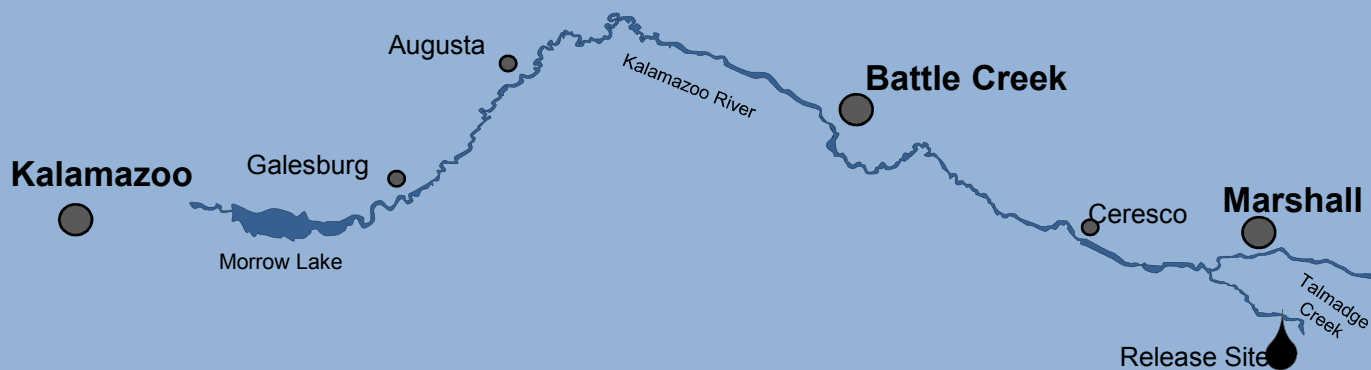




# Enbridge Oil Spill



# Source Area



August 4, 2010

# Source Area



# Source Area



August 5, 2010

# Source Area



September 20, 2012

# Source Area



September 17, 2014

# Talmadge Creek



November 11, 2011

# Talmadge Creek



September 17, 2014



# Talmadge Creek and Kalamazoo River Confluence



March 5, 2012

# Talmadge Creek and Kalamazoo River Confluence



September 17, 2014

# Frac Tank City



September 17, 2014

# Island A



September 17, 2014

# MP 4.5 Overbank Excavation



# Ceresco



September 17, 2014

# Ceresco Dredge Pad



September 17, 2014

# MP 11.25 Overbank Excavation



September 17, 2014



# Mill Ponds



August 17, 2014

# Mill Ponds Dredge Pad



September 17, 2014

# MP 21.5 Sediment Trap



September 17, 2014

# Morrow Lake Delta



July 17, 2014



# E 3.5 Boat Launch and Staging Area



September 17, 2014

# Morrow Lake Dredge Pad



September 17, 2014

# Morrow Lake



September 17, 2014

## EPA Metrics

FY2014



### 2014 Progress Under EPA Order

- Calculated 49,695 gallons of oil recovered
- 26,355 gallons directly linked to “on-pad” dredge wastes.
- Sediment Dredged 196,306 cubic yards
- Water Treated and Discharged on-site 368,123,753 gallons

### Off-Site Disposal

- |                              |                     |
|------------------------------|---------------------|
| • Non-hazardous water        | 424,933 gallons     |
| • Oil impacted debris        | 8,619 tons          |
| • Oil impacted soil/sediment | 214,046 cubic yards |



## EPA Metrics Project Total



### Progress Under EPA Orders (as of 10/06/2014)

#### - Waste shipped off site

- Haz Soil – 19,644 cubic yards
- Non-haz Soil – 327,669 cubic yards
- Non-Haz Soil and Debris – 64,815 cubic yards
- Haz Debris – 12,075 cubic yards
- Non-Haz Water – 11,934,503 gallons
- Haz Water - 3,594,579 gallons
- Oil (as recoverable crude) – 766,288 gallons
- Calculated oil total from all sources – 1,201,098 gallons



## Overview



- Drinking Water Quality
- Source Area/Talmadge Creek
- Dam removal
- Restoration & Monitoring
- Sheen Monitoring
- Risk Evaluation/Management



