Executive Briefing

General Electric Co.'s Comments on EPA's Phase I Report of the Hudson River PCB Reassessment

December 1991

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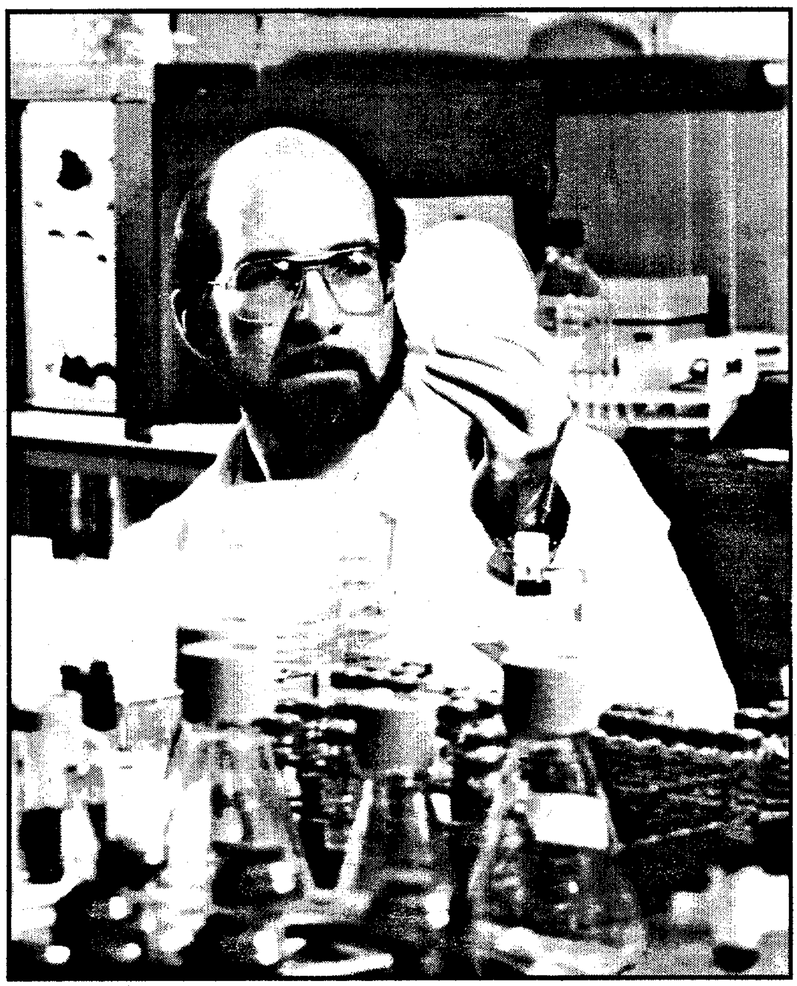

Dr. Frank J. Mondello, a molecular biologist at the GE Research and Development Center in Schenectady, N.Y., examines a culture of bacteria capable of rapidly biodegrading PCBs. Dr. Mondello is one of more than 25 GE scientists working to develop approaches that will speed up the natural biodegradation of PCBs in the Hudson River and elsewhere.

General Electric Co. recently submitted nearly 1,000 pages of comments and documents on the Environmental Protection Agency's August 1991 Phase I Report of the Hudson River PCB Reassessment.

This is a summary of the information that General Electric provided to the agency. For a copy of our complete comments, please call M. Peter Lanahan, manager of state government relations, at (518) 462-4537.

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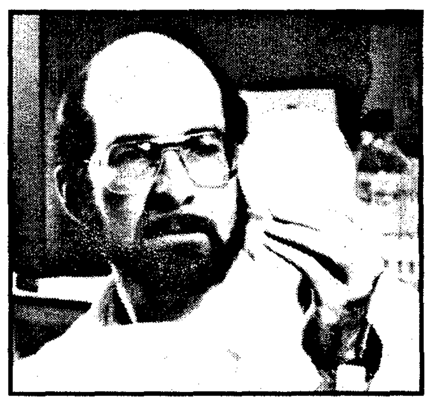


