

**Hudson River Regional Economic Impact Analysis:
Impact of Environmental Remediation**

April 12, 2001

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Executive Summary: **Hudson River Regional Economic Impact Study**

Introduction: During a 30-year period ending in 1977, General Electric Company (GE) discharged as much as 1.3 million pounds of polychlorinated biphenyls (PCBs) directly into the upper Hudson River from facilities at Hudson Falls and Fort Edward. PCBs were widely utilized as insulating material in electrical parts and equipment, particularly capacitors and transformers, until 1976, when Congress passed the Toxic Substance Control Act. By the time Congressional legislation was passed, extensive scientific research in numerous studies pointed to the severe environmental and health risks posed by exposure to PCBs.

In 1983, a 200-mile stretch of the Hudson River, from Hudson Falls to the Battery in New York City, was classified as a Superfund site. Many of GE's PCBs remain concentrated in hotspots in the sediments of the upper Hudson, but PCBs have polluted the entire stretch of River below Hudson Falls.

In December 2000, the Environmental Protection Agency (EPA) announced a proposed plan to clean up the Hudson River and protect public health after a ten-year, exhaustive scientific study of PCB contamination. The agency concluded that targeted environmental dredging of the most contaminated portions—about 12 percent of the 40-mile stretch of the upper Hudson from Fort Edward downstream to the Federal Dam at Troy—was the most feasible strategy to remove PCBs from the Hudson River. The dredging project would take an estimated five years to complete and is estimated to cost about \$460 million. Under the Superfund law, GE is responsible for the cleanup.

In March 2001, a coalition represented by Scenic Hudson and the Hudson River Sloop Clearwater (the Client), commissioned this study to evaluate how the proposed environmental dredging project would affect the economy of the upper Hudson River valley—i.e., Saratoga and Washington Counties—and to examine the economic benefits and potential associated with the Hudson River from the site of the proposed cleanup, downstream along its length.

Scope of work: To conduct this study, the consultant: 1) reviewed data on the proposed dredging project from EPA’s Feasibility Study and Proposed Plan, 2) assessed regional economic impacts using an economic model calibrated for the region by Regional Economic Models, Inc. (REMI), 3) cataloged direct river-related activity and potential, using economic data collected under the ES202 program, and 4) examined recreational and commercial fisheries potential for the Hudson river, assuming successful remediation. The results fall into two categories:

Near-term benefits: The economic impact identified in Part 2, is directly linked to EPA’s preferred remediation alternative. Those benefits occur during a time period leading up to, concurrent with and immediately following environmental dredging and disposal, and are the result of that capital investment project and related operations and maintenance expenditures. Impacts are reported for the combined region consisting of Saratoga and Washington Counties.

Longer-term benefits: The economic value and the economic potential attributed to the Hudson River and identified in Parts 3 and 4, is assessed for a wider region. Part 3 examines a twelve county region surrounding the Hudson River and running from the location of EPA’s recommended cleanup action, for almost 200 miles, south as far as Westchester and Rockland Counties. The economic value is based on actual data reported for 1999. Economic potential assumes successful environmental remediation and removal of restrictions and bans on fishing (i.e., recreational and commercial), with associated restoration of river-related activity.

Benefits relation to expanded recreational fishing and restoration of commercial fisheries also fall into this category.

The study does not explore health-related economic impacts that accrue from environmental remediation.

Results:

1) Near-term benefits: Activity associated with the environmental dredging of PCBs (Saratoga and Washington Counties): Construction costs associated with EPA’s preferred alternative cleanup method have a net present value of \$460 million, of which nearly half is spent in the region. Of the amount spent locally—\$225 million—40 percent represents direct spending on labor. Over the life of the project—i.e., construction, operation and monitoring—nearly 3,543 jobs are added to the local economy. The remainder spent locally represents an increase in the purchase of goods and services.

The direct economic activity—i.e., employment and spending—associated with cleanup activity along the upper Hudson, ripples through the economy and gives rise to additional effects. Spending associated with the cleanup leads to indirect impacts on jobs and business orders for related product and service providers (and, in turn, for their providers). The income associated with cleanup-related employment is likewise re-spent on consumer purchases; these represent induced impacts on the economy. Finally, additional dynamic effects occur, such as changes to wage rates, as a result of demand changes. These indirect or multiplier effects add an additional 1,028 jobs to the local economy and \$53 million of wages.

The overall impact of the proposed cleanup project on the regional economy can be summarized as follows:

	<u>Direct Impact</u>	<u>Indirect¹ Impact</u>	<u>Total Impact²</u>
New Jobs	3,543	1,028	4,571
New Payroll	\$88.5 million	\$52.5 million	\$141 million
Gross Regional Product			\$800 million

Positive increases accrue to residential capital stock (i.e., housing), and exports (i.e., goods produced locally, shipped elsewhere for consumption)

¹ Indirect *plus* induced effects

² Payroll is a subset of Gross Regional Product and is not additive.

decline for the length of the project, thereby moderating commodity price increases that might otherwise occur.

