Tittabawassee River, Saginaw River & Bay Site

Segments 4 & 5
EPA's Proposed Cleanup Options

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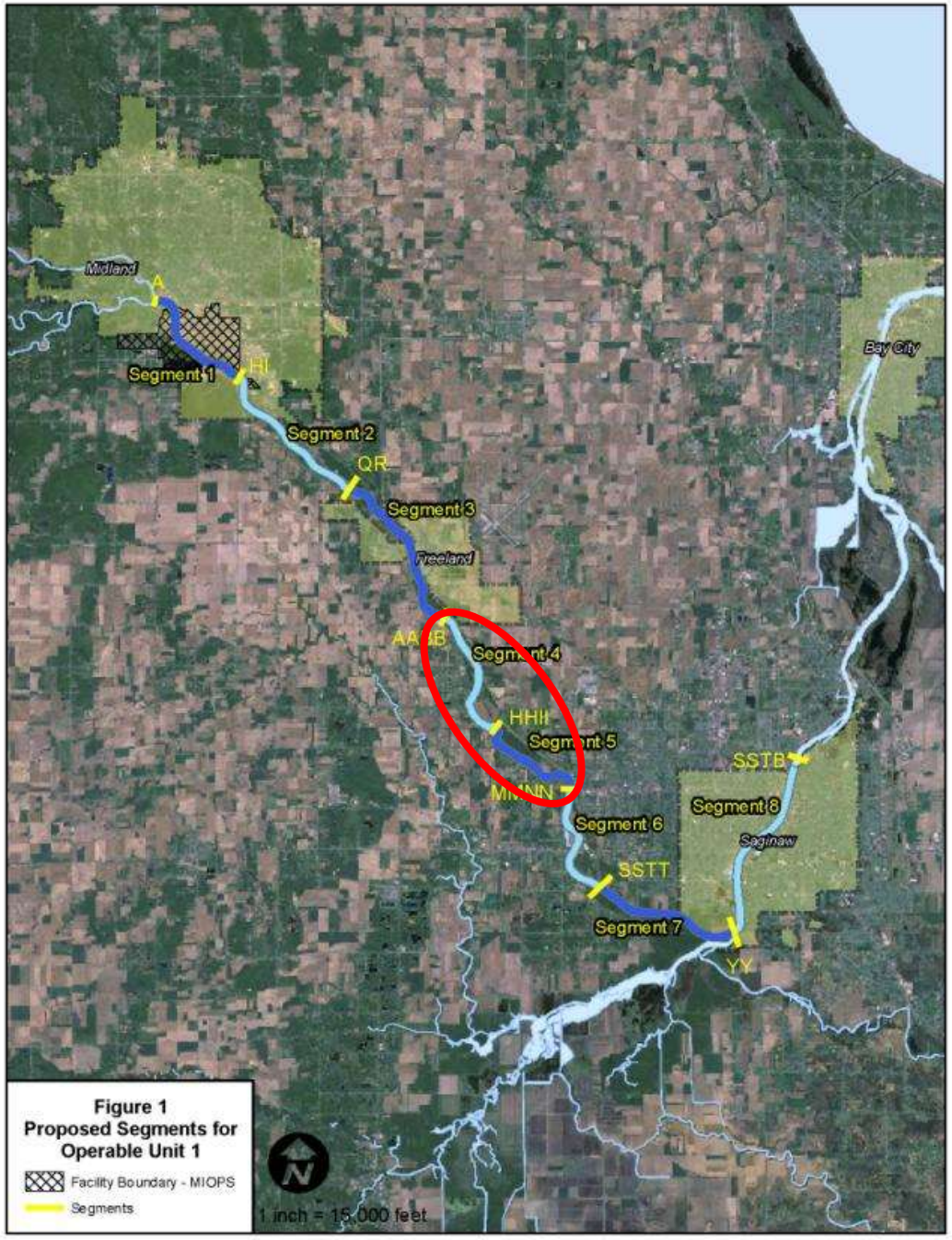
Public Meeting October 19, 2016

Segments 4 & 5

- Part of larger TRSR&B site
- Starts ~ 11.5 miles downstream of Tridge
- Cleanup options are proposed by EPA for
  - 16 Bank Management Areas (BMAs)
  - 2 Sediment Management Areas (SMAs)
- Cleanup expected to begin in 2017