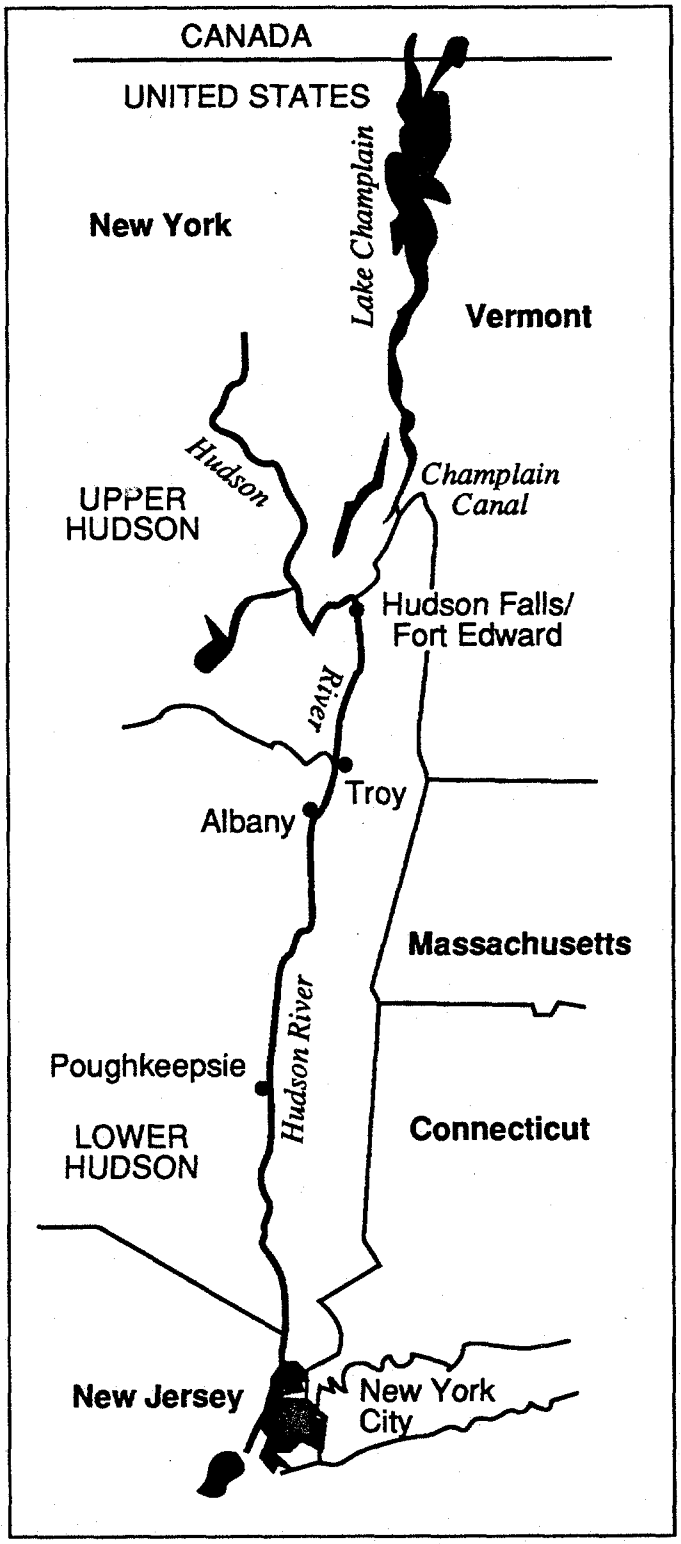
Background

During a 30-year period, ending in the mid-1970s, General Electric Co. used PCBs in the production of capacitors at the Hudson Falls and Fort Edward, N.Y., plants, both of which are located on the banks of the Hudson River. New York State Department of Environmental Conservation (DEC) records show that, for all times required, GE had the necessary permits for the discharge of PCBs from the two plants.

In enacting the Toxic Substances Control Act in 1976, Congress mandated that the use of PCBs be phased out.

In 1983, the Environmental Protection Agency listed a 40-mile stretch of the upper Hudson River between Mechanicville and Fort Edward on the Superfund National Priorities List. After reviewing the river's condition, EPA issued a Record of Decision a year later that called for "no action" on New York State's proposal to dredge PCB-contaminated sediment from the river bottom.

EPA's decision contained an extensive assessment of various ways to clean up the Hudson, including the no-action alternative that it selected and full-scale and selective "hot spot" dredging, both of which it rejected. The EPA said: "Natural on-going sediment transport mechanisms within the river have covered many of the PCB contaminated areas (hot and cold spots) with a less contaminated sediment layer, which significantly reduces the migration of PCBs in the water column and exposure to aquatic life."



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The agency further determined that "both the modeling and sampling data collected to date indicate a decreasing threat to public health and the environment." EPA rejected New York State's proposal to dredge the river because of this decreasing threat and "because the actual reliability and effectiveness of current dredging technologies in this particular situation is subject to considerable uncertainty."

EPA said: "Dredging activities by their nature tend to result in some degree of disturbance of the highly contaminated sediments, and thus result in . . . elevated PCB concentrations in the water and air, as well as increased fish contamination."

As part of the 1984 decision, EPA did require that remnant deposits of PCBs on the shores of the upper Hudson near Moreau and Fort Edward be capped. GE completed the capping process earlier this year, at an estimated cost of $15 million. By DEC's estimates, the remnant deposits, before capping, were a source of more than 30 percent of all the PCBs in the upper river.

The essential question before EPA now is whether to reverse the 1984 ruling, which anticipated a reassessment "in the future if, during the interim evaluation period, the reliability and applicability of in-situ (in river) or other treatment methods is demonstrated, or if techniques for dredging of contaminated sediment from an environment such as this one are further developed."

In order to reverse the 1984 ruling, EPA must demonstrate that conditions in the river have deteriorated significantly or that treatment methods have improved significantly in the last seven years. We believe that conditions in the river have changed — they have improved significantly — but that dredging technologies have not improved. Dredging presents today all of the serious environmental problems that it did in 1984.

> *"Dredging activities by their very nature tend to result in . . . elevated PCB concentrations in the water and air, as well as increased fish contamination."*
>
> ***— EPA's Record of Decision, 1984***

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River Conditions Improving

Since 1984, PCBs levels in water, fish and sediment have declined.

The fundamental purpose of EPA's remedial investigation is to determine whether PCBs in the Hudson River pose an unacceptable risk to human health and the environment and, if so, to determine whether an effective remedial option exists to address the identified risk.

But data gathered since 1984 show that PCB concentrations in all relevant media — water, sediment and fish — in all parts of the Hudson River have declined significantly. Consider:

- PCB levels in the water of the upper Hudson River have shown a "statistically significant downward trend in concentration," the Phase I Report said.

Data from the U.S. Geological Service show the following declines in water concentrations:

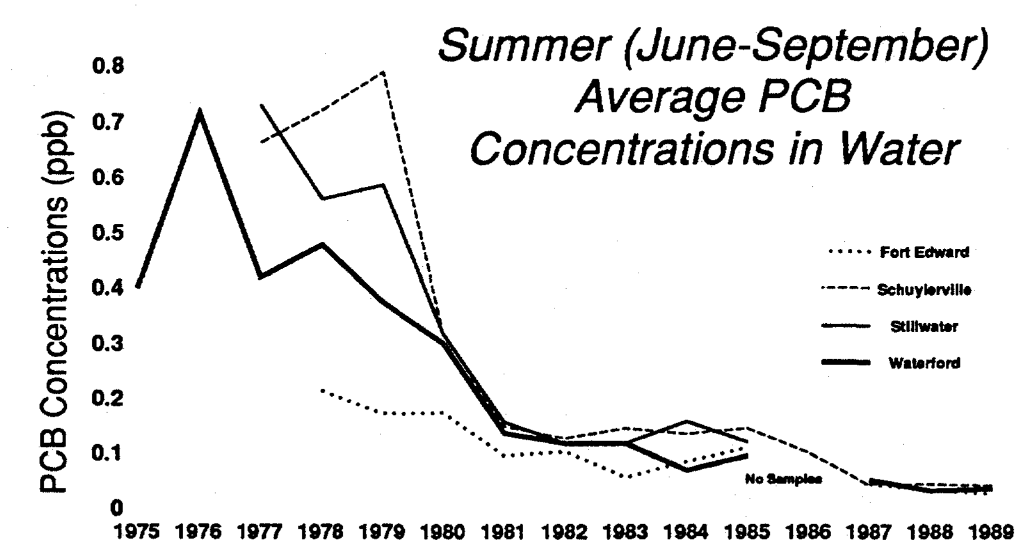
✔ **Waterford:** from .40 parts per billion in 1970 to .033 parts per billion in 1989. *(Since September 1982, no PCB concentration greater than 0.1 ppb has been found in either raw or treated water samples taken at the Waterford plant.)*

✔ **Schuylerville:** from .6 parts per billion in 1977 to .038 parts per billion in 1989.

✔ **Fort Edward:** from .22 parts per billion in 1978 to .026 parts per billion in 1989. (Table B.3-13)

The data also show a significant and steady decline in summer average water column PCB concentrations to well below 0.1 parts per billion.

Indeed, although year-to-year variations exist, the general trend is a 50 percent reduction in total PCB loading every three years. A similar trend is



Source: EPA Phase I Report (Figure B.3-12)

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observed during high flow events.

