



Estabrook Dam – A Discussion of Alternatives

Public Scoping Meeting
June 5, 2014

Presenters

- Kevin Haley, PLA, Milwaukee County
- Don Pirrung, P.E., PH, AECOM
- Mike Hahn, P.E., PH, Southeastern Wisconsin Regional Planning Commission (SEWRPC)

Background

- Estabrook Dam built in 1930's
- Limestone outcrop created pool upstream
- Rock outcrop removed to reduce upstream flooding
- Dam with gates built

Background

- DNR Administrative Order in 2009 required County to repair or abandon dam
- Dam requires structural improvements, gate upgrades, some tree removals
- Retained AECOM in 2010 to investigate dam, design improvements, and assess sediment
- Milwaukee Riverkeeper sued County claiming dam is a public nuisance
- County is proceeding with an Environmental Assessment
- USEPA, County, and DNR are proceeding with Phase 2 of sediment removal in 2014

Environmental Assessment

- National Environmental Policy Act (NEPA) and Wisconsin Environmental Policy Act (WEPA)
- Agency input:
 - ▶ DNR
 - ▶ SEWRPC
 - ▶ Bureau of Land Management (BLM)
 - ▶ US Fish & Wildlife Service
 - ▶ US Army Corps of Engineers
- Comprise Technical Advisory Team

Environmental Assessment Objectives

- Address alternatives to the dam
- Evaluate alternatives based on NEPA and WEPA criteria
- Solicit public input on scoping process and alternatives

Environmental Assessment Criteria

- Physical changes
- Affected environment
- Environmental consequences
- Evaluation of project significance
- Summary of issue identification activities

Physical Changes

- Terrestrial resources
- Aquatic resources
- Roads and structures
- Emissions and discharges

Affected Environment

- Physical Environment
- Biological Environment
- Terrestrial
- Cultural Environment
- Land Use
- Socio / Economic
- Archaeological / Historical
- Other Special Resources

Environmental Consequences

- Physical
- Biological
- Wildlife
- Fisheries
- Water Resources
- Water Depth
- Plant Community
- Endangered Resources
- Cultural
- Land Use
- Socio / Economic
- Archaeological / Historical
- Other State Resources
- Summary of Adverse Impacts That Cannot be Avoided

Evaluation of Project Significance

- Primary and Secondary Environmental Effects:
 - ▶ Short-Term and Long-Term Conditions
 - ▶ Geographically Scarce Resource
 - ▶ Which are Reversible?
- Significance of:
 - ▶ Cumulative Effects
 - ▶ Risk
 - ▶ Precedent
 - ▶ Controversy Over Environmental Effects

