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# HUDSON RIVER BRIEFING

## PRESENTED TO U.S. EPA REGION 2

## JUNE 2, 2000

# Agenda

- GE and EPA Model Projections - Source Control, Natural Recovery, Dredging
- Inconsistency Between Earlier EPA Data Interpretations and the EPA Model
- Dredging
- Hudson Falls (Source Control) Activities

# Central Questions*

- When will PCB levels in fish populations recover to levels meeting human health and ecological risk criteria under continued No Action?
- Can remedies other than No Action significantly shorten the time required to achieve acceptable risk levels?
- Are there contaminated sediments now buried that are likely to become "reactivated" following a major flood, possibly resulting in an increase in contamination of the fish population?

* From U.S. EPA Revised Baseline Modeling Report (January 2000, Vol. 1., page 5)

***EPA's Human Health Risk Assessment Confirms Focus on Fish: Only Unacceptable Risk is Eating Fish***

# Predictions of Recovery

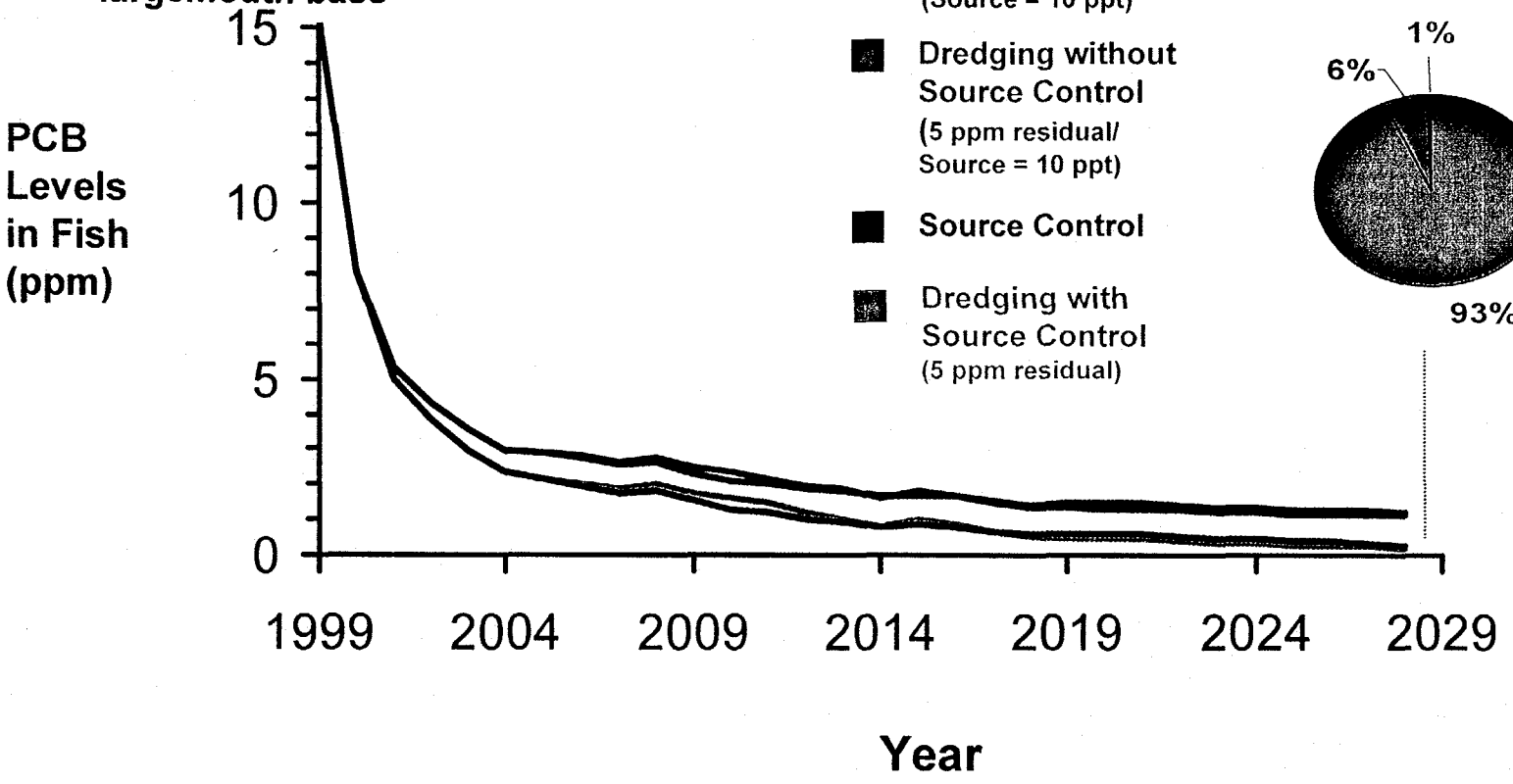
- Use statistical analysis of historical river flows to generate a representation of future river flows
- Use relationships between flow and solids loading to generate a representation of future solids loading
- Assume the structure of the food web remains unchanged
- Assume that upstream loading remains at recent levels of about 0.25 pounds per day (average concentration of 10 ng/L)

# Predictions of Recovery

- Simulate natural recovery
- Simulate source control by resetting the upstream source PCB loading to zero
- Simulate active remediation
  - choose potential actions
  - develop a schedule for implemetation
  - choose post-remediation residual sediment PCB concentration (5 ppm)
  - reset local sediment PCB concentration to residual level at times defined by implementation schedule

## GE Model: Thompson Island Pool Fish (largemouth bass) PCB Concentrations Projected Under Natural Recovery and Combinations of Source Control and Dredging

Projection starts at the average of the 1999 PCB data for largemouth bass




Percent reduction From 1999-2028 PCB levels




- Dredging provides almost no reduction in fish PCB levels beyond that achieved by natural recovery and source control
- Without source control fish PCB levels will eventually plateau