• PCB levels in sediment continue to decline. GE scientists have documented that PCBs in upper Hudson sediments are naturally dechlorinating. Anaerobic organisms found naturally in river sediment are removing the chlorine atoms from the PCB molecules. Once the dechlorination takes place, naturally occurring aerobic organisms destroy what's left of the PCB. This natural destruction process has resulted in PCBs that have markedly reduced toxicity and are less prone to concentrating in biota.

• PCB concentrations in fish tissue have declined exponentially over the last ten years.

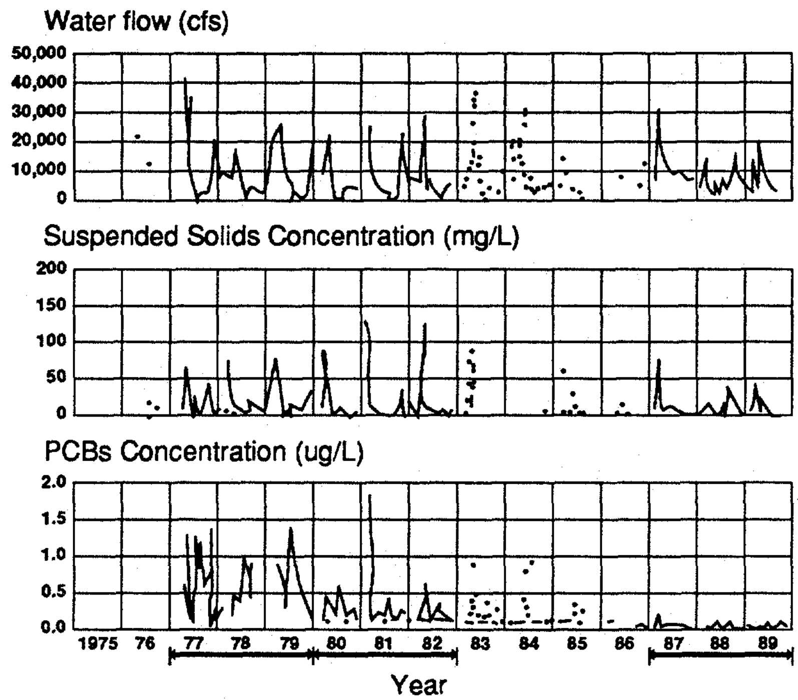
The New York State Department of Environmental Conservation recently released the results of its 1990 striped bass survey, concluding: "Overall, PCB concentrations are significantly lower than they were in 1987."

Since 1988, the state survey showed, there have been reductions of PCB concentrations in Hudson River striped bass of between 25 and 48 percent, depending upon sampling location.

EPA's Phase I Report said all studies

PCB levels no longer rise with water flow

Concentration of PCBs in Hudson near Schuylerville



Source: GE analysis of USGS data.

The top graph, "Water Flow," illustrates the high and low water levels between 1975 and 1989.

"Suspended Solids" illustrates that the level of sediments generally follows water height. When water rises, so does the level of sediments.

However, the third graph illustrates the diminishing relationship between PCB levels and high water. Between 1983 and 1989, even when water flow increased, PCB concentration remained very low.

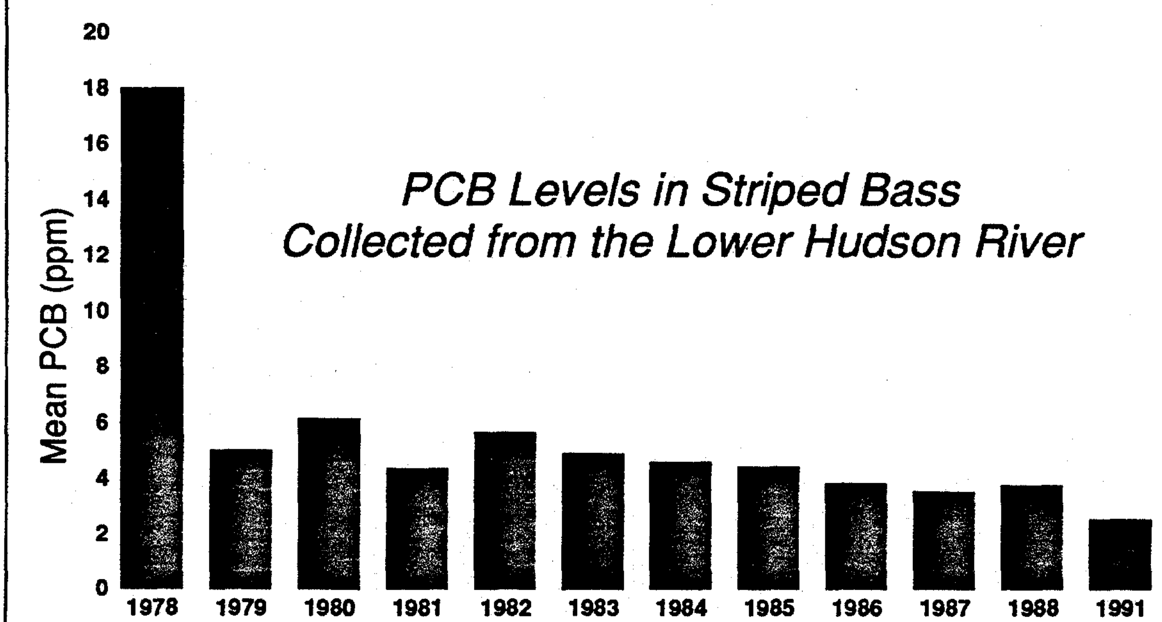
River Conditions Improving

reviewed to date show that most of the species of fish historically present in the lower Hudson continue to reside there. The upper Hudson, between the Federal Dam at Troy and Fort Edward, supports a "diverse and high quality fishery resource," EPA said citing a 1987 study. The same study cited evidence of a "vast improvement" in smallmouth and largemouth bass stocks and other fish species from the early 1960s to the late 1980s. EPA quoted the author of the 1987 study: "Since 1984, the greatly improved warm water fish community in the Fort Edward to Troy (upper Hudson) reach has stimulated interest in reopening the fishery. (Page B.1-13)

When recent DEC data on lower organisms in the upper Hudson is compared to earlier studies, water quality improvements are evident. "The water quality improvement is indicated by the trends of the average number of intolerant (sensitive) species . . . and by the average species richness (total number of species . . .) in multiplate samples from 1972 to 1988." (Page B.7.17)

> *"Overall, PCB concentrations (in striped bass) are significantly lower than they were in 1978."*
> ***— New York State data, 1991***

Taken together, these changes indicate that whatever "risk" PCBs in the upper river posed in 1984 has diminished and will continue to decline. EPA's 1984 ruling said that "risk" in 1984 did not justify dredging the sediments. Today, new evidence demonstrates that the 1984 decision was correct and should be affirmed during this reassessment.



