Class Environmental Assessment for Shabomeka Lake Dam Rehabilitation and Erosion Control Projects

Project Plan Report

Prepared for:
Mississippi Valley Conservation Authority

Prepared by:
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Sign-off Sheet

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Executive Summary

The environmental assessment study described herein has been undertaken in accordance with the *Conservation Ontario Class Environmental Assessment (Class EA) for Remedial Flood and Erosion Control Projects* (approved January 2002 and amended June 2013) which fulfils the requirements of the *Environmental Assessment Act (EAA)*.

The Shabomeka Lake Dam is located at the outlet of Shabomeka Lake (formerly named Buck Lake) on Semicircle Creek, approximately 10 kilometers northeast of the Village of Cloyne, Ontario. Previous studies of the condition of the Shabomeka Lake Dam in 1988, 1989, 2004 and 2005 have recommended remedial works to limit the risk of dam failure. The 2004 study (Trow Associates, 2004) concluded that the factor of safety against rotational failure of the downstream face of the embankment under normal operating conditions is 1.33, which is less than the 1.5 recommended value in the Ontario Safety Guidelines.

This Class EA study examines three alternative design options for remedial works and evaluates each based on a series of environmental, social and technical criteria and recommends a preferred design. The three alternatives examined were:

- Alternative 1 – do nothing
- Alternative 2 – complete embankment and structure deconstruction and reconstruction
- Alternative 3 - embankment rehabilitation and control structure reconstruction

A review of existing environmental conditions allowed for the determination of potential environmental impacts associated with the preferred alternative, and the identification of appropriate mitigation measures.

Based on the screening exercise and given the existing environmental conditions in the vicinity of the dam, Alternative 3 was recommended as the preferred alternative design. Alternative 3 reduces the potential of a dam failure, has the fewest potential environmental impacts, low potential social impacts, and the smallest area of potential direct loss of aquatic and terrestrial habitat. There is the potential for this alternative to result in negative impacts to reptiles and other ground-dwelling animals, as well as the potential for negative impacts to fish habitat resulting from construction activities. To mitigate these potential impacts, it is recommended that disturbed natural areas should be restored to pre-construction conditions, or better, and that all exposed soil areas should be stabilized and re-vegetated, upon completion of construction activities.

Additional permits and approvals may be required prior to commencing construction activities from the Ministry of Natural Resources and Forestry and from Fisheries and Oceans Canada.

Abbreviations

AEP	Annual Exceedance Probability
ANSI	Areas of Natural and Scientific Interest
CA	Conservation Authority
Class EA	Class Environmental Assessment
CO	Conservation Ontario
DFO	Fisheries and Oceans Canada
EAA	Environmental Assessment Act
ESA	Environmental Significant Areas
GSC	Geodetic Survey of Canada
m	Meter
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
MRIC	Mississippi River Improvement Company
MVCA	Mississippi Valley Conservation Authority
PSW	Provincially Significant Wetlands

Glossary

Alternative Methods/Designs	Alternative methods of carrying out an undertaking.
Alternative Solutions	Alternative ways of solving a documented deficiency, including the alternative of doing nothing. An assessment of alternative solutions must precede determination of alternative remedial measures and alternative methods/design.
Aquatic Vegetation	Plants growing in the water.
Berm	An embankment built around a low lying area.
Built Heritage Resource	One or more buildings, structures, monuments, installations, or remains associated with architectural cultural, social, political, economic or military history.
Channel	A natural stream that conveys water; a ditch or channel excavated for the flow of water.
Class EA Document	A report documenting the EA process for a class of undertakings which is formally submitted for approval under the *Environmental Assessment Act*. Once the Class EA document is approved, specific projects covered by the Class EA can be implemented by proponents without having to obtain separate approval. This is provided that the approved planning and design process is followed, and there is compliance with the Notice of Approval.
Conservation	The wise use and management of natural resources to maintain, restore, enhance and protect the quantity and quality of the resources for sustained benefit.
Cultural Heritage Landscape	A geographic area of heritage significance, which has been modified by human activities. Such an area is valued by a community and is of significance to the understanding of the history of a people or place.
Earth Science ANSI (Area of Natural or Scientific Interest)	Areas designated by the Ontario Ministry of Natural Resources as containing natural features that have values related to protection, natural heritage appreciate, scientific study or education.
Ecosystem	A dynamic totality comprised of interacting living and non-living components which encompasses the interacting components of sunlight, air, water, soil, plants, and animals (including humans), within the system.
Environment	As defined in the *Environmental Assessment Act* subsection 1. (1) "environment" means: Air, land or water, Plant and animal life, including human life, The social, economic and cultural conditions that influence the life of humans or a community, Any building, structure, machine or other device or thing made by humans, Any solid, liquid, gas, odor, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or Any part or combination of the foregoing, and the interrelationships between any two or more of them, in or of Ontario.

Erosion	A term used in this document collectively referring to a) The wearing away of the land surface by running water, wind, ice or other geological agents; b) Detachment and movement of soil or rock fragments by water, wind, ice or gravity; c) Instability of a slope.
Fauna	A collective term for animal species present in an ecosystem.
Fill	Any material deposited by any agent so as to fill or partly fill a channel, valley, or other depression.
Flood	A rise in the water level resulting in the inundation of areas adjacent to a lake or stream channel not ordinarily covered by water.
Flood Plain	The area adjacent to a watercourse which is inundated as a result of flows exceeding the channel capacity of the watercourse. Floodplain can be defined according to design storms which inundate specified areas depending on certain conditions.
Flora	The collective term for the plant species present in an ecosystem.
Gabion	A rectangular or cylindrical wire mesh cage filled with rock and used in protecting against erosion.
Geomorphology	The physical features of the earth and ongoing processes which shape landforms.
Gradient	Change in elevation, velocity, pressure or other characteristics per unit length; slope.
Groyne	A shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion. The resulting beach provides shore protection.
Habitat	The place or site where an animal or plant community naturally or normally lives. The environment in which the life needs of a plant or animal organism, population, or community are supplied.
Hazardous Lands	Property or lands that could be unsafe for development due to naturally occurring processes. Along shorelines of large inland lakes, this means the lands including that covered by water, between a defined offshore distance or depth and the furthest landward limit of the flooding, erosion, or dynamic beach hazard. Along river and stream systems, this means the land, including that covered by water, to the farthest landward limit of the flooding or erosion hazard limits.
Hazardous Sites	Property or lands that could be unsafe for development and site alteration due to naturally occurring hazards. These may include unstable soils (sensitive marine clays (leda), organic soils) or unstable bed rock (karst topography).
Individual Environmental Assessment	Refers to an environmental assessment for a specific undertaking to which Part II of the *Environmental Assessment Act* applies and which is neither exempt nor covered by Class EA approval.
Island	A method of shoreline protection, viewed as a wide ultimate off-shore breakwater, mostly circular or oval in shape. Islands are used predominantly to provide habitat improvements as well as to protect the shoreline from the erosive forces of wave action by dissipating the wave energy before the wave intercepts the shore.

Jurisdiction	The extent of territory over which authority may be legally exercised.
Landform	A discernible natural landscape, such as a floodplain, stream terrace, plateau or valley.
Life Science ANSI	Areas designated by the Ontario Ministry of Natural Resources as containing natural features that have values related to protection, natural heritage appreciation, scientific study or education.
Microclimate	The climatic condition of a small area resulting from the modification of general climatic conditions.
MNR	Ontario Ministry of Natural Resources
Part II Order	The legal mechanism whereby the status of an undertaking can be elevated from an undertaking within a Class EA to an Individual Environment Assessment.
Proponent	For the Class EA document, are the Conservation Authorities of Ontario. For a specific undertaking planned in accordance with the approved Class EA, it is the individual Conservation Authority.
Public	Includes interest groups, associations, and individuals.
Regulations	Statutory controls, enacted through legislation, for the purpose of controlling land and water use.
Remedial Projects	Non-structural/structural works which are intended to reduce risk of damages to human life and property caused by flooding, erosion and/or other water related hazards.
Revegetation	The provision of plant materials to an area presently devoid of such.
Rip-rap	A protective layer of quarry stone, usually of mixed size, graded within wide size limit, place to prevent erosion, scour, or sloughing of an embankment or bluff.
Risk	The chance that is associated with any action where harm or loss can be encountered. The risk associated with building in the floodplain can be assigned a percentage value based upon the degree of flood susceptibility of the proposed development.
Runoff	The conveyance of surface water caused by precipitation and/or snowmelt.
Sediment	Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site or origin by air, water, gravity or ice and has come to rest on the earth's surface either above or below sea level.
Slope	The degree of deviation of a surface from horizontal, measured in a numerical ratio, percent or degrees.
Wetlands	Lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case, the presence of abundance water has caused the formation of hydric soils and has favored the dominance of either hydrophytic or water-tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens. Land being used for agricultural purposes, that are periodically 'soaked' or 'wet', we are not considered to be wetlands in this definition. Such lands whether or not they were wetlands at one time, are considered to have been converted to other uses.
Wildlife	A term used in this document to refer to all forms of animal life including insects, amphibians, reptiles, birds, and mammals.

