river bottom. The residence time for suspended matter in the water column is, therefore, much greater than the time required for a given volume of water to pass from one point to another. Although water sampled at Poughkeepsie may represent the water column which flowed past Troy approximately 20 days earlier, the suspended matter included in the sample at Poughkeepsie includes resuspended matter that existed in the water column which flowed past Troy at a much earlier date. It could have been scoured from an area which was deposited any weeks or months prior or included runoff from the stream banks or storm drains. Consequently, suspended matter included in water samples analyzed from Poughkeepsie is likely to have undergone physical, biological and chemical transformation for a period of time longer than that used to approximate water transit time. It is, therefore, inappropriate to assume that changes in the sediment load had not taken place and is, therefore, invalid to provide a direct comparison between the two points and ascribe observed differences to volatilization alone. Further investigation of the assumption would have included a number of water column samples from intermediate points. Also, if the relationship were valid, then a comparison of upstream versus downstream sediments should also reflect a reduction in the lower homologs. This was apparently not considered.

A total of two samples were collected for PCB analysis, one each at Troy and Poughkeepsie. In order to determine or confirm trends with respect to PCB concentrations in the Rirer, additional samples are necessary. Additional samples collected at the same locations as well as at locations between Troy and Poughkeepsie would provide a larger sample size and could be used to evaluate spatial trends in PCB concentrations with a greater degree of confidence.

The effects of biodegradation on PCB in the Hudson River have not been considered in the analysis. Aerobic and anaerobic biodegradation of PCB have been demonstrated to occur in the sediments of the Hudson River (Rhee et al., 1989). Aerobic biodegradation is widespread and primarily degrades lower chlorinated PCB (Abramowicz, 1990). Anaerobic dechlorination of higher chlorinated PCB results in lower congeners subsequently available for aerobic degradation (Brown et al., 1987). Because aerobic organisms that degrade PCB could be more widespread than anaerobes that do the same, and because aerobic processes progress more rapidly than anaerobic reactions, it follows that lower PCB congeners could undergo a reduction in water column concentrations more quickly than higher chlorinated PCB. The differences between aerobic and anaerobic biodegradation could be the basis for, in part, higher degree of reduction in lower congeners measured by Bopp (1983).

Non-Filterable Adsorbed PCB - In the calculation of the distribution coefficients for the various homologs, PCB adsorbed to organic colloids, plankton, and other small biomass would have been measured as dissolved PCB, or these materials would have passed through the filter. Based on their work on PCB flux in Lake Superior, Baker and Eisenreich (1990) found that filtered samples used for PCB analysis contained not only dissolved PCB but PCB adsorbed to non-filterable biomass. Consequently, distribution coefficients developed by Bopp (1983) are likely to be biased low because the "dissolved" PCB bound to colloids and other filterable material are not available for volatilization. This bias would result in a calculated volatilization half-life which is higher than the volatilization half-life expected in the presence of hydrophobic colloidal materials.

Seasonal and Temporal Variations - The impact of variable environmental conditions such as wind, temperature, ice cover, and turbulence were not considered in the model developed by Bopp (1983). Paris et al., (1978) found that the rate of volatilization from water is strongly influenced by the turbulence of the water. Baker and Eisenreich (1990) state that the largest uncertainty in their flux calculations "results from the strong dependence of the equilibrium and mass-transport parameters on environmental conditions. Specifically wind speed and temperature." They state further that ice cover must also be considered in northern waters. Therefore, even if the 40 day estimate of Bopp (1983) was accurate, it would vary significantly based on seasonal and temporal variability in temperature and wind speed. It is, therefore, misleading to consider, or cite, the 40 day estimate as applicable to the Hudson River.

Uncertainties in Model - Bopp (1983) provides a conceptual approach to modeling the behavior at the air water interface. It was not the intention of the model to provide a quantitative evaluation of PCB flux to the atmosphere from the Hudson River. Bopp acknowledged the limitations of his model when he stated "the main point of the exercise does not lie in detailed consideration of transit time, boundary layer thickness, or **mass fluxes of PCB components.**" (Emphasis added.) Furthermore, Baker and Eisenreich (1990) state that "further efforts are required to develop and validate methodologies that directly measure [hydrophobic organic compound] fluxes across the air-water interface."

Conclusion and Recommendation re Volatization - Based on the limited amount of data utilized in the derivation and calculation of the predicted volatization half-life for the PCB homologs, the failure to consider processes affecting volatilization and the reliance on only two water column data points to verify the predicted values, the volatization estimates provided in Bopp (1983) should not be considered an accurate basis for predicting the behavior of the PCB in the Hudson River.

Pg. B.3-43, par 1: GE concurs that the volitization process is one that needs to be carefully evaluated. While EPA believes this process has "important ramifications for highly chlorinated homologs in the lower Hudson," GE believes the real importance is with the lighter chlorinated homologs that now reside in the highly degraded PCBs of the Upper Hudson River sediments. 69

Pg. B.3-43 to B.3-47: The Phase I report discusses PCB uptake by plants to consider whether significant uptake and accumulation of PCB in air by plants could result in elevated PCB concentrations in food crops (Phase 1 Report Section B.3.5.2). The discussion of this topic centers on a study performed by Bush et al., (1986). The Phase 1 Report states the conclusions of this study as follows (page B.3-45):

- **the main route of PCB uptake in purple loosestrife is via the root system**
- **soil, as opposed to air, served as the major pathway of PCB uptake**
- **PCB uptake at the air-leaf interface also occurred.**

A review of the study indicates that PCB plant uptake from soils and air demonstrated inconsistent results and that additional studies would be required to verify and support the conclusion that root translocation is a significant pathway of uptake of PCB into plants. It should also be noted that although uptake of PCB plants does occur, it occurs to a limited extent, as compared to bioaccumulation in fatty tissues of animals.

The paper presented by Bush, et al., (1986), which was the central point of the Phase 1 Report's discussion of plant uptake of PCB, evaluated PCB uptake into purple loosestrife plants as a function of PCB levels in soil and air. PCB concentrations in plants that were transplanted and translocated between a control site with low soil concentrations of PCB (30.2 ng/g) and a Hudson River site with elevated (118.9 ng/g) PCB soil levels were compared. PCB concentrations in the air at the control and Hudson River sites were measured to be <40 ng/m^3, respectively. Three sets of conditions were evaluated in the study: Hudson River site plants translocated with Hudson River site soils to the control site, control site plants translocated with control site soils to the Hudson River site, and control plants transplanted to Hudson River site soils at the Hudson River site. Existing plants at the control site and Hudson River site were monitored for PCB as controls. Monitoring was performed by analyzing plant leaves for PCB. Within six weeks of the test start, the three scenarios tested all indicated increases in PCB concentrations which exceeded concentrations exhibited by the Hudson River control plants. This observation confounds interpretation of the results because the Hudson River control, which should have indicated worst case conditions and thus maximum PCB concentrations, contained lower PCB levels than the plants grown in clean soils and translocated to the Hudson River site.

