



## **Dam Inspection Report**

### **Pefferlaw Dam**

**Town of Georgina  
Regional Municipality of York**

**D.M. Wills Project Number 19-5381**



### **D.M. Wills Associates Limited**

Partners in Engineering  
Peterborough

**December 2019**

**Prepared for:  
Lake Simcoe Region  
Conservation Authority**

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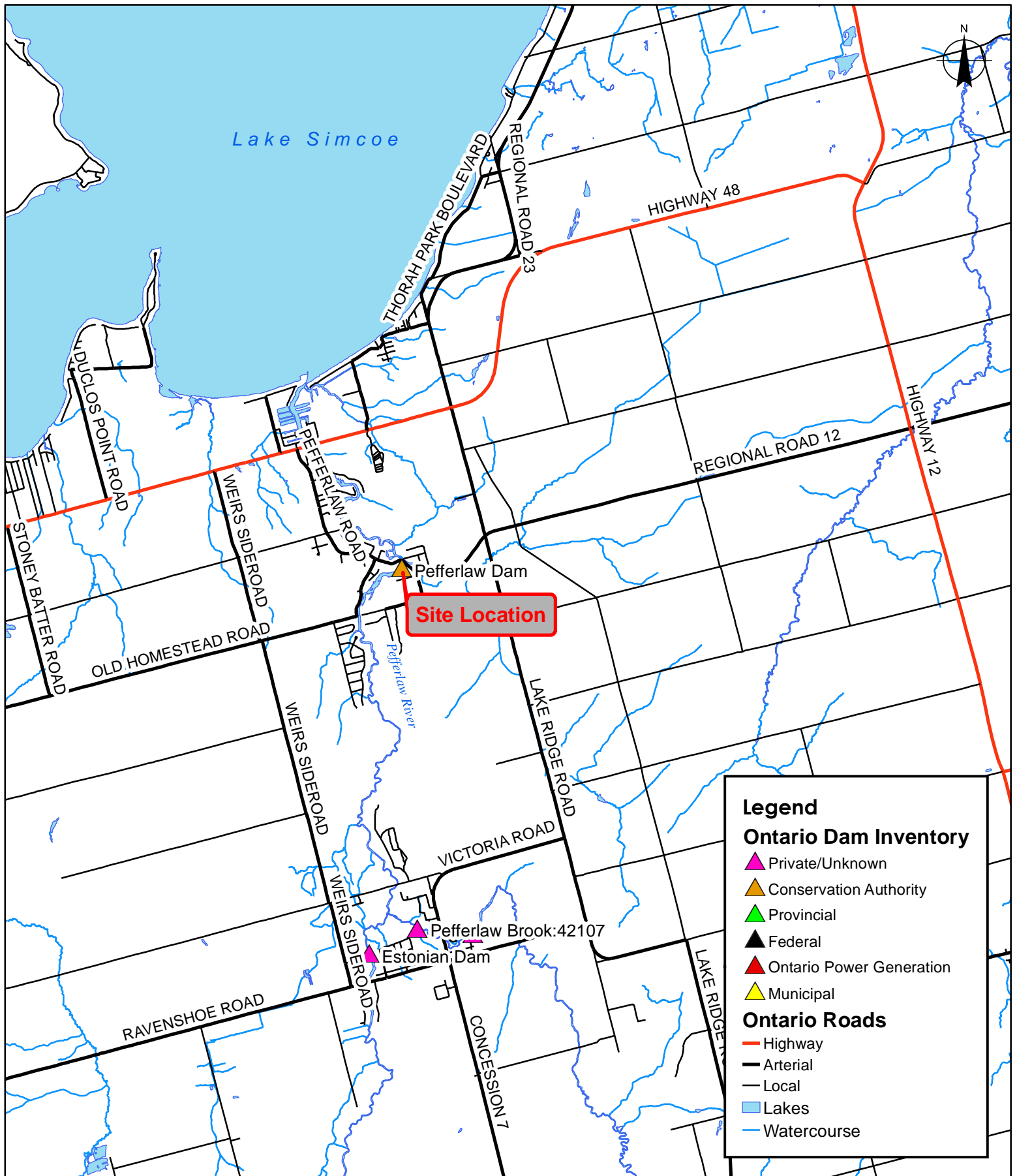
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- Appendix C - Field Notes and Sketches

## 1.0 Introduction

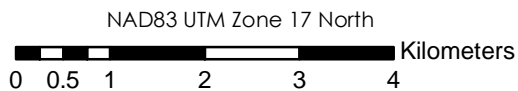
D.M. Wills Associates Limited (Wills) was retained by the Lake Simcoe Region Conservation Authority (LSRCA) to undertake an inspection of the Pefferlaw Dam. The purpose of this report is to document the methodology, observations and recommendations of the inspection. The recommendations are based on the field observations as well as a review of the available background material and discussions with LSRCA staff. Wills' inspection crew consisted of David Green, P.Eng. and Zach Staples, P.Eng..

The Pefferlaw Dam is located on the Main Branch of the Pefferlaw Brook approximately 200 m south of Pefferlaw Road in the village of Pefferlaw, Town of Georgina, Regional Municipality of York. The location plan is provided in **Figure 1**. The dam was constructed in the early 1880's in conjunction with another dam on the East Branch of Pefferlaw Brook. The original purpose of the dams was to provide water storage to power three mills located on the watercourse. Mill races were constructed on both the east and west sides of the Main Branch of the Pefferlaw Brook to channel water to the mills. The mills ceased operations some time ago and the dam's current function is as a flood and ice control structure. The downstream channel and the headpond also provide recreational uses and contribute to the general aesthetic of the area, as the former mill sites downstream of the dam have been redeveloped as a municipal park and a number of residences have been constructed adjacent to the headpond. Several residences have docks constructed on the headpond.

The dam consists of a 31 m long concrete gravity structure with a 20 m long earth embankment on the west side and a 30 m long earth embankment on the east side. The concrete gravity structure includes a 13 m long concrete weir topped with timber flash boards on the left (west) side of the structure, a 4.8 m wide sluiceway with timber stoplogs in the middle of the structure and a 7.2 m long overflow weir on the right (east) side of the structure. There are concrete aprons below the weirs and the centre sluiceway as well as concrete wingwalls on both the left (west) and right (east) sides. Access across the dam is provided by a 1.1 m wide steel truss bridge. The truss bridge is supported on stub concrete abutments located behind the dam wingwalls and by steel posts at the sluiceway piers. The dam is accessed from Pefferlaw Road, which is located approximately 200 m north (downstream) of the structure. Access by motorized vehicles is available via a gravel road on the west side of the Pefferlaw Brook. A gate at Pefferlaw Road restricts unauthorized vehicles from accessing the west side access road. There is a secondary gated access on the east side of the Pefferlaw Brook that could be used as an emergency or maintenance access to the east side of the dam.



**Figure 1: Location Plan**



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Drawn by: DG	Scale (Horz.) 1:80,000
Checked by: DG	
Engineer: DG	Map Date: 12/04/19
Project No. 19-5381	Map File No.: 20191204-5381

## 2.0 Inspection Methodology

Wills undertook the dam inspection with LSRCA staff on November 19, 2019. The dam inspection consisted of a visual inspection of the dam to provide information regarding any condition, operation or safety (dam safety, operator safety, public safety) issues. The dam inspection generally included the following aspects:

- Detailed visual structural inspection of the dam to assess existing conditions, confirm concrete strength and integrity, and to confirm concrete contact with other materials.
- Detailed visual inspection of any earth embankment components to assess existing conditions for seepage, piping, surface erosion, slumping, and cracking.
- Inspect and document the condition of the flow control equipment.
- Review public (safety boom, signage, fencing, railings, etc.) and operator (fall arrest, railings, etc.) safety measures.
- Confirm dam dimensions with the provided sketches / drawings and prepare sketches showing the locations and types of surface defects such that they can be cross-referenced with photographs.
- Georeferenced digital photographs of the major dam components as well as close-ups of identified deficiencies will be captured.
- Aerial imagery and video of the dam and up and downstream areas collected using a Remotely Piloted Aircraft System.
- Underwater video of specific sections of the dam collected using a GoPro camera equipped with an LED lighting system.

During the dam inspection, the head pond was drawn down to its winter water level with one (1) stoplog installed in the sluiceway. There was significant flow through the sluiceway during the inspection, limiting the inspection of the sluiceway and sluiceway apron. Snow was present on the earth embankment and concrete structures during the inspection. Wills' staff cleared snow from the concrete structures to the best of their ability prior to commencing the inspection.

