

2019 IAFSM Annual Conference

Technical Session 4A

The Estabrook Dam Removal

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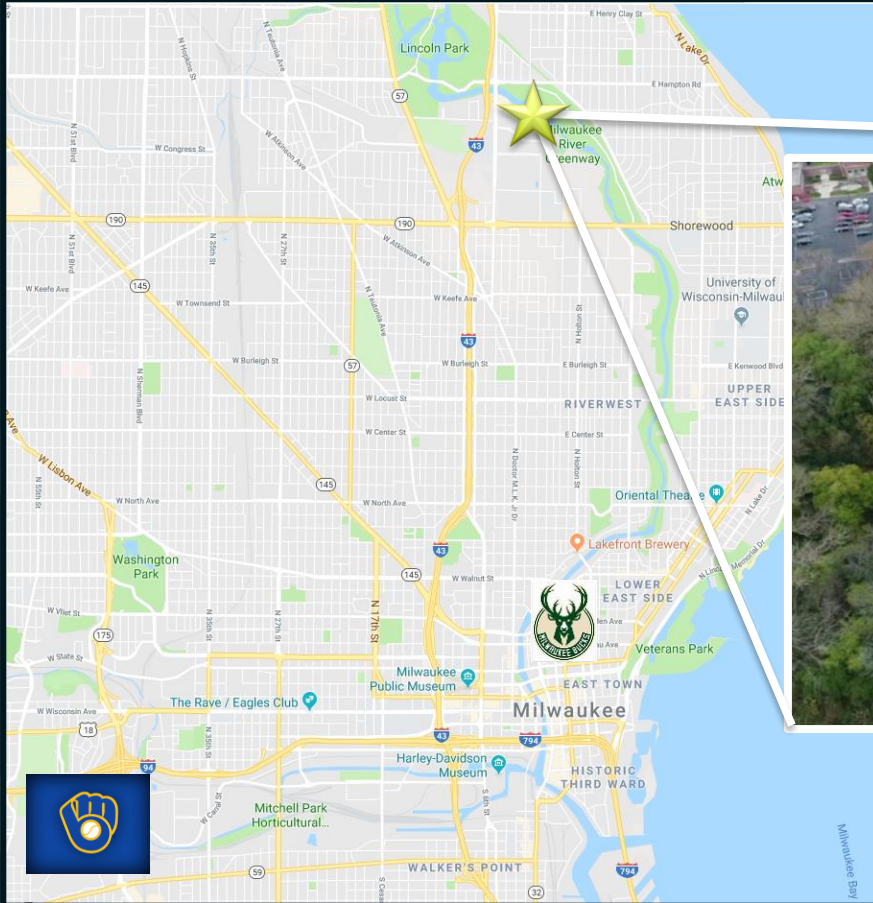


Acknowledgments:

- Milwaukee Metropolitan Sewerage District (MMSD): Owner
- AECOM Technical Services: A/E of Record
- Terra Engineering and Construction: Contractor
- Milwaukee Riverkeeper – Advocacy organization working for swimmable, fishable rivers throughout the Milwaukee River Basin



Project Location:



Estabrook Dam:

- Milwaukee River
- Low Hazard Dam
- Constructed in 1930's
- Normal Pool Impoundment : 200-acre-ft
- Flood Pool Impoundment: 700 acre-feet
- Spillway capacity: 25,800 cfs