The fact that the Hudson River site plants in Hudson River site soils which were translocated to the control site also exhibited higher PCB concentrations than the Hudson River site control demonstrates that the uptake of PCB by the plants is inconsistent, and that some factor operating in the study, other than those monitored and controlled, caused the inconsistent results.

The inconsistencies in the plant PCB uptake demonstrated in the study performed by Bush et al., (1986) indicate that uptake of PCB from contaminated soils and air has not been characterized to the extent required to justify the conclusions drawn. It is, therefore, recommended that the conclusions of the Bush et al., (1986) study be qualified within the text of the Phase 1 Report to reflect these inconsistencies.

70 Pg. B.3-50, chart: The presented chart should be expanded to include all the important data sets including the water column data generated by the U.S. Geological Survey.

Pg. B.3-48, Section B.3.7 (Adequacy of PCB and Aroclor Measurement): EPA must perform a detailed review of every piece of data employed by EPA, particularly the data used in the risk assessment. The assessment of the data presented in the Phase I report is not adequate to meet the EPA requirements given in EPA's own guidance documents. In particular GE would like to bring to EPA's attention the following: 71

1. Guidance for Data Useability in Risk Assessment, EPA/540/G-90/008, OSWER Directive : 9285.7-05, October 1990. On Page 26 of the document the following statement is made:

"The quality of historical data must be determined prior to its use in the RI. The difficulty in using historical analytical data in the RI is that the methods and the detection limits may not be documented. Also whether data review was performed may not be known. This information is required if analytical data are used in the quantitative components of risk assessment."

"Historical data of unknown quality may be used in developing the conceptual model or as a basis for scoping, but not in the determination of exposure concentration. Analytical data from PA/SI that meet minimum data useability requirements can be combined with data from the RI to estimate exposure concentrations. Similarly, historical data of lower quality may be used if the concentrations are confirmed by subsequent RI analysis."

2. Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual, EPA/540/1-89/002, December 1989

Both of these guidance documents specify the types of evaluations EPA should perform on data used for Superfund risk assessment. GE requests that EPA evaluate all the data in a methodical fashion and make available the result of the evaluation to GE and others. Of particular concern is the results from the fish data and EPA's conclusion on Page B.3-62 where it is stated that "the Aroclor measurements were performed by one laboratory, giving what should be a consistent set of results. Aroclor results appear reliable." Did EPA perform a review of any or all of the laboratory to see if laboratory problems occurred or were the summarized results as presented by the NYDEC relied upon completely without any independent verification of data quality? Would EPA make available to GE and others a copy of the laboratory protocols followed by the laboratory employed by the NYDEC for the analysis of the fish? Would EPA make available copies of chromatograms from the PCB anlaysis of fish (NYDEC) and water (U.S. Geological Survey)? Would EPA make available a copy of the analytical method employed by the U.S. Geological Survey for the analysis of PCBs in the water column?

72 Pg. B.4.1, par. 2: EPA presents three pathways for PCBs to interact with biota. EPA should consider the effects of the accumulation of PCBs through the food web.

73 Pg. B.4-3: Estimates of the daily average flood flow rates for the Hudson River below Sacandaga are presented and equivalent estimates at Fort Edward are presented in Table B.4-1. A comparison of the two shows a discrepancy with the average daily flow estimates at Fort Edward. It is indicated that the daily average flows at Fort Edward are lower that than those at the Hudson just below Sacandaga. Due to the difference in drainage area, one would expect a larger flow at Fort Edward. This potential discrepancy should be investigated.

Pg. B.4-7, par. 2: GE supports the reassessment of the magnitude of the 100-year flood and concurs with EPA that it is much less than previously estimated.

74 Pg. B.4.7, par. 3: EPA presents a statement concerning the lower relative suspended sediment concentrations in the Hudson River compared to other similar rivers and attributes this to lower sediment input and the presence of dams. What information does EPA use to come to this conclusion?

Pg. B.4-8, par. 2: EPA states that only after the dam was removed was it determined that the sediments contained large amounts of PCBs. What information does EPA have to support this conclusion?

75 Pg. B.4-10, par. 2: EPA states that a reduction in suspended sediment levels occurred after the sediments reached equilibrium and the remnant deposits remediation occurred. The remnant deposits remediation has just been completed and data on suspended sediment after this have not been presented by EPA in the Phase 1 Report. How can EPA attribute this decline to the remnant deposit remediation without data?

76 Pg. B.4-12, par. 3: The concern on whether dredging may have made the transport of PCB much greater than would have occurred is a legitimate concern. Care must be taken than when making statements about sediment stability based on the historical records due to the actions of New York that caused destabilization.

77 Pg. B.4-17, par. 3: EPA concludes that major portions of the yearly load may be transported during a few brief flood events. This seems to be somewhat contradictory to the statement that the relationship to flow and PCB transport is weak particularly in the most recent data. Is this a theory or a conclusion? If it is a theory it should be so stated and EPA should test it by data collection in later phases of the project.

78 Pg. B.4-24, par. 3: The statement made that PCBs mobilized in the Upper Hudson River are transported through to the Lower Hudson

River is misleading. What the data shows is that the concentration of PCBs in the water column at various points in the Upper River do not change as one moves downstream. Why this is so is unknown. Numerous reasons could be suggested, and the notion that PCB transport on scoured sediments occurs to the Lower River is by no means the only explanation.

Pg. B.4-24, par. 3: The conclusion reached that the PCB load in the Upper Hudson River originates above the Thompson Island Pool is of major significance. This shows that removing the sediment will have little or no effect on the PCB load passing through the Upper Hudson River in any given year. This clearly shows the importance of obtaining monitoring data from the remnant deposits remediation project to see what effect the remedation has had on the water column PCB values. This monitoring is mandated to be done by GE as part of the agreement entered into by the Federal government and GE for the remediation of the remnant deposits.

Pg. B.4-25, par. 2: GE does not agree with the approach being advocated for estimating annual PCB flux in the river. The uncertainty of all the methods employed to date is very great. The basic limitation is a lack of data to accurately determine the actual PCB flux to the Lower River and the lack of a physically based model for determining PCB transport. As discussed in Section 2.0 of GE comments, the appropriate way to understand the transport of PCB is to develop a quantatative framework (i.e. model) that can 79 handle the complexities of the processes being modeled. The statistical model employed by EPA is an oversimplification of a very complex system. EPA needs to interpret the data in a framework that realistically models the river conditions.