### 3.0 Inspection Results and Recommendations

The dam inspection results are documented in the photographic record in **Appendix A** and the Dam Inspection Form B2 in **Appendix B**. Field sketches and notes are provided in **Appendix C**. Digital copies of all photographs and videos from the inspection will be provided to the LSRCA either by USB or other form of digital file transfer.

The inspection recommendations along with prioritization and cost estimates for each recommendation are provided in **Table 1**. The degree of accuracy for the cost estimates is approximately +/-25% and are based the best information available at the time of report production. The priorities are classified as "Immediate", "High", "Medium" and "Low" and are defined as follows:

- **Immediate** – Remedial action that needs to be carried out as soon as possible because the deficiency is an immediate high risk dam safety hazard with a high likelihood of occurrence of loss of life and /or serious environment and/or serious economic consequences.
- **High** – Remedial action is required within the next 2 years to meet current regulations and/or dam safety requirements and is a high risk dam safety hazard.
- **Medium** – These items may include additional work that could improve the performance or issues that may become serious dam deficiencies. These items typically should be addressed within 5 years.
- **Low** – These are opportunities to improve safety or only in the long term may become a serious dam safety deficiency. The recommendation can be carried out at LSRCA's convenience or the recommended remedial action is expected to be required only at least 6 years from now.

The recommendations are prioritized based on the following:

- Risk of occurrence.
- Significance of potential negative impacts.
- Resources (cost, time, effort) required to implement.

**Table 1 – Dam Inspection Recommendations**

Recommendation	Description of Deficiency	Priority	Estimated Cost	Additional Comments
1. Remove the trees from the earth embankment and from adjacent to concrete or masonry structures and remediate the voids left by the root systems.	There are a significant number of large trees located on the earth embankment sections.	Medium	\$15,000	The cost estimate assumes that a contractor would be hired to remove the trees, remediate the root systems and restore the earth embankment. Cost savings may be realized if the LSRCA is able to complete this work using internal resources.
2. Undertake a concrete condition assessment for the dam, including concrete coring and detailed surface mapping, and based on the results of the concrete condition assessment prepare a detailed rehabilitation design for the concrete components of the structure.	The condition of the concrete is poor in a number of locations.	High	\$40,000*	The cost estimate provided is the cost of the concrete condition assessment and detailed rehabilitation design. The cost of completing the concrete rehabilitation could be in the range of \$100,000 to \$150,000, to be confirmed as part of the detailed rehabilitation design project.  This work should be completed by a professional consulting engineer.
3. Undertake a structural evaluation of the truss bridge within one (1) year and develop a detailed repair or replacement design for the truss bridge and dam deck. Depending on the results of the structural evaluation, temporary repairs, the removal of the stoplogs stored on the deck or temporary suspension of dam operations may be required.	The steel truss is in poor condition with failure of the coating and cracking and bowing of the structural steel members.	Immediate	\$5,000*	The cost estimate provided is the cost for the structural evaluation only. The cost for the detailed design for the repair or replacement will depend on the results of the structural evaluation and on the structure type but would likely be in the range of \$30,000 to \$60,000.  This work should be completed by a professional consulting engineer.  As an alternate to undertaking Recommendation 3, the LSRCA could stop operating the dam, remove the stoplogs stored on the dam and eliminate public access across the dam. However, this is only seen as a short term solution and a permanent solution, such as repair, replacement or dam decommissioning will ultimately be required in order to ensure public and operator safety.
4. Repair the chain link fence along the west property line.	The chain link fence is broken.	Low	\$5,000	The cost estimate assumes that the LSRCA would retain a contractor to complete this work. Cost savings may be realized if the LSRCA is able to complete this work using internal resources.

Recommendation	Description of Deficiency	Priority	Estimated Cost	Additional Comments
5. Replace the flashboards and flashboard posts, as planned. Note: Future replacement of the stoplogs may be required.	The flashboards and flashboard posts are in poor condition and the LSRCA is already planning to replace them. The stoplogs may require replacement in 2 to 5 years.	High	\$8,000	The cost estimate assumes that the LSRCA will outsource the fabrication of the flashboard posts and will fabricate the flashboards using internal resources.
6. Repair the erosion on the upstream left (west) and right (east) sides of the earth embankment.	There is erosion at the normal operating water level.	Medium	\$25,000	The cost estimate assumes that the LSRCA will retain a contractor to complete grading and rip-rap placement along the shoreline.
7. Repair the erosion behind the downstream left (west) and right (east) armour stone retaining walls.	There is erosion behind the armour stone retaining walls.	High	\$25,000	The scope of the erosion repair is difficult to determine due to the presence of snow on the ground during the dam inspection. The cost estimate assumes that the LSRCA will retain a contractor to complete the work.
8. Complete a Public Safety Risk Assessment and based on the results of the assessment prepare a Public Safety Plan and implement the recommended additional public safety measures. Additional public safety measures that could be identified during the Public Safety Risk Assessment and may need to be considered as part of the Public Safety Plan include: signage on the pedestrian approaches to the dam and at the entrance to the park, a public safety boom in the head pond and additional railings/fencing around the stoplog storage area on the deck.	There is no existing Public Safety Risk Assessment or Public Safety Plan for the site and there is significant public interaction with the dam. The existing public safety measures may not be sufficient to reduce the risk to public safety.	Medium	\$15,000*	<p>The cost estimate provided is for the completion of the Public Safety Risk Assessment and Public Safety Plan. This work is typically completed by a professional consulting engineer; however, it could be completed by LSRCA staff if they have appropriate training and experience in Public Safety Risk Assessments for dams.</p> <p>Depending on the results of the study, the cost of additional public safety measures could range from \$2,500 for additional signage to \$75,000 for a public safety boom.</p> <p>As an alternate to undertaking Recommendation 8, the LSRCA could go ahead and implement additional public safety measures; however, there would be limited justification for which measures to put in which locations and limited information as to whether or not they would have the intended effect of reducing the risk to public safety.</p>



Recommendation	Description of Deficiency	Priority	Estimated Cost	Additional Comments
<p>9. Confirm, through the structural evaluation of the truss bridge, that the truss/railing has sufficient capacity to act as a fall arrest anchor point for use by operators during stoplog operations. If the anchor point does not have sufficient capacity, implement additional operator fall protection measures.</p>	<p>There is engineered fall arrest anchor point for the stoplog sluiceway and the fall from the top of the deck to the concrete surface below is greater than 3.0 m.</p>	<p>Immediate</p>	<p>\$5,000</p>	<p>This cost estimate assumes that the evaluation of the anchor point will be incorporated into the structural evaluation of the steel truss bridge. The cost would be more if this work is completed on its own.</p> <p>This work should be completed by a professional consulting engineer.</p> <p>As an alternate to undertaking Recommendation 9, the LSRCA could stop operating the dam. However, this is seen as only a temporary solution. Ultimately an engineered anchor point or fall arrest system will be required if the dam is to continue operation.</p>
<p>10. Complete a new Dam Safety Review that incorporates a new hydrology and dam breach study, concrete gravity dam stability assessment and earth embankment stability assessment. The dam safety review should be completed in accordance with the Lakes and Rivers Improvement Act Technical Bulletins and Best Management Practices (MNR, 2011).</p>	<p>The latest Dam Safety Review was completed over 10 years ago using outdated MNR dam safety guidelines and does not include a detailed dam breach analysis. Additionally, the previous Dam Safety Review indicated that the dam was not stable under some loading conditions.</p>	<p>High</p>	<p>\$90,000*</p>	<p>This work should be completed by a professional consulting engineer.</p> <p>As an alternate to undertaking Recommendation 10, the LSRCA could complete a Hazard Potential Classification (HPC) and Inflow Design Flood (IDF) Review instead of a full Dam Safety Review. The results of the HPC and IDF Review would assist the LSRCA in determining if a full Dam Safety Review is required. For example, if the dam is confirmed to be Low hazard then updating the stability assessment may not be required. The cost for an HPC and IDF Review would be in the range of \$50,000.</p>

\* Estimated cost is based on recent quotations and may have a higher level of accuracy.

## 4.0 Closing

Thank you for the opportunity to provide engineering services to the LSRCA for the inspection of the Pefferlaw Dam. Wills would be pleased to further discuss the recommendations provided in **Table 1** and assist the LSRCA with developing a plan to address the noted deficiencies.