Summary of Issue Identification Activities

- Agencies, Citizen Groups, and Individuals Contacted Regarding Project

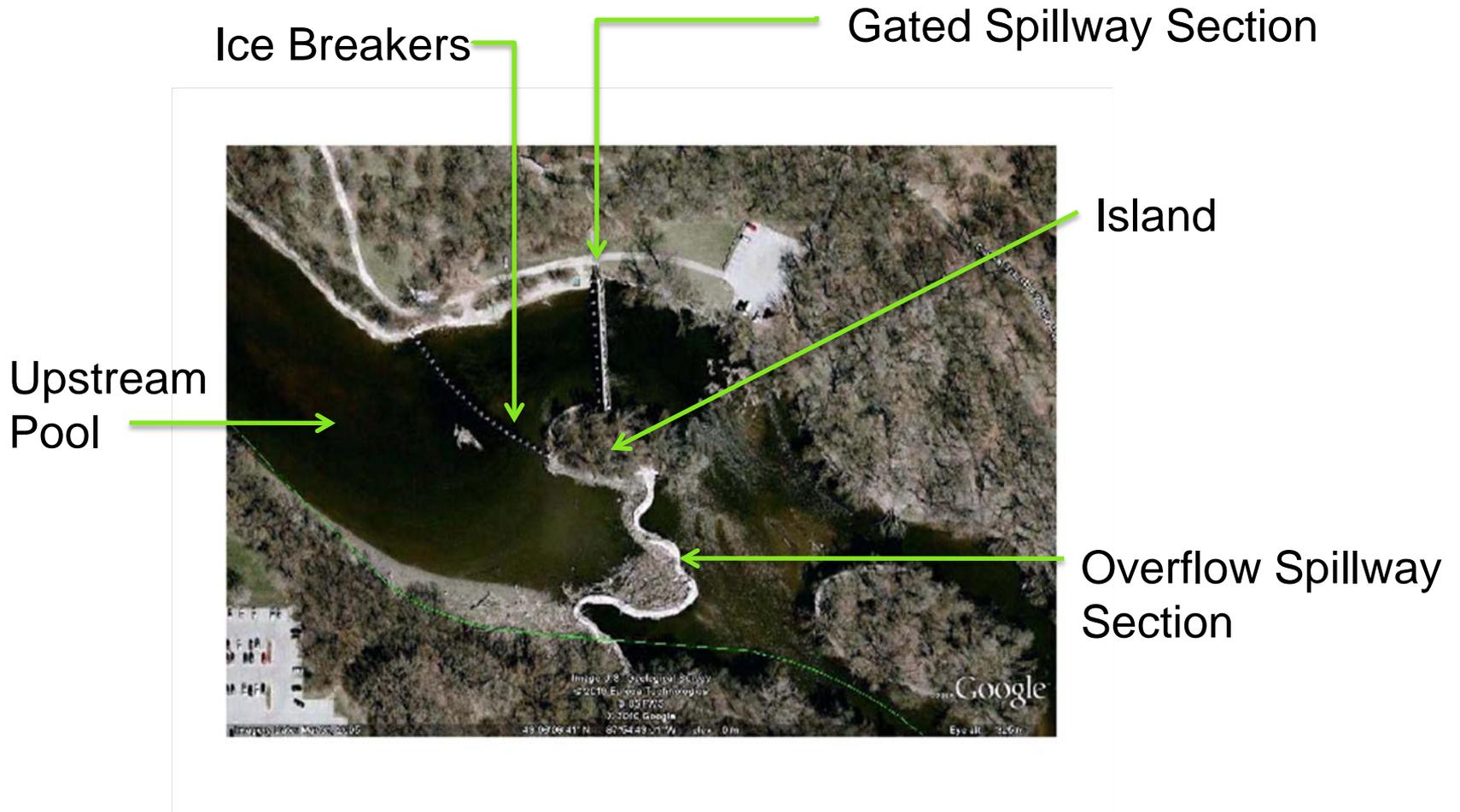
Identification of Alternatives

- Alternative 1 – Rehabilitate the Dam
- Alternative 1A – Rehabilitate the Dam and Add Fish Passage
- Alternative 2 – Abandon and Remove the Dam
- Alternatives 3 and 3A – Abandon and Remove the Dam, Providing a Rock Ramp to Facilitate Fish Passage
- Alternative 4 – Gated Spillway Removed, Serpentine Overflow Spillway Lowered, and 6.3-Foot High Rock Ramp Constructed
- Alternative 5 – No Action
- Alternative 6 – New Dam

Existing Dam Conditions

- Concrete and masonry weathering after 75+ years
- All deterioration is repairable
- Gated spillway requires upstream tie-down anchoring to resist full pool loading with ice loading and factor of safety
- Remove vegetation along shore near dam
- Maintenance and upgrade gates

Estabrook Dam Aerial View, with Features





Gated Spillway
Section, 10
moveable gates
Photo 8/12/10



Photo 8/12/10
Concrete
Deterioration
concentrated in
lower piers





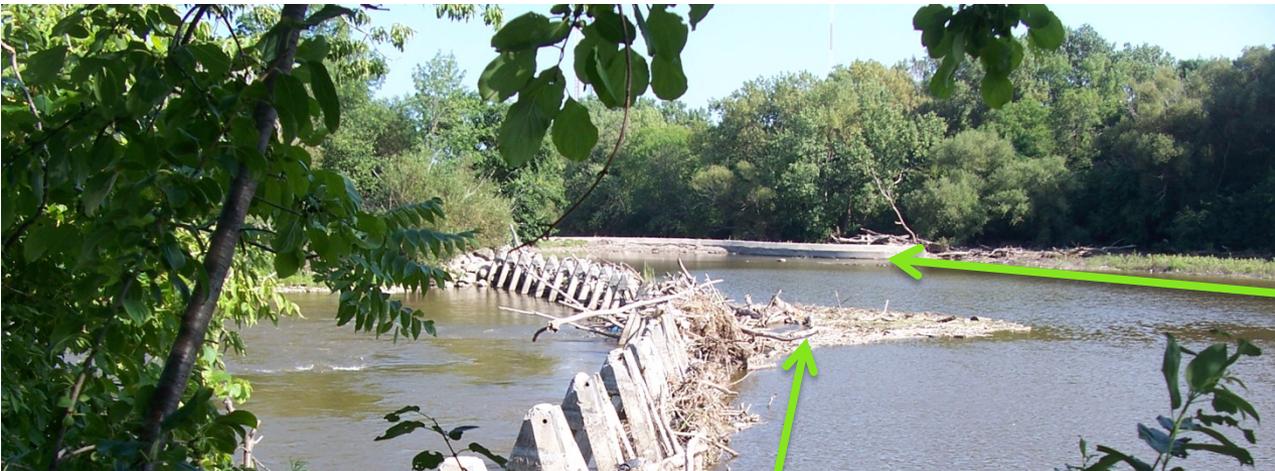
Overflow Spillway Before July 22, 2010



Photo 6/25/10



Overflow Spillway After July 22, 2010 (Taken 8/12/10)