Pg. B.4-26, par. 3: The EPA assessment of PCB loading to the Lower River from the Upper River presented in this section is very 80 speculative and the purpose for presenting this is unclear. The estimates of PCBs discharged are speculative and GE would like EPA to more critically evaluate this information if the numbers will continue to be used. The EPA estimates for loading for PCBs from 1977 to 1988, while limited in quality, are the best estimates of PCB transport to the Lower River. The only reliable estimate that can be made is that it appears that greater than 15,000 kg of PCB, were transported into the Lower River. Conclusions based on the rest of the information presented by EPA is nothing but speculation.

Pg. B.4-28, par 1: As discussed elsewhere in these comments, the 81 use of the dated cores does not allow one to conclude that a peak in PCB concentration occurs in the sediment that corresponds to the removal of the dam in the Upper River in 1973.

Pg. B.4-30, par. 2: As discussed elsewhere, the use of dated cores in the Lower River has been accepted by EPA without a critical review of the information. EPA has not presented any information to suggest that data from such cores could be used to determine, in a reliable way, the pre-1976 loading over the Federal Dam of PCBs.

82 Pg. B.4-30, par. 3: It is stated that the data on the decline in PCB levels in fish will not be sufficient to reduce the PCB burdens in many fish species to acceptable levels in a reasonable period of time. What does EPA consider to be an acceptable level? What is a reasonable time? If a remediation occurs, will this reduce in a significant way the amount of time for the PCB levels to reach the "acceptable level"? Has EPA prejudged the need for a remedy or the effectiveness of a remedy?

83 Pg. B.4-31, par. 2: Does the peak in fish concentration occur at the same time as maximum dredging activity?

84 Pg. B.3-35, par. 2: GE agrees that the risk assessment should include the reduction of PCBs over time. However, the analysis presented by EPA also need to remove the background PCB concentration in fish. This will become significant in future years.

85 Pg. B.3-37, par 1: It appears that EPA utilizes a simple arithmetic mean for calculating PCB levels in the fish. This method is most likely inappropriate and overestimates the PCB levels. EPA should determine whether the data are log-normally distributed (like many other environmental data) and employ the geometric mean as opposed to the arithmetic mean. This is a more appropriate measure of the central tendency of the data.

86 Pg. B.4-37 to B.4-40, Section B.4.4.3 (Relation Between PCB Concentration in Fish and Water): EPA attempts to define a direct linear relationship between the PCB levels measured in the water column and the PCB level measured in the fish. This relationship is generally referred to as the Bioaccumulation Factor (BAF). Based on the data presented in Figure B.4-25, the relationship was apparent with the data from 1979-1981. However, an obvious relationship in the later years (when PCB water column values dropped dramatically) does not occur. This lack of a simple empirical relationship demonstrates the need to more fully analyze the dynamics of PCBs within the food chain of the river biota. This type of analysis needs to consider variations due to PCB homologs that might help explain the difference over time in the presence of Aroclor 1016 and Aroclor 1254. The conclusion presented on page B.4-42 (second bullet) is not supported by the data for the most recent years and the presented BAF's do not appear to have any use in the RRI/FS. As discussed in the main body of GE comments, EPA must analyze all the data in a framework that allows the best understanding of PCB dynamic in the river system to be understood. A simple empirical model (i.e. BAF) does not explain the data nor allow reasonable predictions to be made.

Pg. B.4-42, par. 2: EPA claims that the water and fish data are extensive and reliable and the sediment data is somewhat less reliable. This is a very subjective statement. To address data uses and limitations, EPA will need to carefully and methodically develop and document data quality objectives as required by EPA guidance. After the data quality objectives are defined, then the adequacy of the historical data can be assessed in a more objective way. Additionally, it does not appear that EPA actually reviewed the quality of the data from the fish or water column and, therefore, the reliability of the data should be qualified until such time that EPA reviews the quality of the data. The lack of clearly defined and articulated data quality objectives is of great concern since the Phase 2A data collection work plan prepared by EPA was nearly devoid of them. 1

Pg. B.4-42, bullet 3: The characterization of the projected PCB level based on a decline with time as the "best-case" estimate is incorrect. The projection does not assume a more reasonable rate of decline nor does it employ simple averages. EPA should present the range of PCB values for the worse case scenarios that it has evaluated (12 to 1.5 parts per million). 2

Pg. B.5-6, par. 3: GE concurs that the current sediment scour estimates made by the NYDEC greatly overestimate the amount of sediment resuspension that would occur in the Thompson Island Pool during a 100 year flood. If EPA is going to utilize scour estimates that might occur during a flood scenario, GE believes that the use of a noncohesive sediment transport model based on realistic flow projections will be necessary. 3

Pg. B.6-2, par. 2: The scope of the risk assessment and the scope of the project (as presented on page I-1) may not be consistent. It is GE's understanding that the EPA is attempting to assess the risk associated with the PCBs in the sediments of the Upper Hudson River. This particular focus is on the bulk of the contaminated sediments which are below Rogers Island. This does not include potential PCB sources within the remnant deposit area or above Bakers Falls. Therefore, the risk assessment must be based on information related to the sediments of concern and contributions to risk from these "background" sources must be removed so that a real "baseline" risk assessment can be made. EPA needs to carefully define the project scope. 4

Pg. B.6-4, par. 1: As noted in an earlier comment, the limitations of the existing data are not fully understood and there is a concern that inappropriate conclusions from the data may be made. GE believes that EPA must completely evaluate the data being used to understand all of it's limitations. Until this is done, any risk calculations should at best be considered qualitative in nature.

5 Pg. B.6.4, par. 3: Care must be taken in using the results of the fishing study done by NYDEC on the Hudson River. The study does not distinguish among the major sections of the river, particularly above and below Fort Edward. These two segments of the river are vastly different and, due to the fishing ban, it would appear that the information presented on rates of fishing clearly do not apply to the section of river between Fort Edward and Troy.