Source: NYSDEC

No Harm to Human Health

The latest science about PCBs and more accurate projections of human exposure to this group of 209 different mixtures show that the types of PCBs in the Upper Hudson River will not harm human health.

A careful review of the information in EPA's August 1991 Phase I Report demonstrates that the PCBs in the sediments of the upper Hudson do not present an unacceptable risk of cancer or any other disease in humans. To suggest otherwise, is to ignore the new science on this issue.

As discussed in accompanying articles, the levels of PCBs in water, sediments and fish are declining, those that remain are being biodegraded, and recent scientific work shows that the types of PCBs in the upper Hudson do not cause cancer.

EPA appears to overlook the evidence and use assumptions rather than facts to assess health risks from PCBs. The Phase I Report is deficient because:

- It assumes all 209 types of PCBs have identical toxicological characteristics. This is not true. The types of PCBs that GE discharged into the upper Hudson have been shown to be non-carcinogenic.

- It relies on an assessment of carcinogenic potential now known to be incorrect.

- It fails to consider the epidemiological evidence demonstrating that exposure to PCBs does not result in elevated cancer risk in humans.

- It neglects to account for the effect of natural biodegradation on the cancer potency of PCBs.

- It relies on grossly exaggerated assumptions about human exposure to PCBs, particularly through consumption of Hudson River fish. EPA assumes that, over a 30-year period, humans will eat 24 pounds a year of fish caught from the upper Hudson.

GE has performed its own health risk assessment using the latest science and realistic estimates

PCBs found to be less toxic

In assessing whether PCBs are potential carcinogens, EPA relies on outdated information.

In July 1991, GE submitted to EPA a report demonstrating that PCB mixtures similar to those found in the sediments of the Upper Hudson River are not carcinogenic in rats and that other, more highly chlorinated PCB mixtures have a lower carcinogenic potential than assumed by EPA. The cancer potency factor used in the Phase I Report is incorrect in light of this new scientific

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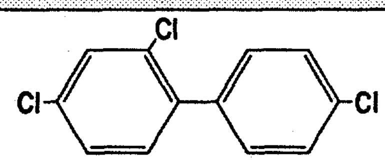


2,4,4' - Trichlorobiphenyl

A polychlorinated biphenyl consists of two interconnected biphenyl rings. In this illustration, three chlorine atoms are attached to the biphenyl rings. There are 209 possible varieties of PCBs. What makes PCBs different from each other are the numbers of chlorine atoms attached to the biphenyl rings and the positions of those atoms.

about human fish consumption and has determined that the hypothetical risk of developing cancer from eating Hudson River fish is probably zero, but no more than two in a million if, contrary to the evidence, the PCBs in river sediments are assumed to be carcinogenic in rats.

In addition, there is no credible evidence that a connection exists between exposure to PCBs and other health problems, such as skin rashes or neurodevelopmental effects. Skin rashes blamed on PCBs in an early Japanese study ultimately were linked to other chemicals, not PCBs. More recently, a North Carolina study that cited PCBs as the cause of neurodevelopmental effects in children was reevaluated by the original researcher. The effects were not found when the children were rechecked.

Health study of GE workers ignored

The largest and most relevant epidemiological study of PCB-exposed workers involved employees of the GE plants in Hudson Falls and Fort Edward.

The two plants are the alleged source of upper river PCBs, on which EPA's Phase I Report's risk assessment is focused. Nevertheless, EPA completely ignored this critical study.

A group of 6,292 GE employees, who worked at the plants for at least three months during 1946-1976 period, was studied. The results showed no increase in cancer mortality or in overall mortality compared to national averages. In fact, as PCB exposure increased, the numbers of overall and lung cancer deaths decreased.

The study was conducted by Dr. P.R. Taylor of the National Cancer Institute, who was assigned to work with the New York State Health Department.

PCBs found to be less toxic

From Page 7 . . .

information, and the human health risk assessment performed with this erroneous factor reached invalid conclusions.

The report submitted to EPA was based on a reevaluation of liver tissue slides from each of five original studies of the carcinogenicity of PCBs in rodents. The liver tissue slides were screened by a panel of expert pathologists, who used current guidelines for interpreting liver lesions. These guidelines were developed by the National Toxicology Program and have been endorsed by EPA. The panel's proceedings were observed by EPA and FDA representatives, among others.

This review confirmed that rats exposed to 60 percent chlorine mixtures of PCBs developed tumors, but fewer benign or malignant tumors than originally estimated.

More important, the reviewers concluded that mixtures containing 42 and 54 percent chlorine were not carcinogenic.

The basic conclusion of the 1991 review is that different PCB mixtures have significantly different carcinogenic effects and some mixtures are not carcinogens.

The issue of selecting the most appropriate potency factor for PCBs is critical for a proper analysis of the Upper Hudson because the PCBs discharged by the two GE plants had less than 60 percent chlorination. Sales records for the period 1957 to 1977 show that more than 95 percent of the PCBs that GE purchased for capacitor production at the two plants were 42 percent chlorinated. The rest were 54 percent chlorinated. GE did not use 60 percent chlorinated PCBs in the production of capacitors at the two Hudson River plants.

Major Dredging Problems Persist

Dredging the upper Hudson presents a host of environmental and social problems that led to EPA's rejection of that technology in 1984. Dredging technologies have not significantly improved since then.

> *The failure of the Phase I Report to consider the environmental, ecological and human health effects of dredging is inexplicable...*
> ***— GE Comments***

The Phase I Report contains a wholly inadequate discussion of the consequences of dredging the river. Prior to selecting any remedial alternative, EPA must consider the:

• Size and character of the Upper Hudson;

• Difficult problems of removing sediments with existing dredging technology;

• Problems involved with transporting the sediments to a disposal or treatment site, and

• Methods of disposing of or treating the material.

The failure of the Phase I Report to consider the environmental, ecological and human health effects of dredging is inexplicable, especially because EPA's 1984 rejection of dredging as a remedial alternative was based largely on these effects. In fact, the Phase I Report makes no mention of EPA's earlier concerns.

