MEMORANDUM

TO: DEPARTMENT OF NATURAL RESOURCES

FROM: FRIENDS OF THE MON MAQ DAM

DATE: NOVEMBER 15, 2017

RE: DNR GRANTS FOR THE MONTICELLO MAQUOKETA DAM

We are the Friends of the Monticello Maquoketa River Dam. We wish to preserve our beautiful and historic dam. The beauty and majesty of the waterfall over our 13 feet tall and 440 feet wide dam is appreciated by all who see it. The Office of the State Archaeologist has evaluated the dam as eligible for the National Register of Historic Places for "its association with the Monticello Electric Company and Monticello's long period of independent local production of electrical power and . . .as an unusual and intact example of a rock-filled reinforced concrete dam that illustrates the range of experimentation with concrete dam construction in the early twentieth century." Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 1 (Iowa Office of the State Archaeologist) (2016). We also wish to avoid the waste of $1.8 million or more of the taxpayers' money. We believe that, like us, the overwhelming majority of the public in Jones County is for saving the dam.

We believe that grant money under the Low Head Dam Public Hazard Program given to the Jones County Conservation Board (JCCB), with respect to the Monticello Maquoketa River Dam, was awarded to the Board in response to alleged facts stated in the Board's applications for such grants. Many of the purported facts, which the DNR relied on in giving these grant monies, are inaccurate or incomplete. The grant applications present a false and incomplete picture of the situation at the dam, particularly with respect to costs, public safety, navigation, environmental problems and quality of fishing and of public support for destruction of the dam. Those grant monies which have not been expended should be clawed back because they are based on misleading information and are a waste of limited public funds which could be better spent making safe dams which present actual public safety hazards. No further grants should be provided for this project. No extensions of time should be provided for any current grants that have not been spent within mandated time limits.

COSTS:

The four Department of Natural Resources (DNR) Low Head Dam Program grants to the JCCB for the Monticello Dam provide the following amounts:

Grant # 1 LHDP Project # 08-01. Awarded June 17, 2008: $ 20,000

Grant # 2 LHDP Project # 13-06. Awarded December 13, 2012: $ 43,583

Grant # 3 LHDP Project # 16-04. Awarded March 11, 2016: $318,000

Grant # 4 LHDP Project # 17-01. Awarded January 27, 2017: $243,140
TOTAL: **$624723**

All of these grants, except the first $20000 grant, were provided between Fiscal Year 2008 and Fiscal Year 2016. According to the Legislative Services Agency, grants appropriated during this time for both the Water Trails and Low Head Dam Mitigation Program totaled $7 million. Legislative Services Agency, Budget Unit Brief FY2017: Water Trails and Low-Head Dam Mitigation Program. This is an average of $889,000 per year. Id. Grants for the Mon Maq Dam project totaled $604,723 during this time, which is 8.6% of the total appropriated for the period. This amount is equal to 68% of the average funding for one year. The grant of $318000 for FY 2016 alone consumed an amount equal to 35.7% of the combined average annual budget for both programs. .

Between January 2016 and August 2017, the cost estimates for the dam removal project skyrocketed 80% from $1 million, as estimated by Brad Mormann, JCCB Conservation Director at a public meeting on January 28, 2016, to $1.8 million, as reported at the August 24, 2017 Jones County Conservation Board meeting. Brooks, K., "Public Input Points to Removal of Mon Maq Dam," Monticello Express (February 2016); Brooks, K., "JCCB Votes 4-1 to Remove Portion of the Dam," Monticello Express (August 30, 2017). There is no reason to believe this increase in costs won't continue. This $800,000 increase alone equals 90% of the funds for the statewide Water Trails and Low Head Dam Mitigation Programs appropriated for an entire year. This is an expensive project.

THE LOW-HEAD DAM PUBLIC HAZARD PROGRAM

The Low-Head Dam Dam Public Hazard Program was instituted by the Iowa Department of Natural Resources under authority given to it by the legislature. Iowa Code section 464A.11.

As a practical matter, the Low-Head Dam Dam Public Hazard Program requires applications for funds under the program to allege that there are "recirculating currents" or similar allegations in order to meet the Iowa Department of Natural Resources rule definition of "low head dam" and to obtain grants under the Low-head Dam Public Hazard Program. Under the DNR rules, *"Low-head dam"* means a uniform structure across a river or stream that causes an impoundment upstream, **with a recirculating current downstream**." 571 IAC 30.51 (emphasis added). The rules also provide:

> *Low-head dam public hazard program.* **The department will provide funds to dam owners, including counties . . . , within Iowa to undertake projects** that warn the general public about drowning hazards related to low-head dams or **that remove or otherwise modify low-head dams to create a safer experience on Iowa's navigable waters**. **Low-head dam removal** and modification **projects, when possible, shall enhance or restore ecological and recreational functions of rivers, including but not limited to fish passage, aquatic habitat, and navigation.**

571 IAC 30.53(2)(emphasis added). **The low head dam hazard program funding is "limited to projects that primarily enhance dam safety in order to reduce drownings."** 571 IAC 30.52 (emphasis added).

The rules require that a scoring committee shall evaluate proposals requesting funds under the program. Id. at 30.57. In evaluating proposals that "enhance safety at low-head dams on or adjacent to navigable waters in Iowa," id. at 30.59(2), the scoring committee:

> shall consider the following criteria when evaluating cost-share proposals for low-head dam public hazard program projects:
> *a.* Improvements to public safety;
> *b.* **Demonstrated** beneficial impacts to the overall stream health, fish migration and habitat, aesthetics, and recreational impacts; and
> *c.* Contribution of private resources or local resources or both beyond the minimum requirements provided by these rules.

Id. at 30.61(emphasis added). The requirement of "demonstrated beneficial impacts" means that such impacts must be shown clearly or proven by reasoning or evidence. Definition of "demonstrated" at https://www.merriam-webster.com/dictionary/demonstrated.

DAM SAFETY: ACCESS TO THE DAM:

The JCCB has grossly exaggerated the public's close contact with the dam and any resulting danger. Being "near" the dam at the public observation deck or catwalk or wading below the apron or even walking on the apron does not mean that one is in imminent danger of drowning from the dam. The applications imply that the dam is "easily accessible" from both upstream and downstream. E.g. Application for Grant # 3 LHDP Project # 16-04 at 7. One cannot just walk off from the road access on to either the top of the dam or the dam apron. The dam is actually guarded from the road access by fencing, railings, 6 foot deep water upstream, an observation overlook, and the foundation of the former generator building. To access the dam from downstream, it is necessary to go around the foundation, down a slope and across a sandbar. A person can then wade to the downstream side of the dam when normal shallow and safe water levels permit such access. The photo below illustrates such downstream access:

Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 17 (Iowa Office of the State Archaeologist) (2016)(showing normal access to the dam from downstream side during normal water levels).

While these concerns are addressed more fully under “Navigation” below, it must be noted that water trail users enter the water ¼ mile down river from the dam and view the receding dam from a distance as they float downstream. The applications falsely imply there are a number of visitors from upstream who supposedly are making “difficult” imaginary portages. Visits originating from upstream are rare and we can find no one who has ever observed anyone making what would be an easy portage to the downstream area shown above.

The application for Grant # 4 expresses a concern about the rare instances when individuals have walked across the top of the dam. Application for Grant # 4 LHDP Project # 17-01 at 2, 7, 34. The top of the dam, at least four feet wide, is only accessible by land from the south side of the river where there is no road or established trail access. A tiny percentage of the visitors to the dam come from the south side of the river. The JCCB has placed no fencing, other barriers or warning signs to prevent such access. Such could be done at a cost of considerably less than $1.8 million.

DAM SAFETY: RECIRCULATING CURRENT

In several grant applications to the DNR, under the low head dam safety program, the Jones County Conservation Board (JCCB) has responded to agency requests on how the grant would serve or impact public safety. There is no mention that there has never been a drowning at the Monticello Maquoketa Dam in 103 years of operation. The JCCB has instead repeatedly stated the mantra that the dam has "dangerous hydraulics", giving the impression that this is a constant danger, when it is extremely doubtful that such hydraulics exist below the dam during periods when members of the public are actually in close contact with the dam.

Details on the assertions in the grant applications will be given below. It must be noted, however, that, on August 24, 2017, the JCCB was presented with several options which would replace the dam, as well as the option of saving the dam. The Board voted, four to one, to replace the dam with option A. Option A is detailed in attached Appendix B.

Copies of a memorandum in support of the dam, prepared by Donald Bohlken on behalf of Friends of the Dam, had been presented to the Board. All members except Chairman Larry Pisarik confirmed that they had read the memo. Since Mr. Pisarik had not had the opportunity to hear these arguments, Donald Bohlken made an oral presentation to the Board covering the arguments made in the memorandum. While Donald Bohlken discussed the issue of recirculating currents and whether the dam was a drowning machine, he said, "And, if this dam were a drowning machine, I would say get rid of it." In response, the Board Chairman Larry Pisarik stated, "Well, we know that's not an issue." The audio transcript of that discussion, which follows, indicates that the JCCB may well understand that, most of the time, the dam being a drowning machine is "not an issue":

> Bohlken**: OK. Well, if you compare the diagrams we have here. Here is this diagram right here, let me show it to you, sir. [Showing Chairman Pisarik the diagrams on recirculating currents shown on pages 10-11 of this memorandum]. This shows a drowning machine dam. And, if this dam were a drowning machine, I would say get rid of it.**
>
> Pisarik: **Well, we know that that's not an issue.**
>
> Bohlken: **You are saying that is not an issue as a drowning machine?**
>
> Pisarik: **We did not, we understand that the amount of water and stuff is not the hydraulics at some of the dams.**
>
> Roman: Excuse me. But in the past, Mr. Moorman has brought this up as a drowning machine. And he says and he states it is a drowning machine.
>
> Bohlken: Yes. He said it in his application for the TAP grant.
>
> Pisarik: **Depending on the flow and stuff.**

> Bohlken: You know. If it is a flood it is a drowning machine, but if it is a flood, it is a flood. Dam or no Dam. Option A or Option B, whatever option you want. It is dangerous, crazy dangerous to be on the river.
>
> Roman: But you do have a photo in your own documents [referring to photo on page 12 of this memorandum] though that show it in fact, in background. In your materials.
>
> Bohlken: Yes. That's at flood stage.
>
> Roman: Right.
>
> Bohlken: That's at flood stage. I have no problem with making that argument at flood stage. Flood stage is when people are not on the river kayaking or swimming if they're sane. We can't deal with crazy people. That's not the norm. What we could do is place warning signs. We have warning signs above the dam now. Place warning signs below the dam saying "Don't swim near the dam, don't get near the dam on high water." Perfectly appropriate. At a lot less than $1.7 million.

Partial Audio Transcript of JCCB Meeting on August 24, 2017.

It would appear from the above that, contrary to the statements in the JCCB's applications implying a constant presence of a recirculating current, that at least some members of the JCCB had been informed that drowning machine hydraulics were only intermittently present at the dam, "depending on the flow and stuff" and so infrequently that "[w]ell, we know that that's not an issue.". "[W]e understand that the amount of water and stuff is not the hydraulics at some of the dams."

At the time of the vote, the four JCCB members supporting removal of the dam had the opportunity to state their reasons for doing so. None of them mentioned recirculating currents or the "drowning machine" effect of such currents. Board member Rob Roman did express, earlier in the meeting, his belief that this was still an issue. Audio recording of JCCB Meeting on August 24, 2017.

In the application for Grant # 1, the application asked, in part, "Describe . . . the relative hazard of the dam and how this project is expected to improve public safety." The JCCB response addressing safety stated, in part, "The removal or alteration of the dam will mitigate safety issues associated with dangerous hydraulics and a difficult portage situation. The feasibility study . . . will consider safety issues as a primary focal point, including minimization of dangerous hydraulics and improved conditions for potential rescue operations." Application for Grant # 1 LHDP Project # 08-01 at 5.

The application for Grant # 2 makes no direct mention of "dangerous hydraulics" "drowning" or "recirculating currents" or any similar topic, despite the requirement that the low head dam grants require that the dam have a "recirculating current" 571 IAC 30.51, and that the low head dam hazard program funding is "limited to projects that primarily enhance dam safety in order to reduce drownings." 571 IAC 30.52.

This grant application does, however, state that, "According to the IDNR 2010 Plan for Dam Mitigation, the Mon Maq Dam ranked near the top in relative risk analysis," which does relate to the issue of preventing drowning. Application for Grant # 2 LHDP Project # 13-06 at 5. This relative risk analysis will be addressed in detail later.

The application for Grant # 3 alleges that "recreational uses bring public very near the dam. This poses a safety hazard due to the turbulent water that is created below the structure." It also purports that one the project's goals is to "eliminate dangerous hydraulics at all flow ranges." Application for Grant # 3 LHDP Project # 16-04 at 2.

With regard to the inquiry on hazards, this application claims that:

> The dam modification will mitigate safety issues associated with dangerous hydraulics and a difficult portage situation. Easily accessible from the shoreline immediately above and below, the 13 foot tall dam poses a high risk of harm to those who fish or swim in the vicinity. The dam modification will minimize or eliminate the dangerous hydraulics and allow for safe passage of paddlers, tubers and aquatic life.

Id at 7.

The application for Grant # 4 asserts that:

> recreational uses bring public very near the dam. Many in the local community are aware of the safety risks posed by the dam but with the water trail being a major tourist draw many that visit are unaware of the safety hazard caused by the turbulent water that is created below the structure. In several cases, the public has even ventured out onto the dam. Safety is of great concern to local residents and we as dam owners want to greatly minimize that concern with this project. . . . the risk of drowning, detrimental ecological effects and dam failure greatly outweigh the benefits.

Application for Grant # 4 LHDP Project # 17-01 at 2.

The hazard inquiry in the application for Grant # 4 makes the following claims:

> The . . . dam . . . when viewed from below and during medium-to-high river flow can be a raging turbulence of water. However, from the upper pool . . . the hazard of the dam is barely visible causing paddlers, tubers and boat operators to be unaware or complacent about its hazard. When water is actively recirculating below the dam the drowning hazard produced by the dam is acute. In particular, new visitors to the area often don't understand the power of rushing water causing them to take risks that knowledgeable locals avoid, such as venturing too close by foot or water craft. Instances have occurred where visitors have walked across the dam's apron and upper surface greatly increasing their risk of injury or death.
>
> By completely removing a large portion of the dam the recirculation issues will be largely negated. River users will also be able to safely navigate the site without

> encountering significant hazards including the structure itself. The need for portaging will also be eliminated.

Id. at 7.

Like its grant applications, the JCCB's "Maquoketa River Mon/Maq Dam Project" website document lists, as the first goal of the dam project: "Eliminate dangerous hydraulics at all flow ranges." It also avers that:

> Low head dams like the Mon/Maq are prone to dangerous hydraulics as water flows over their surface and recirculates in the pool below causing safety and liability issues. Known as a drowning machine, this recirculation causes anything caught within it to be trapped near the dam.

JCCB, Maquoketa River Mon/Maq Dam Project at 1 (2017) http://www.jonescountyiowa.org/current-projects-and-news.

The allegation that there are dangerous "drowning machine" hydraulics at the Mon/Maq dam is based on the assumption that the Mon/Maq dam is like every other low head dam in Iowa.

The most important fact about safety at the Monticello Maquoketa River Dam is that there has never been a drowning at the dam. Due to the design of the dam, especially its apron structure, it is doubtful that there are any recirculating currents or drowning machine hydraulics at the dam at normal or low water levels when people are actually in close contact with the dam.

This is best demonstrated by comparing the photo below of the normal condition of the Mon Maq dam to the two following diagrams, explaining the drowning machine phenomenon. The first and easiest to understand, is from the Pennsylvania state police. According to Diagram # 1 "The water above the dam picks up speed as it squeezes over the structure." The downstream side of the dam plunges in a straight line at an 80 degree angle to the bottom of the river. Three quarters of the dam on that side is below water. The water plunges down that side to the bottom of the river. The diagram notes: "Fast moving water plunges to the bottom of the dam, forcing the water already there to the surface. Water is then forced back down to the bottom by the water falling over the dam, and the cycle repeats itself".

Diagram # 2 is similar. Both diagrams demonstrate an unimpeded plunge of water down the downstream side to the bottom of the river. The downstream water level is near the top of the dam. There is no apron above the water level on the downstream side.

The photograph below of the Monticello Maquoketa dam at normal water levels is markedly different from the situation portrayed in Diagrams #1 and #2. Water does not plunge over the side of the dam to the bottom of the river. It is intercepted by the apron. The apron is above the downstream water level. The apron is about 20 feet wide. The apron totally eliminates any "drowning machine" action caused by

water plunging over a dam straight to the bottom of a river. The water continues to the edge of the apron and falls a short distance, perhaps 2 feet, into the river downstream.