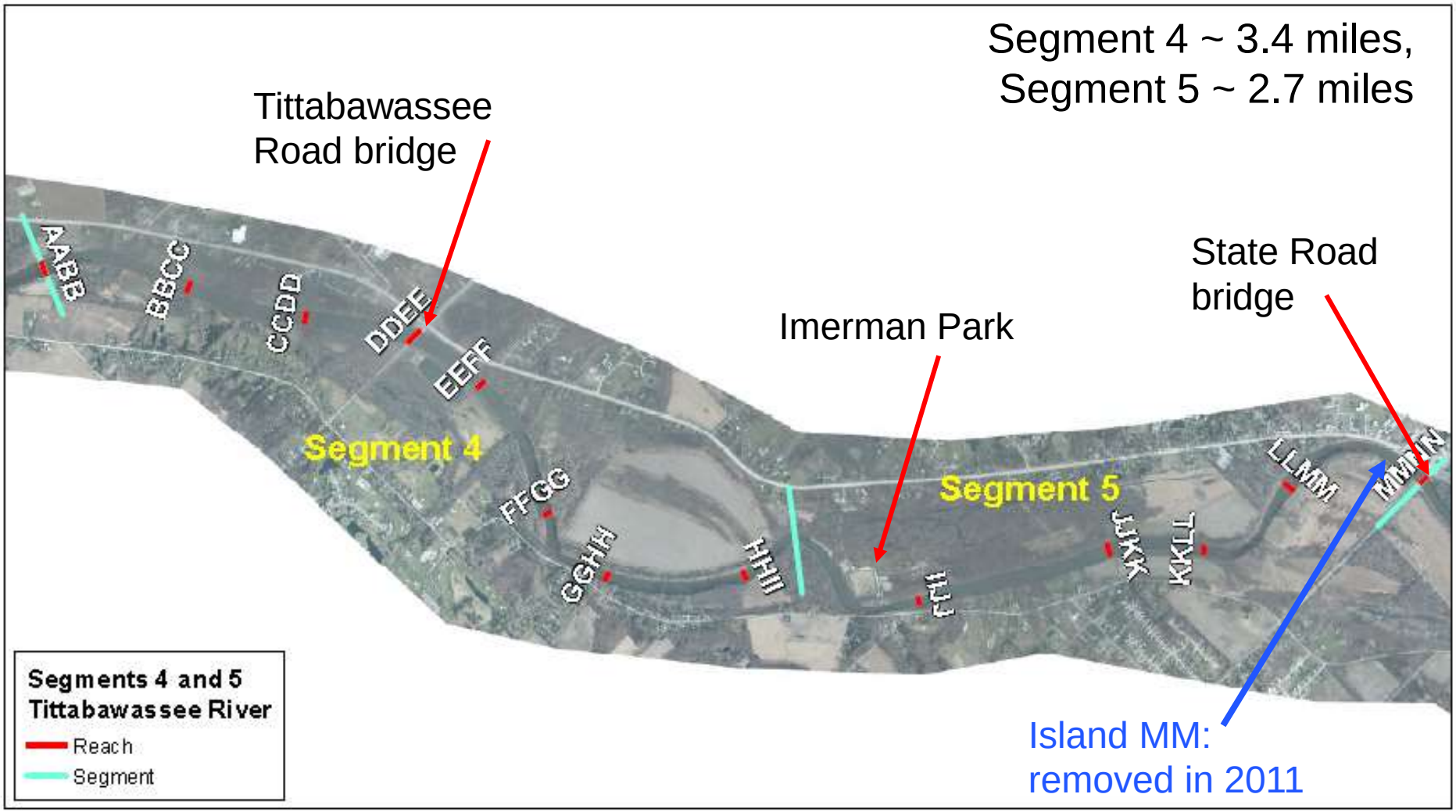


EPA's Proposed Options

- Bank Management Areas
  - BMAs 4-1 through 4-6 and 5-1 through 5-10 → stabilize riverbanks
- Sediment Management Areas
  - SMA 5-1 → combination of removal, capping, and monitored natural recovery (MNR)
  - SMA 5-2 → capping

Segments 4 & 5

Use along river includes residential, undeveloped, agricultural, and recreational areas



Segments 4 & 5 Investigations

Extensive investigations within Segments 4 & 5:

- Chemical sampling and analysis
- Stability evaluations
- Biological evaluations

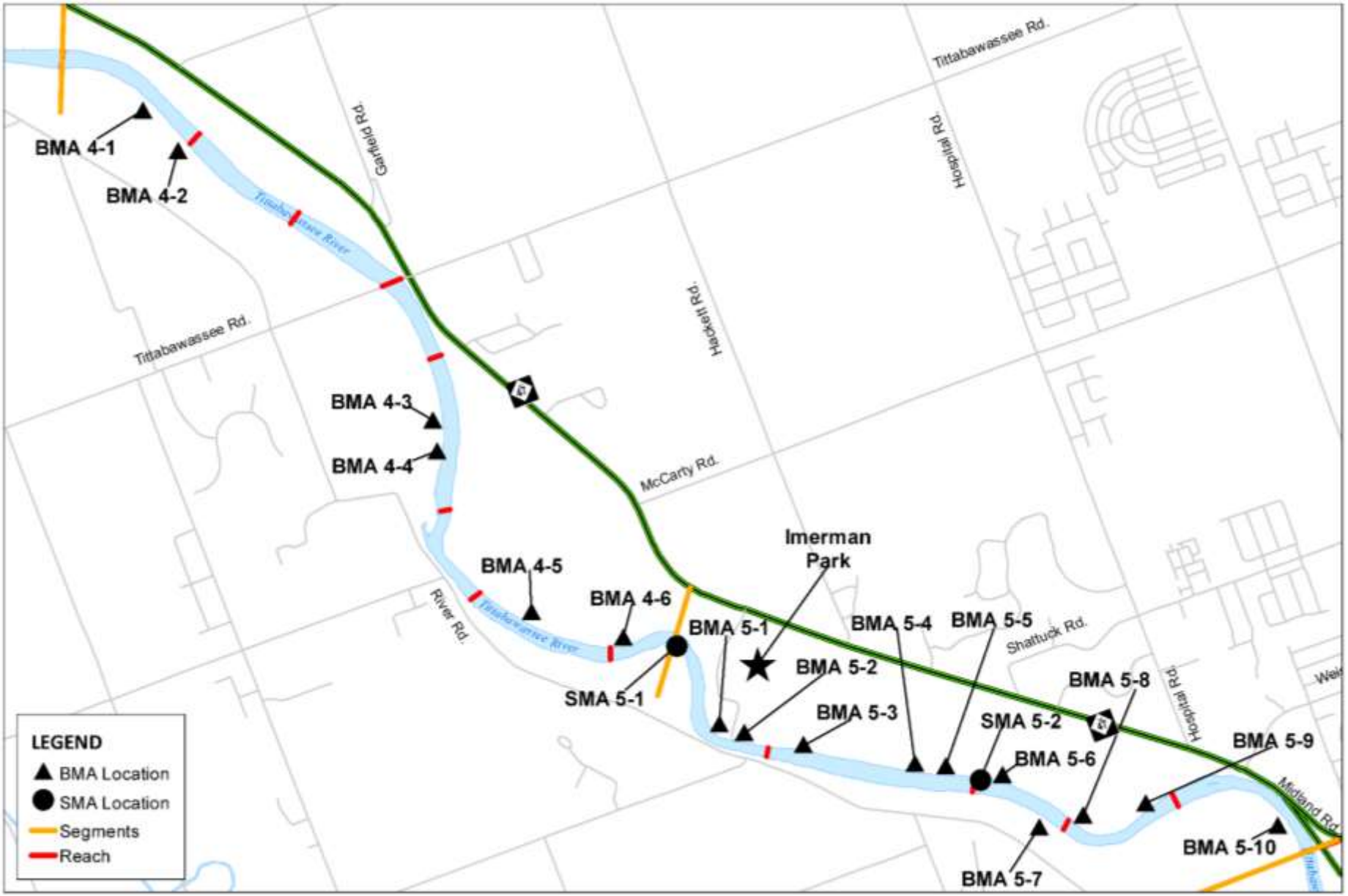
Segments 4 & 5 Key Findings

- Dioxins/furans identified as key driver for Segments 4 & 5 sediment and bank soil
- Dioxins/furans are not evenly distributed within Segments 4 & 5
- Riverbank and sediment erosion varies
- Specific areas have been identified that will need cleanup

Segments 4 & 5 Management Areas

- BMAs
  - 16 currently identified
  - Range between 150 – 650 feet
  - About 1.1 miles total
- SMAs
  - 2 currently identified
  - Each about 0.7 acres
- Evaluations are ongoing
  - More areas may be identified

Segments 4 & 5 Management Areas (cont.)