2) Longer-term benefits: Economic potential of the Hudson River: In 1999, an estimated 7,400 jobs were tied directly to the Hudson River, in the twelve counties identified (Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Saratoga, Ulster, Washington and Westchester). The associated wage bill was \$288 million. Those figures are *considerably lower* than the actual economic benefit, as they include only sectors predominantly tied directly to water-related activity (and related indirect employment), without considering sectors that contain both water-related and unassociated jobs. Furthermore, none of the economic activity associated with the Hudson River in New York or Bronx Counties is included in the total, as estuarine activity could not be separated to that level of detail (i.e., Hudson River or other coastal) for those counties. If missing data were included, then economic benefits tied to the Hudson River would be larger.

The Hudson River valley (i.e., twelve-county region) accounts for nearly 15 percent of all state population and total employment. By comparison, river-related employment in the region, including water transportation, waterfront engineering and recreation, constitutes less than 10 percent of the state total. Eliminating PCBs from the Hudson River would lower waterfront remediation costs and lead to a reduction in the costs associated with waterfront redevelopment and restoration. Reducing those costs could lead to a resumption of water-related activity along the Hudson River. If that were to occur in proportion to the remainder of the state, it could lead to gains in the twelve-county region, over time, of:

- 3,700 to 8,900 new jobs;
- \$144 million to \$346 million new wages.

Activity would be expected to arise from water transportation (e.g., Champlain Canal, Hudson River traffic) and waterfront development, as reflected in Local Waterfront Revitalization Plans and the National Heritage Area Management Plan.

Conversely, while existing restoration costs remain elevated due to continued downstream dispersal of PCBs from the upper Hudson, waterfront restoration and renewal is not as likely or, where it occurs, will proceed more slowly. That exacerbates urban decay problems for riverfront communities, including continued erosion of the tax base and continued fiscal strains.

3) Economic value of Hudson River Commercial Fisheries: The Hudson River is home to many species of fish that are attractive for both recreational and commercial fishing, including striped bass, American eel, shad, herring, carp and sturgeon. At present, no commercial fishing takes place on the Hudson River, due to health advisories associated with the presence of PCBs. Recreational fishing on the Hudson is severely restricted, for similar reasons. It is fair to assume that the region surrounding the Hudson River does not obtain the full economic benefit that would accrue if restrictions on commercial and recreational fishing were eased or removed. When it was closed in 1976, the commercial striped bass fishery industry on the Hudson River was valued at \$40 million annually. Annual income from sportfishing on the lower Hudson during the mid-60s—i.e., before health-related restrictions were established—was estimated at \$20 million (Carlson, McCann, 1969).

The economic benefits accruing from recreational fishing activity are not limited to individuals fishing from privately owned boats, but also include charter and party boat activity and land-based activity. In other areas where economic analysis and surveys have been conducted, direct and indirect benefits accruing from recreational fishing total in the tens of millions of dollars.

A simple estimate of the Hudson’s capacity to support commercial striped bass fishing indicates the following potential impacts:

- 274 to 300 direct jobs;
- \$8 to \$9 million direct wages.

Hudson River Regional Economic Impact Study

1. Introduction

1.1. Overview: The Hudson River, PCB pollution and recommended cleanup: For a thirty year period, from the Second World War until the mid nineteen seventies, General Electric Company (GE) used polychlorinated biphenyls (PCBs) at its electrical parts manufacturing plants along the upper Hudson River. In 1947, GE began using PCBs in the manufacture of electrical capacitors at its Fort Edward plant on the eastern shore of the Hudson River. In 1952, GE began using PCBs in the manufacture of electrical capacitors at its nearby Hudson Falls plant.

PCBs are a synthetic organic compound first manufactured for industrial applications by Monsanto Corporation, in 1929. PCBs were widely utilized as insulating material in electrical parts and equipment, particularly capacitors and transformers, until 1976, when Congress passed the Toxic Substance Control Act. That Act banned the manufacture of PCBs and prohibited all uses except in totally enclosed systems. By the time Congressional legislation was passed, extensive scientific research in numerous studies pointed to the severe environmental and health risks posed by exposure to PCBs. People who eat PCB-contaminated fish face an increased risk of cancer and other serious medical conditions, including developmental, immune system, thyroid and reproductive problems. The compound poses a special risk to the health of children.

In 1983, the Environmental Protection Agency (EPA) released an updated Superfund National Priority List that included the Hudson River. During a 30-year period ending in 1977, GE discharged as much as 1.3 million pounds of PCBs directly into the river from facilities at Hudson Falls and Fort Edward. Many of GE's PCBs remain concentrated in hotspots in the sediments of the upper Hudson, but PCBs have polluted the entire stretch of River below Hudson Falls. In 1983, a 200-mile stretch of the Hudson River, from Hudson Falls to the Battery in New York City, was classified as a Superfund site. In July 1999, EPA released the Human Health Risk Assessment for the Upper Hudson River, which concluded that the cancer

risks to humans who eat contaminated fish caught in the Upper Hudson River is 1,000 times greater than what EPA considers acceptable. Non-cancer risks were found to be 100 times higher than EPA's level of concern.

