



2023 Dam Inspection Report

Rum River Dam

Prepared for
City of Anoka

November 2023

2023 Dam Inspection Report – Rum River Dam

November 2023

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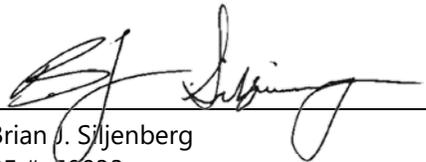
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Certifications

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.



Brian J. Siljenberg
PE #: 50033

November 4, 2023

Date

Executive Summary

The visual inspection of the Rum River Dam was conducted on Thursday May 25, 2023 during flash board installation by city staff. The inspection was performed by Brian (BJ) Siljeborg and Joe Hjerpe both of Barr Engineering Co. (Barr). A dive inspection occurred on June 6, 2023 and bathymetric survey on July 11, 2023. The dam was found to be in satisfactory condition. The following sections address the inspection:

- Section 1 Visual Inspection
- Section 2 Dive Inspection
- Section 3 Bathymetric Survey
- Section 4 Recommendations

Two observations should be considered a high priority:

- 1) The right embankment abutment wall shows signs of movement at the top of wall towards the river. See Section 1.2.
- 2) There is scour where the upstream edge of the stilling basin slab meets the downstream edge of the spillway foundation slab. See Section 1.4.

1 Visual Inspection

Observations are described in this section. Photo logs with similar brief explanations of observations are provided in Appendix A. Recommendations for these observations are presented in Table 1 of Section 4.

1.1 Upstream Reservoir

The upstream reservoir shoreline beyond the dam structures generally consists of forested and appeared to have a stable vegetated shore. There are no signs of erosion or instability changes which would impact dam safety in the upstream reservoir development or conditions since the previous inspection in 1996. Reservoir shorelines viewed during the inspection appear stable.

1.2 Right Embankment and Abutment Wall

The upstream edge of the left embankment appeared stable. Riprap was present and mostly covered the face. There are large trees and other vegetation close to the abutment wing wall (Appendix A, Photo Log 5 and 7). While this may not be considered an embankment, the deleterious impacts of vegetation still may impact the wall or fill behind the wall through volumetric changes of growing roots and the potential for seepage paths.

The downstream embankment riprap and bank appeared stable. Some small vegetation was observed. A storm drain and grouted riprap appeared undermined (Appendix A, Photo Log 1). Overall, the section appears stable.

The downstream abutment appears to be leaning riverward (Appendix A – Photo Log 2; Figure 1). The gap at the top measured at 3.50 inches. Stanley Consultants observed this displacement in 1996 measuring it at 2.75 inches (Stanley Consultants, October 1996). Assuming this gap was 0 inches as of the original 1966 construction, the movement trend is provided in Figure 2. This magnitude of movement does pose a concern. While this could be an indication of destabilization of the wall which would require repair, the leveling off trend with time minimizes the concern. Furthermore, the wall is founded on piles reducing the risk of scour undermining the foundation. A root measuring approximately 2" in diameter was observed.

The sloping of the concrete slab behind the wall is consistent with the leaning of the wall (Appendix A, Photo Log 6).



Figure 1 Right Abutment Wall Displacement and Vegetation

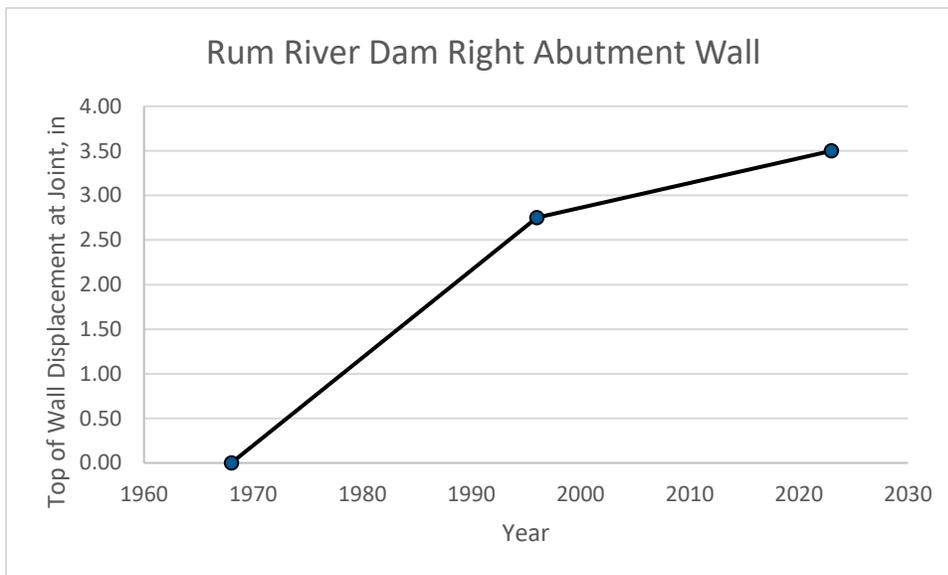


Figure 2 Rum River Dam Right Abutment Wall Top Displacement

1.3 Fixed Crest Spillway

The fixed crest spillway is a buttress type dam with a total length of 236 feet. The spillway consists of an 18-inch thick concrete apron supported by 2-foot thick concrete buttresses, orientated parallel to river flow and spaced at about 18.33-feet on center.

The crest was observed with the pool drawn down and with the concrete cleaned off during flashboard installation. It appeared to be in acceptable condition. Some superficial degradation and exposed aggregate were observed. Some superficial spalling was observed. Minor rust was present on flashboard posts. Flashboard cables were observed to be new. The timber flashboards were heavily deteriorated and warped.

The spillway bays were observed from downstream and were generally in acceptable condition. A typical bay condition is shown in Appendix A, Photo Log 23. Some minor seepage was observed at a joint in Bay 9 (Appendix A, Photo Log 11) with mineral deposits present.

Spalling was observed the following bays:

Bay 3 - Appendix A, Photo Log 21; Figure 3

Bay 5 - Appendix A, Photo Log 16

Bay 9 - Appendix A, Photo Log 9

The spalls observed in bays 3 and 9 are likely honeycombing from the original construction. Exposed rebar was observed.



Figure 3 Bay 3 honey combing and exposed rebar

1.4 Stilling Basin

The downstream stilling basin is a reinforced concrete structure consisting of a 2-foot thick floor slab, a 2-foot, 11-inch tall by 2-foot thick end sill and a series of 3-feet, 9 inch tall by 2-foot thick reinforced concrete baffle blocks. The stilling basin floor and end sill was generally in acceptable condition.

The spillway foundation slab top is approximately 24" above the stilling basin slab top as shown in Figure 4. Surficial spalling in the stilling basin slab adjacent to the downstream spillway foundation slab edge for most of the spillway width was felt by Barr inspectors. In front of Bay 12, this scour increased in depth and width to approximately 18-inches x 12-inches deep. (Appendix A, Photo Log 26). The dive inspection confirmed the presence of this scour as discussed in Appendix B. No seepage was felt at the locations checked during the inspection. However, any change in scour should be monitored and appropriate measures taken to stabilize the areas impacted. If scour progresses, a conduit to the spillway subgrade could develop and permit piping of material.

Various baffle blocks were observed to have damaged concrete or were partially or fully displaced (Appendix A, Photo Log 30). The purpose of the baffle blocks is to disrupt the flow over the spillway to slow it down and reduce potential for scour downstream of the stilling basin. Baffle blocks 1, 2, 3, 4, 41, 42 and 43 (counted from the right to the left when looking downstream) showed honeycombed or spalled concrete. Baffle block 1 showed exposed rebar but none of the others did.