EPA acknowledged in 1984 that "bank-to-bank dredging could be environmentally devastating to the river ecosystem and cannot be considered to adequately protect the environment." The agency also saw the inherent problems of dredging as a remedy:

> "Dredging activities by their nature tend to result in some degree of disturbance of the highly contaminated sediments, and thus result in some short-term problems, in the form of elevated PCB concentrations in the water and air, as well as increased fish contamination." (1984 ROD, Page 7)

EPA noted then that the technology to reduce many of these dredging problems was not proven. Nor, said EPA, was there any way to estimate reliably how much of the river contamination could be remediated with dredging or how much short-term damage might result from releasing PCB materials into the water. Several studies have confirmed that turbidity and resuspension of PCBs caused by dredging increase the concentration of PCBs in the water column and, therefore, increase the uptake of PCBs by fish and other organisms in the river.

Despite these concerns, the Phase I Report does not point to any new technology that would prevent the environmental and human health effects or resolve the problems of transporting and disposing of the material.

The report simply recites the names of dredging systems and superficially describes the various categories of dredging. The report also suggests that recent field studies of the much smaller and less dynamic PCB contamination site in New Bedford Harbor (Massachusetts) prove that the cutterhead

Major Dredging Problems Persist

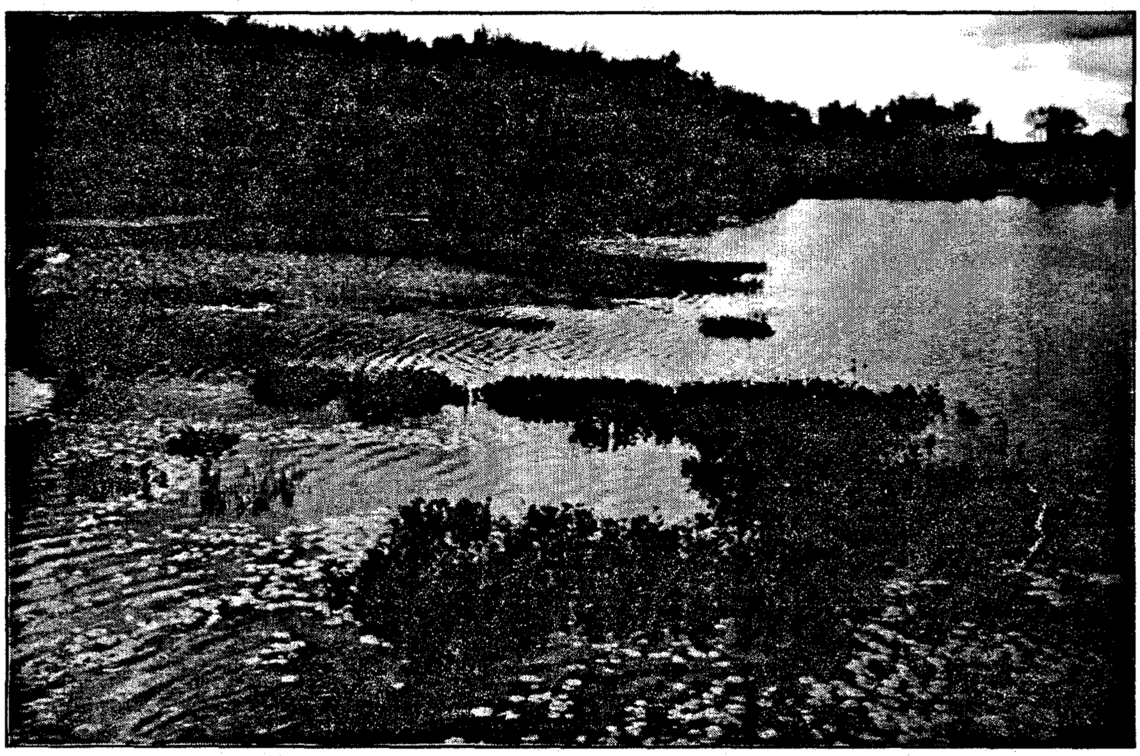
hydraulic dredge is the most successful in limiting sediment resuspension into the water column. Those field studies are not applicable to the Hudson River and do not provide any evidence overcoming the problems identified in 1984.

The Phase I Report should have addressed the site-specific problems that limit the feasibility of dredging. Consider, for instance, that the upper river is 40 miles long and up to 2,000 feet wide — an especially large Superfund site. It is a flowing river and therefore different in character than most dredging sites, such as estuaries and harbors. It is a meandering river, with many large shallow areas, where contaminated sediments may have been deposited.

> *The upper river is 40 miles long and up to 2,000 feet wide. It is a flowing river, different in character than most dredging sites, such as estuaries and harbors.*
>
> ***— GE Comments***

A meandering river is likely to deposit sediments, including contaminated sediments, in shallow waters near shorelines. Most shallow water areas in the Hudson River contain submerged aquatic plant life and would qualify as wetlands under the Clean Water Act. Dredging this environment would destroy this plant life.

The riverbank wetlands are invaluable habitats



Most shallow waters of the upper Hudson contain submerged aquatic life that support the ecosystem. These areas would be destroyed by dredging.

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for wide varieties of species. Submerged aquatic macrophytes provide dissolved oxygen for water, feeding and shelter areas for fish and macroinvertebrates, as well as spawning and nursery areas for various species. These wetlands also stabilize soils and improve water quality. Dredging threatens the viability of communities of benthic organisms — worms, fresh-water mussels, and aquatic insects that provide an important food source for large aquatic animals.

Beyond the immediate ecological impacts of dredging, long-term effects are also clear. Alterations in the food chain as a result of the extinction of lower trophic organisms will diminish the number of higher trophic organisms. Destabilized river banks and beds will cause accelerated erosion, resulting in siltation of downstream wetland areas.

There are practical problems as well:

• The size of the river itself would seriously impede large-scale dredging. Barges would be needed to transport dredged material to an off-loading pier or to a pipeline connected to the shore. Barge traffic would be overwhelming and the infrastructure associated with barge off-loading would be unsightly.

> ***Dredging the shoreline areas of the Hudson would destroy aquatic plant life and many species' habitats, eliminate important food sources for wildlife, destabilize soils and accelerate erosion.***
> ***— GE Comments***

The many barges associated with dredging would need to negotiate the system of locks and dams in the upper Hudson, causing significant navigational problems.

• The bottom of the river is composed of many different types of sediments and other materials, ranging from soft silts to large rocks and debris.

• Tires and logs or other large debris entrained in a hydraulic dredging system could stop operations completely and cause contaminant spills.

EPA did not consider any of the difficult issues related to dredging. Had it considered them, as it did in 1984, the agency could have reached only one conclusion — that dredging the upper Hudson is not feasible. Because the facts relating to dredging have not changed since 1984, EPA should disqualify dredging from further consideration in the reassessment.

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Comprehensive River Model Needed

In environmental decision-making, mathematical simulations — or models — are commonly used to predict environmental conditions. An integrated, quantitative model of PCB fate and transport would show there is no significant benefit from dredging. But EPA has chosen a simple qualitative model that will not lead to a proper characterization of the Hudson River.

