River Raisin Area of Concern – NAPL Area – Sediment Remediation

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Presentation Overview

- Site Description and History
- Project Participants
- Remedial Design
- Construction
- Quality Assurance
- Project Metrics
- Project Challenges
- Lessons Learned
- Project Summary Video
- Questions

Site Description and History

Site Description and History

- **1997 to 2012:** 120,000 cubic yards (cy) of sediments with PCBs were removed from the area of concern
- **2012:** Nonaqueous phase liquid (NAPL) observed during 2012 dredging and verification sampling
- **2013 to 2014:** Define the extent and mobility of the identified NAPL
  - NAPL and Toxic Substances Control Act (TSCA) PCBs (>50mg/kg) found as deep as 28 feet below the existing sediment surface
  - Additional sampling successfully delineated lateral extents of NAPL area
  - Presented remedial alternatives to regulators
- **2015:** Regulators approve final remedy

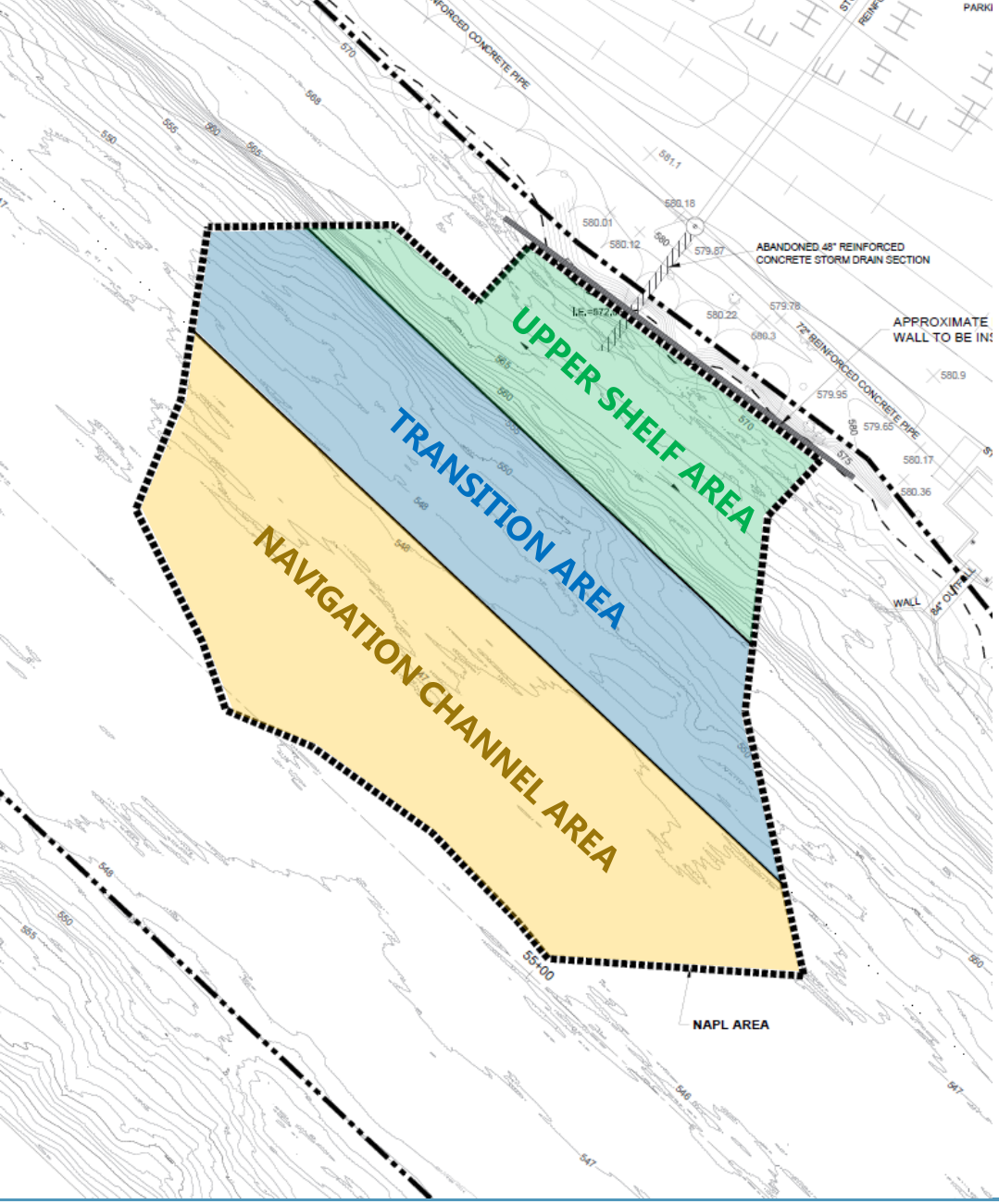
Project Participants

- Ford
  - Mannik & Smith
  - Anchor QEA
  - Sevenson Environmental Services
- EPA
  - GLNPO (Great Lakes National Program Office)
  - Environmental Restoration, LLC
  - U.S. Army Corps of Engineers
- MDEQ (Michigan Department of Environmental Quality)
  - Surface Water Quality Division

The remedy was a joint effort between Ford and EPA (GLNPO).
Construction costs were shared 50/50, up to a total of $9 million for each party.

Remedial Design Elements

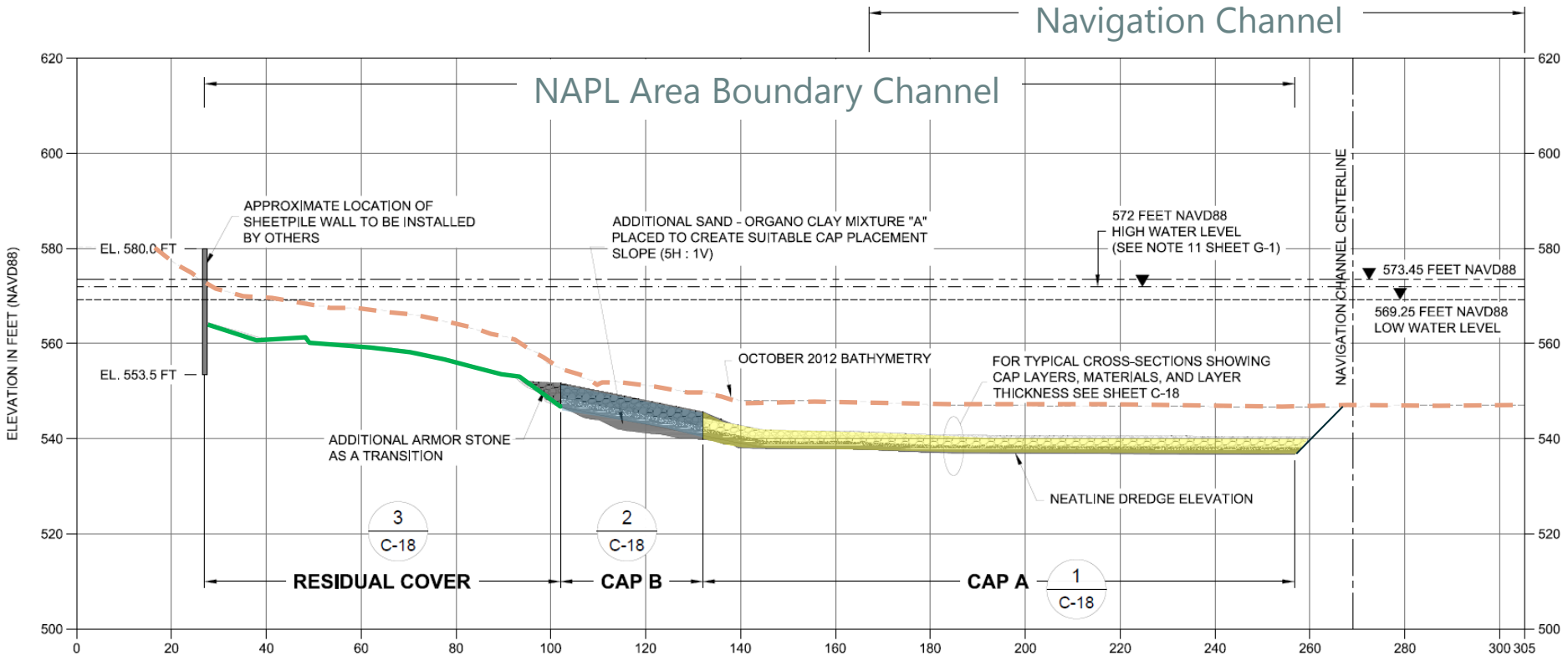
- Permanent sheetpile wall along shoreline to facilitate nearshore sediment removal
- Planned dredging of 28,100 cy of sediment
- Upper shelf area includes:
  - Target removal depth of 8.2 feet of material
  - 6-inch residual cover (graded gravel)
- Transition area and navigation channel includes:
  - Target removal depth of 10.0 feet
  - 5-foot cap in transition area
  - 3.75-foot cap in navigation channel