Baffle blocks 8, 49, 51 and 52 were partially displaced and baffle blocks 8, 47 and 48 were observed to be fully displaced (Appendix A, Photo Log 30). The blocks appeared to be laying downstream.

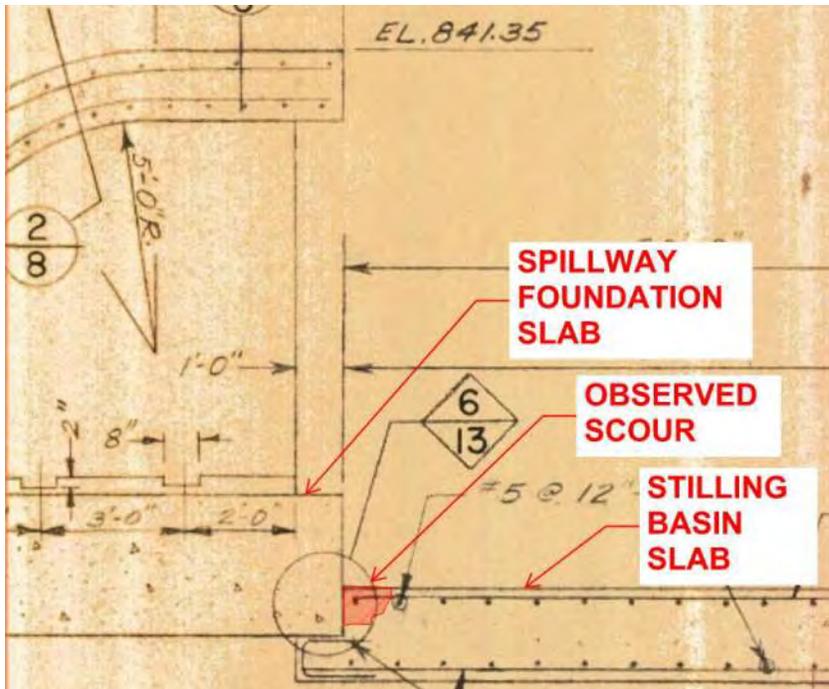


Figure 4 Location of scour in stilling basin slab

1.5 Tainter Gate

The tainter gate exhibited superficial surface rust throughout. Left uncorrected the structural steel elements would continue to deteriorate and possibly render the gates unusable for their intended function. Leakage was observed along the sill (concentrated on the right side) and along the left edge (concentrated at the bottom) as shown in Figure 5. The primary structural elements in the gate appeared undamaged and in satisfactory condition.

The dive inspection and surface inspection indicated satisfactory condition of the stoplog slots. These slots could be used with stoplogs or bulkheads to dewater the tainter gate bay and permit the above recommended repairs to be completed.



Figure 5 Tainter gate leakage

1.6 Left Embankment

The upstream edge of the left embankment appeared stable. Riprap was present and covered at least 80% of the exposed face. Where riprap appeared to be missing there was no evidence of excessive scour indicating this may be silt build up. A short sheet pile wall that raised the embankment elevation appeared stable and in good condition. The connection to the concrete pier was not observed, but there were no signs of material loss indicating a reasonable seal.

The left embankment was well armored with riprap. Seepage discussed in previous inspection reports was not observed,

2 Dive Inspection

J.F. Brennan conducted a dive inspection of underwater elements on the upstream and downstream side of the spillway. The overall condition was observed and judged to be satisfactory which matches the general conditions observed above water.

The following elements were identified which were not visible above water:

- Divers observed spalling along the cold joints at the locations marked as stations 1-4 in Figure 6.
 - **Station 1:** The spalling was present 1-foot upstream of the flashboards and measured 1-foot long by 3-inches wide. The diver could feel minor flow at the area of spalling.
 - **Station 2:** The first area of spalling was present next to the flashboards and measured 29-inches long by 2.5-inches wide by 9-inches deep. The diver could feel flow at the area of spalling. The second area of spalling was present 1-foot upstream of the first area of spalling. The spalling measured 1-foot long by 2.25-inches wide.
 - **Station 3:** The spalling was present 21-inches upstream of the flashboards and 13-inches to the west of the cold joint. The spalling measured 7-inches long by 13-inches wide by 1-inch deep.
 - **Station 4:** The expanded portion of the cold joint started at the flashboards, extended 29-inches upstream and measured 1-inch wide.
- A previously repaired hairline crack was observed at station 5 in Figure 6.
- A gate inspection was not possible due to flows. If stoplogs or bulkheads were developed, they could be installed to enable a dry hands-on inspection of the gate.

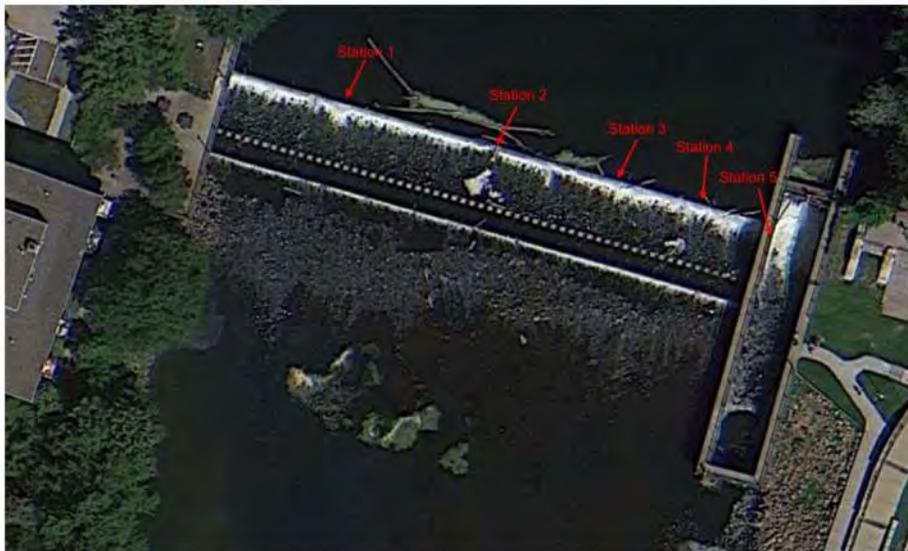


Figure 6 Locations of spalling observed on the upstream side of the spillway

3 Bathymetric Survey

A bathymetric survey was conducted on July 11, 2023 using a survey rod and GPS collection method. Results are shown in Appendix C.

Dam safety engineers typically look for scour holes and accelerated changes when comparing current with past bathymetric surveys. There are localized depressions observed in the 1996 bathymetry that were still present in the 2023 survey as shown in Figure 7. The magnitude of these depressions do not appear to have changed since the last surveyed. There are no other significant changes observed.