In December 2000, EPA announced a proposed plan to clean up the Hudson River and protect public health after a ten-year, exhaustive scientific study of PCB contamination. That proposal supersedes EPA's 1984 interim no action decision for the PCB-contaminated sediments; EPA has been conducting a Reassessment since 1990.

The scientific reassessment found that without extensive cleanup, concentrations of PCBs would not decline to acceptable health and safety levels. The reassessment further determined that the natural breakdown of PCBs cannot be relied on to significantly reduce risks to human health. PCBs that are buried in the river's sediments do not remain in place, but continue to move downstream. Hudson River fish still accumulate PCBs far in excess of safe levels.

EPA evaluated several alternative strategies to remove PCBs from the Hudson River. The agency concluded that targeted environmental dredging of the most contaminated portions—about 12 percent of the 40-mile stretch of the upper Hudson from Fort Edward downstream to the Federal Dam at Troy—was most feasible, based on a multi-factor evaluation. The dredging project would take an estimated five years to complete and is estimated to cost about \$460 million. Under the Superfund law, GE is responsible for the cleanup.

The primary objective of the action is to remove PCB-contaminated sediments at identified “hot spots” on the upper Hudson River, in order to reduce PCB concentrations in fish and minimize potential future human health and ecological risks—including cancer risks and non-cancer health hazards—and to minimize the long-term downstream transport of PCBs in the river. Sediments with the potential to contribute to PCB concentration in fish, now and in the future, are considered principal threats.

The proposed cleanup would remove over 100,000 pounds of PCBs that otherwise pose significant threat to people, fish and wildlife across the food chain. It would reduce risks to health and fish by five times immediately following the cleanup. According to EPA, New York State will be able to relax fish consumption advisories within two years after cleanup is completed. Based on 1998 data from a monitoring station at Schuylerville, as reported by GE, 471 pounds of PCBs continue to flow annually over the Federal Dam at Troy, from the upper to the lower Hudson River.

The cleanup plan calls for removal of more than 2.6 million cubic yards of contaminated sediment, backfilling with clean material, disposal and ongoing monitoring. After treatment, the dredged material would be transported away from river communities by rail for disposal.

The plan recognizes the need for stepped-up containment of PCBs still entering the river through fractures in the bedrock beneath the GE Hudson Falls plant. EPA believes that a source control system will be in place by January 1, 2005, under the terms of a Non-Time Critical Removal Action (NTRCA). The economic impact of the NTRCA was not evaluated in the scope of this study.

1.2. Scope of the economic impact study: A coalition represented by Scenic Hudson and the Hudson River Sloop Clearwater, commissioned this study to evaluate how the proposed environmental dredging project would affect the economy of the upper Hudson River valley—i.e., Saratoga and Washington Counties—and to examine the economic potential associated with a restored Hudson River along its length.

Accordingly, this report describes the economic impact associated with EPA’s preferred alternative cleanup actions on Saratoga and Washington Counties, in the upper Hudson River valley. It documents the impact on regional jobs and sales created directly by the cleanup action; indirectly, as a result of the purchase of goods and services related to the cleanup action; and through induced effects related to purchases and employment linked to increased consumer demand (which results from changes to direct and indirect employment and associated wages).

The analysis of these effects is based on estimates derived from a regional economic model designed specifically for the region by Regional Economic Models, Inc. (REMI). Based on more than two decades of research, the REMI model incorporates a systematic series of structural equations that capture the interrelationships among major components of the economy including output, supply and demand for labor and capital, market prices and shares, wages and population.

The study then goes on to address longer-term economic potential along and relating to the Hudson River—from the cleanup/pollution source, between Hudson Falls and Fort Edward, through its tidal length of almost two hundred miles, to just north of its confluence with the East River and point of discharge into upper New York Bay. The study makes use of wage and employment data from the ES-202 program, a cooperative endeavor of the Bureau of Labor Statistics and the New York State Department of Labor.

Using data from the last available year, 1999, the study identifies and aggregates direct employment and wages tied to the presence of the Hudson River. Next, the proportion of water-related employment and wages for the Hudson River valley as a share of total regional employment is calculated, compared to the corresponding ratio for the remainder of the state and adjusted to equal the rest-of-state ratio. Finally, economic multipliers are used to estimate a range of total—i.e., direct and indirect—wages and employment tied to river-related activity.

Lastly, this report identifies several other studies of the economic impact of commercial and recreational fisheries—along the Hudson and elsewhere—and extrapolates benefits along the Hudson River if restrictions were lifted.

1.3. Study area: The study area consists of counties on either side of the Hudson River. Two counties, Saratoga and Washington, were singled out to examine the direct and indirect economic impacts associated with EPA’s recommended environmental dredging project. The polluted “hot spots” directly affected by the cleanup are on the Hudson River along the border between those counties.

Twelve counties were included for the purpose of assessing direct economic benefits and longer-term economic potential related to the Hudson River. The are: Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Saratoga, Ulster, Washington and Westchester. Those are the counties that border the Hudson River from the source of the pollution and area of proposed cleanup, almost to the river’s discharge into upper New York Bay. Bronx and New York Counties are not included in this study because of difficulty separating out Hudson River-related economic activity from other coastal activity (i.e., Bronx and New York Counties are also bounded by Long Island Sound and the East River, respectively.)