1937 Dam Construction:

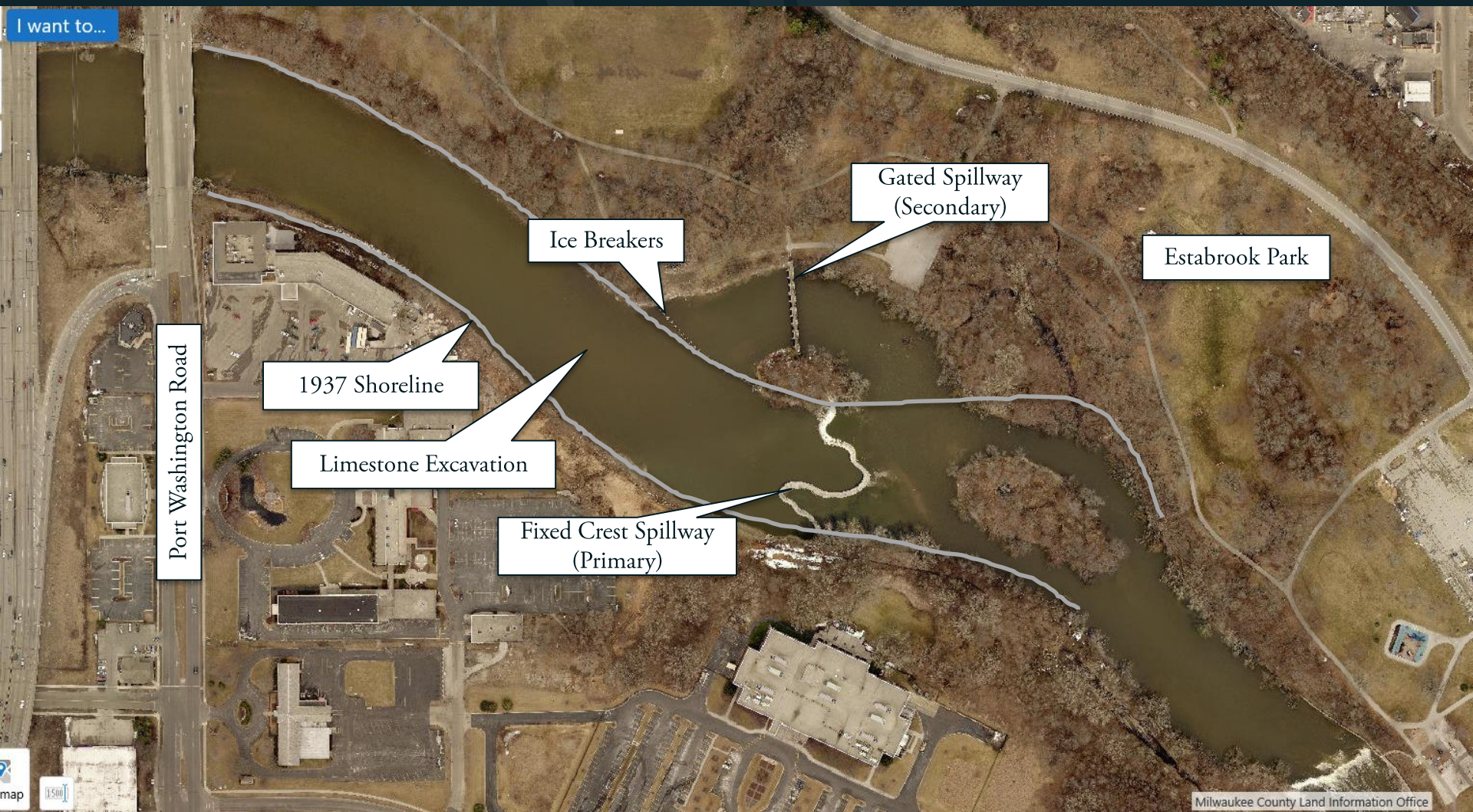


I pledge you, I pledge myself, to a new deal for the American people.

(Franklin D. Roosevelt)



