



Monitoring Effectiveness of Pilot-Scale Sediment Caps in a Dynamic Sand Riverbed

Battelle 2019 Sediments
Conference

February 11-14, 2019

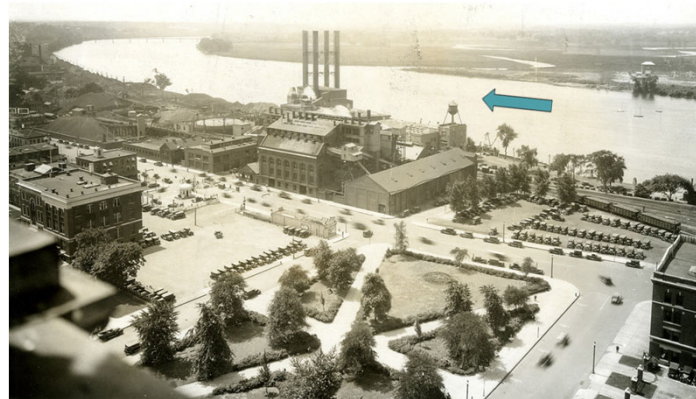
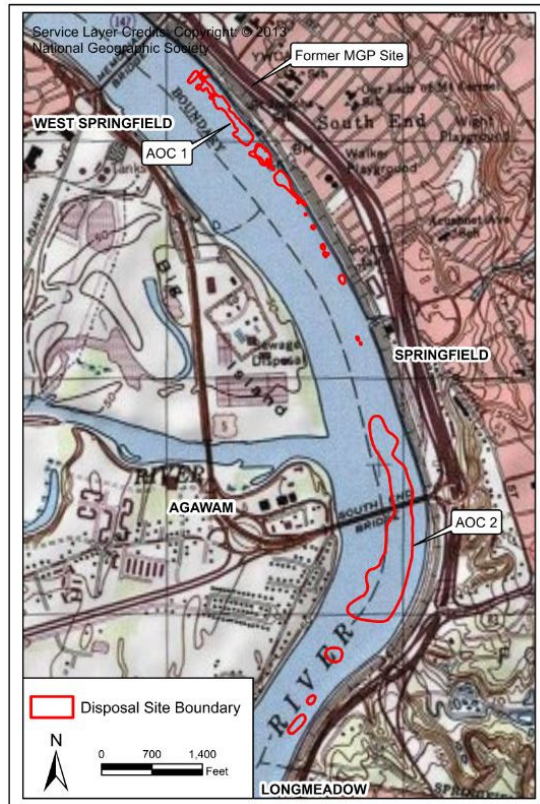
New Orleans, Louisiana

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Site overview

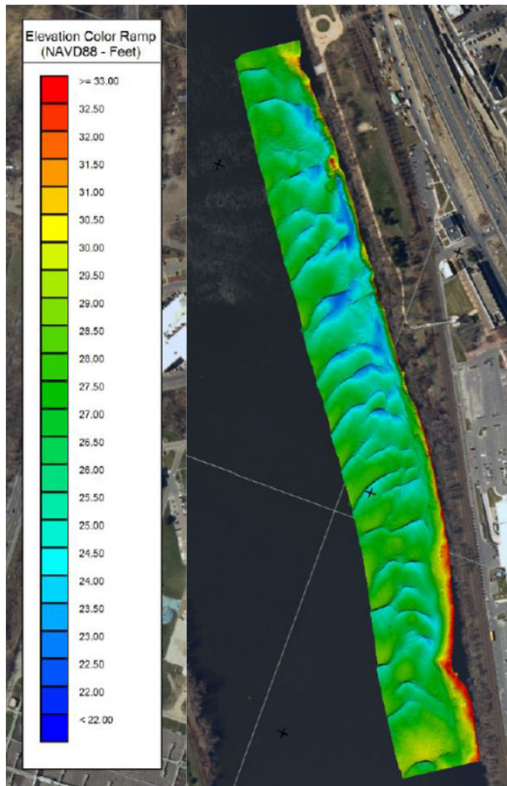


Tar-infused sandy sediment

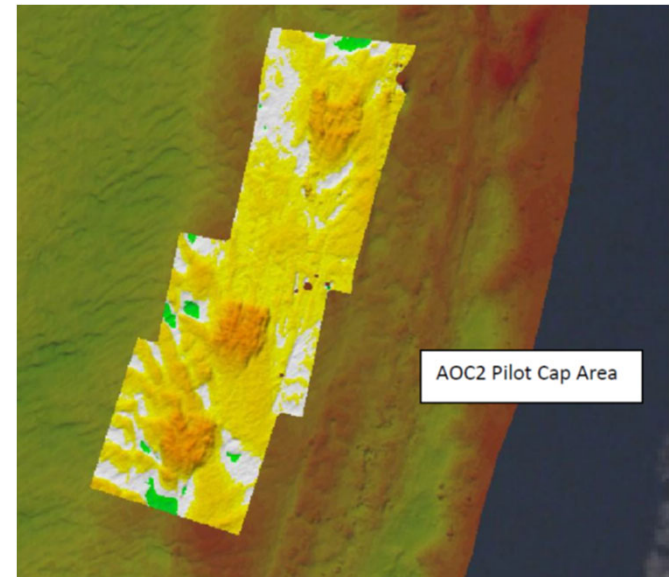
- Tarry sediment at surface:
 - Very weathered
 - Firm
 - Resists erosion
- Tar at depth is less weathered
- Sand constantly in motion
- Low PAHs in sand reflect background