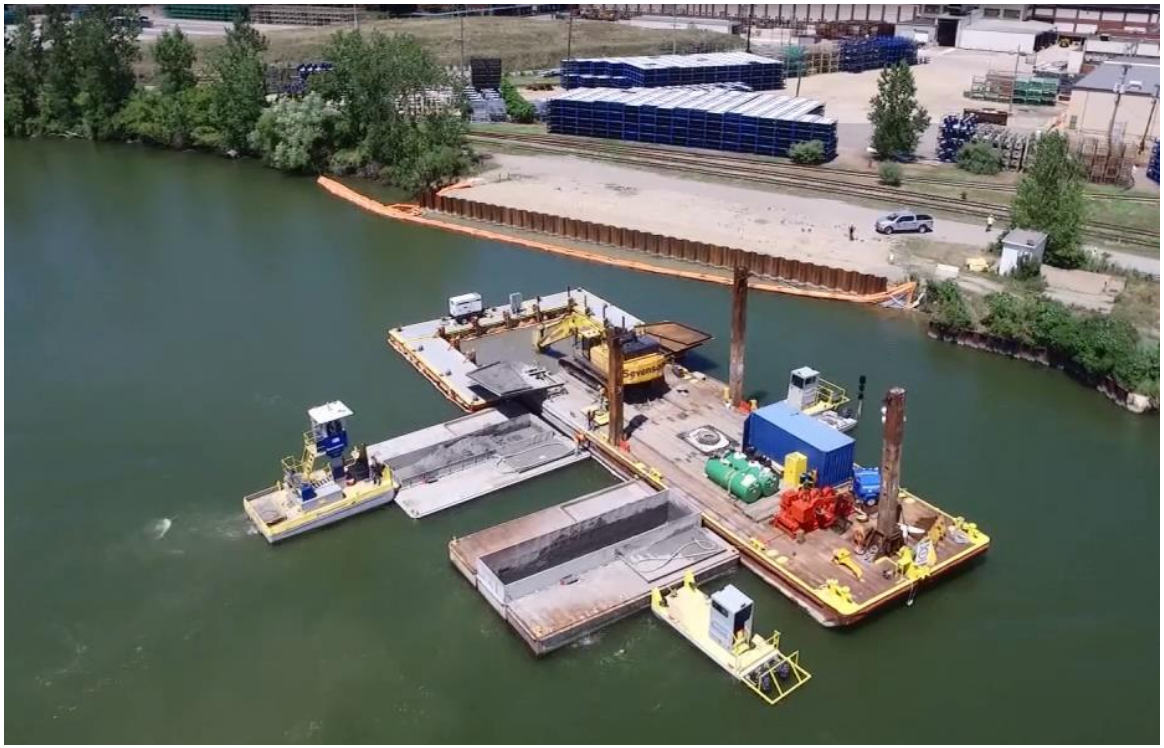
Remedial Design

1. PCBs above 50 parts per million (ppm) and NAPL observed up to 25+ feet below mudline
2. Dredging 8 feet in upper shelf area to remove PCBs above 1 ppm
3. Dredging 10 feet in transition and navigation channel
4. Engineered cap installed in transition and navigation channel after dredging (>10,000 ppm PCBs remain)

Remedial Design



Construction – Dredging



2016 Sediment Remediation at River Raisin[1]

[1] Source: https://www.youtube.com/watch?v=N28ArvufgxI#action=share

Construction – Dredging

- Actual removal was 29,465 cy
- On average, 324 cy dredged per day
- Water depths greater than 35 feet in navigation channel (post dredging)
- Glacial till or weathered bedrock
- Challenging dredging resulted in switching to two 12-hour work shifts 7 days per week