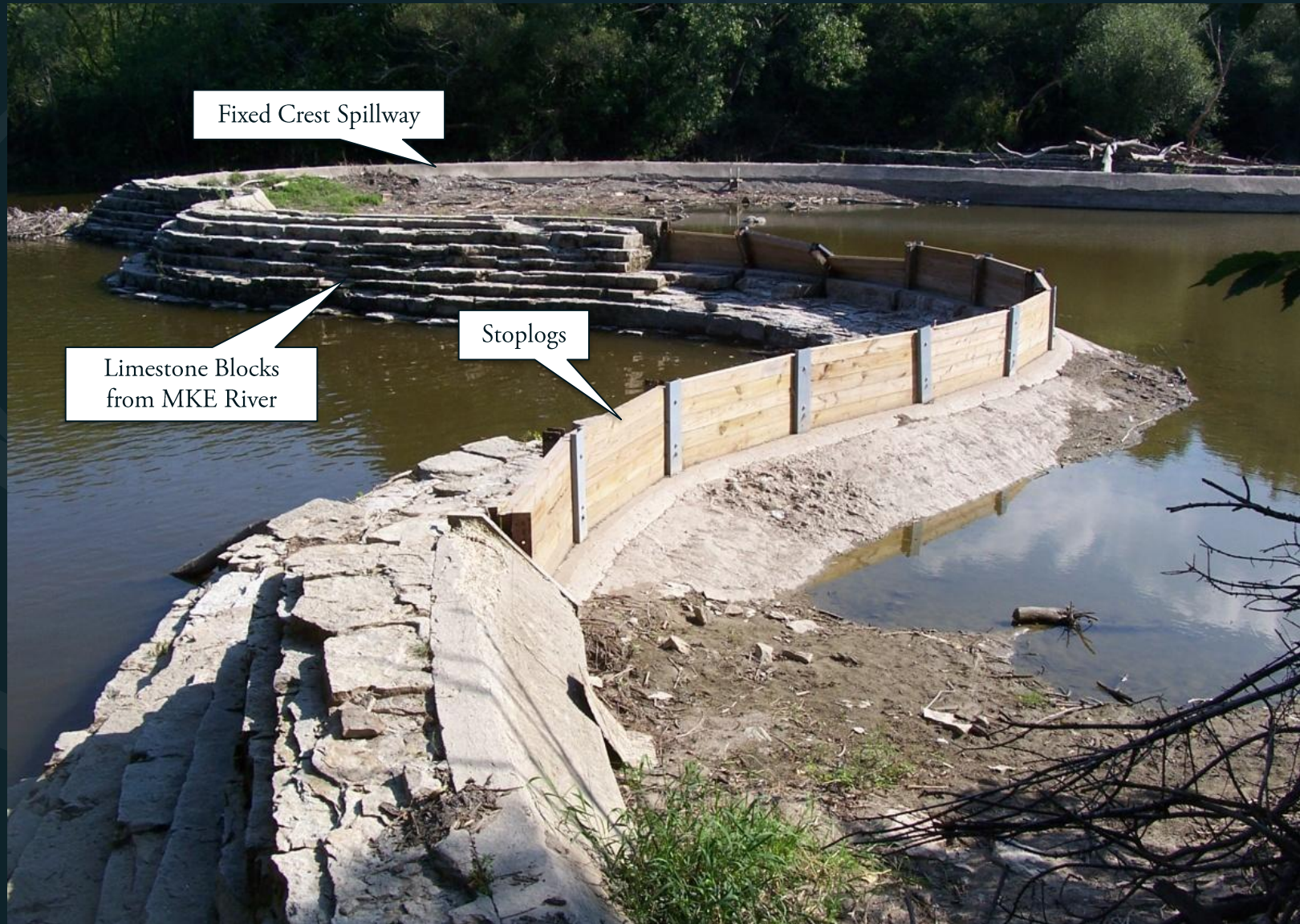
1937 Dam Construction:



Gated Spillway:



Fixed Crest Spillway:



2008 WDNR Inspection:

- WDNR Ordered Inspection
- Consultant & WDNR noted dam safety deficiencies
 - Upgrade Gates
 - Remove Trees
 - Remove Woody Debris
 - Perform Structural analysis
- Gates opened for drawdown in summer 2008



WDNR Order to Remove or Repair
Estabrook Dam Drawdown

AECOM Dam Repair Bid Documents

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

2014 EPA Sediment Cleanup:



Sand Cover over Residual PCB's

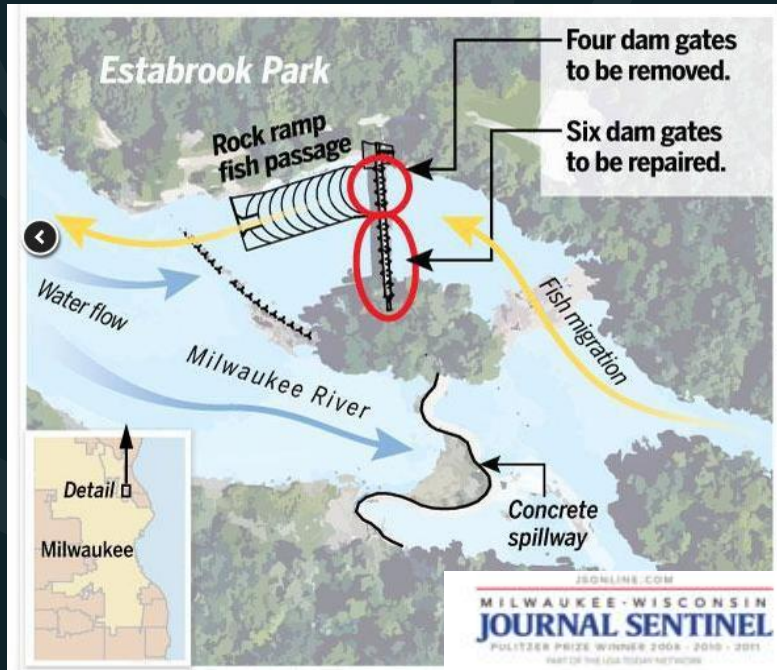
EPA Phase 2

EPA Dredging Project
AECOM Feasibility Study

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

2016 Dam Repair & Fish Passage:

- Engineer's Estimate – \$3.4 Million
- Low Bid Received - \$4.1 Million
- Milwaukee County → Insufficient funding → Project put on hold
- Opened Opportunity for Dam removal once again...