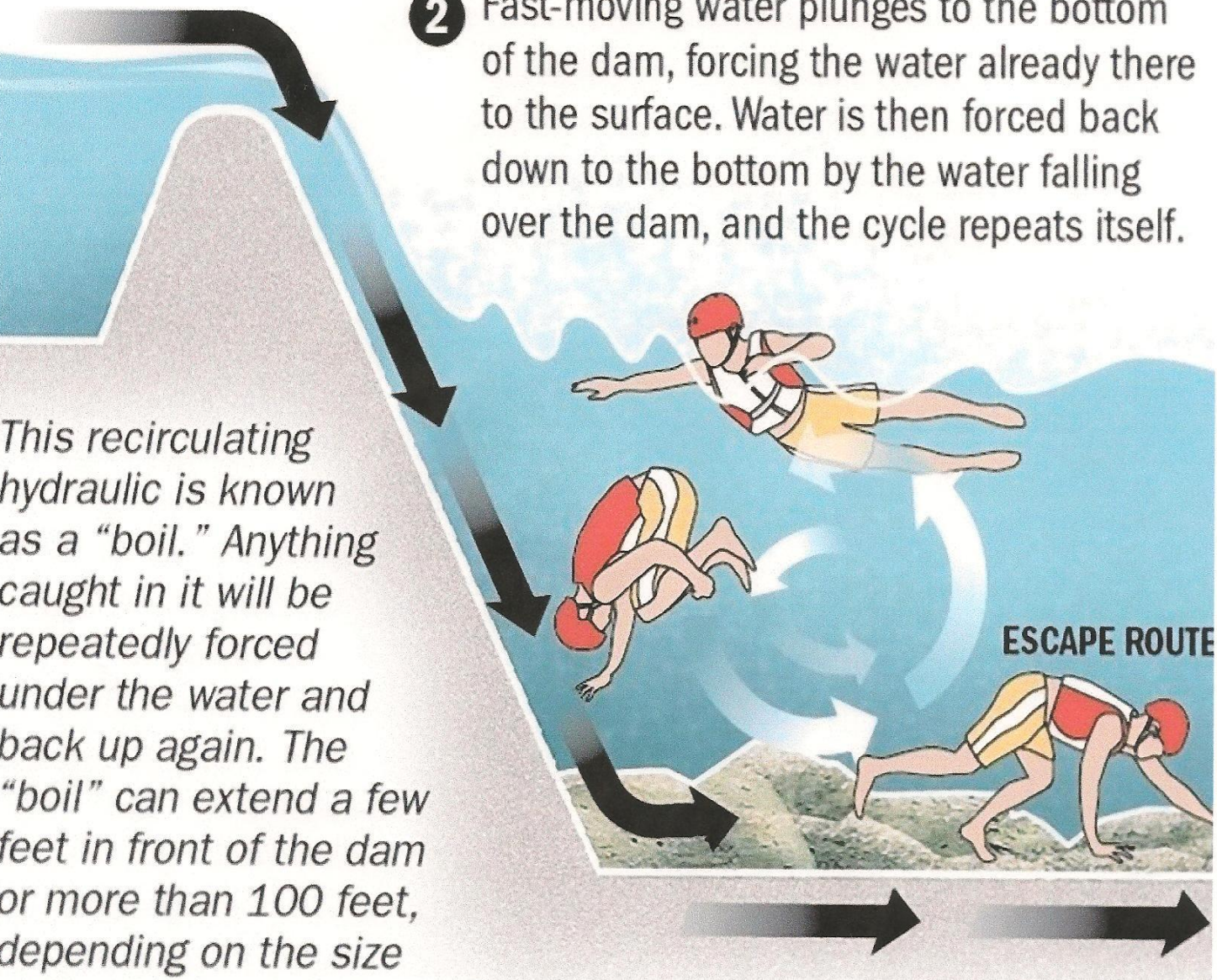
PHOTO OF THE MONTICELLO MAQUOKETA DAM AT NORMAL WATER LEVEL

JCCB, “Maquoketa River Mon/Maq Dam Project” at 10.

DIAGRAM # 1

1 The water above the dam picks up speed as it is squeezed over the top of the structure.

2 Fast-moving water plunges to the bottom of the dam, forcing the water already there to the surface. Water is then forced back down to the bottom by the water falling over the dam, and the cycle repeats itself.



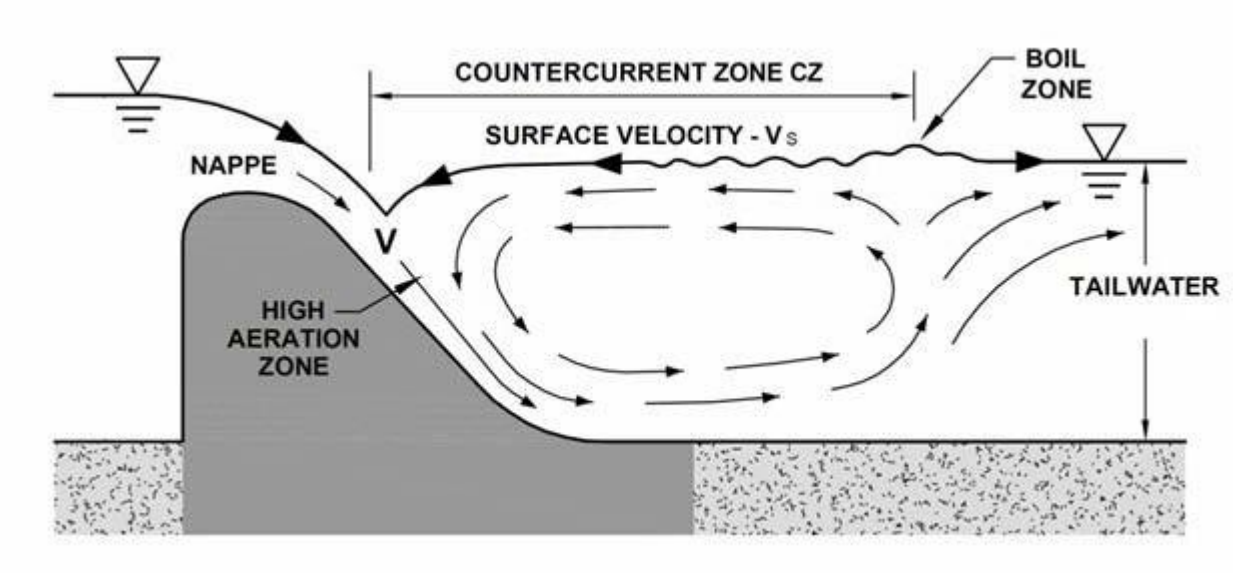
This recirculating hydraulic is known as a "boil." Anything caught in it will be repeatedly forced under the water and back up again. The "boil" can extend a few feet in front of the dam or more than 100 feet, depending on the size of the river and the depth of the water.

3 To escape the this action, curl up, dive to the bottom, and swim or crawl downstream

Sources: Pennsylvania State Police community awareness bulletin, Popular Mechanics

Post-Gazett

DIAGRAM # 2

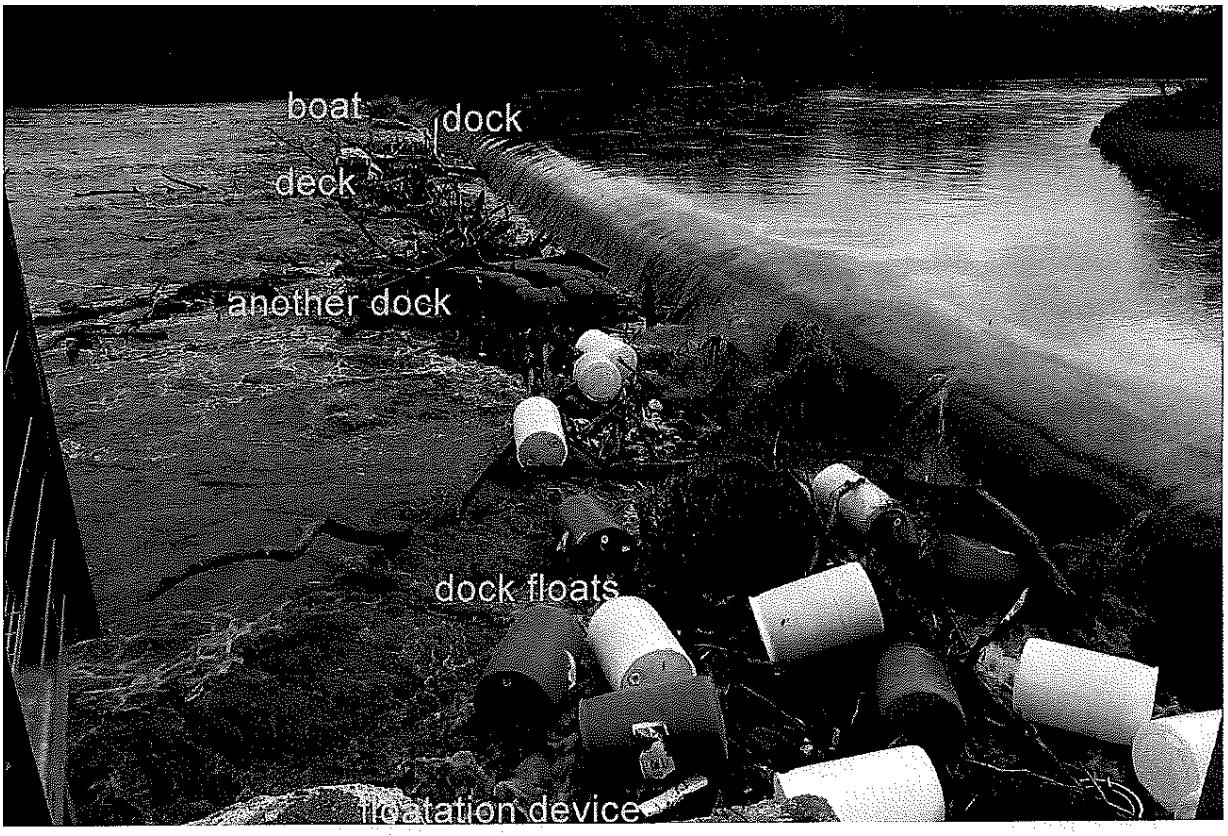


Tschantz, B., "What We Know (and Don't Know) About Low Head Dams," 12 The Journal of Dam Safety No. 4, 38 (2014).

Compare the turbulence at the "drowning machine" dam below to the Mon Maq Dam photo above:

Tschantz, Bruce, "What We Know (and Don't Know) About Low Head Dams," 12 The Journal of Dam Safety No. 4, 37 (2014).

In the application for Grant # 4, the JCCB submitted the following claim and photograph:



Picture 3: Recirculation below the dam traps debris and other material. Known as a "drowning machine," the recirculation can be fatal to anyone trapped within it.

Application for Grant # 4 LHDP Project # 17-01 at 33.

The text accompanying the photo makes no mention of the real hazard here. This is not a photograph of the Maquoketa River at normal water levels. This is a photograph of the river at a high flood stage. Ninety percent of the normally visible dam is submerged in this photo. The apron of the dam, normally visible, is 6 or 7 feet underwater. The river bed below the apron would be 10 or 11 feet underwater. The river is a "serious hazard for visitors to the water trail" at flood stage, regardless of whether there is a dam or not or whether the project selected by the Jones County Conservation Board, designated as "Option A", replaces the dam. To imply, based on this flood stage photo, that the dam presents "dangerous hydraulics" or a "drowning pool" at normal or low water levels, when the public is in close contact with the dam, is grossly misleading.

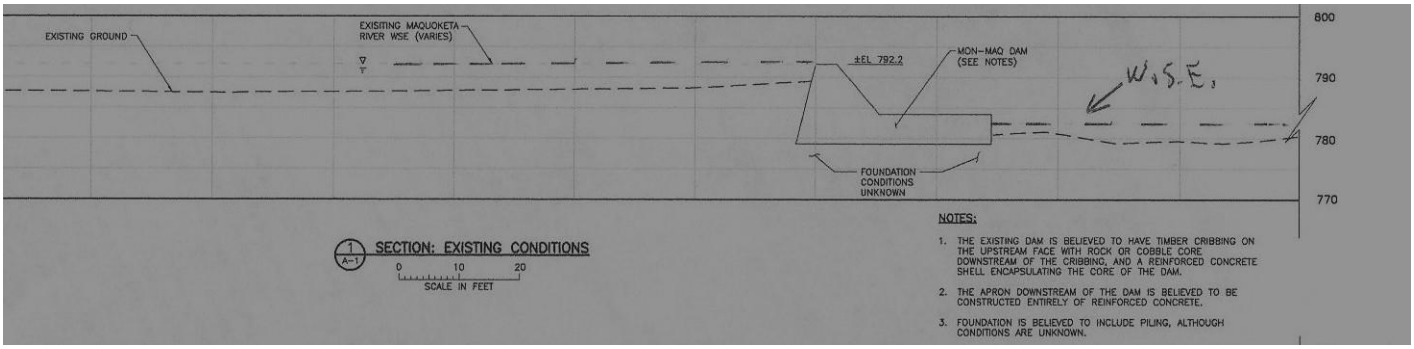
We believe the above photo was taken during the July 2010 flood resulting from the failure of the Delhi Dam. According to the United States Geological Survey (USGS), this flood has a 0.2% to 1 % chance of reoccurrence in a given year or, expressed another way, we can expect reoccurrence of this flood once every 100 to 500 years. USGS, Summary of U.S. Geological Survey Reports Documenting Flood Profiles of Streams in Iowa, 1963–2012 (Table 7).

Given that the USGS has also determined that the Maquoketa River is the only river in Iowa to have "significantly decreased annual maximum flow" between 1940 and 2000, the continuance of this trend may indicate that such flooding may be even less frequent than indicated by the above estimates. USGS, "Increased Baseflow in Iowa Over the Second Half of the 20th Century".

DAM SAFETY: NO RECIRCULATING CURRENTS AT THE APRON EDGE:

Some further comment should be made with regard to the apron structure. Applications for Grants # 3 and 4 allege that that there are recirculating currents or dangerous turbulent water just below the dam and even that people walking on the apron are in danger of falling off the apron and drowning due to such currents. Application for Grant # 4 LHDP Project # 17-01 at 2, 7; Application for Grant # 3 LHDP Project # 16-04 at 2, 7.

We have noted that the apron structure interrupts the drop of water from the top of the dam, which is 8.2 feet above the apron. The water flows horizontally to the edge of the apron and then drops to the water's surface. Can this drop from the apron result in a "drowning machine" hydraulic?
A construction drawing in the application for DNR Grant # 4 provides information on tailwater depth and other dimensions for the dam:



Application for DNR Grant # 4, LHDP Project # 17-01 at 19 (water surface elevation line has been retraced with pen so it can be seen on scan. "W.S.E." notation for the water surface elevation line written in to distinguish that from the "existing ground" or riverbed line)..

Note that this drawing indicates that the apron is about 20 feet wide. **The water depth downstream, immediately adjacent to the apron, on the day represented by this diagram, is less than 2.5 feet.** The river bed elevation is slightly above 780 feet. The water surface elevation is at 782.5 feet. A separate drawing, consistent with this one, specifically indicates that the "existing dam slab" or apron is at 784 feet elevation. Id. Thus, the distance from the apron to the water surface is 1.5 feet. **The distance from the apron to the river bed is less than four feet. The maximum depth that the river can reach before the river is level with the apron is less than four feet. At this point, there is no drop of stream flow**

from the apron to the water surface or to the river bed. Once there is no longer a drop, there cannot be the formation of a recirculating current, as explained below.

An "hydraulic jump" is "a sudden usually turbulent rise of water flowing rapidly in an open channel where it encounters an obstruction or change in the channel slope." https://www.merriam-webster.com/dictionary/hydraulic%20jump. Tailwater depth plays a role in determining whether a **submerged hydraulic jump**, leading to a dangerous recirculating current, is formed:

> Structures such as . . . dam spillways . . .can produce dangerous submerged hydraulic jump conditions typical of low-head dams . . . . **A submerged hydraulic jump occurs when the tailwater depth in the downstream channel exceeds the jump's subcritical sequent depth** forcing a strong rotating current to form immediately downstream from the plunging overflow nappe. The frontal vortex is a degenerate jump and is commonly called a "hydraulic."

Tschantz, Bruce, "What We Know (and Don't Know) About Low Head Dams," 12 The Journal of Dam Safety No. 4, 37 (2014).

Further commentary and an illustrative diagram concerning the recirculating (counterclockwise) current and the role played by increasing tailwater depth in the creation of such a "hydraulic" is provided in Hans Leutheusser's paper, "Drownproofing of Low Overflow Structures," J. Hydraulic Eng. 117(2), 205-13 (1991). In the quote below, we have substituted "dam" for a "weir", which is a small dam. http://www.dictionary.com/browse/weir?s=t. "Nappe" is "the sheet of water that flows over a dam". http://www.dictionary.com/browse/nappe.

The recirculating current is shown in case C in the diagram below and also in Diagram # 1 and Diagram # 2 presented above at pages 10 and 11.

Leutheusser writes:

> **[T]ailwater conditions determine the mechanism of energy dissipation by a hydraulic jump.** With increasing downstream water depth, the swept-out hydraulic jump (case A) is pushed downstream until it reaches its optimum location immediately downstream of the point of nappe impact (case B). **Further increase in tailwater depth pushes the jump against the [dam] and the nappe plunges, and the jump becomes submerged (case C). Eventually the [dam] itself becomes immersed, the nappe stays at the surface, and the jump is wiped out (case D).**
>
> With the jump submerged (case C) the free surface is deceiving quiescent while a strong rotating current forms in a vertical plane immediately downstream of the nappe. The frontal vortex is a degenerate hydraulic jump and is commonly

> referred to as a "hydraulic" by canoeists. . . . [T]his case is clearly the most dangerous one: the "hydraulic," i.e. the submerged hydraulic jump, propels floating material upstream toward the [dam], the plunging nappe entrains the material, and similarly ingested air makes the water lighter and thereby promotes sinking. . . Once in the water . . . the potential victim may be unable to overcome by swimming the relentless upstream drift toward the plunging nappe. There, the body will be heavily impacted by the falling water and forcefully submerged. Unless able to get free from the maelstrom of the hydraulic, the victim will surely then die.