Overflow
Spillway beyond

Photo 8/12/10



Ice Breakers, collected
new logs after July 22,
2010

Missing Icebreaker
Photo 8/12/10



Repair stairs at both ends of gated spillway

Photo 7/8/10

Repair deterioration below water line at gate piers

Photo 8/8/10



Overflow Spillway Debris Pre- and Post-July Flood

- Debris management is key element in annual O&M



Overflow Spillway Before
July 22, 2010

Photo 6/25/10

Spillway After July 22,
2010
(Taken 8/12/10)



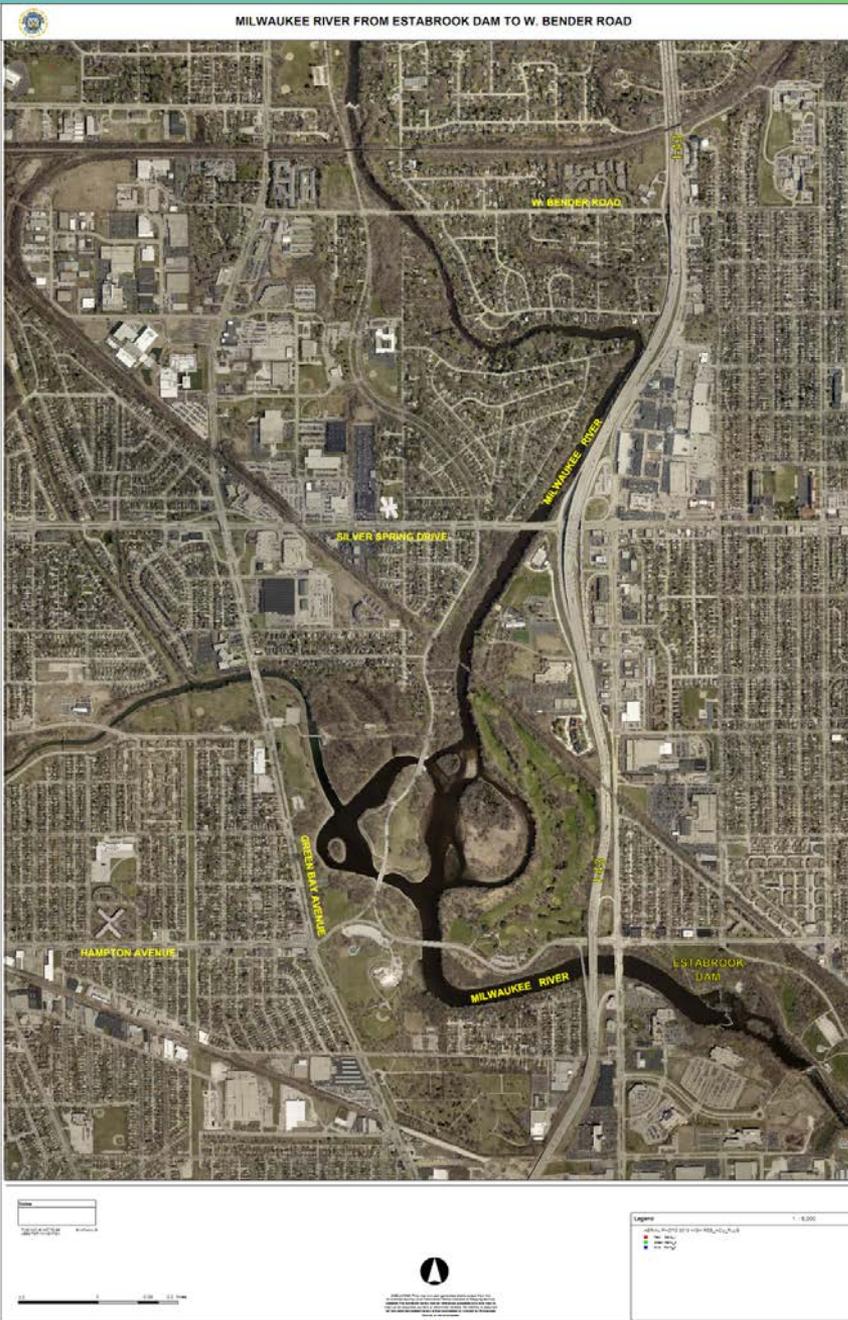
Alternative 1 – Rehabilitate the Dam

- Structural improvements
- Upgrading gates
- Tree removal at dam structure
- County Board voted to implement Alternative 1 in 2010
- Need to address NEPA/WEPA and alternatives
- Alternative 1A – Same as Alternative 1 plus Fish Passage





Figure 54. Generalized conceptual design of the Rock Arch Rapids. *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 48. Minnesota Department of Natural Resources Ecological Resources Division, 2010.