Why Clean Up?

- Contaminated sediment deposits and riverbanks
  - Potential sources of dioxins/furans to the overall river system if they erode

- If these sources erode they may contribute to:
  - Bioaccumulation in fish
  - Downstream movement of contaminants

BMA CLEANUP OPTIONS

BMA Technologies

- **BMA Alternative 1: Stabilization** relies on natural and engineered approaches to reduce or prevent riverbank erosion. Native vegetation is always a key component.

- **BMA Alternative 2: Removal** involves the removal and off-site disposal of the targeted bank deposit using heavy equipment.

Riverbank Stabilization – Major Advantages/Limitations

- Advantages
  - Less disruption during construction
  - Less change to property and riverbank shape
  - Improves habitat quality
  - Cost effective

- Limitations
  - More short-term maintenance needed
  - Contaminants remain in place
  - Long-term monitoring required and possibly maintenance

Bank Stabilization

Banks after 1 – 3 growing seasons

Riverbank Removal – Major Advantages/Limitations

- Advantages
  - Least uncertainty about long-term performance
  - Flexibility for future land use
- Limitations
  - Significant disruption during construction
  - Removes existing habitat
  - Significantly changes riverbank shape and structure
  - May cause unintended changes in other banks
  - Implementation usually more costly and complex

Bank Removal

Bank Removal and Disposal

Recommended BMA Options

- All BMAs → stabilize riverbanks
- Major considerations
  - Expected land owner/ community acceptance
  - Trade offs related to short and long-term effects
  - Potential impact on adjacent areas
  - Access and ability to assure long-term O&M
  - Cost effectiveness

SMA CLEANUP OPTIONS

SMA Technologies

- **MNR** relies on monitoring of natural processes to maintain or reduce contaminant levels and risks over time.

- **Capping** involves placing clean material like sand or gravel over contaminated sediment or letting geocell material fill naturally to isolate and stabilize the underlying sediment. Caps are designed to prevent erosion.

- **Removal** involves taking sediment out of the river in wet or dry conditions using heavy equipment. Water is managed, and the sediment is disposed in an approved location.

Segments 4 & 5 SMA Alternatives

- Each individual technology is an alternative for SMA 5-2
- Technologies were combined to create alternatives for SMA 5-1

SMA	Alt 1	Alt 2	Alt 3	Alt 4
5-1	MNR	Cap & MNR	Remove & MNR	Remove, Cap & MNR
5-2	MNR	Cap	Remove	---

MNR – Major Advantages/Limitations

- Advantages
  - Non-invasive
    - Protects existing habitat
    - No construction or infrastructure
  - Low implementation cost

- Limitations
  - Contaminants remain in place
  - Can be slower in reducing risks compared to active approaches
  - Long-term monitoring required

Capping – Major Advantages/Limitations

- Advantages
  - Rapid risk reduction
  - Less infrastructure/disruption during construction
  - Can improve habitat quality
  - Cost effective
- Limitations
  - Contaminants remain in place
  - Long-term monitoring required and possibly maintenance

Sediment Capping – Sand/Stone

Sediment Capping – CCS

Dredging/Removal – Major Advantages/Limitations

- Advantages
  - Removes contaminants from river
  - Least uncertainty about long-term performance, if low residual levels achieved
  - Rapid risk reduction, if low residuals levels achieved

- Limitations
  - Significant infrastructure/disruption during construction
  - Residuals and resuspension
  - Implementation more costly and complex

