Hudson River PCBs Site
EPA's Phase 1 Evaluation

Presentation to the Peer Review Panel
Introductory Session
February 17 & 18, 2010
Saratoga Springs, NY

First EPS Peer Review – 2004

- Dag Broman – IAER, Stockholm University
- William Creal – Michigan DEQ
- Richard Fox – Natural Resource Technology
- Thomas Kenny – W.F. Baird & Associates
- Victor Magar – Battelle (now Environ)
- Nancy Musgrove – Mgmt. of Env. Resources
- Ken Reimer – Royal Military College of Canada
- Tim Thompson – RETEC (now Sci., Eng'g. and the Env.)
- John Verduin – Anchor Environmental


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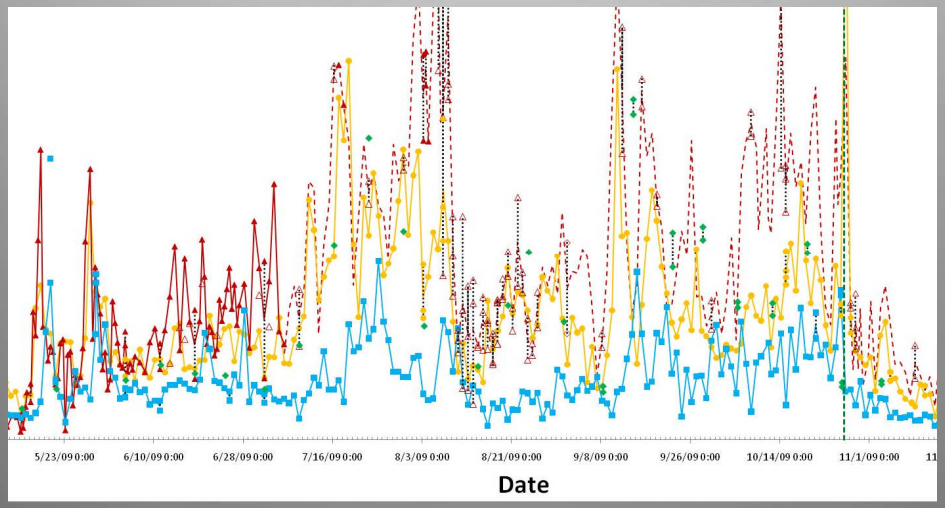
What Went Well

- We learned enough in Phase 1 to do this well in Phase 2
- Exceeded sediment volume & PCB mass goals
- Few shut-downs with limited impact on production
- ~70% of dredged area closed in compliance with the Residuals Standard
- No measurable impacts to Lower River

Phase 1 Challenges

- Higher than normal flows
- Extent of wood debris
- DoC consistently underestimated
- NAPL releases
- Limitations on scow unloading
- Extent of erosion since sampling & design – 35K CY lost before start
- % of bedrock/clay bottom



Resuspension Standard

Evaluation of the Hudson River PCB Superfund Site Phase 1 Dredging Program

Overview of Presentation

- Summary of Resuspension Standard for Phase 1
- What was observed in Phase 1?
  - Challenges and issues encountered
  - Establishing Baseline
  - Load criterion is a key issue in evaluating Phase 1 and going forward
- Influence of design and implementation on Resuspension
- Summary of Phase 1 and recommended changes

Summary of the Resuspension Standard for Phase 1

- "The *Performance Standard for Dredging Resuspension* is designed to limit the concentration of PCBs in river water, such that water supply intakes downstream of the dredging operations are protected, and the downstream transport of PCB-contaminated dredged material is appropriately constrained."
- "A routine water quality monitoring program will be implemented to verify that the objectives of the Resuspension Standard are met during dredging."

EPA Engineering Performance Standards , 2004

- Water Quality Criteria – 500 ng/L
  - Control Level – 350 ng/L
- Loads due to Remediation
  - Total PCB load to Lower Hudson should not exceed 650 kg over project life
  - Waterford is the relevant measurement point
  - 65 kg in Phase 1 (revised to 117 kg)
  - 600 g/day in Phase 1 (revised to 1080 g/day)

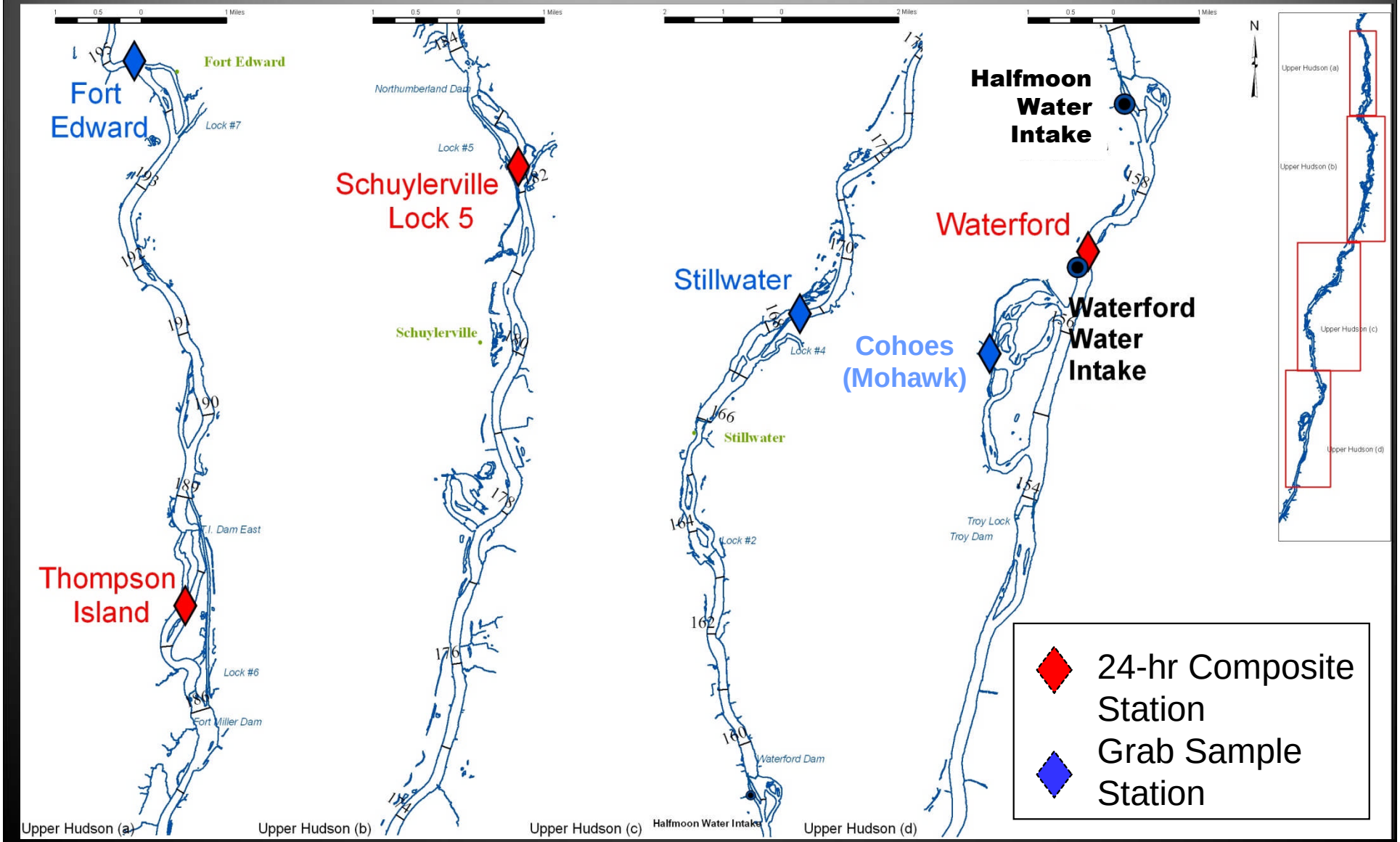
Basis for the Load Standard is 1% of the Mass Removed

- The standard load threshold was based on the ROD estimate of 70,000 kg
  - 650 kg ~ 1% of 70,000 kg
  - 65 kg was based on ROD-anticipated 10% removal in Phase 1
  - Design indicated 18% of mass would be removed in Phase 1
  - GE's total estimated removal mass was 113,000 kg
  - Although Design estimate was raised, the Phase 1 load threshold continued to be based on ROD estimate: 70,000 kg
  - Phase 1 load Control Level was set at 18% of 650 kg, 117 kg
- Based on actual mass targeted, Phase 1threshold would have been ~200 kg