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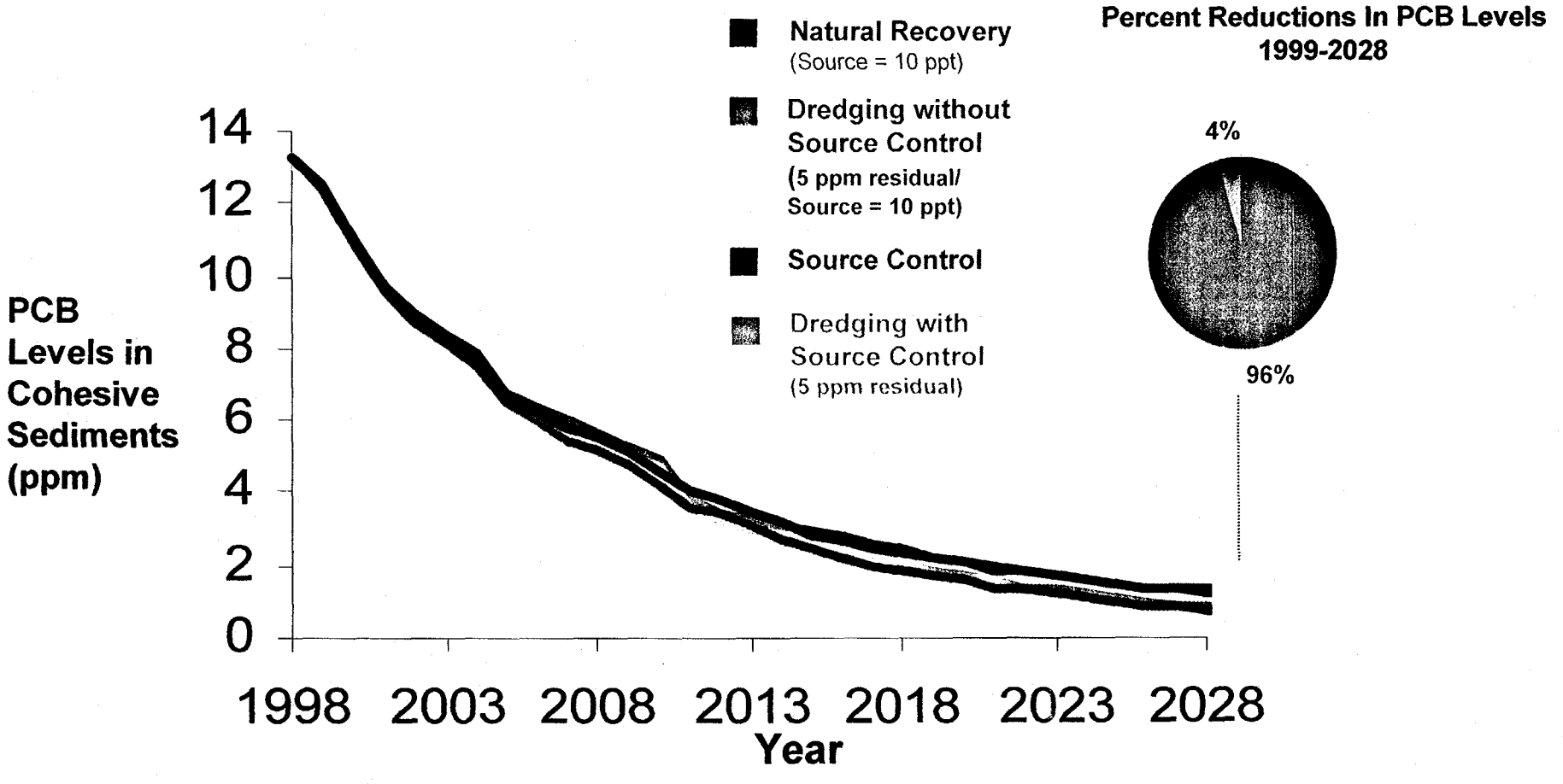
## GE Running of EPA Model: Thompson Island Pool Surface Sediment PCB Concentrations Projected Under Natural Recovery and Combinations of Source Control and Dredging




**EPA results are similar to GE results**

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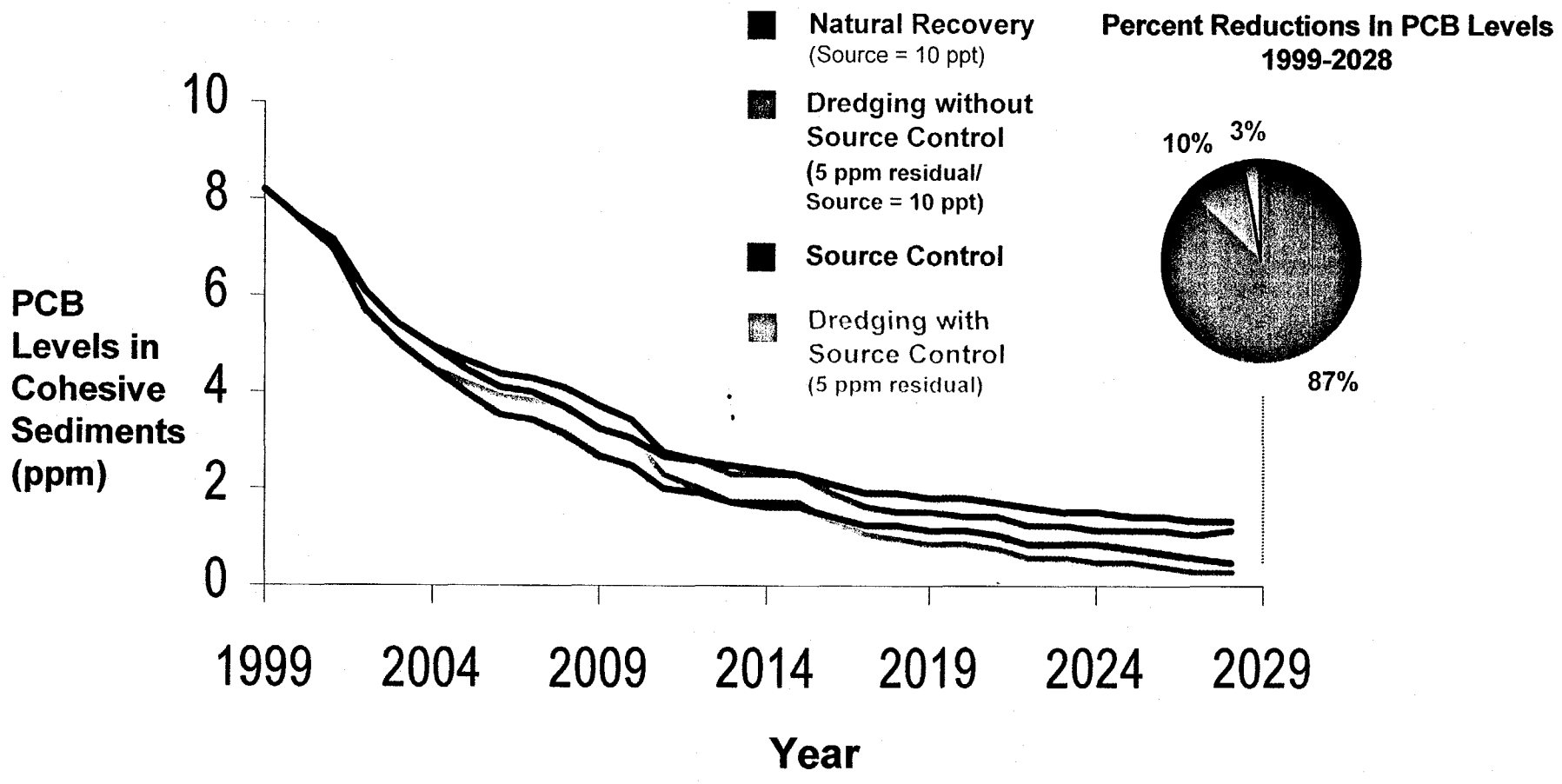
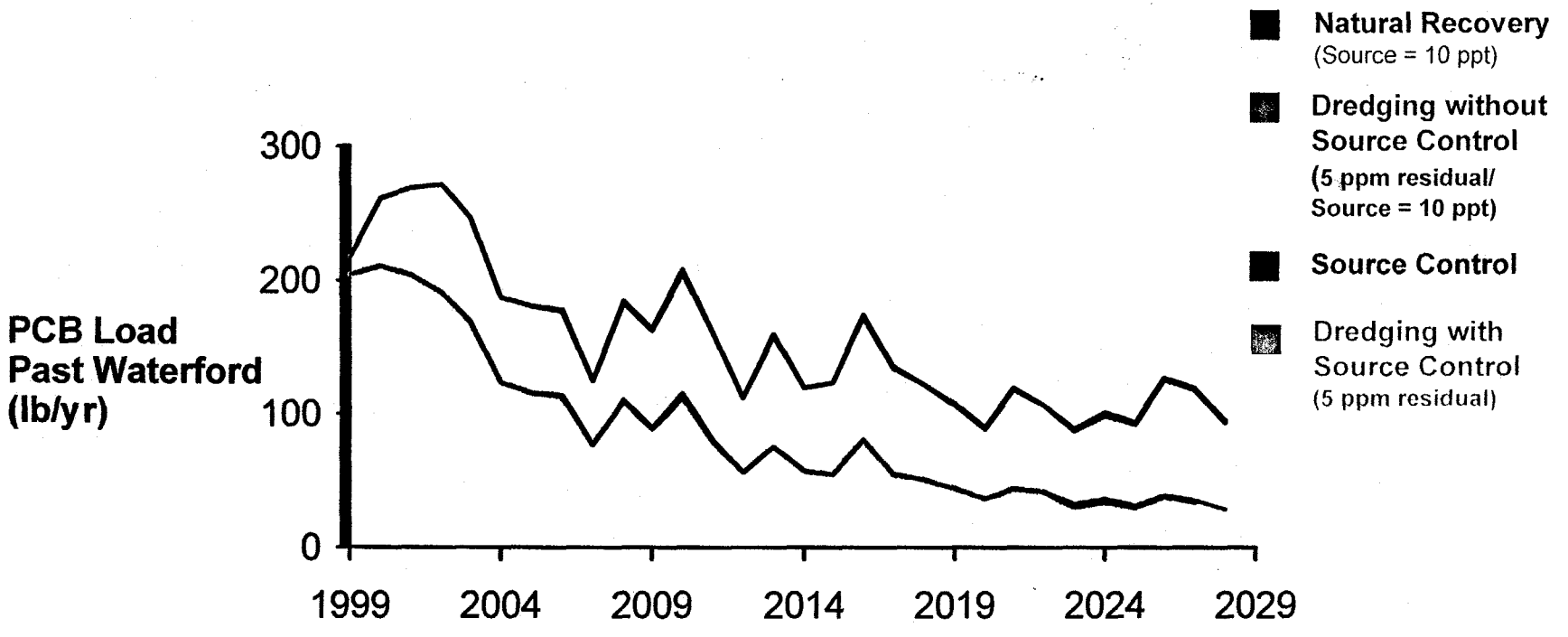
## GE Model: Thompson Island Pool Surface Sediment PCB Concentrations Projected Under Natural Recovery and Combinations of Source Control and Dredging




