

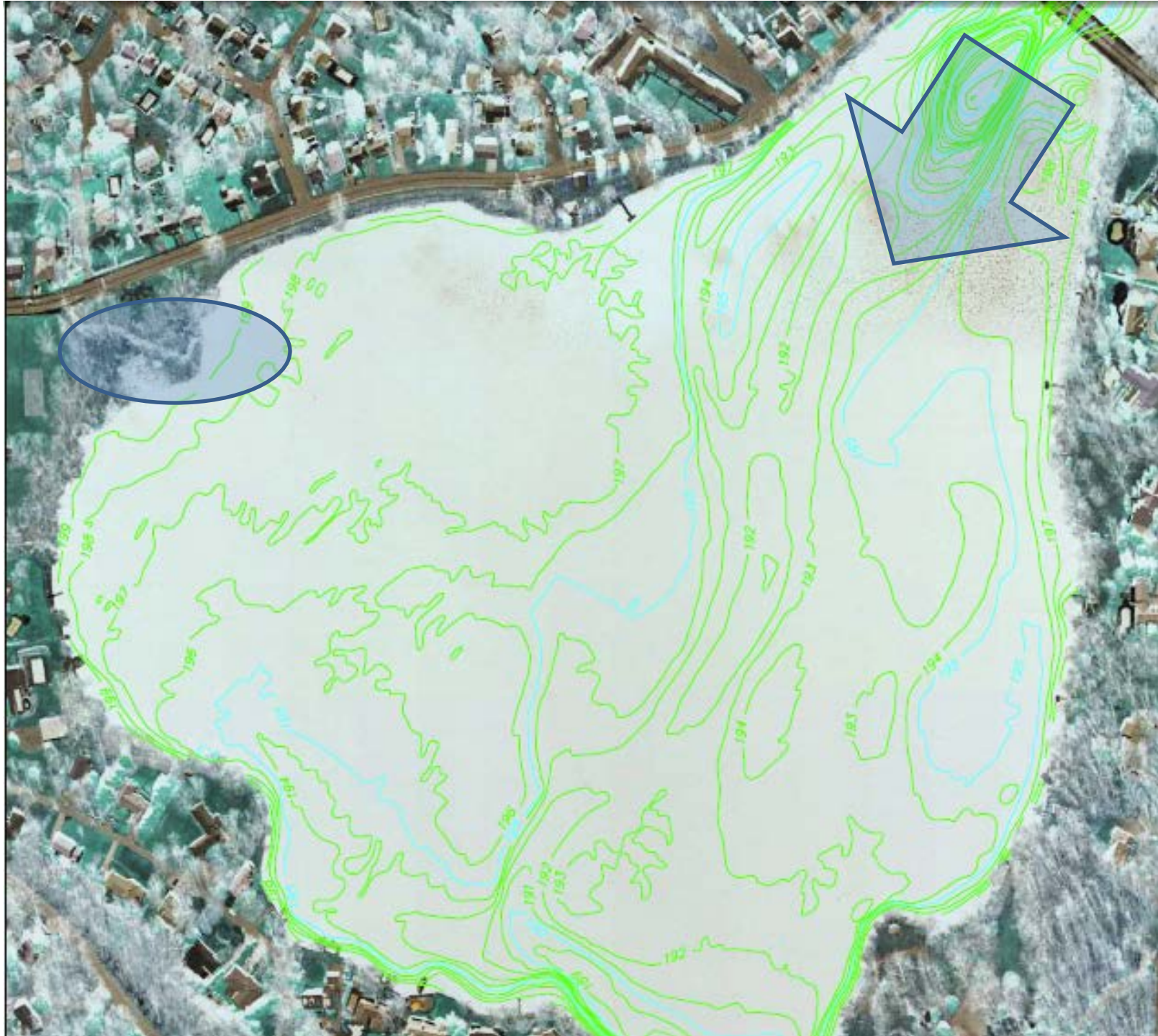
# Basics of Sediment Dynamics

## Pompton Lakes

Mark Reiss

Dredging, Sediment and Oceans Team

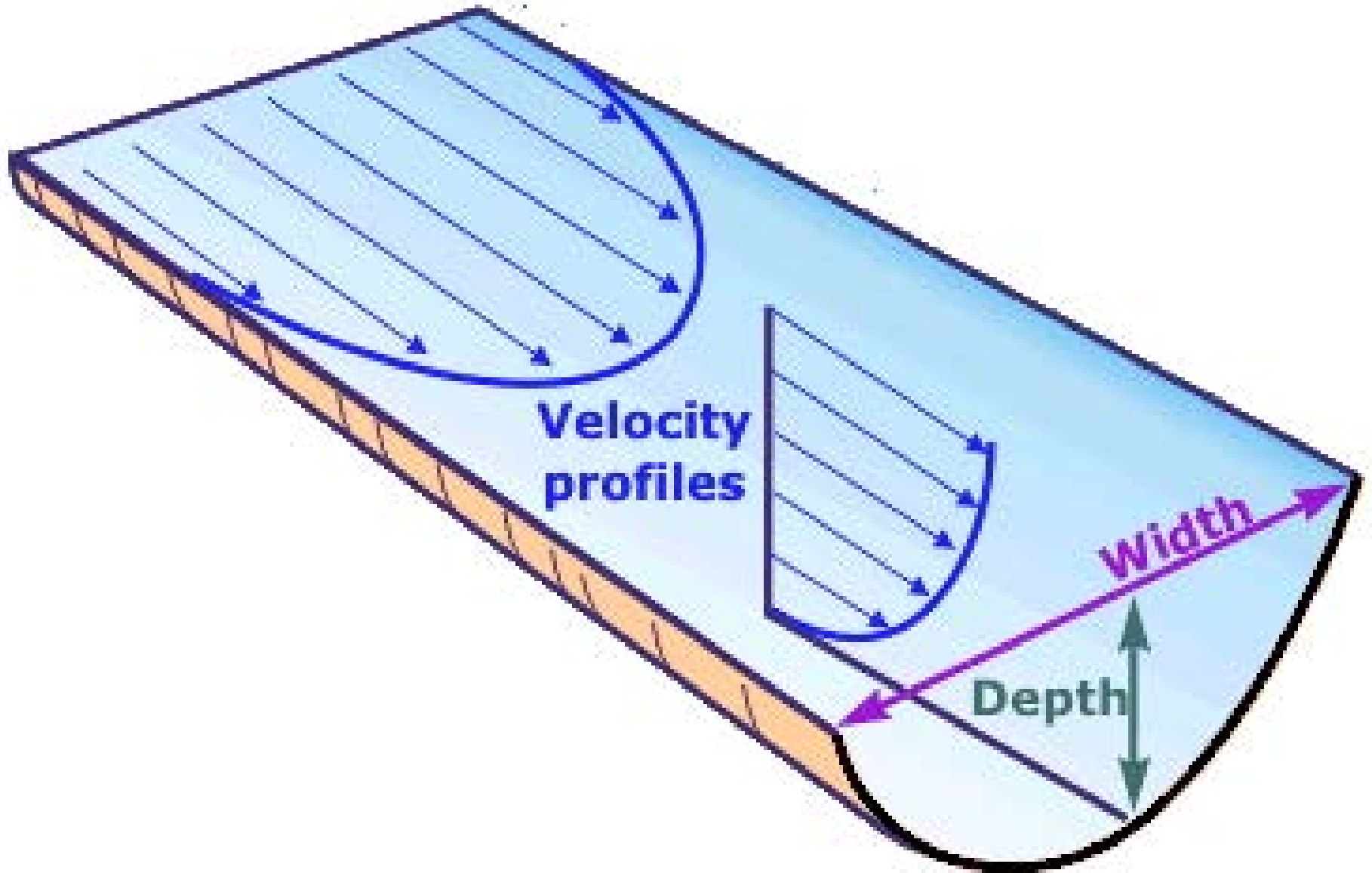
U.S. EPA, Region 2

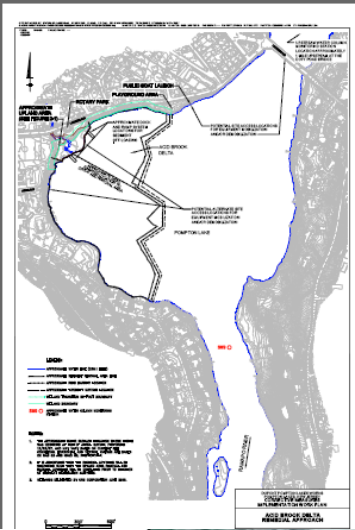