6 Pg. B.6.6, par. 2: It is stated that it is EPA's policy not to assume that fishing bans or other similar types of institutional controls have any significant long-term effect in reducing the intake of contaminated fish. Please provide a copy of this policy with an explanation of how it applies. GE has to believe that the statement is not meant as an evaluation of the effectiveness of the remedy (i.e. fishing restrictions) but rather a statement meant to convey EPA's policy that for the purposes of the "baseline" risk assessment, EPA will assume the no-action alternative is occurring. This allows EPA to evaluate all remedies (including institutional controls) against a common baseline. If this is not the case, GE believes EPA must provide all information that has been relied upon by EPA to conclude that all types of fishing restrictions are ineffective in preventing or limiting consumption. This would be a puzzling conclusion for a risk assessment and is more appropriate for the feasibility study. The Phase I feasibility study does not even mention fishing restrictions. Has EPA Region 2 determined that fishing restrictions are not effective and therefore will not be evaluated in this feasibility study?

7 Pg. B.6-8, par. 4: When the final risk assessment is prepared in Phase 2 EPA will need to reevaluate the rate of decline and average fish concentration based on the anticipated NYDEC fish data. Additionally, since realistically a ROD will not be issued until 1993, EPA will need to perform the projections from 1994-2023.

8 Pg. B.6-9, par. 1: As mentioned previously, the use of the arithmetic average is probably not the most appropriate indicator of central tendency. The use of geometric mean is probably the best estimator.

9 Pg. B.6-13, par. 2: EPA should request the information from the NYDOH to substantiate the claims made in the Phase 1 Report concerning PCB levels in breast milk.

Pg. B.6-13, par. 3: EPA needs to clearly differentiate the subpopulation being considered in Messena, New York and that along the Hudson below Fort Edward. There is no indication that subsistence fishing is of concern on the Hudson River.

10 Pg. B.6-17, par. 3: EPA attempts to utilize skin-adherence values based on soils. Since the exposure assumed is to contaminated sediments, which are generally submerged, the adherence values should be very much less than those reported for soils. Based on

the data reported by EPA in the Phase I report, a value very much less than 1.0 mg/sq. cm. is reasonable.

Pg. B.6-18, par. 2: As discussed earlier, the EPA estimate of average PCB content of the Thompson Island Pool is greatly overestimated since a large amount of the original screening data was ignored. Additionally, the assumption that all contact will occur in the Thompson island pool is not reasonable. EPA should consider the average (a better measure would probably be the geometric mean) PCB concentration in the entire Upper Hudson River. The 1977 data would indicate a value less than 25 parts per million would still be a conservative estimate (see Figure B.3-1). 11

Pg. B.6-19, par. 3: The assumption that children, 1 to 6 years of age, eat 200 grams of sediment per day is absurd. Why would very young children even be near the water, let alone in the water, where ingestion could reasonably occur. Secondly, the sediments being below the water would tend to be washed off hands and items children may place in their mouths. Therefore, the rate of ingestion would be much less than for soil consumption. The average PCB level in the sediment also needs to be adjusted as described in the previous comment. 12

Pg. B.6-22, par. 1: Absorption of PCBs from river water through the skin should be a function of the dissolved PCB level verses the amount absorbed on particles. Since it is thought the dissolved load is a small fraction of the total (including that transported as colloidal material or as macromolecules) EPA should reduce the average PCB level dramatically. Additionally, since the exposure is assumed to occur over a long time period, the average PCB level in the water column over a thirty year period should be used. 13

Pg. B.6-30, Section B.6.3.4 (Toxicity of Specific PCB Congeners): The TEF approach does not currently have a sound technical basis for application to PCB toxicity. Since the approach is described in the Phase 1 Report, EPA should make available the source of the information provided (transcript of the December 1990 meeting?). 14

Pg. B.6-34, par. 2: While EPA's attempt to explain why the use of the FDA advisory level for PCBs in fish may not apply to a Superfund risk assessment, due to specific fish consumption assumptions, it is not clear why EPA and FDA utilize different toxicity factors for PCBs. In particular, why, substantively, does FDA utilize different carcinogenic potency factors (Aroclor 1260 verses Aroclor 1254) for different PCBs and EPA does not? 15

Pg. B.6-44, par. 1: EPA indirectly references the reevaluation of the pathology slides from the relevant PCB feeding studies. As EPA knows, the evaluation is complete. The results with the interpretation were submitted to EPA prior to the completion of the risk assessment. GE has transmitted the report to EPA-Washington and EPA-New York and has asked that the results be evaluated. 16

17 Additionally, GE has requested that this important new information, which is directly applicable to the Hudson River RRI/FS, be placed into the Administrative Record. To date GE has not had a formal response related to this new information and EPA has yet to place this date in the Administrative Record.

18 Pg. B.6-45, par. 1: In the uncertainty analysis EPA mentions a number of obtuse issues relate to why the risks might be underestimated and fail to recognize that due to the way EPA manages uncertainty in the Superfund process that the risks estimated by EPA are grossly overestimated and the real risk is most likely much lower.

19 Pg. B.6-45, par. 2: The data as presented by EPA is insufficient to calculate the risk in the Lower River due to PCBs in the Upper River sediments. The attempt to qualitatively estimate the risk is no better than speculation.

20 Pg. B.7-2, par. 4: The description of the terrestrial ecosystem is inconsistent with that shown in Plate B.1-4.

Pg. B.7.3, par. 2: The presence of pockets of wetlands are mentioned, yet the importance of these along with emergent wetland areas (fish habitat) is not discussed.

21 Pg. B.7-16 to B.7-17: There may be an error in the trophic partitioning. The bluegill's dietary preference would be more appropriately described as epibenthic invertebrates and yellow perch as fish/macroinvertebrate. The list provided in the text appears to be based on two literature citations. Confusion over the dietary preferences for these fish may be due to age (i.e. juvenile fish sometimes have different preferences than adults).

22 Pg. B.7-18, par. 2: EPA states that the improving conditions as measured by improving biological measures should not necessarily reflect the lack of influence of PCBs. EPA should be more open minded and recognize that generally there does not appear to be a negative effect on the aquatic system due to the presence of PCBs.

23 Pg. B.7-22, Table B.7-1: Table B.7-1 indicates a low level of confidence in data for both the herring gull and mink. In spite of insufficient data, the Phase I report provides, in Table B.7-3, proposed ecological guidleines for limits to PCB concentrations in birds and mammals. Although the footnote indicates that the values are not enforceable standards, presentaion in this table implies more knowledge than is currently available regarding allowable concnetrations of PCBs in wildlife.

Pg. B.7-23, Table B.7-1: The assumed sediment PCB level is not reasonable and should be reduced to less than 25 parts per million. See the earlier discussion in the Human Health risk assessment.