The twelve-county region accounted for 14.5 percent of total state employment in 1999. Saratoga and Washington counties, combined, account for less than 1 percent of total state employment. See Table 1 (below) for details:

1999 Establishment Employment	New York State	Hudson River Valley (12-county)³	Share of New York State	Saratoga & Washington Counties	Share of New York State
Total Employment	8,292,305	1,198,279	14.5%	78,045	0.9%
Agriculture & Mining	68,487	15,056	22.0%	1,249	1.8%
Construction	309,443	53,517	17.3%	3,617	1.2%
Manufacturing	890,692	116,001	13.0%	10,977	1.2%
Trans., Comm., Publ. Util.	552,324	70,283	12.7%	2,041	0.4%
Wholesale Trade	444,156	57,885	13.0%	3,858	0.9%
Retail Trade	1,261,996	205,183	16.3%	16,206	1.3%
Finance, Insurance, R.E.	764,838	70,271	9.2%	4,219	0.6%
Services	3,491,490	497,698	14.3%	29,578	0.8%
Government	508,112	112,391	22.1%	6,299	1.2%

Table 1

^{3, 2} Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Saratoga, Ulster, Washington and Westchester Counties

The twelve-county region also accounted for 12 percent of total state wages in 1999. Saratoga and Washington counties, combined, account for less than 1 percent of total state wages. See Table 2 (below) for details:

1999 Establishment Wages	New York State (\$000)	Hudson River Valley (12-county) ⁴ (\$000)	Share of New York State	Saratoga & Washington Counties (\$000)	Share of New York State
Total Employment	349,761,000	42,503,754	12.2%	2,176,830	0.6%
Agriculture & Mining	1,740,697	370,632,824	21.3%	26,232	1.5%
Construction	12,761,688	2,105,387	16.5%	117,358	0.9%
Manufacturing	42,655,152	6,551,760	15.4%	452,525	1.1%
Trans., Comm., Publ. Util.	25,556,213	3,053,834	11.9%	75,200	0.3%
Wholesale Trade	22,527,238	2,678,481	11.9%	130,039	0.6%
Retail Trade	24,615,230	3,883,605	15.8%	255,513	1.0%
Finance, Insurance, R.E.	71,612,591	3,311,816	4.6%	131,351	0.2%
Services	127,643,000	16,219,806	12.7%	787,978	0.6%
Government	20,631,740	4,328,433	21.0%	200,633	1.0%

Table 2

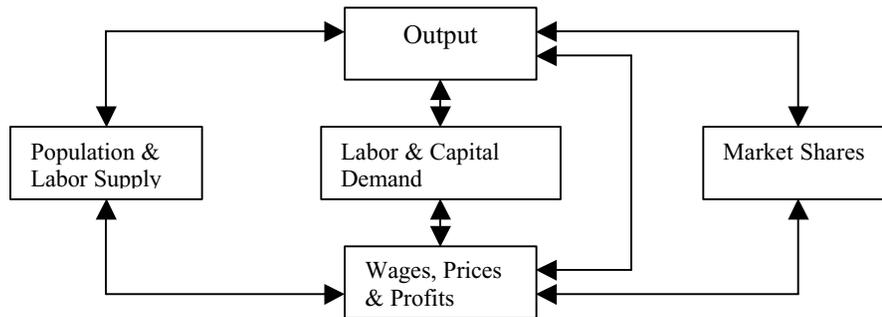
2. Analysis Process

2.1. Overview of the economic modeling process: The economic impact of EPA’s proposed environmental dredging project on Saratoga and Washington Counties is defined as the difference between forecasts of local economic activity with and without the recommended intervention. Details relating to the preferred cleanup alternative are thoroughly documented in Book 6/Appendix I of the Feasibility Study released by EPA in December 2000. Data from that report was used as input to the REMI regional economic model used for this study.

Using the REMI model to estimate economic impact consists of multiple steps. The first step is the computation of a baseline forecast of the regional economy, utilizing historic data and assumptions about the US economy. Next, a policy forecast was generated that included assumptions relating to

EPA’s recommended course of action. The policy forecast was also adjusted to reflect historic employment data that not previously included in the baseline. Finally, the baseline forecast was compared with the policy forecast. The difference between the two forecasts represents economic activity related to the intervention.

Based on more than two decades of research, the REMI model incorporates a systematic series of structural equations that capture the interrelationships among major components of the economy including output, supply and demand for labor and capital, market prices and shares, wages and population, as illustrated in the following simplified schematic diagram:



Since inputs for and impacts from the cleanup project are spread over time, present values were calculated for the data.

2.2. Economic potential of the Hudson River: The wide area analysis measuring the economic potential of the Hudson River is modeled on research conducted for other bodies of water. An effort was made to quantify economic activity that occurs in the region as a direct result of the presence of the Hudson River. Employment and wage data for 1999 was obtained from the ES202 program, jointly administered by the Bureau of Labor Statistics and the New York Department of Labor. Those sectors (2-, 3- and 4-digit Standard Industrial Classifications—i.e., SICs) that could be linked directly to water-related activity were identified, and employment and total wages were summed for the region as well as for the rest of New York.