- Dredging does not reduce sediment PCB levels much beyond what is achieved by natural recovery and source control
- Without source control sediment PCB levels will plateau

## GE Model: Water PCB Loads Past Waterford Projected Under Natural Recovery and Combinations of Source Control and Dredging




- Source control substantially reduces the PCB load to the Lower Hudson
- Dredging provides almost no reduction in PCB load to the Lower Hudson beyond that achieved by natural recovery and source control

# Conclusions

- EPA and GE models give similar results
- Source control is necessary to enhance recovery
- Dredging does not accelerate recovery

***Model Conclusion: Source Control Not Dredging Is the Only Effective Way to Enhance Recovery***

# Areas of Apparent Agreement with EPA

- Fish get PCBs from surface sediments and water, not buried sediments
- PCB concentrations in fish and water will continue to decline without further remediation
- To reduce fish concentrations of PCBs, further control of Hudson Falls source is essential
- Flood does not move or resuspend significant amounts of PCBs

# Areas of Apparent Disagreement with EPA*

- Burial does not isolate PCBs
- TIP sediments are the major source of PCBs in the freshwater Hudson

* From U.S.EPA Presentation on 3/22/00 to the Risk Assessment Peer Review Panel

***Resolution Critical to Remedy Evaluation***
***Only model Provides Predictive Capability***

# Inconsistencies Between EPA Reports & EPA Model Results

**EPA has argued that its model results are consistent with the Agency's earlier reports, but:**

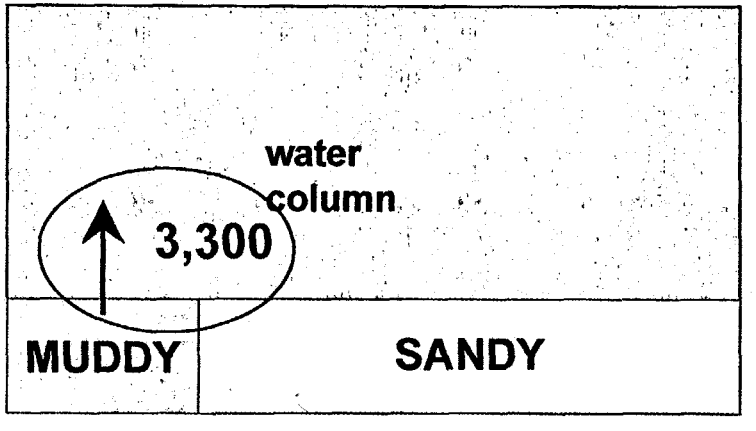
| EPA Reports | EPA Model Results |
|---|---|
| No widespread burial of historic PCB inventory | 93% of 1984 fine sediment PCB inventory is buried |
| From 1984 to 1994 ~ 40% (5% - 59%) of the TIP fine sediment PCB inventory released to the water column | From 1984 to 1994 ~ 3% of the TIP fine sediment inventory released to the water column |
| Most of the PCBs that were released were redistributed in the TIP | 98 % of the PCBs released from the TIP fine sediments are transported out of TIP |
| TIP sediment is the major source of PCBs to the water column and to the freshwater Hudson | TIP sediments are a minor contributor to the PCB load to Lower Hudson River |