Sand bed river

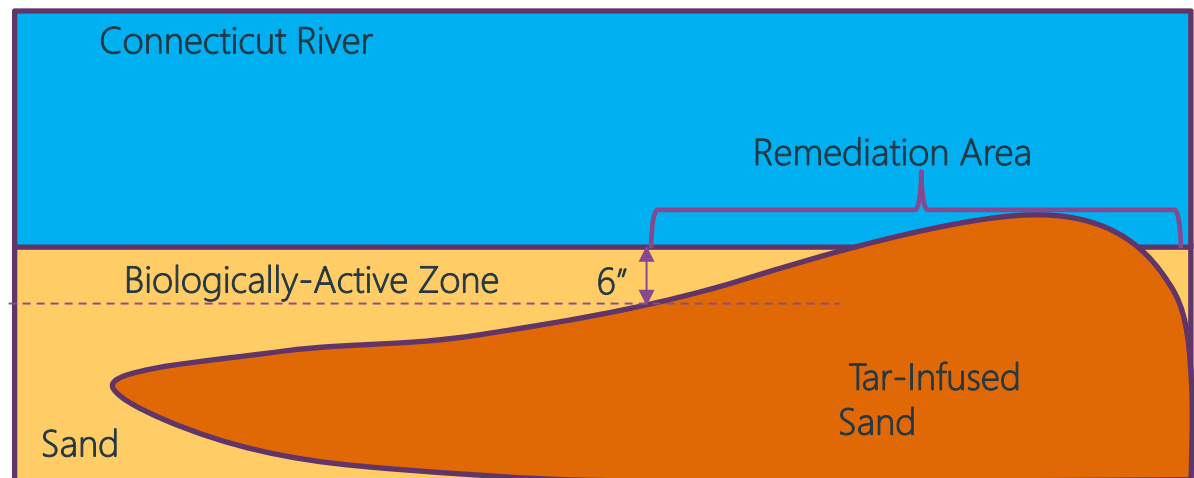


- Primarily medium sand
- Eroded, transported and replenished
- Sand waves and ripples evident from bathymetry



Remediation goal

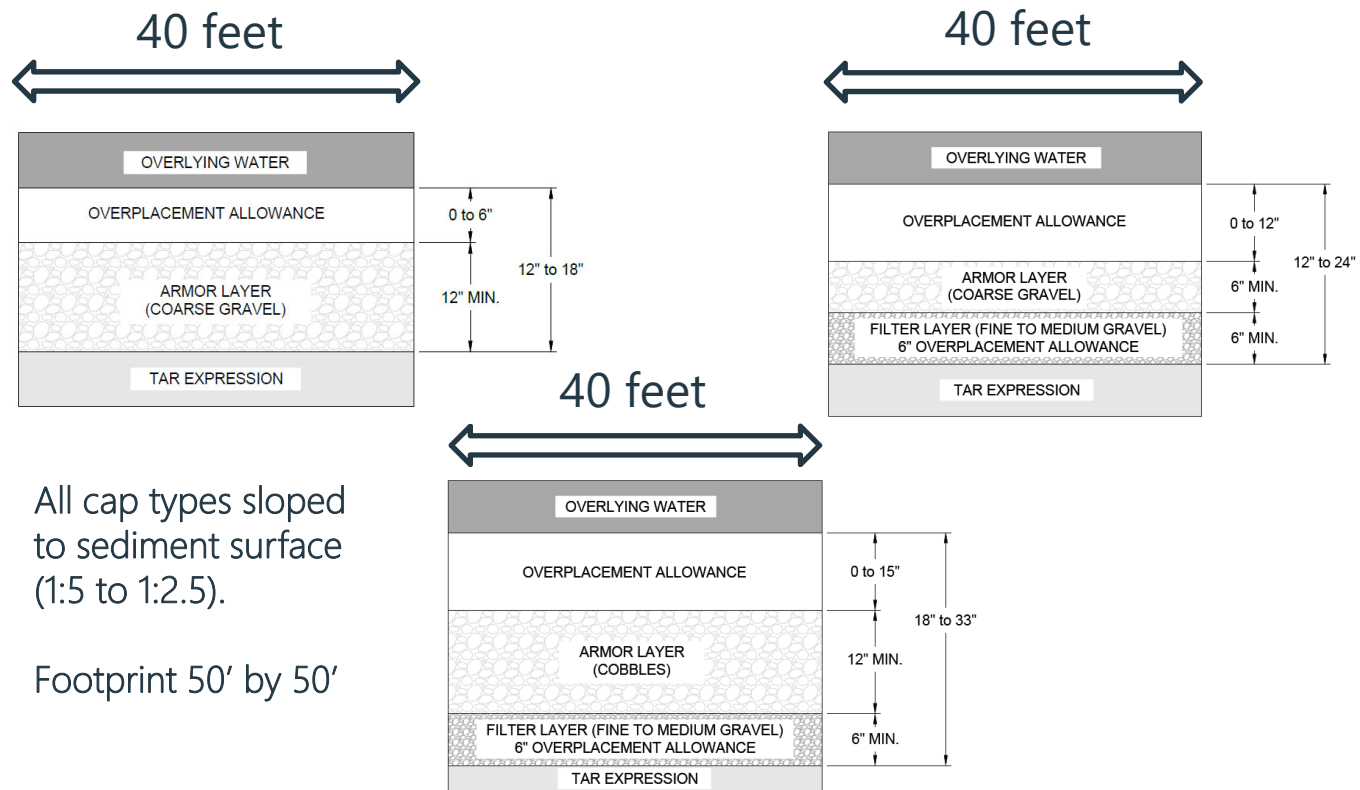
- Cap exposed tar & tar in upper 6 inches
 - Challenge - target footprint constantly changing
 - Benefit - abundance of natural cover material
- High dilution – armoring only