0.13% was never used as a basis for load in the Resuspension Standard

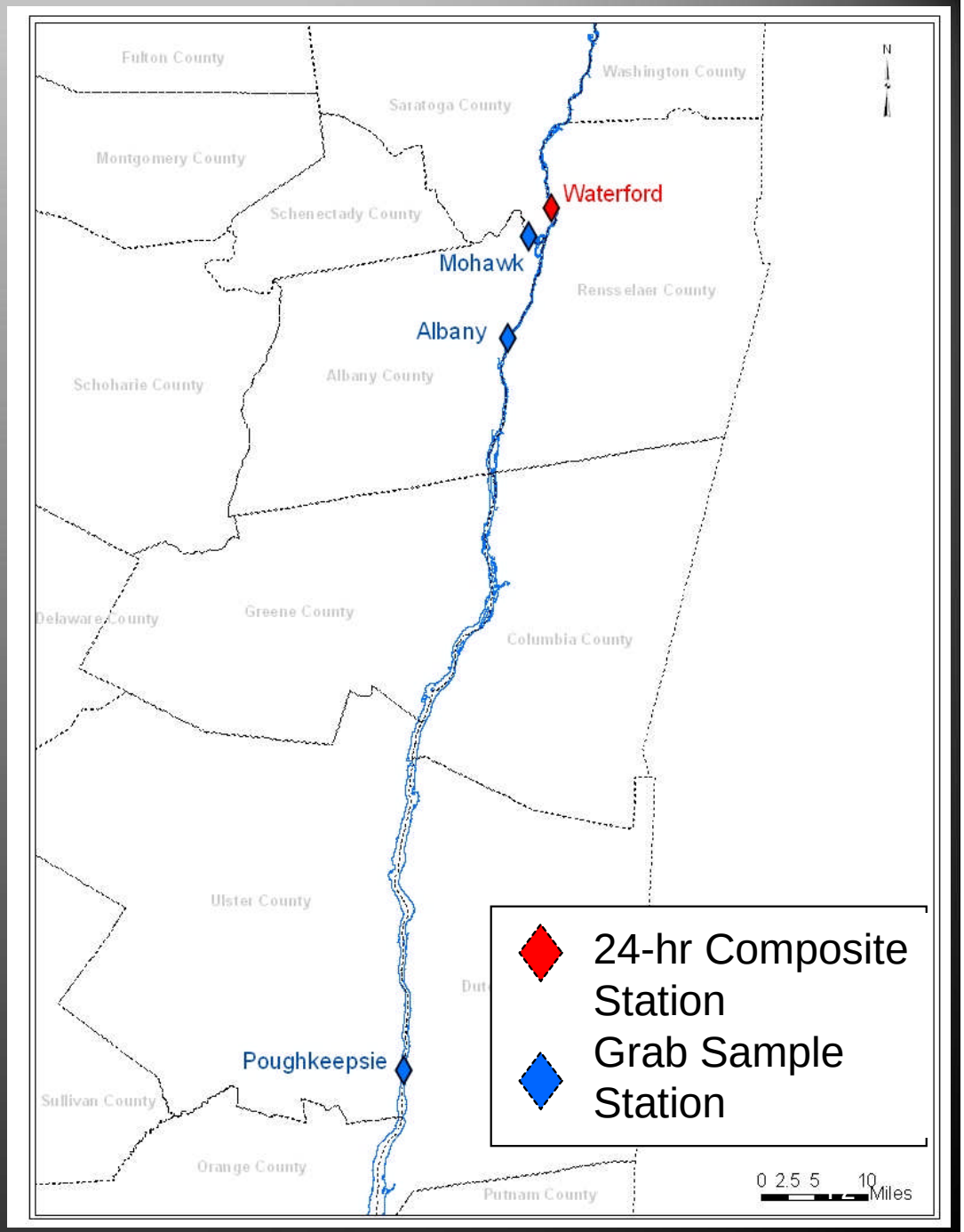
Phase 1 Monitoring Stations

Upper Hudson

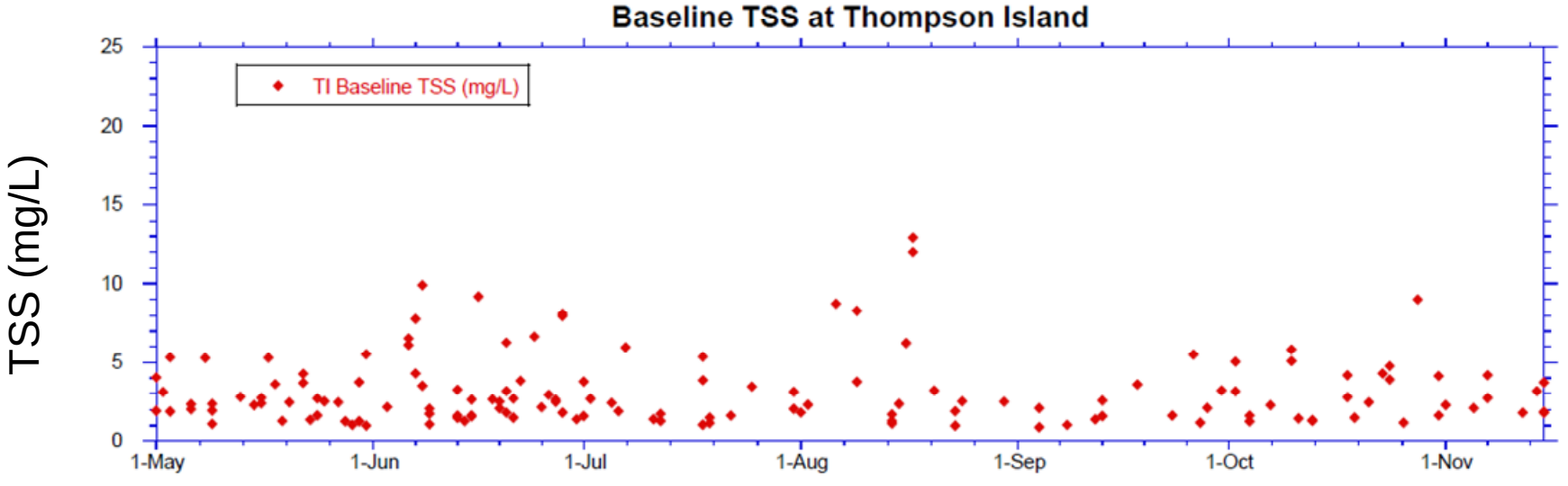


Phase 1 Monitoring Stations

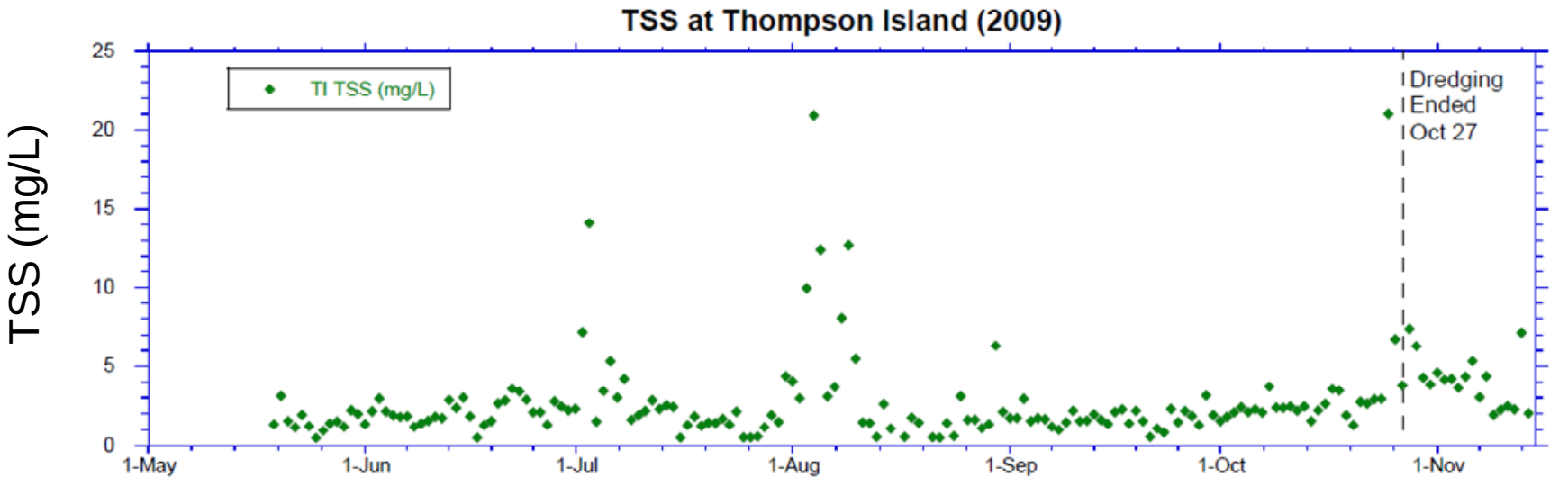
Lower Hudson



Little significant release of solids during dredging

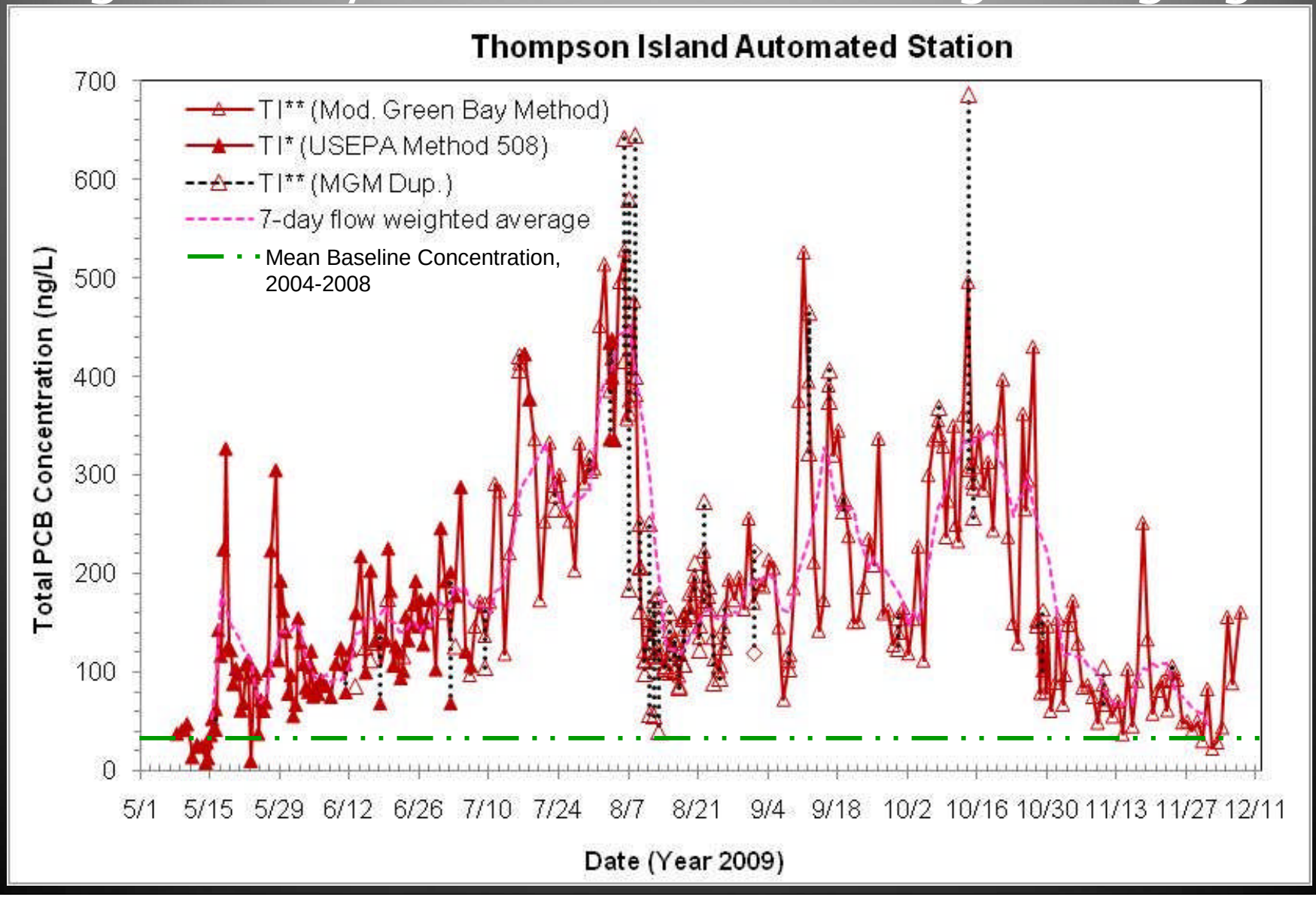