1.0 INTRODUCTION

1.1 EXPLANATION OF PROJECT PLAN

This Project Plan has been prepared for remedial works related to the Shabomeka Lake Dam for which it has been demonstrated that there are no negative impacts or outstanding concerns held by the Conservation Authority or Reviewers.

This Project Plan has been prepared pursuant to the requirements of Conservation Ontario's (CO) Class Environmental Assessment (Class EA) for Remedial Flood and Erosion Control Projects (Conservation Ontario, 2002). The CO's Class EA is an 'approved' Class EA under the Environmental Assessment Act (EAA), which allows Conservation Authorities (CAs) to undertake remedial flood and erosion control projects without applying for formal approval under the EAA.

This Project Plan forms part of the overall Class EA Project File and serves to document the environmental assessment planning process that was followed. That process, which is documented herein, has resulted in the selection of the preferred alternative (i.e., 'the undertaking') to rehabilitate the Shabomeka Lake Dam. The Shabomeka Lake Dam is owned and operated by the Mississippi Valley Conservation Authority (MVCA) who is the proponent of the undertaking. MVCA retained Stantec in July 2017 to assist with the planning of the project.

The Project Plan has been made available for public and agency review as part of a 30-day review period. Subject to comments received on this Project Plan and the receipt of necessary approvals and funding, the MVCA is expected to proceed with the implementation of the project. The implementation phase of the project will involve the preparation of detailed plans and specifications, contractor selection and construction.

The preferred alternative is the rehabilitation of the berm and control structure. The rehabilitation will include increasing the height of the embankment crest and demolishing and reconstructing the spillway within the current foot print of the dam. The preferred alternative, in comparison to the complete embankment and structure reconstruction alternative, will:

- Reduce the environmental impacts;
- Limit the area of construction works within the existing dam location;
- Take advantage of the dam operation to avoid the implantation of a cofferdam by working between September and April; and
- Reduce the cost comparatively with the dam reconstruction option.

1.2 DESCRIPTION OF THE UNDERTAKING

The proposed undertaking consists of the removal of the existing Shabomeka Lake Dam, and the reconstruction of the dam, raising the embankment and road elevation, adding a gravel or a drainage blanket on the downstream slope, and potentially adding an emergency discharge capacity, if required. The reconstruction of the dam will prolong the long-term integrity of the structure.

1.3 PURPOSE AND RATIONALE

The dam was built in the 1950's with earth embankments and a wooden sluice gate which was later changed to concrete. In 1988, rehabilitation works were carried out to the concrete control structure and clay backfill was added to reduce seepage. However, after the 1988 rehabilitation, Ontario Hydro determined that these works are temporary, since the structure did not meet the overturning/sliding condition. It was recommended to rebuild the structure, and in the meantime, follow the imposed water level (summer = 271.3 m; winter = 269.1 m) and perform three inspections per year. Since 1988, no major rehabilitation work has been performed on the dam. In 2016, an assessment of the Shabomeka Lake Dam was performed, and the following recommendations were made:

- Rebuild the control structure (based on the conclusion of the 1988 Ontario Hydro recommendation);
- Raise the embankment and road elevation;
- Add gravel or drainage blanket on the downstream slope, and regrade this slope;
- Add emergency discharge capacity (based on the observed overtopping that occurred in 2002) (Trow Associates, 2004).

The recommendations listed above are considered to be one alternative of the three alternatives evaluated as a part of this Class EA. All three alternatives are described in Section 5.1. A potential dam failure would be a risk to public safety and property, therefore, the dam will need to be reconstructed.

1.4 STUDY AREA

The Shabomeka Lake Dam is located at the outlet of Shabomeka Lake (formerly named Buck Lake) on Semicircle Creek. It is approximately 10 kilometers northeast of the Village of Cloyne. It is situated on Lot 23, Concession XII, Barrie Ward, Township of North Frontenac. The location of the dam is shown in Figure 1-1. The study area is defined as the geographical area upstream and downstream of the dam that could be affected by the various dam rehabilitation alternatives.

Figure 1-1: Location of the Proposed Dam Works

The study area includes the Shabomeka Lake Dam, Shabomeka Lake, Semicircle Creek and associated shoreline areas extending approximately 50m upstream and 50m downstream of the dam, and an overview of the surrounding area.

1.6 PROJECT SCHEDULE

Table 1-1: Proposed Works Schedule

	Embankment	Discharge structure
September	• Out of water works: Vegetation clearing, layout of the site	• Stoplog removal at normal OMS rate
Oct. 1st to Oct. 15th	• Installation of temporary culvert downstream the dam • Excavation of a middle trench and placement of cement-bentonite core	• Removal and protection of stoplogs removal structure • Demolition of existing discharge structure
Oct. 15th to Oct. 31st	• No embankment works	• Construction of new discharge structure
Nov. 1st to Nov. 15th	• Embankment crest heightening • Placement of rip rap on upstream face	
Dec. 1st to Dec. 15th	• Removal of temporary culvert downstream the dam	• Installation of existing stoplogs removal structure

1.7 ENVIRONMENTAL ASSESSMENT

The Reconstruction of the Shabomeka Lake Dam was subject to the *Ontario Environmental Assessment Act* (EAA), namely CO's *Class Environmental Assessment for Remedial Flood and Erosion Control Projects* (Conservation Ontario, 2002). Application of the Class EA for the reconstruction of the dam was premised on meeting the intent of the following project requirements as defined in CO's Class EA:

• *"The project is undertaken by a Conservation Authority (as the proponent).*

• *The project is remedial in nature and is required to protect human life and property from flooding or erosion.*

• *The project is situated within a previously developed area and will not facilitate or anticipate development.*

• *The project requires a solution that is structural in nature and/or requires capital works."*

Figure 1-2 depicts the principal steps associated with the planning and design process associated with CO's Class EA. Application of CO's Class EA process to the project to reconstruct the Shabomeka Lake Dam has resulted in the preparation of this Project Plan Report based on the assessment findings herein that significant, adverse, residual environmental effects can be adequately mitigated.