Cap design objectives

- Isolate tar with minimum 1 foot of armoring
- Resist scour from 100-year storm event
- Minimize cap-induced scour at margins
- Enhance deposition
- Prevent tar intrusion into cap

Full-thickness cap designs

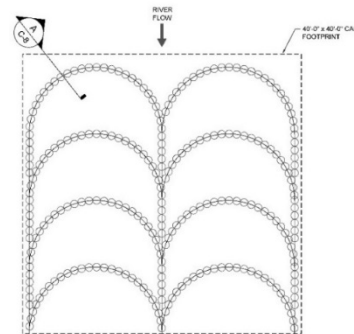


All cap types sloped to sediment surface (1:5 to 1:2.5).

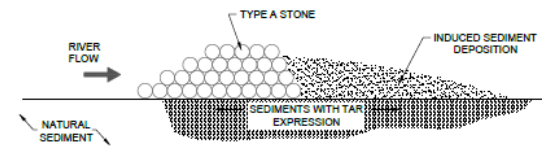
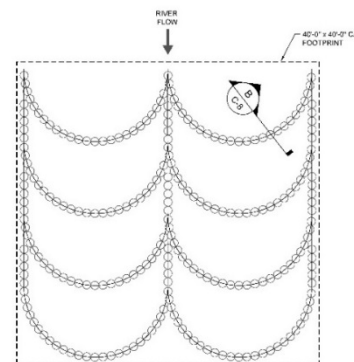
Footprint 50' by 50'

Cellular cap designs

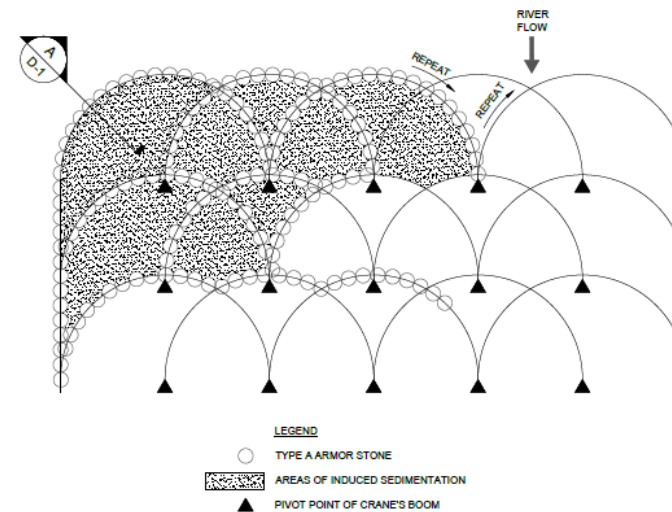
Cellular Cap Convex Placement Method



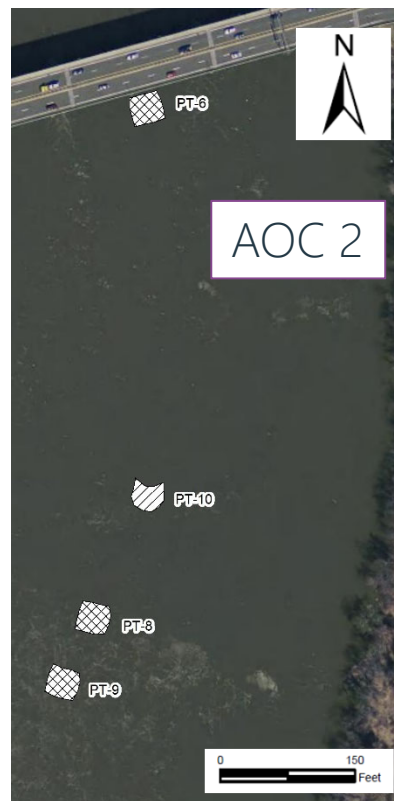
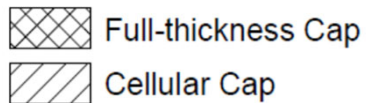
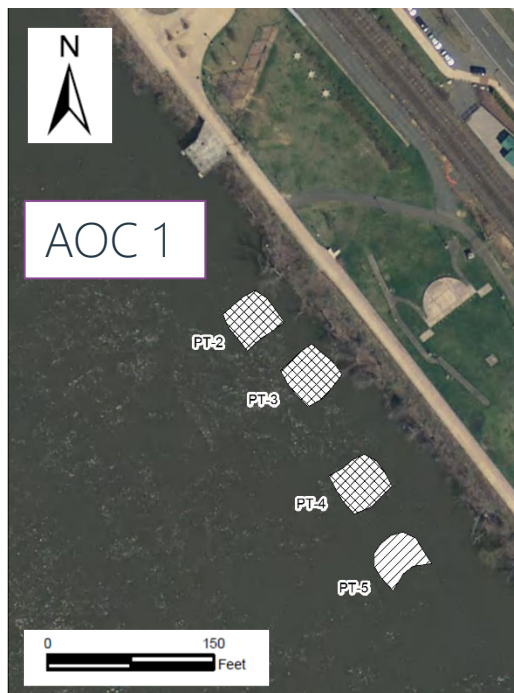
Cellular Cap Concave Placement Method