Alternative 2 – Abandon and Remove the Dam

- Restore the river to a free flowing condition
- Under normal flow, similar to existing conditions
- Under flood flows, river levels will be lower than with the dam and gates open
- Sediment would not accumulate
- Eliminates the impoundment upstream
- Provides for kayaks and canoes but not boats
- Aesthetics of a free flowing river
- No annual O&M cost results in substantial savings to County
- Least capital cost of alternatives
- Fish passage

Alternatives 3 and 3A – Abandon and Remove Dam, Provide a Rock Ramp to Facilitate Fish Passage, and Establish an Impoundment

- Provides impoundment 1,600 feet upstream of dam
- Fish passage
- Similar to natural river with pools and riffles
- Sediment buildup can occur over time
- Capital costs are mid-range between other alternatives
- Annual O&M costs are substantially less than a dam, need debris removal
- Rock ramp height:
 - ▶ 5-foot high, eliminated from consideration (Alternative 3)
 - Would increase 100-year flood elevation
 - Exceeds code NR 116
 - ▶ 4-foot high, feasible alternative (Alternative 3A)



Figure 58. Hellroaring Creek, Montana, a steep , natural, stream with a step-pool channel. *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 54. Minnesota Department of Natural Resources Ecological Resources Division, 2010.



Figure 54. Generalized conceptual design of the Rock Arch Rapids. *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 48. Minnesota Department of Natural Resources Ecological Resources Division, 2010.



Figure 91. Rapids replacing dam to provide grade control and facilitate fish and canoe passage. *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 80. Minnesota Department of Natural Resources Ecological Resources Division, 2010.



Figure 100. Grading the fieldstone base with a bulldozer. *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 86. Minnesota Department of Natural Resources Ecological Resources Division, 2010.