Construction – Environmental Controls

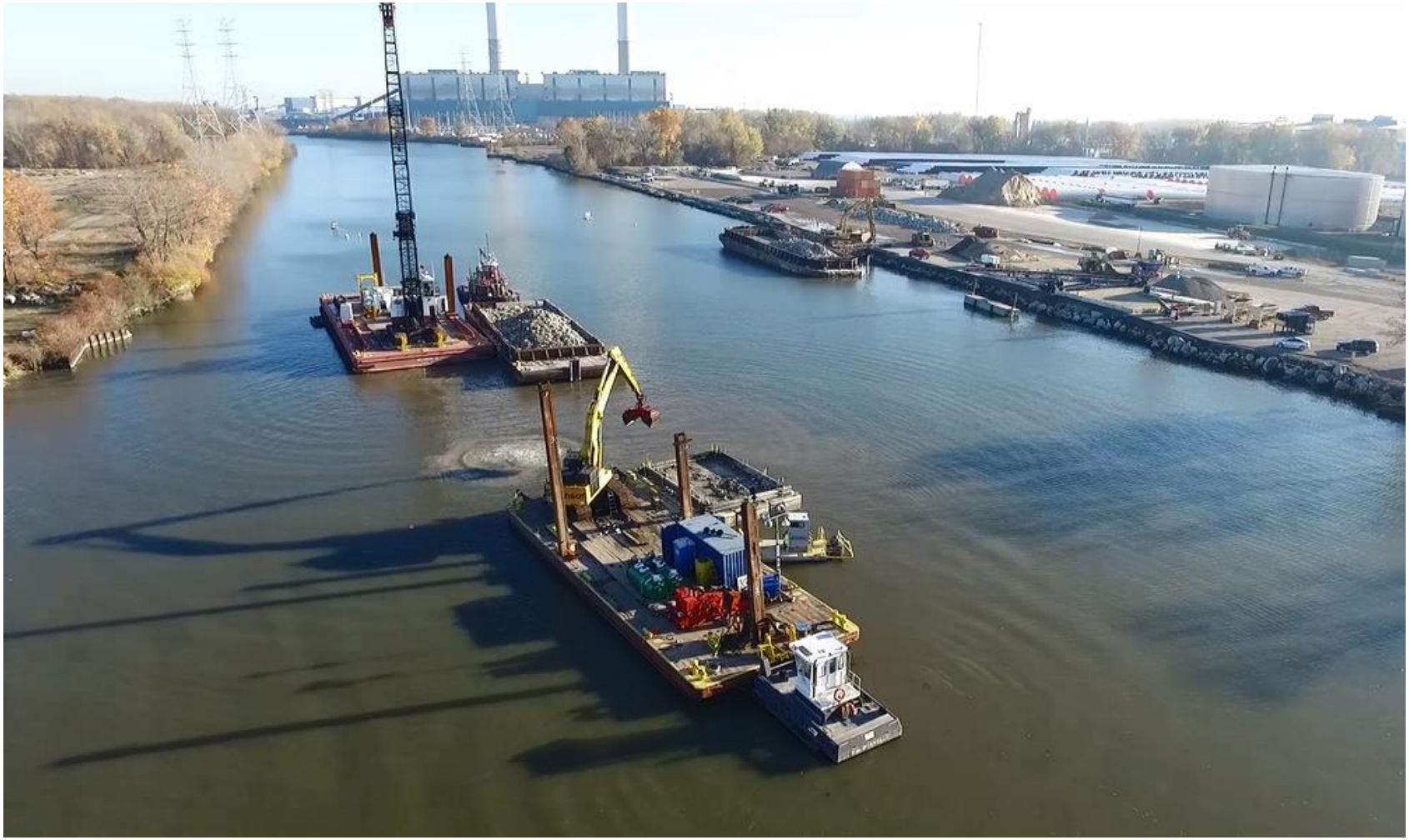
- Dual-curtain system
  - Moon pool
  - Permeable outer curtain
  - Impermeable inner curtain
- Real-time turbidity monitoring
  - Upstream and downstream sensors take readings every 10 minutes, averaged every hour
  - 1 hour average not to exceed 50 Nephelometric Turbidity Units above upstream, or 1.5 times greater than upstream, whichever is greater
  - No project exceedances attributable to dredging or capping