2004-2008

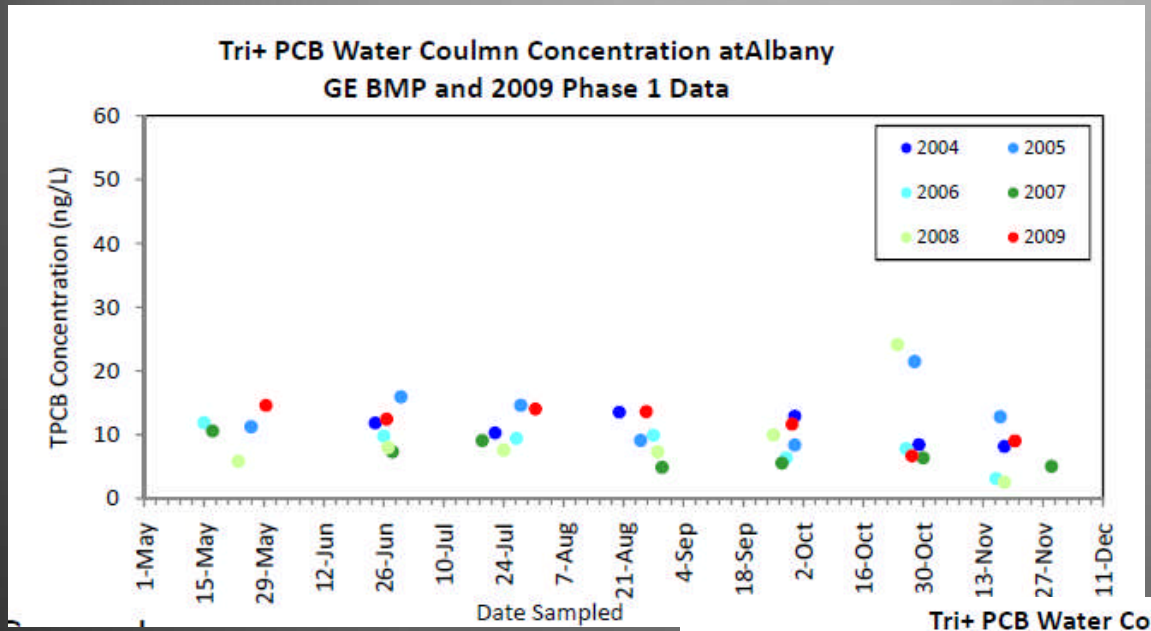


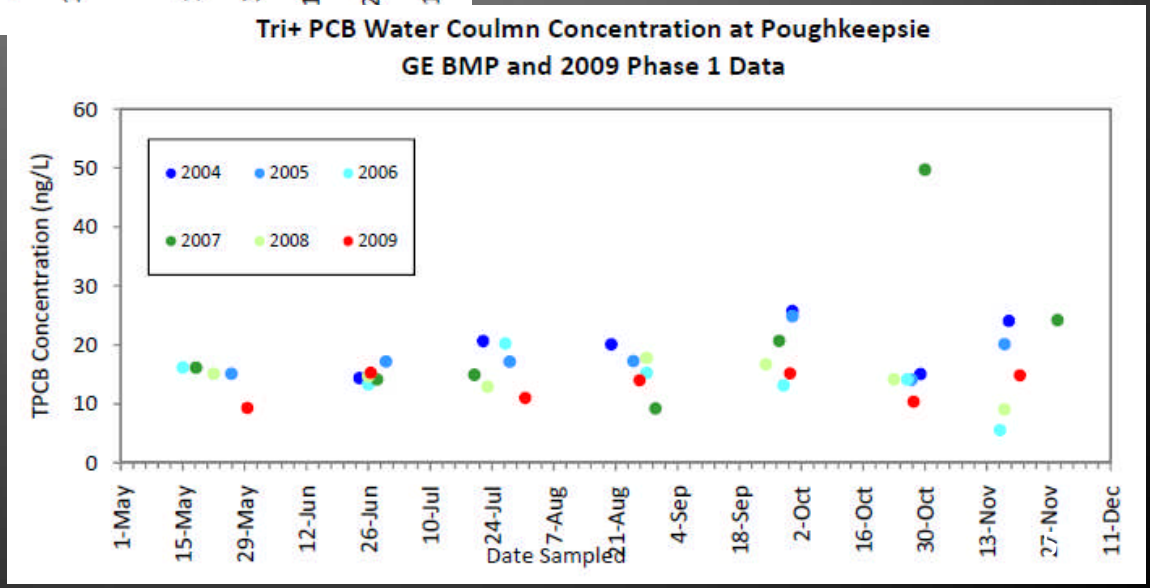
2009

Water column PCB concentrations were significantly above baseline during dredging.

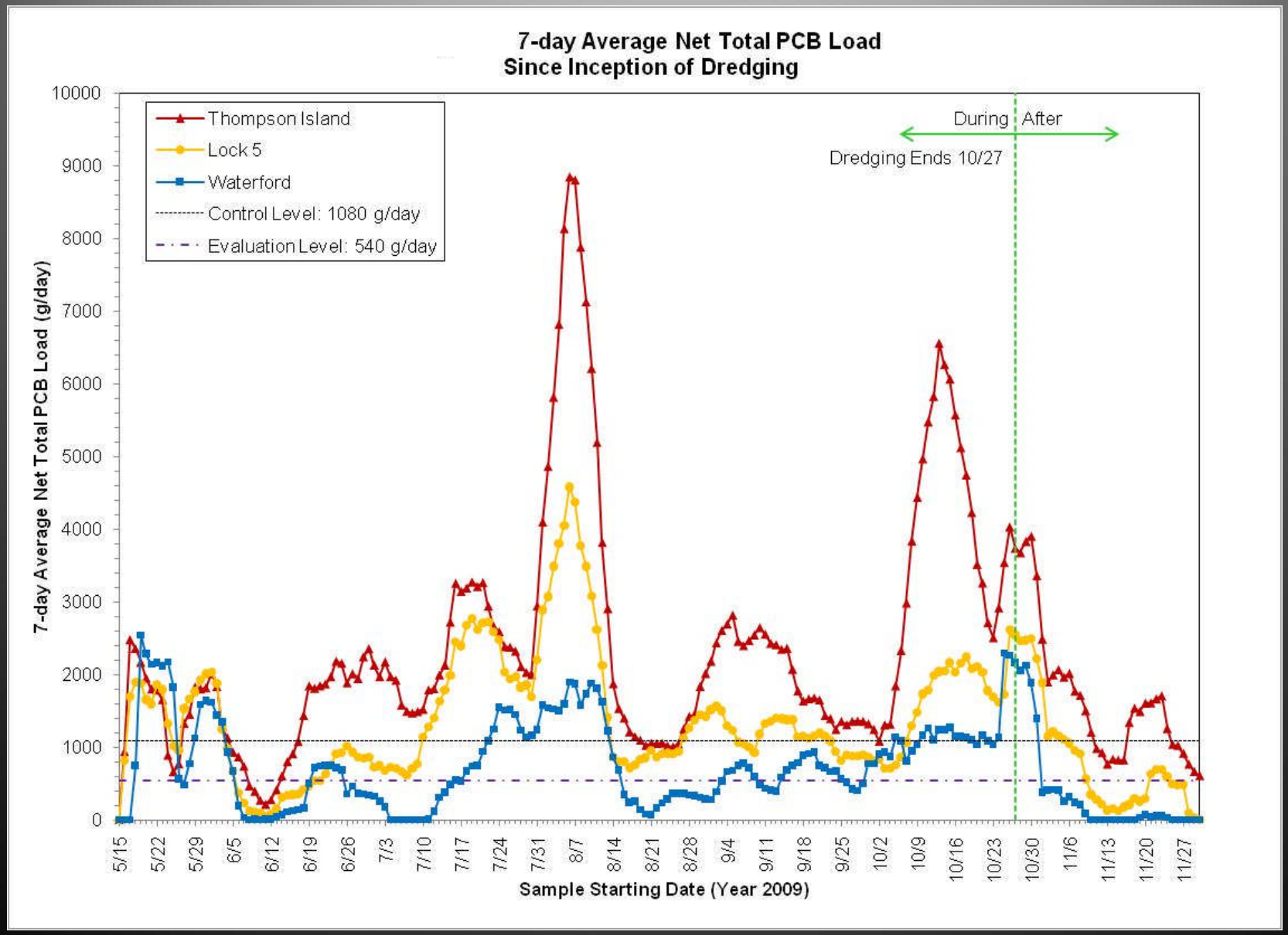


There were no observable impacts of dredging to Tri+ PCB water column concentrations downstream of Waterford.