Leutheusser, H., "Drownproofing of Low Overflow Structures," J. Hydraulic Eng. 117(2), 206-07 (1991)(emphasis added).

The diagram referred to is reproduced below:

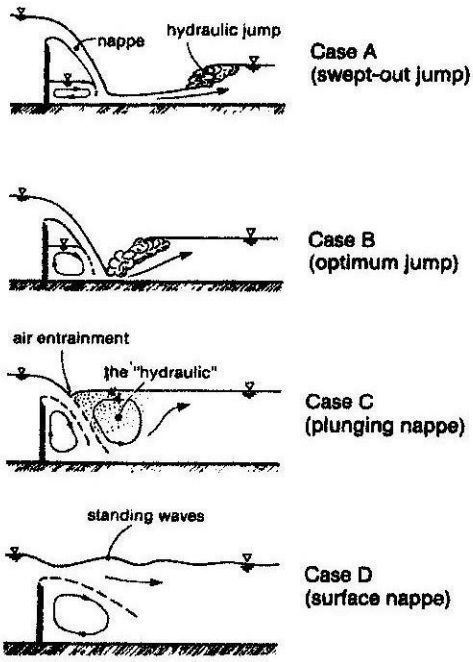


FIG. 1. Schematic Presentation of Various States of Weir Flow as Function of Tailwater Depth

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Leutheusser, H., "Drownproofing of Low Overflow Structures," J. Hydraulic Eng. 117(2), 206 (1991).

We seriously doubt that a tailwater depth of less than 2.5 feet, or even something less than four feet, would provide the required depth for the formation of a hydraulic below the apron under the conditions present at the Monticello Maquoketa Dam. Many Illustrations, including Diagram 1 above on page 10 and the DNR's warning sign, show a human trapped in a recirculating current in a tailwater depth which is significantly greater than the height of a human being. The DNR sign is shown below:

DNR, Iowa Water Trails Program Sign Manual p.6.

Once the water surface elevation has raised to the point that it is level with the apron elevation, there is no more downward drop from the apron to fuel a hydraulic. The situation for the apron is equivalent to that when any low head dam, including the Mon Maq Dam is completely, submerged as illustrated in Leutheusser's case D above.

K. Brooks, "Meeting Outlines Future of Mon Maq Dam," Monticello Express (May 24, 2017).

Notice that, in the above photo, when the water elevation is just high enough that the apron cannot be seen, neither can the sandbar, nor any fishermen or waders in the stream flow.

"Under most flow conditions [low head] dams pose little or no threat." Schweiger, P., "Savings Lives While Improving Fish Passage at Killer Dams," 9 Journal of Dam Safety 2: 16 (2011). Due to the presence of the apron, and the tail water depth, it is clear that the Monticello Maquoketa Dam is also safe at most flows, including all those when the public is in close proximity to the dam.

Below is a typical picture at the Monticello Dam in summer:

Note that the water is over the fisherman's knees, about 2.5 feet in depth. Notice also the ice box or bucket on the sandbar. The sandbar is connected to the north shore and is used for walking to fishing locations near the dam. The apron is accessed from some rocks piled near the dam on the north side of the dam. Photo by Donald W. Bohlken.

The apron may have two or three inches of water flowing over it. Nobody argues (we hope) that the water on the apron constitutes a drowning machine at this depth.

It is not unusual to see people safely walking on or even fishing from the almost 20 foot wide apron at normal or low water flows. Fishermen in the river have even fished close enough to the apron to touch it with their fishing poles. Indeed, dam inspectors walk on the apron at appropriate water levels and refrain from doing so when the water level is too high. (Recording of Board Member Tabor quoting dam inspection reports at 8/24/17 JCCB meeting). The plan for Option A even includes using the apron from the retained portion of the dam as a fishing platform. JCCB, "Maquoketa River Mon/Maq Dam Project" at 2.

The apron cannot be accessed directly from the north shore road access. The foundation of the building formerly holding the hydroelectric generators blocks such access. It is necessary to wade through the river and climb some rocks at the base of the dam, next to the foundation, to gain access to the apron.

If the water goes up an additional 4 feet, both the fisherman and the sandbar will be completely immersed. The apron will be under 2 feet of water. There will be no hydraulic or drowning machine on the apron because there is only 2 feet of water there. In reality, of course, at this level the tail water surface will be over 6 feet above the river bed, with a strong current. Long before this depth is reached, and before the water depth is even with the apron, no one is going to be fighting the current by wading or trying to stand fishing in the river. No one is going walking on the dam apron. The sandbar access is under water. **At these depths, there is no hydraulic, either on the apron or below it, but if there were, no one would be caught in it because no one is in the water approaching the dam from downstream.**

We wonder why, if there were actual dangerous recirculating currents at the base of the dam, the DNR's 18 X 24 inch warning sign, shown above at page 16, is not posted below the dam. Only a smaller warning sign is incorporated in the larger Park Information sign at the overlook.

DAM SAFETY:: THE DNR'S "RELATIVE RISK ANALYSIS":

As previously noted, the JCCB's application for Grant # 2 relied on the DNR's ranking of the Monticello Maquoketa Dam in the DNR's relative risk analysis. Application for Grant # 2 LDHP Project # 13-06 at 5.

Appendix B of the DNR's 2010 Plan for Dam Mitigation indicates that the Mon-Maq dam is 8th in rank of "Dams Ranking High In Relative Risk Analysis" out of 211 structures, including low-head and other types of dams. "Risk factors were developed after analyzing 1998 to present fatalities at dams and examining other available data. Factors weighted and analyzed using GIS modeling, including relative usage statistics from the 2009 Iowa Rivers and River Corridors Recreation survey. . . . Dams in the low-head, breached low-head, large impoundments and ford categories were analyzed (211 total structures)." DNR, 2010 Plan for Dam Mitigation at 61.

We seriously question the analysis and scoring for the Monticello Dam. It appears that a higher score, based on the following factors, results in a higher "relative risk":
Proximity to population centers: (>100,000, 2 pts; > 35000, 1 pt).

Known fatalities: (>5, 3 pts; >3, 2 pts; 1 to 3, 1 pt).

Height: (2' to 15', 2 pts; >15', 1 pt).

Type: (low-head, 3 pts; Breached low-head, 2 pts; Large impoundment or seasonal low-head, 1 pt).

Near university/college: (50 mile radius, 2 pts; 10 mile radius, 1 pt).

On designated or in-progress water trail (1 pt).

River usage survey, total # visits (>1000 1 pt; > 350 .5 pt).

River usage survey, in-water visits including fish/boat/canoe/swim (>700 3 pts; >349, 2 pts).

Id.

There are massive problems with using this "risk analysis" as an argument for granting Low-Head Dam Public Hazard Program grants. The survey acknowledges that, "this type of broad-brush statistical analysis does not account for individual site factors, such as hydraulic retention, site design, education and other factors that may play a role in actual risk". Id.

It appears that, despite having no fatalities and not being in proximity to a population center, the Monticello Maquoketa Dam was assigned a total of 8.5 points, as follows:

Proximity to population centers: 0 points.

Known fatalities: 0 points

Type (low-head): 3 points

Near University (10 mile radius): 1 point.

On designated water trail: 1 point

River Usage Survey (649 total visits): .5 point

River Usage Survey, in water visits (1114 in water visits): 3 points

Note that, because the River Usages Survey asks the participants to place a check mark by each activity engaged in throughout their contact with a river in 2009, 649 "total visits" can result in 1114 'in water visits". Thus, if a visitor went to a river once, but checked off canoeing, fishing and swimming, this one visit would count as three "in water visits". Yongjie J., Herriges B., Kling C., Understanding the Usage Patterns and Most Desirable Characteristics of Iowa's Rivers and Streams, Appendix B at 52-55 (2010).

The risk analysis places far too low a weight on actual, as opposed to hypothetical or potential, loss of human life. The highest number of points assigned for fatalities is 3 points for greater than 5 fatalities. Thus, the Blackhawk County Park Avenue Dam with 6 fatalities, is rated the same, for this factor, as the Ottumwa Market Street Dam, with 9 fatalities, and the Des Moines Center Street Dam, which has 15 fatalities. DNR, 2010 Plan for Dam Mitigation at 61; see Appendix D of this paper.

The Monticello Maquoketa Dam, at eighth place, has the highest listing for any dam without fatalities. Id.; DNR, The 2010 River Dam Inventory at 22-24. It outranks 21 low head and 1 breached low head dams that have a total of 43 fatalities. It far outranks two dams, the Ottumwa Market Street Dam, ranked 18th, and the Buchanan County Littleton Mill Dam, ranked 41st, which have NINE fatalities each! These two dams tie for the second highest number of dam fatalities in the state. DNR, 2010 Plan for Dam Mitigation at 61; DNR, The 2010 River Dam Inventory at 22-24. See Appendix D of this paper.

Appendix B only lists dams down to the 50th percentile in ranking. Under this system three low head dams, with a total of 5 fatalities, are not listed as they do not even make the 50th percentile in the relative risk rating. These are the Lawton, Iowa Dam with 2 fatalities (designated W00-11); the Sill # 4 Dam with 2 fatalities (designated HAS-1; and the Lylah's Marsh Dam (designated HOW-2) with 1 fatality. DNR, 2010 Plan for Dam Mitigation at 61; DNR, The 2010 River Dam Inventory at 22-24.

We wonder if the Monticello Maquoketa Dam was correctly scored on the "near university / college" factor. It is common knowledge that there is a Kirkwood Community College facility in Monticello, which should mean Monticello got 1 point. But, for many years, Monticello had no college facility within 10 miles, so it may have received 2 points because the nearest college was in a 50 mile radius.

It is also common knowledge that Kirkwood is a community college serving largely commuter students. There is no campus other than one large building. There are no dorms or student housing. Monticello is not a typical college town, such as Mt. Vernon, with an abundance of young people at Cornell College who might wish to visit a nearby river.

It must be noted this criterion is irrational as applied. One point is assigned if a college is within 10 miles of a dam, but, inexplicably, 2 points are awarded if the college is not within 10 miles, but in a 50 mile radius. And no points are awarded if the nearest college is further than 50 miles. This awarding of points makes no sense if nearness of the university or college is a factor which increases relative risk.

The "on designated water trail" factor also distorts the frequency of close contact by water trail travelers with the Monticello Maquoketa Dam. While, according to the DNR's map of the Maquoketa River Water Trail, it begins at the dam, and continues downstream, the real access to the river is far downriver from the dam. Canoeists, kayakers and tubers enter the river either at or slightly upstream from the Monticello Canoe Rental location, which the JCCB admits in its application for Grant # 3 is ¼ mile downstream from the dam. Application for Grant # 3, LHDP Project # 16-04 at 7. Trail users can see the dam, but are not near the dam. This is not a reliable indicator of relative risk of drowning.

The criteria of "total visits" and "in water visits" are also not reliable indicators of public proximity to the dam. These factors refer to visits along the entire length of the Maquoketa River in Iowa, not just the Maquoketa River Water Trail or the area of the Monticello Maquoketa Dam. Most in water visits in the dam area start, as previously noted, ¼ mile downstream from the dam and continue downstream. There is some traffic upstream with motorboats for fishing and kayaks for touring, which originate from and return to the upstream boat ramp. There is a large sign warning of the dam next to the boat ramp and another one at the Business Highway 151 bridge, also known as the Main Street Bridge, upstream. But, there is little traffic originating from points upstream. We cannot find anyone who has ever seen a

canoeist or kayaker portage from the boat ramp around the dam. Most upstream use originates in Hopkinton and terminates at the Outback Canoe Rental, far upstream from the dam. These factors are addressed more thoroughly in the section on Navigation. These factors also give an exaggerated impression of the actual amount of water traffic in the immediate vicinity of the dam.

The grant applications and the relative risk analysis all ignore the effect on safety at the Monticello Maquoketa Dam of warning signs, the apron, the low tail water depths and slow current when the public is actually in close contact with the dam, and fencing and other barriers to access.

DAM SAFETY: UPSTREAM SAFETY:

The application for Grant # 4 includes a photo of the pool upstream of the dam with the notation, "View of the dam from the pool area. The dam's presence and risk potential is largely hidden from view." Application for Grant # 4 LHDP Project # 17-01 at 32. At an earlier point the application even claims that "the hazard of the dam is barely visible causing paddlers, **tubers** and boat operators to be unaware or complacent about its hazard." Id. at 7 (emphasis added).

This concern ignores the fact that the number of water visitors whose journey actually originates from upstream above than the boat ramp is very low. Boaters and canoeists enter the river at the boat ramp, go upstream, and then return to the ramp. The reference to "tubers" is especially imaginative. Since tubers can only go downstream, it is obvious that they are not entering the water at the boat ramp so they can bump into or be swept over the dam. This might be a problem if the few visitors originating from upstream had no notice of the dam. The grant writer forgot, however, to mention or photograph the large easily visible sign at the upstream pool, next to the boat ramp, reproduced below:

There is also a dam warning sign upstream at the Business Highway 151 Bridge. The JCCB can hardly claim that visitors from upstream will be taken by surprise by the dam. Funding for additional warning signs, if such are necessary, is available from the DNR at a cost far less than $1.8 million. 571 IAC 30.53(2). See also the discussion under "Navigation" below.

DAM SAFETY: DAM FAILURE:

The applications for Grant # 2 and Grant # 3 make allegations relating to dam failure, including such exaggerations as the dam being built in 1841 or 1901, when it was actually completed in 1914.

Application for Grant # 2, LDHP Project # 13-06 at 2, 5; Application for Grant # 3, LHDP Project # 16-04 at 2; Carlson, R., Phase I Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 23 (Iowa Office of the State Archaeologist) (2016).

Funding under the Low-Head Dam Public Hazard Program is limited "to projects that primarily enhance dam safety in order to reduce drowning." 571 IAC 30.52. Since low-head dams are, for the purpose of the rule, limited to dams with "recirculating currents," it is clear that the primary goal of the program is to enhance the safety of dams with "recirculating current[s]" in order to "reduce drowning". See 571 IAC 30.51-.52.

The DNR's 2010 Iowa River Dam Inventory states that "no deaths have occurred due to dam failure to date." DNR, The 2010 River Dam Inventory at 18. The Monticello Maquoketa Dam is rated by the DNR as a "low hazard" dam with respect to possible damage or injury or loss of life downstream if the dam were to fail. Email from Jonathan Garton, DNR Senior Dam Safety Engineer, August 24, 2017. Under these facts, it is clear that the dam failure allegations do not address the primary goal of preventing drownings.

As a practical matter, if such a rating were available, the Mon Maq Dam could accurately be rated as a "no hazard" dam. Unlike the dam at Delhi, this dam is a low head dam which does not hold back a large reservoir of water. Since the dam is sometimes submerged by flooding, it is self-evident that any downstream flood plain flooded by the sudden collapse of the dam would not be as wide as the flood plain from larger floods on the Maquoketa. In the event of catastrophic failure, flooding a smaller flood plain than other floods, where is the private property which could possibly be damaged by such a massive breakdown of the dam? One can search downstream in vain for potential damage to lives or property.

If you construct in a flood plain, you assume the risk of flooding. Not only that, but any catastrophic failure of the dam would probably be caused by a flood which submerged it. Can anyone seriously argue that any hypothetical damage of the hypothetical buildings downstream was caused by dam failure and not by the flood which caused the dam to fail? Even if that were so, the dam is covered by Jones County's general liability policy. Telephone Conversation with JCCB Conservation Director Brad Mormann on September 12, 2017.

It is more likely that a portion of the dam, not the dam in its entirety, may someday break down. Breached low head dams are nothing new in Iowa. According to The 2010 River Dam Inventory, there were seven breached low-head dams in existence, with six breached before 2010, one of which was owned by the DNR and three by other government entities. DNR, The 2010 River Dam Inventory at 22-24. The effect of a breach, insofar as increased water flow is concerned, may be similar to that of Option A, chosen by the county to replace the dam. Based on the drawing and the illustrative photo of Option A on page 24 of this paper, the "arching boulders" will, in effect, create a new, albeit shorter, dam, composed of boulders instead of concrete, with a big hole which supposedly will allow the passage of boats. See Appendix B of this paper. Option A also has "rock riffle" on the north side, which would also increase water flow. Id. Any threat of liability from such a breach causing a hole in the dam would be no greater than that from implementing Option A.

The allegations in the application for Grant # 2 include that "the 110 year old dam is deteriorating and local officials are concerned with water undermining the structure and river washing a new channel around the dam. A control joint in the center of the dam is widening every year and the wing walls are leaking. The dam's integrity and safety is in jeopardy and this projects purpose is to prescribe and complete improvements before the dam fails." Application for Grant # 2, LDHP Project # 13-06 at 5.

