RESPONSIVENESS SUMMARY
HUDSON RIVER PCBs SITE RECORD OF DECISION

JANUARY 2002

For

U.S. Environmental Protection Agency
Region 2
and
U.S. Army Corps of Engineers
Kansas City District

TAMS Consultants, Inc.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ACHP	Advisory Council on Historic Preservation
AGC	Annual Guideline Concentration
AOC	Administrative Order on Consent
ANOVA	Analysis of Variance
APEG	Alkaline (Alkali Metal Hydroxide) Polyethylene Glycol
ARAR	Applicable or Relevant and Appropriate Requirement
ARCC	Adirondack Regional Chambers of Commerce
ARCS	Assessment and Remediation of Contaminated Sediments Program
ATSDR	Agency for Toxic Substance and Disease Registry
AWQC	Ambient Water Quality Criterion
BAT	Best Achievable Technology
BBL	Blasland, Bouck, and Lee
BCD	Base-Catalyzed Decomposition
BMR	Baseline Modeling Report
CADD	Computer-Aided Drafting and Design
CDF	Confined Disposal Facility
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIP	Community Interaction Program
CLU-IN	Hazardous Waste Clean-up Information (EPA web site)
COC	Chemical(s) of Concern
COPC	Chemical(s) of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CT	Central Tendency
CWA	Clean Water Act
CZM	Coastal Zone Management
DEIR	Data Evaluation and Interpretation Report
DMR	Discharge Monitoring Report
DNAPL	Dense Non-Aqueous Phase Liquid
DOC	Dissolved Organic Carbon
DOSM	Depth of Scour Model
DOT	Department of Transportation
DRE	Destruction and Removal Efficiency
ECD	Electron Capture Detector
ECL	Environmental Conservation Law (New York)
EE/CA	Engineering Evaluation/Cost Analysis
EEC	Extreme Effect Concentration
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ETWG	Engineering/Technology Work Group
FAIR	Farmers Against Irresponsible Remediation

LIST OF ACRONYMS and ABBREVIATIONS (*cont'd*)

FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FR	Federal Register
FRTR	Federal Remediation Technologies Roundtable
FS	Feasibility Study
FSSOW	Feasibility Study Scope of Work
FWIA	Fish & Wildlife Impact Analysis
g/m^2	Grams per meter squared
GAC	Granular Activated Carbon
GC	Gas Chromatography
GCL	Geosynthetic Clay Liner
GE	General Electric Company
GIS	Geographic Information System
GLNPO	(EPA's) Great Lakes National Program Office
GRA	General Response Action
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HHRASOW	Human Health Risk Assessment Scope of Work
HI	Hazard Index
HMTA	Hazardous Materials Transportation Act
hp	Horsepower
HQ	Hazard Quotient
HROC	Hudson River PCB Oversight Committee
HSI	Habitat Suitability Index
HTTD	High Temperature Thermal Desorption
HUDTOX	Upper Hudson River Toxic Chemical Model
IBI	Index of Biotic Integrity
IRIS	Integrated Risk Information System
ITT	Innovative Treatment Technologies (database)
kg	Kilogram
KPEG	Potassium polyethylene glycol
LOAEL	Lowest Observed Adverse Effect Level
LRC, LRCR	Low Resolution Sediment Coring Report
LTI	LimnoTech, Inc.
LTTD	Low Temperature Thermal Desorption
LWA	Length-Weighted Average
MANOVA	Multivariate Analysis of Variance
M&E	Metcalf and Eddy
MBI	Macroinvertebrate Biotic Index
MCA	Menzie-Cura and Associates
MCACES	Cost Estimating Software (USACE)
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDEQ	Michigan Department of Environmental Quality
MDPR	Molar Dechlorination Product Ratio
MEC	Mid-Range Effects Concentration
mg/kg	Milligrams per Kilogram (generally equivalent to parts per million, or ppm)
mg/L	Milligrams per Liter (generally equivalent to ppm)
MNA	Monitored Natural Attenuation
MPA	Mass per Unit Area

MS	Mass Spectroscopy
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Coding System
NAS	National Academy of Sciences
NCP	National Oil Spill and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
ng/L	Nanograms per Liter, parts per trillion
NHPA	National Historic Preservation Act
NiMo	Niagara Mohawk Power Company
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
NRC	National Research Council
NTCRA	Non-Time Critical Removal Action
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
NYSDOT	New York State Department of Transportation
NYSPDES	New York State Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OPRHP	Office of Parks, Recreation, and Historic Preservation
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response (EPA)
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PCRDMP	Post-Construction Remnant Deposit Monitoring Plan
PEL	Probable Effects Level
PMCR	Preliminary Modeling Calibration Report
ppm	part(s) per million (mg/kg or mg/L)
PRG	Preliminary Remediation Goal
PSG	Project Sponsor Group
PVC	Polyvinyl Chloride
RAMP	Remedial Action Master Plan
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RBMR	Revised Baseline Modeling Report
REACH IT	Remediation and Characterization Innovative Technologies (EPA database)
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RI	Remedial Investigation
RIMS	Remediation Information Management System
RM	River Mile
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SAV	Submerged Aquatic Vegetation
SEC	Sediment Effect Concentration
SHPO	State Historic Preservation Office
SITE	Superfund Innovative Technology Evaluation Program
SPDES	State Pollution Discharge Elimination System