***The EPA Model Does Not Support The Earlier Reports***

# PCB Mass Balance in Thompson Island Pool 1984-1994
# (numbers indicate kg of PCBs)

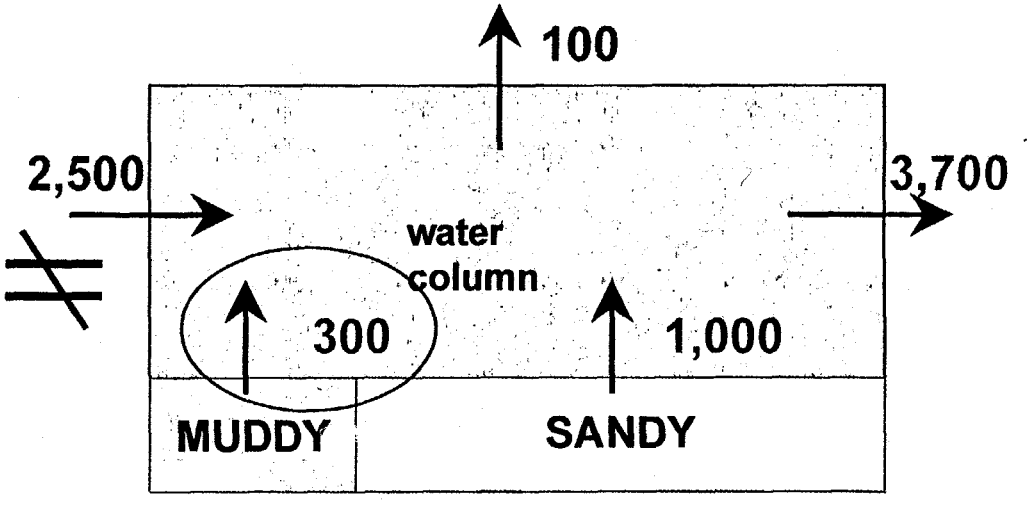
## Low Resolution Core Report (LRCR)

**~ 40% of 8,200 kg PCB inventory left muddy sediments**




## EPA Model

**3% of the PCB inventory left muddy sediments**




- The inputs and outputs of PCBs computed by the model are consistent with data for the water and sediment
- The LRCR flux cannot be reconciled with the other inputs and outputs

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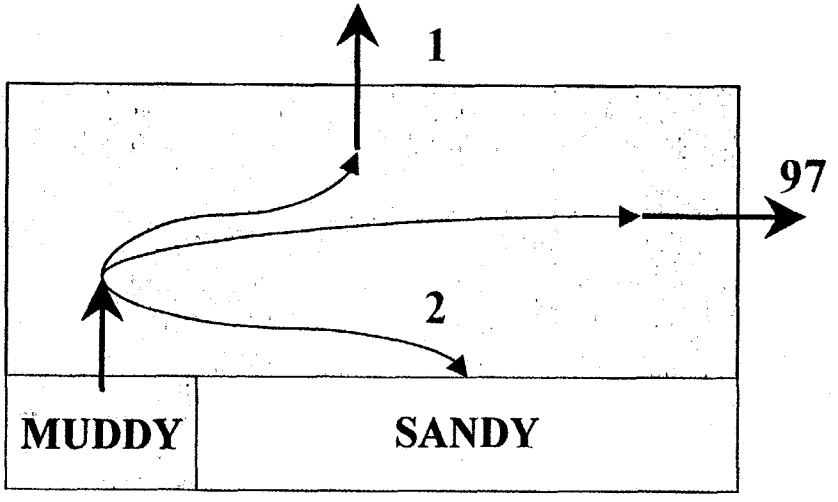
# EPA Model Projected Fate of PCBs Leaving TIP Fine Sediments between 1984 and 1994

**(numbers indicate percentage distribution)**




- Only 2% of the PCBs that left the fine (muddy) sediments (0.03% of the inventory) were redistributed within the TIP
- This constitutes only 0.06% of the PCB inventory in the fine sediments

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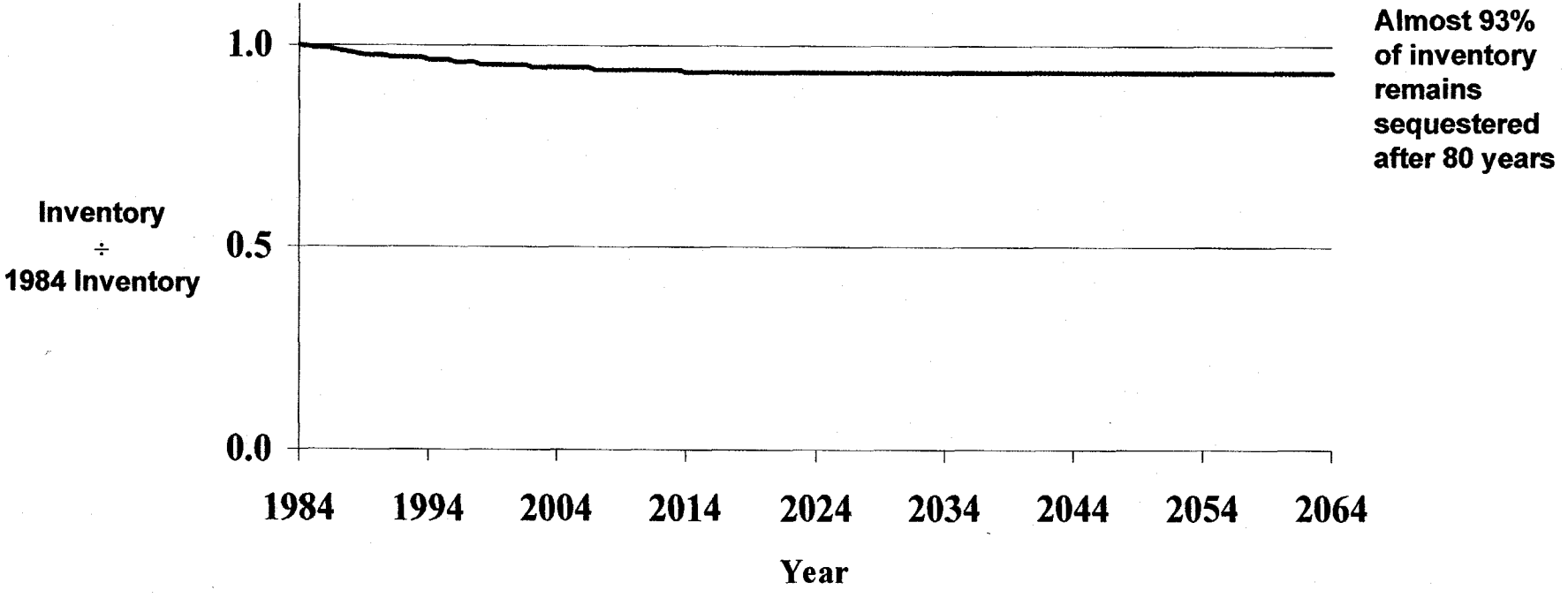
# EPA Model Projected Change in TIP Fine Sediment PCB Inventory




- Only 7% of the 18,000 pound inventory leaves the fine sediments over an 80 year period
- 93% of the fine sediment inventory is sequestered as indicated by the plateau in the inventory change