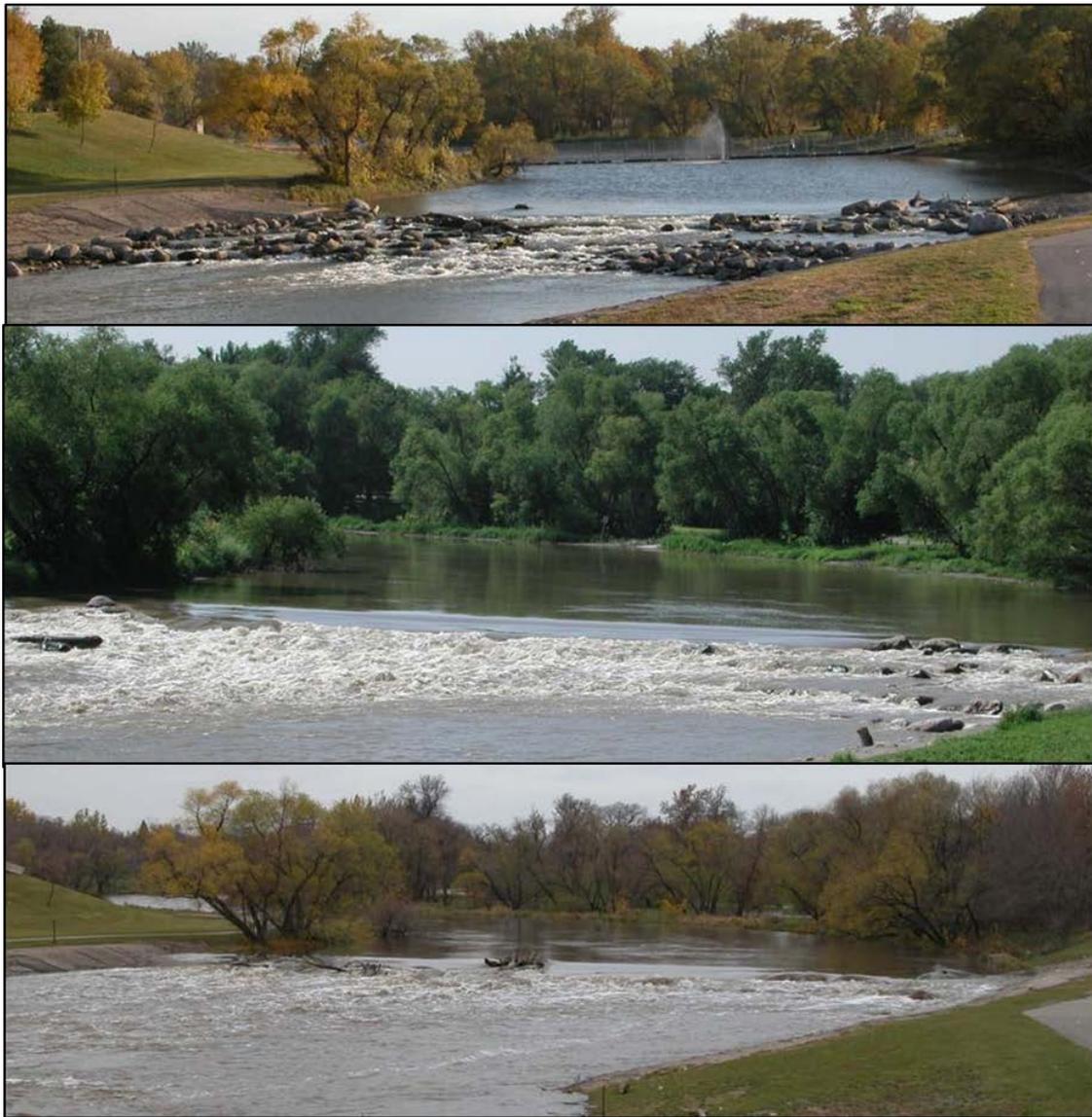


Figure 75. Rapids at flows of 405 cfs (upper photo), 1,640 cfs (middle photo), and 2,560 cfs (bottom photo). *Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage*, p. 68. Minnesota Department of Natural Resources Ecological Resources Division, 2010.

Alternative 4 – Gated Spillway Removed, Serpentine Overflow Spillway Lowered, and 6.3-Foot High Rock Ramp

- 10 gates removed
- Provides a more natural setting
- Provides impoundment, deeper than Alternative 3A
- Classified as a dam by DNR
 - ▶ Operation, inspection, and maintenance plan
 - ▶ Emergency action plan
 - ▶ Owner inspection – 10 years
- Less O&M than Alternative 1A
- Less capital cost than Alternative 1A
- Similar to 4-foot rock ramp (Alternative 3A), but deeper impoundment
- Fish passage

Alternative 5 – No Action

- Refers to taking no action on the dam
- Violates DNR's 2009 Administrative Order to repair or abandon dam
- Violates Milwaukee Riverkeeper suit
- Could lead to more structural issues with dam
- No impoundment possible
- Eliminated from further consideration

Feasible Alternatives

- Alternative 1A – Rehabilitate the dam and add fish passage
- Alternative 2 – Abandon and remove the dam
- Alternative 3A – Abandon and remove the dam, providing rock ramp (4 feet high) upstream from dam, fish passage, impoundment
- Alternative 4 – Gated spillway removed, serpentine overflow spillway lowered, and a 6.3-foot high rock ramp



Estabrook Dam Environmental Assessment Public Scoping Meeting

Hydraulic Analyses of Alternatives

June 5, 2014

Michael G. Hahn, P.E., P.H.
SEWRPC Chief Environmental Engineer

Estabrook Dam Environmental Assessment Alternatives, Milwaukee River Water Surface Profiles for Normal (Median) Flow