SQRT	Screening Quick Reference Tables
STC	Scientific and Technical Committee
T&E	Threatened and Endangered
TAG	Technical Assistance Grant
TAGM	Technical Assistance Guidance Memorandum (NYSDEC)
TBC	To-be-considered
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCP	2,4,6-Trichlorophenol
TEC	Threshold Effect Concentration
TEF	Toxicity Equivalency Factor
TEQ	(Dioxin-like) Toxic Equivalent Quotient
TI	Thompson Island
TID	Thompson Island Dam
TIN	Triangulated Irregular Network
TIP	Thompson Island Pool
TLV	Threshold Limit Value
TOC	Total Organic Carbon
TOGS	Technical and Operational Guidance Series (NYSDEC)
TOPS	Trace Organics Platform Sampler
TQ	Toxicity Quotient
TR	Target Risk
TRV	Toxicity Reference Value
TSCA	Toxic Substances Control Act
TWA	Time-Weighted Average
UCL	Upper Confidence Limit
UET	Upper Effects Threshold
μg/kg	Micrograms per Kilogram, (generally equivalent to parts per billion, or ppb)
μg/L	Micrograms per Liter, (generally equivalent to parts per billion, or ppb)
USACE	United States Army Corps of Engineers
USBEA	United States Bureau of Economic Analysis
USBLS	United States Bureau of Labor Statistics
USC	United States Code
USDOC	United States Department of Commerce
USDOD	United States Department of Defense
USDOE	United States Department of Energy
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VISITT	Vendor Information System for Innovative Treatment Technologies (EPA Program)
VLDPE	Very Low Density Polyethylene
WHO	World Health Organization

Hudson River PCBs Site Record of Decision
Responsiveness Summary

EXECUTIVE SUMMARY

INTRODUCTION

Since its inception in 1990, EPA's Reassessment Remedial Investigation/Feasibility Study (RI/FS) has had the benefit of an extensive public-involvement program. Even before the initiation of the formal public comment period on the Proposed Plan for the Hudson River PCBs Superfund Site and the supporting analysis and information, there had been over 65 meetings/forums with the public, involving many issues, people, and places. It was through this extensive effort that EPA determined that local landfilling of dredged materials would not be an option in the event that a dredging remedy were selected.

EPA opened the formal public comment period with the release of the Hudson River PCBs Superfund Site Proposed Plan on December 12, 2000. The Proposed Plan presented EPA's preferred remedy and the rationale for its selection. The preferred remedy consisted of removal (targeted dredging) of 2.65 million cubic yards of contaminated sediments containing over 150,000 pounds of PCBs from the Upper Hudson River using environmental dredging techniques that would minimize adverse environmental impacts, including the resuspension of sediments. The comment period, originally scheduled to close on February 16, 2001, was extended to April 17, 2001. During the comment period, EPA chaired 11 public meetings that were attended by thousands of individuals, several hundred of whom provided oral comment. By the close of the comment period, EPA had received 73,215 discrete submissions of comments, of which nearly half were e-mails. As multiple individuals signed some submissions, the number of commenters is recorded as over 90,000 individuals.

The results of this public involvement program and EPA's response to the concerns raised are clearly evident in the Record of Decision (ROD), which is being released at this time. Some of the more notable examples of decisions that reflect public comment on the Proposed Plan include:

- A commitment to develop (with input from the affected public) a comprehensive public involvement program to be employed throughout the design and construction phases of the project.

- A commitment to develop, during the design phase (with input from State and federal agencies, as well as the public), performance standards for key project aspects, including sediment resuspension and dredging production rates.

- A commitment to perform the construction in a phased manner whereby a first phase of construction (one construction season) will precede the full-scale, five-year construction period.

- A commitment to include in the first phase, in addition to project shakedown, the field verification of various project assumptions.

- A commitment to move dredged materials and backfill within the Upper Hudson River area by barge or rail to ensure that disruption of traffic patterns in neighboring communities does not occur.

The aforementioned are some of the more significant aspects of the decision or ROD that have been aimed at responding to concerns raised throughout the public comment period. Other quality-of-life factors, such as noise, odor, maintenance of navigation, water supply protection, construction lighting, air quality, aesthetics, maintenance of recreational opportunities, and impacts on farm activities, also have been taken into account within the selected remedy and are addressed in detail within this Responsiveness Summary (RS). What follows in this Executive Summary is an abbreviated discussion of some of these issues. For each, a more detailed discussion can be found within the main body of the RS.

PUBLIC INVOLVEMENT IN DESIGN AND CONSTRUCTION

A number of comments dealt with the necessity of developing and implementing a comprehensive and detailed public involvement plan for the remedial design and implementation phases of the Hudson River PCBs Site cleanup.

Since the beginning of the Reassessment, EPA has been committed to a public process that is fully open to any interested party. The original community interaction plan (CIP) was designed to be flexible so that it could be modified in response to changes dictated by the project or requested by the participants. Since 1990, EPA has modified not only the CIP but also certain aspects of the RI/FS itself, as well as the selected remedy, based on public input.

EPA continues to be committed to involving the public, this time throughout the project's design (including development of performance standards and the sediment processing/transfer facility siting process) and construction phases. In the near future, EPA will involve the community in the development of a project-tailored public process that allows for incorporation of public involvement throughout the design and construction phases of the project and fully considers input received.