These allegations are contradicted by the DNR's 2010 Iowa River Dam Inventory which lists the dam's condition as "good". 2010 River Dam Inventory at 23. None of the dam safety inspection reports, dated September 14, 1988, October 25, 1989, July 9, 1999 and September 15, 2010, quoted in full by JCCB Board member Dave Tabor at the JCCB meeting on August 24, 2017, verify any of the above allegations. Audio Recording of 8/24/17 JCCB Meeting. Indeed, the September 14, 1988 inspection established that "the notch in the center of the spillway was constructed that way and is not a deteriorated construction expansion joint." Id. Also, the dam was 98 years old in 2012, not 110 years old.

These allegations are also contradicted by the state's architectual survey of the dam, "[the dam's] integrity of *design*, *materials*, and *workmanship* also remain high. The dam appears today essentially as it did when it was first constructed, and it is not known to have undergone any major repairs or other changes." Carlson, R., Phase I Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 23-24 (Iowa Office of the State Archaeologist)(2016).

The speculation, in the application for Grant # 2, on "water undermining" of the dam is unsupported by facts. Application for Grant # 2, LDHP Project # 13-06 at 5. The construction drawing, shown on page 13 above, states "FOUNDATION CONDITIONS UNKNOWN". Application for DNR Grant # 4, LHDP Project # 17-01 at 19. It also shows that 10 feet of the dam, exclusive of pilings, is below the upstream river bed level, which is inconsistent with the conclusion that there is "water undermining". Id.

In light of the above facts, we believe that the "dam failure" rationale for the dam project has not been demonstrated by proof. **No new Low-head Dam Public Hazard Program grants for the Mon Maq Dam should be approved or current grants extended based in whole or in part on the rationales that removal of the dam is necessary due to dam failure or other dam safety issues.**

DAM SAFETY: COMPARATIVE SAFETY OF "OPTION A":

How safe is the dam replacement voted for by the JCCB, Option A? The JCCB's "Maquoketa River Mon/Maq Dam Project" provides the following photo and comment on Option A:

*** Picture is of Elkader's Whitewater drop. The actual rock structure in Option A's design will be slightly different than this picture. In particular, the preliminary design has a more gradual slope and at least 2 arching rows of rock. The goal is to allow safe paddler/tubing passage in addition to shallow water boat traffic at most flows while creating a scour hole for fish attraction and angler success.

JCCB, "Maquoketa River Mon/Maq Dam Project" at 3. *See also* id. at 2 (preliminary design showing scour hole). (A further description of Option A is in Appendix B of this paper).

Please note that the goal is to provide "safe paddler/tuber passage . . . **at most flows** (emphasis added)." At what flows will paddler/tuber passage be unsafe? One must wonder at what flow any tuber would be safe going over this. As far as motorboats, mentioned in the JCCB's website document "Maquoketa River Mon/Maq Dam Project" at 1, this would be a high risk proposition at all water levels, especially for upstream travel. For all users, of course, flood stage flow will be unsafe. A paddler may hit submerged or visible boulders or debris which they cannot evade due to the rapid flood currents.

But, what about normal flows after a flood? A canoeist relying on this "safe" passage at normal flows may discover, at the last second, that a recent flood has deposited a submerged or visible tree in the passage. If the canoeist is knocked unconscious or otherwise injured before being swept to the deep scour hole, this may be the last river trip the paddler ever takes. Water pressure jamming the canoe against the tree also creates a dangerous situation. The dam area may have its first drowning with Option A.

While the accompanying map indicates the boat passage will be a minimum of two feet deep, what if there is a drought or very low river flows and a canoe hangs up in the passage? See Appendix B; JCCB, "Maquoketa River Mon/Maq Dam Project" at 2. Now, if a canoe hangs up in a slow moving, shallow, level river, it is no big deal. The canoeists get out into the river, move the canoe to slightly deeper water, and get back in. But here, the canoe is hung up at a downward angle, on a slippery surface, with faster water being funneled to the passage, and a deep scour hole at the end. Appendix B (preliminary design showing scour hole immediately downstream of passage). It would not be so easy to reenter a tippy canoe before getting into water that is too deep for re-entry. There is a real risk of injury or death.

Because of the promise of supposedly safe and unimpeded navigation offered by the passage, paddlers will now be encouraged to enter an area with "two arching rows of rock", actually very large boulders according to the above photograph. Such boulders present a hazard at low or normal water flows, as well as at higher water flows where they may be submerged, but not deep enough to allow passage of water craft.

Construction of Option A contains the same risks as constructing a "canoe chute' through a dam. "A downside to a canoe chute is that it may become an open invitation or destination for canoers and kayakers, and the added interest and visitation to the dam site can increase the dam owner's exposure to liability. Constructing a canoe chute may also convey a measure of safety to boaters, skilled and unskilled alike, that may not exist ." Schweiger, P., "Savings Lives While Improving Fish Passage at Killer Dams," 9 Journal of Dam Safety 2: 16 (2011).

This conclusion is consistent with statements in the application for Grant # 1: " If the dam is removed or altered warning signage will still be required and a portage around the breeched structure will be available for those wishing to bypass the challenge presented by fast water or a riffle area." Application for Grant # 1 LHDP Project # 08-01. At a public meeting this year, the JCCB admitted that the passage will require some skill. Even without the passage hazards at flood level, low level or when a submerged or visible tree or other debris blocks the passage, what happens with someone without the requisite skill tries to go through it?

Option A also has a remnant of the apron being used as a fishing platform next to the edge of an 6 foot deep rock lined scour hole with fast current and passing watercraft. See Appendix B (map of Option A). With respect to drowning risk, this is obviously more dangerous than falling two feet off the current apron into 2.5 feet of water with a slow current and a riverbed lined with a sandy gravel base. Construction drawing at page 13 above; audio recording of August 24, 2017 JCCB Board meeting with reading of September 14, 1988 dam inspection report.

With respect to drownings, Option A is more a dangerous alternative than leaving the dam in place.

CONCLUSION ON DAM SAFETY:

The previously cited facts and reasoning demonstrate that the dam is already safe. In over 100 years, there have been no drownings at the dam. Immediate access to the dam from the north access road is limited by fencing, railings, the foundation of the former generator building, and six foot deep water upstream. There are warning signs upstream of the dam where water entrances and exits are available at a safe boat ramp. The public is only in close contact with the dam downstream, when the sandbar is exposed and the water depth is well below four feet. The public is then exposed to no dangerous recirculating currents. The replacement option chosen by the JCCB encourages watercraft to enter an area with boulders, a rock riffle and a potentially hazardous passage. Not only that, but Option A will use the remnant of the apron as a fishing platform with a risk of falls to a deep rock lined scour hole with a fast current and possible watercraft traffic. The risk of drowning is greater under Option A than with the dam. This alternative makes no sense for a program whose primary goal is to "reduce drownings." 571 IAC 30.52. **There is no reason to spend taxpayer's dollars for a bogus safety benefit and a dangerous alternative. No Low-head Dam Public Hazard Program grants for the Mon Maq Dam**

should be approved or extended based in whole or in part on the false rationale that removal of the dam is necessary to reduce drownings.

NAVIGATION

The JCCB's "Maquoketa River Mon/Maq Dam Project" lists "Enhance river navigation" as one of the project's goals. The document further claims:

> Navigation within the Maquoketa River was reduced with the construction of manmade dams**. Motor boats are no longer able to travel between the upstream and downstream stretches.** Paddlers and tubers are required to portage around the dam. This impediment is of major concern to recreationists with reduced mobility.

JCCB, "Maquoketa River Mon/Maq Dam Project" at 1(emphasis added). Motor boats were never "able to travel between the upstream and downstream stretches". The Evinrude Motor Company, the first commercial company producing outboard motors, was not formed until 1909. https://en.wikipedia.org/wiki/Ole_Evinrude. While the present dam was constructed between 1913 and 1914, "[a] dam has been located on or near the site of the present dam since 1853". Carlson, R., Phase I Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 2, 23 (Iowa Office of the State Archaeologist) (2016).

With respect to portages, in order to portage a canoe or kayak around the dam from upstream, one would take the canoe out at the boat ramp and carry it the short distance around the dam, down a slope to the sandbar, and thence to the river. This is not a "difficult" portage, despite the claim to the contrary by the JCCB's applications for Grants # 1 and # 3. Application for Grant # 1 LHDP Project # 08-01 at 5; Application for Grant # 3 LHDP Project # 16-04 at 7. The issue of difficult portage is however, almost certainly a hypothetical one.

This is so because, if one goes to the dam on a summer weekend, one will see many people putting canoes, kayaks, and tubes, either their own or those of Monticello Canoe Rental, into the water ¼ mile below the dam to make the float trip to Picture Rocks Park. In the application for Grant # 1, the JCCB stated: "On peak use weekends from Memorial Day through Labor Day, approximately 300 canoes and kayaks are staged . . . each day. In addition, 100 to 115 people floating in tubes may stage . . . each day." Application for Grant # 1 LHDP Project # 08-01 at 2.

One will also see motorized fishing boats and some kayaks at the boat ramp, either going to or returning from fishing or touring trips upstream. (The kayakers can now go upstream in slow current and circumnavigate the island and return. Given the faster current of a narrower river, will this opportunity exist if Option A is implemented?).

What one will not see are paddlers and tubers using the ramp to portage around the dam. Why is this?

The application for Grant # 4 indicates that removal of the dam will "reconnect 70 miles of water trail." . Application for Grant # 4 LHDP Project # 17-01 at 8. This is based on a reconnection from "Lake Delhi Dam – 20.38 river miles upstream and the Maquoketa Dam located approximately 49.69 miles downstream." Id. at 2.

But, we rarely, if ever, see portagers at the Monticello Dam. It is rare for canoeists to even venture all the way to the dam from Hopkinton. Such canoeists often rent canoes from Outback Canoe Rental. Their canoes are put in at the Hopkinton Dam and proceed for 8 miles downriver to their business location, miles upriver from the Monticello Dam. According to their website, the float takes 4 to 5 hours of floating time, which is combined with 3.5 hours to 5 hours of stops for picnics, sunbatheing, swimming or play. By the time the canoeists have arrived at their destination, miles upstream from the dam, they have put in a full day. http://outbackcanoerental.com.

According to the Iowa Rivers Survey of 2010, 27% of typical river visitors will be on the river for only one day or less. 65% of river visitors will be on the river for one-half day or less. Only 8% will be on the river for 2 or more days. Yongjie J., Herriges B., Kling C., Understanding the Usage Patterns and Most Desirable Characteristics of Iowa's Rivers and Streams 16 (2010).

So, the demand for river travel is met by the current trip from the Hopkinton Dam long before canoeists or kayakers get to the Monticello Dam. Given the time demands of such a trip, the idea that tubers, who cannot increase their speed by paddling, want to float from Hopkinton to the Monticello Dam is absurd.

If a canoeist desires a longer trip, they can put in at the Monticello Dam and continue to Eby's Mill, Highway 136, Canton, or points further downriver.

It must be noted that, navigation is a secondary concern under the DNR's rules governing the granting of funds under the Low Dam Hazard Project. 571 IAC 30.53(2)("Low-head dam removal and modification projects, **when possible**, shall enhance or restore . . . recreational functions of rivers, including but not limited to . . . navigation (emphasis added)." Funds under the Low-head Dam Public Hazard Program must be granted to "projects that primarily enhance dam safety in order to reduce drowning," such as those projects addressing recirculating currents. 571 IAC 30.51-.52. Low-head dams which receive funding must have a recirculating current. 571 IAC 30.51. There have been no drownings at the Monticello Dam. We seriously doubt that recirculating currents exist at the Monticello Dam at normal or low water levels, when the public is in close enough contact with the dam to be harmed by such currents.

The navigation goal is simply not supported by the facts. The rules require that when the scoring committee is "evaluating cost-share proposals for low-head dam public hazard program projects" it "shall consider" certain criteria, including, "b. "**[d]emonstrated** . . . recreational impacts." 571 IAC 30.61(2)(b)(emphasis added). There must be proof, which is lacking, of the recreational impact. *See* id. **No Low-head Dam Public Hazard Program grants for the Mon Maq Dam should be approved or extended based in whole or in part on the rationale of improving navigation.**

ADVERSE EFFECT OF LOWERING OF WATER LEVEL ON PONDS, WELLS, AND WETLANDS

Public guidance from the JCCB on what effect the removal of the dam would have on water surface level of the river above the dam has been inconsistent. The JCCB's Conservation Director stated, on the same day, both that Option A would "raise the water slightly" upstream in comparison to the present dam, but also that the water level would decrease, by "mere inches" at the upstream Jellystone Campground.

Brooks, K., "Residents Question Mon Maq Dam Project," Monticello Express (Aug. 2, 2017). Previously, on January 28, 2016, he indicated there would be a 10 foot drop in the water level at the dam and a "medium lowering" up to a mile upstream from the dam. Brooks, K., "Public Input Points to Removal of Mon Maq Dam," (February 2016).

The JCCB's applications for Grant # 3 and Grant #4 indicate there will be significant lowering of the water level as the Kitty Creek water level will be reduced due to removal of the dam. Application for Grant # 3 LHDP Project # 16-04 at 3; Application for Grant # 4 LHDP Project # 17-01 at 3. These applications also indicate that the Business Highway 151 bridge (also known as the Main Street Bridge) will require armoring due to scouring caused by lower water levels. Application for Grant # 3 LHDP Project # 16-04 at 3; Application for Grant # 4 LHDP Project # 17-01 at 3. There will also have to be a diversion structure on a secondary channel upstream from the Business Highway 151 bridge due to lowering of the river bed. Application for Grant # 3 LHDP Project # 16-04 at 3; Application for Grant # 4 LHDP Project # 17-01 at 3. Finally, both the Barr Engineering Report and a TAP application to the IDOT indicate that the boat ramp will have to be extended due to lowering of the river. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 44 (April 22, 2016). Request for Transportation Alternatives Program Funds (TAP)(March 30, 2016) at 12. The applications for Grant # 3 and Grant # 4 confirm that a boat ramp modification is budgeted. Application for Grant # 3 LHDP Project # 16-04 at 11; Application for Grant # 4 LHDP Project # 17-01 at 11.

The Barr Engineering Report confirms that there will be substantial lowering of the upstream water level of the Maquoketa River within the Area of Potential Effect. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 25, 39, 40, 44-45 (April 22, 2016). The Area of Potential Effect was determined as follows:

> ## 5.1 Area of Potential Effect Determination
>
> The Area of Potential Effect (APE) was defined by the extent the dam removal would impact water surface elevations by at least 0.5 feet.
> In the No Bed lowering Scenario, all flow scenarios are within the minimal change definition at the Main Street Bridge on the Maquoketa River and at the sewer crossing on Kitty Creek.
> In the Moderate Bed lowering Scenario, the APE extends to the downstream side of Highway 38.
> In the Maximum Bed lowering Scenario, the APE extends approximately 1,000 feet upstream of Highway 38. In this case, the APE extends to that location because the change to the 2-year flood profile is impacted that far upstream. All other flows modeled had minimal changes on the upstream side of Highway 38.
> The Maximum Bed lowering Scenario provides the largest upstream to downstream extent for the APE, and thus was utilized to define the APE reviewed in this report. The Area of Potential Effect is shown on Figure A-8

Id. at 40.

The Barr Engineering Report admits that the final channel profile, including the depth of river bed lowering "is difficult to predict" when, as in this instance, there are no known bedrock outcroppings. Id. at 24.

The Barr Engineering Report stated that the No Bed lowering "scenario is implausible;" meaning that there will probably be moderate or maximum bed lowering. Id. at 25. The report suggested that the moderate bed lowering was the most likely scenario. Id. at 26.

The report states that:

> Removing the Mon/Maq dam will cause a decrease in water surface elevations upstream of the dam. In all three scenarios modeled, the greatest impacts to the water surface elevations were between the dam and the Main Street Bridge . . . . The water level lowering would be most apparent during low and median flow conditions.

Id. at 39.

The report indicates that, with respect to the Moderate Bed Lowering scenario, that "water surface elevations . . .are impacted through the assumed bed lowering areas; however impacts on the Maquoketa River are minimally present upstream of Highway 38. The locations with the largest changes in water surface elevation between the dam and Main Street, which is to be expected." Id. at 31.

With respect to the Estimated Maximum Bed Lowering scenario, "water surface elevations . . . are impacted through the reach where bed lowering would occur; however, impacts are minimally present upstream of Highway 38 and the sewer crossing. The exception to this is the 2-year flood for which the modeling indicates that impacts are carried approximately 1,000 feet upstream of the Highway 38 Bridge on the Maquoketa River." Id. at 35.

Since, as noted above, the actual depth of the river bed after dam removal is "difficult to predict," caution requires that the most adverse scenario, the Maximum Bed Lowering scenario, should be relied on to predict the amount of lowering that will occur due to removal of the dam. The maximum extent of bed lowering is likely to extend to the Highway 38 bridge. Id. at 26.

The Bar Engineering Report predicts the following impacts, with respect to lowering the river bed, under the Maximum Bed Lowering Scenario.
:

	UpStream Of Dam	Main Street Bridge (Bus. Hwy. 151)	Upstream of Island	Hwy 38 Bridge
Difference Btwn Current Water Surface Elevation and Elevation After Dam Removal At Low Flow	**-11.05 ft.**	**-6.59 ft.**	**-5.45 ft.**	**-0,26 ft.**

Difference Btwn Current Water Surface Elevation and Elevation After Dam Removal At Median Flow	**-10.34 ft.**	**-5.69 ft.**	**-5.69 ft.**	**-0,45 ft.**

Id. at 36. There is little difference between the Moderate Bed Lowering Scenario and the Maximum Bed Lowering Scenario until upstream of the island, where the Moderate scenario shows a lowering of the water surface level at low flow of -2.98 feet and at median flow of -3.07 feet. Id. at 32.