A
D-1 CELLULAR CAPPING PLACEMENT METHOD SECTION
NOT TO SCALE



Cap locations



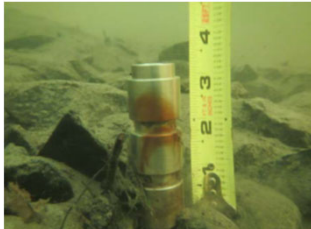
- Full thickness
 - Gravel only
 - PT-2, PT-3, and PT-9
 - Filter layer & gravel
 - PT-4 and -8
 - Filter layer & cobbles
 - PT-6
- Cellular
 - Gravel only
 - PT-5 (Convex)
 - PT-10 (Concave)

Armoring material

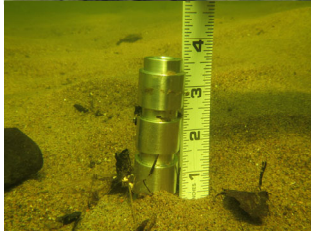


- Fine to medium gravel – filter layer
- Coarse gravel – armor layer
 - 4-inch minus
- Cobbles – armor layer between bridge piers
 - 8-inch minus

Settlement plates and test cells

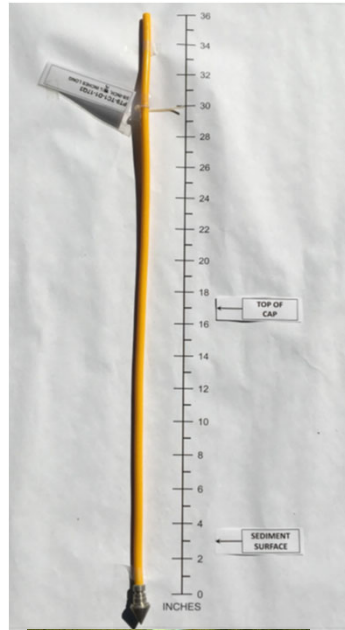


Armored
PT3 – SP3



Cellular
PT5 – SP2

DART
PT9 – TC1



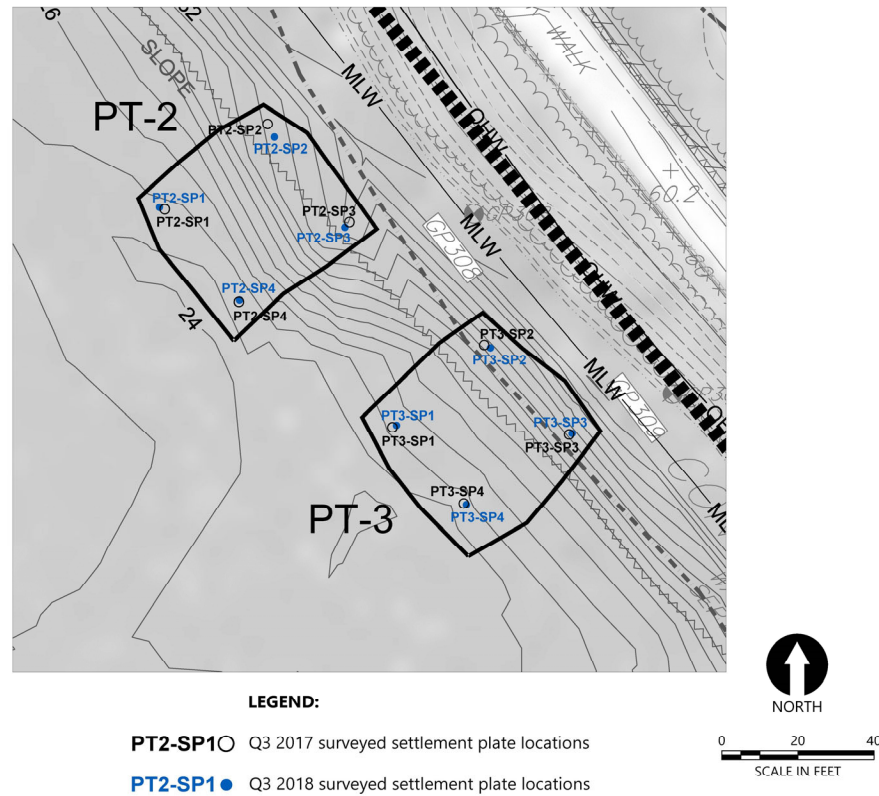
Closed Cell
PT6 – TC1



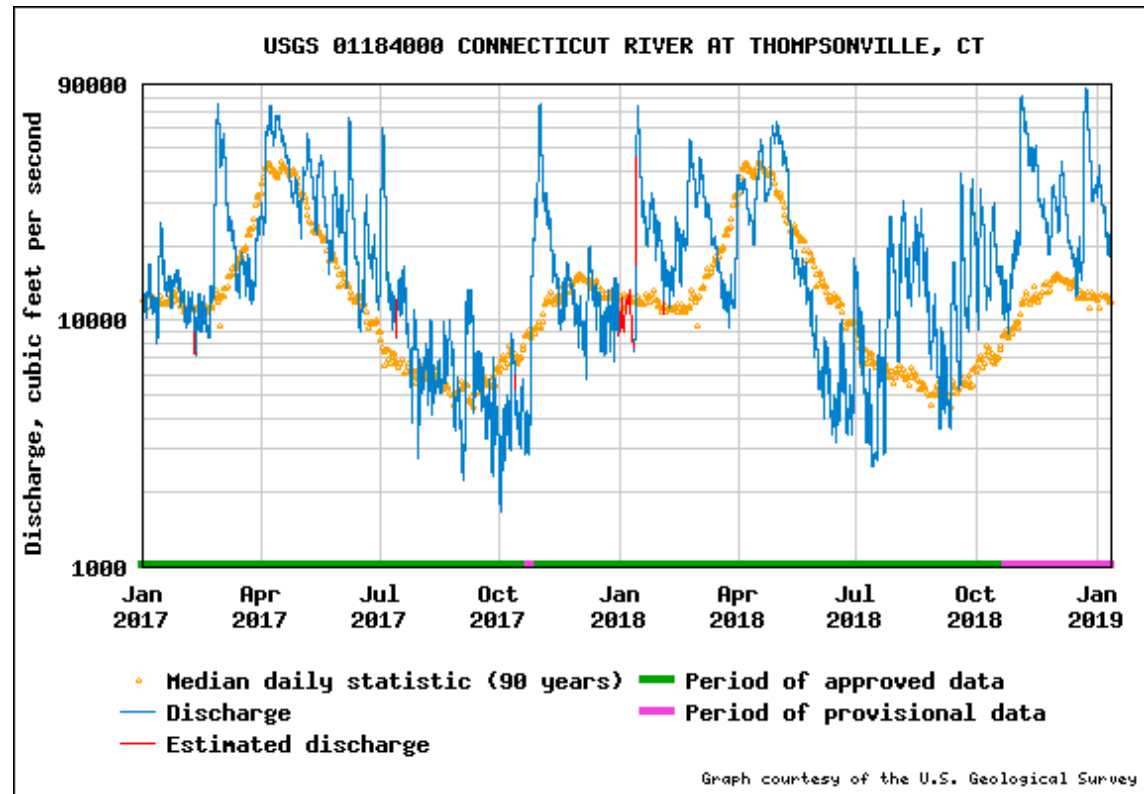
Open Cell
PT9 – TC2



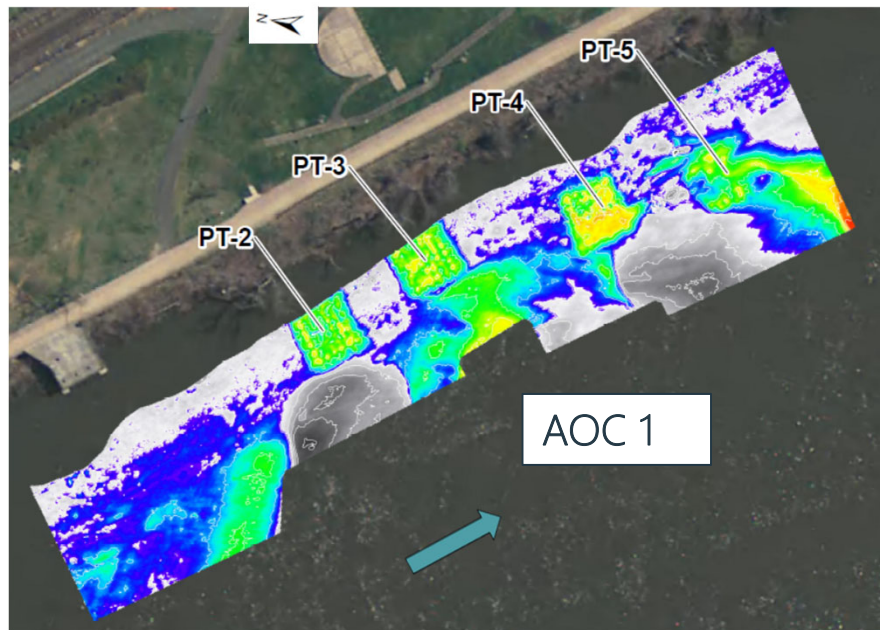
Lateral movement



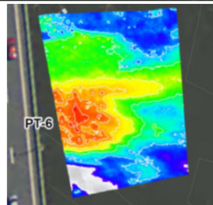
River discharge 2017-2018



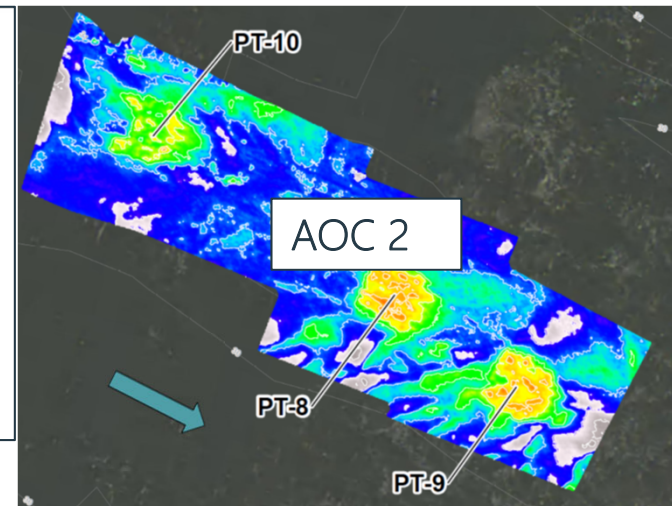
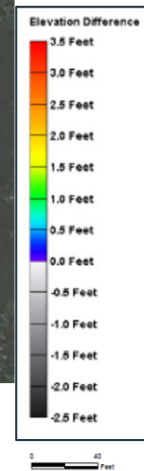
Pre-construction to July 2017