Pg. B.7-34, par. 4: It is indicated that while few reports of the effects of PCBs on aquatic insects exist, many of the species seem to exhibit sensitivities similar to those of Daphnia magna. EPA should make this data available to GE and others. 24

Pg. C1-1: The requirements for a feasibility study (FS) from the National Contingency Plan (NCP) are correctly repeated. However, EPA does not explain what the purpose of performing the Phase 1 FS was since we are very early in the RI/FS process. Therefore, it is difficult to know if the objectives were met or if there will be additional opportunities for parties to comment on all aspects of the FS. If the purpose is to identify data needed to complete the field investigation, the result is incomplete. The only data identified as being needed is bench testing of four technologies. GE believes the following data are also needed: 25

1. Sufficient data on the physical/chemical and biological nature of the river so that the fate and transport of PCBs can be determined under various remedial scenarios. This will necessitate a complex model that will allow projections of the PCB concentration (for biota as the receptor) into the future (for the risk assessment) for various remedial actions including the no- action alternative (comparative risk reduction).

2. Evaluation of the feasibility of dredging in the unique environment presented by the near shoreline locations of the sediment deposits in the Upper Hudson River.

Pg. C.1-2: EPA mentions that during Phase 2 data on the nature and extent of contamination will be gathered. To date, EPA has not defined what the objectives of such an evaluation would be or, overall, what the data needs might be for the risk assessment or the feasibility study. EPA not only needs to define to what degree the nature and extent of contamination must be determined, but also must determine the time dependent interactions between the various media. Understanding the nature and extent is not sufficient to understand the complex chemical/physical/biological system where the PCBs interact over time. EPA must perform a methodical analysis of data quality objectives as dictated by EPA guidance. As an example, if EPA is going to consider dredging as a remedy, and furthermore, EPA targets areas of high concentration in an effort to reduce volume, EPA will need to be able to determine volume to see if the type of equipment to handle the volume of material is available. Additionally, there are doubts whether EPA can define "Hot Spots" and remove them. Therefore, to determine feasibility of dredging, EPA will need to understand how the PCBs are distributed on a scale that is meaningful for the type of dredge and project being considered.

Pg. C.2-1, par. 3: EPA claims it is apparent that the main problem are impacts upon aquatic life and consumers of aquatic life. The 26 only hypothetical impacts documented by EPA, using EPA default assumptions on toxicity, fish consumption, and other exposure parameters is human consumption of fish (see earlier comments on the risk assessment). It is imperative that EPA carefully define the preliminary remedial action objectives as dictated by the RI/FS guidance, based on appropriate exposure pathways and receptors.

27 **Pg. C.2-1:** Under the no-action scenario, EPA lists the use of institutional controls. Institutional controls are considered to be an action. EPA should define another category of action referred to as institutional controls which may include such items as monitoring, fishing restrictions (various types), and land use controls. Otherwise, the use of the term is misleading. EPA should also consider another category that is any combination of the above actions. It is possible that there could be a combination of activities.

Table C.2-1: 1. The table of institutional controls should include as process options fishing ban, managed fishery (i.e. catch and release), monitoring, educational programs, land use restriction. 2. Excavation as a remedy is given as is dredging. This would imply that EPA is evaluating something other than the sediments within the river. What is the scope of the RRI/FS? 3. A very good compilation of sediment removal options and technologies is given in the document entitled: Review of Removal, Contaminant and Treatment of Contaminated Sediment in the Great Lakes (U.S Army Corps of Engineers - December 119, Miscellaneous Paper EL 90-25). EPA should consider this relevant and timely information. This document notes the importance of dredged material transport options. It is suggested that EPA create a subcategory under dredging for material transport.

28 **Pg. C.3-1:** EPA seems to indicate that nonpromulgated advisories or guidance documents could substitute for ARARs where there are no specific ARARs applicable to a situation or where ARARs are not protective. GE strongly disagrees that any guidance or nonpromulgated standard can ever be treated as an ARAR for the purposes of Superfund/CERCLA.

Table C.3-2: Wetland impacts caused by dredging must be considered and weighed against the alternative. GE agrees that this requirement is applicable.

29 **Pg. C.4-1, par. 3:** It is stated that various issues related to capping need to be investigated, such as ability to withstand scour, leaching, etc. GE agrees such investigations are needed and believes that EPA should begin the investigation of these technologies at this time. This is a defined data need.

30 **Pg. C.4-7, par. 3:** EPA is relying on published data for determining the fugitive sediment releases from dredging. This is acceptable as long as the same type of dredge(s) is evaluated in

the same type of condition (small channel, high velocity riverine system). If the data is not comparable, EPA will need to perform tests to determine if this will be a significant issue.

Pg. C.4-6: An important component of any dredging program assessment is the evaluation of transportation of the dredged material. EPA will need to include an evaluation of this in the future work.

Pg. C.4-8, par. 2: Mention is made that, historically, the NYDOT has dredged in river. The occurrence of dredging historically cannot be used alone to determine that dredging is feasible. NYDOT dredging is in the navigational channel in the center of the River, not in the near bank areas and in backwater eddies where PCB containing sediments accumulate. 31

Pg.C.4-8, par. 2: Is the EPA specifically evaluating the option considered either historically or currently by the NYDEC?

Pg. C.4-8, Section C.4.4 (Treatment Technologies): This section is difficult to follow and is overly simplistic. GE believes EPA needs to prepare preliminary remedial action objectives (RAOs) prior to evaluating individual technologies. It is not clear what level of PCB treatment is needed (i.e. What residual level is acceptable and why?). Also, a major confounding problem with the treatment of the Hudson River sediment may very well be other constituents present in the sediments such as metals. This important consideration is not even discussed. GE believes EPA should first prepare general site-specific preliminary-RAOs and then compile and evaluate candidate technologies based on the RAOs. EPA also relies heavily on information that is either not referenced, or if it is referenced, is not readily available. GE again requests that EPA prepare a complete administrative record so GE can evaluate conclusions reached based on the information that is otherwise not available to GE. 32

GE also would like to caution EPA against utilizing vendor supplied information without independent corroborating information. Additionally, GE strongly believes that if EPA chooses a treatment option in the ROD (GE does not advocate this) and that if a vendor-specific technology is selected that the costs will be uncontrollable. GE believes EPA should allow selection of the specific technology as part of remedial design. EPA would instead set performance standards for the technology to meet.

Pg. C.4-8, par. 3: EPA states that the incineration of PCB contaminated sediments is the most widely practiced and permitted method for the management. GE is unaware of any significant amounts of sediment (contaminated with anything) that have been incinerated and then landfilled. Additionally, GE is unaware of any significant upland sediment disposal sites that have been used for the disposal of significant quantities of PCB (or other 33 contaminants) contaminated sediments. EPA should provide the data that indicates the assertion is correct. This information would be helpful in focusing future work.