RESUSPENSION

Many comments addressed the potential for PCB release to the water column during remedial dredging operations. Concerns over the extent and impact of releases caused by resuspension of contaminated sediments on public health and the environment have been raised. In reviewing these concerns, EPA agrees that such releases must be carefully balanced with impacts associated with ongoing PCB releases to the water column from the sediments and existing impacts to the aquatic biota. After a thorough review of available dredging equipment, EPA concludes that conventional hydraulic cutterhead dredges and enclosed environmental bucket dredges are best suited to the selected remedial dredging activity. Data from projects using these dredges were used as the basis for estimating water quality impacts that would result during dredging operations. These data show loss rates adjacent to the dredge head of 0.35 percent (by mass of fine sediments) for a conventional hydraulic cutterhead dredge and 0.3 percent (by mass of fine sediments) for an environmental bucket dredge.

During the first year of project design, with input from State and federal agencies as well as the public, EPA will develop the details of performance standards and performance monitoring that will be utilized during the first phase of project construction to field verify and modify, as appropriate, project operations.

PROJECT SEQUENCE AND SCHEDULE

Many commenters questioned the viability of EPA's schedule for accomplishing the selected remedy. EPA will begin the initial steps toward implementation once the ROD is signed. These pre-remediation activities, including project design, are scheduled for completion by Spring 2005, and many of these activities will be performed simultaneously. They include the following:

- Development of performance standards.
- Additional sediment sampling and analysis.
- Evaluation and selection of dredging technologies.
- Selection of contractor(s).
- Sediment processing/transfer facility siting and construction.
- Finalization of agreements with landfills, rail companies, backfill material suppliers, and energy providers.
- Mobilization (*e.g.*, assembling of equipment, planning the materials-handling operation, and arranging for sediment transportation and disposal).

Dredging operations will commence during the 2005 canal season.

Some commenters requested that EPA consider smaller, more focused projects, or perform a demonstration dredging project, to determine the feasibility of the selected remedy. EPA did, in fact, consider the possibilities of a short-term demonstration project and smaller-scale remedial efforts in the Upper Hudson River. Modeling indicated that smaller-scale efforts would not substantially reduce the PCB concentrations in fish.

In the Proposed Plan for this project, EPA proposed a five-year schedule for the work, beginning in the year 2004. However, given the concerns expressed by commenters, the Agency has decided to implement the project using a phased approach. Performing dredging operations in this manner provides the opportunity to evaluate overall project performance more intensively at the beginning and, as appropriate, refine the operations, which are now planned over a six-year period.

The selected remedy will be conducted in two phases over the six-year schedule. The first phase of dredging, to begin in 2005, will be implemented during the first construction season. The dredging during that year will be implemented initially at less than full-scale operation, and will include an extensive monitoring program based on performance standards that will address (but may not be limited to):

- Resuspension rates during dredging.
- Production rates.
- Residuals after dredging.
- Community impacts (*e.g.*, noise, air, odor, navigation).

Data gathered during this first phase will enable EPA to determine if adjustments are needed to operations in the succeeding phase of dredging or if performance standards need to be reevaluated. The current schedule assumes that, after the phased-in operations of 2005, dredging operations will proceed at full scale in the years 2006, 2007, 2008, and 2009, with completion of remaining work in 2010.

Similarly, commenters questioned the plausibility of achieving targeted dredging rates with the dredging equipment selected. EPA considered available technologies in combination with a series of Site-specific factors such as sediment characteristics, river geometry, in-river transportation systems, and environmental constraints in arriving at likely production rates. EPA concludes that the production rates generated by examination of these factors are considered practical and attainable.

Commenters also compared EPA's productivity estimates to lower rates actually attained at other Superfund sites. EPA believes that project scale and Site-specific conditions render such comparisons technically invalid.

QUALITY OF LIFE FACTORS

With regard to concerns expressed about the potential for negative impacts to the quality of life of people residing near or utilizing the river in the vicinity of the remediation, EPA has made every effort to fully assess and address such issues. They are summarized below in the categories of traffic, noise, construction lighting, air quality, odor, aesthetics, and recreation.

While there may be short-term impacts with respect to some of these issues, the project will follow strict guidelines to minimize and mitigate potential impacts to the maximum extent practicable.

It is EPA's belief that any temporary impacts are manageable and far outweighed by the long-term benefits of the remediation on human health and the environment.

Traffic

Commenters raised concerns about the ability of the existing infrastructure to accommodate project-related increases in vehicular and truck traffic, and the potential disruption to regional roadways that could result from these increases. In response to these concerns, EPA has determined that dredged materials will be taken from the Site by barge and/or rail, rather than by truck. Likewise, material used for project backfill will be transported within the Upper Hudson River area by barge and/or rail. While the location(s) of the sediment processing/transfer facilities have not yet been determined, for purposes of the FS and Responsiveness Summary, northern and southern facility sites were assumed.

Impacts from vehicle and truck traffic caused by both worker commutation and construction of dredged-material processing facilities were the key elements of concern remaining, once trucking of dredged material and backfill was eliminated. At the southern sediment processing/transfer facility site, impacts will be easily manageable, because much of that locale is currently highly industrialized and experiences much greater activity than would be generated by project operations.

For the northern facility, estimates of the project-related road traffic were evaluated in the context of current traffic volumes and road capacities. During peak traffic conditions, it was concluded that employee traffic generated by the project will not be disruptive to the area's local communities, because the volume increase on nearby roadways will be minor (*i.e.*, less than 10 percent). Given that this increase in road usage is relatively small, it is unlikely that there will be an escalation in road hazards or a need for increased road maintenance as a result of implementing the selected remedy.