GE is deeply troubled by the qualitative approach to data analysis that EPA used in the Phase I Report. We believe that EPA must construct an integrated, quantitative model of PCB fate and transport in the upper Hudson in order to characterize the contamination problem accurately and to assess the results of remedial alternatives adequately.

The Phase I Report acknowledges that significant data gaps exist but then proceeds to derive conclusions from the data regarding the dynamics of PCB transport and the fate of PCBs in the river.

Over the last 30 years, EPA and many state and regional agencies have used quantitative modeling extensively to address specific water-quality issues. EPA's Region II office, which is conducting this reassessment, recently sponsored a modeling study to analyze Long Island Sound effluent.

One of the more recent examples of a quantitative framework that relates PCB sources to fish concentrations is the model used in a June 1989 study by R.V. Thomann for the Hudson River Foundation. Thomann's complex model considered many aspects of PCB transport, geochemistry, and biogeochemistry. The model included water column transport, sediment interactions, degradation, dredging, gas exchange, biological interactions and tidal dispersion. The model also considered individual types of PCBs and their potential environmental fate.

Thomann determined that dredging upper Hudson sediments would provide, at most, negligible benefits for fish and that PCB concentrations in the lower Hudson and lower Hudson fish would improve nearly as rapidly without dredging.

Although the Phase I Report points to some uncertainties in the Thomann model, EPA should not abandon it without replacing it with similarly capable tools.

Any scientifically defensible assessment of remedies must account for the relationship between sediment PCB concentrations and water concentrations, between water and biota, between sediment and biota and ultimately between all three media and fish, the primary route of exposure for humans. Those relationships must also be understood for various types of sediments and biota, different species of fish, varying flow conditions and over both long and short distances and over time.

Given these interactions, a quantitative, integrated framework for understanding the fate and transport of PCBs in the Hudson River is essential. Instead, EPA intends to conduct a simplistic qualitative analysis of the available data. GE believes that this is not a sound scientific approach to a large and complex river system. It is a methodology that will inescapably produce indefensible conclusions.

PCBs Degrading Naturally

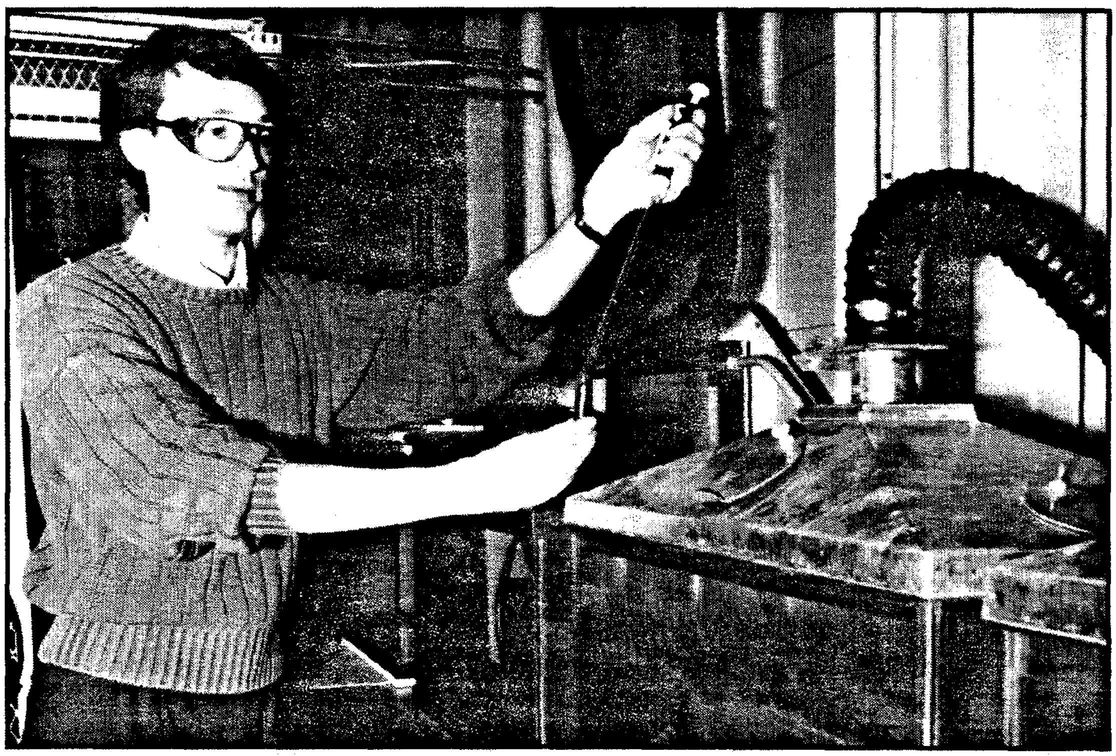
Natural processes are continuously and significantly reducing any impact of PCBs in the Hudson River. These natural processes should be permitted to solve this problem.

Since EPA's 1984 decision, numerous researchers have found that PCBs, once believed to be indestructible, can be degraded in an environment like the Hudson River by naturally occurring organisms. Despite EPA's national emphasis on developing new technologies to address remedial problems, the Phase I Report dismisses the importance of the naturally occurring biological dechlorination that is taking place in the river.

Biodegradation is a fundamental process that must be evaluated as the EPA assesses PCB fate and transport, human health and ecosystem risks and remedial alternatives. To assist EPA in this effort, GE will continue to provide the results of its ongoing biodegradation research and to answer any questions EPA may have.

Extensive research by GE scientists and others has established that two separate and complementary biological processes are working in the Hudson to degrade PCBs. First, anaerobic bacteria remove chlorine from highly chlorinated PCBs. The resulting, more lightly chlorinated compounds are not carcinogenic. *(See "PCBs Found to be Less Toxic," Page 7.)* They accumulate in organisms to a lesser extent than more highly chlorinated PCBs. Aerobic bacteria then destroy the PCB.

Anaerobic biodegradation is not limited to the Hudson River, of course. PCB-containing sedi-



Scientists at the GE Research and Development Center in Schenectady, N.Y., use 15-gallon tanks of PCB-contaminated sediments and water from the upper Hudson River to evaluate how the various nutrients and microorganisms affect the rate of PCB dechlorination in the environment. Extracting a sediment sample for analysis is Dr. Mark L. Stephens, a researcher in the GE R&D Center's Environmental Technology Program.

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ments from Escambia Bay, FL., Hoosic River, MA., Kalamazoo, MI., Massena, NY., New Bedford Harbor, MA., and Waukegan Harbor, IL., among others, all undergo PCB dechlorination, recent research has shown.