2016 Design

- Fish Passage through 4 left gates
 - Target Species: Northern Pike
- Gate Replacement
- Concrete Repairs
- Spillway Upgrades

AECOM Fish Passage
Bid Documents

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Dam Ownership Transfer

- City of Milwaukee re-zoned a parcel of Estabrook Park to non-park use
- Through a unique state law that was only recently enacted, a three-person panel sold parcel to MMSD for \$1
- MMSD then transferred Milwaukee County after removal



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Ownership Transfer /
Dam Removal Design

Dam Removal Outreach

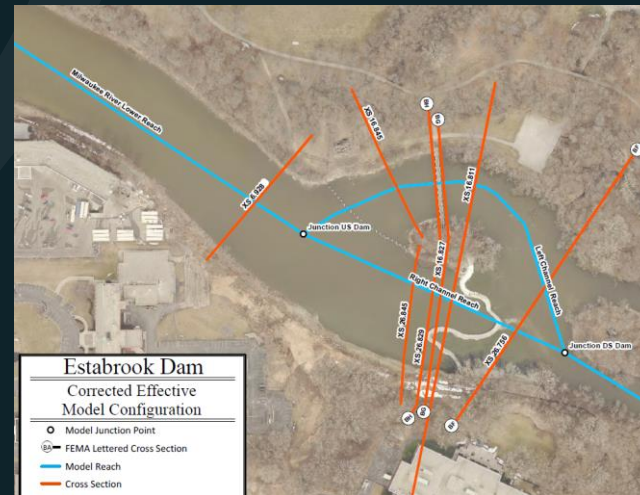
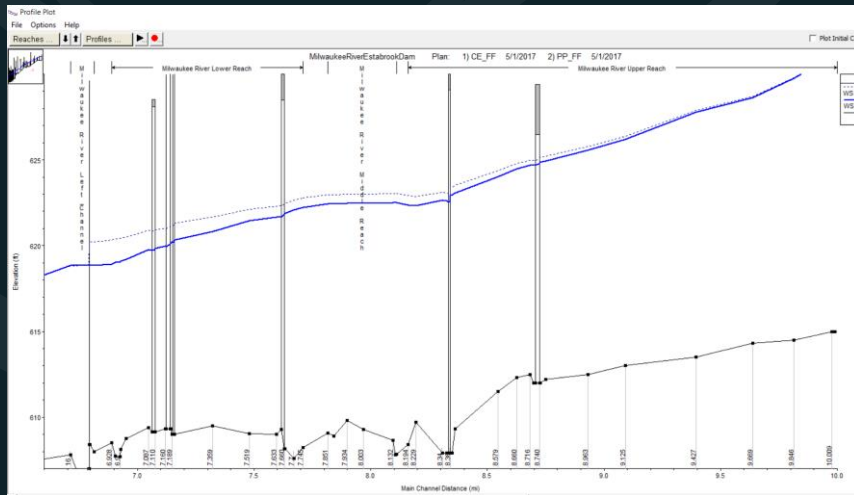
- Public Outreach – Project was contentious and high-profile
 - Government stakeholders
 - Vocal citizen groups for and against dam removal
- Two public information meetings
 - MMSD accepted written comments
 - 87% supporting dam removal unconditionally



Ownership Transfer /
Dam Removal Design

Dam Removal Process

- HEC-RAS Hydraulic Analysis
 - Dam in place (gates open)
 - Dam in place (gates down)
 - Dam Removed
- Milwaukee River Flow Conditions
 - Flood Flows (10-,50-,100-,500-year recurrence interval)
 - Low Flows (low, median, mean, spring runoff)