Noise

The short-term noise associated with construction of the sediment processing/transfer facilities and hydraulic and mechanical dredging operations will not exceed the New York State Department of Transportation- (NYSDOT) established construction impact guidelines.

With respect to noise associated with operation of the sediment processing/transfer facilities, such noise levels will comply with applicable federal and State criteria, including the Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC). While the long-term noise associated with stationary booster pump operations under the hydraulic dredging option could, if not mitigated, exceed FHWA NAC in areas within an 800-ft radius of the booster, a series of mitigation measures (*e.g.*, noise attenuation shrouds, optimizing locations of the booster stations to avoid populated areas to the extent practicable, or use of electric pumps) can be implemented as appropriate to mitigate the impact.

Construction Lighting

Artificial lighting systems will be used to illuminate nighttime dredging and in-river transport operations, as well as land-based sediment processing/transfer facility operations. EPA has examined the types of artificial lighting that will likely be used in support of the project. Positioning of lights, brightness, and direction are key factors in minimizing the potential for off-site impacts.

While nighttime lighting requirements for the proposed work will conform to established industry safety standards, it will not be necessary to use high-mast lighting systems at dredging sites or at the sediment processing/transfer facilities. The lighting required for in-river transport will conform to the Coast Guard and New York Navigation Law standards for commercial towboats and barges and is not expected to be disruptive. Lighting at the land-based sediment processing/transfer facilities will meet OSHA standards for construction. Lighting will be directed toward work areas and away from neighboring properties. In addition, the use of low-mast lights will limit off-site glare.

Odor

The two potential sources of odor from the project are the construction equipment and the dredged material from the river itself.

Nuisance odors from construction equipment are not anticipated to be a significant problem, because such equipment is used routinely on most construction projects with few complaints. Although sulfur in a reduced form is present in the river sediments, concentrations are sufficiently low so as to preclude the generation of noticeable and persistent odors from hydrogen sulfide in dredged material. Further, no significant ammonia-related odor will be generated during dredging operations. Should any odor be encountered, strategies will be implemented to mitigate adverse effects.

Air Quality

The total concentration of pollutants from the dredging and sediment processing/transfer facility operations will not exceed the National Ambient Air Quality Standards (NAAQS) established by EPA to protect public health. It is not anticipated that the project will have a significant air quality impact.

The cancer risks associated with inhalation of volatilized PCBs in air by residents living near the river or near the sediment processing/transfer facilities are projected to be about an order of magnitude *below* the most stringent acceptable level. With respect to workers at the Site, the estimated cancer risk is within the acceptable risk range. Air monitoring, engineering controls, appropriate personal-protection equipment for workers, and standard safety procedures will be used to protect the on-site workers and nearby communities.

With the public involved, EPA will develop and implement a comprehensive community health and safety plan, including air monitoring, to address any potential risk associated with dredging and processing of the PCB-contaminated sediment.

Aesthetics

Potential aesthetic and visual impacts from the dredging will apply to only a small portion of the 40 miles of river and, where they do occur, will be very temporary. Such potential impacts from the sediment processing/transfer facilities will be limited by the siting of these facilities in industrial or commercial regions and apply only to areas of close proximity; these impacts will be minimized, to the extent practicable, by careful siting and design of these sites. For travelers on the river or moving along adjacent roadways, project-generated visual intrusion will be short-term and limited to within several hundred feet of the work area.

Recreation

Because of the relatively small area of the river that will be affected by dredging at any given time, the recreational experience on the river will remain substantially unaffected in areas not immediately adjacent to the dredging operation. In fact, it is expected that the project will improve recreational conditions. Few adverse impacts are anticipated for recreational boaters during implementation of the selected remedy. A significant portion of the dredging is oriented to navigational dredging that, when completed, will provide an expanded and safer capacity for recreational use of the river.

The risk of swimming in the Hudson River, as discussed in the baseline Human Health Risk Assessment (HHRA), is considered to be within the acceptable range. It is anticipated that during the remediation project, PCB concentrations in the river will remain at or near current levels. Therefore, during the project, as now, the risk of swimming in the river will remain within the acceptable range.

It is anticipated that the impact on recreational fishing will be minimal during the remediation. Anglers will be able to find alternate sites to fish where the dredging and backfill operations are not proximate; impacts to fish habitat will be temporary and will affect only limited areas and certain species; and minor, temporary resuspension of PCBs during dredging should not affect catch-and-release fishing. In fact, the PCB remediation offers long-term prospects of renewed and enhanced recreational fishing.

SEDIMENT PROCESSING/TRANSFER FACILITY SITING AND DESIGN

EPA has not yet determined the location(s) of sediment processing/transfer facilities necessary to implement the selected remedy. For purposes of the FS, example locations were identified from an initial list of candidate sites based on screening-level field observations that considered potential facility locations from an engineering perspective. In the FS, it was necessary to assume the locations of sediment processing/transfer facilities in order to develop conceptual engineering plans, analyze equipment requirements, and develop cost estimates for the remedial alternatives. For this purpose, two example locations were identified: one at the northern end of the project area in the vicinity of the Old Moreau Dredge Spoil Area site and another at the southern end of the project area near the Port of Albany. Each of these example locations fulfills many of the desired engineering characteristics for such a facility to support the remedial work, and is representative of reasonable assumptions with regard to distance from the dredging work and cost. Other locations, both within the Upper Hudson River area and farther downstream, are possible.