Respectfully Submitted,



David Green, P.Eng.  
Assistant Manager,  
Water Resources Engineering

# **Appendix A**

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## **Photographic Record**



Photo 0921 - Nov. 19, 2019  
Pefferlaw Dam

Pefferlaw Dam, Downstream Elevation



Photo 0925 - Nov. 19, 2019  
Pefferlaw Dam

Channel and Bridge Downstream of Dam



Photo 0927 - Nov. 19, 2019  
Pefferlaw Dam

Downstream Area



Photo 0934 - Nov. 19, 2019  
Pefferlaw Dam

General Plan View of Dam



Photo 0935 - Nov. 19, 2019  
Pefferlaw Dam

Upstream Area / Head Pond



Photo 0939 - Nov. 19, 2019  
Pefferlaw Dam

Pefferlaw Dam, Upstream Elevation



Photo 0922 - Nov. 19, 2019  
Pefferlaw Dam

Public Safety Sign, Downstream Side of Dam



Photo 0923 - Nov. 19, 2019  
Pefferlaw Dam

Public Safety Sign, Downstream Side of Dam



Photo 0940 - Nov. 19, 2019  
Pefferlaw Dam

Public Safety Sign, Upstream Side of Dam



Photo 0942 - Nov. 19, 2019  
Pefferlaw Dam

Pier 1 (West Pier) Upstream and Right Face



Photo 0943 - Nov. 19, 2019  
Pefferlaw Dam

Pier 2 (East Pier) Upstream and Left Face



Photo 0947 - Nov. 19, 2019  
Pefferlaw Dam

Retaining Wall Along Head Pond Shoreline



Photo 0948 - Nov. 19, 2019  
Pefferlaw Dam  
Head Pond



Photo 0961 - Nov. 19, 2019  
Pefferlaw Dam  
Sluiceway and Operating Deck from Above



Photo 0964 - Nov. 19, 2019  
Pefferlaw Dam  
Remnants of Fish Ladder



Photo 0965 - Nov. 19, 2019  
Pefferlaw Dam  
Left (West) Dam Abutment



Photo 0966 - Nov. 19, 2019  
Pefferlaw Dam  
Left (West) Dam Abutment



Photo 0967 - Nov. 19, 2019  
Pefferlaw Dam  
Left (West) Dam Abutment



Photo 0968 - Nov. 19, 2019  
Pefferlaw Dam

Left (West) Apron and Weir



Photo 0969 - Nov. 19, 2019  
Pefferlaw Dam

Pier 1 (West Pier) Downstream and Left Sides



Photo 0972 - Nov. 19, 2019  
Pefferlaw Dam

Sluiceway Elevation



Photo 0973 - Nov. 19, 2019  
Pefferlaw Dam

Right (East) Weir, Apron and Dam Abutment



Photo 2607 - Sept 19, 2019  
Pefferlaw Dam

West Entrance and Gate



Photo 2608 - Sept 19, 2019  
Pefferlaw Dam

Sign Near West Entrance



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2612 - Sept 19, 2019  
Pefferlaw Dam

Looking Upstream from Pefferlaw Road Towards Dam



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2614 - Sept 19, 2019  
Pefferlaw Dam

Downstream of Pefferlaw Road



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2629 - Sept 19, 2019  
Pefferlaw Dam

East Access and Gate



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2631 - Sept 19, 2019  
Pefferlaw Dam

Sign near East Access



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2632 - Sept 19, 2019  
Pefferlaw Dam

Garbage Receptacle Near East Access



2019.11.19



Lake Simcoe Region  
Conservation Authority

Photo 2633 - Sept 19, 2019  
Pefferlaw Dam

Commemorative Plaque Near East Gate





2019.11.19



Photo 2637 - Sept 19, 2019  
Pefferlaw Dam

Park on East Side of Pefferlaw Brook



2019.11.19



Photo 2638 - Sept 19, 2019  
Pefferlaw Dam

Pefferlaw Road Bridge



2019.11.19



Photo 2645 - Sept 19, 2019  
Pefferlaw Dam

Park Structure



2019.11.19



Photo 2648 - Sept 19, 2019  
Pefferlaw Dam

Masonry Wall from Former Mill Structure



2019.11.19



Photo 2655 - Sept 19, 2019  
Pefferlaw Dam

Masonry Wall from Former Mill Structure



2019.11.19



Photo 2657 - Sept 19, 2019  
Pefferlaw Dam

Masonry Wall from Former Mill Structure



Photo 2658 - Sept 19, 2019  
Pefferlaw Dam

Masonry Wall of Former Mill Structure



Photo 2659 - Sept 19, 2019  
Pefferlaw Dam

Culvert Inlet/Outlet East of Dam



Photo 2660 - Sept 19, 2019  
Pefferlaw Dam

Expected Site of Former Mill Intake, East of Dam



Photo 2665 - Sept 19, 2019  
Pefferlaw Dam

Upstream Right Earth Embankment



Photo 2666 - Sept 19, 2019  
Pefferlaw Dam

Upstream Right Earth Embankment



Photo 2667 - Sept 19, 2019  
Pefferlaw Dam

Upstream Right Earth Embankment



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2670 - Sept 19, 2019  
Pefferlaw Dam  
Upstream Right Earth Embankment



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2671 - Sept 19, 2019  
Pefferlaw Dam  
Upstream Right Earth Embankment



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2674 - Sept 19, 2019  
Pefferlaw Dam  
Upstream Right Earth Embankment



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2676 - Sept 19, 2019  
Pefferlaw Dam  
Right Earth Embankment Crest



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2677 - Sept 19, 2019  
Pefferlaw Dam  
Right Earth Embankment Crest



WILLS WILSON CONSULTANTS  
Lake Simcoe Region Conservation Authority  
Photo 2682 - Sept 19, 2019  
Pefferlaw Dam  
Monitoring Well on East Side of Park



2019 11 19



Photo 2686 - Sept 19, 2019  
Pefferlaw Dam  
West Access Road



2019 11 19



Photo 2687 - Sept 19, 2019  
Pefferlaw Dam  
West Access Road Gravel Surface



2019 11 19



Photo 2693 - Sept 19, 2019  
Pefferlaw Dam  
Fencing on West Side of Park



2019 11 19



Photo 2694 - Sept 19, 2019  
Pefferlaw Dam  
Fencing on West Side of Park



2019 11 19



Photo 2701 - Sept 19, 2019  
Pefferlaw Dam  
Large Tree on Crest of Left (West) Earth Embankment



2019 11 19



Photo 2702 - Sept 19, 2019  
Pefferlaw Dam  
Large Tree on Right (East) Earth Embankment



Photo 2703 - Sept 19, 2019  
Pefferlaw Dam

Downstream Left (West) Earth Embankment



Photo 2704 - Sept 19, 2019  
Pefferlaw Dam

Downstream Left (West) Earth Embankment



Photo 2705 - Sept 19, 2019  
Pefferlaw Dam

Downstream Left (West) Armour Stone Retaining Wall



Photo 2709 - Sept 19, 2019  
Pefferlaw Dam

Gate from Private Property to Park, Left (West) Side



Photo 2712 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Earth Embankment



Photo 2713 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Earth Embankment



Photo 2715 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Earth Embankment



Photo 2717 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Earth Embankment



Photo 2720 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Retaining Wall



Photo 2723 - Sept 19, 2019  
Pefferlaw Dam

Upstream Left (West) Retaining Wall



Photo 2724 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2725 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2726 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2727 - Sept 19, 2019  
Pefferlaw Dam

Flashboard Gate, Left (West) Side of Left (West) Weir



Photo 2728 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Bridge Abutment and Anchor, Downstream Side



Photo 2730 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Bridge Abutment and Anchor, Upstream Side



Photo 2731 - Sept 19, 2019  
Pefferlaw Dam

Underside of Truss Bridge



Photo 2733 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Weir Crest at Left (West) Dam Abutment



Photo 2734 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Weir Crest



Photo 2735 - Sept 19, 2019  
Pefferlaw Dam

Flashboard Post Hole (Typical)



Photo 2738 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Weir and Left Side of Pier 1 (West Pier)



Photo 2739 - Sept 19, 2019  
Pefferlaw Dam

Left Side of Pier 1 (West Pier)



Photo 2742 - Sept 19, 2019  
Pefferlaw Dam

Top of Pier 1 (West Pier)



Photo 2743 - Sept 19, 2019  
Pefferlaw Dam

Top of Pier 1 (West Pier) and Truss Support





Photo 2744 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Side of Pier 2 (East Pier)



Photo 2747 - Sept 19, 2019  
Pefferlaw Dam

Downstream Side of Pier 1 (West Pier)



Photo 2751 - Sept 19, 2019  
Pefferlaw Dam

Stoplog Sluiceway



Photo 2752 - Sept 19, 2019  
Pefferlaw Dam

Stoplog Sluiceway Apron



Photo 2759 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Weir and Left (West) Apron



Photo 2760 - Sept 19, 2019  
Pefferlaw Dam

Gap Between Left (West) Weir and Left (West) Apron



Photo 2762 - Sept 19, 2019  
Pefferlaw Dam

Crack in Left (West) Apron at Downstream End



Photo 2763 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2764 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2765 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2766 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment



Photo 2767 - Sept 19, 2019  
Pefferlaw Dam

Left (West) Dam Abutment





  Photo 2769 - Sept 19, 2019  
Pefferlaw Dam  
Downstream of Left (West) Apron





  Photo 2771 - Sept 19, 2019  
Pefferlaw Dam  
Void Below Armour Stone Wall, Left (West) Side





  Photo 2773 - Sept 19, 2019  
Pefferlaw Dam  
Left (West) Side of Dam





  Photo 2777 - Sept 19, 2019  
Pefferlaw Dam  
Fencing on Left (West) Retaining Wall



  Photo 2778 - Sept 19, 2019  
Pefferlaw Dam  
Entrance to Left (West) Side of Truss Bridge



  Photo 2779 - Sept 19, 2019  
Pefferlaw Dam  
Locked Gate on Upstream, Left (West) Side of Truss Bridge



Lake Simcoe Region  
Conservation Authority

Photo 2780 - Sept 19, 2019  
Pefferlaw Dam

Locked Gate on Downstream, Left (West) Side of Truss Bridge



Lake Simcoe Region  
Conservation Authority

Photo 2781 - Sept 19, 2019  
Pefferlaw Dam

Fall Arrest Cable Connection, Left (West) Side



Lake Simcoe Region  
Conservation Authority

Photo 2782 - Sept 19, 2019  
Pefferlaw Dam

Fall Arrest Cable



Lake Simcoe Region  
Conservation Authority

Photo 2783 - Sept 19, 2019  
Pefferlaw Dam

Typical Deck Grating and Railing



Lake Simcoe Region  
Conservation Authority

Photo 2786 - Sept 19, 2019  
Pefferlaw Dam

Fall Arrest Cable Mid Support



Lake Simcoe Region  
Conservation Authority

Photo 2787 - Sept 19, 2019  
Pefferlaw Dam

Fall Arrest Cable Mid Support Connection



Photo 2790 - Sept 19, 2019  
Pefferlaw Dam

Remnants of Fish Ladder Bracket



Photo 2792 - Sept 19, 2019  
Pefferlaw Dam

Top of Upstream Side of Pier 1 (West Pier)



Photo 2793 - Sept 19, 2019  
Pefferlaw Dam

Top of Downstream Side of Pier 1 (West Pier)



Photo 2794 - Sept 19, 2019  
Pefferlaw Dam

Operating Deck and Stoplog Storage Above Sluiceway



Photo 2795 - Sept 19, 2019  
Pefferlaw Dam

Winch Mounting Bar Bracket, Downstream Left



Photo 2796 - Sept 19, 2019  
Pefferlaw Dam

Winch Mounting Bar Bracket, Upstream Left



Photo 2797 - Sept 19, 2019  
Pefferlaw Dam

Stoplogs Chained to Truss Bridge



Photo 2798 - Sept 19, 2019  
Pefferlaw Dam

Stoplog Condition



Photo 2799 - Sept 19, 2019  
Pefferlaw Dam

Stoplog Condition



Photo 2801 - Sept 19, 2019  
Pefferlaw Dam

Stoplog Gain Cover Lock



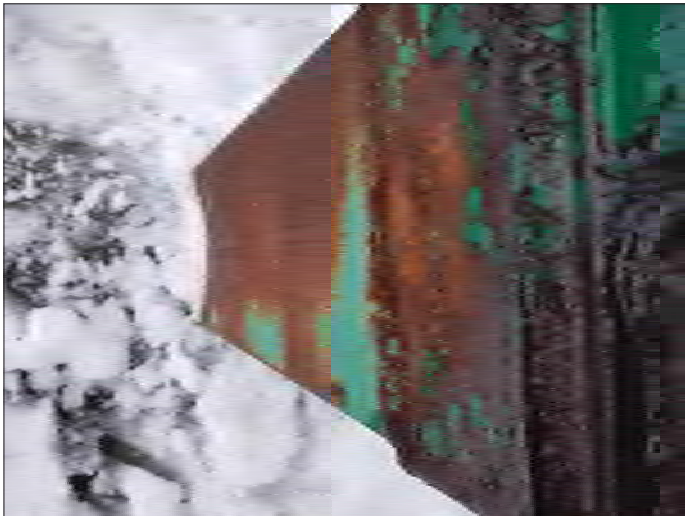
Photo 2803 - Sept 19, 2019  
Pefferlaw Dam

Winch Mounting Bar Bracket, Downstream Right Side



Photo 2804 - Sept 19, 2019  
Pefferlaw Dam

Winch Mounting Bar Bracket, Upstream Right Side



Lake Simcoe Region  
Conservation Authority

Photo 3916 - Sept 19, 2019  
Pefferlaw Dam

Support Post for Truss Bridge, Typical Upstream Side



Lake Simcoe Region  
Conservation Authority

Photo 3916 - Sept 19, 2019  
Pefferlaw Dam

Cracks in Vertical HSS Sections of the Truss Bridge



Lake Simcoe Region  
Conservation Authority

Photo 2812 - Sept 19, 2019  
Pefferlaw Dam

Gate Access on Right (East) Dam Abutment



Lake Simcoe Region  
Conservation Authority

Photo 2814 - Sept 19, 2019  
Pefferlaw Dam

Access to Right (East) Side of Truss Bridge



Lake Simcoe Region  
Conservation Authority

Photo 2817 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Bridge Abutment



Lake Simcoe Region  
Conservation Authority

Photo 2818 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Bridge Abutment and Retaining Wall



  Photo 2819 - Sept 19, 2019  
Pefferlaw Dam  
Upstream Right (East) Retaining Wall and Dam Abutment



  Photo 2820 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Weir Crest





  Photo 2821 - Sept 19, 2019  
Pefferlaw Dam  
Pier 2 (East Pier) Right (East) Side



  Photo 2823 - Sept 19, 2019  
Pefferlaw Dam  
Stoplog Gain Cover and Opening from Below





  Photo 2824 - Sept 19, 2019  
Pefferlaw Dam  
Top of Pier 2 (East Pier), Downstream Side



  Photo 2828 - Sept 19, 2019  
Pefferlaw Dam  
Chain Link Fencing on Right (East) Embankment





Photo 2829 - Sept 19, 2019  
Pefferlaw Dam

Downstream Side of Dam from Right (East) Side



Photo 2832 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Apron



Photo 2851 - Sept 19, 2019  
Pefferlaw Dam

Undercutting in Right (East) Apron



Photo 2833 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Apron



Photo 2834 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Dam Abutment



Photo 2835 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2836 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2838 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2839 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2840 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2841 - Sept 19, 2019  
Pefferlaw Dam  
Right (East) Dam Abutment



WILLS WATERSHED  
Lake Simcoe Region Conservation Authority  
Photo 2842 - Sept 19, 2019  
Pefferlaw Dam  
Downstream Side of Right (East) Weir



Photo 2843 - Sept 19, 2019  
Pefferlaw Dam

Downstream Side of Right (East) Weir



Photo 2844 - Sept 19, 2019  
Pefferlaw Dam

Downstream Side of Right (East) Weir



Photo 2845 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Apron



Photo 2846 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Apron



Photo 2847 - Sept 19, 2019  
Pefferlaw Dam

Sluiceway and Right Side of Pier 1 (West Pier)



Photo 2850 - Sept 19, 2019  
Pefferlaw Dam

Downstream Side of Pier 2 (East Pier)



Photo 2854 - Sept 19, 2019  
Pefferlaw Dam

Right (East) Armour Stone Retaining Wall



Photo 2856 - Sept 19, 2019  
Pefferlaw Dam

Typical Flashboard Post



Photo 2857 - Sept 19, 2019  
Pefferlaw Dam

Typical Flashboard



Photo 2858 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch Mounting Bar



Photo 2859 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch



Photo 2860 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch



Photo 2864 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch Name Plate



Photo 2865 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch



Photo 2866 - Sept 19, 2019  
Pefferlaw Dam

Typical Winch J-Shaped Mounting Plate/Bracket

## **Appendix B**

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**Dam Inspection Form B2**



<b>Date:</b>	November 19, 2019
<b>Name of Dam:</b>	Pefferlaw Dam
<b>Municipality:</b>	Town of Georgina, Regional Municipality of York
<b>Location:</b>	Pefferlaw, Ontario
<b>GPS Coordinates:</b>	643765 m E, 4908276 m N, UTM Zone 17T
<b>Inspected By:</b>	David Green, P.Eng., Zach Staples, P.Eng.
<b>Weather:</b>	1°C, overcast with snow on ground and dam structure

**1 – Earth Embankment**

The inspection of the earth embankment sections of the dam was limited due to the presence of snow on the ground. Snow was removed in a number of areas and the grassed surface of the embankment was verified. The embankment surface appears to be well vegetated (established grass) and sink holes, rodent holes and settlement were not noted but would have been covered by snow during the inspection.