Natural biodegradation offers several important benefits over an invasive remediation remedy, such as dredging. For instance:

- Biodegradation is a permanent solution that destroys PCBs, as opposed to only relocating contaminated sediments.

- No landfills are required for biodegradation and there is no land destruction or community disruption.

- Biodegradation does not disrupt wetlands and aquatic habitats or have the other devastating ecological effects of dredging.

The results of the research on natural PCB biodegradation have been widely published. GE believes there is no justification for the Phase I Report's failure to properly take this research into account. The transformation and destruction of PCBs must be understood if the fate and transport of PCBs are to be evaluated in a scientifically sound manner.

Research in the field of biodegradation is extensive. Here is a partial list of individuals in the United States and Canada who are involved in biodegradation research of various organic contaminants:

AeroVironment Inc. — Khalique A. Khan
Battelle — Robert E. Hinchee, Say Kee Ong
Batelle Columbus Operations — Pradeep K. Aggarwal, Jeffrey L. Means

Heidi M. Van Dort, a biochemist formerly at the GE Research and Development Center in Schenectady, N.Y., is shown examining sediments obtained from the upper Hudson River near Fort Edward, N.Y. These samples are used by GE scientists and other researchers who are trying to accelerate the natural breakdown of PCBs in the Hudson River and elsewhere.

Beak Consultants Limited — Eric W. Hodgins, David W. Major
CH2M Hill — D.D. Hicks
Computer Sciences Corporation — E. Dorwin, M.P. Eisman
Cornell Univ. — James M. Gossett
Du Pont Chemicals — Bernard C. Lawes
Du Pont Environmental Remediation Services — M.D. Lee, R.L. Raymond Sr.
Ecova, Corp. — William Mahaffy
Envirogen, Inc. — Burt Ensley, Ron Unterman
Environmental Science & Engineering, Inc. — D. Blaes, P. Keating, W. Richards

ESE Biosciences, Inc. — J.A. Caplan, M.T. Lieberman, E.K. Schmitt
Groundwater Technology, Inc. — Richard A. Brown, Jeffrey C. Dey, Cliff Harper, James Oppenheim
Hydro Group, Inc. — Frank Lenzo, David G. Ward Jr.
John Mathes & Associates, Inc. — Richard A. Bell, Adam H. Hoffman
Mantech Environmental Technology Inc. — Mark V. White
McGill Univ., Canada — E.C.S. Chan, R. Leduc, L.P. Tousignant, R.N. Yong
Michigan State Univ. — S. Boyd, J. Quensen, James Tiedje
Monsanto Chemical Company — Bruce S. Yare
National Urban League — Herbert R. Pahren
Naval Civil Engineering Laboratory — Denise M. Barnes, Ron Hoeppel, B. Nelson
New York Univ. — L. Young
North Carolina State Univ. — Robert Borden
Oak Ridge National Laboratory — P.A. Boerman, T.L. Donaldson, S.E. Herbes, A.V. Palumbo, G.W. Strandberg
OHM Remediation Services Corporation — John H. Carson Jr., Paul E. Flathman, S. Jeanne Whitehead
Science Applications International Corporation — John S. Evans
Stanford Univ. — Harold A. Ball, C. Deane Little, Mark E. Dolan, E.A. Edwards, Cresson D. Fraley, Steven M. Gorelick, D. Grbic-Galic, Thomas C. Harmon, Gary D. Hopkins, Abdul Matin, Michael P. McCann, Perry L. McCarty, Martin Reinhard, Paul V. Roberts, Lewis Semprini, Claire Tiedeman, L.E. Wills
State Univ. of New York, Syracuse — S. Tanenbaum
Stearns & Wheeler — Wayne E. McFarland
Texas A&M Univ. — C.G. Coble, R.P. Egg, D.L. Reddell
The Traverse Group, Inc. — John M. Armstrong, Robert H. Douglass, Christopher J. Griffin, William M. Korreck, Barbara J. Prosen
TreaTek Incorporated — M. Talaat Balba, Thomas G. McNeice, Anthony C. Ying

> ***The transformation and destruction of PCBs must be understood if the fate and transport of PCBs are to be evaluated in a scientifically sound manner.***
> ***— GE Comments***

U.S. Air Force — Ross N. Miller, Catherine C. Vogel
U.S. Army Corps of Engineers — Rick Scholze
U.S. Dept. of Agriculture — Cathleen J. Hapeman-Somich, Daniel R. Shelton
U.S. EPA — Thomas L. Baugh, B.F. Bishop, Bert E. Bledsoe, Wendy J. Davis-Hoover, John A. Glaser, Scott G. Huling, S.R. Hutchins, Robert Menzer, Gregory G. Ondich, P. Hap Pritchard, Patrick R. Sferra, John H. Skinner, Henry H. Tabak, J.T. Wilson
U.S. Geological Survey — C. Marjorie Aelion
Univ. of California, Riverside — W.T. Frankenberger, U. Karlson
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Univ. of Louisville — Ronald M. Atlas
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Univ. of Waterloo, Canada — Barbara J. Butler, J.F. Sykes
Utah State Univ. — William J. Doucette, R. Ryan Dupont

Lower-River PCB Sources

PCB contamination of the Hudson River did not result from the massive movement of PCBs from a single upper Hudson River source, such as the GE plants, but rather from minimal movement from several local sources.

Importantly, the Phase I Report acknowledges that there are significant sources of PCBs to the lower Hudson River that are not related to PCB transport from the upper river. EPA's investigation into these and other PCB sources, however, is insufficient.

Under EPA rules, it is fundamental to the Superfund process that a site be adequately characterized and, in particular, the sources of contamination be defined. Without identification of the significant lower-river PCB sources, it is impossible to predict what impact, if any, potential remedies will have on reducing exposure to contamination. Whatever remedy EPA selects may not address the actual source of the problem.

In the Phase I Report, EPA accepts without question the assumption that historical PCB contamination of both the upper and lower Hudson is dominated by massive movement of PCBs from the GE plants at Hudson Falls and Fort Edward after the 1973 removal of a dam that held back the sediments. A thorough review of the sediment data demonstrates that this assumption is false.

The peak PCB concentration in lower Hudson sediments occurred in 1971 — prior to the removal of the dam and coincident with the peak in national PCB use and releases to the environment. The same peak in PCB loading also has been observed in the Great Lakes and other bodies of water.

Six other categories of sediment data further support the conclusion that PCB contamination in the entire river has not been caused by massive movement from a primary, single source in the Upper River, but rather by minimal movement of PCBs from multiple sources. In fact, the concept that PCB contamination resulted from multiple sources first was proposed by investigators at EPA's Region II office in 1977. Later, investigators at the New York University Institute of Environmental Medicine Laboratory for Environmental Studies also observed multiple sources with minimal transport.