Ownership Transfer /
Dam Removal Design

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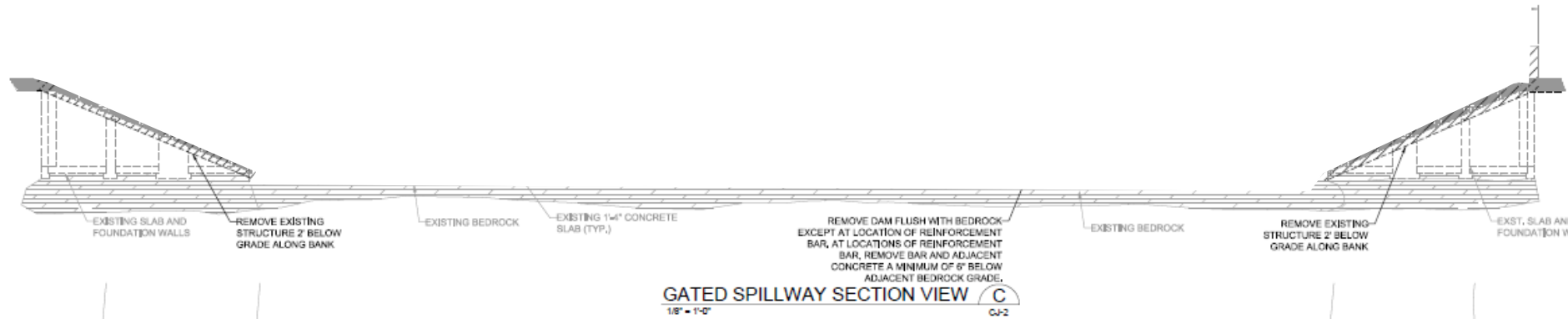
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Dam Removal Process

- Gated Spillway
 - Removed to bedrock in the river channel
 - Removed to shoreline on the river banks



Ownership Transfer /
Dam Removal Design

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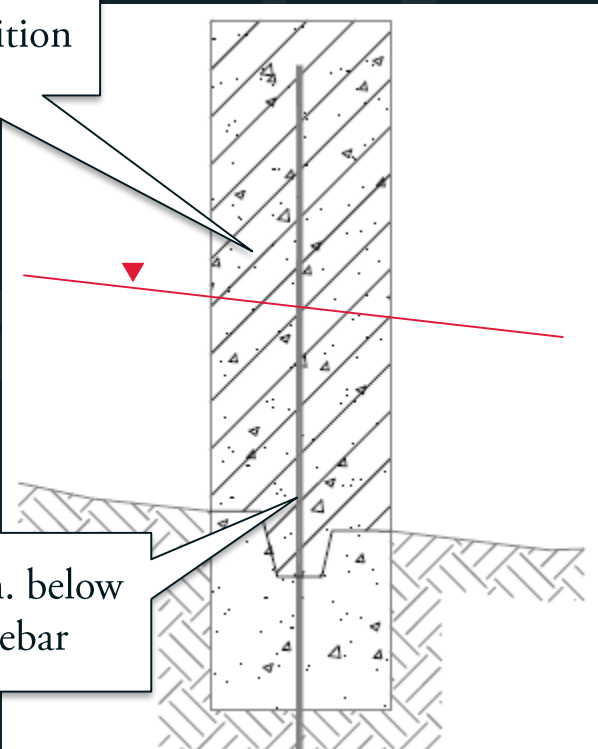
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Dam Removal Process

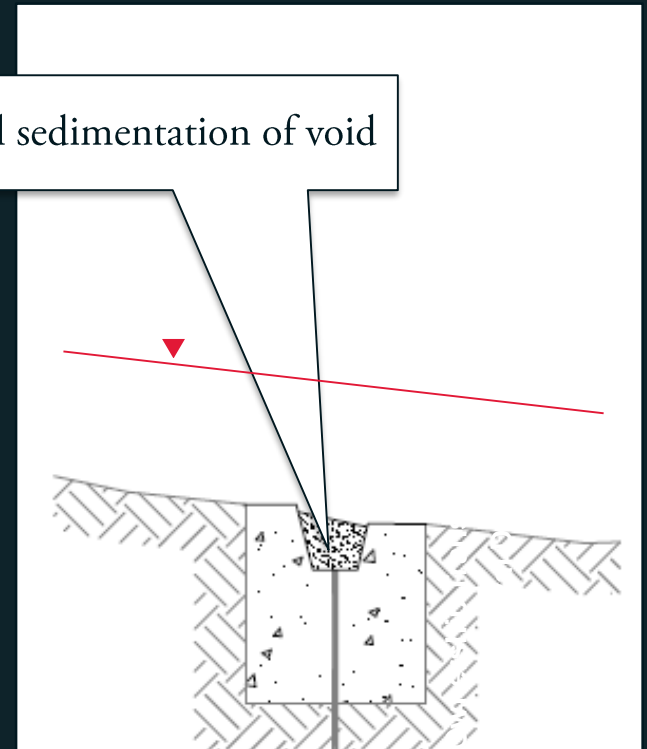
- Fixed Crest Spillway
 - Removed to bedrock in the river channel
 - Removed to shoreline on the river banks