As further described in Section 9, erosion was noted on the upstream left and right embankments at the normal summer water level and there was erosion noted behind the left and right downstream armour stone retaining walls.

There are a number of large trees growing on the embankment and immediately adjacent to the concrete structures. The root systems from these trees have the potential to cause damage to the concrete sections of the dam and encourage piping through the earth sections of the dam. Additionally, if one of the large trees were to fall and pull up the root ball, the ability of the earth embankment to retain the head pond may be compromised.

There is a portion of the right (east) embankment that is retained by the stone foundation wall of the former mill. The stone wall generally appears to be in fair condition.

**2 – Concrete Structures** (wingwalls, piers, deck, spillways, apron, etc.)

Note: The majority of the concrete structures were covered in snow upon arrival of the dam inspection crew. Wills' staff cleared off as much snow as possible to facilitate the inspection of the concrete sections of the dam; however the inspection was limited in some areas.

**Upstream Left (West) Retaining Wall** – The upstream left (west) retaining wall is generally in good condition. There is medium scaling above the high water mater, revealing the large round aggregate used in the concrete.

**Left (West) Dam Abutment** – The left (west) dam abutment is generally in fair to poor condition. There is a large spall measuring approximately 500 mm by 400 mm by 200 mm deep at the interface of the upstream face of the left (west) weir and the left



(west) abutment. There are a number of smaller spalls near the base of the wall at the winter water level. There is some delaminated concrete near the flashboard gain.

There is a wide crack at a construction joint that extends across the height of the wall extending from the interface with the left (west) weir to the top of the wall. There are two large spalls above the downstream crest of the weir along the wide crack measuring approximately 400 mm by 600 mm (exposed and corroded steel reinforcing, large round aggregate) and 450 mm by 700 mm. There is another spall at the base of the abutment (where it meets the apron) that measures approximately 600 mm by 200 mm.

**Left (West) Bridge Abutment** – The left (west) bridge abutment is generally in good condition. There is a spall around the bearing seat for the truss bridge (upstream side), exposing the bearing anchor and reducing the bearing area of the truss support.

**Upstream Right (East) Retaining Wall** – Limited inspection, snow and vegetation prevented clear access. The upstream right (east) retaining wall generally appears to be in good condition.

**Right (East) Dam Abutment** – The right (east) abutment is in poor to very poor condition. There is evidence of patch repairs at this wall area. The majority of the wall surface is delaminated and there are several large spalls. There is some map cracking with efflorescence at the far downstream end of the wall, with a 300 mm by 1000 mm by 300 mm deep void. There is a masonry wall perched on the downstream edge of the right (east) abutment that is in very poor condition.

**Right (East) Bridge Abutment** – The right (east) bridge abutment is generally in fair to good condition. There is medium scaling along the face of the abutment, and there is a wide crack in the precast concrete block that is supporting the cast in place abutment.

**Left (West) Weir** – Inspection of the left (west) weir was limited as it was partially snow covered during the inspection. There is a large gap (25 mm) at the construction joint where the flat section of the weir crest meets the sloping section of the weir crest. There is also a wide crack located approximately 200 mm downstream of the construction joint. There is a 600 mm wide strip along the sloping section of the weir that is delaminated in the area that was exposed by Wills' snow removal. The flat section of the weir crest contains a number of square holes for the installation of the flashboard posts. There appears to be a construction joint approximately 60 mm below the downstream weir crest on the downstream face of the weir. The downstream face of the weir is in good condition, however, there is a 30 mm gap at the interface of the weir and the apron. Video from the underwater inspection did not identify any undercutting of the upstream side of the weir.

**Left (West) Apron** – The left (west) apron was cleared of snow to facilitate the inspection. The entire surface of the apron is severely eroded on the face (100%). There is a wide crack at the downstream left side of the apron. The cracked area is





approximately 1600 mm by 2300 mm. The downstream edge of the apron is approximately 800 mm high. Video from the underwater inspection identified the possibility of some cracks with efflorescence and some minor spalls. There was also one location that appeared to show some minor undercutting of the apron.

**Right (East) Weir** – The upstream face of the weir is generally in good condition with some bug holes. The weir crest is in good condition. The downstream face of the weir is in fair to good condition with honeycombing noted near the interface with the abutment (1.2 m<sup>2</sup>).

**Right (East) Apron** – There are some medium width cracks along the apron surface. The apron is undermined by approximately 1500 mm and it would appear as though the end of the apron has spalled off. Video from the underwater inspection appears to indicate that the undermining is restricted to the right side of the apron and does not extend to the sluiceway. The top of the apron is approximately 700 mm off the river bottom.

**Pier 1 (West Pier)** – The downstream face and top surface of the pier is in good condition. The upstream, west and east faces are also in good condition with some map cracking, cracks with efflorescence and pitting above the high water mark. Video of the underwater inspection did not indicate any undermining of the pier or significant concrete deterioration below the winter water level.

**Pier 2 (East Pier)** – The downstream face of the pier is in good condition with some cracking. The top surface of the pier was partially snow covered for the inspection but appears to be in good condition. The upstream, west and east faces are also in good condition with some scaling at the water line and minor map cracking with efflorescence above the high water mark. Video of the underwater inspection did not indicate any undermining of the pier or significant concrete deterioration below the winter water level.

**Sluiceway and Apron** – Due to the presence of fast flowing water, snow and ice, the sluiceway and the apron downstream of the sluiceway could not be fully inspected. Video from the underwater inspection indicated that there may be severe erosion of the concrete surface in this area (similar to the left (west) apron surface).

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### **3 – Wooden and Metal Structures** (decks, gains, railings, conduits, etc.)

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**Truss Bridge** – The east and west pedestrian spans are in fair condition, with coating failure and minor corrosion throughout.

The operation span is in poor condition. The northwest, southwest, and southeast truss end posts have deformed/bowing out with wide cracking a corner of the square HSS. The edges of the cracks are corroded.

The south face of the square HSS support of the operation span at the southwest support is deformed. This appears to have been in this condition for some time.

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**Deck Grating** – The galvanized steel deck grating is supported by and secured to the truss bridge. The grating is in fair condition with some surface rust and damaged sections. A deck panel on the operation span has broken welds.

**Pier Nosings** – The pier nosings appear to be galvanized steel are generally in fair to good condition with minor corrosion and section loss (<10%) below the high water mark.

**Gain Liners** – The gain liners are in fair condition with failure of the coating, surface rusting and minor section loss below the high water mark.

**Fall Arrest System** – The fall arrest support posts appear to be galvanized steel, are mounted to the truss bridge and appear to be in good condition. The steel cable is secured at both ends and in the middle and appears to be in good condition. All connections for the cable appear to be secure.

**Railings** – The deck railings are formed as part of the truss bridge. Welded wire mesh has been added to the inside of the truss to cover the gaps between the truss sections. The railing on the dam deck is approximately 1700 mm high. The welded wire mesh is in good condition, however, as described above, the truss bridge is in poor condition.

**Chain Link Fence** – The chain link fencing on the dam wingwalls is in good condition and measures approximately 1220 mm high. The chain link fence between the park and the private property to the west is damaged (bent upper rail and disjointed connection at the end post).

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#### **4 – Gates and/or Stop Logs** (identified looking downstream left to right)

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**Stoplogs** – The dam is supplied with six (6) 11 in high by 8 in wide wooden stoplogs. Five (5) stoplogs are used for operation and one (1) spare remains on the deck. Five (5) stoplogs were stored on the deck at the time of the inspection (winter drawdown) and were chained and locked to the railing. Each stoplog end has a steel mounting bracket this is used to lift the logs. The steel mounting brackets show signs of surface rust and section loss while the wooden stoplogs show signs of deterioration. The stoplog gain cover is level with the remainder of the dam deck and is locked. The frame and grating show signs of surface rust but generally appear to be in fair condition.

**Flashboards** – One (1) typical flashboard post and one (1) typical flashboard was on site for the inspection. Both showed signs of deterioration due to their age. LSRCA staff indicated that they are being replaced for the next operating season.

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#### **5 – Water Level Gauge** (reading and condition)

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There is no water level or flow gauge located at the Pefferlaw Dam site. Operators use the flow data from the “Pefferlaw Brook Near Udora” (02EC018) Water Survey of Canada stream gauge to anticipate the need for operations at the dam.