Sediment Removal – Wet

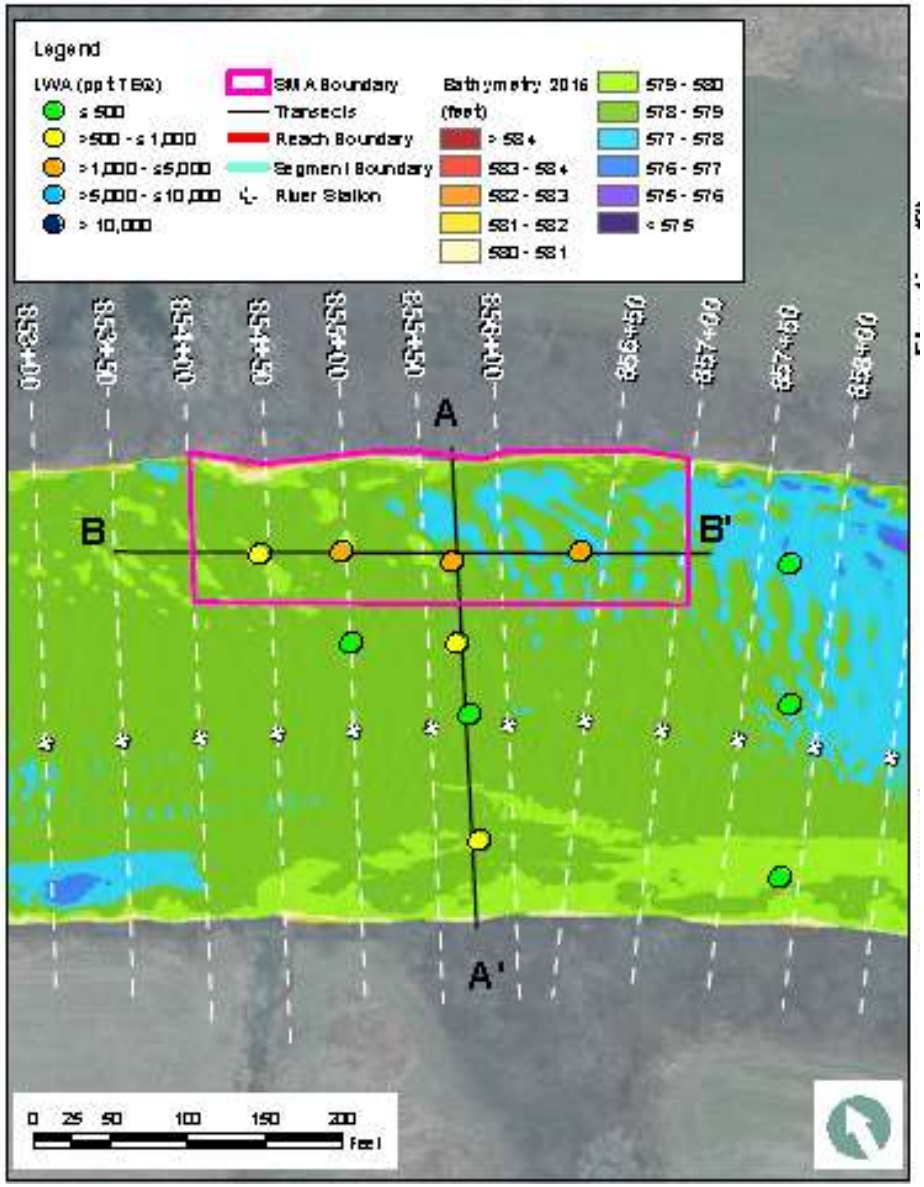
Sediment Removal – Dry

Recommended SMA Options

- Recommended Options
  - SMA 5-1 → Alt 4: combo of remove, cap and MNR
  - SMA 5-2 → Alt 2: cap (likely CCS cap)

- Major considerations
  - Contaminant depth and profile
  - Stability evaluations
  - Adjacent work needed
  - Implementation challenges
    - Access and staging availability
    - Water depth/construction issues

