



Memorandum

To: Richard Maslowski – City Administrator
From: Collin Johnson – Director of Inspection Services
Date: 8/8/2014
Re: Estabrook Dam

On September 18, 2014, the Milwaukee County Board will decide which of the four final alternatives to formally adopt and ultimately proceed with. Since the City of Glendale and a good number of its residents may be impacted by that decision, I felt it was important to advise and inform the Council of the results of that environmental assessment should they choose to take a position regarding the proposed alternatives. I am providing this memo simply to summarize the findings of those studies and subsequent reports in a simpler, condensed format that is hopefully easier to understand.

As you are aware, in 2008, the WI-DNR issued an Administrative Order to Milwaukee County to repair the Estabrook Dam. Separating the dam and spillway is an island that is owned by the Bureau of Land Management. As a result, the BLM required Milwaukee County to conduct a comprehensive environmental assessment to determine what, if any, impacts the work would have on a variety of environmental issues.

The assessment included 13 primary categories detailed on the document titled: *Excerpts from Draft 1 – Environmental Assessment for Estabrook Dam*, which was prepared by AECOM. The Environmental Assessment covered the six remove/repair alternatives listed below:

Identification of Alternatives:

- | | |
|----------------------|---|
| Alternative 1 - | Rehabilitate the Dam |
| Alternative 1A - | Rehabilitate the Dam and Add Fish Passage |
| Alternative 2 - | Abandon and Remove Dam |
| Alternative 3 & 3A - | Abandon and Remove the Dam, Providing a 5.5 Foot Rock Ramp to Facilitate Fish Passage (Alt. 3A includes a 4.0 Foot Rock Ramp) |
| 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 |

Of these options, four were deemed feasible after evaluation of their environmental benefits, impacts, and related costs which are detailed below:

- Alternative 1A - Rehabilitate the Dam and Add Fish Passage
- Alternative 2 - Abandon and Remove Dam
- Alternative 3A - Abandon and Remove the Dam, Providing a 4.0 Foot Rock Ramp to Facilitate Fish Passage
- Alternative 4 - Gated Spillway Removed, Serpentine Overflow Spillway Lowered, and 6.3-Foot High Rock Ramp Constructed

SEWRPC then completed a comprehensive hydraulic analysis for each of the four alternatives to determine the potential impact to upstream water depths on the Milwaukee River during both median and flood conditions. Those impacts are detailed on the attached document titled: *Table 6 Maximum Water Depth Under Median Flow Conditions*. (It is important to note that these are “medium flow conditions” and not flood flow conditions.)

The impact each of the four alternatives can generally be associated with those properties located in the River Forest Subdivision and impacted by the current one-percent chance interval flood zone more commonly referred to as the 100-Year Flood Zone. The results of the hydraulic analysis for each of the four alternatives are detailed in the SEWRPC document titled: *HYDRAULIC ANALYSES FOR THE ESTABROOK DAM ENVIRONMENTAL ASSESSMENT*, Dated April 8, 2014 and revised April 25, 2014 of which you have a copy. The impact to the one-percent chance (100-Year) flood elevations for each of the alternatives results are excerpted and highlighted below for reference:

Alternative 1 – Rehabilitate the Dam and Add Fish Passage

Alternative 1 water surface elevations are shown in Table 1. As described above, the rehabilitated dam alternative is the same as the existing conditions model. Therefore there is no difference in water surface elevations as compared to existing conditions. Under normal (median) flow conditions, which assume that the Estabrook dam gates are closed, the maximum water depth of the lower reach ranges from 7.4 to 8.7 feet. The maximum depth of the middle reach ranges from 6.3 to 9.2 feet, and the maximum depth of the upper reach ranges from 2.4 to 9.1 feet

Alternative 2 - Abandon and Remove Dam

Under 1-percent-probability flood flow conditions, the water surface elevation in the lower reach would decrease between 0.7 and 1.5 feet as compared to existing conditions. The 1-percent-probability elevation in the middle reach would decrease between 0.5 and 0.7 foot, and the 1-percent-probability elevation in the upper reach would decrease by up to 0.5 foot. Under normal (median) flow conditions, the water surface elevation in the

lower reach would decrease between 3.7 and 7.5 feet with a maximum water depth ranging between 0.7 and 2.5 feet. The normal elevation in the middle reach would decrease between 4.5 and 5.4 feet with a maximum water depth ranging between 1.6 and 4.5 feet. The normal elevation in the upper reach would decrease between 0.5 and 4.6 feet with a maximum water depth ranging between 0.8 and 4.5 feet.