Pg. C.4-8, Section C.4.4: If EPA selects a type of technology, GE
34 strongly recommends that EPA not be overly prescriptive in its selection, but rather leave latitude for design, where cost and schedule issues can be optimized. EPA should instead provide realistic treatment levels (i.e. performance standards). Specifying a specific technology that may only come from a single vendor will result in enormous costs. As an example, EPA may find that a number of chemical treatment technologies have been shown to be feasible. GE should be allowed some latitude in deciding which one is most appropriate after detailed design occurs. In the record of decision, EPA could specify a class of treatment (e.g. chemical treatment) and a performance standard. GE would then, based on detailed design, select the most efficient method. This same comment would apply to removal technologies.

Pg. C.4-9, par. 1: EPA should consider the work being done as part
35 of the Federal ARCS program (see comment on Table C.2.1). The listing of potentially applicable technologies need to be further evaluated with such contemporary literature. Additionally, the more recent evaluations performed at Massena, New York and New Bedford Harbor need to be considered.

Pg.C.4-9, par. 4: EPA refers to a study conducted by Research
36 Triangle Institute (RTI) yet does not supply a reference to a published report. Since this information seems to be the basis of EPA's views on the PCB treatment technologies in general, GE believes EPA must make this report available for review in the administrative record.

Pg. c.4-14, par. 1: Reference is made to a recent study by RCC for processing liquid sludge or contaminated sediment. The source of the information is not divulged. This information should be made available to GE.

Pg. C.4-14, Table C.4-4: In discussions on LEEP, EPA references Steiner (1991). An examination of the reference section of the report indicates this was some sort of seminar material. Since GE is unaware of the seminar or how to obtain the materials, GE requests that the information be made available to GE by EPA.

Pg. C.4-13: For the B.E.S.T. process, EPA should provide cost information if it is available.

Pg. C.4-13, par. 2: EPA indicates that the B.E.S.T. process was
37 able to achieve a PCB reduction of 99 percent. This result was from sediments that contain much higher levels of PCBs than generally found in the Hudson River (5,800 and 420 ppm). Would the same extraction efficiency occur for sediments with lower amounts

of PCB? It is also indicated that the process yielded sediments having a PCB level of 16 ppm after six extraction stages. Is this level acceptable? What is the remedial action objective being used as a measuring stick for evaluating the effectiveness for these and other technologies?

Pg. C.4-15, par. 2: It is indicated that LEEP, has feed stream particle size limitations. What are these limitations and are they an issue with Hudson River sediment? Does particle size information on Hudson River sediments need to be gathered? 38

Pg. C.4-15, Propane Extraction: The only reference to information on the propane extraction process is a reference cited in Table C.4-5. In the reference section, all that is given is a personal communication with the vendor. GE requests that EPA make available relevant information and not to rely on vendor supplied information. 39

Pg. C.4-16, par. 2: A number of problems with the propane extraction system are listed. These problems were found at New Bedford and the material handling and low extraction efficiencies seem to indicate that the use on sediments would be limited. Is EPA planning to gathering the field data necessary to characterize the Hudson River sediments sufficiently to evaluate these problems? EPA indicated the process was rejected for the New Bedford sediments project due to these problems. Why has EPA not rejected this technology for the Hudson River sediments? What additional information does EPA have? 40

Pg. C.4-16, par. 2: What cost estimates are available for the propane extraction technology?

Pg. C.4-16, Thermal Treatment Technologies: EPA must consider the fact that significant amounts of metals are present in the sediments and not just consider the PCB destruction potential but also the effect the metals might have on the system as well as the need for extensive emission controls and the fact that after incineration the metal may be more mobile since organic materials have been destroyed. 41

Pg. C.4-17, par. 1: EPA indicates that the Toxic Substances Control Act (TSCA) requires that PCBs be incinerated at a temperature of 2,200 degrees fahrenheit. While this is true for PCBs of certain concentration or those generated under certain conditions, it does not appear that those sediments in the Hudson River would fall under the given requirement. EPA also indicates that PCBs in the residue material would have to be treated to a level of 2 parts per million or less. Please provide a reference for this specific requirement and an explanation of why the Hudson River sediments would have to meet this requirement. 42

43 Pg. C.4-17, par. 3: EPA states that due to the anticipated load for this project that more than one thermal system will be required. What is the load (yards of sediment?) being assumed by EPA?

Pg. C.4-17, par. 3: EPA needs to consider early on in the feasibility study the likely public opposition to incineration. This is particularly true given the statement that multiple units will be necessary.

Pg. C.4-17: EPA does not mention methods for handling materials that may include separation into differing size fractions or for separating the water. Both of these need to be considered for pretreatment of sediments. These may be very important as a pretreatment technology for the thermal technologies since they reduce the volume of material treated as well as significantly change the required energy inputs.

44 Pg. C.4-19, par. 3: EPA again mentions the requirement for destroying PCBs at a temperature of 2200 degrees fahrenheit. EPA needs to explain its rationale for arriving at the conclusion that the sediments, regardless of PCB concentration or time an method of origin are regulated by the specified requirement.

45 Pg. C.4-20, par. 2: The fluidized bed incinerator is criticized for not being transportable. Is ease of transport an important consideration for the type of project EPA is envisioning?

Pg. C.4-21, par. 3: EPA states that the circulating fluidized bed incinerator has been shown to destroy PCBs at a temperature below 2200 degrees fahrenheit. Please make available to GE the information being relied upon by EPA to make this statement. Does this also indicate that EPA will accept this as equivalent to a TSCA incinerator?

Pg. C.4-21, par. 3: Does this technology require that dewatering of sediments occur?

Pg. C.4-21: On page C.4-20, paragraph 2, EPA rejects the fluidized bed incinerator due to the fact it does not destroy PCBs at sufficiently high temperatures and the technology is not transportable. These same limitations appear to apply to the circulating bed incinerator, yet EPA has not rejected it as a technology.

46 Pg. C.4-21, Conveyor Furnace: EPA does not provide any information on the use of this technology for PCB contaminated sediments. Is this technology capable of handling high moisture content material and given the low temperatures cited, (operates at less than 2200 degrees fahrenheit) is this material applicable, in EPA's opinion, to the PCB contaminated materials?