Construction – Sediment Processing

Construction – Stabilization and Disposal

- 62,293 tons of stabilized sediment hauled off site as TSCA waste (1,353 truckloads)
- Calciment® and Type II Portland cement
- Average dosage rate of 6%
- Processed an average 776 tons of sediment each day on a 28,900-square-foot pad

Construction – Capping



Construction – Engineered Cap

Field modification – Chemical containment layer changed to single layer with 3% organoclay by weight

Armor Layer

Filter Layer

Chemical Containment Layer

27" to 36"

6" to 12"

2 layers @ 6"

Construction – Capping

- Sand and organoclay blended onshore using series of hoppers, conveyors, and mixing augers
- Heavy liquid separation method used to determine percentage of organoclay in chemical containment layer
- Subcontractor utilized to accelerate cap installation

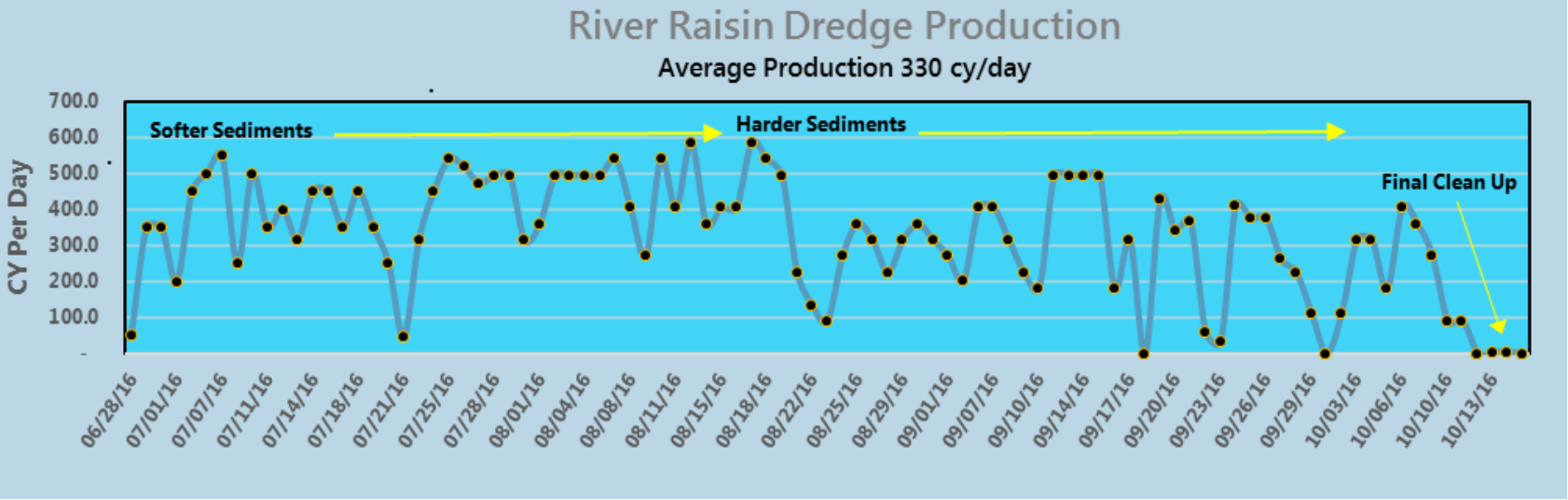
Quality Assurance

- Daily coordination
- Full-time oversight
- GPS control
  - Dredgepack®
  - ClamVision®
- Capping
  - Sand leveling
  - Depth of placement
  - Organoclay content
- Bathymetric survey

Quality Assurance

Project Metrics

- Dates: June 2016 through December 2016
- Dredged volume: 29,465 cy
- Average dredge production: 330 cy/day



Project Challenges

- Subsurface geology
- Water depth
- Surface water quality
- Vessel traffic
- Variable work schedule – up to 24 hours per day

Lessons Learned

- Developing and maintaining good working relationships with regulators and project partners was key to success
- Selection and size of equipment that can meet project schedule and constraints
- Placement methods for chemical containment layer are critical

Project Summary Video

Questions

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