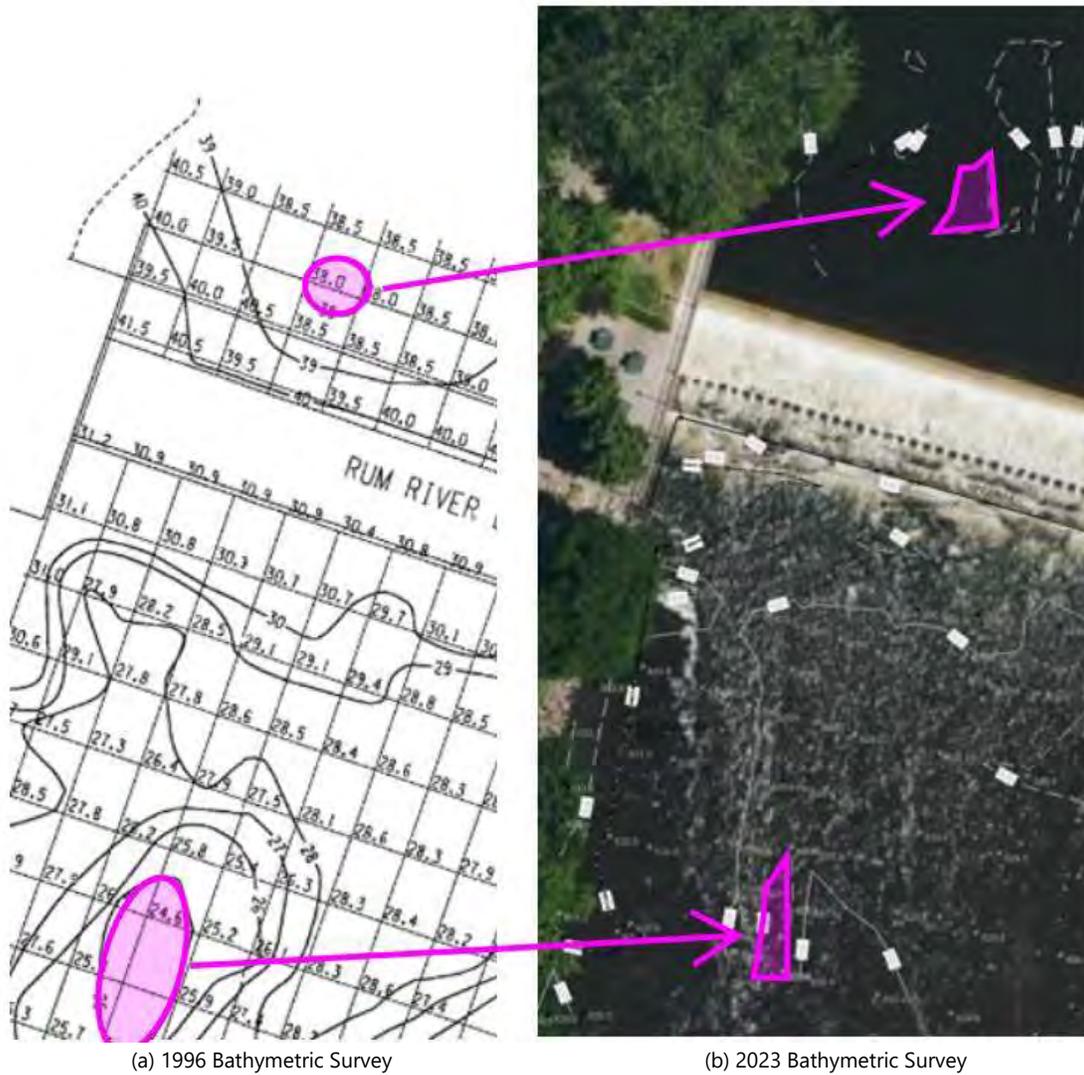


Figure 7 Localized depressions observed in bathymetric survey

4 Recommendations

Table 1 summarizes recommended repair actions for findings warranting corrective action. Priorities are set based on potential impact on dam safety should disrepair continue at an accelerated rate.

Table 1 Recommendations

Index	Location	Recommendation	Photo Log	Priority
1	Right embankment/abutment Downstream	Place a crack gauge to measure to the nearest 0.1" and record changes every year. Remove tree root passing through expanded joint and any nearby trees which may have roots behind the wall.	2	High
2	Stilling basin slab	Evaluate the scour potential and determine a remediation to address the scour and protect from further deterioration, if necessary.	26	High
3	Right embankment/abutment	Remove and reinstall concrete slab behind abutment wall so it has positive drainage away from wall.	6	Medium
4	Stilling basin baffle blocks 1, 2, 3, 4, 41, 42, 43	Evaluate the scour potential and determine a remediation to address the scour and protect from further deterioration, if necessary.	30	Medium
5	Stilling basin baffle blocks 8, 49, 51, 52	Evaluate if missing baffle blocks are required and design appropriate mitigation as needed.	30	Medium
6	Right embankment/abutment Upstream	Remove vegetation within 15-feet upstream of upstream abutment wingwall	5 7	Low
7	Spillway underside Bays 3, 5, 9	Develop a plan to document and inspect the spalling to determine the rate of change and then the development of a long-term plan.	6 16 21	Low
8	Spillway upstream face Stations 1-4 Appendix B	Develop a plan to document and inspect the spalling to determine the rate of change and then the development of a long-term plan.	Appendix B	Low

Notes

- 1) See Appendix A for photo log

Appendix A

Inspection Photo Log



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearthmap (April, 2023)

Date: 4/21/2023

Comment: Erosion where downstream wing wall ties in with bank.



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Downstream wing wall joint expansion indicates tilting of the wall. Joint expanded past keyway.



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Right abutment wall,
superficial degradation



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: View from downstream



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Right abutment general condition, general weathering, some staining and vertical cracking



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Sloping slab at backside of right abutment wall



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Erosion evident at upstream wing wall tie in.



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Spalling on 4 baffle block corners and tops. Exposed rebar on right one



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Missing baffle block. Appears to be tipped over immediately downstream



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition, superficial degradation, exposed aggregate



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Bay 9, minor seepage, mineral deposits, construction deficiency exhibiting exposed rebar



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Bay 6, some spalling present at top of right pier



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Condition under flashboard, some superficial spalling



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition of flash board post, some superficial rust



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Spall approx. 12"x4"x1" deep, additional smaller spalls in vicinity, no exposed rebar



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Bay 5, some spalling present towards top of right pier



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Corner spalls on 3 baffle blocks



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition of downstream face at flashboard post, superficial rust present on steel embeds, superficial spalling on concrete



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition of joint, expansion joint material present, some superficial spalling at corners



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Two baffle blocks missing. One appears to be tipped over immediately downstream



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Bay 3, note damp concrete on right pier, evidence of poorly consolidated concrete, 3 spalls exhibit exposed rebar, soundings indicate delaminated concrete on approx 20% of bay face.



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Two displaced baffle blocks, additional concrete block present downstream of right displaced baffle block