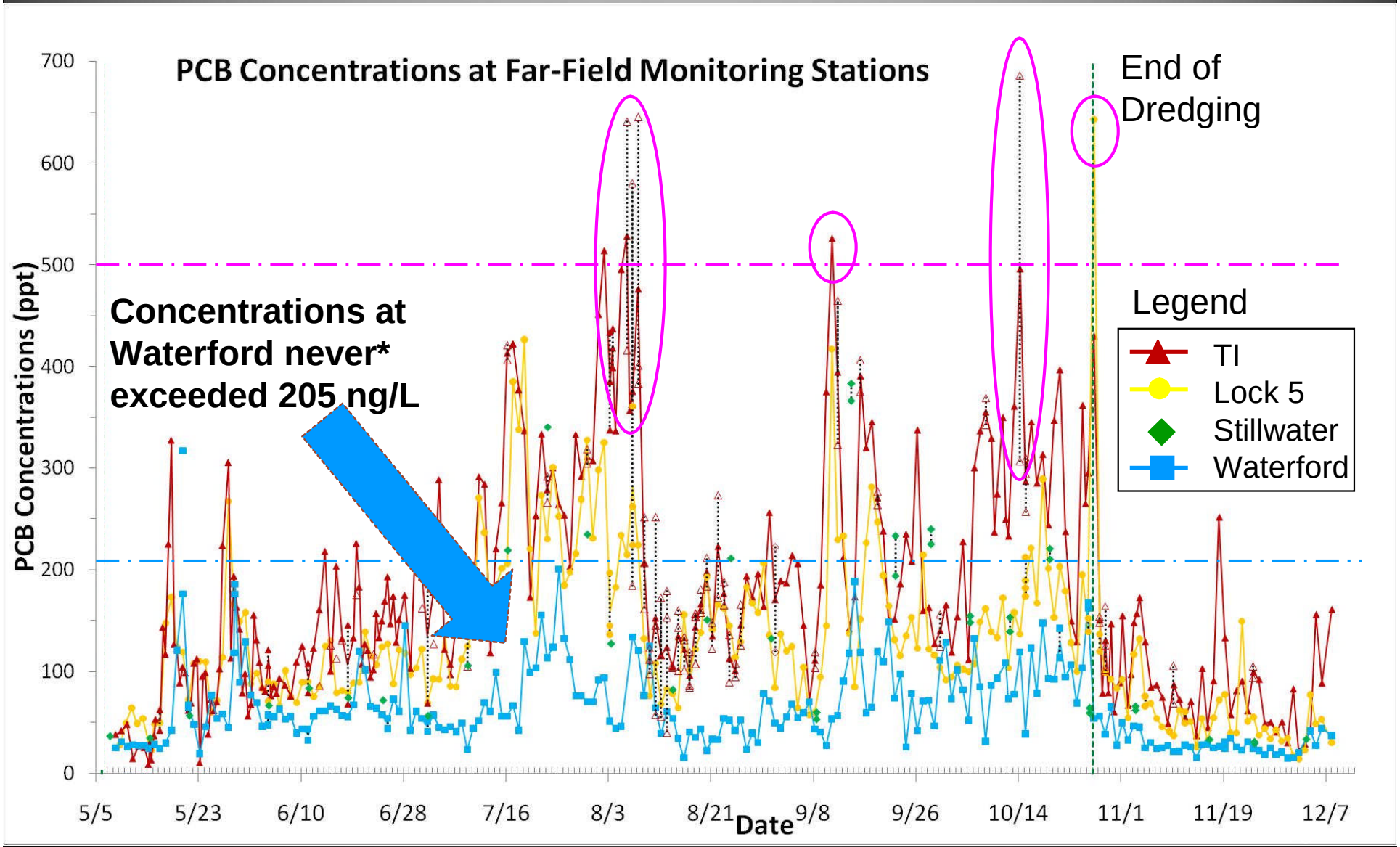
PCB daily loads decreased down river significantly



PCB-bearing oil sheens were extensive and are a potentially important vector for PCB release

Concerns

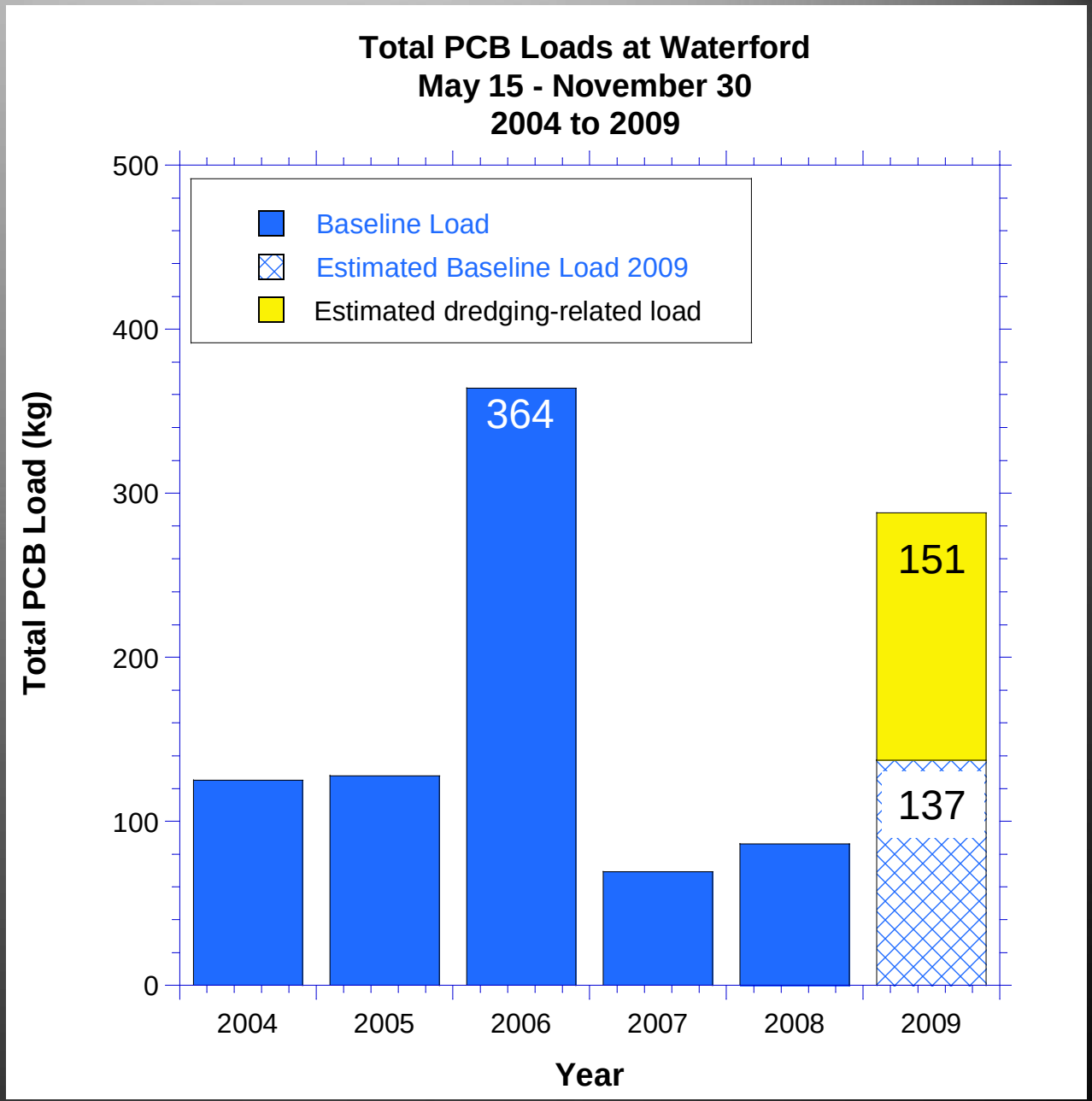
The MCL of 500 ng/L was exceeded four times in 5 months, Aug 6 – 8, Sept 10, Oct 13, & Oct 26; resulting in 3 work stoppages.



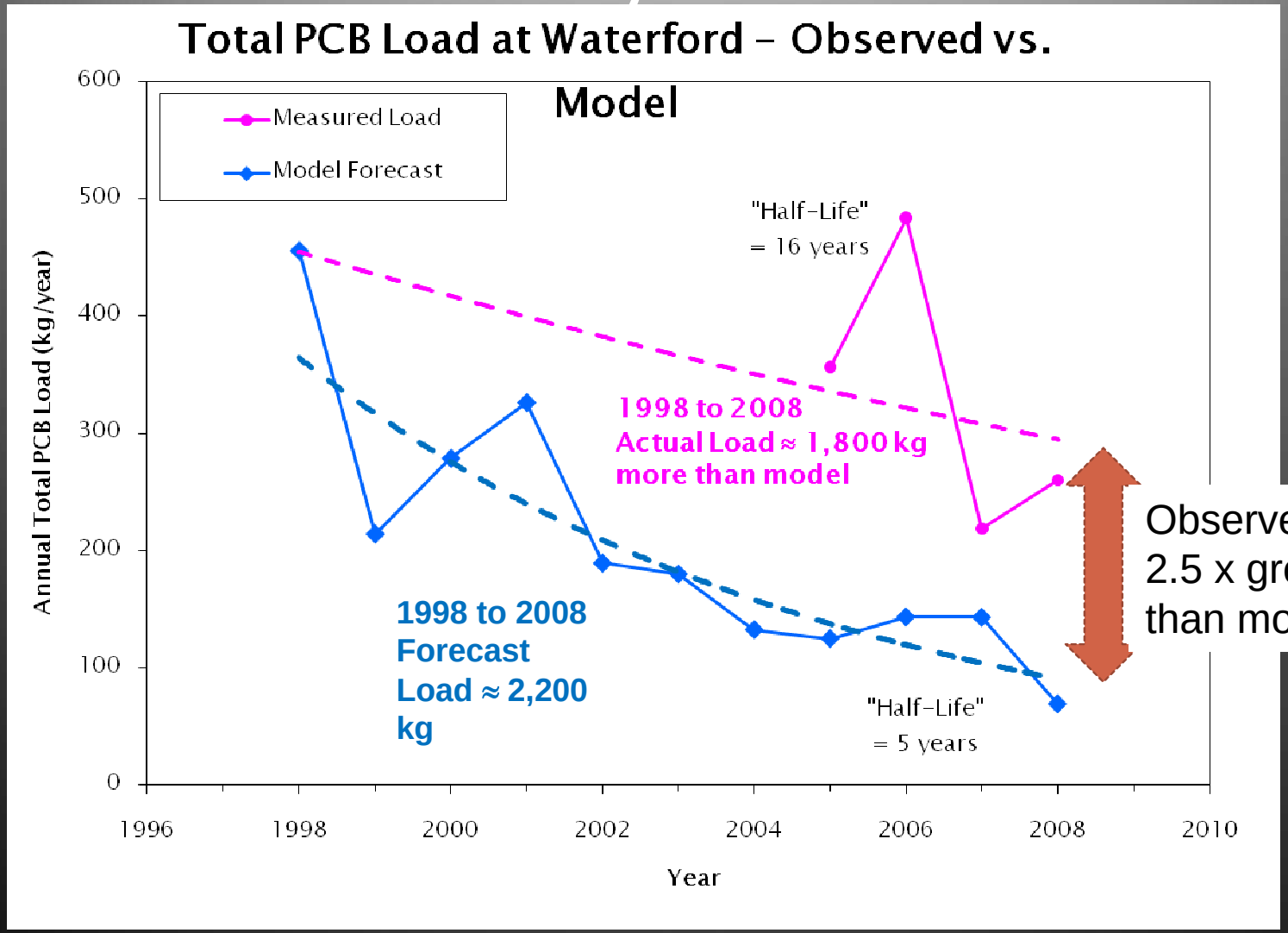
Establishing Baseline

- Baseline estimated per Resuspension Standard formulation
- Baseline established for dredging period May 15-Nov 30
- Data from entire Baseline Monitoring Period (BMP) 2004-2008