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**6 – Winches** (type and number)

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The dam is equipped with two (2) Jeamar heavy duty hand winches. The winches are stored off site at the operator's workshop in East Gwillimbury (1 hour from site). Only one (1) of the two (2) winches was on site at the time of the dam inspection. The name plate on the winch provided was scratched and difficult to read; however, the operator indicated that the capacity of the winches is 2100 lbs.

The winch provided exhibited signs of damage/repair, surface rust and paint chipping; however the operator indicated that the winches were generally in good working order and that they are greased at the end of each year.

The winches are installed onto the dam for log operations and removed after log operations are complete. A J-shaped mounting plate/bracket bolted to the winch slides over a mounting bar (also stored off site at the operator's workshop) that is installed into steel brackets on the truss that supports the deck. The mounting bars have end plates that would prevent them from moving horizontally and the weight of the stoplogs would prevent the mounting bar from moving vertically. The J-shaped mounting plate/bracket and the mounting bar have surface rust and chipping paint but are generally considered to be in fair condition.

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**7 – Valves** (type and number)

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This dam is not equipped with a valve.

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**8 – Boom** (driftwood, chains, anchors)

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This dam is not equipped with a debris or public safety boom.

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**9 – Erosion** (upstream and downstream)

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Erosion was noted on the upstream left and right sides of the earth embankment at what is expected to be the normal summer water level.

Erosion was noted on the downstream left and right sides behind the armour stone retaining walls. The full extent of this erosion could not be determined at the time of the inspection due to the presence of snow on site. The area with the most significant erosion noted was downstream of the left wing wall where there was a large void under/behind the armour stone.

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**10 – Seepage or Leaks**

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Inspection for seepage and leaks was limited due to the presence of snow on the ground and the fact that the headpond has been drawn down for winter. No seepage or leaks were identified by the inspection team or reported by the dam operator.

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**11 – Access Route**

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The main dam access is via an approximately 3 m wide gravel access road located on the west side of the Pefferlaw Brook. The access road is gated and locked to prevent entry by unauthorized vehicles; however, pedestrians are able to walk

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around the gate to access the park area surrounding the dam. Inspection of the gravel access road was limited due to the presence of snow on the ground; however the presence of the gravel surface was verified.

There is a secondary access on the east side of the Pefferlaw Brook. The access is gated and locked to prevent entry by unauthorized vehicles; however, pedestrians are able to walk around the gate to access the park area surrounding the dam. There is no formal access road to the dam as part of the secondary access.

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## 12 – Safety Issues (public and operator)

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**Public Safety** – There is no safety boom located upstream of the dam. The reservoir is used primarily by the private property owners surrounding the head pond for non-power boating. Access to the head pond by members of the public is possible through the park adjacent to the dam or from upstream in the Pefferlaw Brook.

There is expected to be significant public interaction with the deck of the structure due to its location within the park and the convenience for members of the public to cross the Pefferlaw Brook at this location. Access to the deck of the dam is not restricted.

There is no signage on the pedestrian approaches to the dam warning about the hazards posed by the dam.

Members of the public could climb the stoplogs that are stored on the deck of the dam. If they do, the railing in that area is not high enough to prevent them from falling.

**Operator Safety** – The dam is equipped with a fall arrest system; which is located above the overflow weir/flashboards. The fall arrest system does not cover dam operators during stoplog operations and the operators indicated that they tie off to the railing. The height an operator could fall from the deck to the downstream sill is just over 3.0 m.

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## 13 – Signage

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There is standardized dam safety signage located on the upstream and downstream sides of the control structure. The signs read “DANGER, Keep Out, Swift Currents & Undertow May Occur at Anytime”, identify the LSRCA as the dam owner, provide contact information for the dam owner and identify that 911 should be called in an emergency. Both signs are in good condition.

There is a “NO DIVING FROM BRIDGE, SHALLOW WATER” sign located on the upstream side of the dam to the left of Pier 1 (West Pier). The sign is in poor condition and appears to have been vandalized.

There are signs near the entrances to the park, near the gated access points, BY THE Town of Georgina that indicate “NO SMOKING BEYOND THIS POINT”.

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**14 – Divestment and/or Decommissioning Opportunities**

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None.

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**15 – General Remarks**

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The LSRCA has been operating and maintaining the dam since 1982. The primary purpose of the dam is as a flood and ice control structure; however, the headpond created by the dam also creates recreational opportunities and contributes to the general aesthetic of the area.

The dam operators work out of their shop in East Gwillimbury, which is a 1-hour drive from the site in normal weather conditions.

There is no target water level for the head pond, however operators do follow an operating plan for when to install/remove the stoplogs and flash boards (spring/fall operations). The dam is rarely operated outside of the spring/fall operating seasons.

There are the remnants of the fish ladder downstream of the overflow weir with some mounting brackets remaining on the pedestrian bridge truss.

A Public Safety Risk Assessment and a Public Safety Plan have not been prepared for this site; however, there is significant public interaction with the dam.

The latest Dam Safety Review (DSR) was completed by TSH in 2008 using the 1977 Lakes and Rivers Improvement Act Guidelines (MNR) as well as the Draft 1999 Ontario Dam Safety Guidelines (MNR). The DSR concluded that the Hazard Potential Classification (HPC) for the dam was Low; however, dam breach modelling was not undertaken as part of the analysis. Based on the HPC of Low an Inflow Design Flood (IDF) of the 100-year peak flow was selected. TSH indicated that the dam has adequate hydraulic capacity for the IDF. The structural stability assessment of the concrete gravity dam sections indicated that some sections do not meet the required factors of safety for some loading conditions.

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Form B2  
Dam Inspection Report



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## 16 - Recommendations

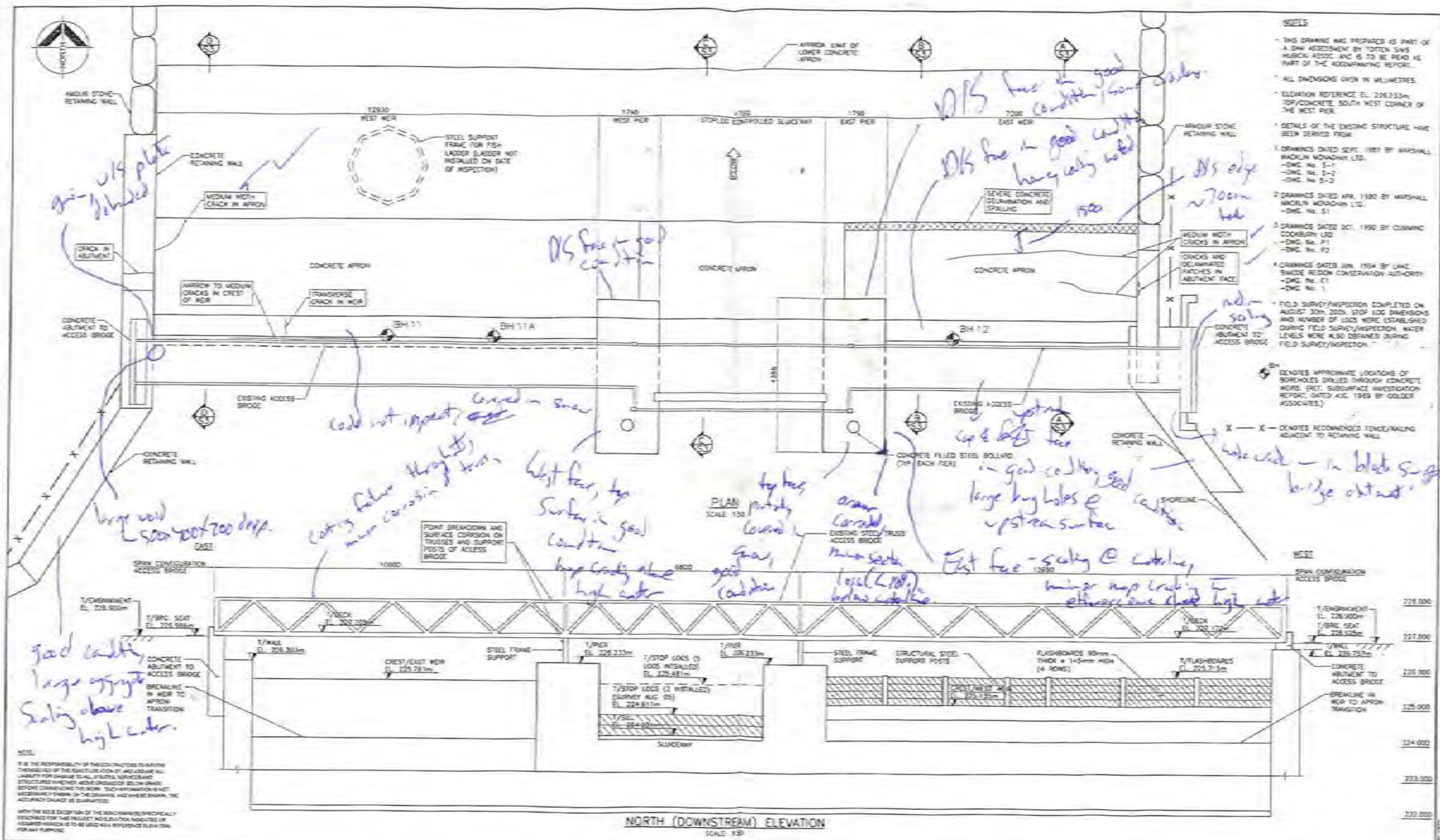
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1. Remove the trees from the earth embankment and from adjacent to concrete or masonry structures and remediate the voids left by the root systems.
  2. Undertake a concrete condition assessment for the dam, including concrete coring and detailed surface mapping, and based on the results of the concrete condition assessment prepare a detailed rehabilitation design for the concrete components of the structure.
  3. Undertake a structural evaluation of the truss bridge within one (1) year and develop a detailed repair or replacement design for the truss bridge and dam deck. Depending on the results of the structural evaluation, temporary repairs, the removal of the stoplogs stored on the deck or temporary suspension of dam operations may be required.
  4. Repair the chain link fence along the west property line.
  5. Replace the flashboards and flashboard posts, as planned. Note: Future replacement of the stoplogs may be required.
  6. Repair the erosion on the upstream left (west) and right (east) sides of the earth embankment.
  7. Repair the erosion behind the downstream left (west) and right (east) armour stone retaining walls.
  8. Complete a Public Safety Risk Assessment and based on the results of the assessment prepare a Public Safety Plan and implement the recommended additional public safety measures. Additional public safety measures that could be identified during the Public Safety Risk Assessment and may need to be considered as part of the Public Safety Plan include: signage on the pedestrian approaches to the dam and at the entrance to the park, a public safety boom in the head pond and additional railings/fencing around the stoplog storage area on the deck.
  9. Confirm, through the structural evaluation of the truss bridge, that the truss/railing has sufficient capacity to act as a fall arrest anchor point for use by operators during stoplog operations. If the anchor point does not have sufficient capacity, implement additional operator fall protection measures.
  10. Complete a new Dam Safety Review that incorporates a new hydrology and dam breach study, concrete gravity dam stability assessment and earth embankment stability assessment. The dam safety review should be completed in accordance with the Lakes and Rivers Improvement Act Technical Bulletins and Best Management Practices (MNR, 2011).
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# Appendix C