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition downstream bay

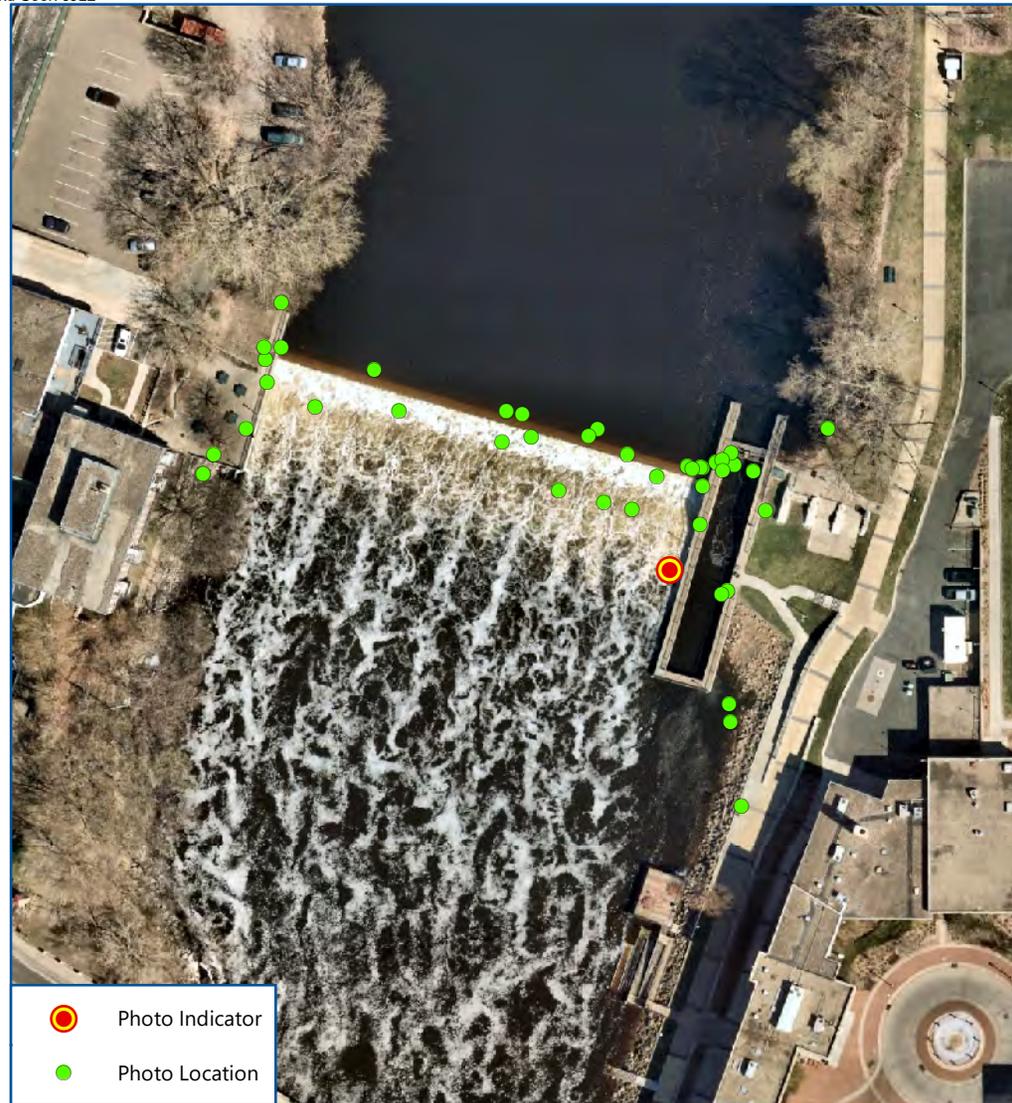


Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Seepage through base of two joints on left training wall



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Left abutment, general condition, superficial aging



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Approx 18"x12" trench in
stilling basin where lower spillway slab
meets



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Flash board, wood heavily deteriorated, superficial rust on vertical posts, new cables



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Spillway surface, superficial scour (less than 1"), portions of exposed aggregate



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition at left training wall, dampness observed, no flowing water



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Lower tailwater with gate closed prior to upstream pool reaching flash boards



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Spalling on sidewalk, no rebar visible



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Daylight visible through training wall joint, no misalignment evident



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Typical condition of land side of abutment wall. Some cracking in top slab edge.



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Operators bridge I'm acceptable condition. Spalling at end of bridge at top of wall.



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition.



 Photo Indicator

 Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Cap missing on walkway on right side of tainter gate



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Surface rust on strut arms and tainter gate upstream face, bent flange on brace



-  Photo Indicator
-  Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Typical inside face of left abutment wall



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: General condition upstream side of tainter gate



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Tainted gate from ds side, minor surface rust, walls in good condition



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: More leakage through left sill after closing gate. Some spalling on gate spillway



Photo Indicator

Photo Location

PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Left retaining wall general condition, minor superficial cracking



-  Photo Indicator
-  Photo Location



PHOTO LOCATION SUMMARY

2023 Dam Inspection
City of Anoka
Anoka, Minnesota



Imagery: Nearmap (April, 2023)

Date: 4/21/2023

Comment: Dam tie in to left bank general condition, typ weathering on steel sheet pile, concrete to sheet pile connection appears to be sound, small trees present

Appendix B
Dive Inspection

Underwater Inspection Report

Inspection Performed for:



Prepared by:



818 Bainbridge St.
La Crosse, WI 54603
608.784.7173

www.jfbrennan.com

Owner: City of Anoka
Structure(s): Rum River Dam
Location: Anoka, Minnesota
Body of Water: Rum River
Inspection Date: June 6, 2023





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Disclaimer: The information provided herein is for the limited administrative and operational use of Barr – City of Anoka and their contractors. Other requests for this document shall be referred to J.F. Brennan Company, Inc. The accuracy of the information provided is limited by the conditions of the site during the day of the inspection.



Executive Summary

Project: Underwater inspection of the Rum River Dam.

Scope of Work: To perform an inspection of the in-water structures to gain a global condition assessment of the structure.

Inspection Team:

Dive Supervisor:	Sean McMullen
Diver:	Luke Arneson
Tender:	Will Martin
Project Technician:	Justin Brendon
Assistant Technician:	Aiden Miller

Inspection Date: June 6, 2023

Weather: Sunny, 75°F

Water Visibility: Good, 2-feet.

Coordinates: 45.199543°, -93.390982°

Dive Mode: Surface Supplied Air via Boat.

Access Location: Upstream: 45.213848°, -93.389322°, Downstream: 45.192409°, -93.390218°

Condition Assessment: **Satisfactory.**

Summary of Findings:

- There were multiple areas of spalling on the cold joints on the upstream portion of the spillway.
- The hardware associated with the flashboards was in satisfactory condition.
- The bulkhead slots on the upstream and downstream portions of the Tainter Gate experienced moderate rust nodules throughout.
- On the downstream portion of the Tainter Gate, a hairline crack that appeared to have been previously repaired was present on the west wall.

Summary of Recommendations:

- It is recommended that the areas of spalling on the cold joints on the upstream portion of the spillway be periodically monitored to determine if further deterioration has occurred.



1. Introduction/Background

J.F. Brennan Company, Inc. (Brennan) performed an underwater inspection on the Rum River Dam. The inspection was performed on the in-water structures to gain a global condition assessment of the structure. Specific attention was given toward determining if scour or undermining were present along any portions of the structure. Environmental conditions, such as channel bed material, biological growth, and drift/debris, were also generally noted.

Structure Data:

Owner:	Barr – City of Anoka
Structure:	Rum River Dam
Location:	Anoka, Minnesota
Waterway:	Disharoon Lake

2. Method of Investigation

A Level I visual and tactile inspection of the structure and surrounding riverbed was used to observe signs of distress and deterioration including, but not limited to: movement, cracks, scaling, spalling, honeycombing, scour, and undermining.

The crew and equipment accessed the structure using a mobile platform. The inspection was conducted using surface-supplied air with equipment including a Kirby Morgan dive helmet with full diver-to-surface communications; and a helmet-mounted Outland Video Camera / Light combo with a video recorder providing live streaming at the dive platform.

All dives were conducted in accordance with Brennan's Safe Diving Practices Manual as well as all pertinent ADCI, OSHA, and USCG regulations. Additionally, all dives adhered to the dive schedules and decompression tables outlined in the U.S. Navy Dive Manual, Rev. 7.

All measurements referenced hereinafter were approximate and reflect the conditions on-site at the time of the inspection.

The three (3) levels of underwater inspections are described as:

Level I - A simple visual or tactile (by feel) inspection, without the extensive use of tools or measuring devices. It is usually employed to gain an overview of the structure and will precede or verify the need for a more detailed Level II or Level III inspection.