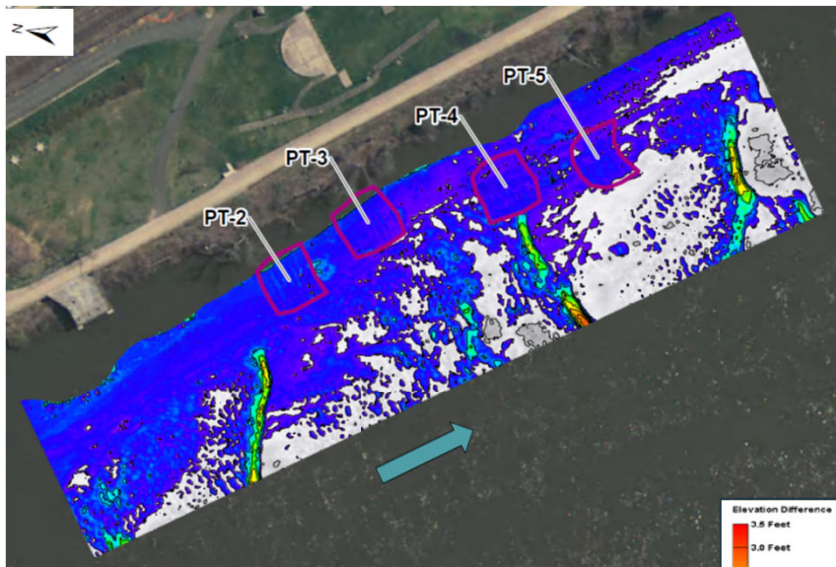
Cobble Cap
AOC2-PT6



Gravel Caps

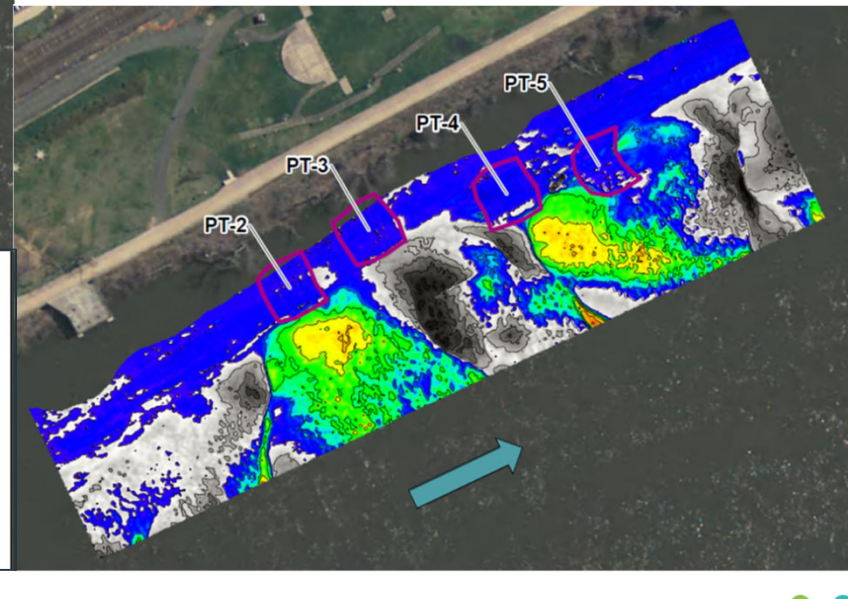


AOC 1 difference maps

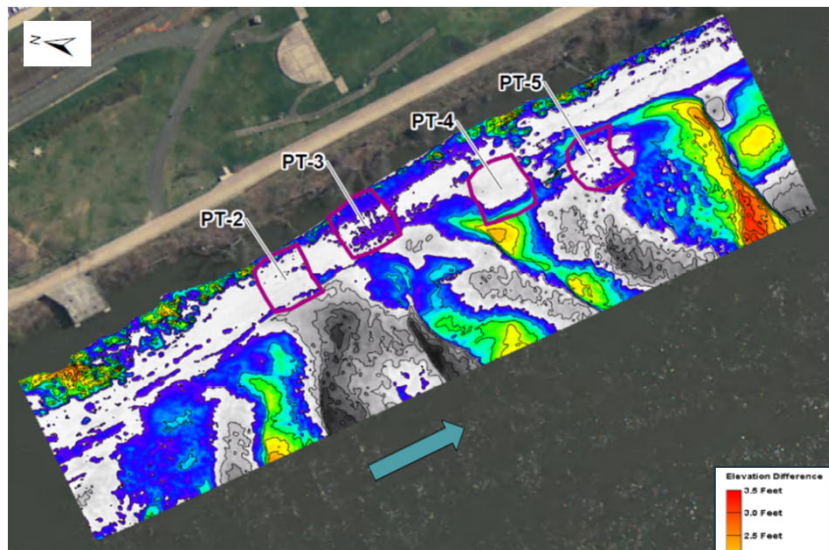


August to October 2017

October 2017 to May 2018

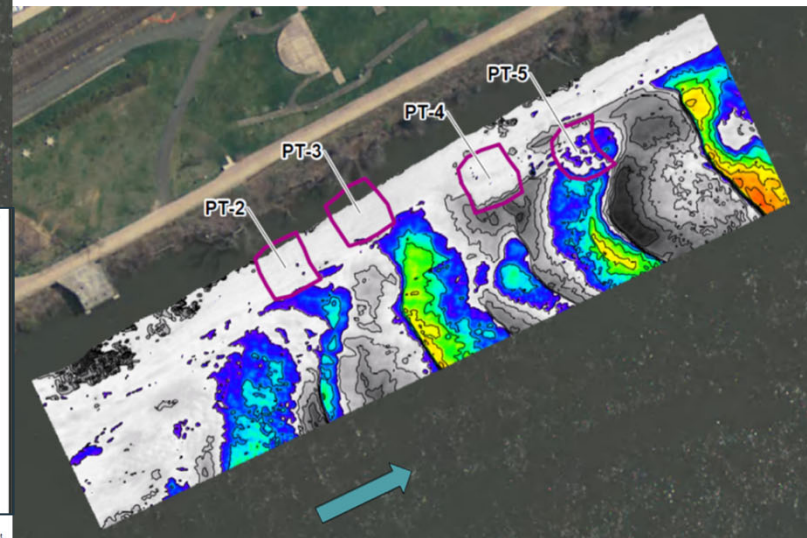


AOC 1 difference maps

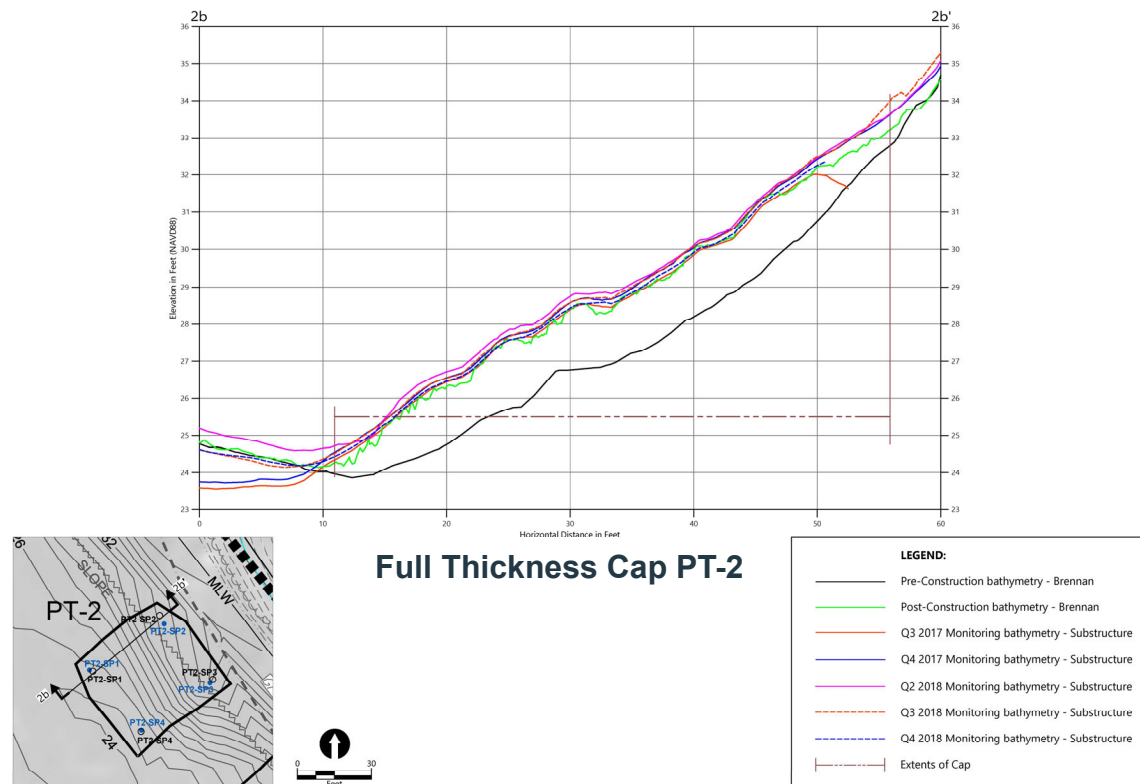


May to August 2018

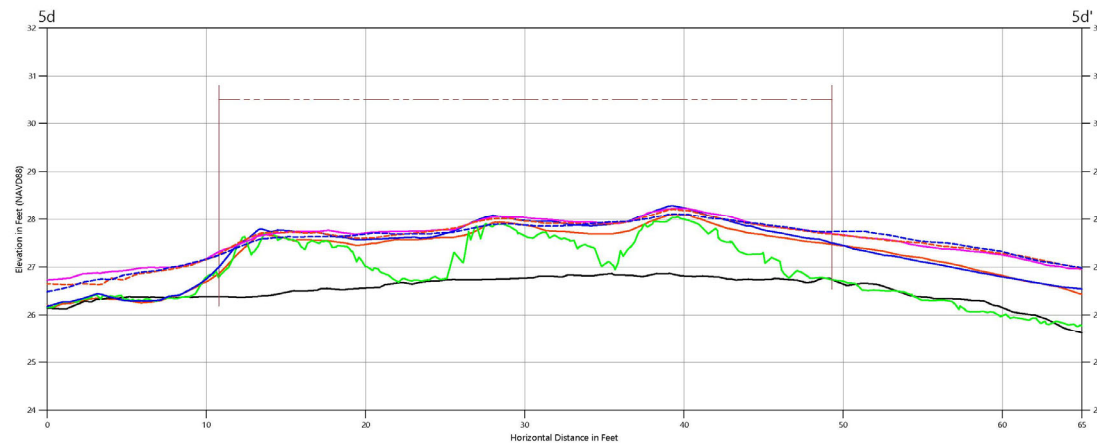
August to November 2018