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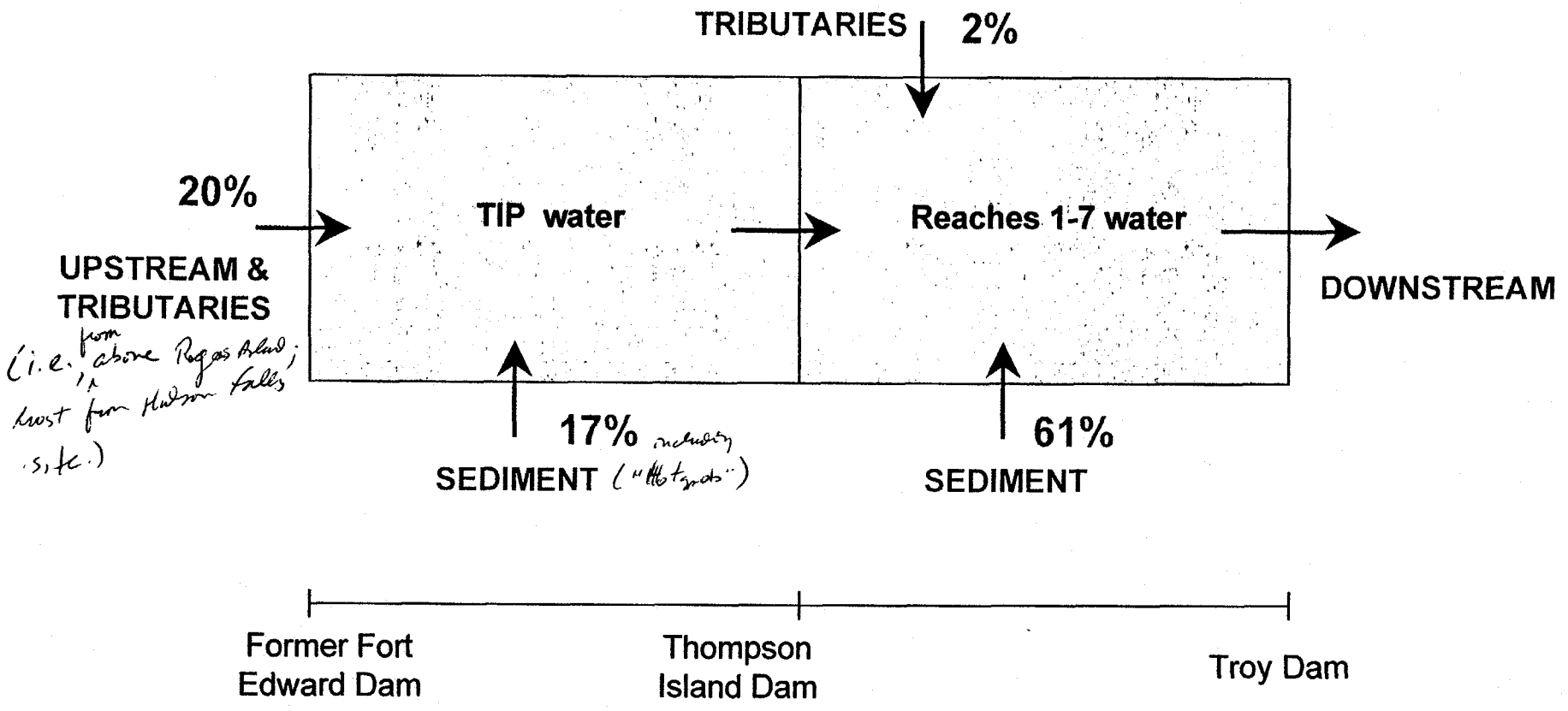
# EPA model estimate of the contribution of sources to PCB flux at Troy Dam in 1994




- 63% of the PCBs transported from the Upper Hudson to the Lower Hudson in 1994 originated from downstream of the TI Dam
- Only 17% of the PCBs transported from the Upper Hudson to the Lower Hudson in 1994 originated in the TIP sediments

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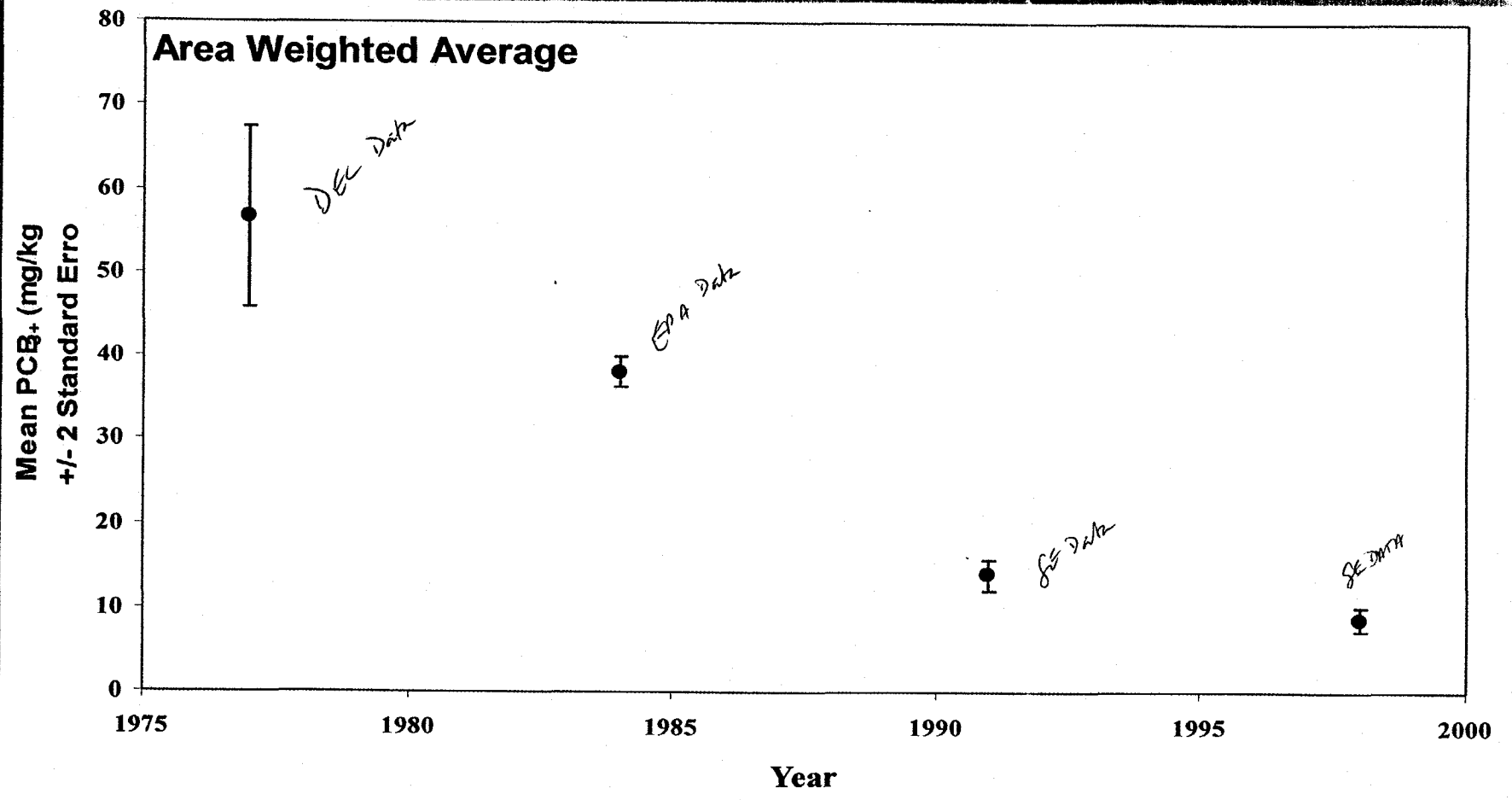
# Dredging