Level II - A detailed inspection which involves physically cleaning or removing growth from portions of the structure. In this way, hidden damage may be detected and assessed for severity. This level is usually performed on at least a portion of a structure, supplementing a Level I.

Level III - A highly detailed inspection of a structure which is warranted if extensive repair or replacement is being considered. This level requires extensive cleaning, detailed measurements, and testing techniques that may be either destructive or non-destructive in nature.

3. Inspection Findings

*To view/download the footage from the inspection please follow the instructions below. The SharePoint site will remain active for 30 days, during this period please download the files if you want to keep them for your record. After the 30-day period, the site will be removed, and you will no longer be able to access the videos through the SharePoint link.

- [Rum River Dam](#) (Click and follow link directly. Your email address must have been given access for you to open up the folder. If you do not have access and need it, please reach out so we can get your email address added.)



Upstream, Spillway

The inspection began on the west end of the spillway and worked towards the east.

- The west wingwall was in satisfactory condition with no notable deficiencies present.
 - The water depth was 4-feet deep.
- Overall, the concrete throughout the spillway experienced light to moderate scaling.
 - Near the flashboards, the scaling was light. Further upstream, the concrete experienced moderate scaling.
- Overall, the flashboards and hardware were in satisfactory condition.
 - The Crosby clips were in satisfactory condition throughout (See [‘Appendix A, Figure 20’](#)).
 - The anchor points for the clips were in satisfactory condition with no cracking found (See [‘Appendix A, Figure 21’](#)).
 - The brackets attached to the flashboards experienced moderate rust.
- **Station 1:** An area of spalling was present on a cold joint approximately a quarter of the way across the spillway (See [‘Appendix A, Figure 22’](#)).
 - The spalling was present 1-foot upstream of the flashboards and measured 1-foot long by 3-inches wide.
 - The diver could feel minor flow at the area of spalling.
- **Station 2:** Two areas of spalling were present on a cold joint approximately halfway across the spillway (See [‘Appendix A, Figures 23-24’](#)).
 - The first area of spalling was present next to the flashboards and measured 29-inches long by 2.5-inches wide by 9-inches deep.
 - The diver could feel flow at the area of spalling.
 - The second area of spalling was present 1-foot upstream of the first area of spalling.
 - The spalling measured 1-foot long by 2.25-inches wide.
- **Station 3:** An area of spalling was present approximately three quarters of the way across the spillway (See [‘Appendix A, Figure 25’](#)).
 - The spalling was present 21-inches upstream of the flashboards and 13-inches to the west of the cold joint.
 - The spalling measured 7-inches long by 13-inches wide by 1-inch deep.
- **Station 4:** Near the east end of the spillway, the cold joint had expanded, and the diver was able to see light through the cold joint (See [‘Appendix A, Figure 26’](#)).
 - The expanded portion of the cold joint started at the flashboards, extended 29-inches upstream and measured 1-inch wide.

Upstream, Tainter Gate

- Due to the gate leaking, the diver was unable to inspect the gate itself.
- Sill:
 - The sill had a vertical face that measured up to 30-inches tall.
 - The vertical face was at its tallest near the center of the sill.
 - No areas of undermining were present.
- West Bulkhead Slot:
 - Prior to inspection, a rock was present in the slot. The diver removed the rock from the area to prevent any future issues with sealing the gate.
 - The concrete at the bulkhead slot was in satisfactory condition.
 - The embedded steel experienced moderate rust nodules throughout (See [‘Appendix A, Figure 27’](#)).
- East Bulkhead Slot:
 - The concrete at the bulkhead slot was in satisfactory condition.



- The embedded steel experienced moderate rust nodules throughout.
- Concrete Floor:
 - The floor experienced moderate scaling throughout.
- Outer Portion of East Wall:
 - The concrete was in satisfactory condition.

Downstream, Tainter Gate

- Sill:
 - The sill experienced a vertical face that was up to 7-inches tall.
 - No areas of undermining were found.
- East Bulkhead Slot:
 - The concrete was in satisfactory condition.
 - The embedded steel experienced moderate rust nodules throughout.
- East Wall:
 - The concrete was in satisfactory condition.
 - The cold joints experienced up to 0.75-inches of separation.
- Floor:
 - The floor was smooth and did not have any notable deficiencies.
- West Wall:
 - **Station 5:** A hairline crack was present near the Tainter Gate (See '[Appendix A, Figure 28](#)').
 - The crack began at bottom and extended 6-feet towards the waterline.
 - It appeared that the crack had been previously repaired.
 - The cold joints experienced up to 0.75-inches of separation.
 - At the time of the inspection, water was flowing into the structure through one of the cold joints (See '[Appendix A, Figure 14](#)').
- West Bulkhead Slot:
 - The concrete was in satisfactory condition.
 - The embedded steel experienced moderate rust nodules throughout.
- Outer Portion of West Wall:
 - The concrete was in satisfactory condition.

Downstream, Stilling Basin

- The diver attempted to locate any significant scour in the northeast corner of the stilling basin.
 - They were unable to locate any areas of significant scour.
- Downstream End of Stilling Basin:
 - The downstream end of the stilling basin was in satisfactory condition.
 - Riprap was present throughout.
 - No areas of undermining were found.
- West Wingwall:
 - The concrete was in satisfactory condition.

4. Evaluation and Summary

Based on the dive inspection, the Rum River Dam was considered to be in satisfactory condition. Limited minor to moderate defects or deterioration are observed, but no overstressing was observed.

There were multiple areas of spalling on the cold joints on the upstream portion of the spillway. The hardware associated with the flashboards was in satisfactory condition. The bulkhead slots on the



upstream and downstream portions of the Tainter Gate experienced moderate rust nodules throughout. On the downstream portion of the Tainter Gate, a hairline crack that appeared to have been previously repaired was present on the west wall.

Refer to 'Routine Underwater Condition Assessment Rating Descriptions' below for explanations of above noted condition rating(s).

5. Recommendations

It is recommended that the areas of spalling on the cold joints on the upstream portion of the spillway be periodically monitored to determine if further deterioration has occurred.

Brennan recommends that the entire underwater section of the facility, be inspected within a 60-month maximum interval. An immediate post-event inspection should be conducted on the structure after any significant or unusual event, including, but not limited to: flood, earthquake, storm, vessel impact, or other event that has potential to cause damage to the structure. Drift and debris material should be cleared to prevent scour and undermining or any further damage to the structure.



Routine Underwater Condition Assessment Rating Descriptions

Good: No visible or only minor damage was noted. Structural elements may show very minor deterioration, but no overstressing was observed. No repairs are required.

Satisfactory: Limited minor to moderate defects or deterioration are observed, but no overstressing was observed. No repairs are required.

Fair: All primary structural elements are sound, but minor to moderate defects or deterioration was observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs recommended, but the priority of the recommended repairs was low.

Poor: Advanced deterioration or overstressing was observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.

Serious: Advanced deterioration overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restriction may be necessary. Repairs may be carried out on a high-priority basis with urgency.

Critical: Very advanced deterioration, overstressing or breakage has resulted in localized failure(s) of primary structure components. More widespread failures are possible or likely to occur, and load restriction should be implemented as necessary. Repairs may need to be carried out on a very high priority basis with strong urgency.

We appreciate the opportunity to work with the Barr – City of Anoka on this project. If you have any questions or concerns regarding the information in this report or if Brennan can be of any further assistance, please do not hesitate to contact me directly.