## Groundwater Hydrology



- Hydrogeological Investigation
  - Regional groundwater flow toward the Kalamazoo River
  - Kalamazoo River is a gaining stream, except near impoundments
  - Meander bends have localized effect on groundwater



## Drinking Water Monitoring Program



- Residential Wells
  - Approximately 200 private wells monitored
  - Line 6B contaminants not detected
- Community Wells
  - Augusta and Kalamazoo
  - Line 6B contaminants not detected



## Talmadge Creek 2011 Remedial Investigation



### Objectives:

- Assess effectiveness of 2010 removal action
- Evaluate nature and extent of remaining impacts
- Identify areas where additional removal may be considered along Talmadge Creek





## Talmadge Creek 2011 Remedial Investigation



Rapid Pace: 70 days to complete 2.5 Miles



Challenges resulted in.....



## Talmadge Creek 2011 Remedial Investigation

### Innovative Approaches

- Swamp Buggy w/direct push technology





# Talmadge Creek 2011 Remedial Investigation



## Mobile Core Logging Station



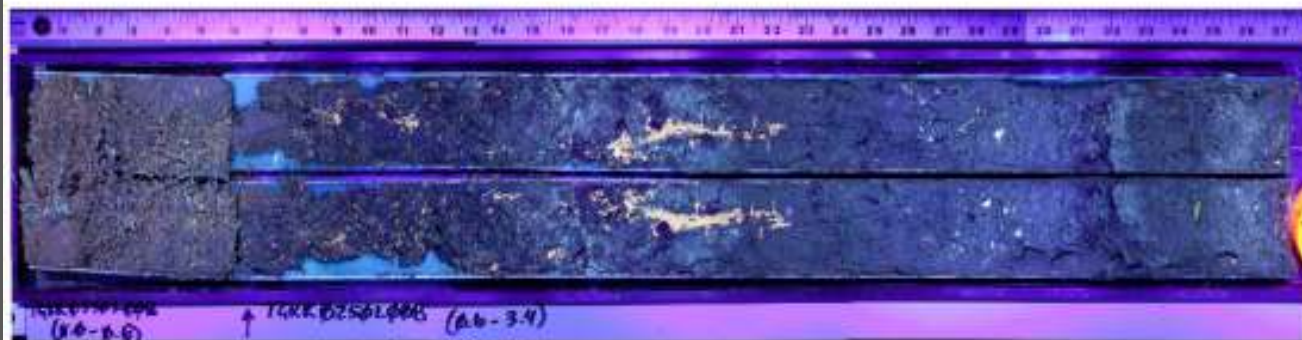




# Talmadge Creek 2011 Remedial Investigation



## Fluorescence





## Talmadge Creek 2011 – 2012 Remedial Action



- Objectives:
  - Prevent oil and/or sheen from reaching the river (source removal),
  - Prevent potential exposure to humans and wildlife (direct exposure),
  - Prevent downstream recontamination caused by mobilization of oil and/or sheen,
  - Comply with State requirements (Parts 201, 31, 301, and 303 of the Natural Resources and Environmental Protection Act)
  - Improve aesthetics of Talmadge Creek



## Talmadge Creek 2011 Remedial Action



## Impacts Observed During 2011-2012 Remedial Action



Oil accumulated in pockets in the overbanks and presented as seeps during excavation





## Talmadge Creek 2011 Remedial Action



During the scraping process oil would seep from the floor of excavations as visible in these photos.





# Talmadge Creek Restoration





# Talmadge Creek Restoration





# Ceresco Dam Removal





# Ceresco Dam Restoration







# Former Ceresco Dam 2014





What's Next?



## Residual Oil Monitoring & Maintenance



## Sediment Trap Monitoring & Maintenance





## Residual Oil Monitoring & Maintenance



## Sheen Monitoring



## Annual Poling



## Restoration and Monitoring



## Talmadge Creek Vegetation Monitoring



## Kalamazoo River Vegetation Monitoring



## Restoration and Monitoring



## Aquatic Vegetation Monitoring





## Restoration and Monitoring



- Wetland Mitigation
- Habitat Restoration
- Large Woody Debris



## Evaluate & Manage Risks



- Overbank
  - ✓ Remedial Investigation
  - ✓ No Further Action Report
- In-channel
  - ✓ Remedial Investigation - Sediment