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Field Notes and Sketches



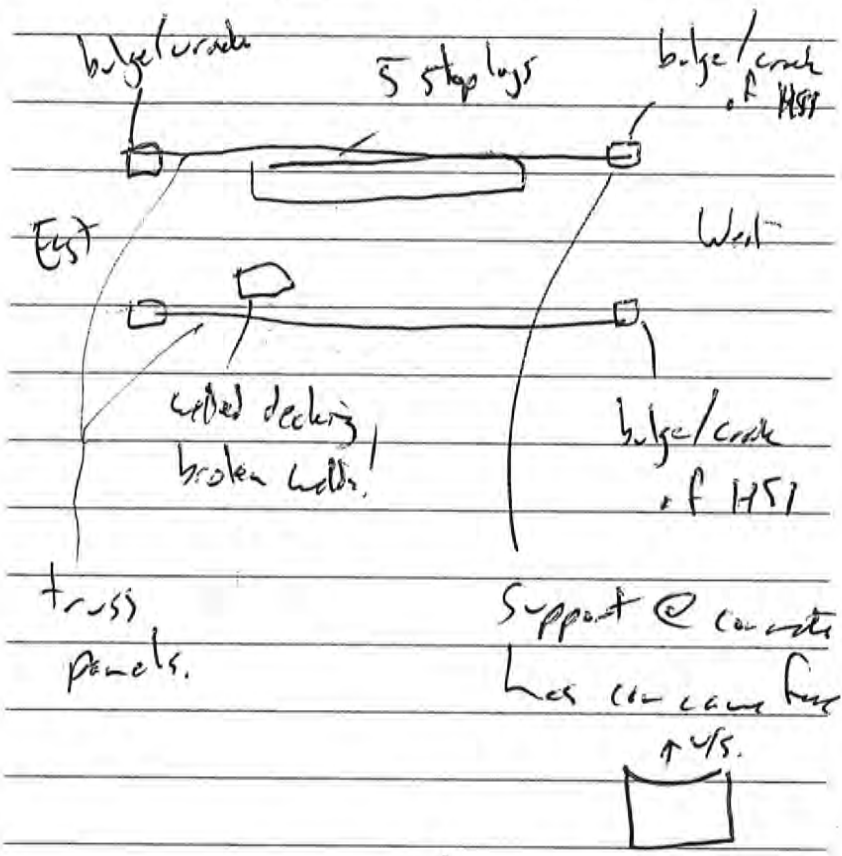
- NOTES**
- 1. THIS DRAWING WAS PREPARED AS PART OF A DAM ASSESSMENT BY TOTTEN SONS SURVEYING ASSOC. AND IS TO BE READ AS PART OF THE ACCOMPANYING REPORT.
  - 2. ALL DIMENSIONS GIVEN IN MILLIMETRES.
  - 3. ELEVATION REFERENCE EL. 226.233m TOP/CONCRETE SOUTH WEST CORNER OF THE WEST PIER.
  - 4. DETAILS OF THE EXISTING STRUCTURE HAVE BEEN DERIVED FROM:
    - 1. DRAWINGS DATED SEPT. 1981 BY MARSHALL MACLEIN MONAGHAN LTD. -DWG. NO. S-1 -DWG. NO. S-2 -DWG. NO. S-3
    - 2. DRAWINGS DATED APR. 1980 BY MARSHALL MACLEIN MONAGHAN LTD. -DWG. NO. S1
    - 3. DRAWINGS DATED OCT. 1990 BY CUNNING COOKBURN LTD. -DWG. NO. P1 -DWG. NO. P2
    - 4. DRAWINGS DATED JUN. 1954 BY LAKE SWITZE REGION CONSERVATION AUTHORITY -DWG. NO. K1 -DWG. NO. 1.
  - 5. FIELD SURVEY/INSPECTION COMPLETED ON AUGUST 30th, 2006. STOP LOG DIMENSIONS AND NUMBER OF LOGS WERE ESTABLISHED DURING FIELD SURVEY/INSPECTION. WATER LEVELS WERE ALSO OBTAINED DURING FIELD SURVEY/INSPECTION.
  - 6. BH DENOTES APPROXIMATE LOCATIONS OF BOREHOLES DRILLED THROUGH CONCRETE HERE. (RET. SUBSURFACE INVESTIGATION REPORT, DATED AUG. 1989 BY GOLDER ASSOCIATES.)
  - 7. X-X DENOTES RECOMMENDED TENSILE/RAILING ADJACENT TO RETAINING WALL.

NORTH (DOWNSTREAM) ELEVATION  
SCALE: 1:50

<p>ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.</p> <p>ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.</p>		<p>30 Pefferlaw Drive TOTTEN, ONTARIO L4R 1A5 TEL: 905-880-1900 FAX: 905-880-1901 WWW.TOTTEN.COM</p>		<p>DRAWN BY: E.J. REINHOLD</p>	<p>CHECKED BY: M. SHALLOON</p>	<p>PROJECT: DAM SAFETY ASSESSMENT PEPPERLAW DAM PEPPERLAW BROOK WATERSHED</p>	<p>PROJECT NO: 42-70902</p>
				<p>DESIGNED BY:</p>	<p>APPROVED BY:</p>		