Respectfully submitted,

Justin Brendon

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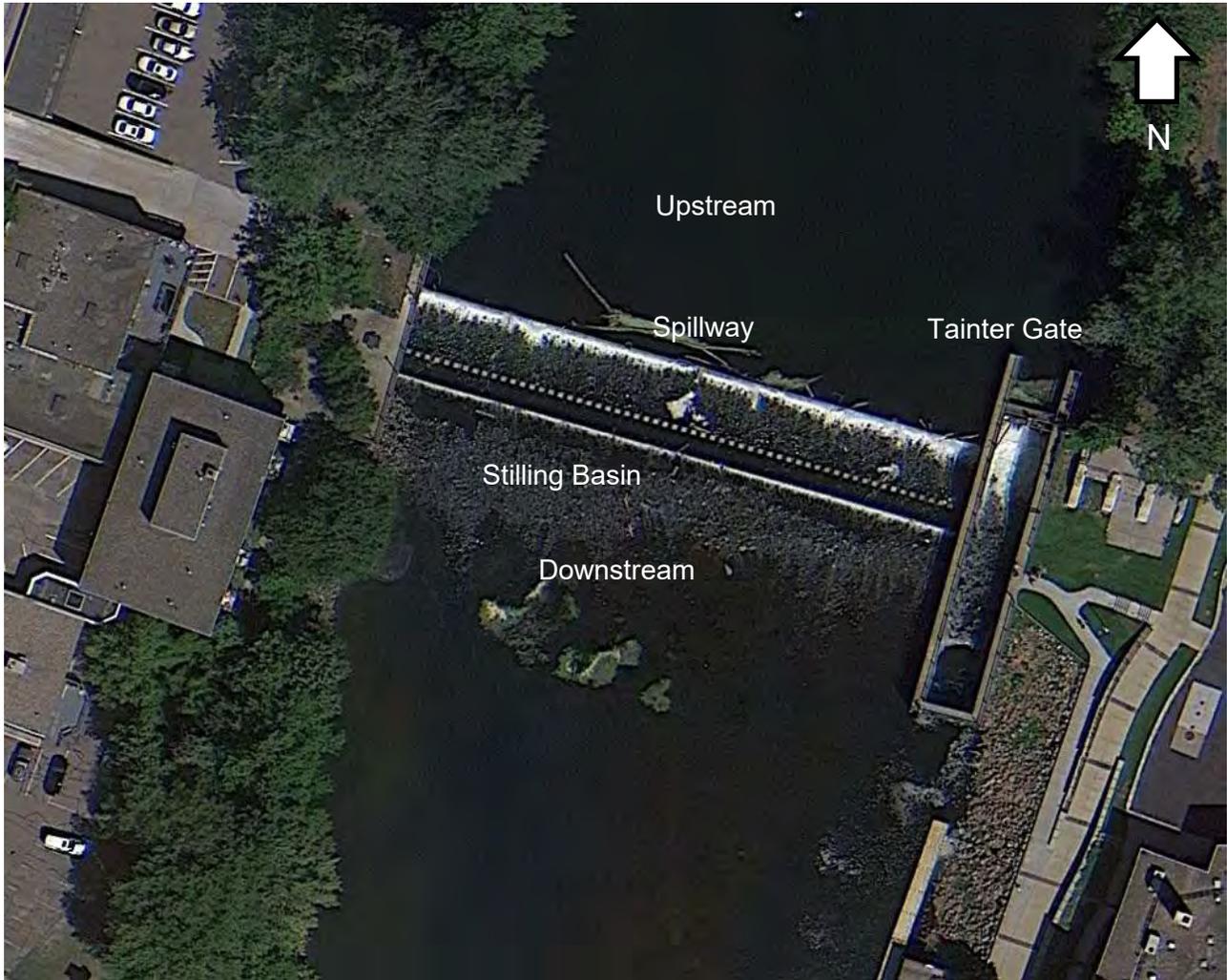