- No positive gains from dredging if surface sediments continue to be contaminated by active source
- Without further source control, fish in Upper Hudson TIP will plateau at 1-4 ppm
- PCB surface concentrations are already near 10 ppm with further declines expected
- Experience at other sites indicate that low residual PCB levels have rarely been achieved--10 ppm is a realistic assumption (we assumed a more optimistic 5 ppm residue for model simulations)
- In practical terms, dredging could not start before 2005 and depending on size it could last for 10-20 years

***99% of Reduction in PCB Levels in Fish Over the Next 30 Years Achieved Through Source Control And Natural Recovery***

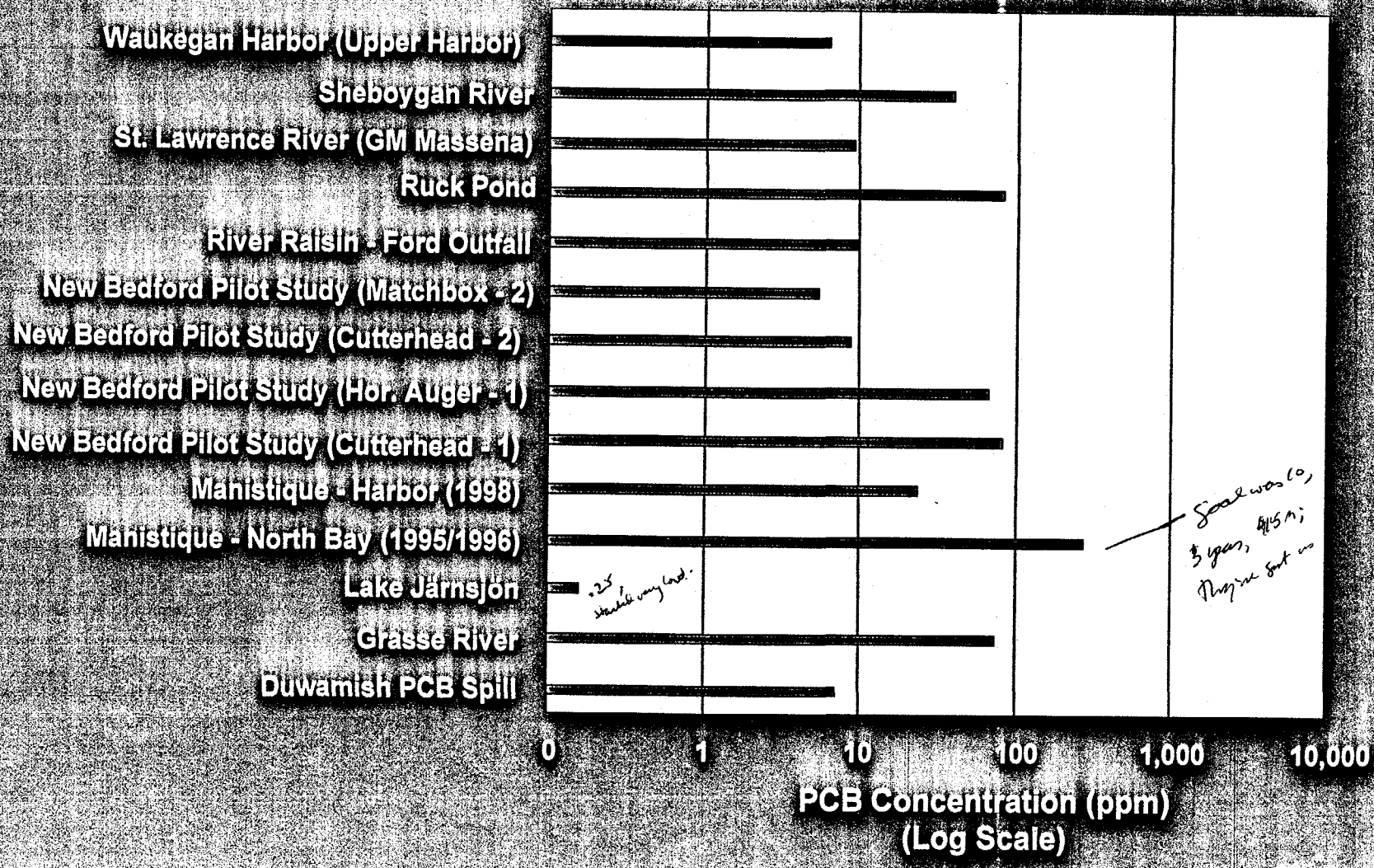
# Dredging: Surface Sediment Concentrations in TIP




*Note: Data averages were developed to represent 0-5 cm layer. However, 1984 average includes surface samples with depths up to 20 cm.*

# Dredging Experiences Elsewhere

## *Post-Dredging Surface Sediment PCB Concentrations*



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Much mass reduction to overwhelm risk reduction

# Negative Aspects of Dredging

- **Impact on Ecosystem**
  - loss of vital aquatic habitat (Sub-aquatic Vegetation beds) and fishery productivity
  - 1984 EPA ROD recognized that large scale dredging would be "environmentally devastating"
  - Period and nature of recovery is uncertain
- **Disruption of Recreational Uses of the River**
  - Project could last 10-20 years
  - Creates physical obstruction to uses
  - Increases in PCB levels are likely and may result in fishery shutdown
  - Inconsistent with government canal revitalization initiatives
- **Impact on Local Community**
  - Project will require a permanent landfill or long term waste handling facility; local community opposes both landfilling and dredging
  - Activities inconsistent with local land use
  - Overloading of infrastructure capabilities (roads, bridges, etc)
- **Mobilization of Contaminants**
  - Success of efforts to eliminate mobilization and subsequent downstream impacts uncertain

# GE Hudson Falls Capacitor Plant

Background:

- 1952-1982: GE operated capacitor manufacturing plant located on the river;
- 1976-1977: PCB use stopped; abatement program put into place
- 1986, 1993, 1996: Consent orders with GE and NYDEC for investigation and clean-up
- 1991-1992: Allen Mill Failure and increase in PCBs levels in river

Clean-up:

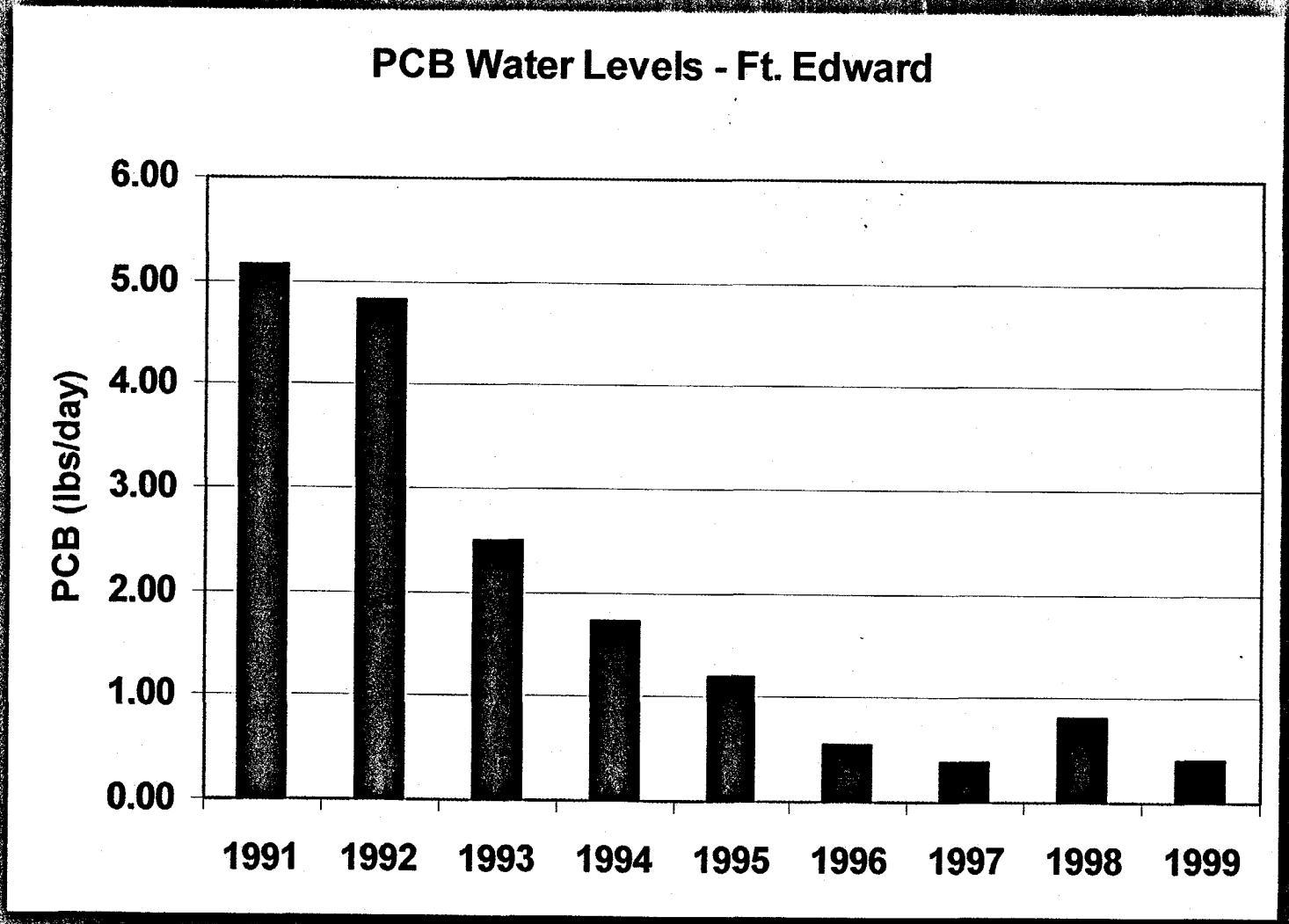
- Oil seepage from rock on riverbed (22 seeps) controlled
- Removed 3,400 tons of material containing 46 tons of PCBs from Allen Mill
- 216 monitoring wells and 35 dual phase recovery systems in place to control PCB migration to the river
- Over 21 tons of PCB oil collected from ground water
- Designed, built & operated "state-of-the-science" WTP; over 120 MM gallon treated
- Ground water hydraulic containment system in place and effective for controlling migration from on-site to the river

Results:

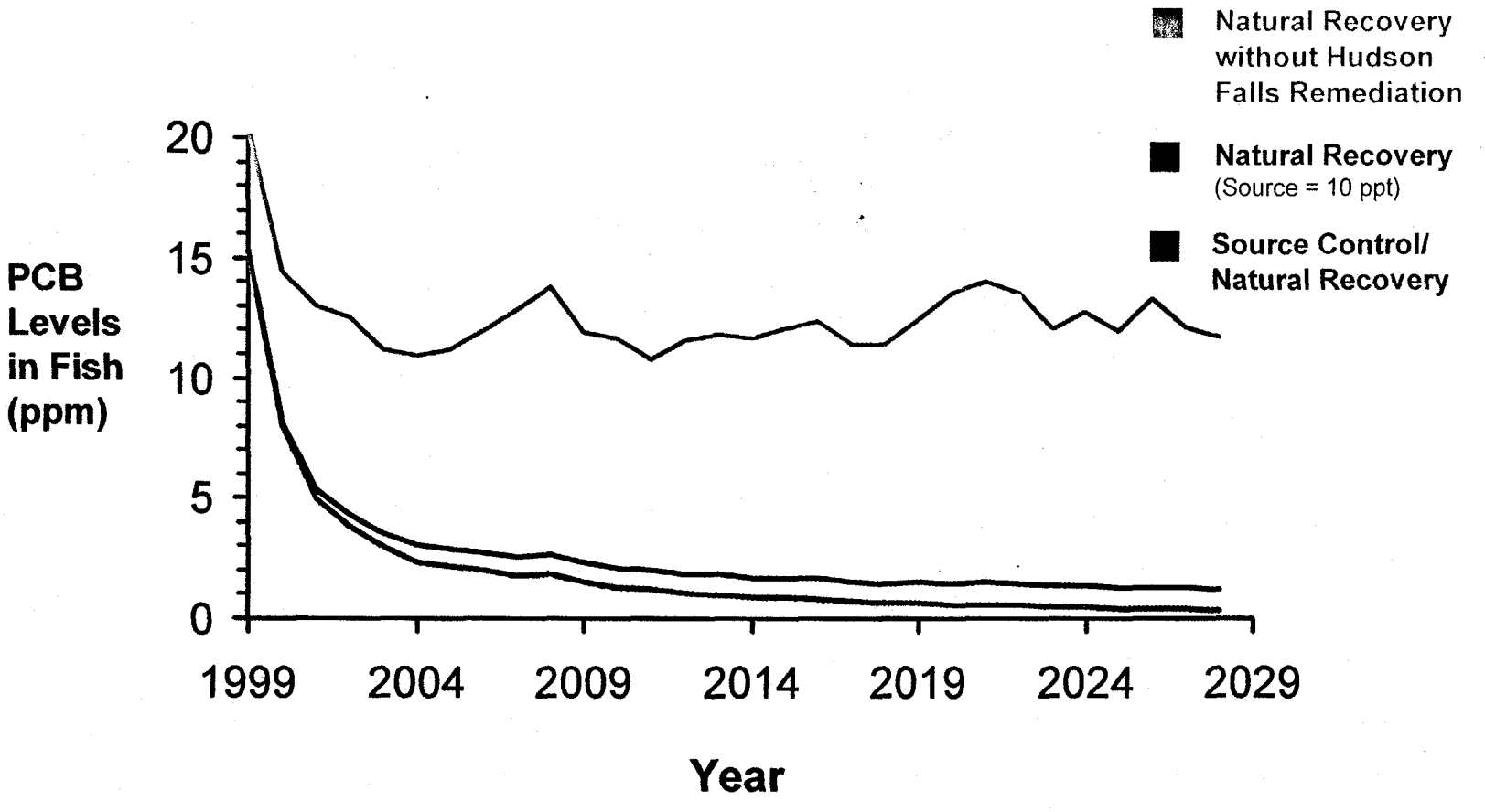
- PCB levels in fish and water greatly reduced; ~ 5lb/day avg. in 1992 to ~ 0.2 lb/day currently.