1.8 DAM CONDITIONS

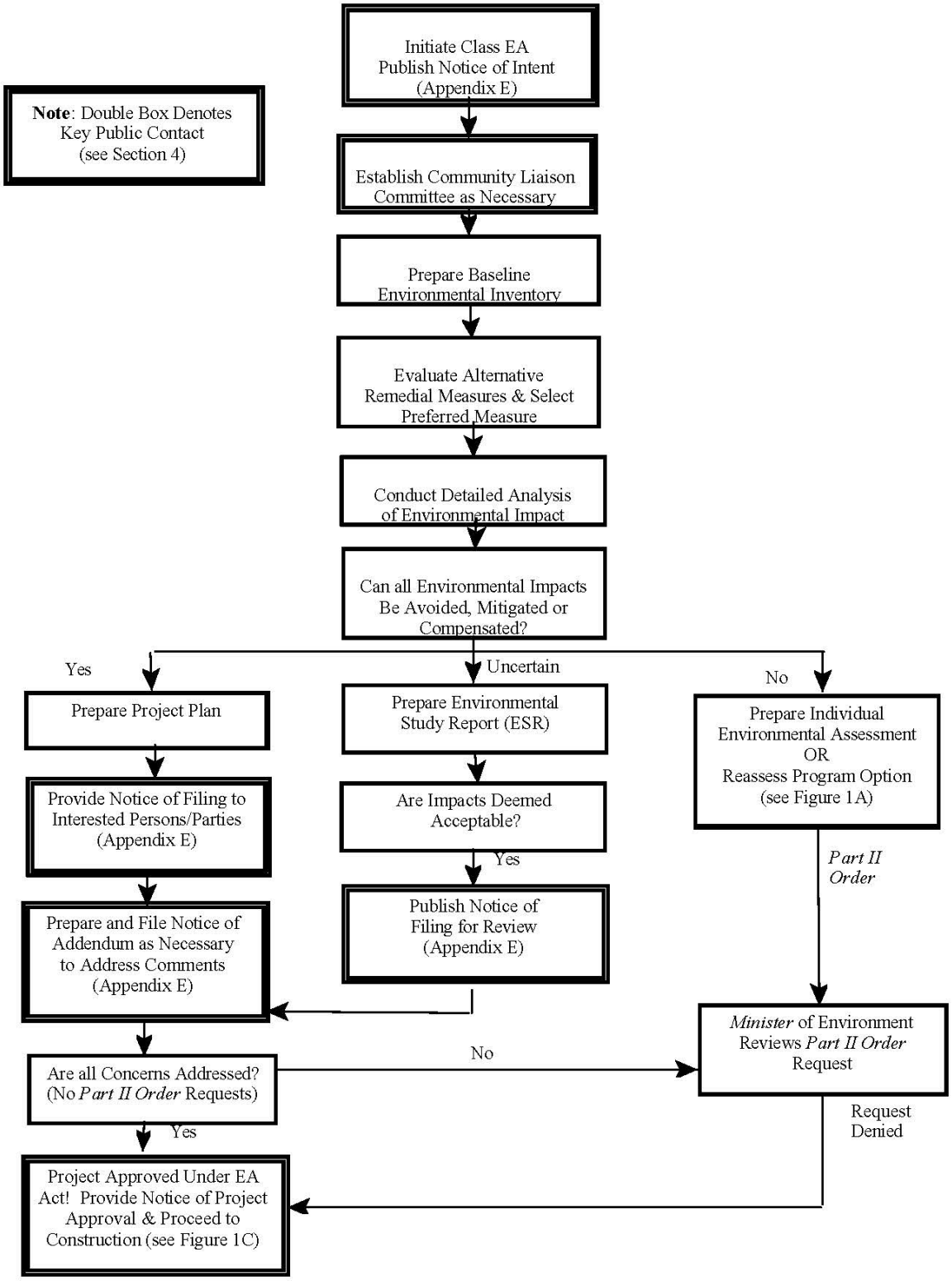
In 1989, major rehabilitation work was completed on the dam. The work included removal of vegetation, debris, rip-rap protection and the existing culverts. Most of the old concrete was removed and steel reinforcing bars were inserted when the abutment was reformed and capped. Steel cross braces were also installed between the abutments to further stabilize the control section. Rock filled gabion baskets were installed along the upstream slope on either side of the control section to reduce erosion. A cutoff wall was also incorporated into the earth embankments to reduce the amount of seepage. These repairs were seen as a temporary solution, with the recommendation of the dam being replaced.

Following the rehabilitation, an assessment was conducted and found that the dam does not meet both generally accepted community engineering standards, or Ontario Hydro Dam Safety Standards (Wizniak, 1989). Following the completion of the repairs, it was recommended that the entire dam structure be replaced (Wizniak, 1989).

Inspections of the dam conducted between 1990 and 2014 indicated the following deficiencies in the earth embankment and control structure:

- Seepage at the toe of the south embankment, and water flow approximately half way up the slope of the north embankment.
- Noticeable dips in the elevation of the north and south embankments at the control structures.
- Several turtle holes and depressions along the edge of the north and south earth embankments.
- Gabion baskets have settled and have pulled away from the front face of the control structure, resulting in the safety railing become deformed and lifting off the deck of the control structure.
- Longitudinal cracks were observed in the top of the north earth embankment on the upstream face of the dam in 2002.
- Some erosion of the upstream faces of the earth embankments.

Figure 1-2: Conservation Ontario Class EA Process



A geotechnical investigation was conducted by Trow Inc. in July of 2004 to obtain subsurface information to assess the stability and seepage conditions of the earth embankments, and to provide information for the possible rehabilitation of the dam. Trow concluded from their slope stability analysis that the factor of safety against rotational failure of the downstream face of the embankment under normal operating conditions is 1.33 (Trow Associates 2004). This is less than the 1.5 recommended value in the Ontario Safety Guidelines. Trow indicated that rehabilitation works should be considered to improve the factor of safety against rotational failure.

In 2011, two bollards were installed on either side of the concrete deck as safety considerations.

In October 2015, Houle Chevrier Engineering carried out a visual inspection of the dam. As a result of the visual inspection, it was recommended that the dam be replaced, with a new control structure being placed slightly north of the existing structure to avoid the known bedrock fault (Chevrier 2016).

1.9 PREVIOUS STUDY AND REPORTS

Provided is a listing of previous studies and background reports related to the operation and condition of the dam, and the environmental features within the study area:

- Project Summary, Shabomeka Lake Dam, Mississippi River, dated February 1989
- Geotechnical Investigation, Shabomeka Lake Dam, North Frontenac, Ontario, prepared by Trow Associates Inc. dated July 20, 2004
- Dam Safety Assessment, Shabomeka Lake Dam, Prepared by Trow Associates Inc. dated August 2005, and;
- Operation, Maintenance and Surveillance Manual, Shabomeka Lake Dam

1.10 JUSTIFICATION OF CONSERVATION AUTHORITY INVOLVEMENT

Mississippi Valley Conservation Authority's involvement with the removal of the existing Shabomeka Lake Dam is clearly justified given their ownership of the dam and their legislative authority pursuant to the *Conservation Authorities Act*.

Under the Act, the MVCA has prime responsibility for water management, in terms of water quantity and hazards related to flooding and erosion within areas under its jurisdiction. Section 21(1) of the Act provides administrative powers to the Conservation Authority to, among other things, construct dams, control the flow of surface waters and divert or alter watercourses in order to prevent hazards related to flooding and erosion. The construction, operation, maintenance and retirement (i.e., decommissioning) of dams are valid activities pursuant to MVCA's mandate and are consistent with its Water Management Policy in the Flood and Erosion Control Program Areas.

2.0 BACKGROUND

2.1 HISTORY

The Shabomeka Lake Dam was originally known as Buck Lake Dam and was constructed for timber cribbing around the turn of the century. As the timber trade declined, the dam fell into disrepair. During the 1950's, Ontario Hydro reconstructed the dam for Mississippi River Improvement Company (MRIC) to take ownership (Shabomeka Lake Dam 2005). Development on the lake was not very extensive as most of the surrounding land was Crown land, and the only access to the west side of the lake is by boat.

During MRIC ownership the dam had undergone some major repair works in 1959 and 1970. Repairs completed while the dam was under the ownership of the MRIC, included a wooden sluice repaired by a concrete sluice in 1959, and the wooden planking on the face of the timber cribbing was replaced by aluminum sheeting to reduce seepage through earth embankments in 1970, which had moderate success (Shabomeka Lake Dam, 2005).

In 1989, rehabilitation work was completed, these repairs were completed as a temporary solution. As the sluice structure is in poor condition, founded on unsuitable material and does not meet both generally accepted community engineering standards or Ontario Hydro Dam Safety Standards (Shabomeka Lake Dam, 2005).

In January 1991, the MVCA assumed ownership of the dam, and maintained the same operating procedures. The optimum water level of Shabomeka Lake is 271.00 m, with a maximum target of 271.28 m. From June 14 to 17, 2002, there was 161 millimeters of rainfall, which caused the water level to reach 271.44 m (the highest on record). This caused overtopping of the earth embankments on both sides of the control structure (Shabomeka Lake Dam 2005).

3.0 BASELINE INVENTORY – EXISTING ENVIRONMENT

3.1 DESCRIPTION OF EXISTING DAM

The dam was built in the 1950's with earth embankments and a wooded sluice gate which was later changed to concrete. In 1988, rehabilitation works were carried out to the concrete control structure and clay backfill was added to reduce seepage. However, after the 1988 rehabilitation, Ontario Hydro determined that these works are temporary, since the structure did not meet the overturning/sliding condition. The water level is lowered in winter for safety during the spring freshet. Since 1988, no work has been performed on the dam.

3.1.1 Dam Configuration and Operation

The Shabomeka Lake dam consists of a single concrete control structure separating two earth embankments. The North and South embankments are 48.8 m and 12.2 m long, respectively. The height varies to a maximum of about 3 m with a crest width of approximately 4 m and a crest elevation of 271.34 m.

During the fall, drawdown begins in early September, when two stoplogs are removed from the dam. Approximately two additional stoplogs are removed the following week, leaving two stoplogs to remain in the dam throughout winter. The fall operating range is between 269.90 to 271.00 m GSE (Geodetic Survey of Canada) (Trow, 2005). The starting date of spring operation is dependent on the timing of the spring runoff. Two stop logs are replaced as spring runoff begins to fill the lake to reduce the flood levels downstream on Mazinaw Lake. Following the peak runoff, additional logs are replaced to achieve the regulated summer water level of 271.00 m. If the lake level exceeds 271.15 m, logs are removed as necessary until the water level begins to recede. During the summer, once the water level reaches 271.00 m and all stop logs are in the dam, no further operations are required. If sufficient rainfall begins to raise the water level above 271.10 m, one or more logs will be removed until the levels drop to the regulated summer level.