What effects will this severe river bed lowering have? The Barr Engineering Report admits that wetlands will be affected. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 50-51 (April 22, 2016). It should be noted that the analysis of impact on wetlands was based on a desktop review, not a boots on the ground or boat on the water review which could have shown that larger wetland areas will be adversely affected. Id. at 20.

At the August 24, 2017 JCCB meeting both JCCB Conservation Director Brad Moorman and JCCB board member Russ VanBehren admitted that they will not know what removal of the dam will do to wetlands until after the dam is removed. Audio Recording of 8/24/17 JCCB Meeting.

The Barr Engineering Report states:

7.7 Wetland Impacts

Wetlands were identified along the Maquoketa River in the vicinity of the Mon/Maq dam (see Figure A- 12). The identified wetlands will be impacted to varying degrees with the dam removed. The most direct impact will be to the riverine wetlands that are directly associated with the river water level. With the dam removed, the water surface area will shrink upstream of the dam to more closely resemble the river that is unaffected by the dam. Average channel widths were evaluated both downstream of the US 151 Bridge and upstream of the Highway 38 Bridge. The channel located between these bridges was assumed to adjust to more closely resemble those reaches**. It is estimated that the water surface area will shrink by approximately 10 to 12 acres following dam removal**. It is likely that this area will convert to floodplain forest or seasonally flooded basin. The non-riverine wetlands will also be affected to varying degrees. The floodplain forest and shrub swamp will be flooded less-frequently, particularly between the dam and the Main Street Bridge, and to a lesser degree in the island and oxbow pond areas. The seasonally flooded basin that is prominent upstream of the island should be less affected because the water level reduction is expected to be much lower in that area, and minimally affected extending upstream toward the Highway 38 Bridge.

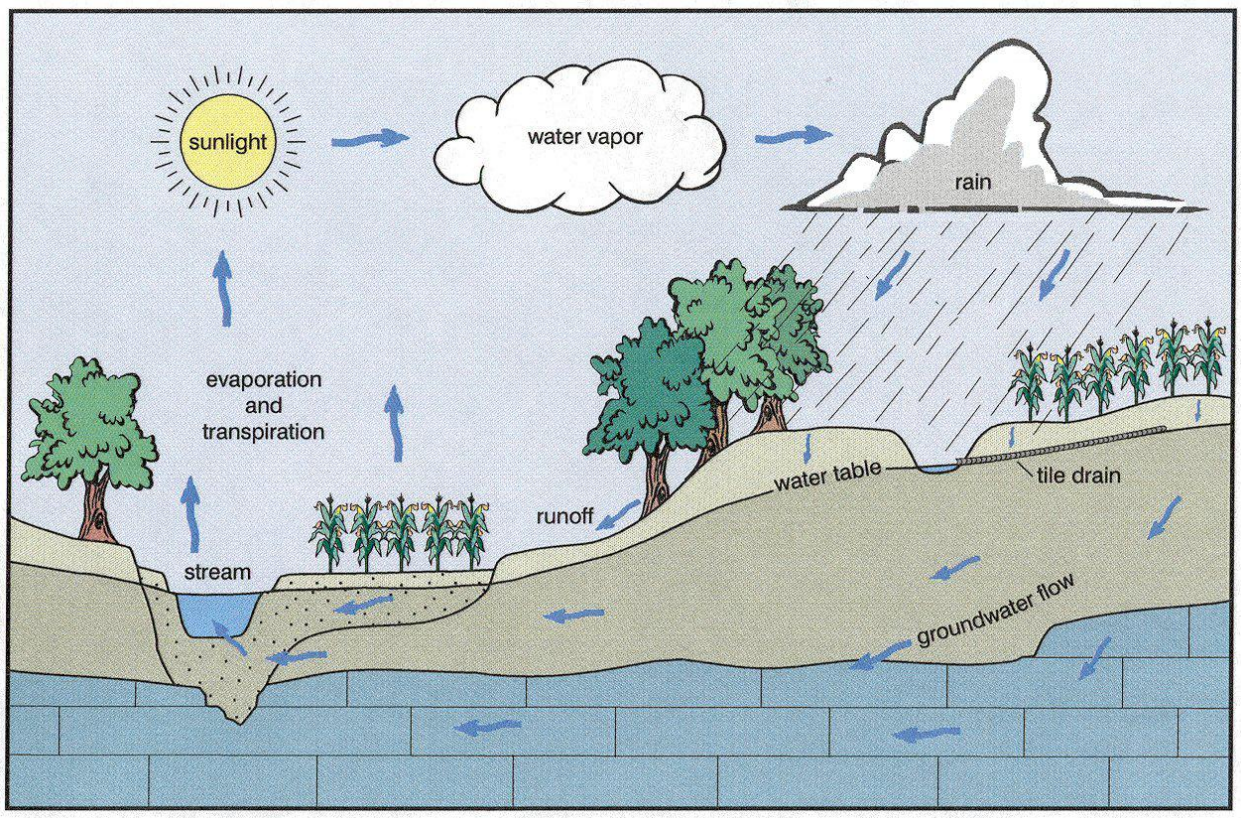
Id. at 50-51 (emphasis added).

It should be noted that the boundaries of the Area of Potential Effect, as shown on Figure A-8 in the Barr Engineering report, are, with rare exception, very close to the shorelines of the Maquoketa River. They do not include, for example, most of Riverside Gardens, a park which has wetlands which may be affected by the lowering of the river. Riverside Gardens is not even labeled on Figure A-10, Locations of Potentially Impacted Features. Therefore, the Barr Engineering review of impact on wetlands may be incomplete.

Many residents of the Monticello area have observed that water levels in wetlands and ponds near the Maquoketa River go down when water levels in the river go down.

The JCCB conservation director has tried to reassure the public that Riverside Gardens and other wetlands, ponds and wells by the river will not be affected by lowering the river level because the current surface level of these ponds and wetlands is already above the surface level of the river. See Mormann, Brad, "Riverside Gardens and Golf Course Water Level Elevations" (Data collected August 12, 2017).

It is however, normal for the water table on higher ground to be above the surface level of the river, as illustrated below:



Libra, Bob, "Iowa Water Resources" (Iowa Geological Survey-DNR) at 10.
www.iowadnr.gov/water/quantity.html

The problem is, however, that: "**Water levels in wells near lakes and streams fluctuate in response to changes in surface-water stages."** Russell, R.R., "Ground Water Levels in Illinois Through 1961" 12 (Illinois Water Survey Urbana) (1963). There is no reason to suspect that water levels in wetlands and ponds would not respond to changes in the water table in the same way. **Thus, as the water level of the river recedes, so does the water level in wetlands and ponds.** This is demonstrated by the chart below, showing the effect of different river stages in the Illinois River on nearby wells:

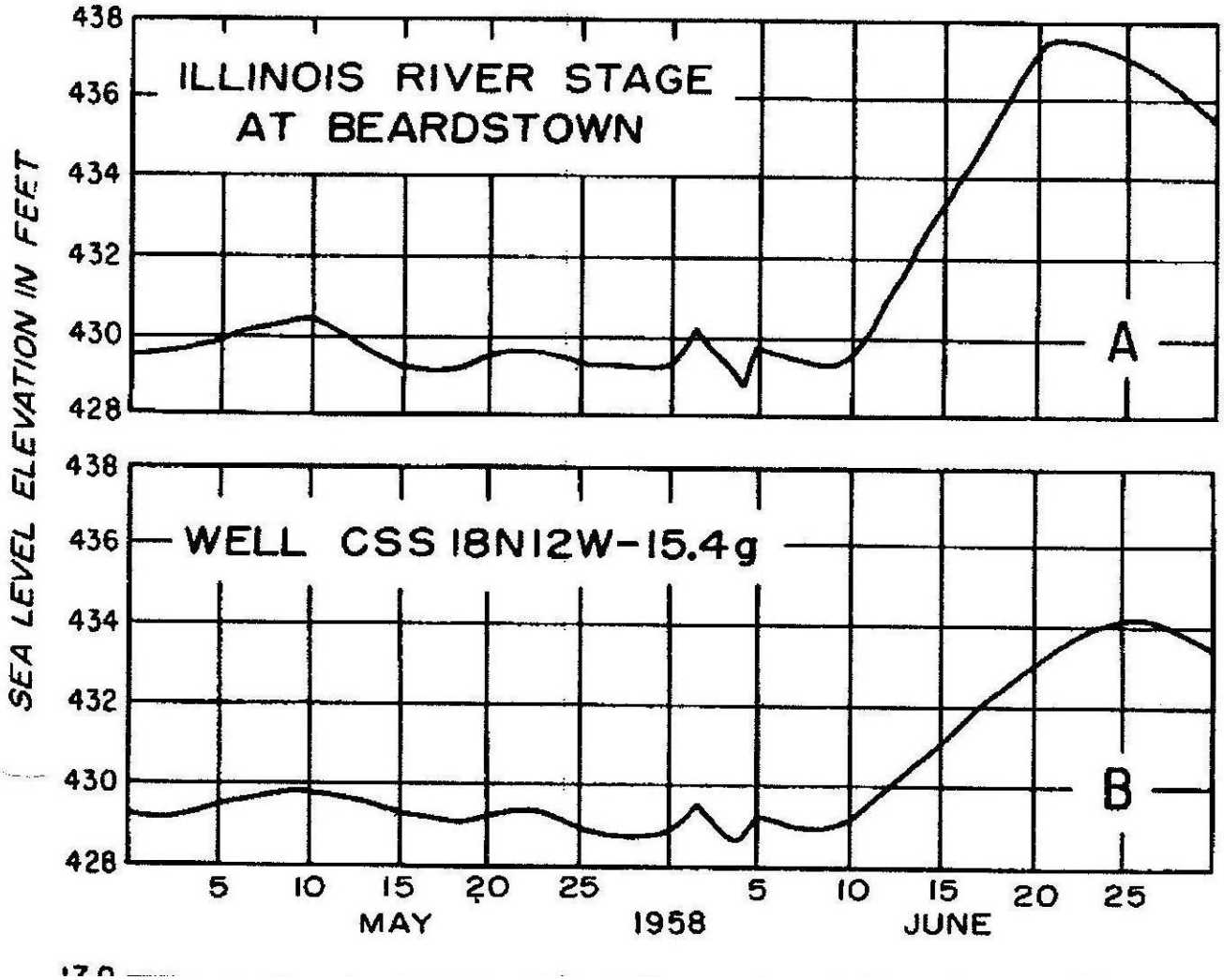


Figure 12. Fluctuations caused by river stage changes. Russell, R.R., "Ground Water Levels in Illinois Through 1961" 12 (Illinois Water Survey Urbana) (1963).

This factor, the effect of water table changes, resulting from a lowering of the water surface elevation in the Maquoketa River, on ponds, wells and wetlands not directly connected to the river is not even discussed in the Barr Engineering Report. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project (April 22, 2016). **A more thorough**

investigation of the impact of removal of the dam on wetlands, ponds and wells, including the effect on Riverside Gardens and other wetlands outside the designated Area of Potential Effect, and the effect of the lowering of the water table should be investigated before any more grants or extensions of Low Head Dam Public Hazard program grants are awarded for removal of the dam.

FISHING

Based on the generalized proposition that "[a]ngling success in pooled areas above low head dams is often reduced", the JCCB set a goal for the dam project of "improve angling opportunities near the dam vicinity and upstream in the impounded area " JCCB, "Maquoketa River Mon/Maq Dam Project" at 1.

The application for Grant # 3 admits that:

> Angling is also a popular form of recreation associated with this section of river. . .
> .Mon/Maq lies in a transitional area of the Maquoketa River that provides good fishing opportunities for channel catfish, smallmouth bass, and walleye.
> . . .
> The current impoundment offers limited recreational fishing opportunity, but we expect that improved opportunities will exist for fishing upstream following restoration. **There is expected to be little change in the downstream habitat and fishery following restoration.** There will be some change in the tailwater fishery, but we have and will continue to refine fish habitat improvement concepts at or near the dam site.

Application for Grant # 3 LHDP Project # 16-04 at 2 (emphasis added).

It must be noted that improvement in "recreational functions" is a secondary concern under the DNR's rules governing the granting of funds under the Low Dam Hazard Project. 571 IAC 30.53(2). Funds must be granted to resolve safety problems, which we believe do not exist at the Monticello Dam at normal or low water levels, when the public is in close contact with the dam.

There is no data cited in the applications supporting the proposition that fishing needs improvement "in the dam vicinity and upstream in the impounded area." The public has made it abundantly clear at meetings of the JCCB that fishing immediately downstream of the dam is excellent. They would find it laughable that the fishing opportunities at the dam are "limited". On August 24, 2017, JCCB Board member, Dave Tabor admitted that anglers were one of the major groups opposing removal of the dam. Audio Recording of 8/24/17 JCCB Meeting.

The JCCB's application for Grant # 3, quoted above, claims that "there will be little change in the downstream . . . fishery." While we think this is highly optimistic, it is at least an admission that there will be no improvement in the downstream fishery by removal of the dam. It is a matter of common knowledge that fisherman use the boat ramp to go fishing upstream, where the fishing is also good. It makes no fiscal sense to spend $1.8 million to develop a scour hole downstream or to finance a marginal or imaginary improvement in upstream fishing.

The fishing goal is simply not supported by the facts. The rules require that when the scoring committee is "evaluating cost-share proposals for low-head dam public hazard program projects" it "shall consider"

certain criteria, including, "b. "**[d]emonstrated** . . . recreational impacts." 571 IAC 30.61(2)(b)(emphasis added). There must be proof, which is lacking, of the positive recreational impact. *See* id. **No Low-head Dam Public Hazard Program grants for the removal of the Mon Maq Dam should be approved or extended based in whole or in part on the rationale of improving fishing.**

UPSTREAM FLOODING

The JCCB indicated that one goal of the dam project is to "Reduce upstream flooding" which is based on the proposition that "Increased flooding upstream can occur due to the presence of dams." JCCB, "Maquoketa River Mon/Maq Dam Project" at 1. The secondary goal of "reduce upstream flooding, if possible" is also stated in the applications for Grants # 3 and # 4. Application for Grant # 3, LHDP Project # 16-04 at 3; Application for Grant # 4, LHDP Project # 17-01 at 3.

At times, the dam has been completely submerged by flooding. It stands to reason that the total extent of upstream flooding on those occasions was not "caused" by the dam anymore than it would be caused by any other submerged object. There are other supervening causes, such as rainfall or release of water from the Delhi Dam, which account for flooding.

The Barr Engineering Report states that:

> Removing the Mon/Maq dam will cause a decrease in water surface elevations upstream of the dam. In all three scenarios modeled [no bed lowering, moderate bed lowering and maximum bed lowering], the greatest impacts to the water surface elevations were between the dam and the Main Street Bridge, and between the confluence and the sewer crossing on Kitty Creek. The water level lowering would be most apparent during low and median flow conditions. **The largest extent of water surface impacts is for the 2-year flood, for which the impacts were carried approximately 1,000 feet upstream to the Highway 38 Bridge in the Maximum Bed Lowering scenario and to the Highway 3 Bridge on Kitty Creek in both the Moderate and Maximum Bed Lowering scenarios. Upstream water levels are less impacted for larger flood events, with negligible impacts for the 100-year and 500-year flood events.**

Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 39. (April 22, 2016).

We believe that the construction of the new Delhi Dam, allowing for greater control of outflows from that dam, and the removal of homes and businesses from the flood plain on the east end of Monticello may have eliminated whatever flood problem existed with respect to those areas that would be positively affected by the lowering of the river bed. The effectiveness of these measures, however, was not investigated in the Barr Engineering Report. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project. (April 22, 2016). The effectiveness of these measures, in eliminating this problem at flood levels and areas that would be significantly affected by the lowering of the river bed after removal of the dam, should be investigated.

The Monticello Maquoketa River Dam has sluice gates that formerly provided water to power the dam's turbines. See Appendix A. At times, they were open long after the dam's generators were removed. The reason steam generators were added on site, when it was used to generate electricity, is that the open sluice gates would lower the upstream pool so that a sufficient flow to power the turbines could

not always be achieved. E.g. Carlson, R., Phase I Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 7 (Iowa Office of the State Archaeologist) (2016). Diesel generators on the site probably served the same purpose. A possible solution to any flooding contributed to by the Monticello Dam would be to make any necessary repairs or modifications to the sluice gates and surrounding area, including any necessary excavation, so that the sluice gates could be opened during floods. By allowing the pool of water upstream from the dam to once again have access to the sluice gates, an additional volume of water could be released from the pool when the gates were opened. Neither the feasibility nor the impact of this action on two year flood levels was investigated by Barr Engineering or the JCCB. These should be investigated.

In light of the above facts, without further investigation as set forth above, we cannot conclude that the "upstream flooding" rationale for the dam project has been demonstrated by proof.

A thorough investigation of (a) the impact of the new Delhi Dam and the removal of homes from flood prone areas of Monticello on the flooding problem; and (b) of the alternative of using the Monticello Maquoketa Dam sluice gates to control flooding should be implemented before any more grants or extensions of grants are awarded for removal of the dam.