Figure 1 – Area Map



Figure 2 – Upstream, West Wingwall



Figure 3 – Upstream, Spillway



Figure 4 –Upstream, Spillway



Figure 5 – Upstream, Spillway



Figure 6 – Upstream, Spillway



Figure 7 – Upstream, Spillway and Outer Wall of Tainter Gate



Figure 8 – Upstream, West Bullnose of Tainter Gate Wall



Figure 9 – Upstream, Tainter Gate West Wall



Figure 10 – Upstream, Tainter Gate East Wall



Figure 11 – Upstream, West Bullnose of Tainter Gate Wall



Figure 12 – Upstream, Outer Portion of Tainter Gate Wall



Figure 13 – Downstream, Tainter Gate Structure



Figure 14 – Downstream, Tainter Gate Structure: Water Flowing Through Cold Joint



Figure 15 – Downstream, Tainter Gate Structure



Figure 16 – Downstream, Tainter Gate Outer Portion of Wall



Figure 17 – Downstream, Spillway and Stilling Basin



Figure 18 – Downstream, Spillway and Stilling Basin



Figure 19 – Downstream, Spillway and Stilling Basin

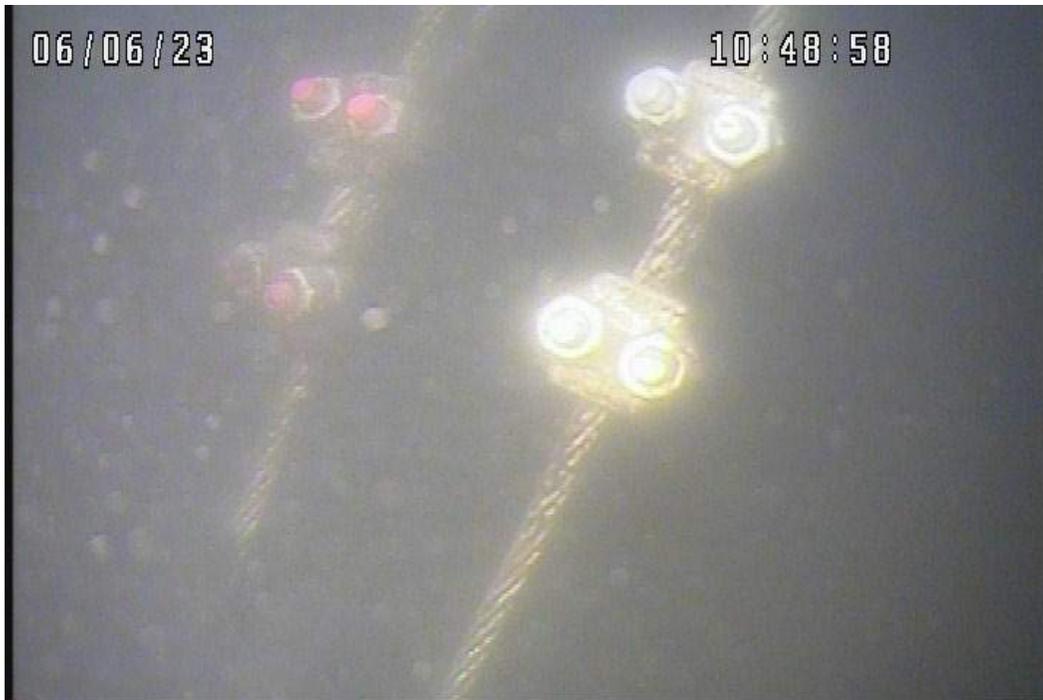


Figure 20 – Upstream, Spillway: Condition of Crosby Clips



Figure 21 – Upstream, Spillway: Condition of Anchor Points



Figure 22 – Upstream, Spillway: Spalling at Cold Joint



Figure 23 – Upstream, Spillway: Spalling at Cold Joint



Figure 24 – Upstream, Spillway: Spalling at Cold Joint

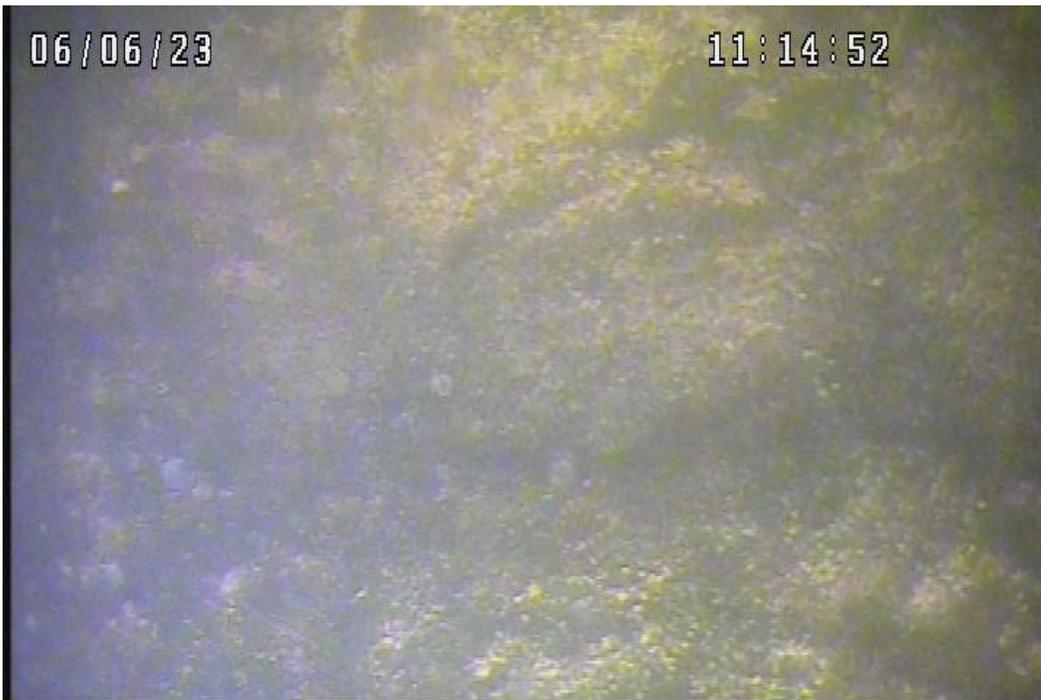


Figure 25 – Upstream, Spillway: Spalling



Figure 26 – Upstream, Spillway: Expanded Cold Joint

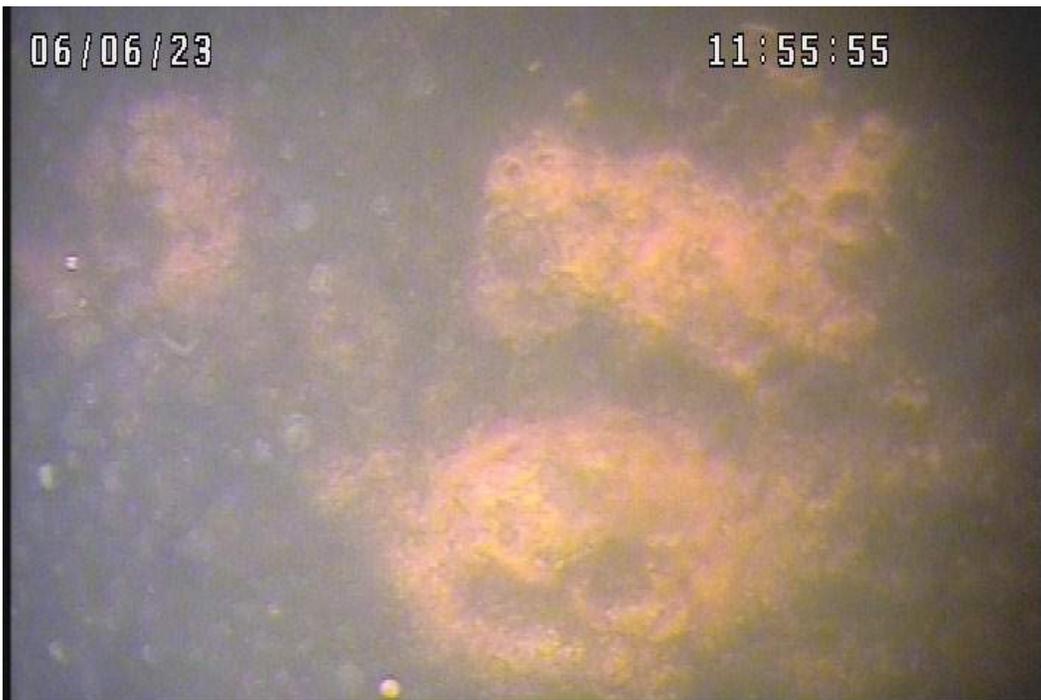


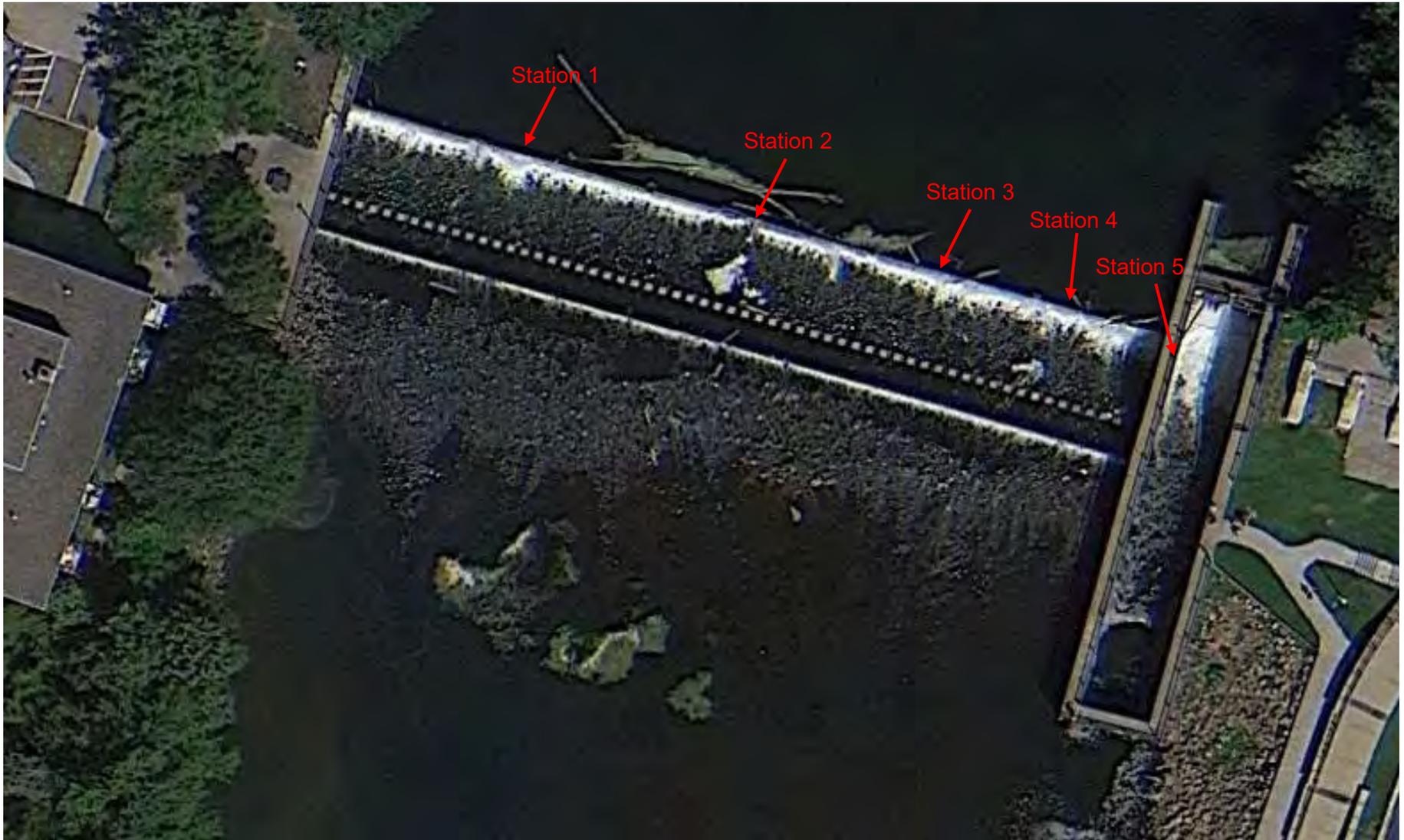
Figure 27 – Upstream, Tainter Gate West Bulkhead Slot: Rust Nodules