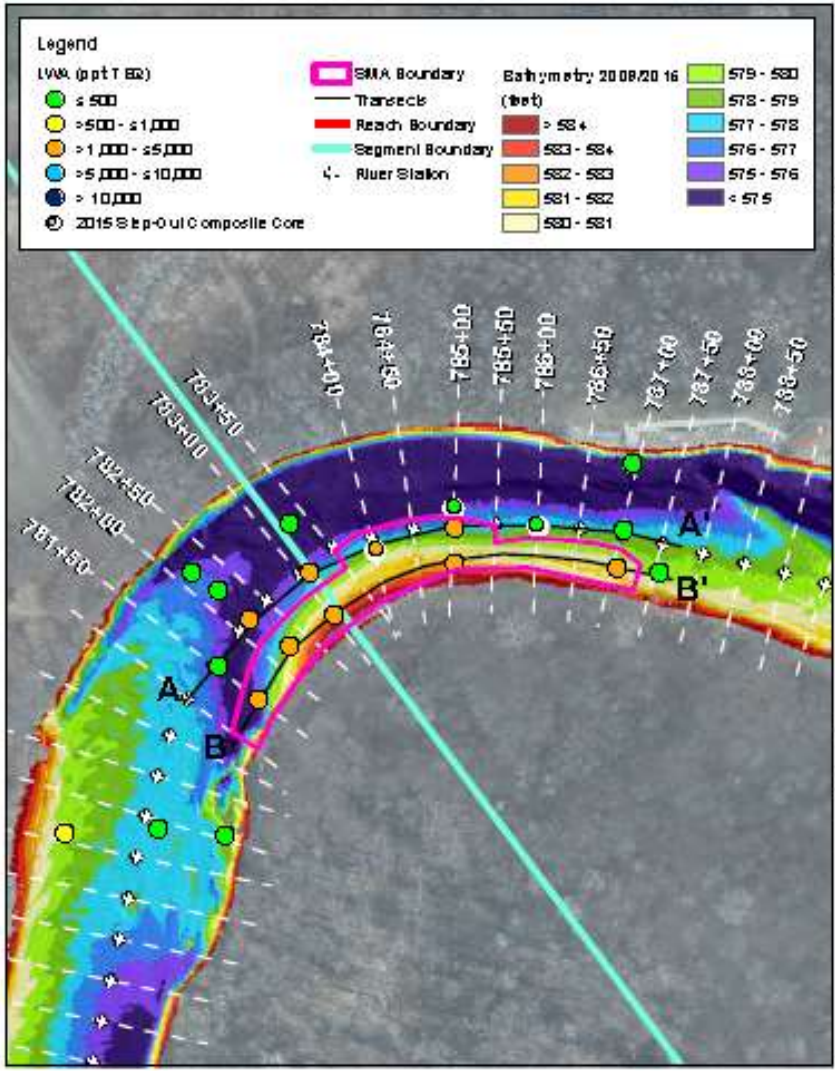
SMA 5-2, ~ 0.7 acres



- Directly adjacent to BMA 5-6
- Dioxin deposit is buried below 1.0 to 1.7 ft
- Relatively stable area
- Road: ~ 1,700-ft through a sparsely wooded area