FISH PASSAGE

The JCCB's goals for the dam project include, "Improve upstream passage of native fish at all flow ranges". JCCB, "Maquoketa River Mon/Maq Dam Project" at 1.

"Fish passage" is a secondary concern under the DNR's rules governing the granting of funds under the Low Dam Hazard Project. 571 IAC 30.53(2). Funds must be granted to resolve safety problems, which do not exist at the Monticello Dam at normal or low water levels.

This goal was also set forth in the applications for Grants # 1, 2, 3, and 4. Application for Grant # 1 LHDP Project # 08-01 at 5; Application for Grant # 2 LHDP Project # 13-06 at 3; Application for Grant # 3 LHDP Project # 16-04 at 3; Application for Grant # 4 LHDP Project # 17-01 at 3.

We will readily concede that any dam may impede upstream passage of fish, including invasive species which may, someday, be downstream of the dam. It has been suggested that the sluice gates could be removed or modified, along with other necessary excavation and modifications, to create a side channel allowing fish to move upstream. We believe that such a project on the north side of the dam could be undertaken for considerably less than $1.8 million without destroying the dam. But, this alternative was never investigated. It should be investigated before any further funding is provided or extended for removal of the dam. A proposal for such a fishway or side channel and photographs of the sluice gate area are shown in Appendix C.

During the Board's discussion at the August 24, 2017 JCCB meeting, it was brought up that the conservation agencies would not fund a water park type modification because the water velocity in such a park would be too high to allow fish to swim upstream. If one examines the photograph on page 24 above, one must wonder if fish could proceed upstream through the proposed passage for Option A. We are not aware of any evidence that this question been investigated by any entity.

We would note that, part of the argument for dam removal is that there are certain species of fish that live below the dam, but not above it. How thorough have the surveys, especially those above the dam, been that have reached this conclusion? Has the sampling been sufficient to ensure that no species above the river has been missed? It would seem that this objective could largely be implemented, in any event, by transplanting the missing species to the Maquoketa River above the dam at a cost far less than $1.8 million. **The alternatives of additional upstream sampling and transplantation of missing species of fish, as well as construction of a side channel, and the question of whether the velocity of water present in option A is too great to allow fish to swim upstream should be investigated prior to providing further funds or extending current funds for removal of the dam.**

SEDIMENT RELEASE

Another concern is the release of sediment from the reservoir pool upstream of the dam.

> Even if the reservoir sediments are not contaminated, the sudden release of fine and coarse sediments following dam removal will temporarily increase the suspended sediment concentration and turbidity of the flow, possibly creating lethal conditions for fish, and can result in sediment deposition along the downstream channel affecting spawning beds. . . . Sediment management is often the most important and technically challenging environmental consideration for a dam decommissioning project, and can represent a significant portion of the total project cost.

US Society on Dams, Guidelines for Dam Decommissioning Projects at 17 (2015).

According to the Barr Engineering report the estimated sediment mobilization, under the maximum bed lowering scenario, resulting from the removal of the dam would be 165500 cubic yards of sediment. Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 43 (April 22, 2016). This is equal to 4,468,500 cubic feet or 1170 semi trailer loads of sediment for a 53 foot semi trailer with a capacity of 3816 cubic feet.

If the maximum bed lowering scenario is correct, the Barr Engineering report indicates that the amount of sediment mobilization is the equivalent of 1.35 years of sediment normally moved by the Maquoketa River at the Mon Maq Dam site. The report indicates this will have, according to standards set by the United States Society on Dams, a “medium” impact. There is no detail on what a” medium impact” would entail. Id.

The Barr Engineering report indicates that, “sediment dredging was assumed for the channel upstream of the dam to facilitate removal of the structure and to minimize transport of sediment during the construction process.” Id. at 60. But it also holds open the possibility of just allowing erosion to move the sediment. Id. at 18. Grant application # 4 states that, “Sediment will be removed from the pool directly in front of the dam and will cover the newly placed material on the river bank. Excess sediment will be transported from the site if required.” Application for Grant # 4 LHDP Project # 17-01 at 3.

Such sediment removal by mechanical means would avoid impacts to the river if it could all be done without sediment removal by river erosion or flooding. Assuming that the JCCB still intends to remove sediment by dredging, there is still a problem with sediment flowing downstream during the dewatering and dredging process. According to the Barr Engineering Report:

> One of the first steps during construction is to remove the upstream pool by drawing down the reservoir. Since the current dam structure does not have an active system to lower the pool, the contractor will most likely need to construct a bypass channel or remove portions of or "notch" the dam (Figure 2-3 below), allowing the pool to be lowered sufficiently to reduce the impounded water volume and to allow sediment along the channel edges to dewater. The bypass or notch would need to have sufficient capacity to maintain safe conditions during flood events, but larger events would likely continue to flow over the dam crest. This process will ideally begin at least six weeks prior to construction to allow sediment and river banks to dewater allowing easier access to the work area.

Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 14 (April 22, 2016).

Water and sediment would, however, flow out of the upstream pool during dewatering through the huge notches which may be cut in the dam. Id. at 14-16. Flood events would also overflow the dam as well as any notches cut in it. Id. The Barr Engineering report also notes that turbidity of the water may have to be monitored during the construction process, but gives no clue as to what could be done if turbidity exceeded acceptable levels. Id. at 18.

Additional sediment management efforts may be required, prior to determining an initial sediment impact analysis, if there are:

> Sensitive aquatic species (threatened or endangered) . . . present downstream of the dam that cannot tolerate sediment impacts without dire consequence to the species primary production or community composition.

Randle, T. et. al, Guidelines for Assessing Sediment-Related Effects of Dam Removal 9 (2nd Joint Federal Interagency Conference) (2010).

With respect to "sensitive aquatic species", it should be noted that a recent episode of the IPTV program Iowa Outdoors noted that the Maquoketa River is part of a project to restore mussels to rivers in Iowa. Has any research been done to determine what effect the sediment will have on this endeavor? In 2013, a spill of bentonite, used as drilling mud, into the Mary's River in Oregon created a "smothering hazard" for invertebrates. Rimel, Anthony, "NW Natural to Remove Bentonite From Mary's River" Corvallis Gazette Times (Sept. 7, 2013). Could the release of sediment have a similar effect on mussels in the Maquoketa River?

Another concern which must be addressed is possible contamination of the sediment retained by the pool upstream of the dam. According to the JCCB's Board Minutes for July 11, 2016, the JCCB voted to not conduct sediment testing. The JCCB chose to not do testing because Mel Pins, of the DNR's Iowa Brownfield Redevelopment Program, informed the JCCB that there was no reason to believe that a hazardous condition was present in the sediment. Telephone Conversation with JCCB Conservation Director Brad Mormann on September 12, 2017.

This conclusion, however, is contrary to the guidelines issued by the United States Society on Dams, which state:

> Site surveys and testing programs are generally required for the identification of hazardous materials, and should be performed during the design phase. . . . Testing should include the surrounding soils and impounded reservoir sediments for possible contamination.

US Society on Dams, Guidelines for Dam Decommissioning Projects 96-97 (2015). Even Barr Engineering recognized that, "[i]t may be necessary to conduct analytical testing of this sediment prior to construction depending on agency input. " Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project 60 (April 22, 2016).

No further allocation of monies or extensions of time for current grants should be awarded for the Mon-Maq Dam removal project until (a) a thorough investigation of the potential impact of sediment release during the dewatering, dredging and construction stages on mussels and other sensitive species has been completed, (b) a thorough investigation of the potential impact of contamination in sediment upstream of the dam is completed, (c) a thorough assessment of the costs necessary to mitigate the potential impacts of these problems has been made, budgeted and funded.

WATER QUALITY

The Monticello Maquoketa Dam aerates the water flowing over the dam. It also provides a 440 foot platform where a few inches of water streaming over the top of the dam, the sloping face, and the apron, at low or normal water flows, are exposed to ultraviolet light. By adding oxygen to the water and exposing e coli and other bacterial organisms to ultraviolet light, the dam may play an important role in reducing water pollution, such as that coming from legacy sewer systems upstream. It is common knowledge that aeration is used to treat wastewater. It is established in marine studies that "the bactericidal effects of u.v. light" is one of the factors to cause e. coli bacteria to have "disappeared rapidly" in water. Flint, K., The Long-Term Survival of Escherichia in River Water, 63 Journal of Applied Bacteriology 261 (1987).

Since the effect of ultraviolet light is diminished in water with increased turbidity, as such turbidity reduces the penetration of light, id., it may be deduced that the thin layer of water going over the dam provides ideal exposure to ultraviolet light to allow it to have maximum effect.

Jerry Muller, a former Monticello city councilman, was informed years ago that the dam had precisely this beneficial effect. He was informed that this phenomena was important to the City of Monticello as, without the dam, additional sewage treatment facilities would have to have been installed.

Does this benefit exist at the Monticello Maquoketa River Dam? If so, what is the extent of this benefit? What will be the effect on water quality of removing the dam? These questions have not been investigated.

No further allocation of monies or extensions of time for current grants should be awarded for the Mon-Maq Dam removal project until these issues have been investigated. The loss of these potential benefits to water quality must be taken into account before further funding is allocated or extended.

PUBLIC SUPPORT FOR THE DAM

Why do we believe that the public supports the dam and opposes those alternatives calling for destruction of a large portion of the dam?

First, there was a survey in July on public sentiment toward modification or destruction of the dam by the Jones County Historic Preservation Commission. The survey asked the respondents if they wanted: "Option A. Preserve the dam. Option B. Restore the natural channel. Option C. Compromise." 405 of the 436 respondents to the survey wanted to "preserve the dam" in preference to all other named alternatives. Ninety-three percent of respondents wanted to save the dam! The survey states, "If it is assumed that survey is representative, the Jones County results can be generalized (with 99 percent certainty) to all county residents, with a margin of error of (plus or minus) 3.3 percent." Jones County Historic Preservation Commission, Survey Data Sheet.

The survey asks for the assumption that the survey is representative. Why would this survey not be representative of the entire county? Dr. James Krapfl drafted the information sheet for the survey. He stated:

> While I am a professional historian who has studied quantitative methods and who collaborates with sociologists who conduct surveys of this sort, my involvement was limited to drafting the information sheet that survey participants were asked to read before indicating their preferences, and to compiling and analyzing the results. Non-professional volunteers were responsible for data collection. Second, only some of the responses came from the fairgrounds on July 4; most were solicited on the streets of Monticello and via door-to-door canvassing between July 1 and 14. Given these two facts, I cannot guarantee that participant selection was fully random or uninfluenced by volunteers' personal networks. That said, I see no reason to consider the respondent pool wildly unrepresentative--which it would have to be if a majority of county residents were actually in favor of removing the dam. Volunteers were told that we wanted an accurate assessment of public opinion and that they should refrain from expressing their own views, and while I have no way of knowing how rigorously they adhered to these instructions, they would have had to go far out of their way to get 99% opposed to dam removal (with 6% open to minor modifications) if a majority were actually in favor.

Email Krapfl to Bohlken dated August 4, 2017.

Although the procedure described above resulted in a higher percentage of persons living in and near Monticello being respondents to the survey (337 of 436 respondents), the worst that can be said is that persons who were most likely to be familiar with and knowledgeable of the dam, due to Monticello being adjacent to the dam, were more likely to be respondents.

For the sake of argument, let us assume that the survey overstates the numbers opposing the destruction of the dam by a whopping 20 percent. This would mean that 73 percent of the county residents oppose the destruction of the dam.

These results should be compared to two surveys relied on by the JCCB. The JCCB relied on a questionnaire, dated March 30, 2011 of Mon Maq Dam Study and Advisory Committee members, a total of only 8 people. Application for Grant # 2 LHDP Project # 13-06 at 23. The questionnaire found only 50% support for removing the dam, as opposed to 100% support for altering the dam. Id. Option A calls for the removal all but 100 feet of the dam, with the area upstream filled with dirt and no water flowing over it. JCCB, Maquoketa River Mon/Maq Dam Project" at 2; Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 16 (April 22, 2016). This is more than an alteration. Indeed, it is referred to by Barr Engineering, as the "Full Dam Removal Concept". Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at 13 and Figure A-2 (April 22, 2016). It would appear that this plan, in 2011, would have garnered the support of only 50% of the Committee. Application for Grant # 2 LHDP Project # 13-06 at 23.

A second survey was also relied on by the JCCB. From January 16 to 19, 2012, no fewer than 6 meetings were held with high school students and others to inform them of the alternative proposals and get input. Id. at 20. There is no indication that they heard anything about the benefits of retaining the dam. Based on questions in the survey, it appears that they were informed about whitewater type features, which would be expected to appeal to young people. Id. at 28-31. These would include 3 drops upstream of 18 inches each and 2 drops at the dam of 2 feet each. Id. at 40.

The survey was administered at these "input sessions" to 172 high school students and 66 adults. Id. at 27. Thus, the high school students represented 72% of those surveyed. This was, to put it mildly, a wildly disproportionate overrepresentation of high school students and in no way could be considered a representative sample of Jones County or any other county in Iowa. After being indoctrinated at the meetings, those surveyed were presented with a question loaded with reminders of six hypothetical benefits to be derived from modifying the dam and two categories of costs (and zero mention of benefits) associated with retaining the dam, and asked whether the dam should be modified. Id. The actual question was: "Based on the alternatives presented, the impacts of the dam on fish passage, in-stream passage by paddlers, economic considerations, safety, ecological considerations, recreational opportunities and economic and environmental costs associated with maintaining the existing dam, do you feel the dam should be modified?" Id. No one will be surprised to learn that 97% of the respondents voted for modification of the dam. Id.

Other meetings were held with other groups to inform them of the project as then conceived, in 2011-12. There is no indication that those persons heard anything about the benefits of saving the dam. Id. at 22.

Second, 2487 people from Jones County signed a petition to save the dam during a short three week period prior to August 24, 2017. This is equivalent to eighteen percent of the 13500 registered voters in Jones County. Iowa Secy of State, State of Iowa Voter Registration Totals County (8/1/17).This includes 1452 from those with a Monticello address, which is adjacent to the dam. This is equivalent to 55% of the 2652 registered voters in Monticello. Even taking into account 2440 registered voters from 5 adjoining townships most likely to have a Monticello address, these Monticello signatures are equivalent to 29% of 5092 registered voters in the Monticello area. Iowa Secy of State, Precinct Statistics for 2016 Election.

That is a phenomenal result showing widespread support for saving the dam, given that there will be many people who have not had the opportunity to sign the petition.

Third, the majority of the public attending meetings on this issue have been in favor of saving the dam! According to articles in the Express, a majority of the public was opposed to the dam's destruction at the May 18 and July 17, and August 24, 2017 meetings of the JCCB. This was also the case at the July 25th and August 8th Board of Supervisors' meetings, as well as a panel discussion sponsored by the Jones County Historic Preservation Commission on August 23, 2017. Brooks, K. "Meeting Outlines Future of Mon Maq Dam," Monticello Express (May 24, 2017)("the opposition [to destroying the dam] was palpable" at May 18th meeting of 60 people with the JCCB); Temple, P. "Mon Maq Dam Decision is Tabled; Meeting to Come," Monticello Express (July 27, 2017)(majority of 40 attending JCCB meeting opposed removing the dam); Brooks, K., "Residents Question Mon Maq Dam Project" Monticello Express (August 2, 2017)(attendee notes "growing public opposition" to removing dam at July 25th Supervisor's Meeting); Brooks, K., "Supervisors Vote to Support Conservation in Dam Project" Monticello Express (August 16, 2017)(after being told that they were not allowed to talk unless they had something new, all 5 citizens who were quoted, out of 20 attending, were opposed to dam removal); Brooks, K. "Preservation Commission Hosts Panel to Discuss Mon Maq Dam" Monticello Express (August 30, 2017)(many of 60 attendees, and all who were quoted, opposed removal of dam); Brooks, K., "JCCB Votes 4-1 to Remove Portion of the Dam," Monticello Express (August 30, 2017)(majority of over 40 present opposed removing dam).

Fourth, in the July and August (through August 16th) editions of the Express, 13 out of 17 letters were against the destruction of the dam, with one writer declaring himself neutral on the issue. One of the three letters supporting the proposal was from a Cedar Rapids resident who did not say he had ever been a resident of the county. These three letters are the only ones we have seen supporting the project in the Express.

Fifth, the members of the Board of Supervisors were asked to give a breakdown of emails they had received. Only one responded. Supervisor Manternach indicated that all of his emails and conversations from the public were for saving the dam and none for destroying it. Email Manternach to Bohlken (August 15, 2017). According to the Monticello Express, Supervisor Eaken said, at the August 8, 2017 meeting, that a majority of the persons he had spoken with supported saving the dam. Brooks, K., "Supervisors Vote To Support Conservation in Dam Project," Monticello Express (August 6, 2017).

Sixth, the conclusion that the majority of Jones County residents wish to save the dam is consistent with a 2009 Iowa State University survey seeking input on Iowa's rivers. The DNR publication "The 2010 Dam Inventory" stated:

> One canoe, kayak, and livery owner mentioned dam safety being of concern in a 2009 survey, and others have mentioned the importance of reducing navigation hazards at livery trainings held annually. Of the 327 paddlers who responded to the internet stakeholder survey, 61 percent favored a balanced approach to mitigation methods, 11 percent believed portages around dams should be emphasized over physical modifications, and 10 percent thought that all dams should be removed. **Among these groups, it is clear a plan with a strong bias toward dam removal would face limited support among key stakeholders.** (emphasis added).