EPA also assumes that the only *current* significant sources of PCB contamination in the upper river are the deposits from GE's historical discharges and that transport from those deposits continues to be a major source for the lower river. EPA's estimate of PCB discharges from current sources is low. The upper river contributes only a small fraction of the lower river PCB loadings. Of critical importance, the evidence demonstrates that the upper river will play an even smaller role in the future.

Analysis of the fish data shows that fish accumulate PCBs from local sources. To a significant degree, the PCBs accumulated by lower river fish come from sources other than the upper river. In the case of striped bass, which spend as little as two months in the Hudson, those local sources are primarily outside the Hudson and are not GE-related.

If, historically, no massive movement of PCBs occurred in the Hudson, EPA must seriously re-evaluate what quantity of PCBs could possibly be transported today over long distances from the Thompson Island Pool near Fort Edward to other parts of the river.

EPA must consider focusing its resources on controlling these other local PCB sources with local impact rather than on pursuing a potentially devastating, expensive and ultimately ineffective remedy that requires the dredging of Upper Hudson River sediment. Presumably, because of its early acceptance of the single source/massive movement theory to explain lower-river PCB loadings, EPA thus far has neglected to look for other sources even as it acknowledges in the Phase I Report that those sources are "poorly identified and quantified."

In searching for industrial contributors, for instance, EPA looks only at New York facilities that hold current discharge permits, finds only five such facilities and makes no estimates of the amounts of PCBs that may have been discharged. There is no evidence that EPA investigated any of those dischargers to determine the volume or nature of the discharges.

Literally hundreds of facilities in the upper and lower Hudson watershed now conduct, or in the past conducted, the very operations identified as likely sources of PCB contamination. A 1977 study listed approximately 220 direct dischargers and over 200 indirect dischargers of PCBs in the lower Hudson drainage basin. Perhaps even more telling, sales data from Monsanto, the principal producer of PCBs, revealed that in 1971 and

Striped bass get PCBs elsewhere

PCBs found in Hudson River striped bass do not resemble those found in Hudson River sediments. The PCBs in the fish are more highly chlorinated.

Scientists can determine where striped bass bioaccumulate PCBs by looking at the composition of the PCBs — as well as other contaminants — in fish tissue. The Phase I Report says that tissues from lower-river striped bass show concentrations of PCBs that are more highly chlorinated than the PCBs that GE discharged.

A 1990 study by B.K. Shepard into where striped bass pick up PCBs found that sediments and biota in the lowest parts of the Hudson and in New York Harbor have more highly chlorinated PCBs than those in the upper river.

Chlorinated pesticides also are present in Hudson River striped bass, as they are in sediment samples from Long Island Sound and New York Harbor. By contrast, the same substances are found at very low concentrations only in the Hudson River estuary biota and sediments.

GE's examination of Hudson River fish data demonstrates that:

- The habits of striped bass and the type of PCBs found in them prove that Hudson River sources are not even the main contributor to the PCBs found in them.

- Striped bass are not appropriate to demonstrate the distribution of PCBs in the lower-river sediments because they migrate.

- Resident fish data disprove the existence of an upper-to-lower river PCB concentration gradient. The only relevant fish data confirm that PCBs in the lower river came from multiple lower-river sources, not a single, upper-river source.

1972 alone, over three million pounds of PCBs were sold to users on or near the lower Hudson. The fact that these facilities may not today have state discharge permits is virtually meaningless; most of these facilities ceased using PCBs in or around 1971.

Many PCB users, perhaps including the federal government, deposited PCBs at landfills, where they continue to leach into nearby waterways. The Phase I Report candidly acknowledges that its estimate of lower-river PCB loadings from landfill leachate is based on a "minimal number of measurements and on a simple model." However, based on this lack of data and the enormity of the area from which landfill leachate might flow to the lower Hudson (estimated by EPA to be between 2,000 and 3,000 acres), EPA is apparently ready to conclude that less than three-tenths (0.3) of a pound per day of PCBs flow from these sources to the lower river.

Documents from the New York Department of Environmental Conservation show that EPA's estimate is entirely premature. Numerous landfills that are immediately adjacent to the lower river and its tributaries will, until remediated, continue to release and threaten to release PCBs directly or indirectly into the lower river.

In addition to their many industrial uses, PCBs are inadvertently produced when biphenyl is chlorinated during wastewater treatment. The lower Hudson and its major tributaries receive direct discharges from over 20 municipal treatment systems with multiple on-line industrial dischargers.

The Phase I Report notes that "estimates of PCB loadings from tributaries to the lower Hudson can all be characterized as poor." If that is so, GE believes more data should be gathered and analyzed. Sampling from the Hoosic River, a Hudson tributary, shows high PCB concentrations in several locations. PCBs have been discharged by several facilities along two other tributaries, the Mohawk River and Kinderhook Creek. The Mohawk's many sewage treatment plants and industrial sources establish it as an almost certain source of lower river PCBs.

Less obvious sources of PCBs also play a significant role. For example, PCBs originally in carbonless paper are believed to be a major source of contamination of effluents from the paper-recycling industry.

Against the total of all the lower-river PCB sources discussed here, the Phase I Report estimates that in 1980 only 4.4 pounds per day of PCB passed over the Federal Dam in Troy from the upper to the lower river. Further, the report notes that this load, *decreased* exponentially, with a half life of approximately three years, resulting in a current upper river contribution of approximately three tenths (0.3) of a pound a day. For perspective, it should be noted that at least 27 billion pounds of water wash over the Federal Dam each day. The upper river PCB contribution is dwarfed by those from other lower-river sources, which, as EPA acknowledged, are falling less rapidly than the upper river contributions. Thus, the Upper Hudson's contributions will be decreasing in both absolute and relative terms in coming years.

Conclusion

EPA's Phase I Report fails to show that the conclusions reached by EPA in 1984 were wrong or that changes in river conditions warrant a modification in those conclusions.

If EPA intends to proceed with this reassessment, GE believes it must collect and analyze:

- More data pertaining to PCB interactions in Hudson River sediment, water and biota;

- Site-specific data pertaining to human exposure to PCBs from the Upper Hudson;

- Current data relating to natural bioremediation in the Hudson River sediment;

- Data pertaining to the impediments to and the environmental consequences of massive dredging in the Upper Hudson, and

- Information regarding all sources of PCBs in the Hudson River.

The Phase I Report, although intended only as an interim characterization and evaluation of the Hudson River site, creates a flawed and inadequate foundation for the remainder of the reassessment.

The enormity of EPA's responsibility, the complexity of the site and the potentially devastating impact that selection of the improper remedy will have demand that EPA correct these deficiencies.