Data was collected for the twelve counties adjacent to the Hudson River, from the site of the proposed cleanup, to (but not including) New York City.

This was defined as the region of direct economic activity relating to the Hudson River. The counties included are: Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Saratoga, Ulster, Washington and Westchester. Bronx and New York Counties are not included because it was not easily possible to separate establishments in those counties with activity along the Hudson River, from establishments with activity along the East River or Long Island Sound.

Next, the proportion of water-related employment and wages for the Hudson River valley as a share of total regional employment was calculated and compared to the corresponding ratio for the remainder of the state. That share was adjusted to equal the rest-of-state ratio, and economic multipliers were used to estimate a range of total—i.e., direct and indirect—wages and employment tied to river-related activity.

3. Activity Related to Proposed Environmental Dredging

3.1. EPA’s recommended action: In December 2000, EPA released its Feasibility Study and Proposed Plan relating to remedial alternatives considered for the Hudson River PCBs Superfund Site. The agency identified its preferred remedy for the site based on analysis of nine evaluation criteria for Superfund remedial alternatives. The preferred remedy is identified in the documents as “Alternative 4: REM-3/10/Select.”

The preferred remedy consists of removal via targeted environmental dredging of 2.65 million cubic yards of contaminated sediment, which is estimated to contain over 100,000 pounds of PCBs. EPA and NYDEC have identified forty contaminated “hot spots” along a 30-mile reach of the upper Hudson, stretching from river mile 163, above the Federal Dam, at Troy, to river mile 193, near the former site of the Fort Edward Dam. The total area of sediments targeted for removal is about 493 acres.

Environmental dredging techniques minimize adverse environmental impacts, including the resuspension of sediments during dredging. The economic activity documented in this report is based on the proposed use of

mechanical dredging techniques rather than hydraulic dredging techniques. Dredging will occur to remove PCB-contaminated sediments and leave minimal residual that remains below a target threshold goal (>1 mg/kg). Subsequent to removal, approximately one foot of backfill will be placed where appropriate (excluding the navigation channels) over the residual layer, in order to further reduce the available PCB concentration and to provide appropriate substrate for biota. Backfill will also help stabilize riverbank areas after dredging and minimize hydraulic changes to the river.

Dredged sediments will be transported by barge to two land-based processing facilities. Once landside, sediment will be dewatered and stabilized with Portland cement, then loaded onto rail cars for disposal at existing licensed TSCA (Toxic Substance Control Act) or solid waste landfills outside the Hudson River Valley. The water that is separated from the sediment before transfer will undergo treatment to remove fine sediment particles and dissolved PCBs, and will ultimately be discharged back into the Hudson River.

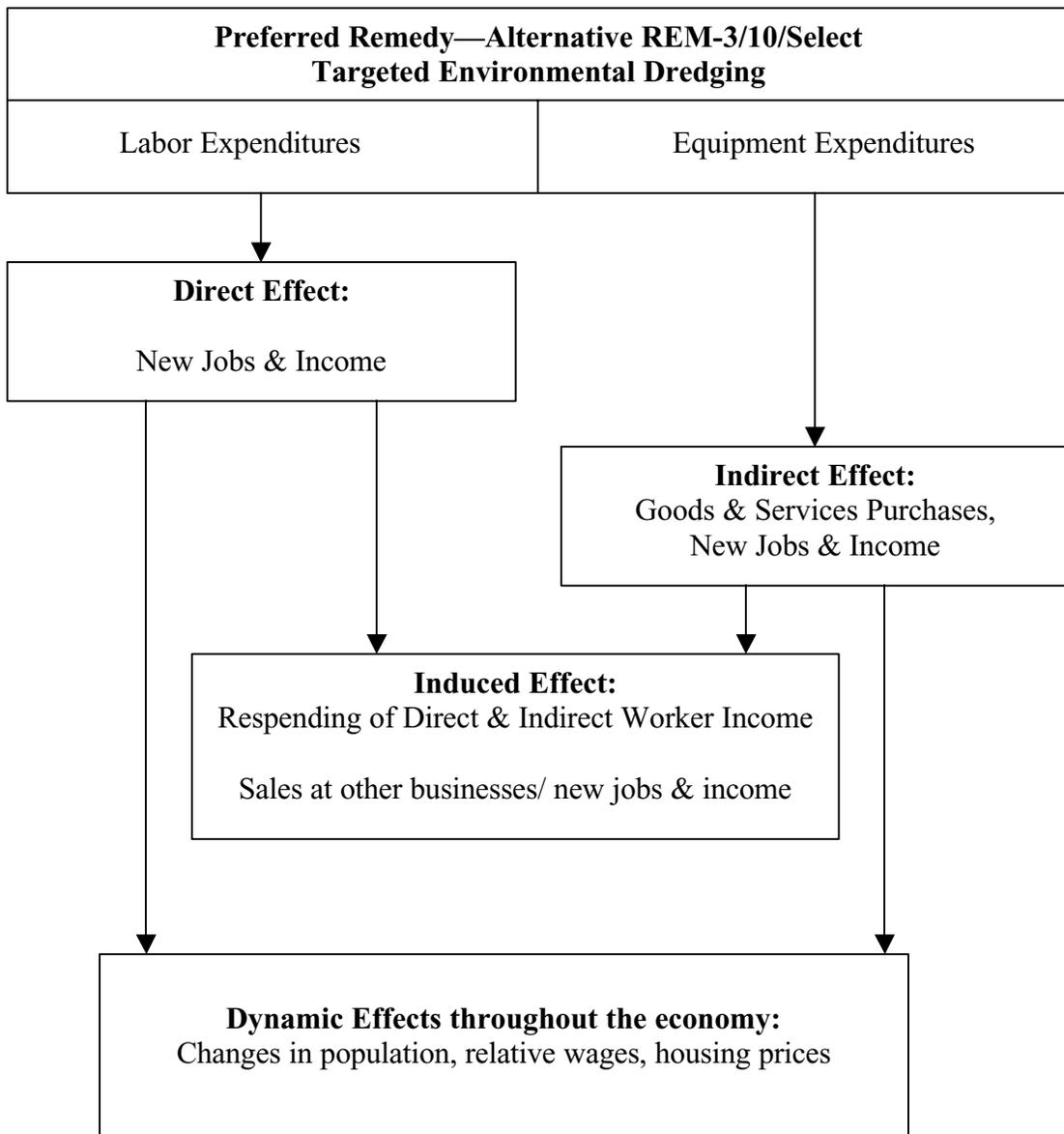
It will take approximately 3 years to design and 5 years to implement this remedy. Plans call for implementation over the period 2004 to 2008. In conjunction with the dredging, a separate action will be implemented to control upstream PCB sources near the General Electric Hudson Falls plant.