Dam Demolition



Removal 6" min. below river bed at rebar

Natural sedimentation of void



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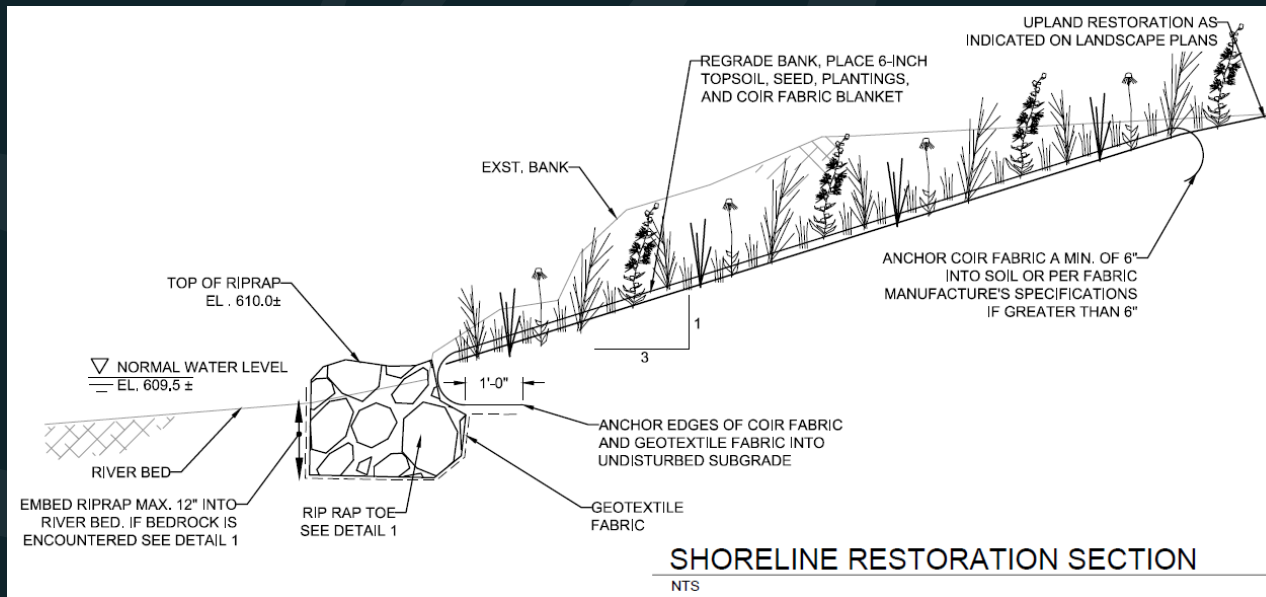
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Dam Removal Process

- Streambank Restoration
 - Geomorphology Study
 - Field Assessment
 - Shear stress analysis
 - Hydraulic model



Ownership Transfer /
Dam Removal Design

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Permitting

- Municipal (City of Glendale, MKE County)
 - Floodplain Development
 - Erosion Control
- WDNR Permits
 - Dam Removal
 - Wetland Disturbance
 - Dredging (Sediment Removal)
 - Erosion Control
- USACE – Section 404 / Nationwide Permit
 - Wetlands
 - River Bed Disturbance (Waters of the U.S.)
 - Historical and Archeological Review & Mitigation

Ownership Transfer /
Dam Removal Design

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Construction



- Schedule
 - Bid on October 24, 2017
 - Six Bids Received
 - Engineers Estimate - \$1,700,000 Million
 - Low Bidder - \$845,000
 - MMSD Received \$2,300,000 in grant funding for design and construction
 - Contract Awarded: December 4, 2017
 - Notice to Proceed: January 19, 2018
 - Contractor Mobilized: February 12, 2018
 - Substantial Completion: July 31. 2018
 - Three-year Maintenance Agreement for Shoreline Restoration

Dam Removal

2008 — 2009 — 2010 — 2011 — 2012 — 2013 — 2014 — 2015 — 2016 — 2017 — 2018

Why a Sewerage District Demolished a Dam

- MMSD 2035 Vision includes integrated watershed management
- 2,500 structures removed from the floodplain since 1999
- 1,300 structures remain at flood risk
- The dam removal; reduces the current mapped floodplain upstream by taking more than 50 homes out of the floodplain.
- Updated FIRMs not yet available.
- Improved water quality
- Improved aquatic habitat
- Financially sustainable alternative for the community