3.1.2 Dam Condition

This section is a description of the dam stability and condition and includes the Ontario Dam Safety Guidelines (ODSG) (MNR, 1999) classification, any dam break modeling results, and the dam's incremental hazard potential. Included is a description of the concrete structure and stability calculations.

3.1.2.1 Dam Failure Simulations Results

The sunny day failure, 100-year summer and 100-year winter scenarios were performed. The results of these simulations are presented in Table 3-1, Table 3-2, and Table 3-3.

Table 3-1: Sunny Day Dam Failure HEC-RAS Results

			Sunny day					
	HEC-RAS Cross section	**Distance from dam (m)**	**Peak Flow (m^3/s)**	**Flood wave arrival time (hour)**	**Peak flow arrival time (hour)**	**Water elevation without dam break (m)**	**Water elevation with dam break (m)**	**Incre-mental Water Level (m)**
Dam Location	4963	0	67.51	0:00	0:00	269.62	271.38	**1.76**
Semicircle Lake outlet	3585	1378	67.51	0:22	2:41	269.62	271.36	**1.74**
Between Semicircle and Lower Mazinaw Lakes	3192	1771	67.51	0:26	2:44	267.76	269.91	**2.15**
Lower Mazinaw Lake	Storage area	4963	66.65	1:08	3:22	267.8	268.05	**0.25**

Table 3-2: 100-Year Summer Dam Failure HEC-RAS Results

			100-year summer					
	HEC-RAS Cross section	**Distance from dam (m)**	**Peak Flow (m^3/s)**	**Flood wave arrival time (hour)**	**Peak flow arrival time (hour)**	**Water elevation without dam break (m)**	**Water elevation with dam break (m)**	**Incre-mental Water Level (m)**
Dam Location	4963	0	156.2	0:00	0:30	270.68	271.99	**1.31**
Semicircle Lake outlet	3585	1378	132.3	0:05	2:07	270.67	271.96	**1.29**
Between Semicircle and Lower Mazinaw Lakes	3192	1771	132.26	0:11	2:10	268.83	270.23	**1.40**
Lower Mazinaw Lake	Storage area	4963	130.15	0:17	2:15	268.38	268.75	**0.37**

Table 3-3: 100-Year Spring Dam Failure HEC-RAS Results

			100-year spring					
	HEC-RAS Cross section	**Distance from dam (m)**	**Peak Flow (m^3/s)**	**Flood wave arrival time (hour)**	**Peak flow arrival time (hour)**	**Water elevation without dam break (m)**	**Water elevation with dam break (m)**	**Incre-mental Water Level (m)**
Dam Location	4963	0	103.6	0:00	0:30	270.68	271.68	**1.00**
Semicircle Lake outlet	3585	1378	88.16	0:05	2:13	270.67	271.66	**0.99**
Between Semicircle and Lower Mazinaw Lakes	3192	1771	88.15	0:07	2:30	268.83	269.84	**1.01**
Lower Mazinaw Lake	Storage area	4963	86.7	0:15	2:35	268.74	268.99	**0.25**

3.1.2.2 Consequence Identification and Dam Classification

The dam classification is performed according to the technical bulletin "Classification and Inflow Design Flood Criteria" published in 2011 by the Ontario Ministry of Natural Resources and Forestry (MNRF). It is also performed following Canadian Dam Association (CDA) Guidelines. The CDA Guidelines for Dam Classification are shown in Table 3-4, and the MNRF Dam Classifications are shown in Table 3-5, below.

Table 3-4: CDA Guidelines Dam Classification

Criteria	**Consequence of failure**	**Classification according to CDA Guidelines 2007 (revision 2013)**
Population at risk	Temporary only (users of Snyder Bay Lane crossing)	Significant
Loss of life	There is no possibility of loss of life other than through unforeseeable misadventure	Low
Environment and cultural	Short-term impacts	Low
Infrastructure and economics	Losses of infrequently used transportation routes (Private road: Snyder Bay Lane crossing) Temporary loss of recreational uses to Shabomeka lakeside residents	Significant
Overall classification		**Significant**

Table 3-5: MNR Dam Classification

Criteria	Consequence of failure	MNRF Technical Bulletin (2011)
Life Safety	No potential loss of life	Low
Property Losses	Private road (Snyder Bay Lane crossing) Minimal damage to residential areas	Moderate
Environment losses	Minimal loss	Low
Cultural – Built Heritage Losses	None	Low
Overall classification		**Moderate**

CDA Guidelines indicate that a "significant" dam has an annual exceedance probability (AEP) between 1/100 and 1/1000 selected on the basis of incremental flood analysis, exposure and consequences of failure. The MNR Technical Bulletin indicates that a "moderate" dam has an annual exceedance probability (AEP) between 1/100 and 1/1000.

3.2 NATURAL ENVIRONMENT

An Environmental Inventory/Existing Conditions Report was prepared to review background environmental information and a single site visit was performed to ground truth site conditions of the Project and document aquatic and terrestrial environments in the immediate vicinity of the dam.

3.2.1 Methodology

Terrestrial background data applicable to the Study Area were obtained through review of existing documents and information available online. Background information was supplemented with a field visit on August 4, 2017 to document existing conditions within the Study Area. The purpose of the field visit was to verify conditions from the desktop review exercise, including ground truthing preliminary observations made from the examination of aerial photography. Vegetation, wildlife, and aquatic habitats were assessed. No comprehensive botanical or faunal surveys were completed. Site photos were taken and representative photos are in Appendix A.

3.2.2 Results

3.2.2.1 Landscape Context and Designated Areas

The Study Area is located on the southern edge of the Canadian Shield, with physiographic landforms characterized by bare rock ridges and shallow till.

There are no provincially designated natural areas, including: areas of natural and scientific interest (ANSIs), provincially significant wetlands (PSWs), environmentally significant areas (ESAs), provincial or national parks, or conservation areas within 120 meters of the Project site. An unevaluated wetland is located approximately 25 m downstream of the Project site on Semicircle Creek. The southern boundary of Bon Echo Provincial Park is located approximately 1.8 km to the north of the Project site.

3.2.2.2 Species at Risk and Provincially Rare Species

A search of various wildlife atlases identified 74 birds, 9 amphibians, 6 reptiles, and 34 mammals with ranges that have the potential to occur in the Study Area. Seven species at risk and provincially rare species were identified as occurring in the area reviewed, containing the dam site.

3.2.2.3 Aquatic Habitat Data

Shabomeka Lake reaches depths of approximately 32 metres at its deepest point and has a perimeter of approximately 14 kilometres. It is classified as supporting a cold-water fishery, with Lake Trout identified as a key species inhabiting the lake. Based on a review of data summarized in State of the Lake Reports prepared by MVCA for 1998, 2003, 2008 and 2013, the lake has occasionally exhibited characteristics associated with mesotrophic lakes.

Shabomeka Lake has been recognized by MNRF as a key lake for lake trout management, and identifies the lake as a put-grow-take lake where stocking occurs to support recreational angling opportunities. Spawning habitat is available in the lake, however water level management surrounding the fall drawdown of the lake increases the susceptibility of potential spawning shoals and the survival of eggs over the winter.

3.2.2.4 Vegetation

The Study Area was characterized by a mixture of natural vegetation communities, and disturbed areas primarily associated with the embankment and control structure, where the vegetation is maintained to prevent the establishment of deep rooting species that may compromise the integrity of the embankment. A description of the vegetation within the Study Area is provided in Table 3-6, below.

Table 3-6: Vegetation Communities Within the Study Area

Property and ELC Vegetation Type	Community Description
SHORELINE COMMUNITIES	
OA Open Aquatic	These are two open water areas, associated with Shabomeka Lake and Semicircle Creek, on either side of the embankment and control structure
MEADOW COMMUNITIES	
CUM1 Mineral Cultural Meadow	This community is present on the top and sides of the embankment and appears as a clearing between FOM to the north and FOD to the south. The community is forb-dominated. The area is subject to regular maintenance to prevent the establishment of woody vegetation
FOREST COMMUNITIES	
FOM Mixed Forest	This upland forest community is extensive and widespread to the north of the embankment dam and control structure (CUM1). A mix of coniferous and deciduous trees including maple, oak (*Quercus sp.*), white pine (*Pinus strobus*) and spruce (*Picea glauca*) typify this community. Staghorn sumac (*Rhys typhina*) grows along the edges associated with the disturbed embankment area.
FOD Deciduous Forest	This upland forest community is extensive and widespread to the south of the CUM1. It is dominated by deciduous species such as poplar, beech (*Fragus sp.*), maple, and oak intermixed with lesser numbers of white pine, cedar (*Thuja occidentalisl)* and spruce
MARSH COMMUNITIES	
MAS 3-1 Cattail Organic Shallow Marsh	This community extends along the north shoreline of Semicircle Creek to the northwest of the dam, and is mapped as an unevaluated wetland by LIO. It is dominated by narrow-leaved and broad-leaved cattails (*Typha sp.*) in variable proportions, established on organic soils.
MA Marsh	This is a small island in the mid-channel area of Semicircle Creek immediately downstream of the dam. The island supports growths of graminoid and forb vegetation.