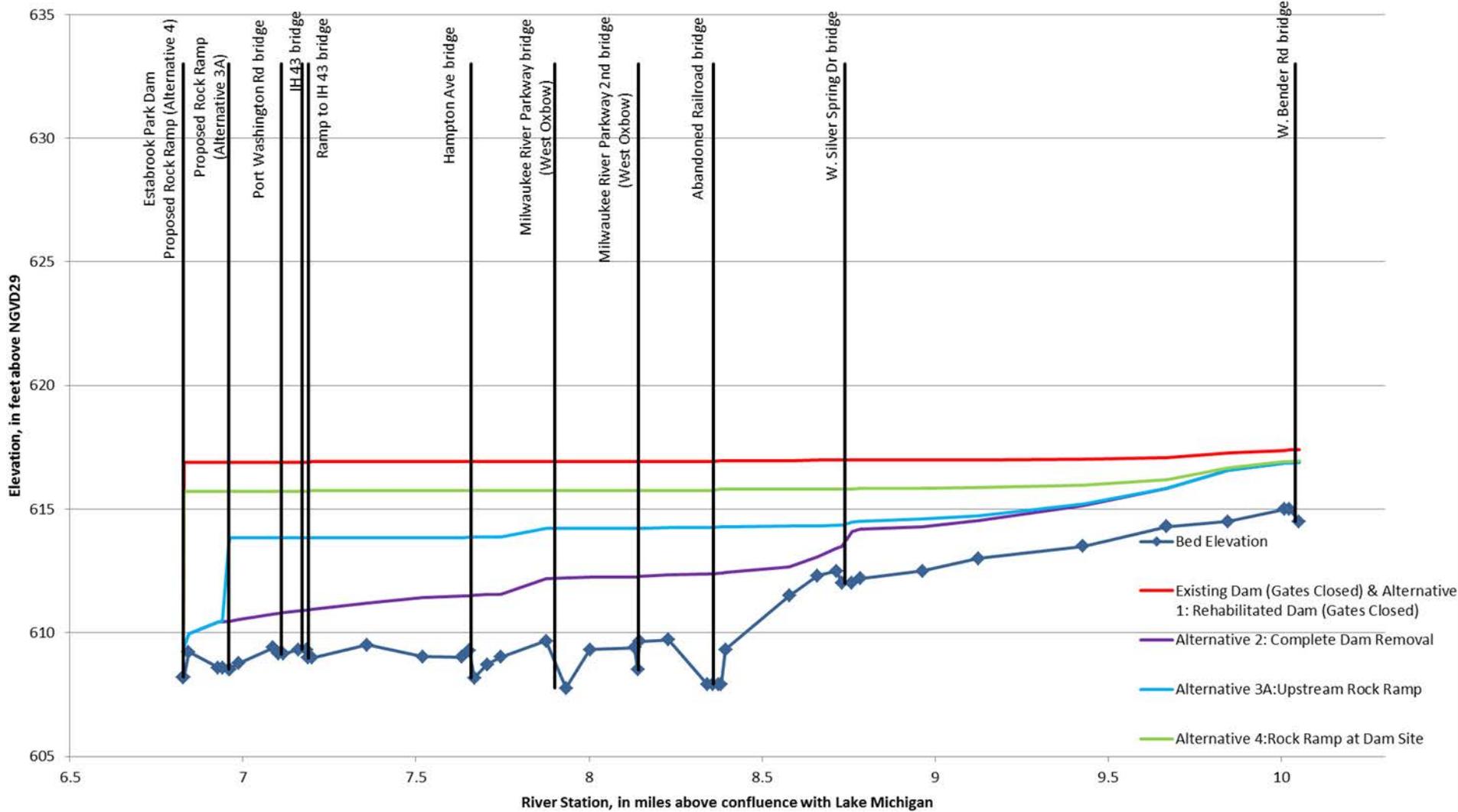


Table 6**MAXIMUM WATER DEPTH UNDER MEDIAN FLOW CONDITIONS**

• Condition Alternative	Lower Reach (Estabrook dam or Rock Ramp to W. Hampton Avenue) (feet)	Middle Reach (W. Hampton Avenue to abandoned railroad bridge upstream of Lincoln Park) (feet)	Upper Reach (Abandoned Railroad Bridge Upstream of Lincoln Park to W. Bender Road) (feet)	W. Silver Spring Drive to W. Bender Road (subreach of Upper Reach) (feet)
Existing Condition	7.4 to 8.7	6.3 to 9.2	2.4 to 9.1	2.4 to 5.0
Alternatives 1 and 1A Rehabilitated Dam (with and without fish passage)	7.4 to 8.7	6.3 to 9.2	2.4 to 9.1	2.4 to 5.0
Alternative 2 Dam Abandoned and Removed	0.7 to 2.5	1.6 to 4.5	0.8 to 4.5	1.5 to 2.1
Alternative 3 Dam Abandoned and Removed with a 5.5-Foot-High Rock Ramp Constructed	5.8 to 6.8	4.7 to 7.6	1.7 to 7.5	1.7 to 3.4
Alternative 3A Dam Abandoned and Removed with a Four-Foot-High Rock Ramp Constructed	4.3 to 5.3	3.6 to 6.5	1.5 to 6.4	1.5 to 2.5
Alternative 4 Gated Portion of Dam Abandoned and Removed with a 6.3-Foot-High Rock Ramp Constructed and Low- ered and Rehabilitated Overflow Spillway	6.2 to 7.5	5.1 to 8.0	1.9 to 7.9	1.9 to 3.8