2008 — 2009 — 2010 — 2011 — 2012 — 2013 — 2014 — 2015 — 2016 — 2017 — 2018

Access Roads



Dam Removal

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Cofferdam and Sediment Removal



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Ice Breaker Demolition



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Dam Removal

Gated Spillway Demolition



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Dam Removal

Fixed Crest Spillway Demolition



Dam Removal

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Material Management

- Sediment: 700 Tons
- Concrete: 1,425 Cubic Yards
- Limestone Block 1,240 Cubic Yards
- All Concrete and Limestone crushed and recycled



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Dam Removal

Post Construction



Post Construction

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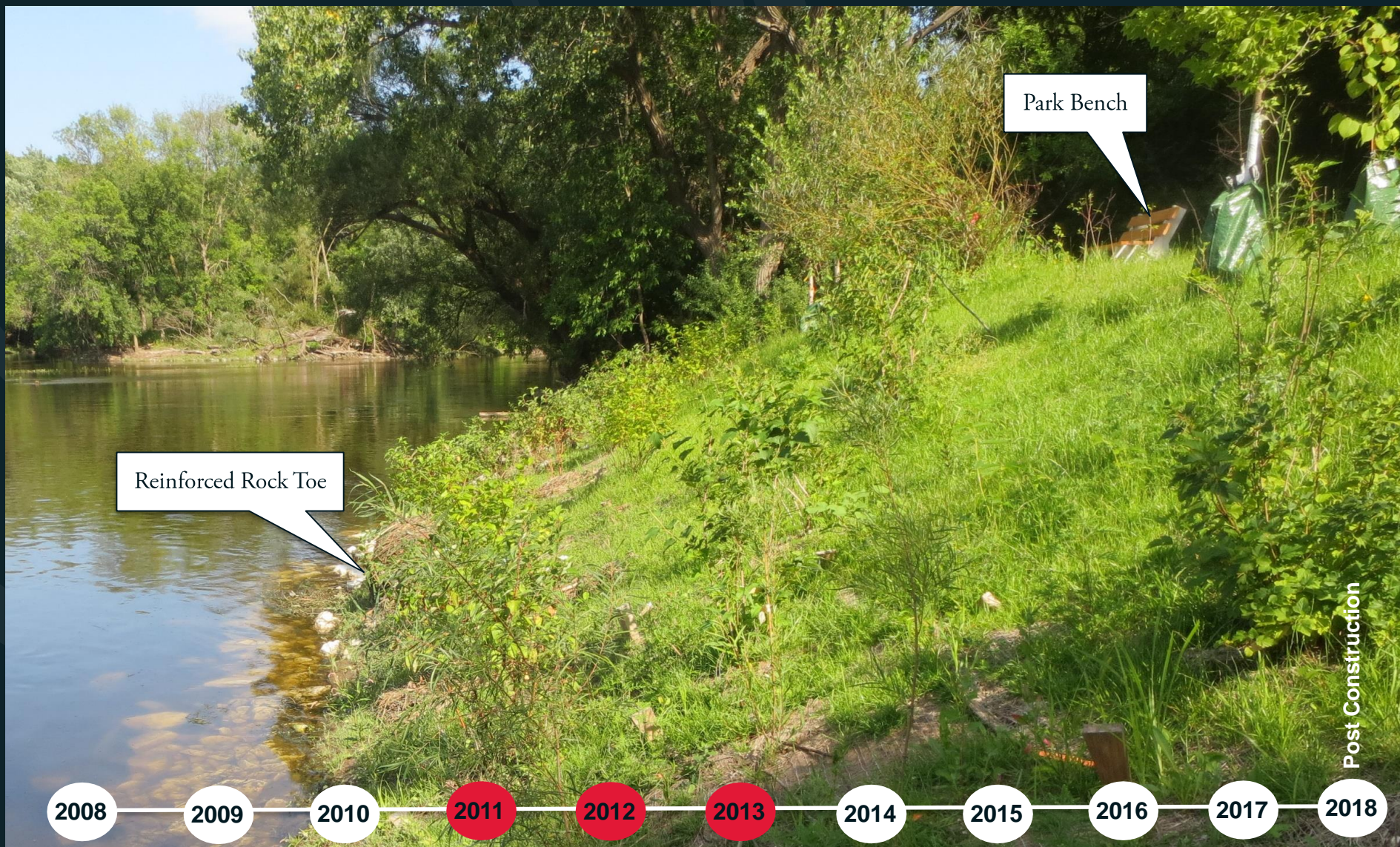
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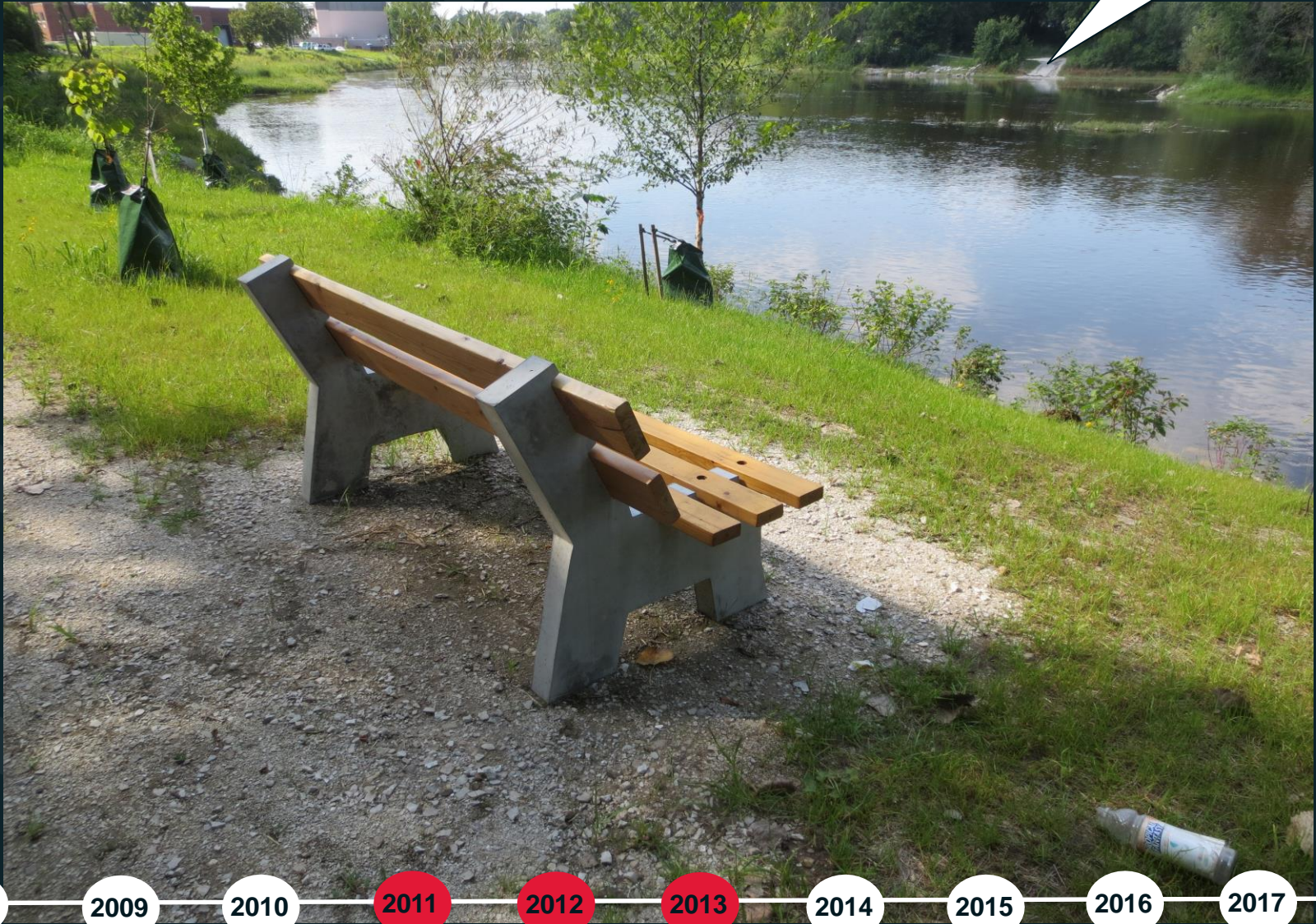
Post Construction



Post Construction

Post Construction

Canoe / Kayak Launch



Post Construction

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Post Construction



Post Construction

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Thank You!

- Questions?
- Concerns?
- Queries?
- Requests?
- Lunch Time?