The example facility locations presented in the FS have also been used in this Responsiveness Summary in order to clarify material presented in the FS and Proposed Plan and in connection with additional noise, odor, and other analyses that were performed in order to respond to public comments. EPA will not determine the actual facility location(s) until after EPA performs additional analyses and holds a public comment period on proposed locations and considers public input in the final siting decision. Thus, all information provided in this Responsiveness Summary relative to potential impacts of the sediment processing/transfer facilities on communities, residents, agriculture, the environment, and businesses should likewise be considered representative and illustrative. Further specific assessment of and, as necessary, mitigation of, potential impacts will be addressed during design.

The general engineering characteristics that can be useful in identifying a potential site include a waterfront location so that barges and other floating equipment may be accessed; an existing heavy-duty bulkhead; fairly level topography to keep transfer operations, material processing, and rail facilities at approximately the same elevation; an industrial or commercial site, to avoid impacting residential, recreational, and institutional land uses; access to areas for storage of project-related equipment; roadway access for both construction equipment and employees that avoids densely populated residential communities; two-lane roadways to accommodate truck traffic, or direct connection to such routes; and rail access to facilitate hauling and reduce overall transportation costs.

Already-developed industrial areas are preferable for consideration in siting these facilities. It is not anticipated that residences will be affected by processing/transfer of dredged material at these sites.

Potential impacts from the facilities on surroundings will be mitigated by attention to facility design and layout; lighting; screening and buffering of the facility; and minimization of truck traffic, among other considerations. Although it is expected that these facilities will be land-based, water-based facilities will also be evaluated.

PCB TRENDS IN FISH AND WATER COLUMN

While it is true that levels of PCB contamination in all Upper Hudson River media have declined relative to the early 1980s, most of the decline was prior to 1985. In recent years there has been limited improvement and, in fact, PCB levels have remained relatively consistent. The conditions in the river were extremely poor in the late 1970s, largely due to events such as the breaching of the Fort Edward Dam. After the resulting massive influx of PCBs, EPA has documented that PCB levels in the river declined until 1985, which was approximately the time the Agency issued its original plan for the river – no action – in the hope that levels would continue to decline.

Since that time, however, the rate of improvement has leveled off, and substantial further improvement via natural attenuation does not appear to be occurring. For this reason, EPA has concluded that active remediation is needed to restore the Hudson River to a healthy ecosystem. To support this conclusion, further information on PCB concentrations in specific media is presented below.

- Water column concentrations: In general, PCB concentrations in the water column declined between 1991 and 1995 due to source control but, due to the continued, unabated input of PCBs from the sediment, little change has occurred over the past five years.

- Sediment concentrations: While sediment PCB concentrations have slowly declined on average, the response is very heterogeneous and does not solve the contamination problem. Even though concentrations have declined in some areas, high concentrations remain at or near the surface in many of the *hot spots*. The stability of PCBs that are currently buried in sediment cannot be assured, and it is the position of both EPA and an independent peer-review panel that the sediments of the Upper Hudson River do not represent a secure location for the long-term storage of PCBs.

  Examination of PCB stability in sediment is complicated by the fact that modeling cannot accurately compensate for the variety of conditions within a river reach. For example, while the Thompson Island Pool is considered to be net depositional, specific highly contaminated areas are clearly not consistently depositional. Further, the presence of deposition does not ensure the stability and sequestration of the PCBs contained within the contaminated sediments. Evidence from multiple sources indicates that PCBs are not being safely buried to a degree sufficient to remove them from interaction with the Hudson River.

- Fish concentrations: Despite the leakage of unweathered PCB oil from the vicinity of the GE Hudson Falls facility having been largely controlled, PCB concentrations in fish tissue have shown little decline in recent years (up to the year 2000). Sampling studies and modeling of such concentrations indicate continuing exposure through sediment food-chain pathways.

BENEFITS OF PROJECT

EPA's decision to pursue the selected remedy balanced short-term impacts against long-term benefits. In doing so, the Agency examined three active remediation alternatives and two more-passive options: the No Action and the Monitored Natural Attenuation (MNA) Alternatives.

Under the "overall protection of human health and the environment" criterion (40 CFR § 300.430[e][9][iii][A]), EPA evaluated the degree to which the remedial alternatives provide adequate protection of human health and the environment from unacceptable risks posed by PCBs at the Site, and compared the relative protection afforded by each alternative.

Based on the comparative analysis of alternatives, EPA determined that active remediation of contaminated sediments is necessary in order to significantly reduce the human health and environmental risks at the Site. Unlike the selected remedy, the alternatives that do not require removal of PCB-contaminated sediments are not sufficiently protective. Similarly, EPA's analysis of the more extensive remedy (REM-0/0/3) found the differential in protection from that afforded by the selected remedy was insufficient to justify the greater cost of REM-0/0/3. There may be short-term impacts as a result of implementation of the selected remedy, including potential transportation, noise, odor, and lighting impacts, as well as potential impacts from construction and operation of the sediment processing/transfer facilities. However, these temporary impacts are expected to be manageable through appropriate controls. Consequently, EPA has determined that the potential short-term impacts of the selected remedy, which can be minimized, are substantially outweighed by the remedy's benefits to human health and the environment.

Projected PCB Trends in Fish

Because PCBs bioaccumulate in fatty tissue, PCB levels in fish of the Hudson River has been a critical factor in this project and a critical issue for the public. Commenters frequently asked how many years would be required to attain the preliminary remediation goal (PRG) for human health, which is 0.05 ppm (mg/kg) PCBs in fish or other target levels. Commenters also observed that, and at times questioned why, this goal is 40 times stricter than the US Food and Drug Administration's commercial fish limit of 2.0 ppm. Others asked when the fish would be 'edible.'