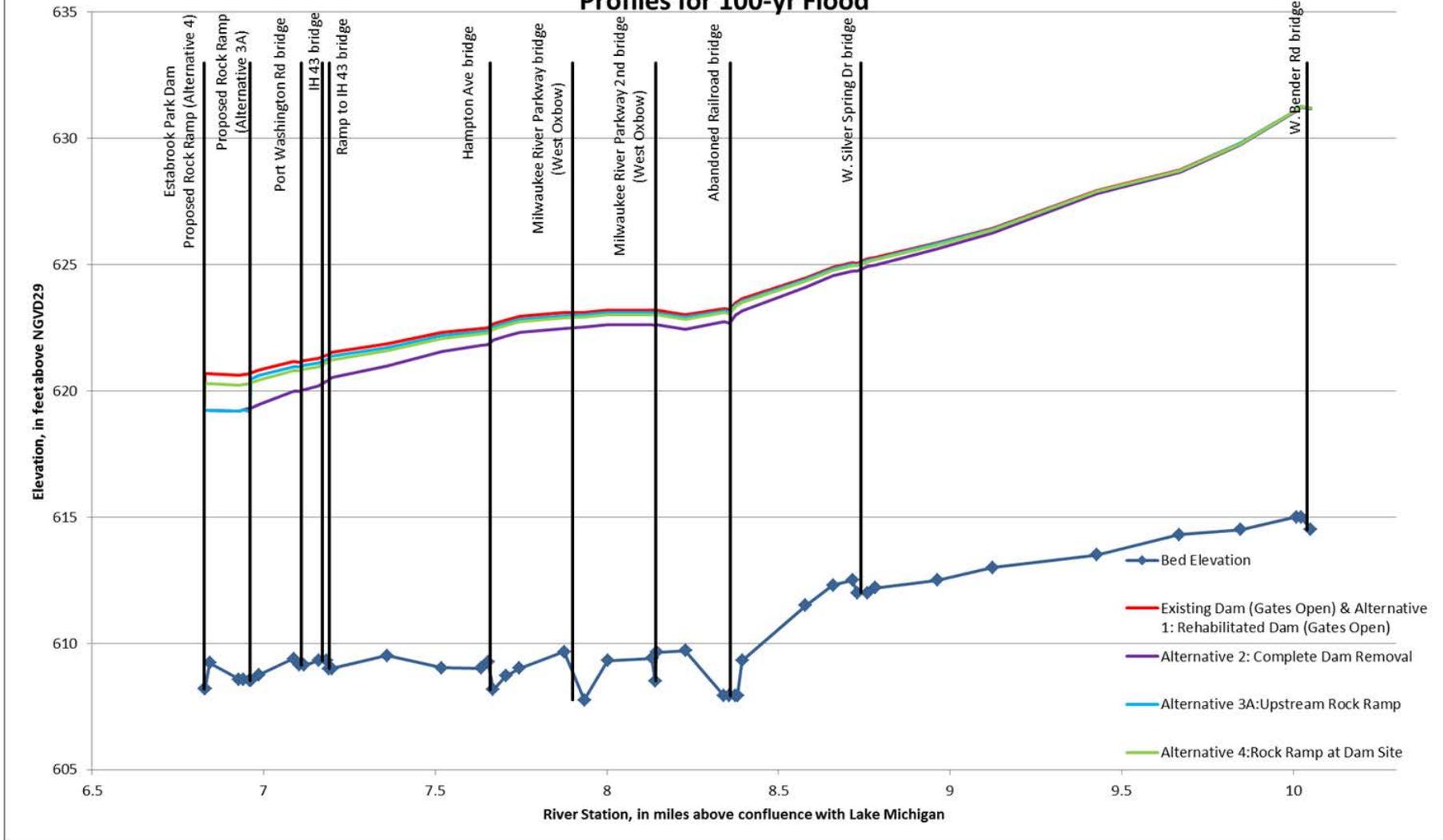
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Alternative 3A Dam Abandoned and Removed with a Four- Foot-High Rock Ramp Constructed	4.3 to 5.3	3.6 to 6.5	1.5 to 6.4	1.5 to 2.5
Alternative 4 Gated Portion of Dam Abandoned and Removed with a 6.3- Foot-High Rock Ramp Constructed and Low- ered and Rehabilitated Overflow Spillway	6.2 to 7.5	5.1 to 8.0	1.9 to 7.9	1.9 to 3.8

Source: SEWRPC.

Estabrook Dam Environmental Assessment Alternatives, Milwaukee River Water Surface Profiles for 100-yr Flood