3.2.2.5 Wildlife Observations

Two reptiles, or signs thereof, were observed during field investigations on August 4, 2017:

- Three Eastern garter snakes (*Thamnophis sirtalis sirtalis*) were observed within the top gabion basket on the south side of the dam control structure.
- Two turtle nests that had been predated were noted near the top of the embankment immediately south of the dam structure. The nest site consisted of excavations and scattered egg shell fragments surrounding the opening. The species that created the nests is unknown.

3.2.2.6 Aquatic Habitat Assessment

Shabomeka Lake

During the August 4 site visit, water levels in Shabomeka Lake were slightly elevated due to recent heavy rains. In the immediate area of the embankment and control structure, the shoreline is characterized by an approximate 3 m wide shallow shelf ranging in depth from 10 cm near the shore and slope gradually to 40 cm at the extent of the shelf, where depth gradually drops off to 3 m in the central area approximately 15 m in front of the dam. In the shelf area, substrates consist of large fractured rock, smaller rounded cobbles and interspersed gravels. Off the south end of the embankment exists an embayment where the shallow shelf extends approximately 15 m from the shoreline and deposition provides substrates suitable for the establishment of submerged and emergent aquatic vegetation.

Shoreline substrates are suitable for spawning areas for sunfish and cyprinids, and a single pumpkinseed was noted in the shallows just north of the sluice during the site visit. Although substrates in the shallows are suitable for smallmouth bass spawning areas, bass tend to prefer spawning areas in 1 to 5 m of water which are likely present in deeper water shoals offshore. They also tend to choose preferred substrates near some form of cover such as large boulders or logs.

Semicircle Creek

The Shabomeka Lake Dam discharges into a short tailrace that flows into a shallow riffle/run approximately 2 m in depth which extends for a distance of approximately 10 m downstream of the dam. Beyond this distance, flow velocities slow considerably in a low gradient environment where the creek is flanked by a large depositional wetland on its north shore. Substrates immediately downstream of the dam consist of large rounded cobble and gravels where flows are swift and provide scouring during elevated discharges from the lake. Approximately 5 m downstream of the dam, a cobble ridge exists where water depths are much shallower at 15 cm.

No fish were observed in the creek during the August 4 assessment, however it is expected that a typical assemblage of baitfish would utilize the area immediately downstream of the dam for feeding, particularly given that dam discharges produce turbulent waters with high oxygen content. Smaller fish that feed on plankton would also be attracted to the discharge to feed on floating organisms in the current from the tailrace.

3.3 SOCIAL ENVIRONMENT

The Shabomeka Lake Dam is located in a rural area on a lake that is characterized by recreational angling and other recreational uses. Seasonal residences are located along the shores of the lake.

3.3.1 Zoning and Land Use Designation

The area surrounding the dam has zoning designated for either rural or rural and limited service rural use (Tunnock Consulting Ltd., 2004). The lake has approximately 100 cottages (Mississippi Valley Conservation 2003), and is popular for fishing and hiking.

The land use of the dam is classified in the North Frontenac Official Plan as being on Crown Land and Bon Echo Ontario's Living Legacy (Township of North Frontenac, 2017). The edges of the lake are classified as Waterfront Area, and a portion of the lake has been designated as Deer Wintering Area (Township of North Frontenac, 2017). Shabomeka Lake has been designated a Lake Trout Lake at Capacity (Township of North Frontenac, 2017).

4.0 PROJECT ALTERNATIVES AND EVALUATION

The identification of project alternatives for the Project was based on the requirements to address the problem (Section 1.3). This included the need to establish a solution to address the final disposition of the dam given its deteriorated and potentially unsafe condition and the fact that the dam does not provide a significant flood control benefit.

4.1 IDENTIFICATION OF PROJECT ALTERNATIVES

The following project alternatives for the Project undertaking were considered:

Alternative 1 - Do Nothing (Status Quo)

Alternative 2 – Complete embankment and structure deconstruction and reconstruction

Alternative 3 – Embankment rehabilitation and control structure reconstruction

4.1.1 Alternative 1 – Do Nothing

This alternative would involve the continuance of the Shabomeka Lake Dam in its current condition, with no changes to the nature of the dam itself, or its management. This conceptual alternative provides a baseline condition with which to compare each of the other alternatives and considers the potential ramifications of undertaking no present-day rehabilitation to the existing dam.

4.1.2 Alternative 2 – Complete embankment and structure deconstruction and reconstruction

This alternative would involve raising the earth embankments on both sides of the control structure; placing a zone of gravel at the downstream toe of the north and south earth embankments; establishing emergency discharge capacities in the event of extreme water level increases. The reconstruction of the dam would require the construction of a diversion channel around the entire work area to facilitate work.

4.1.3 Alternative 3 – Embankment rehabilitation and control structure reconstruction

This alternative would involve the excavation of a trench in the existing embankment; installing an impervious dam core to stop the existing seepage; the embankment crest will be heightened slightly; the existing spillway will be demolished and reconstructed in the current foot print.

4.2 ENVIRONMENTAL EFFECTS SCREENING

For each alternative, a screening of the potential environmental effects was conducted. The purpose of the screening was to identify alternatives that could result in significant, net negative environment impacts (i.e., with mitigation in place), which if identified, could indicate that an alternative should be discounted (i.e., screened from further consideration), or that the project should be subject to an Individual Environmental Assessment.

The screening process involved an identification of the types and extent of impacts according to a series of environmental factors (i.e., screening criteria). Both positive and negative effects were considered, as well as an assessment of whether the impact would be temporary during construction or permanent (long-term) due to operation and maintenance (CO, 2002). The significance of each potential effect was classified as high, medium or low based on a qualitative assessment of the magnitude and severity of the potential effect. Where appropriate, environmental mitigation measures were identified.

The results of the screening are presented in Table 4-1 and key points are discussed in Sections 4.3.1, 4.3.2, and 4.3.3. Based on the findings of the screening it was concluded that none of the alternatives, with the exception of the Do Nothing option (in the event of a dam failure) would result in significant net negative environmental impacts that would preclude their consideration as a viable project alternative.

4.3 EVALUATION OF ALTERNATIVES

To identify the most appropriate solution for the Shabomeka Lake Dam, the project alternatives were compared in terms of their overall effectiveness (safety, 50-yr life cycle cost, environmental control), net environmental effects and mitigation requirements. The outcome of the effects screening is shown in Table 4-1. Table 4-2 summarizes the advantages and disadvantages, and net environmental effects of each alternative.

The Screening of Potential Effects are identified as negative (-), neutral (NIL) or positive (+) and rated as relatively high (H), medium (M), low (L), or not applicable (NA).

For each screening criteria, the alternatives have been indicated in the table (1 for Alternative 1, 2 for Alternative 2, and 3 for Alternative 3) based on the anticipated potential effect of each alternative on the criteria. The alternative with the most positive effect is selected for further detailed analysis of potential impacts and required mitigation measures.