DNR, The 2010 River Dam Inventory at 20.

In light of public support for the dam, no further monies, or extensions of time for current funds, should be granted for the dam removal project. Unspent funds should be returned to the DNR.

CONCLUSION:

Option A, the project approved by the JCCB, calling for destruction of a large portion of the Monticello Maquoketa River Dam, is a dangerous alternative that has completely failed to take into account the historic, aesthetic and environmental value of the dam and public support for the dam. We believe that the alleged safety, navigational, and environmental benefits of this project, as set forth in the grant applications for this project, are either exaggerated or nonexistent and that the costs, financial and otherwise, have been minimized.

Due to inaccurate and incomplete information provided by the JCCB to the DNR in its grant applications, and in light of overwhelming public support for the dam, no more monies nor extensions of time to spend funds already awarded should be granted to the JCCB for removal of the Monticello Maquoketa River Dam. Any grant monies that have not been spent by the JCCB for this project should be returned to the DNR.

If, after review of this document, additional investigation is necessary to terminate funding for removal of the Mon-Maq Dam, we specifically recommend:

1. An investigation of what water levels and current speeds, if any, recirculating currents sufficient to cause a drowning machine effect at the Mon Maq Dam occur and how those times relate to the water levels and current speeds during which the public is actually in close contact with the dam. This should include computational fluid dynamics (CFD) modeling, taking into account the actual design of the dam, including the apron, to predict when, if at any time, such hydraulics occur. We believe that public close contact immediately downstream of the dam ceases at some point before the water level rises even to the apron, a depth of four feet, because of the combined effect of increased depth, increased current, and submersion of the sandbar makes wading or fishing too difficult to pursue. If investigation

discloses, as we suspect, that such hydraulics only occur at flood stage or other times when the public is not in close contact downstream of the dam, all funding for removal of the dam based on public safety should be terminated, as the funds should be used to mitigate dams which constitute a real threat of drownings.

2. An investigation of the other dam safety issues, including all points raised in this memorandum, including access to the dam, upstream safety, the DNR's relative risk analysis, dam failure, and the comparative safety of Option A.

3. An investigation of the navigation issues, including all points raised in this memorandum.

4. An investigation of the adverse effect of the lowering of the water level on ponds, wells, and wetlands, including all points raised in this memorandum.

5. An investigation of the effects of the dam removal on fishing, including all points raised in this memorandum.

6. An investigation of the upstream flooding problem, including the suggested sluice gate remedy, and all other points raised in this memorandum.

6. An investigation of the fish passage problem, including the suggested side channel remedy, and all other points raised in this memorandum.

7. An investigation of the effects of sediment release due to removal of the dam, including all points raised in this memorandum.

8. An investigation of the effects of removal of the dam on water quality, including all issues raised in this memorandum.

RESOURCES

571 IAC 30.51 et. seq.

Application for Grant # 1 LHDP Project # 08-01

Application for Grant # 2 LHDP Project # 13-06

Application for Grant # 3 LHDP Project # 16-04

Application for Grant # 4 LHDP Project # 17-01

Audio recording of JCCB Meeting on August 24, 2017.

Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project (April 22, 2016).

Brooks, K., "JCCB Votes 4-1 to Remove Portion of the Dam," Monticello Express (August 30, 2017).

Brooks, K. "Meeting Outlines Future of Mon Maq Dam," Monticello Express (May 24, 2017).

Brooks, K. "Preservation Commission Hosts Panel to Discuss Mon Maq Dam" Monticello Express (August 30, 2017

Brooks, K., "Public Input Points to Removal of Mon Maq Dam," Monticello Express (February 2016)

Brooks, K., "Residents Question Mon Maq Dam Project," Monticello Express (Aug. 2, 2017)

Brooks, K., "Supervisors Vote to Support Conservation in Dam Project" Monticello Express (August 16, 2017).

Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 1 (Iowa Office of the State Archaeologist) (2016).

Donald W. Bohlken, Photo of Mon Maq Dam

DNR, 2010 Plan for Dam Mitigation

DNR, Iowa Water Trails Program Sign Manual

DNR, The 2010 River Dam Inventory

Email Krapfl to Bohlken dated August 4, 2017.

Email Jonathan Garton, DNR Senior Dam Safety Engineer, to Bohlken (August 24, 2017).

Email Manternach to Bohlken (August 15, 2017).

Flint, K., The Long-Term Survival of Escherichia in River Water, 63 Journal of Applied Bacteriology 261 (1987).

http://outbackcanoerental.com

http://www.dictionary.com/browse/nappe.

http://www.dictionary.com/browse/weir?s=t

https://www.merriam-webster.com/dictionary/demonstrated.

https://en.wikipedia.org/wiki/Ole_Evinrude

Iowa Code section 464A.11

Iowa Secy of State, Precinct Statistics for 2016 Election.

JCCB, JCCB Board Minutes for July 11, 2016.

JCCB, Maquoketa River Mon/Maq Dam Project at 1 (2017) http://www.jonescountyiowa.org/current-projects-and-news.

Jones County Historic Preservation Commission, Survey Data Sheet.

Legislative Services Agency, Budget Unit Brief FY2017: Water Trails and Low-Head Dam Mitigation Program

Leutheusser, H., "Drownproofing of Low Overflow Structures," J. Hydraulic Eng. 117(2), 206-07 (1991).

Libra, Bob, "Iowa Water Resources" (Iowa Geological Survey-DNR) at 10. www.iowadnr.gov/water/quantity.html.

Mormann, Brad, "Riverside Gardens and Golf Course Water Level Elevations" (Data collected August 12, 2017).

Partial Audio Transcript of JCCB Meeting on August 24, 2017.

Request for Transportation Alternatives Program Funds (TAP)(March 30, 2016)

Randle, T. et. al, Guidelines for Assessing Sediment-Related Effects of Dam Removal 9 (2nd Joint Federal Interagency Conference) (2010).

Rimel, Anthony, "NW Natural to Remove Bentonite From Mary's River" Corvallis Gazette Times (Sept. 7, 2013).

Russell, R.R., "Ground Water Levels in Illinois Through 1961" 12 (Illinois Water Survey Urbana) (1963).

Schweiger, P., “Savings Lives While Improving Fish Passage at Killer Dams,” 9 Journal of Dam Safety 2: 16 (2011).

Telephone Conversation with JCCB Conservation Director Brad Mormann on September 12, 2017.

Temple, P. “Mon Maq Dam Decision is Tabled; Meeting to Come,” Monticello Express (July 27, 2017).

Tschantz, B., “What We Know (and Don’t Know) About Low Head Dams,” 12 The Journal of Dam Safety No. 4, 38 (2014).

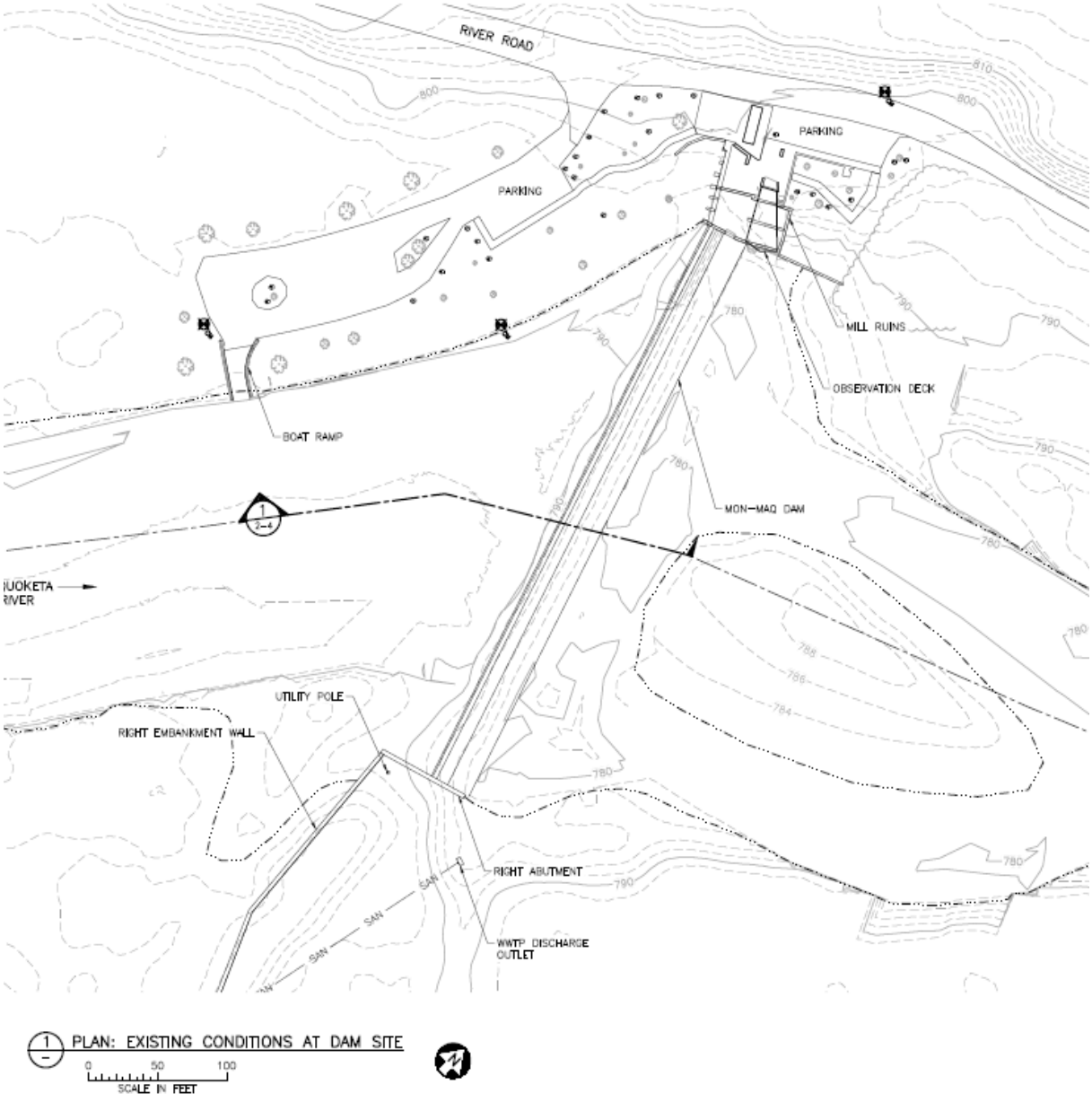
USGS, Summary of U.S. Geological Survey Reports Documenting Flood Profiles of Streams in Iowa, 1963–2012 (Table 7).

USGS, “Increased Baseflow in Iowa Over the Second Half of the 20th Century”.

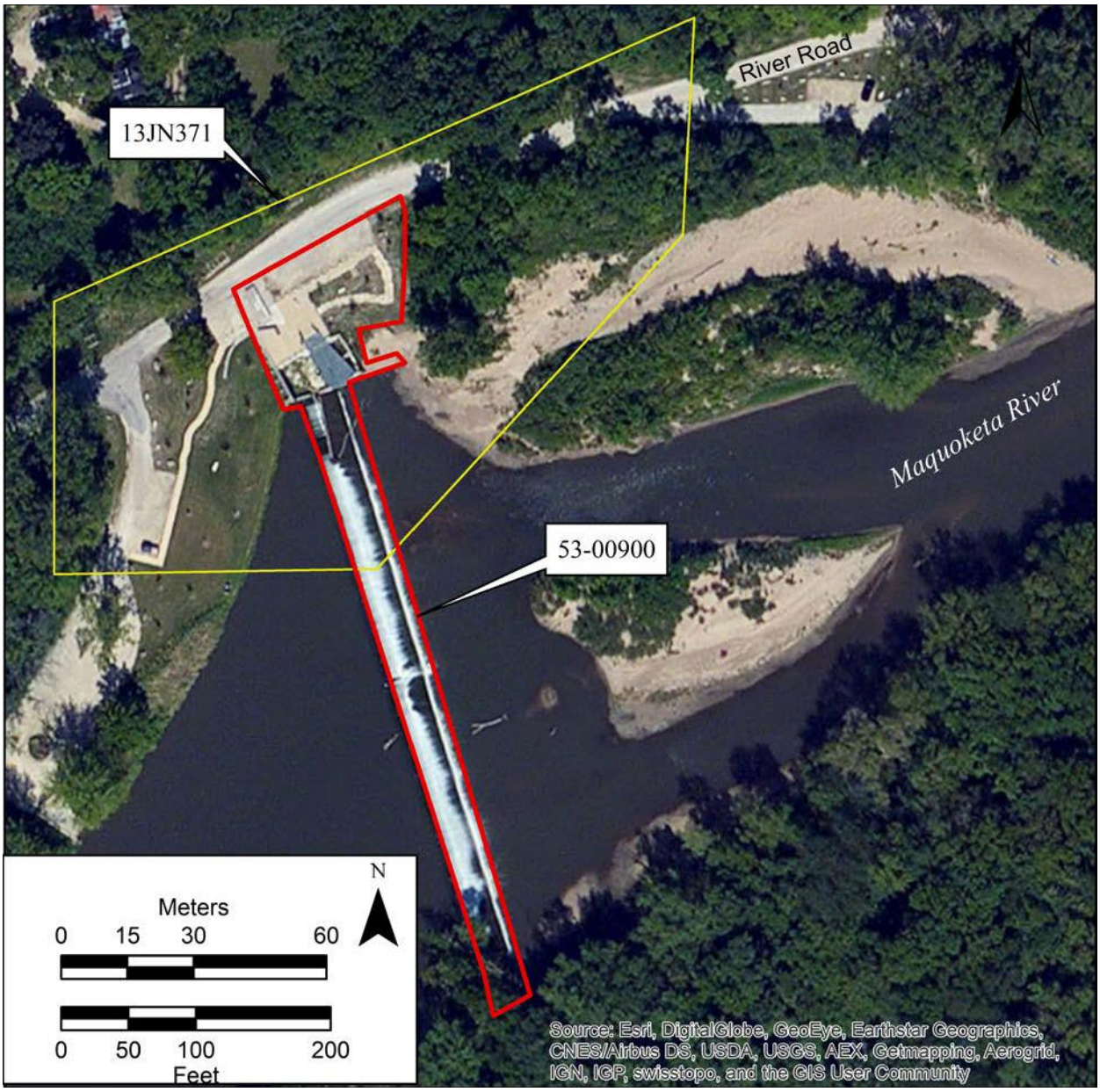
US Society on Dams, Guidelines for Dam Decommissioning Projects (2015).

Yongjie J., Herriges B., Kling C., Understanding the Usage Patterns and Most Desirable Characteristics of Iowa’s Rivers and Streams (2010).

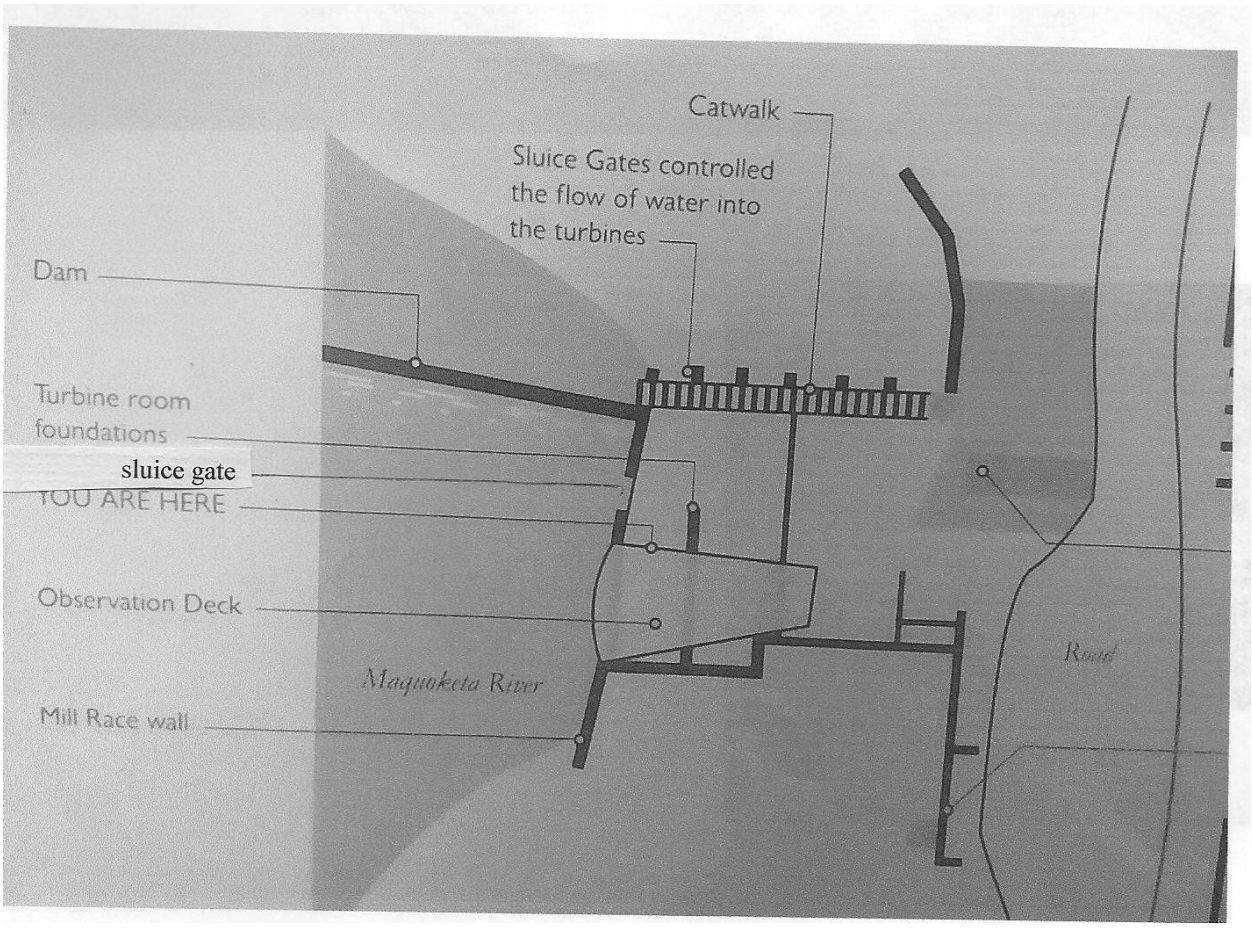
APPENDIX A - THE MONTICELLO MAQUOKETA DAM MAPS & AERIAL PHOTOS



Barr Engineering, Full Dam Removal Concept and Project Reach Analysis Report Mon/Maq Dam Mitigation Project at Figure A-1 (April 22, 2016).