# Streamflow in Rivers

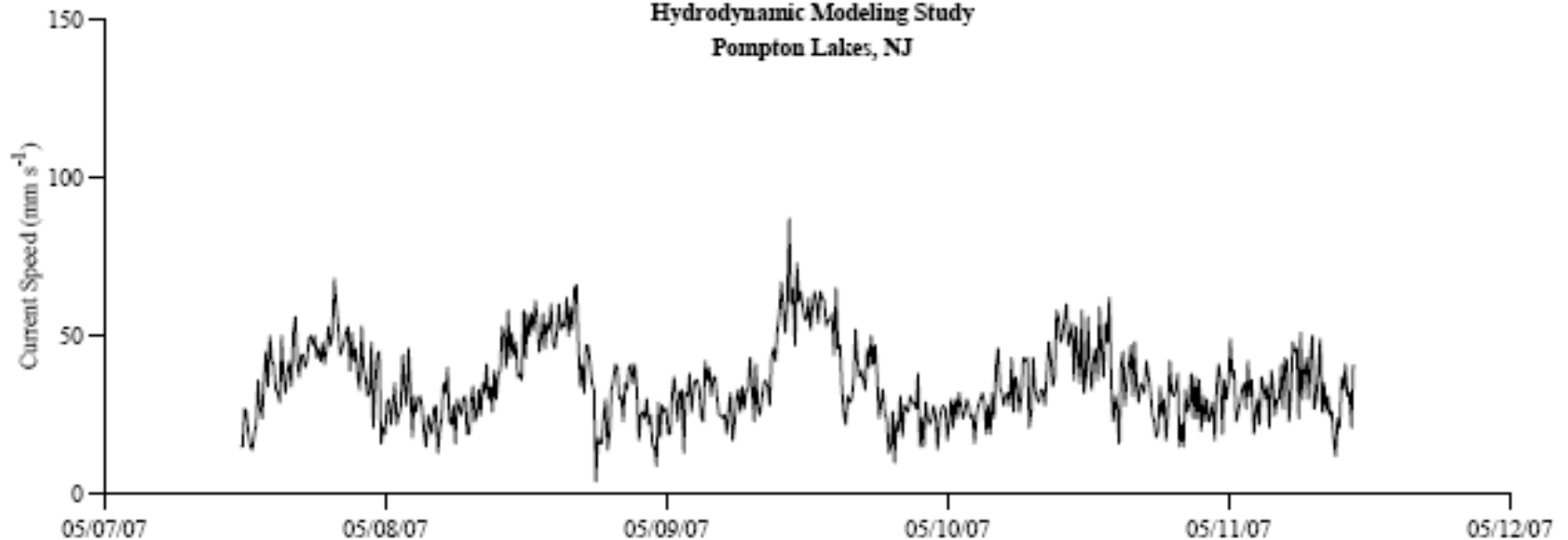
- Water flows downhill
- Stream velocity is related to elevation changes and channel geometry (depth and width) and volume
  - The narrower and shallower the river, the faster the current
  - Steeper the elevation, the faster the current
- “Wall effects” due to friction are important and will steer flow to deeper areas of the channel
- Precipitation events may introduce large amounts of sediment into river systems