Alternative 3 -

Abandon and Remove the Dam, Providing a Rock Ramp to Facilitate Fish Passage

Alternative 3 water surface elevations are shown in Table 3. A 5.5-foot-high rock ramp was modeled in order to maximize the normal impoundment level upstream of the ramp while clearly meeting the definition of a dam that would not be regulated under Chapter NR 333, “Dam Design and Construction,” of the Wisconsin Administrative Code. Chapter NR 333 exempts dams with storage capacities of more than 50 acre-feet (as would be the case for an impoundment created upstream of a 5.5-foot-high rock ramp in the River), but a structural height of six feet or less, assuming the dam is not likely to endanger life, health or property. While the 5.5-foot-high rock ramp alternative results in a decrease in water surface elevations for the normal (mean and median) flow conditions analyzed relative to existing conditions, including at each storm sewer outfall, it results in an increase in water surface elevations under each of the flood flow conditions analyzed, including the 1-percent-probability flood.

Alternative 3A -

Abandon and Remove the Dam, Providing a Rock Ramp to Facilitate Fish Passage

Since Alternative 3 resulted in an increase in the 1-percent-annual-probability flood flow profile upstream of the rock ramp, an additional rock ramp alternative was analyzed. A four-foot-high rock ramp was modeled in order to maximize the impoundment level upstream of the ramp while not causing an increase in the 1-percent-probability flood profile. The rock ramp slopes of this alternative were reduced as compared with Alternative 3 due to the lower height of the crest and the desire to maintain the same design “foot print” and ramp cross-section locations in order to provide water surface elevation comparisons consistent with Alternatives 1, 2, and 3. The four-foot high rock ramp would be expected to result in a decrease in water surface elevations for each analyzed flow condition relative to existing dam conditions, including at each storm sewer outfall. Alternative 3A water surface elevations are shown in Table 4.

Under 1-percent-probability flood flow conditions, the water surface elevation in the lower reach, also defined for this alternative as the reach between the rock ramp and W. Hampton Avenue, would decrease between 0.1 and 0.2 foot as compared to existing conditions. The 1-percent-probability elevation in the middle reach would decrease 0.1 foot, and the 1-

percent-probability elevation in the upper reach would decrease by up to 0.1 foot. Thus, this alternative would meet regulatory requirements set forth in local zoning ordinances and Chapter NR 116 of the *Wisconsin Administrative Code* that do not permit activities which would increase the 1-percent-annual-probability flood stage unless easements were obtained from all affected property owners and a Conditional Letter of Map Revision (CLOMR) were obtained from FEMA prior to any construction.

Under normal (median) flow conditions, the water surface elevation in the lower reach would decrease 3.1 feet with a maximum water depth ranging between 4.3 and 5.3 feet. The normal elevation in the middle reach would decrease between 2.7 and 3.1 feet with a maximum water depth ranging between 3.6 and 6.5 feet. The normal elevation in the upper reach would decrease between 0.5 and 2.7 feet with a maximum water depth ranging between 1.5 and 6.4 feet.

Alternative 4 -

Gated Spillway Removed, Serpentine Overflow Spillway Lowered, and 6.3-Foot High Rock Ramp Constructed

This alternative was developed to increase the elevation of the impoundment water surface as compared to Alternative 3A, while not causing an increase in the 1-percent-probability flood profile by moving the location of the rock ramp to the site of the removed gated spillway portion of the dam and maintaining the serpentine overflow spillway. Since the overall width of the Milwaukee River is greater at Estabrook Dam than at the location of the rock ramp included under Alternatives 3 and 3A, utilizing both a rock ramp at the gated spillway site and the overflow spillway with a lowered crest in tandem to establish the impoundment level allows for a greater conveyance capacity at a given headwater elevation to pass flood flows as compared to Alternatives 3 and 3A, while enabling establishment of a higher ramp crest to increase the elevation of the impoundment water surface under normal flow conditions. However, under this alternative, both the 6.3-foot-high rock ramp and the serpentine overflow spillway would meet the definition of a dam that would be regulated under Chapter NR 333.

The 6.3-foot- high rock ramp and lowered overflow spillway alternative would be expected to result in a decrease in water surface elevations upstream of the dam for the normal (mean and median) flow conditions and for the 2-, 1-, and 0.2-percent-probability flood flow conditions relative to existing dam conditions, including at each storm sewer outfall. Under the 10-percent-probability flood it would not be expected to result in hydraulically significant differences in water surface elevations. Alternative 4 water surface elevations are shown in Table 5.

Under 1-percent-probability flood flow conditions, the water surface elevation in the lower reach, would decrease between 0.2 and 0.4 foot as compared to existing conditions. The 1-percent-probability elevation in the middle reach would decrease 0.2 foot, and the 1-percent-probability elevation in the upper reach would decrease by up to 0.2 foot. Thus, this alternative would meet regulatory requirements set forth in local zoning ordinances and Chapter NR 116 of the Wisconsin Administrative Code that do not permit activities which would increase the 1-percent-annual-probability flood stage unless easements were obtained from all affected property owners and a Conditional Letter of Map Revision (CLOMR) were obtained from FEMA prior to any construction.