Pg. C.4-29, par. 3: EPA states that a compositing operation would require a RCRA liner and leachate collection system meeting the RCRA minimum technology requirements. Has EPA decided that RCRA is an ARAR for the Hudson River sediments? 47

Pg. C.4-31, par. 3: EPA identifies additional evaluation and data it needs to more fully evaluate the applicability of bioremediation of Hudson River sediments. As pointed out in the other GE comments, some of this information is available and needs to be considered by EPA. Based on this statement, it is not clear if EPA will perform the needed work or if they are identifying this for GE to perform. GE is willing to work closely with EPA and others to gather the information if EPA will consider the information during the Hudson RRI/FS. 48

Pg. C.4-32, par. 3: EPA states that subaqueous confinement will not be considered further since EPA believes that relatively steep (hydraulic) gradients exist. This is not totally correct and EPA needs to more thoroughly evaluate the use of either subaqueous disposal or a technology that will be used to further stabilize existing deposits of contaminated sediment. While the topographic gradient in the Upper Hudson is relatively steep compared to that in the Lower Hudson River, the hydraulic gradients within the pools behind the dams are relatively shallow. The majority of the Upper River is composed of pools of relatively small hydraulic gradients. EPA needs to make a more meaningful comparison of water velocities that the materials in the Upper River will be exposed to and compare those to tidal areas where disposal has occurred in other areas of the country. The continued stability of the sediments present in the Upper Hudson attest to the viability of in river containment. GE suggests these potential actions be retained for further analysis. 49

Pg. C.4-32, par. 4: EPA states that a landfill will need to meet regulatory requirements for the disposal of PCB contaminated material. EPA needs to perform a more careful analysis of this point. It is possible that if dredging were to occur, a vast majority of the material would contain less than 50 parts per million of PCB. This material should not have to be put in a landfill meeting the TSCA requirements. This also points to the possibility that only a small amount of material dredged may need to be treated as a TSCA material. Additionally, if the material is first processed into size fractions, then the vast majority of PCBs would be transferred to the very fine grained fraction of the sediment. The majority of the sediment volume may be relatively clean and will not need to be managed within the regulatory framework. 50

Pg. C.4-32, par.4: EPA states the technology for a landfill is readily available. This may true in the sense that the type of materials can be controlled in lined landfills. However, the application is extremely limited due to potential constraint presented by the site hydrogeology and the inability to site the landfill. Based on past failed attempts to site a landfill by the State of New York for the purpose of disposing of contaminated sediments, EPA should view this technology as having limited potential for application for the project.

51 Pg. C.6-1, par. 1: EPA states that the data upon which the initial screening of technologies was based is from various sources. GE requests that EPA make the data or information available to GE. GE also request that EPA specifically identify the data and information relied upon.

Pg. C.6-1, par. 1: The statement made by EPA that it is possible to render some judgements considering remedial options is somewhat confusing. The analysis presented by EPA was focused on technologies without much consideration of how they might be combined to form a remedial option. Therefore, it is not clear how EPA will reach a decision. GE believes, as stated in EPA's own guidance, that before any technologies are screened preliminary remedial action objectives must first be identified.

Pg. C.6-1, par. 2: EPA states that technologies related to excavation of remnant deposits have not been evaluated nor screened for further evaluation. Additionally, Figure C.6.1 shows that excavations as a removal technology has been retained for further analysis. GE is very concerned that EPA is attempting to increase the scope of the RRI/FS without directly acknowledging it. Page I-1 of the EPA Phase 2 report clearly states that the scope for the project is limited to the sediments in the Upper River and not to the remnant deposits of other areas outside the river. EPA has also stated in public meetings that the focus is only on the sediments within the Upper River and not outside of the banks. GE has implemented an agreement for remediation of the remnant deposits. The "ink" has barely dried on the agreement and EPA is suggesting that the 6 millon dollars spent by GE to implement the EPA chosen remedy was for nothing. Why is EPA considering excavation of the remnants? EPA must remove all considerations of remnant excavation from within the confines of this RRI/FS.

52 Pg. C.6-1, par. 3: EPA states that it is waiting to evaluate the three types of dredging pending availability of additional information on material characteristics and quantities. What specific information is required and when is EPA planning to obtain this information?

53 Pg. C.6-2, par. 2: On Table C.6-1, EPA eliminates from consideration the possibility of subaquesous disposal. As stated in an earlier comment, EPA should retain this option for further analysis.

54 Pg. C.7-1, par. 2: EPA should either perform biological testing as part of its RI/FS efforts, or work with GE so GE efforts can be

better directed to meeting EPA program needs for the Hudson River RRI/FS.

Pg. C.7-1, par. 3: EPA states that they will test a number of technologies on the bench scale and that they will work with the developers. GE has extensive experience in such endeavors and needs to voice a few words of caution. The first is that EPA must carefully oversee vendors since they have a strong vested interest in showing their technologies have application. The second problem is the possibility that if the sediment to be tested is TSCA regulated (we are not suggesting it is, however, EPA may think it is), the vendors will have to obtain TSCA research and development permits prior to testing. This is a time consuming cumbersome process. GE also requests that EPA develop specific work plans from each test and specific objectives for measuring success. These work plans should be made available for public comment prior to implementation. 55

References (pp. R-1 et seq.)

Many references that are by the same author or organization in the same year are not differentiated making it difficult to determine what the source of information was. As an example see USEPA 1990. 56

Numerous citations in the text are not included in the references making it nearly impossible to evaluate conclusions reached by EPA.

The materials referenced by EPA are a diverse range of information, most of which is difficult to obtain. For some material refernced by EPA to a source is not clear and GE does not know exactly what the information being referred to is. GE believes, as part of EPA's community involvement project, that a central library of information be established that will house all data or information for the project. This would include copies of all published reports (including peer review and journal articles) that have relevance to the study. 57

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APPENDIX B

COMMENT ON THE CHARACTERIZATION OF PCBs FOUND IN ENVIRONMENTAL SAMPLES

Section B.3.7 of the Phase 1 Report contains a discussion of PCB nomenclature and methods of analyzing environmental samples for PCB content. It correctly points out that PCBs were manufactured and sold as mixtures of congeners and that the "Aroclor" designations were applied to these mixtures. It also correctly points out that as soon as any given Aroclor (a mixture of known composition) is subject to environmental influences, the composition is altered in a way that cannot be known without congener-specific analysis. It then notes that the convention of characterizing PCBs found in environmental samples by Aroclor is both inaccurate and misleading, since:

> "Aroclor designations are no longer descriptive of the congeners present and their relative amounts" (p. B.3-51).

In Subsection B.3.7.3, the Phase 1 Report summarizes the various problems that arise in using the existing data because of both the inaccuracy of the Aroclor nomenclature when applied to environmental samples as well as the inability of commonly used laboratory techniques to accurately quantitate the PCBs in such samples.