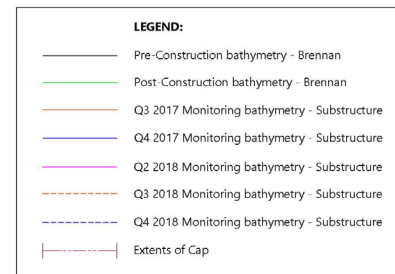
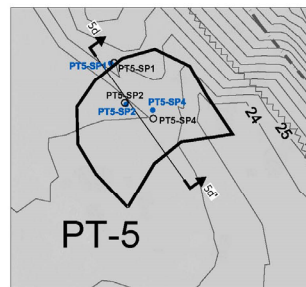
AOC 1 event summary



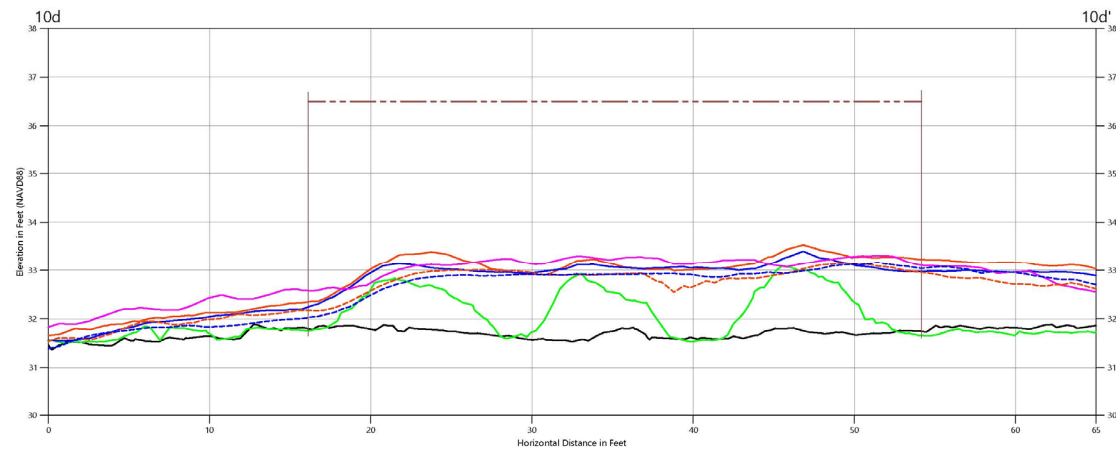
AOC 1 event summary



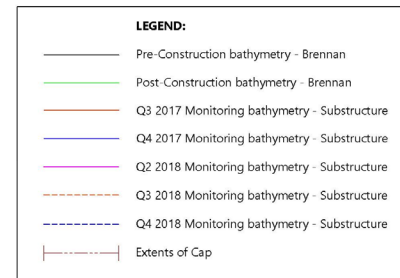
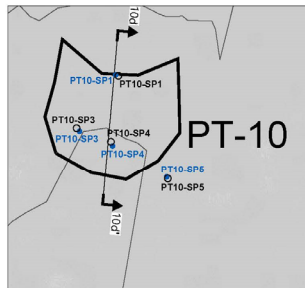
Cellular Cap PT-5



AOC 2 event summary



Cellular Cap PT-10



Conclusions

- Cap design causes sediment accumulation
- Low-profile cap does not cause margin effects
- Cap margins influenced by passing sand waves
- No evidence of tar intrusion
- Cap types appear to perform equally well



Next steps

- Cap designed for 100-year storm event, but
 - Flows only approached two-year recurrence interval
 - Targeting 10-year event to assess scour resistance
- Monitor less frequently until 10-year event occurs



Tropical Storm Irene August 2011

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