Table 4-1: Environmental Effects Screening

Screening Criteria	Rating of Potential Effect							
	-H	-M	-L	NIL	+ L	+ M	+ H	NA
Physical								
Unique Landforms								1, 2, 3
Existing Mineral/Aggregate Resources Extraction Industries								1, 2, 3
Earth Science – Areas of Natural and Scientific Interest								1, 2, 3
Specialty Crop Areas								1, 2, 3
Agricultural Lands or Production								1, 2, 3
Niagara Escarpment								1, 2, 3
Oak Ridges Moraine								1, 2, 3
Environmentally Sensitive/Significant Areas (physical)								1, 2, 3
Air Quality								1, 2, 3
Agricultural Tile or Surface Drains								1, 2, 3
Noise Levels and Vibration				1, 2, 3				
High/Storm Water Flow Regime	1					2	3	
Low/Base Water Flow Regime				1	2	3		
Existing Surface Drainage and Groundwater Seepage		1			2	3		
Groundwater Recharge/Discharge Zones			1			2, 3		
Littoral Drift								1, 2, 3
Other Coastal Processes	1					2	3	
Water Quality	1				2	3		
Soil/Fill Quality	1				2	3		
Contaminated Soils/Sediments/Seeps	1				2	3		
Existing Transportation Routes								1, 2, 3
Construction Crossing (e.g. bridges, culverts)								1, 2, 3
Geomorphology	1			2, 3				
Biological								
Wildlife Habitat	1				2	3		
Habitat Linkages or Corridors	1				2	3		
Significant Vegetation Communities	1		2		3			
Environmentally Sensitive/Significant Areas (biological)								1, 2, 3
Fish Habitat	1		2	3				

Screening Criteria	Rating of Potential Effect							
	-H	-M	-L	NIL	+ L	+ M	+ H	NA
Species of Concern (e.g. species at risk, vulnerable/threatened/endangered species, conservation priorities – either flora or fauna)				1, 2, 3				
Exotic/Alien and Invasive Species				1, 2, 3				
Wildlife/Bird Migration Patterns								1, 2, 3
Wildlife Population	1		2		3			
Wetlands		1	2		3			
Microclimate								1, 2, 3
Life Science ANSI's								1, 2, 3
Unique Habitats		1		2, 3				
Cultural								
Traditional Land Uses								1, 2, 3
Aboriginal Reserve or Community								1, 2, 3
Outstanding Native Land Claim								1, 2, 3
Transboundary Water Management Issues								1, 2, 3
Riparian Uses	2	1			3			
Recreational or Tourist Use of a Water Body and/or Adjacent Lands	1		2			3		
Recreational or Tourist Uses of Existing Shoreline Access Locations	1		2			3		
Aesthetic or Scenic Landscapes or Views	1	2		3				
Archaeological Resources, Built Heritage Resources and Cultural Heritage Landscapes			2					1, 3
Historic Canals								1, 2, 3
Federal Property								1, 2, 3
Heritage River System								1, 2, 3
Socioeconomic								
Surrounding Neighborhood or Community	1						2, 3	
Surrounding Land Uses or Growth Pressure	1			2, 3				
Existing Infrastructure, Support Services, Facilities		1		2, 3				
Pedestrian Traffic Routes	1					2	3	
Property Values or Ownership	1			2, 3				

Screening Criteria	Rating of Potential Effect							
	-H	-M	-L	NIL	+ L	+ M	+ H	NA
Existing Tourism Operations	1						2, 3	
Property/Farm Accessibility		1		2, 3				
Engineering/Technical								
Rate of Erosion in Ecosystem	1				2	3		
Sediment Deposition Zones in Ecosystem	1				2	3		
Flood Risk in Ecosystem	1						2, 3	
Slope Stability	1						2, 3	
Existing Structures	1					2	3	
Hazardous Lands								1, 2, 3
Hazardous Sites	1						2, 3	

Alternatives

Alternative 1 – "Do Nothing" (Status Quo)
Alternative 2 – Complete embankment and structure deconstruction and reconstruction
Alternative 3 – Embankment rehabilitation and control structure reconstruction

Table 4-2: Evaluation of Alternatives

Alternative Solution and Estimated[1] Cost	Effectiveness (Safety, Cost, Environmental)		Potential Environmental Effects		Required Mitigation Measures
	Advantages	Disadvantages	Natural Environment	Social Environment	
1 – Do Nothing Maintain the status quo Estimate Life Cycle Cost: NA	• No construction work required	• Dam failure is likely to occur and will have safety and environmental impacts.	• Release of large quantities of sediment to downstream habitat • Sudden draining of lake resulting in immediate impacts to fish habitat • Impacts to vegetation	• Dam failure could cause property damage and safety concerns	N/A
2 – Complete dam and structure deconstruction and reconstruction Estimated construction cost: $679,375 (Excluding provisional allowances) Operation and Maintenance cost for alternatives 2 and 3 are the same	• Reduces the potential of a dam failure	• High costs • High impacts on the environment • Potential risk of impacts associated with weather events	• Increased impacts due to the creation of temporary diversion channel • Increased duration of site disturbance • Direct loss of vegetation due to required removal. • Potential impacts to reptiles and other ground-dwelling animals • Potential direct impacts to aquatic habitat from the placement of structures or fill below the high-water mark. • Potential for sediment or construction debris into the water.		N/A
3 – Embankment rehabilitation and control structure reconstruction Estimated construction cost: $565,622 (Excluding provisional allowances) Operation and Maintenance cost for alternatives 2 and 3 are the same	• Reduces the potential of a dam failure • Low environmental impacts • Low social environmental impacts		• Direct loss of vegetation due to required removal. • Potential impacts to reptiles and other ground-dwelling animals • Potential direct impacts to aquatic habitat from the placement of structures or fill below the high-water mark. • Potential for sediment or construction debris into the water.		• Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas. • All exposed soil areas should be stabilized and re-vegetated, upon completion of construction activities. • Disturbed natural areas should be restored to pre-construction conditions, or better. • Reduce the area of impact to the extent possible.

4.3.1 Alternative 1 – Do Nothing

The Do Nothing alternative would not resolve the current deficiencies of the dam, and in the event of catastrophic failure of the embankment or current structure, the impacts to the natural environment could include:

- Sudden release of massive volumes of water to Semicircle Creek with rapid escalation of erosive forces;
- Release of large quantities of sediment to downstream habitat in Semicircle Creek;
- Sudden drainage of lake environment resulting in immediate impacts to fish habitat, possible fish stranding and effects on fish year class strength.

There are no mitigation measures available to reduce impacts to the existing conditions, there is a high likelihood of a future dam failure which will cause large impacts to the surrounding environment and communities.

4.3.2 Alternative 2 – Complete embankment and Structure deconstruction and reconstruction

The complete reconstruction alternative will require the construction of a diversion channel around the entire work area to facilitate working "in the dry". This would result in increasing the disturbance footprint beyond the current embankment to facilitate construction of the diversion. The duration of the site disturbance would be increased, with greater risk of impacts associated with weather events occurring during the prolonged construction period. This alternative has higher impacts to the surrounding environment. The cost of replacement of the embankment would be higher than the rehabilitation in Alternative 3, the estimated cost not including HST or provisional allowances is $679,365 (Houle Chevrier, 2016).

4.3.3 Alternative 3 – Embankment rehabilitation and control structure reconstruction

This alternative does not require an increase to the footprint of the existing embankment and control structure. The works can be timed to commence soon after normal annual lake drawdown, and low winter flow movement from Shabomeka Lake to Semicircle Creek will be maintained during this portion of the work through the use of a temporary culvert or bypass pumping. This approach also shortens the duration of construction disturbance. This alternative reduces the construction impact zone to the existing dam location, does not create any new areas of disturbance and can be completed well within the winter period.

4.4 SELECTION OF PREFERRED PROJECT

Alternative 3 – Embankment rehabilitation and control structure reconstruction is the preferred alternative, as it reduces the construction impact zone to the existing dam location; does not

create any new areas of disturbance and can be completed well within the winter period when the lake levels are lowered on a typical annual basis, and when it will have the least social-economic disturbance.

4.5 NET ENVIRONMENTAL EFFECTS AND MITIGATION

This section describes recommended mitigation measures associated with potential effects of construction activities, and net effects after mitigation. Mitigation measures are presented in Table 4-3, and categorized by the potential effect on potentially-affected components of the natural environment and the socioeconomic environment.

Table 4-3: Preferred Alternative Mitigation Measures and Net Effects

Potential Effect	Mitigation Measures	Net Effects
Natural Environmental Effects		
Vegetation	• Reduce the area of impact to the extent possible. • Implement standard measures for erosion and sediment protection measures, including use of construction barrier fencing along natural areas, and re-vegetation of all disturbed substrates.	Minor direct loss to vegetation within the embankment and control structure area.
Soil Quality	• Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas • All exposed soil areas should be stabilized and re-vegetated, through the placement of seed and mulching or seed and an erosion control blanket, promptly upon completion of construction activities. • All sediment and erosion controls should be monitored regularly and properly maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is re-established. • Disturbed natural areas should be restored to pre-construction conditions, or better.	No net effects anticipated.
Water Quality	• Equipment should be refueled a minimum of 30 m away from the lake and creek to avoid potential impacts. In the event that an accidental spill occurs, spill control materials, should be kept on site to quickly address any accidental spills immediately.	No net effects anticipated
Terrestrial Habitat/ Wildlife	Standard mitigation measures are available to reduce potential for interaction with reptiles and other wildlife. • Reptile barrier fencing should be installed before any construction activity is initiated • If construction is initiated during turtle nesting season, a qualified biologist should visually inspect the site for turtle nests and adult turtles. • In the event reptiles are encountered during construction, work should be stopped until the reptiles are no longer present.	No net effects anticipated.
Aquatic Species/Habitat	Standard mitigation measures are available to reduce potential indirect impacts. • No in-water work or access should take place from May 1 to July 15.	Minor impacts to habitat associated with the embankment and structure anticipated.
Socioeconomic Environment		
Land/Water Use	The public safety signs that are presently in place should be re-installed on the rehabilitated dam.	No net effects anticipated.
Public Safety	• The public safety signs that are presently in place should be re-installed on the rehabilitated dam. • The design includes handrails on top of the gabion walls and the top of the concrete structure to avoid fall hazards.	No net effects anticipated.