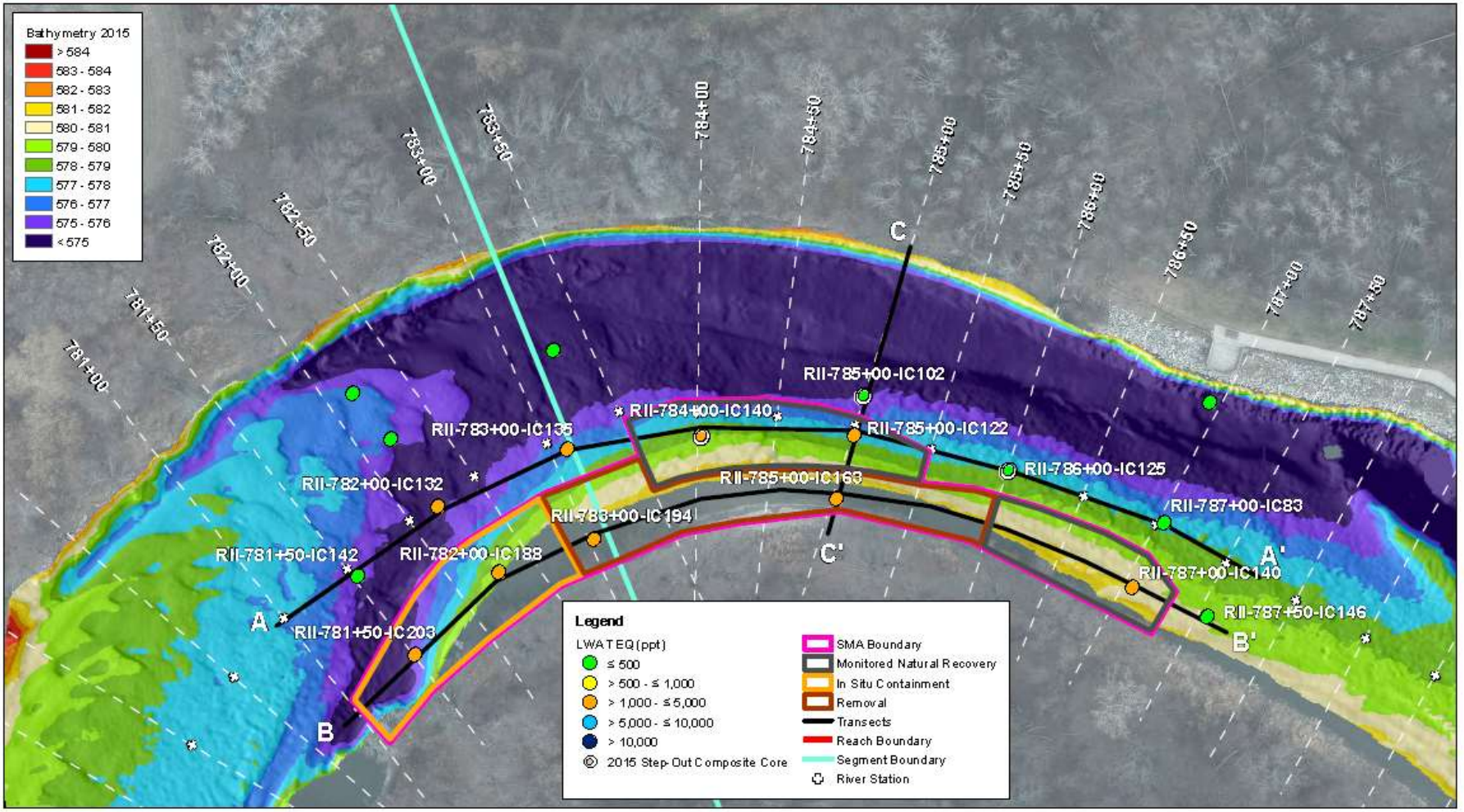
BMAs 5-4 thru 5-9 and SMA 5-2

SMA 5-1, ~ 0.7 acres



- Not near other work
- Dioxin deposit depth varies
  - Some close to surface
  - Mid-channel and downstream is buried below > 2 – 4 ft
- Upstream end has deep water
- Road: ~ 1,400-ft through an existing open field, and ~ 650-ft through a wooded area