# RIVER FLOW VELOCITIES





Vertically Averaged Currents  
Hydrodynamic Modeling Study  
Pompton Lakes, NJ



This record was measured during somewhat below average flow conditions

Vertically-averaged currents were mostly between 3-7 cm/s, bottom velocities would be lower

Major flood conditions would significantly increase the currents in this area, including near the bottom

# Bed Sediment Erosion

- If critical bottom current velocities are exceeded, there can be erosion of sediment from river beds
- Potential for erosion of bedded sediment is also related to velocity near the bottom but is also related to sediments themselves
  - Cohesiveness
  - Particle size, weight, shape
- Other important factors to consider are the turbulence of the river and friction as they affect velocity and potential for erosion of bedded sediment

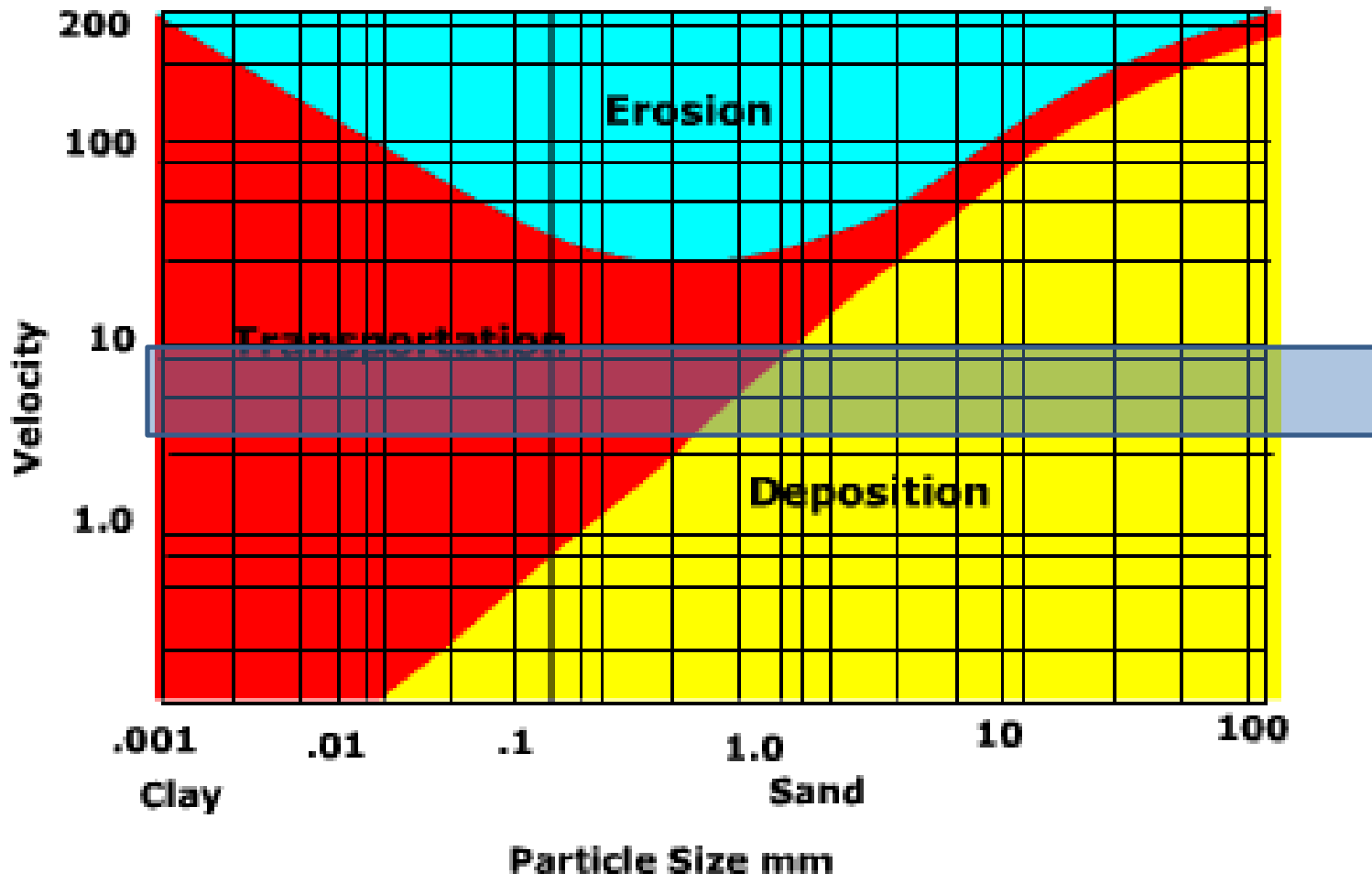



Figure 18.30 Critical velocity (cm/sec) for erosion, transportation and deposition