After construction is completed, the remedy relies on Monitored Natural Attenuation (MNA) of residual PCB contamination that remains in dredged and unremediated areas until the Remedial Action Objectives (e.g., reduction of concentration of PCBs in fish tissue to acceptable levels, etc.) are achieved. Institutional controls such as fish consumption advisories and fishing restrictions will remain in place, albeit modified as necessary, until that time. Annual monitoring and five-year site reviews will occur following completion of the remedy.

Operation and maintenance costs and capital costs for this remedy have a present value of \$460,000,000. These costs do not include any costs for source control measures taken at the GE Hudson Falls plant as part of the separate NTCRA (Non Time Critical Removal Action).

4. Regional Economic Impacts along the Hudson River

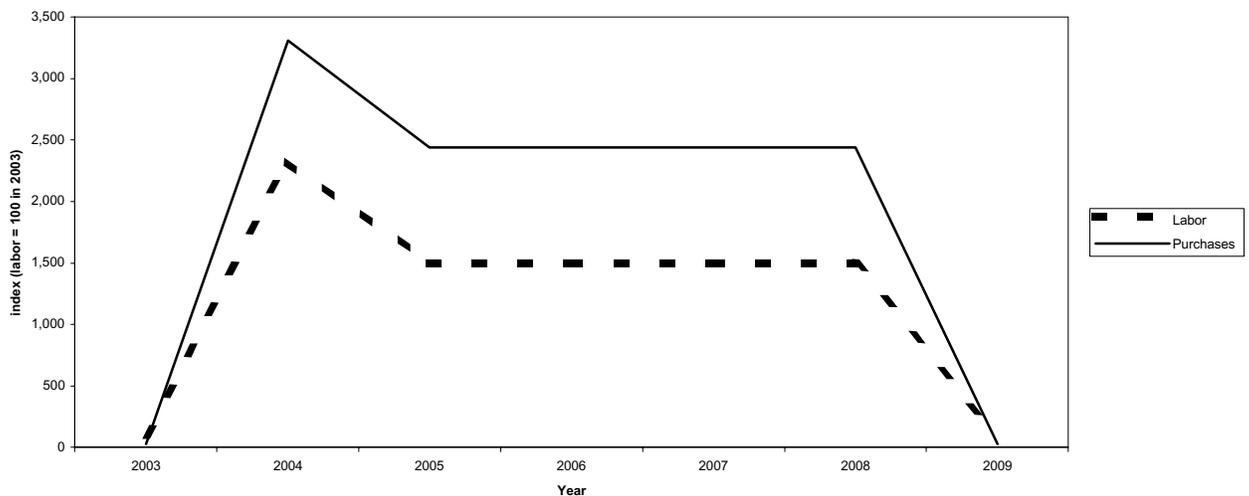
4.1. Calculation of regional impact: The calculation of regional impacts proceeds according to the following schematic description (a narrative description follows):



1. Direct employment and payroll—based on data from Book 6/Appendix I of EPA’s feasibility study (December 2000);
2. Direct spending on goods and services—based on data from Book 6/Appendix I of EPA’s feasibility study (December 2000);
3. Estimation of indirect economic impact—This includes additional rounds of goods and services sold, jobs and income generated as a result of direct spending—based on REMI output;
4. Estimation of induced economic impact—This includes additional goods and services sold, jobs and income generated due to new income from direct and indirect impacts—based on REMI output;
5. Estimation of dynamic and structural changes in the economy—based on REMI output.