Figure 28 – Downstream, Tainter Gate West Wall: Hairline Crack



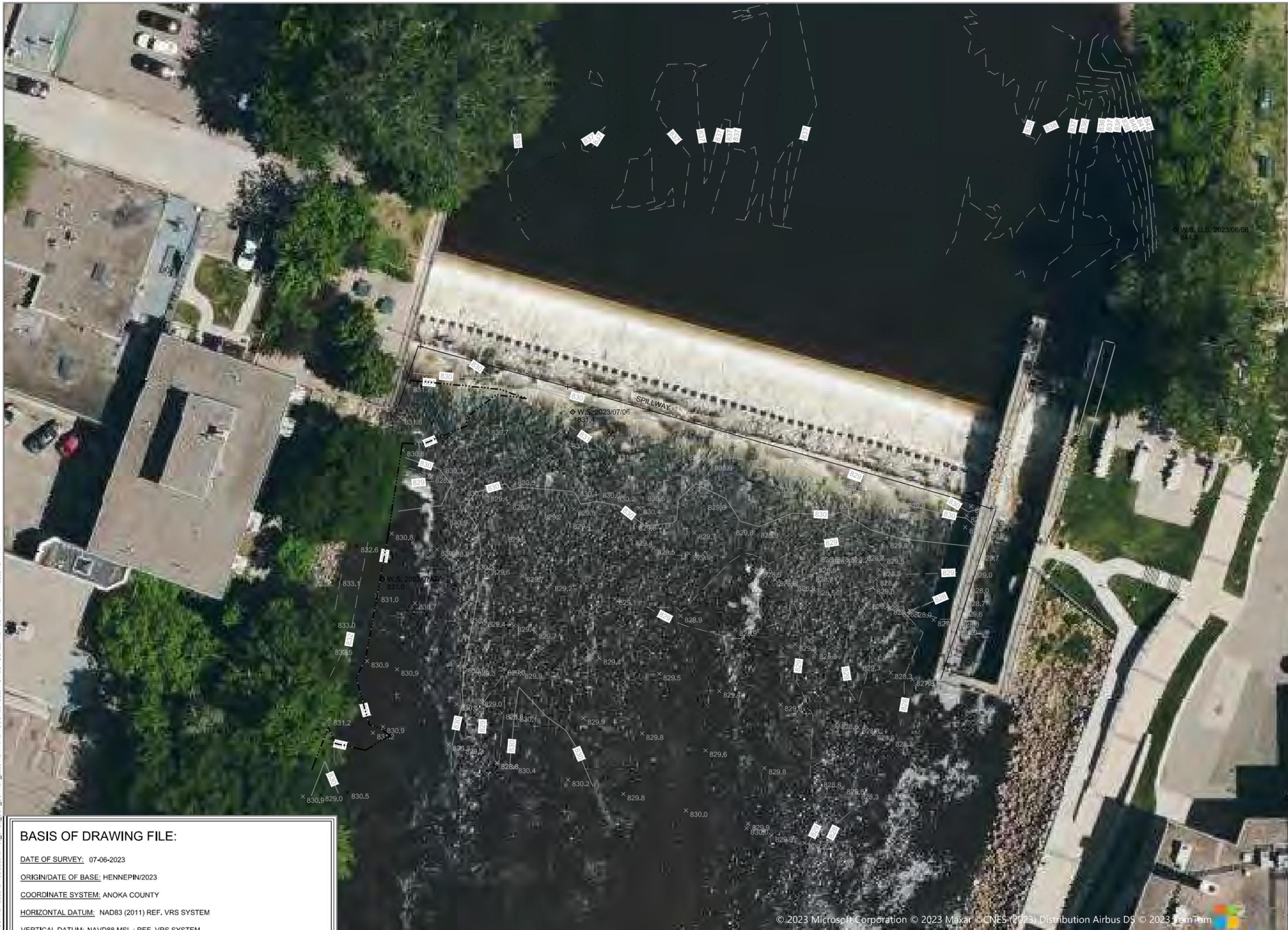
Appendix B – Station References



Stationing 1 – Rum River Dam Station References

Appendix C

Bathymetric Survey



LEGEND - - SURVEY

— 1380 —	MAJOR CONTOUR
- - - 1379 - - -	MINOR CONTOUR
-----	SHORELINE
.....	BATHYMETRIC POINTS

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844.3

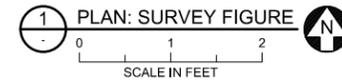
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CADD USER: JIM STABERG FILE: M:\DESIGN\SURVEY\230621\10023021100_BASE_SUR_SURVEY_2023 RUM RIVER SOUNDINGS.DWG PLOT SCALE: 1:2 PLOT DATE: 7/11/2023 10:14 AM

BASIS OF DRAWING FILE:

DATE OF SURVEY: 07-06-2023
 ORIGIN/DATE OF BASE: HENNEPIN/2023
 COORDINATE SYSTEM: ANOKA COUNTY
 HORIZONTAL DATUM: NAD83 (2011) REF. VRS SYSTEM
 VERTICAL DATUM: NAVD88 MSL.; REF. VRS SYSTEM

ADDITIONAL FILE INFORMATION:
 Bathymetric survey UPSTREAM SOUNDINGS: Using a Remote controlled Z-boat; with a 200 KHz Transducer; DOWNSTREAM: RTK GPS Pole depth survey



PRELIMINARY DRAFT
NOT FOR CONSTRUCTION

					CLIENT BID CONSTRUCTION RECORD			Project Office: BARR ENGINEERING CO. 3033 ORCHARD VISTA DR SE SUITE 200 GRAND RAPIDS, MI 49546 Corporate Headquarters: Minneapolis, Minnesota Ph: 1-616-512-7000 Fax: (951) 832-2601 Ph: 1-800-632-2277 www.barr.com			Scale: AS SHOWN Date: --/-- Drawn: -- Checked: -- Designed: -- Approved: --		ANOKA, CITY OF ANOKA, MINNESOTA		RUM RIVER DAM ANOKA, MINNESOTA 2023 BATHYMETRIC SURVEY BASE MAP		BARR PROJECT No. 23/02-1211.00 CLIENT PROJECT No.		DWG. No. SRVY-1	REV. No. -
NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION			RELEASED TO/FOR	A	B	C	0	1	2	3					