5.0 PROJECT IMPLEMENTATION

This section provides an overview of the principal actives associated with implementing the Project, including general guidance for environmental permitting and approvals, construction activities and recommended mitigation measures.

5.1.1 Environmental Permits and Approvals

The implementation of all project activities assumes that all necessary federal, provincial and municipal permits and approvals will be obtained prior to initiating the project works. The following provides a summary of potential approvals that may be required.

- Fisheries Act Authorization (Fisheries and Oceans Canada);
- Endangered Species Act Overall Benefit Permit (Ontario Ministry of Natural Resources and Forestry);
- Lakes and Rivers Improvement Act Authorization (Ontario Ministry of Natural Resources and Forestry);
- Provincial Parks and Conservation Reserves Act (Ontario Ministry of Natural Resources and Forestry).

5.1.2 Construction Access and Management

The dam site is accessible via an existing road. Materials storage and stockpiling shall be placed outside of the regulatory floodplain where feasible. The contractor shall monitor the weather several days in advance of the onset of the project to ensure that the works will be conducted during favorable weather conditions. Should an unexpected storm arise, the contractor will remove all unfixed items from the Regional Storm Flood Plain that would have the potential to cause a spill or an obstruction to flow.

5.1.3 Sediment Management

Major dredging is not proposed as a part of this project, however as a result of construction activities it is possible that some material could wash into the water column while portions of the embankment are exposed. Specific erosion control measures will be specified in detailed designs and could include sediment and erosion control fencing, or a silt curtain placed in the water around the proposed area of construction. All dewatering/unwatering shall be treated and released to the environment at least 30 metres from area waterbodies and wetlands and allowed to drain through a well-vegetated area. No dewatering effluent shall be sent directly to any watercourse, wetland or forest, or allowed to drain onto disturbed soils within the work area. These control measures shall be monitored for effectiveness and maintained or revised to meet the objective of preventing the release of sediment laden water.

5.1.4 Site Restoration

Post-construction site restoration plans will be developed in detail during the detailed design stage of project implementation. Restoration activities may include revegetation of areas disturbed by equipment storage or materials stockpiles, excavation, or vegetation clearing for site access. Bare soils will be stabilized using either geotextile mats or reseeding, and excavated areas will be filled. Any signage removed during construction activities will be replaced. Aquatic and/or terrestrial habitat enhancement may also be included in designs.

5.1.5 Environmental Monitoring and Follow-up

5.1.5.1 Construction Mitigation and Monitoring

Sediment and Erosion Control

Mitigation measures for sedimentation, erosion and dust control should be implemented to prevent sediment and dust from entering sensitive natural features. The primary principles associated with sedimentation and erosion protection measures aim to minimize the duration of soil exposure; retain existing vegetation; encourage re-vegetation; reduce runoff and divert it away from exposed soils, and; trap sediment as close to the source as possible. To address these principles, the following mitigation measures are proposed:

- Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas.
- No equipment should be permitted to enter any natural areas beyond the vegetation protection fencing.
- All exposed soil areas should be stabilized and re-vegetated, through the placement of seed and mulching or seed and an erosion control blanket, promptly upon completion of construction activities.
- Equipment should be refueled a minimum of 30 m away from the lake and creek to avoid potential impacts, in the event that an accidental spill occurs. Spill control materials, including absorbent barriers and mats, should be kept on site to quickly address any addental spills immediately.
- In addition to any specified requirements, additional silt fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency.
- All sediment and erosion controls should be monitored regularly and properly maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is re-established.

- Disturbed natural areas should be restored to pre-construction conditions, or better.

Vegetation and Potential SAR Habitat

The primary mitigation strategy for direct loss of vegetation is to reduce the area of impact to the extent possible. Temporary removal of vegetation cover is mitigated using standard measures for erosion and sediment protection measures identified above.

Disturbance to nesting birds covered under the Migratory Birds Convention Act will be avoided as the construction phase will not commence until September.

Suitable maternity roost habitat may be surveyed prior to construction to determine presence/absence of SAR bats. Surveys will include identification of suitable snag trees during the winter months and acoustic monitoring during the peak maternity season (June). If SAR bats are detected, consultation with MNRF is required to determine authorization requirements under the ESA. Mitigation may include tree removal outside the maternity season, and compensation for loss of snag trees via installation of bat boxes or similar.

Wildlife

Reptile barrier fencing should be installed before any construction activity is initiated. Installation should occur before June 1 or after September 1, as this is during the reptile active season and outside of turtle nesting season. Reptile barrier fencing should follow Best Practice Technical Note – Reptile and Amphibian Exclusion Fencing (MNR 2013).

If construction is initiated during the turtle nesting season, the qualified biologist should also visually inspect the site for turtle nests and adult turtles, and direct installation of barrier fencing whereby all nests are avoided. The site should also be inspected to identify and avoid potential snake hibernacula if possible. If potential snake hibernacula features cannot be avoided, a qualified biologist should inspect the feature to determine use by snakes during the suitable season.

A thorough visual search of the area should be conducted by construction contractors each day to avoid interaction with reptiles. Visual searches should include inspection of the machinery and equipment, prior to starting equipment. In the event reptiles are encountered during construction work should be stopped until the reptiles are no longer present.

5.1.5.2 Operational Mitigation and Monitoring

It is recommended that additional public safety signs should be installed on the rehabilitated dam.

6.0 CONSULTATION

Details of the consultation activities undertaken for this EA study are provided under separate cover.

7.0 ADDENDA TO PROJECT PLANS

Comments raised in the 30-day public/agency review of a project plan may necessitate a change to the proposed undertaking. In such circumstances, where it is determined by a Conservation Authority in consultation with the undertaking's Community Liaison Committee and affected parties that the change is significant, an addendum to the Project Plan shall be prepared by the proponent Conservation Authority. During this time, no work will be undertaken which might adversely affect that part of the project being addressed by the proposed addendum. Where it is determined that the change is significant enough, in consultation with all who expressed an interest in the project, then a Conservation Authority may volunteer to prepare a new project plan or a new Environmental Study Report rather than an addendum.

The addendum shall describe the circumstances necessitating the change, the environmental implications of the change and what mitigation methods will be employed to mitigate negative environmental effects of the change. The addendum shall be filed with the Project Plan and a Notice of Filing of Addendum shall be issued in the same manner as the Notice of Filing for the ESR or Project Plan of the undertaking.

A period of 15 days following the issuance of a Notice of Filing of Addendum shall be provided by the proponent for public and agency review of the addendum. During this 15-day period, it may be requested that the undertaking, as documented in the addendum, be subject to a Part II Order, in accordance with the procedures set out in Section 7.0 of the Class EA document.

When the proposed change is in response to an emergency situation during construction of the undertaking or where a delay in the implementation of the change would result in detrimental environmental effects, the change would be implemented without delay and affected parties would be contacted. An addendum would subsequently be prepared for significant changes to the undertaking.

8.0 REFERENCES

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APPENDIX A: ENVIRONMENTAL INVENTORY

Stantec

Shabomeka Lake Dam Environmental Assessment - Environmental Inventory/Existing Conditions Report

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Mississippi Valley Conservation Authority

Prepared by:
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File 159100390
February 19, 2018

Sign-off Sheet

This document, entitled Shabomeka Lake Dam Environmental Assessment - Environmental Inventory/Existing Conditions Report was prepared by Stantec Consulting Ltd. ("Stantec") for the the Mississippi Valley Conservation Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) has been retained by the Mississippi Valley Conservation Authority (MVCA) to complete a Class Environmental Assessment and Preliminary Design for the Shabomeka Lake Dam (the Project). The Shabomeka Dam is located at the outlet of Shabomeka Lake (formerly known as Buck Lake) and discharges to Semicircle Creek, leading to Semicircle Lake which subsequently discharges to the southern end of Mazinaw Lake.