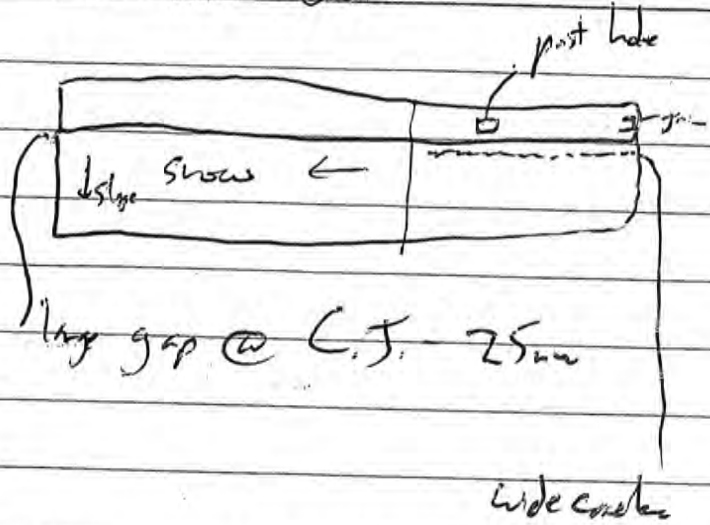


# Operation Span

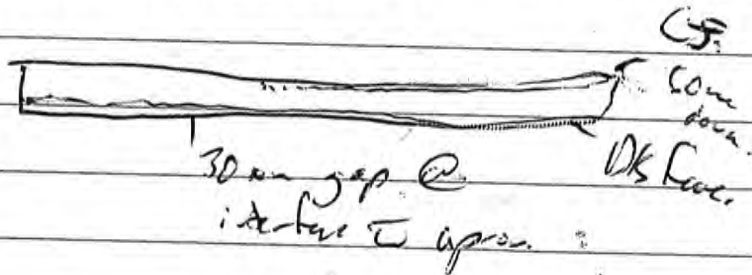


-300+ 200... stop logs

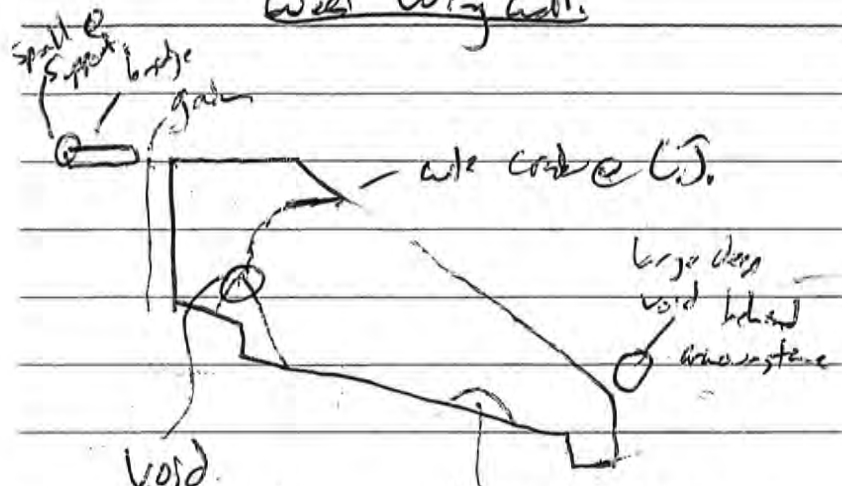
West Weir



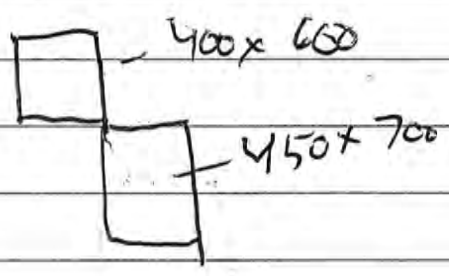
- 600m strip along slope detailed in report annex.



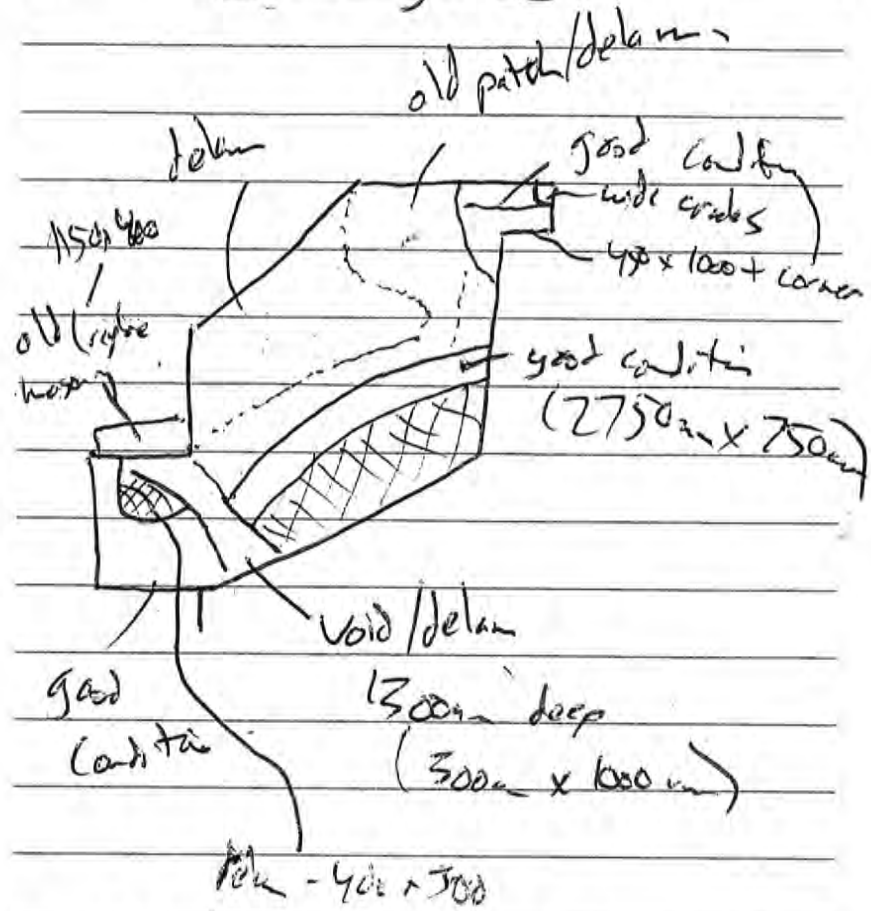
# West Wing wall



to exposed  
re-inforcing  
large, round aggregate  
cast spall 600x250

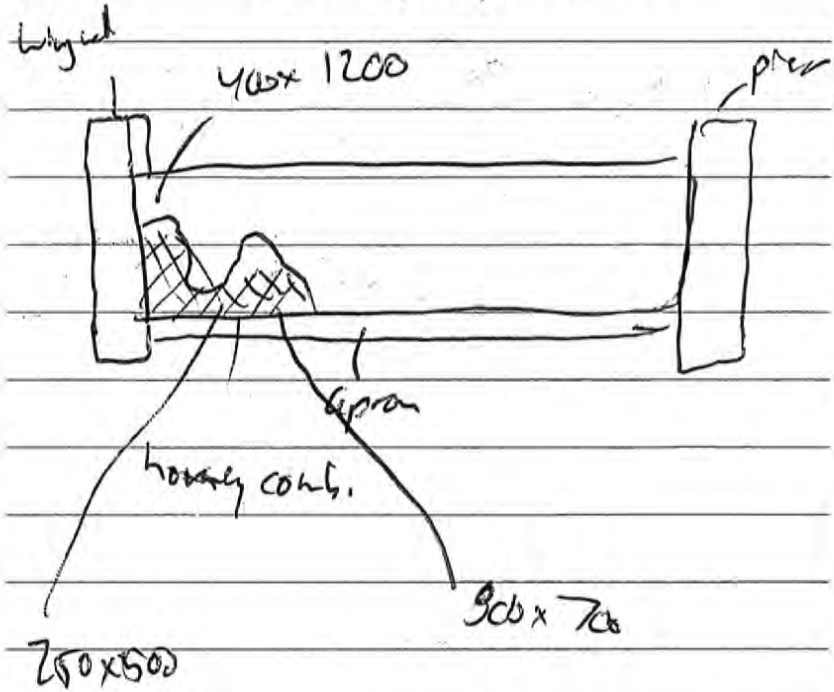


Project: East Wing

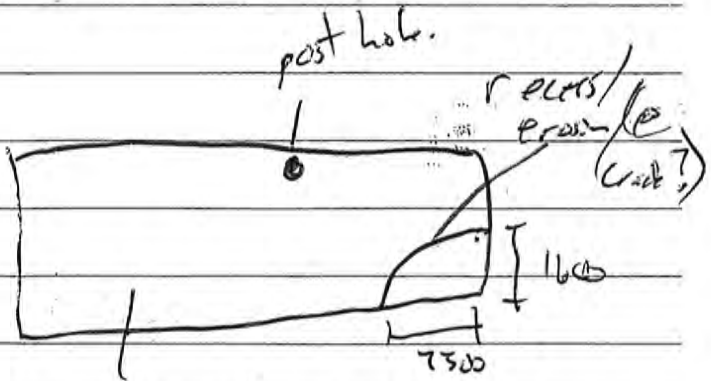


Notes: large, round exposed aggregate.  
Past patch repair.

East Sully, DIS factor



West Apoch



Severely eroded face  
(100%)

D/S edge ~ 800 - 1.1A.