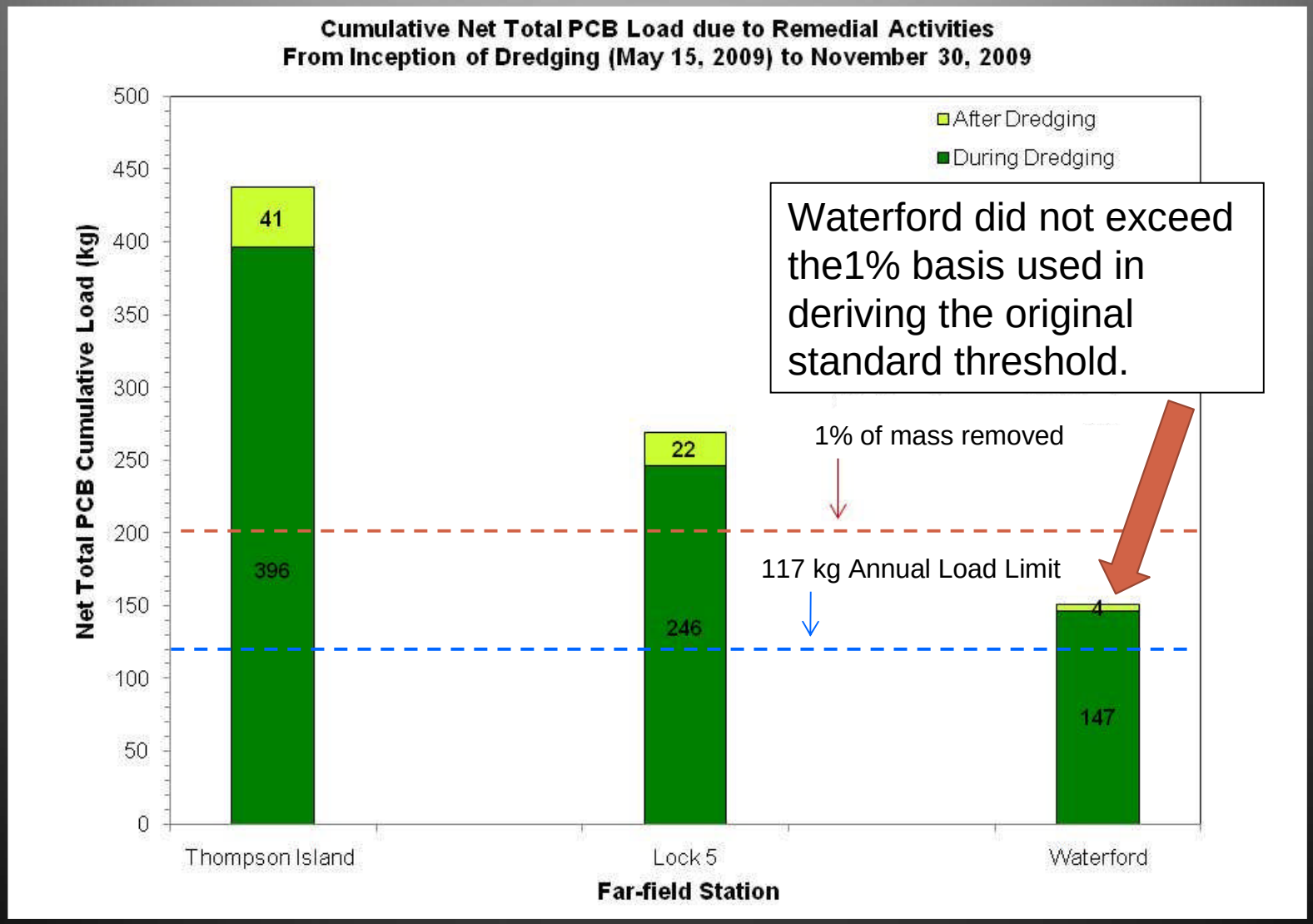
Baseline loads comparable to and sometimes greater than Phase 1 release due to dredging



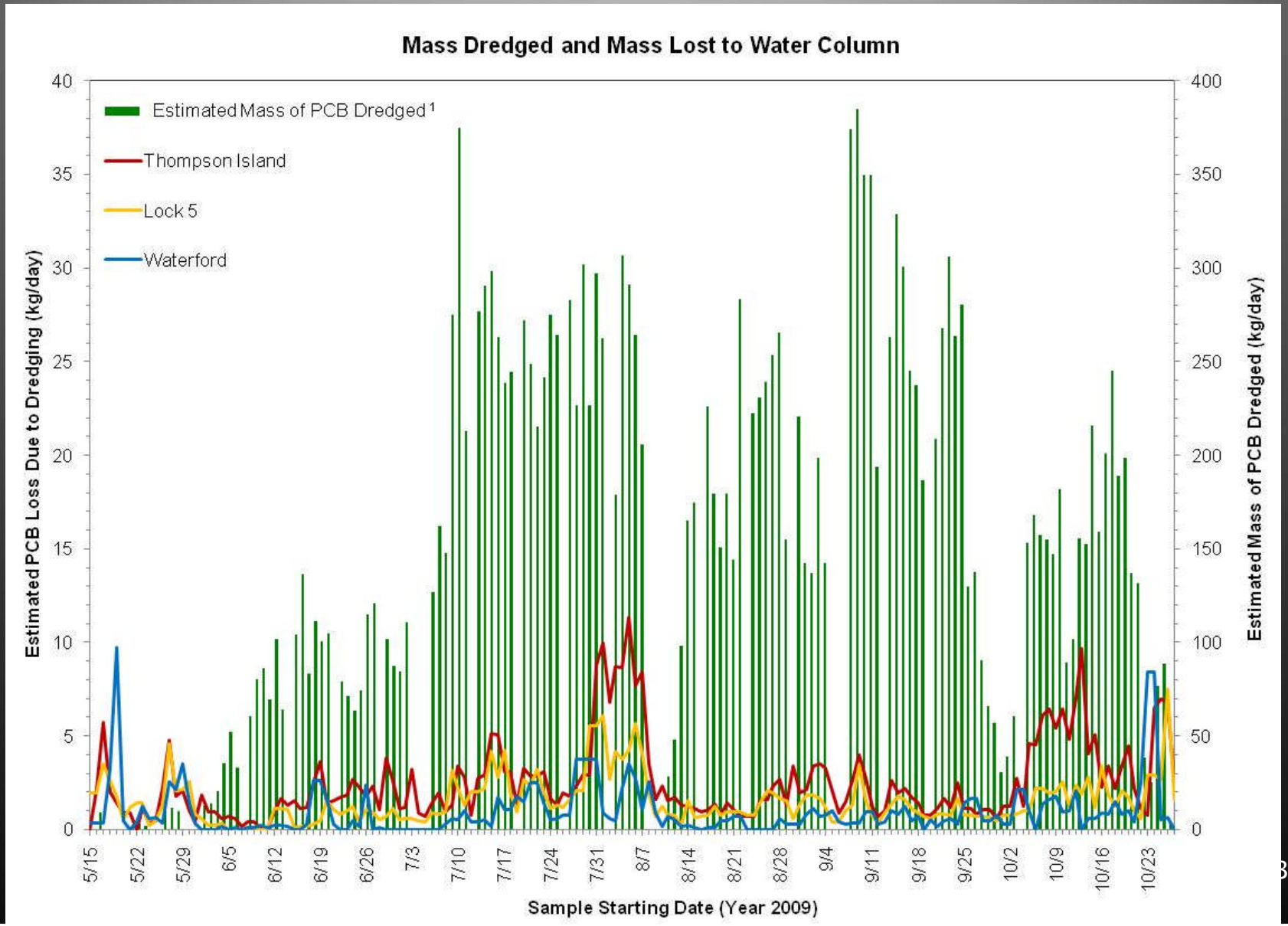
Baseline loads are declining much more slowly than forecast