# Historical Crests for Ramapo River at Pompton Lakes



**National Weather Service**  
**Advanced Hydrologic Prediction Service**

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**Ramapo River**     

Return to: [Ramapo River Point Selection Page](#)      Important Note: [Book-marking page saves current search criteria](#)

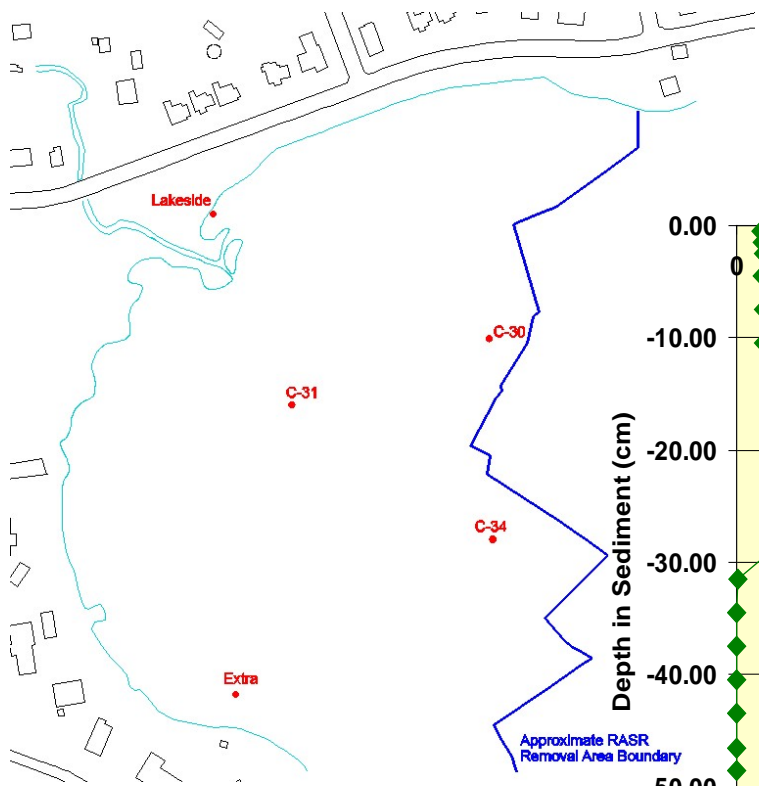
<b>at Pompton Lakes</b> Flood Stage: 11.5 Feet Latest Stage: 8.11	<b>Current</b> Warnings/Statements/Advisories: None currently.	<a href="#">Complete information about the Ramapo River at Pompton Lakes</a> available from <a href="#">NWS Philadelphia/Mount Holly, NJ.</a>
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Flood Categories (in feet)	Historical Crests
Major Flood Stage: 14.5	(1) 22.62 ft on 08/29/2011
Moderate Flood Stage: 13.5	(2) 21.60 ft on 04/05/1984
Flood Stage: 11.5	(3) 18.05 ft on 03/14/2010
Action Stage: 10	(4) 16.99 ft on 04/16/2007
	(5) 16.72 ft on 03/11/2011
	<a href="#">Show More Historical Crests</a>