***PCB Flux to Hudson River Reduced to Near Non-Detect Levels***
***This Produced the Recovery of the 1990's - More Work to Do***

# Hudson River: Source Control Results



**GE Model: Thompson Island Pool Fish (largemouth bass) PCB Concentrations Projected If the Hudson Falls Remediation from 1993-1999 Had Not Occurred and Compared to Natural Recovery or Source Control in the Future**




- Remediation completed to date at Hudson Falls has had a substantial benefit in terms of fish PCB levels

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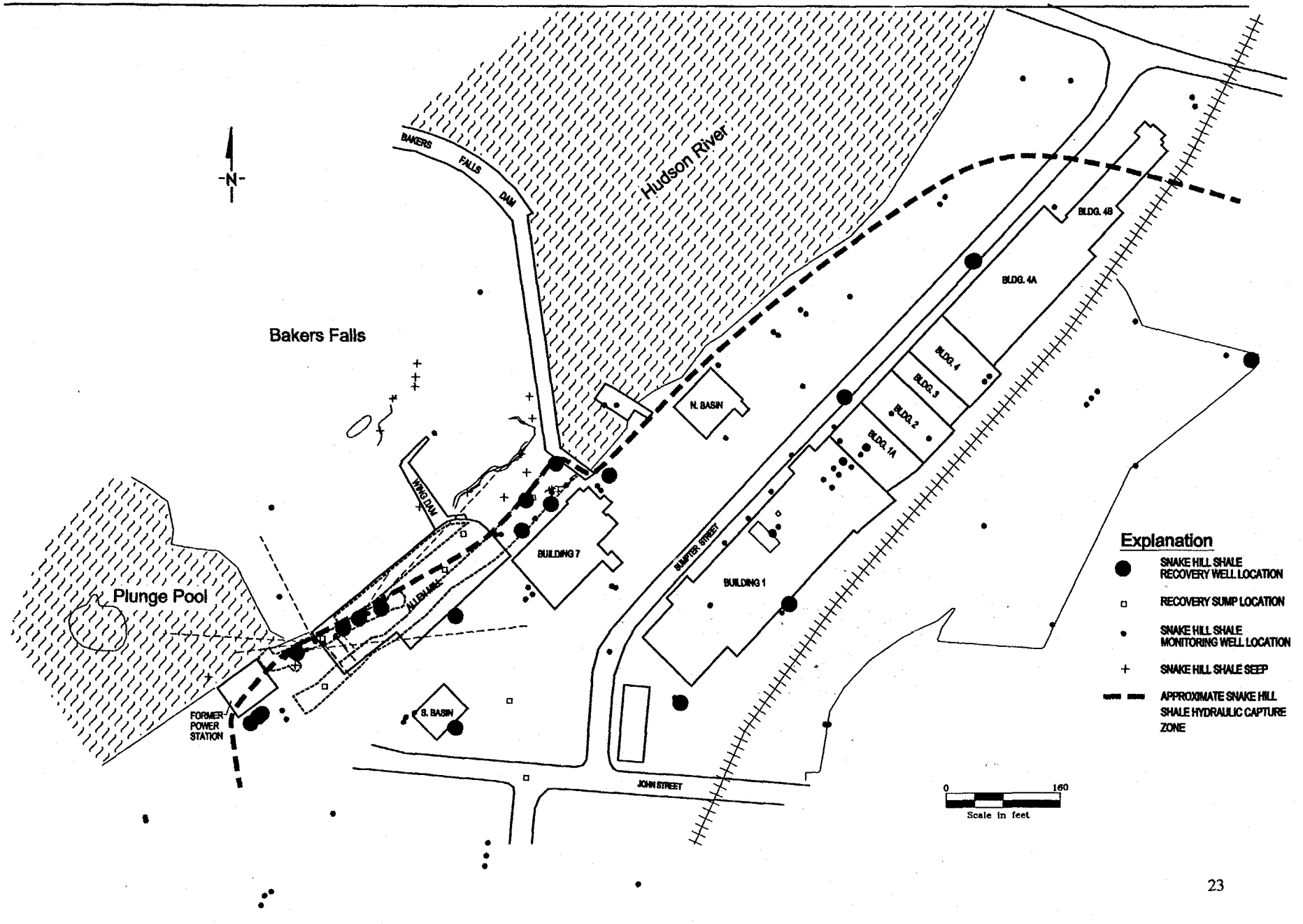
# Recovery System and Hydraulic Capture Boundary, Snake Hill Shale

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# Hudson Falls Final Remedy Concept

- Enhance the existing recovery system
  - Increase ground water capture zone to isolate the PCB in the fractured rock under the adjacent water fall
  - Create a redundant capture system to further isolate PCBs in the rock under the site
- The "plunge pool" at the base of the Falls is the primary entry point for contaminants to migrate to the river from areas outside the current capture system
- Currently evaluating the feasibility of constructing a "french drain" near the "plunge pool" to intercept this contamination before it enters the river
- Evaluating the use of vertical or horizontal recovery wells, a series of tunnels, oil field flushing technologies, etc.
- Developing a proposal for the NYDEC review and approval (Summer/Fall 2000?)

# Conclusions

- EPA and GE models give similar results
- EPA's model does not support EPA's position that burial is not important or that "Hot Spots" in TIP are the major PCB source to the river.
- Source control is necessary to enhance river recovery
- A feasible remedy has been identified for reducing PCB loading from Hudson Falls
- Dredging does not accelerate recovery and has numerous negative consequences to both the community and the environment

***Source Control Not Dredging Is the Only Effective Way to Enhance Recovery***

# Requests and Questions

- **Meeting to have candid dialogue on key issues:**
  - Are the "Hot Spots" the problem or are they primarily buried and stable?
  - How to factor in source control efforts into the remedy evaluation?
  - What are dredging technology capabilities and limitations?
- **What happens between now and the proposed plan (document releases, public meetings, remedy review board, etc)?**