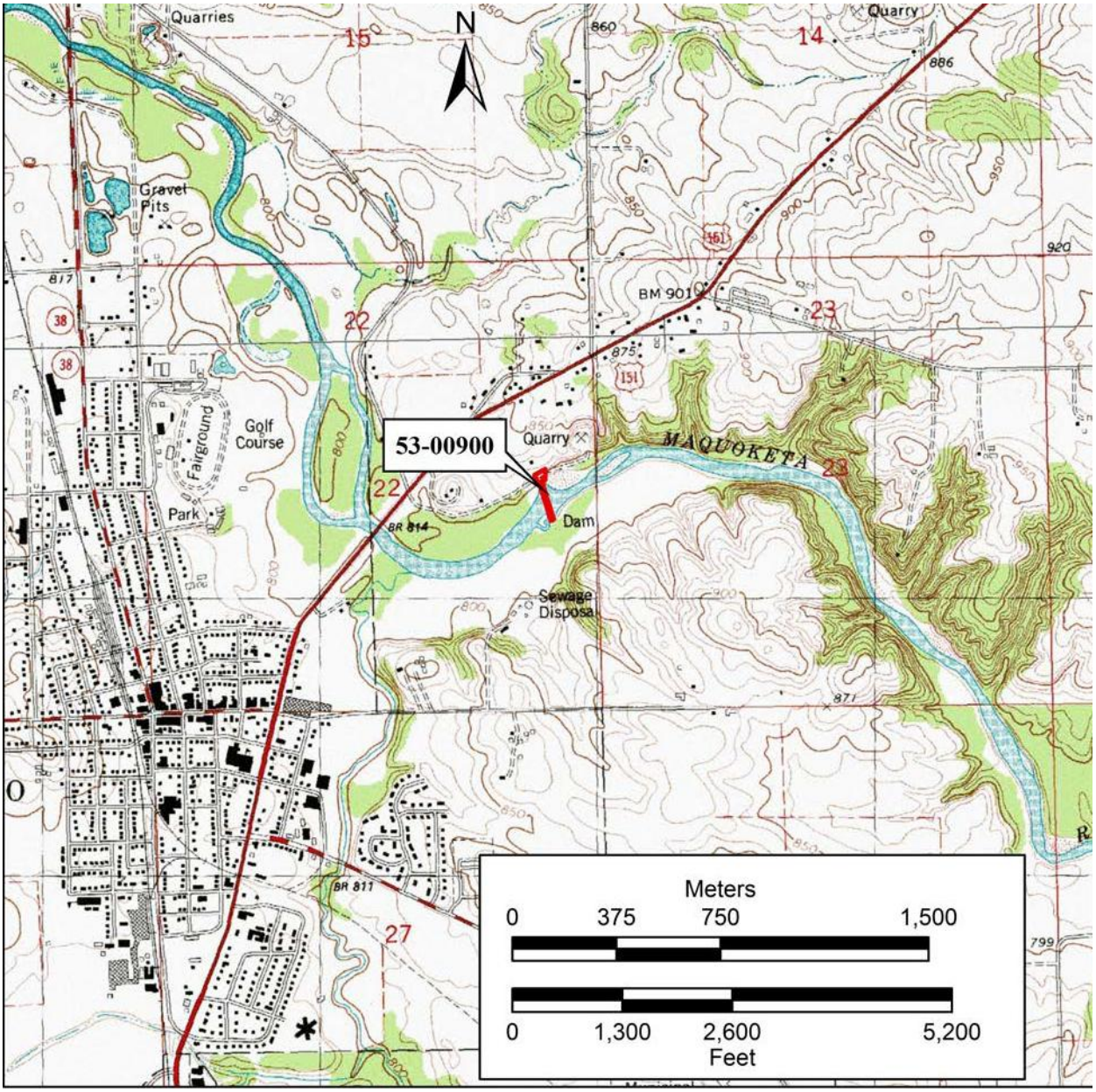


Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 32 (Iowa Office of the State Archaeologist) (2016)



Immediate Area of Dam From Sign on Observation Deck. Photo and additional "sluice gate" notation by Donald Bohlken

1980 USGS TOPOGRAPHIC MAP SHOWING DAM LOCATION



Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 31 (Iowa Office of the State Archaeologist) (2016)

APPENDIX B: DESCRIPTION OF OPTION A

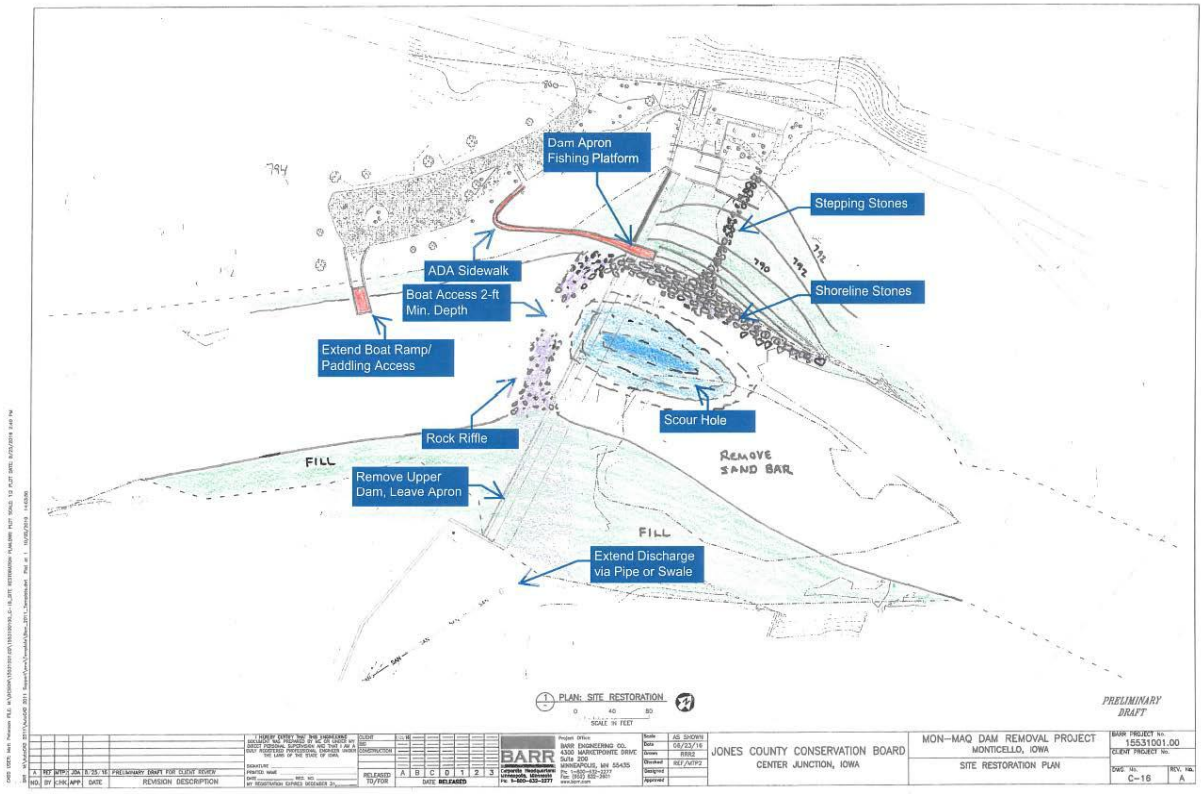
Option A. Remove a large portion of the dam and add arching boulders across the channel. Boulders will be positioned to allow paddler, tube, and boat passage during most flow ranges. This will be done by lowering the elevation of the boulders directly above the scour hole and near the fishing access points. The scour hole will be developed and maintained by the river current attracting and holding fish. Development of a handicap accessible sidewalk will allow all visitors the opportunity to move closer to the cascading water and fishing access. A fully intact portion of the dam would remain on the north end for historical interpretation, in addition to signage explaining the history of the site. The boat ramp would be extended during the initial project.

Kitty Creek-A rock arch rapids structure would be constructed below the Kitty Creek sewer line crossing. The rapids would have a 20:1 slope. Base and choke stone would fill the void between the required structure height and existing creek bed. Four arching rows of large boulders would be placed on the surface to increase surface roughness and add structural stability.

HWY 151-The north shoreline under the Business Hwy 151 Bridge would be stabilized with stone to minimize shoreline erosion and protect the north abutment.

Cost: $1.7 Million – Grant Funding Has Been Acquired.

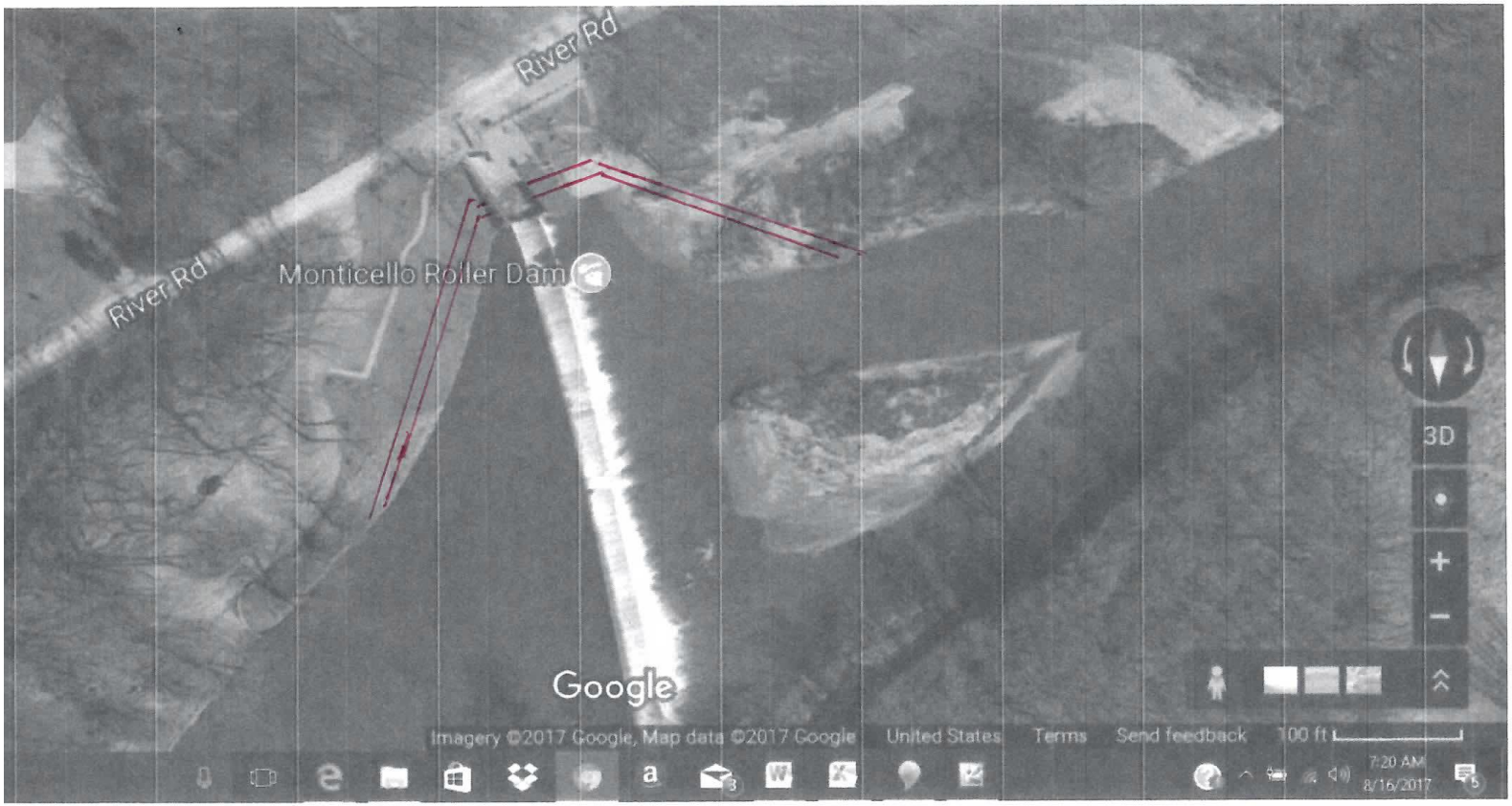
Figure 1. Preliminary design to remove a large portion of the dam and add arching rows of boulders across the channel.



JCCB, "Maquoketa River Mon/Maq Dam Project" at 2.

MDN - MAQ DAM FISHWAY

FISH MOVEMENT ALTERNATIVE



NOTES:

- AT A 2011 ELEVATION - FISHWAY SHOULD BE AT LEAST 260 FT.
  - AS DRAWN = 400+ FT.
- UTILIZES GATES AT OLD MILL SITE

Submission by Tom Osborne, Friends of the Mon Maq Dam

Photo of catwalk above sluice gates showing excavation required to reconnect upstream pool to gates.

Photo of Sluice Gates

Photo showing proximity of upstream pool to sluice gates. This and prior 2 photos from: Carlson, R., Phase I Intensive Historic Architectual Survey and Evaluation of the Monticello Electric Company Dam (a.k.a. Mon-Maq Dam), Section 22, T86N-R3W, Jones County, Iowa 36-38 (Iowa Office of the State Archaeologist) (2016)

APPENDIX D RANKING OF DAMS WITH FATALITIES AND THE MON-MAQ DAM IN THE DNR'S RELATIVE RISK ANALYSIS (FROM HIGHEST TO LOWEST).

RELATIVE RISK ANALYSIS RATING*	ID*	NAME*	NUMBER OF FATALITIES**
1.	BLA-3	PARK AVENUE DAM	6
2.	POL-1	CENTER STREET DAM (DES MOINES)	15
3.	JOH-2	BURLINGTON STREET DAM	5
4.	JOH-1	IOWA RIVER POWER COMPANY DAM	4
5.	LIN-4	PALISADES-KEPLER DAM	4
6.	LIN-2	C STREET ROLLER DAM	7
7.	BLA-1	CEDAR FALLS DAM/CENTER STREET DAM	7
8.	**JON-3**	**MON-MAQ DAM**	**0**
10.	JON-1	ANAMOSA DAM	2
17.	BRE-2	WAVERLY DAM	1
18.	**WAP-1**	**MARKET STREET DAM**	**9**
19.	HAR-1	ALDEN DAM	2
20.	WEB-2	LITTLE DAM	MILLS1
21.	HUM-5	CORN BELT POWER DAM	3
23.	POL-2	SCOTT STREET DAM	3
26.	MIT-2	OTRANTO MILL DAM	1
31.	HAR-3	STEAMBOAT ROCK DAM	1
35.	BUC-3	INDEPENDENCE LOW DAM	1
41.	**BUC-2**	**LITTLETON MILL DAM**	**9**
51.	WOR-2	NORTHWOOD DAM	2

63.	CER-11	12TH STREET DAM	1
70.	WIN-3	WEIST MILL DAM	1
72.	HEN-1	OAKLAND MILLS DAM	1
74.	WOR-1	FERTILE MILL DAM	1
81.	HUM-2	REASONER DAM	1
85.	JAS-1	WAGAMAN MILL DAM	2
92.	BRE-1	FREDERIKA DAM	1

SPECIFIC RANKING NOT AVAILABLE (RANKED(BELOW THE 50TH PERCENTILE):

NA	HAS-1	SILL # 4 DAM	2
NA	WOO-11	LAWTON DAM	2
NA	HOW-2	LYLAH'S MARSH DAM	1

- *This information for all dams listed in the DNR's Relative Risk Analysis obtained from that analysis. DNR, 2010 Plan for Dam Mitigation at 61. Information for dams for which the specific rank is not available, as they ranked below the 50th percentile, is from the DNR's 2010 Dam Inventory. DNR, The 2010 River Dam Inventory at 22-24.
- ** DNR, The 2010 River Dam Inventory at 22-24.