[Return to the Top](#)

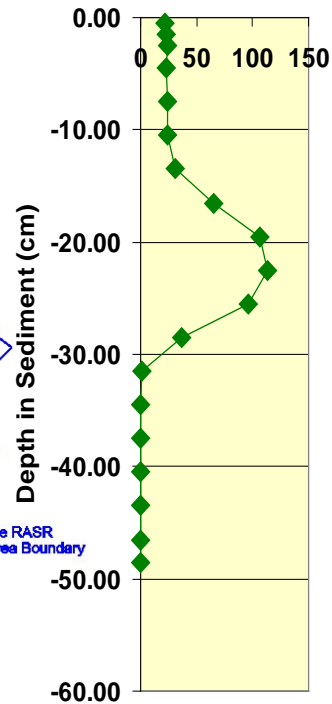
- (1) 22.62 ft on 08/29/2011
- (2) 21.60 ft on 04/05/1984
- (3) 18.05 ft on 03/14/2010
- (4) 16.99 ft on 04/16/2007
- (5) 16.72 ft on 03/11/2011
- (6) 15.83 ft on 03/07/2011
- (7) 14.80 ft on 04/17/2011
- (8) 14.33 ft on 09/08/2011
- (9) 14.22 ft on 04/03/2005
- (10) 13.66 ft on 10/13/2005
- (11) 13.02 ft on 12/24/2007
- (12) 11.12 ft on 03/31/2010
- (13) 11.03 ft on 12/12/2008
- (14) 10.58 ft on 03/29/2005

# Total Mercury Profiles vs. Sediment Depth (Within Dredging Footprint)

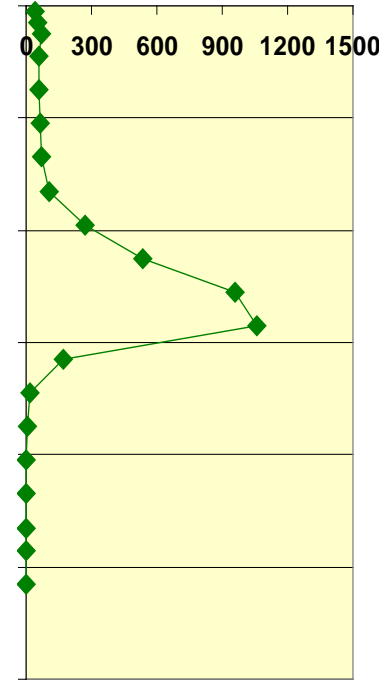


Note: Scales of Hg axes differ significantly

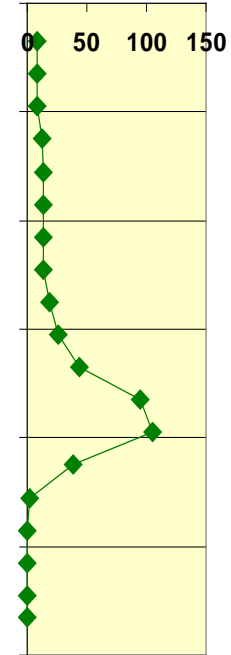
Total Hg (ppm dry wt)



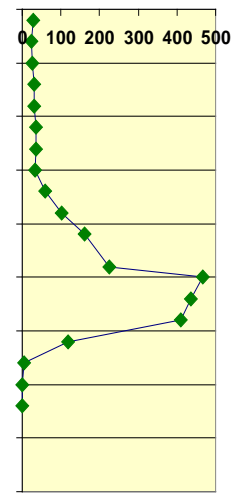
Core 30



Core 31



Core 34



Core Extra  
6-ft "hole"

Sediment Hg profiles indicate a stable sediment environment with little or no mixing of deeper mercury

# Residuals

- Target: 97% removal of contaminant in areas slated for dredging
- This is a high target removal rate. Rates for completed projects range 91-98%
- Hudson and Marathon Battery target 95%
- Factors that are favorable include gentle slopes, shallow project depths.