

Full Authority
24 February 2023
Agenda Item: 15

Crowe Bridge Weir Assessment

Background

Crowe River Bridge Weir (dam) is located in Lot 19, Concession 11 of Seymour Township (which is now part of the Municipality of Trent Hills) on the Crowe River. Crowe River Bridge Weir is located within the Crowe Bridge Conservation Area, 120m downstream from the bridge on Crowe River Road, (approximately 14km south-west of the Town of Marmora). Vehicle access is through Crowe Bridge Park.

The weir is an overflow structure and does not require operation. It is the last weir in the Crowe Valley watershed before the Crowe River empties into the Trent River system.

The construction date of this concrete gravity dam is uncertain, likely pre-1970. It consists of a concrete overflow weir, which has a west portion (1.3m high, 24.2m long, connected to a concrete abutment at the extreme west end) and an east portion (1.1m high, 30.8m long, connected to a concrete abutment at the extreme east end). Therefore, the total length is 55m long. The crest elevation for the west portion of the weir is 163.48m, while it is 163.33m for the east portion of the weir. The dam is situated on bedrock.

The Crowe River drainage area at the dam is approximately 2005 square kms. It maintains water levels just downstream of the Crowe River Bridge for recreation purposes.

The CVCA had never completed a dam safety assessment on this structure since obtaining the Crowe Bridge Conservation Area (CBCA) property in the 1970's and there are no records indicating any previous formal engineering inspections of this structure.

Considering CBCA has been operated by the Municipality of Trent Hills for a number of years on behalf of the CVCA (within the parameters of a written agreement), there has been increased usage of CBCA due to the onset of the COVID pandemic and the age of the structure, the CVCA staff and Board believed it was prudent to launch the assessment. As well, Trent Hills was considering further investments of resources into the area and if the condition of the weir had deteriorated beyond any repairs, then the investment would be at risk.

Therefore, an assessment with combined funding from the Water and Erosion Control Infrastructure (WECI) program (through the Ministry of Natural Resources, Trent Hills and the CVCA). The assessment includes a site inspection/report, structural analysis, drawings, diving report and public safety measures plan.

Crowe River Bridge Weir was inspected on August 10, 2022 by William Grandy of Exp Services Incorporated. Divers from Lower Lakes Marine were also on site on that date for the underwater inspection.

Report Highlights

Inspection Report

A number of concrete deficiencies were noted during the inspection (14 in total) ranging from vertical and horizontal cracks, scaling and spalling. Most of these types of deficiencies are consistent with the age of the structure and the water flow conditions (volume, speed, debris).

An unusual U-shaped crack was noted at the 34.1m mark extending to 37.5m.

Divers did not observe any evidence of seepage at the base of the weir.

Overall, the dam's concrete is in fair to good condition considering where the dam is situated in its life cycle stage. The east portion of the weir is in better overall condition than the west portion, likely because the east portion is normally submerged at all times, while the west portion's crest and downstream face experience several wet-dry cycles throughout the year.

There are currently no safety booms installed at this dam.

Recommendations:

- Monitor all narrow/medium concrete cracks as noted in the report.
- Repair concrete spalling locations and U-shaped crack in west portion.

Construction Costs/Priority for Implementation of Recommendations

Minor Maintenance (less than \$100,000)				
Item	Quantity	Unit Price	Estimated Price	Priority Ranking*
Concrete Crack Repairs	13	\$3,000	\$39,000	4
TOTAL			\$39,000	

Major Maintenance (more than \$100,000)				
Item	Quantity	Unit Price	Estimated Price	Priority Ranking*
U-Crack and Spalling Repairs	1	\$110,000	\$110,000	3
TOTAL			\$110,000	

*Priority Ranking based upon the following:

Priority	Description
1	Urgent – Unexpected repair/rehabilitation, corrective action required immediately.
2	Now – Corrective action required within 1 year.
3	1-5 Years – Corrective action required within 1 to 5 years, monitor until corrected
4	6-10 Years – Corrective action required within 6 to 10 years, monitor until corrected.
5	None – Corrective action not anticipated in next 10 years, monitor defect and only take corrective action when required.

Structural Analysis Overview

- Assumptions – No rock anchors installed to connect the concrete structure to the bedrock
- The dam does not meet the minimum factor of safety based on Ontario Ministry of Natural Resources Technical Bulletin.
- However, in-situ condition indicates there are no signs of failure or slippage at the structure.
- Installation of rock anchors would eliminate any possibility of slippage and withstand winter and flooding loading conditions.

Hazard Potential Classification (HPC)

Low

Flood elevation

- Approximately .5m above the west portion crest elevation – using Low HPC and the Marmora Dam Safety Assessment

Public Safety Measures Plan (PSMP)

Prepared in order to meet the following objectives:

- Identify potential public safety hazards created by the dam.
- Determine the threat to public safety created by the hazards.
- Describe the required and existing hazard mitigation measures at the dam site.

Roles/Responsibilities

The Dam Owner (CVCA) must ensure that:

- Policy for public safety around dams is established and implemented.
- All personnel responsible for the management and operation of the structure are trained in the requirements of the PSMP and aware of their responsibilities, including both the identification of hazards and reporting of incidents (occupational and involving the public).
- Progress with the recommendations and standards of this Public Safety Measures Plan is made and monitored.

- Any change in site conditions is managed and addressed in subsequent versions of this PSMP.
- Every incident at the site is investigated to minimize the risk of recurrence.
- The PSMP review is conducted on schedule and findings are reported to the CVCA Board.

The Dam Operator (CVCA) must ensure that:

- All personnel responsible for the operation of the structure are trained in the requirements of the PSMP and aware of their responsibilities, including both the identification of hazards and reporting of incidents (occupational and those involving the public).
- Dam operation, inspection and maintenance are in accordance with the recommendations and standards of this Public Safety Measures Plan.
- Public education and communication protocols are adhered to and updated as required.
- Every incident at the site is investigated to minimize the risk of recurrence.

Planning/Execution of Maintenance/Inspection Activities

Each site visit to the dam must include an inspection of the following items:

- Signage
- Physical Security Barriers
- Concrete
- Trespassing (i.e. during site visit and/or evidence/indications of previous trespassing)
- Vandalism

Annual Reviews and Updates of the PSMP

The CVCA must update the PSMP report annually to record safety changes at the site. Changes could include installation of new safety boom, signs, handrails, etc.

Changes at the Site and/or Changes in the Degree of Public Interaction Potentially Impacting on Public Safety

If changes occur at/near the dam site that could potentially impact the degree of public exposure at/near the dam, such as the construction of a new campground or public park area, it should be noted in the PSMP.

Next Steps

The CVCA Board has now been informed of the condition of the dam and the safety concerns that have been raised in the Crowe Bridge Assessment. It is incumbent upon the CVCA to take the appropriate steps to rectify the issues brought forward and ensure safety precautions for the public and staff from the CVCA and Trent Hills is addressed in a timely manner.

1. Provide a summary for the Municipality of Trent Hills.
2. CVCA staff continue to engage and collaborate with Trent Hills to ensure the implementation of the mitigation measures.
3. The CVCA take the lead role seek funding opportunities through the WECI program to install the appropriate barriers, signage and safety boom as recommended in the PSMP as discussed with Trent Hills.
4. Submit WECI applications for projects based on discussions and possible support from Trent Hills in the next funding window in 2024.
5. Follow the maintenance schedule as provided to repair the weir.
6. Implement the PSMP in conjunction with Trent Hills.

Staff Recommendation

That the CVCA Board accept the report from EXP Services Inc. and approve the next steps as presented in this report.

Board Decision

TP