Attainment of Target Levels

The time it takes to achieve the Remediation Goal of 0.5 mg/kg PCBs in fish fillet and other risk-based PCB concentrations in fish (i.e., 0.4 mg/kg and 0.2 mg/kg) is species- and location-specific. Some fish will achieve these concentrations sooner than others, based on feeding and habitat preferences. The modeling projects that the selected remedy will attain the PCB concentration of 0.4

mg/kg in fish fillet, which is protective of the average adult who consumes one Hudson River fish meal every two months, in River Sections 1 and 2 within 20 years after the start of active remediation and earlier for River Section 3. The modeling also projects that the target PCB concentration of 0.2 mg/kg in fish fillet, which is protective of an adult who consumes one fish meal from the Hudson River per month, is expected to be attained in River Section 2 within 35 years of the start of active remediation. These time periods are significantly shorter than the time periods projected for attaining these targets under the No Action and the MNA Alternatives. Moreover, the actual time differentials may be greater than those calculated by EPA's models, as evidenced by the trend analysis of recent PCB concentrations in fish tissue.

The selected remedy is projected to meet the Remediation Goal for human consumption of fish, 0.05 mg/kg, in River Section 3 within 41 years of completion of active remediation. As a result, the remediation goal of 0.05 mg/kg, or one fish meal per week for an adult, also is expected to be attained in the majority of the Lower Hudson River within this time frame, due to the lower initial concentration of PCBs in the Lower Hudson compared to the Upper Hudson. Because of the continuing Tri+ PCB load of 2 ng/L assumed after implementation of the source control action in the vicinity of the GE Hudson Falls plant, the PCB concentration in fish averaged over the Upper Hudson is expected to be reduced to a range of 0.09 to 0.14 mg/kg within the 70-year modeled time period, which is slightly above the PRG of 0.05 mg/kg. However, the protectiveness of the selected remedy is further enhanced through continuation of institutional controls, such as the fish consumption advisories and fishing restrictions. In the ROD, EPA has adopted the 0.05 mg/kg concentration in species-weighted fish fillet as a final Remediation Goal for the Site.

If upstream source control is more successful than currently projected (*i.e.*, less than 0.025 kg/day), then the time frames identified above would be shorter and the Remediation Goal of 0.05 mg/kg may be met within the modeling time period in River Sections 1 and 2.

FDA Limit/Establishment of Target Level

The FDA tolerance level of 2.0 ppm is based on a "market basket" of commercially caught fish obtained from supermarkets. The "market basket" concept assumes that fish purchased from a market come from varied sources, rather than from a sole source, such as fish taken from the Hudson River. The 2.0 ppm tolerance level in commercially marketed fish is an average PCB concentration, and assumes that consumers are buying a variety of different species from a variety of different locations.

The Remediation Goal of 0.05 mg/kg PCBs in fish fillet represents an average PCB concentration in fish and takes into account the specific expected reasonable maximum exposure (RME) consumption rate of anglers who consume fish caught only from the Hudson River. These consumption rates reflect the habits reported by anglers in New York State and what would be expected in the absence of fish consumption advisories. It should also be noted that the Remediation Goal of 0.05 mg/kg is consistent with the Great Lakes Sport Fish Advisory level, which is used by the eight states bordering the Great Lakes.

Downstream Transport

PCBs are transported from the Upper Hudson River to the Lower Hudson River (*i.e.*, south of the

Federal Dam at Troy). The mass of PCBs transported over the Federal Dam to the Lower Hudson declined from about 3,000 to 4,000 kg/year Tri+ PCBs (6,610 to 8,820 lbs/year) in the late 1970s to about 150 to 500 kg/year Tri+ PCBs (331 to 1,100 lbs/year) by the late 1980s or early 1990s. The most recent estimate of Tri+ PCBs, based on 1998 GE data from a monitoring station at Schuylerville, is 214 kg/year (472 lbs/year); the estimated (modeled) average for the 1990s is about 290 kg/yr (639 lbs/year) over Federal Dam, with a modeled daily average Tri+ PCB water column concentration of 30 ng/L. It is projected that the selected remedy will reduce downstream transport by approximately 40 percent.

GE SOURCE CONTROL ACTIVITIES

Over a 30-year period, GE discharged a significant amount of PCBs into the river from its Hudson Falls and Fort Edward plants. At the Hudson Falls plant location, leakage of PCB-bearing oils through bedrock to the river continues to be a source of PCB contamination.

The selected remedy accounts for the fact that some source control measures are already in place near the GE Hudson Falls plant. Additionally, pursuant to a Consent Order with the NYSDEC, additional source-control work is to be carried out by GE near its Hudson Falls plant because PCBs continue to leak from that facility into the Upper Hudson River. Therefore, the selected remedy also assumes reasonable further reduction in PCBs entering the river through bedrock at Bakers Falls near the Hudson Falls plant, as a result of the implementation of these additional source control measures.

Through detailed monitoring, EPA found that PCB levels in the water column (and consequently, PCB mass load) increase more than threefold as the water passes through the Thompson Island Pool. The PCB source available in this location is the contaminated sediments that lie on the pool's bottom.