4.2. Regional economic impacts: Construction costs associated with EPA’s preferred remedy have a net present value of \$460 million. Nearly \$225 million is spent locally, with approximately 40 percent—\$89 million—spent on labor and \$136 million used to purchase goods and services. The project will take 3 years to design and 5 years to complete, with construction beginning in 2004. Expenditures increase during 2003 and 2004, level

Alternative REM-3/10/Select



off for the remainder of the project (shown above), then decline and remain

significantly lower during the post construction monitoring period (not shown).

Over the life of the project—i.e., construction, operation and monitoring—3,543 direct jobs are added to the local economy. The remainder of direct spending locally represents an increase in the purchase of goods and services.

These direct economic impacts ripple through the economy and give rise to additional effects. Spending associated with the cleanup leads to additional activity in the economy in the form of more goods and services purchased as well as additional job growth. In turn, each round of spending generates another round of economic activity. These rounds represent indirect impacts. Likewise, spending elsewhere in the economy also originates as a result of new income associated with employment that grows directly from the cleanup project. Those purchases and the associated employment represent induced impacts on the economy. Finally, additional dynamic effects occur, such as changes to wage rates, house prices and population, as a result of demand changes. The sum of these multiplier effects adds an additional 1,028 indirect jobs to the local economy and \$53 million of wages.

The overall impact of the proposed cleanup project on the regional economy between 2003 and 2008 is as follows:

- 3,543 new direct jobs;
- 1,028 new indirect and induced jobs;
- 4,571 total new jobs;
- \$88.5 million new direct wages;
- \$141 million new indirect and induced wages;
- \$229.5 million total new wages;
- \$800 million Gross Regional Product.

The model further indicates a net increase in residential capital stock of approximately \$9 million, during the projected period of activity, representing a positive impact on residential property.

With respect to raw material prices, the likelihood of local shortages and/or extreme price rises is low. Rather, the capital project will reduce exports of such materials from the area, shifting the proportion produced and consumed locally.

5. Economic Benefits and Potential of the Hudson River

The Hudson River valley (i.e., twelve-county region) accounts for nearly 15 percent of New York state population and total employment. River-related employment in the region, by comparison, including water transportation, waterfront engineering and recreation, represents less than 10 percent of the state total. In 1999, an estimated 7,400 jobs were tied to the Hudson River, in the twelve counties identified (Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Saratoga, Ulster, Washington and Westchester). The associated wage bill was \$288 million.

Those figures are *lower* than the actual total, as they include only direct and indirect employment relating to sectors (i.e., 2-, 3-, 4-digit SIC) for which water-related employment is likely to account for the majority, if not all, of employment. For example, water-dependent wholesale and retail trade and water-dependent/-intensive manufacturing are not included, since those sectors could not easily be split from the larger trade and manufacturing classifications in which they fall. In such situations, the conservative approach—i.e., record no activity—was taken. Furthermore, no economic activity associated with the Hudson River in New York or Bronx Counties is included in the total, as estuarine activity could also not be easily separated to distinguish between Hudson River activity and other coastal activity for those counties. If missing data were included, economic benefits tied to the Hudson River would be larger.

The sectors thus linked to the river, include:

- SIC 154: Nonresidential Building Construction—port warehouse facilities;

- SIC 1629: Heavy Construction not elsewhere classified—dredging, piers, pile driving and bulkheading;
- SIC 373: Ship and boat building and repairing;
- SIC 422: Public warehousing and storage;
- SIC 44: Water transportation;
- SIC 555: Boat dealers (retail).

At present, waterfront activity costs are elevated, due to hazardous material handling and disposal. The elimination of PCBs from the Hudson River would lower waterfront remediation costs over time and lead to a reduction in the costs associated with waterfront redevelopment and restoration. A resumption of water-related activity along the Hudson River would be expected to arise from renewed waterfront development, as reflected in Local Waterfront Revitalization Plans and the National Heritage Area Management Plan and from water transportation (e.g., Champlain Canal, Hudson River traffic). If a resumption were just to boost water-related activity in Hudson River counties to the same proportion as for the remainder of the state, that could lead to gains in the twelve-county region over time, of:

- 3,700 to 8,900 new jobs;
- \$144 million to \$346 million new wages.

Conversely, while existing costs of restoration remain elevated as a result of continued downstream dispersal of PCBs from the upper Hudson, waterfront restoration and renewal is less likely or will proceed more slowly. The result is an exacerbation of urban decay problems for riverfront communities, including continued erosion of the tax base and continued fiscal strains. Historic employment sectors in waterfront communities along the Hudson have experienced long-term decline, forcing population to migrate outward in search of new jobs. Urban renewal depends upon the revitalization of these waterfronts, albeit with new jobs in new sectors—including tourism hospitality and recreation. For such job creation to occur, the image and reality of the restored Hudson River is imperative.