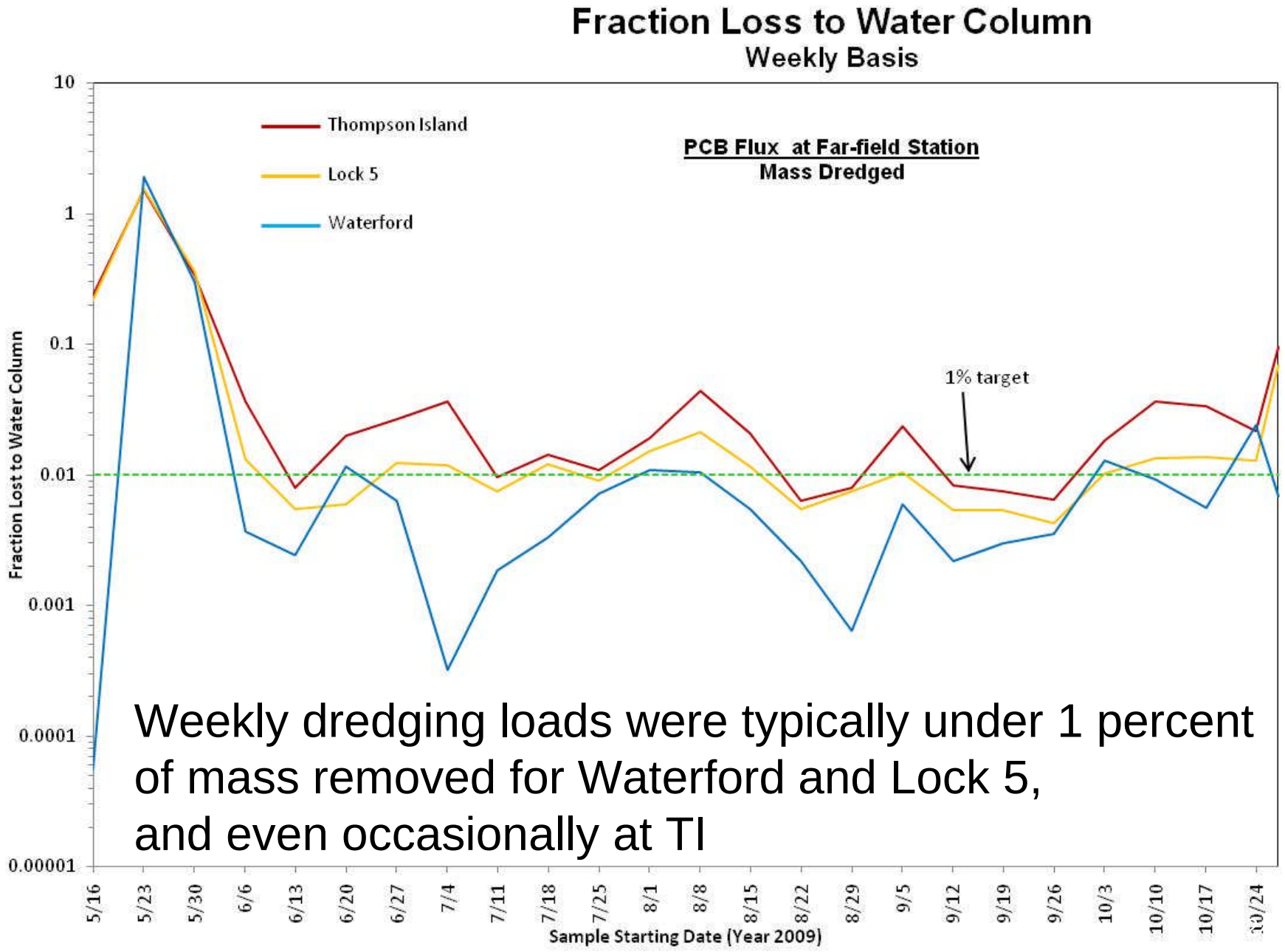


The Resuspension Standard performance targets for cumulative load for both TPCB (117 kg) and Tri+ PCB (39 kg) were exceeded at the three downstream monitoring stations



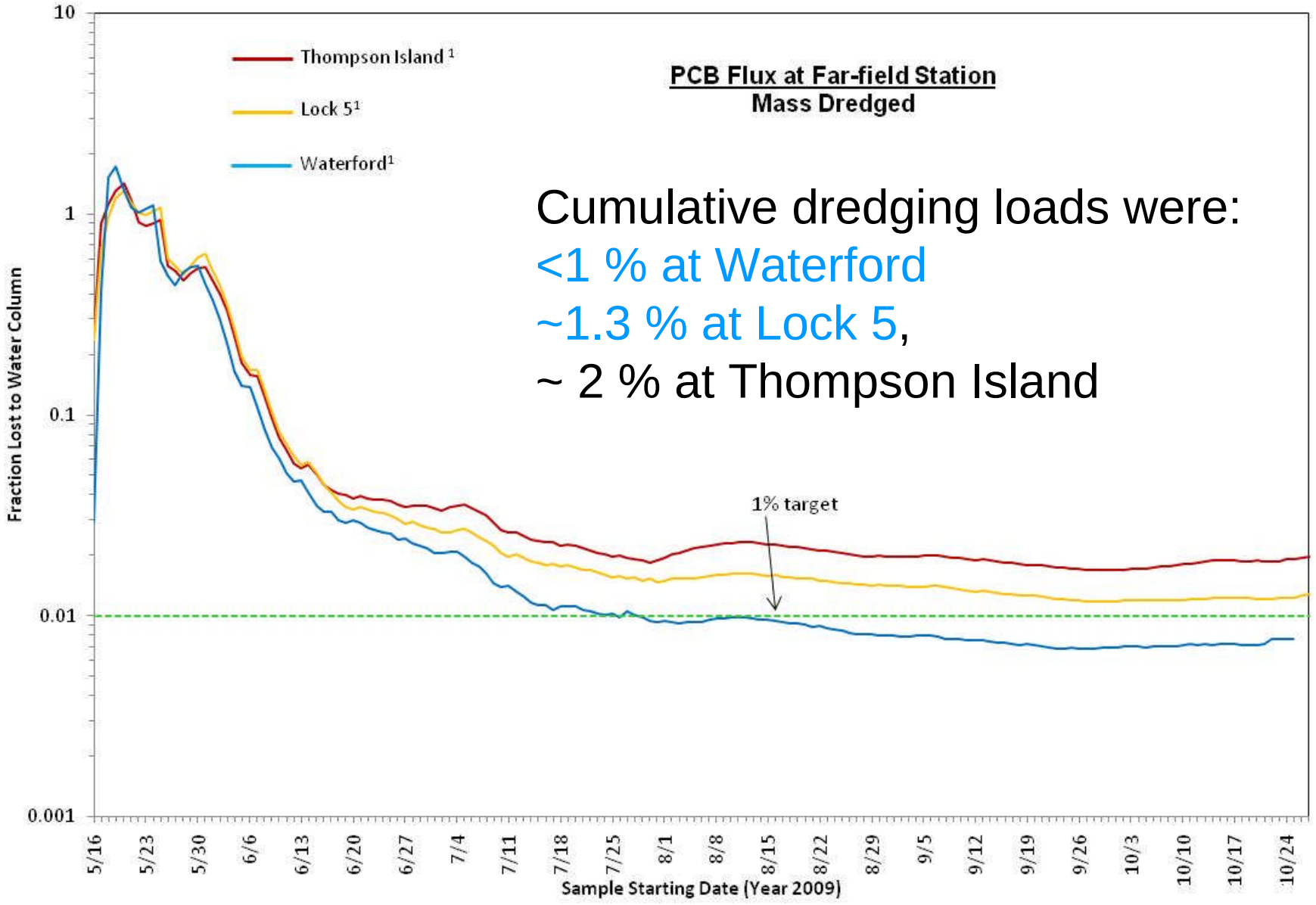
Mass loss did not correlate with mass removed.





Weekly dredging loads were typically under 1 percent of mass removed for Waterford and Lock 5, and even occasionally at TI

Cumulative Mass Loss As a Fraction of Mass Removed



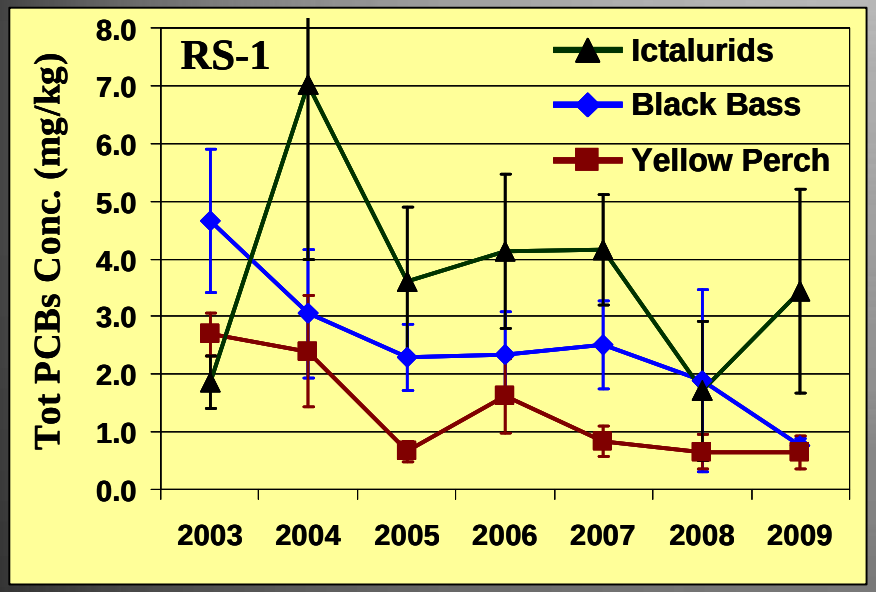
Cumulative dredging loads were:

<1 % at Waterford

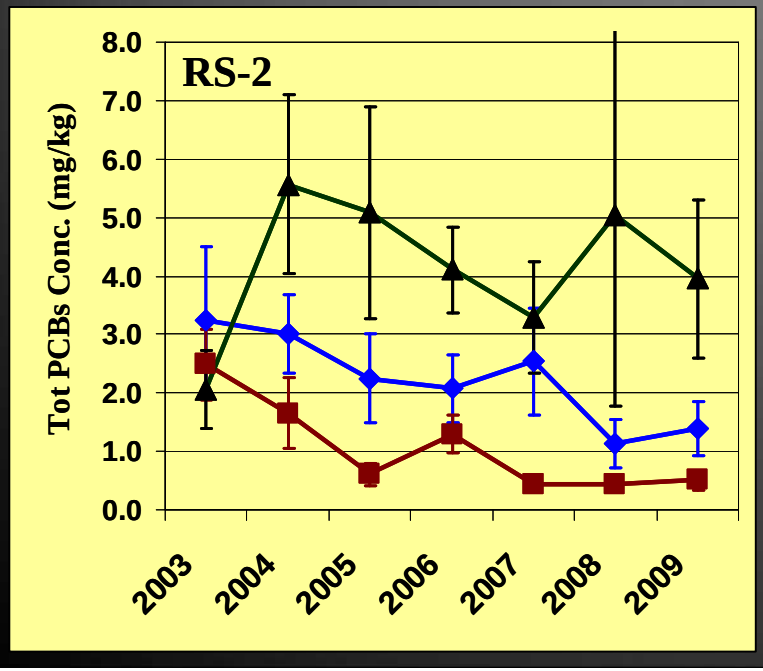
~1.3 % at Lock 5,

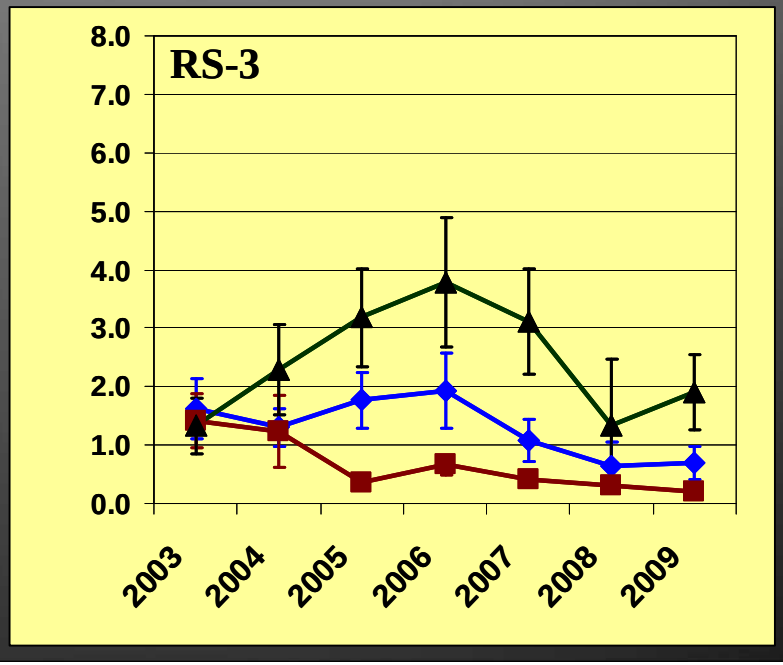
~ 2 % at Thompson Island

PCBs in Hudson River Resident Sport Fish (Adults) – Summer Collections

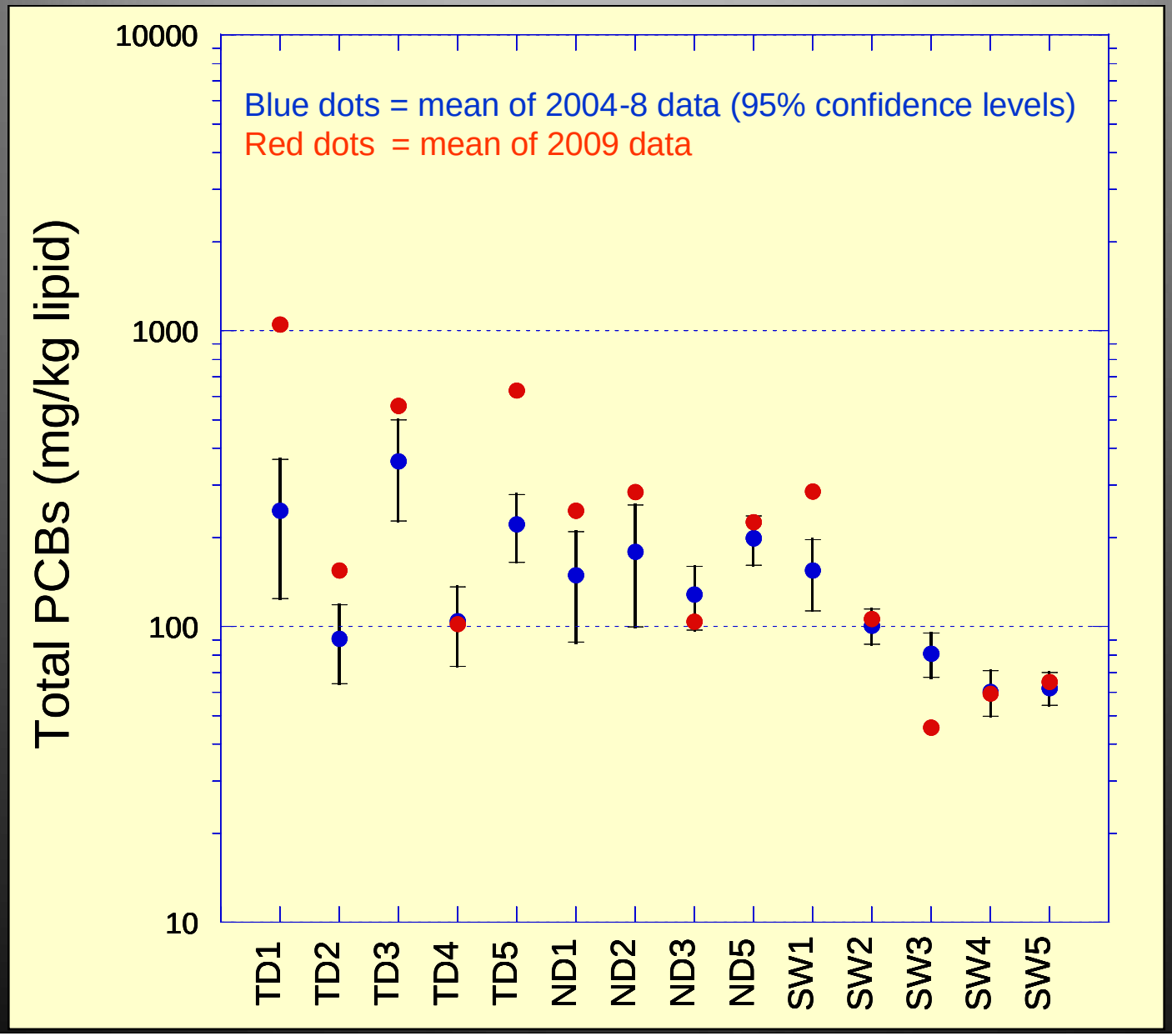


- Tissue concentrations generally stable or slightly declining in recent years.
- June 2009 fish sampled less than a month after onset of dredging.





Hudson River Pumpkinseed (Fall Collections): Baseline vs. 2009

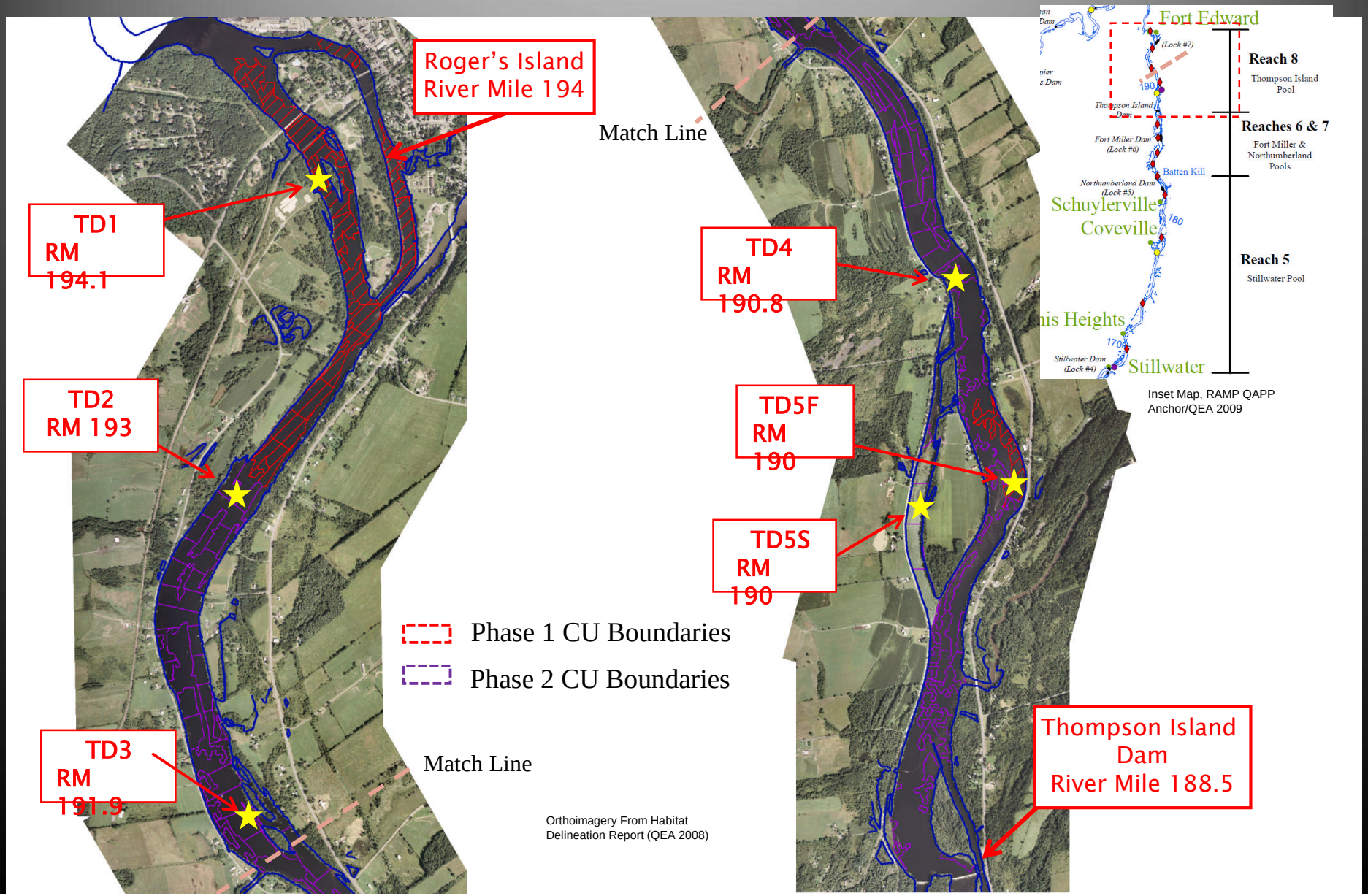


Total PCBs in Fish Tissues: Baseline vs. 2009

SECTION	STATION	Black Bass	Bullhead	Yellow Perch	Pumpkin -seed	Forage Fish
1	ALL	-		-	+	+
2	ALL	(-)		-	+	
3	ALL		-	-		
SECTION	STATION					
1	TD1			+	+	
1	TD2	-			+	
1	TD3	-		(-)		
1	TD4			-		(+)
1	TD5	-		-	+	
2	ND1		(-)		(+)	
2	ND2			-		-
2	ND3					
2	ND5	-		-		
3	SW1					+
3	SW2					
3	SW3		-	-		
3	SW4					
3	SW5					

	No change p > 0.10
-	Decrease btwn 2004-8 and 2009; p<0.05
+	Increase btwn 2004-8 and 2009; p<0.05
( )	p<0.10

BMP Fish Sampling Transect Locations: Thompson Island Pool (River Section 1)



Spikes in tissue concentrations linked to exposure events have been observed to recover