Conceptual SMA 5-1 Combined Remedy



BMA 4-6 and SMA 5-1

SELECTING THE FINAL CLEANUP PLAN

EPA's Proposed Options

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EPA's Evaluation Criteria

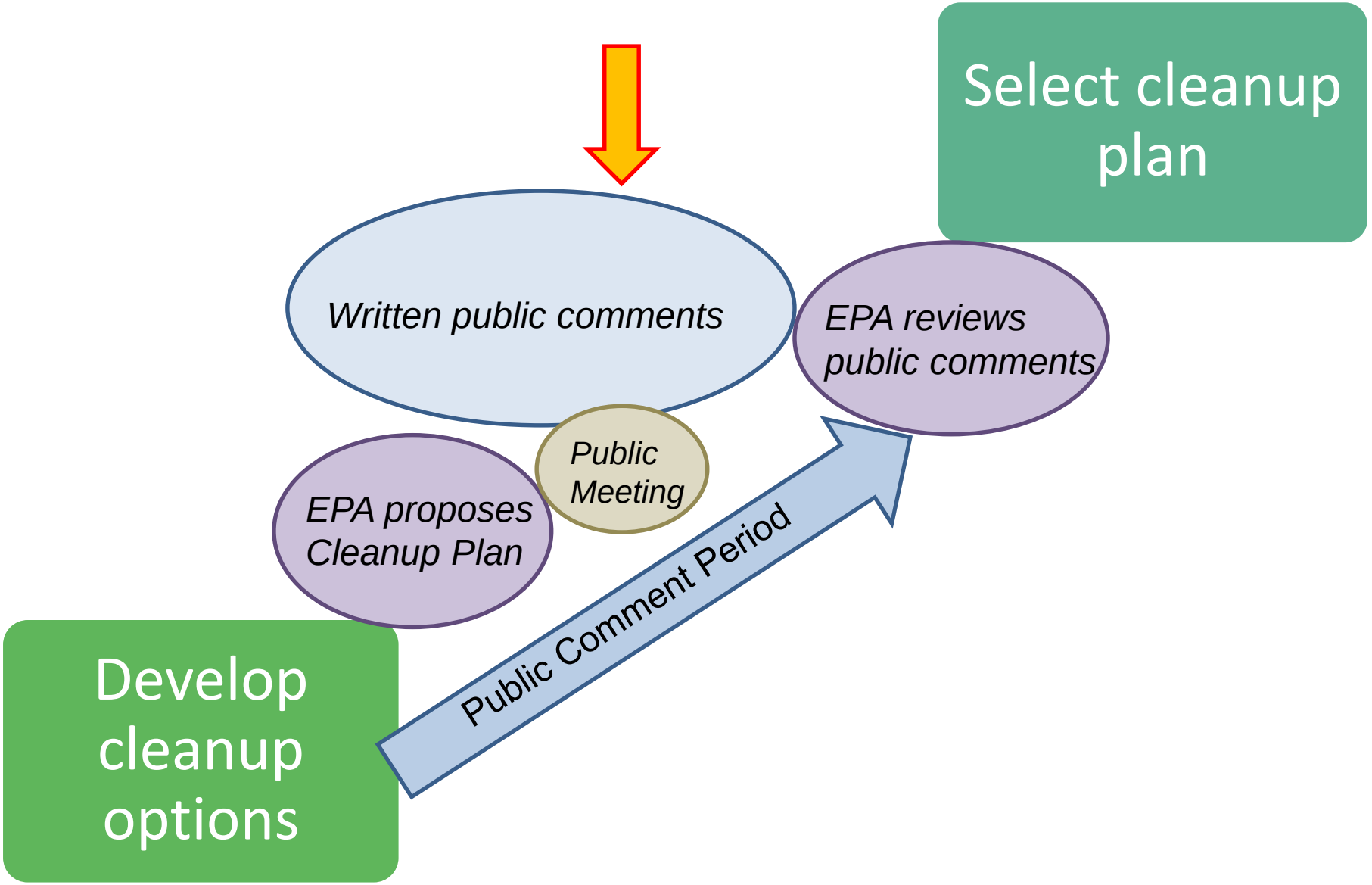
- Effectiveness
  - Overall protection
  - Compliance with laws and regulations
  - Short- and long-term effectiveness
- Implementability
  - How difficult to complete
  - Owner/ community acceptance
- Cost
  - EPA's estimated costs for the proposed Segment 4 & 5 cleanups range from $5.2 million to $6 million

Recommended Alternatives

Recommended alternatives – best balance of effectiveness, implementability and cost

- Provides long-term effectiveness and permanence
- Minimizes short-term effects
- Can be built and are reliable to maintain

Public Process



Public Comment Period

- Public comment period for 45 days
  - September 22 to November 6

- Submit comments
  - Orally – here tonight
  - Written – submit here or via mail
  - Email to russell.diane@epa.gov
  - Use the on-line form https://www.epa.gov/mi/forms/tittabawassee-river-saginaw-river-and-bay-site-public-comment

Next Steps

- EPA, working with MDEQ, will review and respond to public comments
  - The plan may change based on comments
- EPA, working with MDEQ, will finalize the plan
- Dow will design the remedies
  - Working with affected property owners
- EPA expects Dow to implement this work beginning in 2017

EPA Tittabawassee River, Saginaw River and Bay Cleanup Progress

Reaches B and J/K - Removed riverbank soil

Reach O - Removed in-channel sediment

Riverside Boulevard - Removed soil

Reach B - Capped sediment

Reach O - Stabilized riverbank

Reach J - Conducted sediment capping pilot study

2007

2008

2009

2010

Reach M - Stabilized riverbank

West Michigan Park - Removed soil and stabilized riverbank

MM Island - Removed soil and capped sediment

Reach D and Wickes Park - Dredged sediment

Reach N - Stabilized riverbank

Segment 1- Capped sediment

Segment 1- Recovered DNAPL, a highly contaminated oily liquid

2011

2012

2013

2014

Segment 2 - Stabilized riverbank

Segment 2 - Removed in-channel sediment

Segment 1- Isolated contaminated sediment with sheet pile

Segment 1 - Capped sediment

Reach K - Conducted sediment capping pilot study

Floodplain properties - Installed barrier controls

END