6. Economic Value of Hudson River Fisheries

6.1 The opportunity costs of restrictions on recreational fishing and bans on commercial fishing: The Hudson River is home to many species of fish that are attractive for both recreational and commercial fishing, including striped bass, American eel and shad. At present, no commercial fishing takes place on the Hudson River, due to health advisories associated with the presence of PCBs. Recreational fishing on the Hudson is severely restricted, for similar reasons. It is fair to assume that the region surrounding the Hudson River does not obtain the full economic benefit that would accrue if restrictions on commercial and recreational fishing were eased or removed. Annual income from sportfishing on the lower Hudson during the mid-60s—i.e., before health-related restrictions were established—was estimated at \$20 million (Carlson, McCann; 1969).

When it was closed in 1976, the commercial striped bass fishery industry on the Hudson River was valued at \$40 million annually. A study in the mid-80s found the Fulton Fish Market, in Lower Manhattan, to be the most important wholesale market for striped bass in the Mid-Atlantic (Norton, Smith and Strand; 1984). At that time—after closure of the Hudson River commercial fishery—its stripers came from as far away as Maine and North Carolina, as well as coastal New York—i.e., Suffolk, Nassau and Kings Counties.

The economic benefits accruing from recreational fishing activity are not limited to individuals fishing from privately owned boats, but also include charter and party boat activity, as well as land-based support services. In other areas where economic analysis and surveys have been conducted, direct and indirect benefits accruing from recreational fishing total upwards of several millions of dollars:

- A 1988 study by Gunderson, found that 67 charter boats operating in the Minnesota waters of Lake Superior generated an annual economic impact of \$3.2 to \$4.4 million dollars, with each boat generating from \$48,000 to \$66,000 in local spending.

- A follow up study in 1990 (Gunderson, Kreag), placed the impact of charter boat fishing in the Minnesota waters of Lake Superior at \$8.41 to \$11.65 million, while noncharter recreational fishing generated \$4.25 to \$5.89 million.
- A 1986 study of the Michigan charter boat industry (Mahoney, Brunke and Pistis), concluded that each charter boat was a significant contributor to the state's tourism industry. Each charter boat operator (920) had almost \$34,000 invested in boats and equipment (total investment: \$31 million), while annual spending in communities located near the charter boats totaled \$21 million (exclusive of chartering fees). Out-of-state residents whose primary reason for visiting was charter boat fishing (67,000 out of 228,000 annual charter boat visitors), accounted for \$7 million of the total, with landside benefits accruing for restaurants, lodging and retail.
- A 1973 study of Michigan's salmon and steelhead fishery (Ellefson) found that it had annual net economic impact of \$8.3 million to resident fisherman.
- A 1976 study of activity during two peak weekends of salmon season on the Salmon River, in Oswego County (Brown), estimated local economic impact at \$455,000, with \$379,000 coming in the form of direct new revenue to the county. Interestingly, this study appears to have been produced as an early reaction to PCB-related fishing restrictions on Lake Ontario.

The 1984 study by Norton, Smith and Strand of the economic impact of commercial and recreation striped bass fisheries in a 10-state region on the Atlantic coast, separates New York for some indicators, however not for total economic impact. The study looks at the fishery during a period of decline. It notes, however, that during the higher population period (i.e., the study makes use of economic data from the 1980s in combination with species population data from the 1970s), the impact of the fishery on the Mid-Atlantic region (i.e., New York, New Jersey and Delaware) would be \$100 million and 3,000 jobs. Interim data from the report indicates that New York accounts for between 60 and 80 percent of Mid-Atlantic striper activity.

In 1999, in New York, three counties accounted for the majority of commercial fishing activity, based on ES202 data—i.e., Kings, Nassau and Suffolk:

- 137 employees;
- \$4 million wages;
- \$30,000 average annual wage.

Conversations with commercial fisherman indicate a belief that Hudson River striped bass fisheries could be effectively managed to sustain twice that many employees, perhaps as many as 300:

- 274 to 300 direct jobs;
- \$8 to \$9 million direct wages.

A number of related issues further point to the economic advantages of restored commercial and recreational fisheries on the Hudson—i.e., river cleanup leading to the elimination of commercial prohibitions and recreational restrictions:

- Surveys of anglers along the Hudson indicate a high incidence of disregard for catch-and-release and other voluntary restrictions on fish consumption from the river. Numerous scientific studies point to increased health risks related to the presence of PCBs. Morbidity and mortality rates may be higher among populations that consume PCB-laden fish. The incidence of subsistence fishing among low income, non-English speaking populations along the Hudson River is of particular concern.
- Illegal commercial operations to harvest striped bass from the Hudson River have been discovered and prosecuted. There are significant costs associated with patrolling and monitoring compliance with fishing restrictions.
- Improved water quality, leading to the easing of restrictions on recreational fishing and, eventually, to a revocation of the ban on

commercial fishing, can have ancillary amenity benefits. Further restoration of the Hudson River will lead to increased recreational opportunities and an increase in property values in communities along the river. The impact may be nontrivial for communities that have experienced long-term economic decline.

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