GE agrees with EPA's frank criticism of the historic database. Unfortunately, after saying all of the correct things, throughout the Phase 1 Report EPA uses the data as if it were (a) fully accurate and (b) uniformly collected and analyzed. In the 1 absence of congener-or homolog-specific data, EPA repeatedly treats all PCBs the same, jumps to conclusions as to PCB source and fate based on crude Aroclor designations, and makes assumptions about the presence, composition, and masses of PCBs in various environmental media.

Since, as EPA elsewhere in the Phase 1 Report acknowledges, the toxological and other properties of individual members of the PCB family vary greatly, glossing over the nomenclature and analytic ambiguities of the existing data base can lead to erroneous conclusions. GE believes that EPA's conclusion on page B.3-63 is correct. GE regrets that EPA has not acted consistently with that conclusion in the rest of the Phase 1 Report. For the future phases of the RI/FS, and in the ultimate EPA decision-making process, GE urges that EPA not just pay lip service to its own conclusion, but act as if that conclusion were valid and highly significant.

2 In addition, the Phase 1 Report presents an inappropriate comparison of sediment PCB concentrations collected from the same regions of the river by GE in 1990, EPA in 1983, and Malcolm Pirnie in 1978 (p. B.3-14; Table B.3-8). The report states:

> "In four of the six locations, the GE samples indicate average PCB levels above both the 1976-78 and 1983 values; the remaining two locations show 1990 PCB levels lower than the 1976-78 and/or 1983 results" (p.B.3-14).

This statement is inaccurate and was made without regard to the differences in analytical techniques employed for the different surveys.

The 1978 and 1983 data used in this comparison were generated by packed column techniques. Packed column separations of sediment PCB extracts typically cannot resolve Webb and McCall peak numbers 11 and 14, which contain the more volatile monochlorinated biphenyls, because they elute with the solvent in the extract (Webb and McCall, 1973). In contrast, the capillary column techniques employed to analyze the 1990 GE data provide sufficient separation to quantify monochlorinated biphenyls.

In samples which have undergone reductive dechlorination, monochlorinated biphenyls can constitute as much as 50 percent of the total PCBs (Brown et. al., 1987). Therefore, for dechlorinated samples, capillary column techniques produce a greater total PCB concentration than packed column methods. For this reason, the comparisons in total PCB concentrations made in Section B.3.2.4 are inappropriate and lead the reader to the erroneous conclusion that PCB levels in the sediments are elevated relative to historical data. Indeed, comparing the results from the capillary column technique to the packed column technique is akin to comparing apples to oranges.

References

Brown, J.F., R.E. Wagner, H. Feng, D.L. Bedard, M.J. Brennair, J.C. Carnakan, and R.J. May, 1987, Environmental Dechlorination of PCBs. Environ. Toxicol. Chem. 6:579, 593.

Webb, R.G. and A.C. McCall. 1973. Quantitative PCB Standards for Election Cafture Gas Chromatography. J. Chromatogr. Sci. 11:366-373

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APPENDIX C

COMMENT ON "TBC" ITEMS

1

The National Contingency Plan (NCP) permits EPA, as part of its duty to identify applicable or relevant and appropriate requirements to identify "other advisories, criteria, or guidance to be considered for a particular release" (TBCs) (NCP § 300.400(g)(3)). The Phase 1 Report briefly refers to these TBCs in its Section C.3.1.3, and several TBCs are preliminarily identified in Tables C.3-1 and C.3-2.

One of the items preliminarily identified as a TBC in Table C.3-1 is a New York State document, identified as "Sediment Criteria" and dated December 1989 Sediment Criteria. The Phase 1 Report improperly classifies this document as a TBC, however, because (1) it does not meet the NCP's definition of a TBC; (2) it was never intended to be used to establish a clean-up level or other remedial goal and thus is not appropriate for use in an RI/FS; and (3) it is scientifically invalid and unreliable.

The document identified in Table C.3-1 apparently refers to a paper dated December 1989 written by Dr. Arthur J. Newell of the New York State Department of Environmental Conservation entitled "Sediment Criteria - December 1989." The cover of this paper states:

> "Note: This document is used as a guidance by the Division of Fish and Wildlife. It is neither a standard nor a policy of the Department."

Because this document has not been expressly adopted by the State as an official standard or policy, it cannot reasonably be said to have been "developed" by the State. It is thus quite clear that the paper was not "developed by EPA, other federal agencies, or states" (NCP § 300.400(g)(3)). Therefore, it fails to meet the NCP's express definition of a TBC.

Furthermore, the paper itself is clearly not intended to be used in establishing sediment clean-up goals. Its sole purpose is to propose a methodology for mathematically simulating the fate and transport of a contaminant found in sediments to the evaluate the effects on human health and the environment of such contaminants. Thus, if it is relevant all to the RI/FS process, it is relevant to the site characterization, human health risk, and ecological assessment elements. EPA has not used the paper for such purposes, and GE's comments on those elements of the Phase 1 Report are contained in Sections 2 and 3 of these comments. In any event, it should be clear that the unpromulgated, unofficial NYSDEC paper it is not relevant to any of the NCP's evaluation criteria and therefore cannot be "appropriate" for use in setting remedial goals or in comparing alternatives (NCP § 300.400(e)(9)).

Lastly, if by some stretch of the NCP standard the paper is found to be a "state" guidance that is "appropriate," the preamble to the NCP (see 55 Fed. Reg. 8745) makes it clear that TBCs must be evaluated by EPA for "reliability and validity." As far as GE is aware, EPA has not performed any evaluation of this non-peer reviewed paper and must do so if it is to be used as a TBC. In fact, EPA has rejected sediment criteria for compounds such as PCBs, due to significant technical and scientific concerns regarding the validity of the approach (i.e., equilibrium partitioning) employed in the paper.

Even a cursory review of the paper, however, reveals a fundamental flaw. The approach described in the paper relies on the bioaccumulation factor (BAF) approach to relate PCB levels in fish and PCB levels in water. As discussed in Section 2.0 of these comments, the BAF approach (which assumes a linear relationship between PCB levels in fish and PCB levels in water) has no physical, chemical or biological basis and is invalid for the entire range of PCB concentrations. Moreover, the paper's reliance on the BAF approach is additionally flawed because the paper fails to account for the fact that different PCB congeners behave differently in different environmental media and have significantly different toxicities and physical-chemical properties.

GE therefore believes that the sediment criteria paper is improperly identified in the Phase 1 Report as a potential TBC. It is not a guidance adopted or used by any State agency, it is not applicable to the setting of remedial goals, and it is scientifically unreliable and invalid.

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