Under normal (median) flow conditions, the water surface elevation in the lower reach would decrease 1.2 feet with a maximum water depth ranging between 6.2 and 7.5 feet. The normal elevation in the middle reach would decrease 1.2 feet with a maximum water depth ranging between 5.1 and 8.0 feet. The normal elevation in the upper reach would decrease between 0.4 and 1.2 feet with a maximum water depth ranging between 1.9 and 7.9 feet.

Tables 6 & 7 from the SEWRPC *Hydraulic Analysis for Estabrook Dam Environmental Assessment* detail the effects each of the alternatives would have on the water elevations under both the median and flood flow conditions between W. Silver Spring Drive and W. Bender Road. I reference only this area as it is the only area within Glendale that is impacted by the dam and each of the proposed alternatives. It is referenced as the “subreach of the Upper Reach” area of the Milwaukee River on *Tables 6 & 7*.

Water depth impacts from *Tables 6 & 7* from the SEWRPC document titled: *HYDRAULIC ANALYSES FOR THE ESTABROOK DAM ENVIRONMENTAL ASSESSMENT* are summarized below:

	<u>Median Flow (240 cfs approx.)</u>	<u>1% Flood Flow (14,800 cfs approx.)</u>
Existing Conditions	2.4 to 5.0	
Alternative 1 & 1A	2.4 to 5.0	0
Alternative 2	1.5 to 2.1	0 to -0.3
Alternative 3	1.7 to 3.4	0 to 0.4
Alternative 3A	1.5 to 2.5	0 to -0.1
Alternative 4	1.9 to 3.8	0 to -0.1

As shown on the tables, a drop in water surface elevation during median flow does not correlate to reduced flood elevations as one might think. A 0.3 foot drop in water elevation equates to 3.6 inch drop in flood elevation. It is important to note that this decrease does not apply to the entire upper reach. The water elevation would decrease between 0.0 to 3.6 inches throughout the subreach area (Silver Spring Dr. to Bender Rd.) of the Milwaukee River.

Based on the above comparison, dam removal (Alternative 2) would provide the greatest flood relief to those properties located between N. Silver Spring Drive and W. Bender Road. If the County were to move forward with Alternative 2, the Milwaukee River would remain similar to its current condition.

A nearly four-inch reduction in the 1% Chance Flood Elevation would reduce the 1% Chance Flood Elevation for numerous houses throughout Glendale as well as reduce flood insurance premiums for those that carry flood insurance or are interested in purchasing even a basic coverage policy. Furthermore, floodplain designations and mandated flood insurance costs directly impact the improvability, value and salability of a home and/or property.

As a Floodplain Administrator, it is my obligation to support the alternative that provides the most relief from flooding. As a result, it is my position that Alternative 2 is the only viable option and the only option that should be approved by the County Board. Alternative 2 will provide much needed flood relief, a reduction in flood insurance premiums and is clearly the more sustainable solution both fiscally and environmentally.

While lower water levels may not be desirable to all riparian owners, the overall benefit of reduced flood levels, insurance premiums, and overall salability, impacts a greater proportion of properties and property owners. In my opinion, it would be grossly imprudent for the Milwaukee County Board to disregard the impact removal of the dam would have on countless Glendale property owners.

Realizing that there are additional issues to contemplate regarding the repair or removal of the dam, it is justly imperative to considering the following:

- Historically, Milwaukee County has not been very responsive to Glendale's requests to open the dam gates during flooding conditions. As explained, should the County have to open the gates, they would be limited (currently) to a maximum draw down of six (6) inches at a time. It is unclear whether the DNR would permit a "full gate open" scenario in advance of or during a significant storm or flood event.

The hydraulic modeling provided assumes that all gates are operational. If just one gate is non-operational due perhaps to debris or ice impeding its operation, it would directly impact flood levels upstream.

The dam must have electricity in order to operate the gates. During a storm or flood, electricity may not be available. Manual operation is unlikely as electricity is also needed to open the gates manually.

The passive options (Alternatives 2, 3, 3A & 4) would not require human intervention.

- The impoundment area above the dam has historically been a catch-all for trees and other debris which must be cleared at a cost to taxpayers. With the exception of alternatives 1 and 1A, the other alternatives would generally allow debris to pass through.

The passive options (Alternatives 2, 3, 3A & 4) would have significantly reduced operating, maintenance and future capital costs to tax payers.

- It is also important to consider expanding development not only in Glendale but upstream as well. The constant placement of new impervious surfaces which direct more stormwater to the Milwaukee River will continue to negatively impact both median and flood level elevations in the future. Tangible reductions in flood levels are an extreme rarity and by no means should they be disregarded.
- Apart from alternatives 1 and 1A, each of the other alternatives allows the river to function in a more natural state.

Attachments: Table 6 - Maximum Water Depth Under Median Flow Conditions

Table 7 - Changes In One-Percent-Annual-Probability Water Surface Elevations as Compared to Existing Conditions