W. Silver Spring Drive to W. Bender Road, Milwaukee River Water Surface Profiles for 100-yr Flood

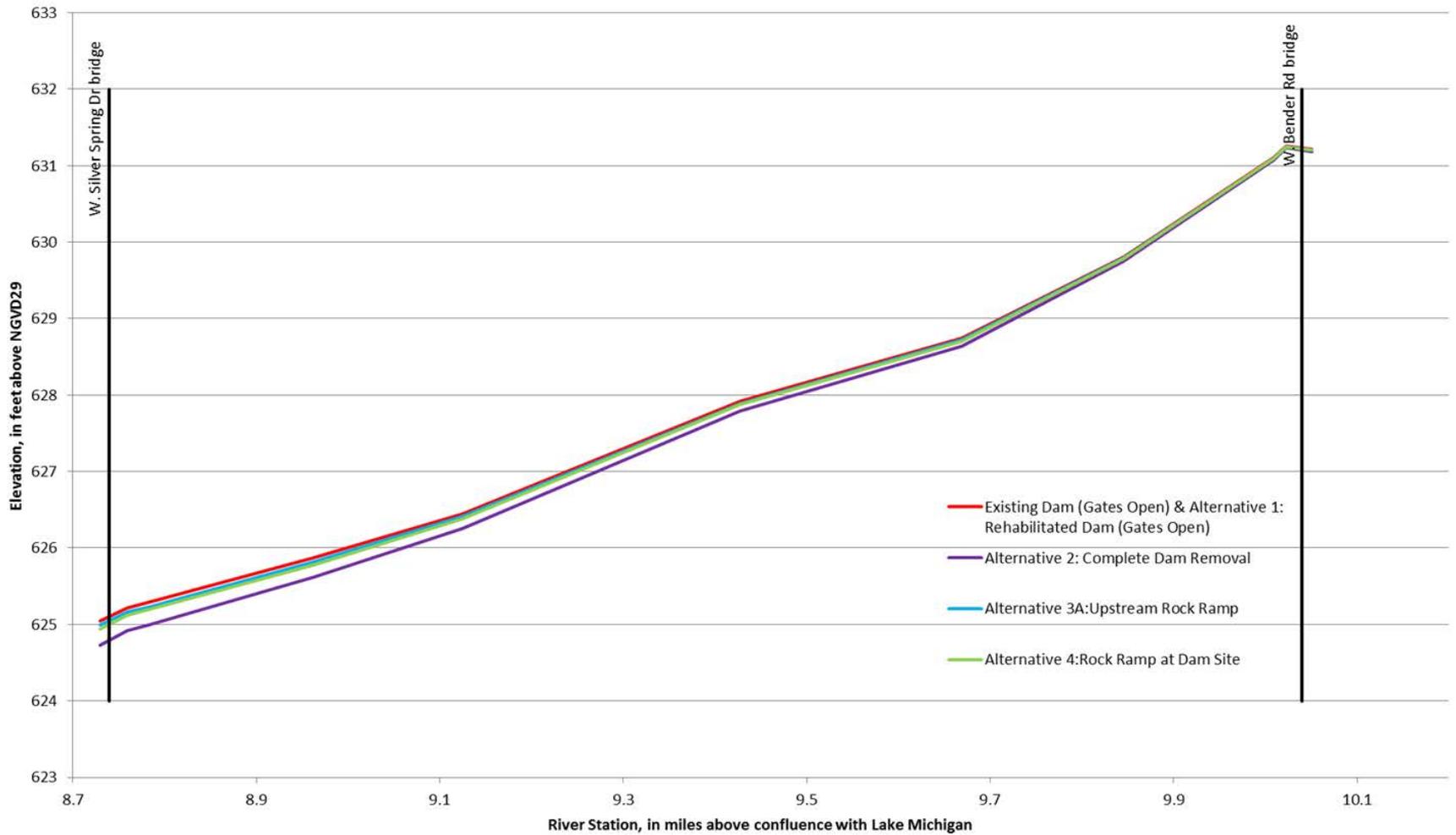


Table 7
CHANGES IN ONE-PERCENT-ANNUAL-PROBABILITY
WATER SURFACE ELEVATIONS AS COMPARED TO EXISTING CONDITIONS

Condition Alternative	Lower Reach (Estabrook dam or Rock Ramp to W. Hampton Avenue) (feet)	Middle Reach (W. Hampton Avenue to abandoned railroad bridge upstream of Lincoln Park) (feet)	Upper Reach (Abandoned Railroad Bridge Upstream of Lincoln Park to W. Bender Road) (feet)	W. Silver Spring Drive to W. Bender Road (subreach of Upper Reach) (feet)
Alternatives 1 and 1A Rehabilitated Dam (with and without fish passage)	0	0	0	0
Alternative 2 Dam Abandoned and Removed	-0.7 to -1.5	-0.5 to -0.7	0 to -0.5	0 to -0.3
Alternative 3 Dam Abandoned and Removed with a 5.5-Foot-High Rock Ramp Constructed	0.7 to 1.2	0.6 to 0.7	0 to 0.6	0 to 0.4
Alternative 3A Dam Abandoned and Removed with a Four-Foot-High Rock Ramp Constructed	-0.1 to -0.2	-0.1	0 to -0.1	0 to -0.1
Alternative 4 Gated Portion of Dam Abandoned and Removed with a 6.3-Foot-High Rock Ramp Constructed and Low- ered and Rehabilitated Overflow Spillway	-0.2 to -0.4	-0.2	0 to -0.2	0 to -0.1

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Alternative 3A Dam Abandoned and Removed with a Four-Foot-High Rock Ramp Constructed	-0.1 to -0.2	-0.1	0 to -0.1	0 to -0.1
Alternative 4 Gated Portion of Dam Abandoned and Removed with a 6.3-Foot-High Rock Ramp Constructed and Lowered and Rehabilitated Overflow Spillway	-0.2 to -0.4	-0.2	0 to -0.2	0 to -0.1