Concerns about Identification of Additional Sources

As reflected in the Phase 1 Report, EPA recognized the importance of upstream sources of PCBs from the outset of the Reassessment. From an analysis of sampling data gathered by GE's monitoring program in accordance with an EPA Consent Order, EPA has established that the GE facilities are the only significant external source of PCBs to the Upper Hudson River. Modeling efforts, including use of the HUDTOX and FISHRAND models, indicate that control of upstream sources is critical. However, recognition of these upstream sources does not in any way negate the findings of recent EPA reports noting that the sediments continue to release large amounts of PCBs.

As described in the FS, control of the upstream source is an important adjunct to the active remediation of the contaminated river sediment. The anticipated controls at GE's Hudson Falls facility and remediation in the vicinity of the Fort Edward 004 outfall should reduce that input within the next few years. EPA acknowledges the importance of further remediation of upstream sources and will work with NYSDEC and GE to control these sources to the extent practicable. However, given existing PCB sediment loads, complete control of these upstream sources is not necessary prior to sediment removal.

WHY A MORE AGGRESSIVE REMEDY WAS NOT SELECTED

EPA's analysis found that:

- The incremental increase in water column loading from the sediments decreases as the water moves downstream from the Thompson Island Pool. This suggests that there is less sediment involved in PCB release in the downstream river sections relative to the Thompson Island Pool.

- The model forecasts showed little improvement in recovery of the river for REM-0/0/3 as compared to the selected remedy. This analysis suggests that little benefit comes from the additional dredging.

- As described in the FS and in this Responsiveness Summary, the targeted areas include more than 85 percent of the areas with PCB concentrations greater than 10 ppm and more than 75 percent of the areas with PCB concentrations greater than 3.2 ppm. Going beyond this one would encounter problems such as greater access limitations and shallow underlying bedrock, which greatly increase costs while yielding little additional public health or environmental benefit.

After considering all these factors, EPA decided upon the selected remedy as an appropriate balance among these issues, reconciling the desire to remove contamination with the uncertainties associated with each river section. Note, however, that the final areas and boundaries will be refined during remedial design.

RAIL TRANSPORT

EPA is committed to avoiding large increases in the volume of heavy truck traffic in communities of the Upper Hudson River valley. The selected remedy provides for rail transport or barge transport. The necessity for rail access at sediment processing/transfer facility sites has been incorporated into the facility-planning process.

In studying rail transport of the processed materials, EPA estimated the rail movement that will occur in order to implement the selected remedy in the context of the capacity and current operation of the regional rail line operated by the Canadian Pacific Railroad (CPR).

Increased train volumes are not expected to impact passenger or non-project-related freight service in the region. There are currently six passenger trains and up to 14 freight trains per day (through and local) operating along the Fort Edward/Albany rail corridor. This level of activity does not approach the capacity of the line. After speaking with representatives of the CPR, it has been determined that the current Fort Edward/Albany rail line, dominated by freight service, has additional capacity available on the line.

With regard to rail-yard requirements for the northern processing/transfer facility, it would be necessary to store 16 gondola cars on-site. There would be daily pickups of these gondolas by the railroad. It is expected that existing rail yards in the project vicinity can be used to store rail cars and assemble larger trainloads for movement to remote landfill sites; CPR has indicated that their existing rail yard facilities can accommodate gondola cars generated by the project, as well as the daily transport and assembly of these railcars into unit trains.

No new rail yards are expected to have to be constructed in the region to support the proposed activities. The availability of rail cars/gondolas in the region has also been assessed, with the determination that the number of gondolas required for the project can be obtained by leasing them on the open market; therefore, CPR will not necessarily provide them. It has also been determined that current rail car leasing costs are low due to market demand; many are actually being scrapped at this time. The shipping of three commodities, specifically Toxic Substances Control Act (TSCA)-regulated materials, non-TSCA materials and backfill, adds moderately to the project's complexity, but will be manageable.

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INTRODUCTION TO THE RESPONSIVENESS SUMMARY

By the conclusion of the public comment period on April 17, 2001, EPA received nearly 73,000 separate, individual statements providing comment on its December 2000 Proposed Plan for the Hudson River PCBs Site. This number includes several thousand replicate statements, which are identical pieces submitted by multiple individuals, or petitions signed by multiple individuals, but does not include carbon copies or duplicates of the same message sent to multiple recipients within EPA or to other agencies. Of these 73,000 statements, approximately 35,000 were in the form of e-mails directed to EPA's project team. The remainder was received in the form of letters (some typed, but many handwritten), post cards, form letters, multi-page documents and technical reports, videotaped statements, and petitions on various media. A number of the technical reports contain appendices covering specific issues in depth. The largest body of comment was received from General Electric Company and occupies 19 volumes.

Given these circumstances, three basic steps have been followed in preparing a Responsiveness Summary that is responsive to all significant public comments received during the public comment period: (1) all comment documents were reviewed and catalogued, (2) the material was organized for content, all significant comments were identified, and each such comment was either individually adopted as a "master comment," or was combined with other significant comments (addressing similar issues) which were then collectively distilled into a single master comment, and (3) a response was prepared for each master comment.

A quality assurance program was implemented to verify that the full body of significant comment is accurately represented in the master comments, the responses are technically sound and the entire summary is internally consistent. The process by which these three steps and the attendant quality assurance processes were accomplished is summarized as follows.

Each of the comment letters and other documents was reviewed, and individual significant comments within each comment document were delimited (*i.e.*, identified). A single comment document may contain as few as one or as many as several hundred delimited comments. Each of the unique comment source documents was assigned a bar-coded identification number which was affixed to the document[1] and was then scanned as an image into an electronic file compatible with *Adobe Acrobat Reader*™ software (*i.e.*, "pdf" format), effectively creating an electronic "photocopy." Approximately 18,000 unique significant comments were delimited from the source documents.[2] Because of the large number of comments to manage, each of the delimited comments was also assigned representative keywords (or key phrases) and entered into an electronic database for sorting and processing.