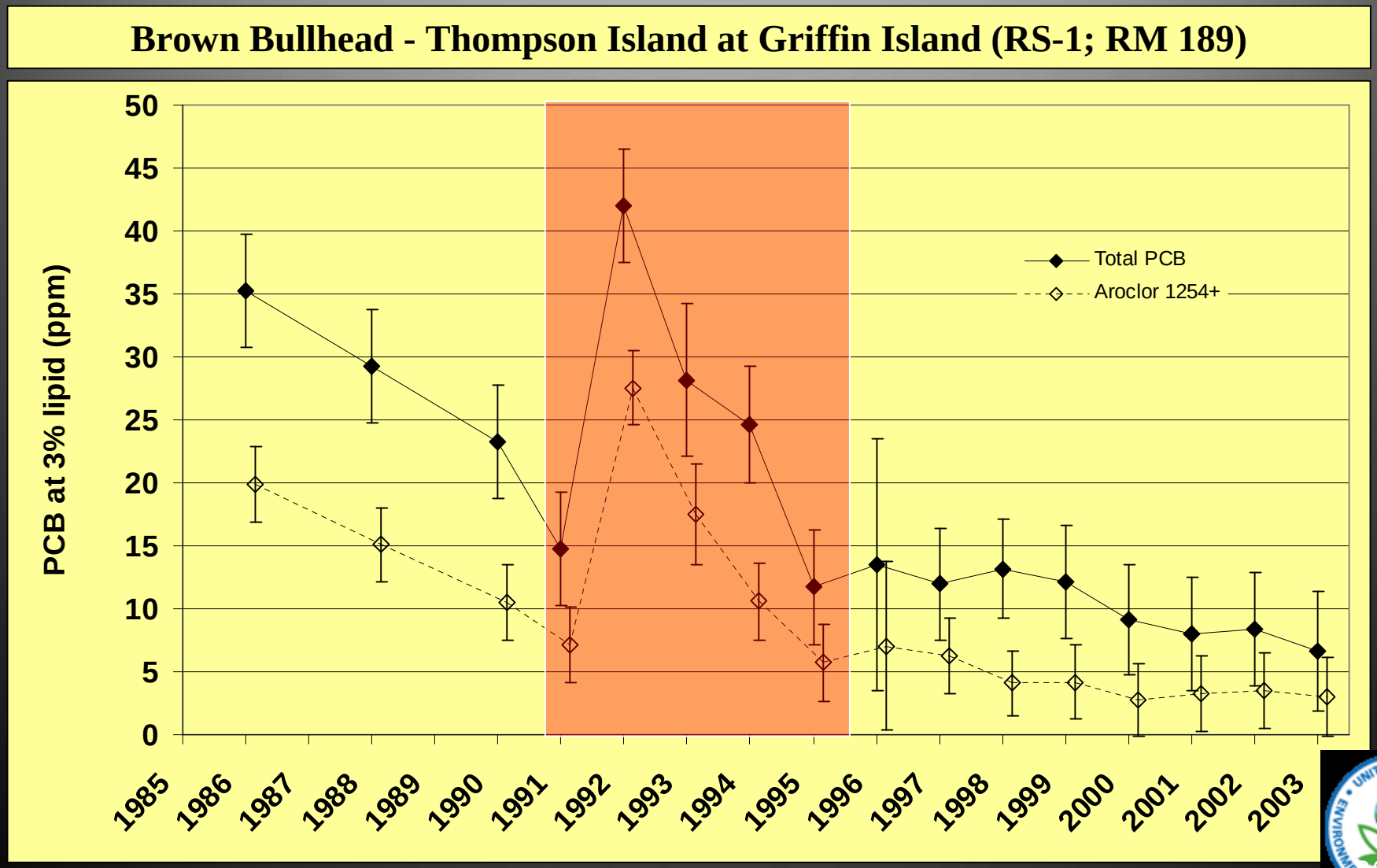


Figure courtesy of NYSDEC (2005)

Spikes in tissue concentrations linked to dredging events have been observed to recover

Cumberland Bay Site, Plattsburgh, NY – Yellow Perch, Wilcox Dock

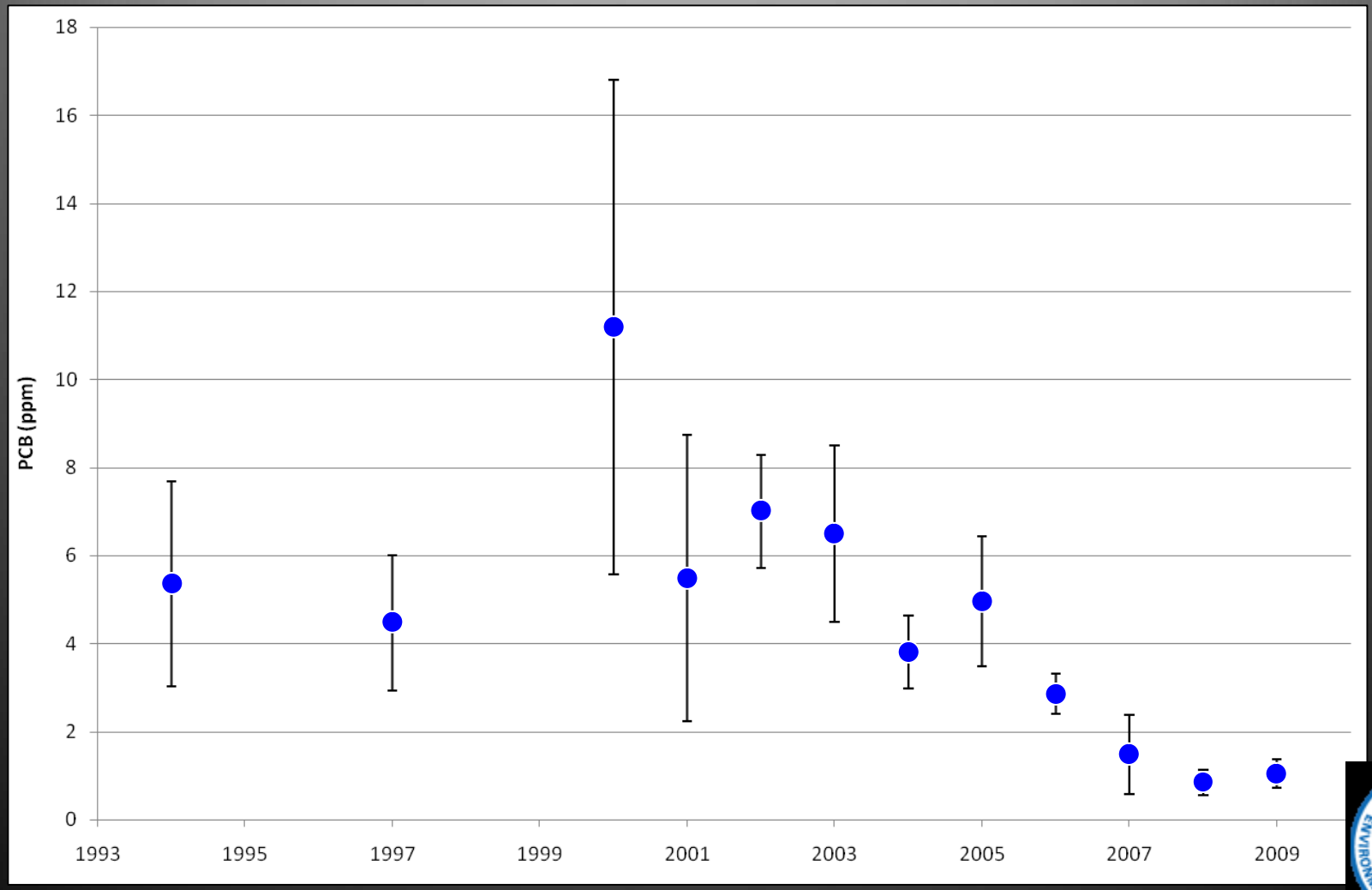


Figure courtesy of NYSDEC (2009)

Basis Differences with GE

- Measurement of PCB concentrations
  - Application of GE's proposed correction factor remains unresolved.
- Calculation of Baseline Load
  - GE excludes 2004, 2006 data, does not include flow affect
  - 2009 was 2nd wettest year in 2004-2009
- Estimation of PCB mass removed
  - GE uses SSAP cores as part of post-dredge surface characterization
  - GE interpolates data using theissen polygons.
  - GE *in situ* density estimates are much higher.

Problems encountered

- The MCL of 500 ng/L was exceeded four times, Aug 6 – 8, Sept 10, Oct 13, & Oct 26; resulting in 3 work stoppages.
- The Resuspension Standard performance targets for cumulative load for both TPCB (117 kg) and Tri+ PCB (39 kg) were exceeded at all of the downstream monitoring stations.
- The 7-day running average net loadings at Thompson Island exceeded the Phase 1 Control Levels for the majority of the dredging period.

Phase 1 Resuspension Standard Summary of Observations

- No significant release of solids during dredging
- Water column PCB concentrations were significantly above baseline during dredging.
- PCB-bearing oil sheens were extensive and are a significant vector for PCB release.
- Water column concentrations of PCB substantively decreased downstream of Thompson Island to Waterford.
- There were no observable impacts of dredging to Tri+ PCB water column concentrations downstream of Waterford.

Phase 1 Resuspension Standard Observations (cont)

- TPCB Loads at Lock 5 and Waterford were significantly lower than loads at Thompson Island. A concurrent decrease was not observed in solids transport.
- The net load at Thompson Island was still small relative to the overall mass removed in Phase 1 at 440 kg, vs the 20,000 kg removed (roughly 2 percent).
- The net load to the Lower Hudson was roughly 150 kg Total PCB.
- The resuspension goal of maintaining the Total PCB export rate to 1 percent or less relative to the mass of PCBs removed was achieved at Waterford and nearly met at Schuylerville.

Interaction with the Productivity and Residual Standard

Underestimated DoC led to:

- Multiple dredging bites per pass and multiple inventory passes
- Dredged surfaces were left open awaiting closure
- Completion of later bites with higher loss rates

Proposed Revisions to the Resuspension Standard

- Adjust the Evaluation and Control Level loads upwards, in accordance with new information on the inventory of PCB targeted for removal. (~3 fold increase)
- Automated water sampling station should be constructed at Stillwater to allow for collection of 24-hr composite samples
- The near-field and far-field solids criteria should adjusted for Phase 2.
- The water column Control Level of 350 ng/L should be maintained.

Proposed revisions to the Resuspension Standard

- The near-field buoy deployment and frequency of monitoring can be reduced for Phase 2 so long as far-field solids concentrations are similar to levels observed during Phase 1
- The seven day averaging period for daily loads should be maintained.