[1] Only a single example of each set of perfectly identical submittals (*i.e.*, replicates – for example, postcards provided to its members by an organization) was bar-coded for entry to the database. However, a record was compiled of the names and, where supplied, addresses of all commenters. Such mailings were individually bar-coded in those instances where additional comment was added to the text by the commenter. True duplicates (*i.e.*, multiple copies of the same document sent by the same individual, sometimes transmitted to multiple recipients) were bar-coded only once and the identity of the commenter recorded only once.

[2] While some documents yielded multiple delimited comments, others were replicates of other identical documents which together yielded a single comment. This total represents the number of "unique" significant comments.

Some comments were received electronically or could readily be scanned (via optical character recognition, or OCR) for entry into the database. Many delimited significant comments, however, required manual entry. Quality assurance reviews were conducted to ensure that all comments were entered in the database. There is a high degree of confidence that all significant comments were identified and captured.

Due to the large volume of comments received, it is not possible to present these documents as physical (hard copy) attachments to the Responsiveness Summary, as has customarily been done for previous Hudson River PCBs Site Responsiveness Summary reports. Each comment is, however, provided in electronic format on a set of CDs in Appendix D, along with tables identifying authors and showing the relationships between authors, delimited significant comments and master comments. For copies of the Responsiveness Summary provided entirely on CD, the comments are included as separate files.

Similar or related delimited comments were combined into master comments in various topical areas capturing the significant issues raised by each of the source comments.[3] A total of 274 master comments were synthesized from the roughly 18,000 comments initially delimited. These master comments were then reviewed for accuracy and thoroughness to ensure that they represent each of the associated delimited comments. In addition, a review was conducted to verify that all delimited comments were associated with at least one master comment. Because of the several threads of thought sometimes inextricably combined, an individual delimited comment may be, on occasion, associated with multiple master comments. This process has provided a means for all significant comments to be included and to receive due consideration in preparing the Responsiveness Summary.

Master comments have been organized according to topical areas for presentation in this volume (Book 1) of the Responsiveness Summary, as shown in the Table of Contents. A response has been prepared for (and is presented immediately following) each of the master comments, drawing from material presented in the Proposed Plan, the FS, or other previous project reports, other literature, remedial projects and individuals, and EPA policy, as well as additional technical analyses performed specifically to address comments or questions raised during the public comment period.[4] Methodologies used and results obtained from additional technical analyses are presented as "white papers" in a separate volume (designated as Book 2 of this document). These papers cover a variety of topical areas, providing more in-depth analysis and supporting detail concerning topics addressed in various comments. Many responses draw upon these white papers and may utilize the conclusions or quantitative results of various modeling efforts (for noise or air emissions, for example) or extended series of calculations, without encumbering the text with voluminous detail. Each of the responses and white papers has been reviewed for technical quality by senior professionals within the project team.

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[3] Master comments were assigned a three- or six-digit identification number by the database program sequentially upon creation; these numbers are used to identify the master comments, the associated responses, and any companion tables and figures throughout the Responsiveness Summary, regardless of the final order of presentation in the document. White papers are similarly identified.

[4] Additional technical analyses were performed for several reasons, including refinement or clarification of work performed in the FS, gathering and evaluating additional data from outside sources and other projects to clarify or support conclusions or statements made in the FS, and providing information not ordinarily presented in an FS but which is appropriate to address public comment germane to the community acceptance criterion of the remedy selection analysis.

While some smaller tables have been embedded in the text of a response or white paper, most larger tables and figures have been placed in a separate volume dedicated to that purpose (designated as Book 3 of this document). This allows the reader (if using the printed version of the document) to view the associated tables and figures alongside the text, without having to turn back and forth in the document. Book 3 also contains Appendices to the Responsiveness Summary. These include a Preliminary Wetlands Assessment (Appendix A), a Preliminary Floodplains Assessment (Appendix B), and a Stage 1A Cultural Resources Survey (Appendix C). These Appendices provide additional information relating to potential impacts of the selected remedy on wetlands, floodplains, and cultural resources. The Appendices also are pertinent to issues addressed in Book 1 of the Responsiveness Summary. Appendix D is described below.

Significant effort has been made to make this document as user-friendly as practicable, while covering the full body of significant comment. It is anticipated that many readers will want to find where their particular comment or concern is addressed. An important tool in this search is the Index at the end of this volume. The Index allows a reader to identify master comments and responses of interest, based on keywords or key phrases. While an attempt has been made to cover a comprehensive range of subjects and as much detail as practicable in the Index, it is not intended to be exhaustive. Despite the topical arrangement of the document, and provision of the Index, some readers may need to resort to the comment database to identify the code associated with a comment of interest, and then track this code through a table of associations between delimited significant public comments and master comments provided on CD# D1 in Appendix D in Book 3 of the Responsiveness Summary. While neither the Index nor the table of associations is a perfect tool, together they provide a reliable means of finding the responses to particular comments. Appendix D, Compendium of Public Comments, provides a compilation of the public comments in electronic database form. Appendix D consists of a set of instructions to the database as well as a set of six CDs, which contain the database of authors and comments (Disk D1) and scanned images of the public comments (Disk D2 to D6).

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