Shabomeka Lake is a headwater lake of the Missisippi River system, and is located approximately 10 kilometres northeast of Cloyne in the Township of North Frontenac. The natural heritage Study Area for the Project includes the immediate dam and control berm area, upstream and downstream aquatic and vegetation environments within 50m upstream and 50 m downstream of the dam, and an overview of the surrounding area (**Figure 1, Appendix A**).

1.1 HISTORY

The Shabomeka Lake Dam (formerly Buck Lake Dam) was originally constructed as a timber crib structure operated for log driving around the turn of the century. As the timber trade declined, the dam fell into disrepair. During the 1950's, Ontario Hydro reconstructed the dam for the Mississippi River Improvement Company (MRIC) to take over ownership (Trow, 2005).

During MRIC ownership the dam had undergone some major repair works in 1959 and 1970. The berm and dam structure was rehabilitated in 1988 to address structural, erosional and seepage problems, and included the removal of portions of the berm on either side of the sluiceway, clearing of the base of the lake upstream of the dam to facilitate stability of the structure on bedrock, reconstruction of the berm and repairs to the existing concrete sluiceway.

In January 1991, the MVCA assumed ownership of the dam, and maintained the same operating procedures. From June 14 to 17, 2002, there was over 150 millimetres of rainfall which caused overtopping of the earth embankments on both sides of the control structure (Trow, 2005).

Inspections of the dam conducted between 1990 and 2014 indicated the following deficiencies in the earth embankment and control structure:

- Seepage at the toe of the south embankment, and water flow due to seepage approximately half way up the slope of the north embankment
- Noticeable dips in the elevation of the north and south embankments at the control structures

- Several turtle holes and depressions along the edge of the north and south earth embankments which were considered as potential detriments to berm stability, as well as safety hazards for pedestrian movements
- Gabion baskets had settled and pulled away from the front face of the control structure, resulting in the safety railing become deformed and lifting off the deck of the control structure
- Longitudinal cracks were observed in the top of the north earth embankment on the upstream face of the dam in 2002
- Some erosion of the upstream faces of the earth embankments had occurred
- Locals had built rock dams below the outlet to make it easier to get across with ATVs, potentially causing serious impact to the structure during high flow periods due to the potential for backwater issues

In October 2015, Houle Chevrier Engineering carried out a visual inspection of the dam and provided a geotechnical review of the structure. As a result of the visual inspection, it was recommended that the dam be replaced with a new control structure being placed slightly north of the existing structure to avoid the known bedrock fault (Houle Chevrier 2016).

This Environmental Inventory / Existing Conditions report characterizes the significance and sensitivity of the natural features in the Study Area, and will be used to inform the analysis of dam rehabilitation alternatives, identify potential impacts of the project on these natural features, and recommend appropriate specific mitigation measures to avoid or minimize potential negative impacts once a preferred alternative is selected.

2.0 POLICY OVERVIEW

The natural heritage features and functions within the Study Area were assessed in accordance with the requirements of agency jurisdictions, and the policy and guideline documents described below.

2.1 MISSISSIPPI VALLEY CONSERVATION AUTHORITY

The Mississippi Valley Conservation Authority (MVCA) has the responsibility to regulate activities in wetlands, watercourses and hazard lands (e.g., areas in and near rivers, streams, floodplains, wetlands, slopes and shoreline) through the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (O. Reg. 153/06, also known as the "Generic Regulation"). The MVCA implements the regulation by issuing permits for works in or near watercourses, valleys, wetlands, or shorelines, when required.

Development within 120 m of all provincially significant wetlands (PSW) and areas within 30 m of all other wetlands greater than 0.5 ha in size is regulated by the MVCA. There is one unevaluated wetland within the Study Area, located immediately downstream of the dam and associated control berm.

MVCA is the current owner of the Shabomeka Lake Dam.

Under the Conservation Authorities Act, the MVCA has prime responsibility for water management, in terms of water quantity and hazards related to flooding and erosion within areas under its jurisdiction. Section 21(1) of the Act provides administrative powers to the Conservation Authority to, among other things, construct dams, control the flow of surface waters and divert or alter watercourses in order to prevent hazards related to flooding and erosion. The construction, operation, maintenance and retirement (i.e., decommissioning) of dams are valid activities pursuant to MVCA's mandate and are consistent with Water Management Policy in the Flood and Erosion Control Program Areas.

The Conservation Authorities Act, 1990 (CAA) was created in part to protect and manage water and other natural resources at the watershed level. The CAA is administered by the Ministry of Natural Resources and Forestry (MNRF); however, it enables Conservation Authorities with regulatory responsibility within their respective jurisdictions. Under Section 28 of the CAA and Ontario Regulation 97/04, Conservation Authorities may make regulations under their jurisdiction to prohibit, restrict, regulate or permit certain activities in and adjacent to watercourse, wetlands, valleylands, shorelines, and other hazards. Conservation Authorities represent both provincial and broader watershed interests in the watershed planning process.

Section 28 of the CAA and Ontario Regulation 97/04 is administered by Conservation Authority specific regulations. The Study Area is entirely with the jurisdiction of the MVCA and the implementing regulation is Ontario Regulation 153/06.

2.2 ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY

Specific to dams, the Ontario Ministry of Natural Resources and Forestry (MNRF) administers the Lakes and Rivers Improvement Act (LRIA). The purposes of the LRIA are outlined under Section 2 of the Act and include the following:

- the management, protection, preservation and use of the waters of the lakes and rivers of Ontario and the land under them
- the protection and equitable exercise of public rights in or over the waters of the lakes and rivers of Ontario
- the protection of the interests of riparian owners
- the management, perpetuation and use of the fish, wildlife and other natural resources dependent on the lakes and rivers
- the protection of the natural amenities of the lakes and rivers and their shores and banks,
- the protection of persons and of property by ensuring that dams are suitably located, constructed, operated and maintained

The LRIA requires dam owners to obtain approval from the Ministry of Natural Resources for:

- the construction of new dams
- certain repairs and alterations to existing dams
- certain water crossings and channelization works

MNRF also administers the Endangered Species Act.

2.3 ENDANGERED SPECIES ACT

Provincial species at risk are identified and assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO). The Ontario *Endangered Species Act* (ESA), 2007, protects species listed by COSSARO as threatened, endangered or extirpated in Ontario and their habitats by prohibiting anyone from killing, harming, harassing or possessing protected species, as well as prohibiting any damage or destruction to the habitat of the listed species. Under the ESA, all listed species are provided with general habitat protection aimed at protecting areas that species depend on to carry out their life processes such as reproduction, rearing, hibernation, migration or feeding. For some species, detailed habitat regulations have been passed that go

beyond the general habitat protection to define specifically the extent and character of protected habitats.

Activities that may impact a protected species or its habitat require a Permit from the Ministry of Natural Resources and Forestry (MNRF), unless the activities are exempted under the Regulation. The current Ontario Regulation 242/08 identifies activities which are exempt from the permitting requirements of the Act but which are subject to controls outside of the permit process, including registration of the activity and implementation of mitigation approaches. Activities that are not exempted under O. Reg. 242.08 require a complete permit application process.

Consultation with the MNRF, background review of species occurrences and targeted habitat assessments for species at risk determine whether species at risk have the potential to occur in the Study Area. Any species identified as having the potential to occur in the Study Area will be subject to the policies of the ESA.

2.4 FISHERIES ACT

The *Fisheries Act* prohibits causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans, Canada (DFO). This applies to activities in or near waterbodies that support fish that are part of or that support a commercial, recreational, or Aboriginal (CRA) fishery. Since November 25, 2013, proponents can assess projects under the Self-Assessment process. If a project meets the Self-Assessment criteria (DFO 2016), DFO review is not likely required. If the Self-Assessment criteria cannot be met, the proponent should contact DFO for a formal review and possible Authorization under the *Fisheries Act*.

2.5 MIGRATORY BIRD CONVENTION ACT

The federal *Migratory Birds Convention Act*, 1995 (MBCA) protects migratory birds and their nests (S.4). Section 6 of the Migratory Bird Regulations (C.R.C., c. 1035) prohibits the disturbance, destruction or taking of a nest, egg, or nest shelter of a migratory bird. Nest disturbance during the course of vegetation clearing for a project may be considered as “incidental take”, and could be seen as a contravention of the MBCA.

2.6 FISH AND WILDLIFE CONSERVATION ACT

Nests and eggs of wild birds that are not protected by the MBCA, such as raptors (e.g. owls, hawks, and osprey), are protected from harm by the provincial *Fish and Wildlife Conservation Act, 1997* (FWCA).

2.7 PROVINCIAL PARKS AND CONSERVATION RESERVES ACT

The project site is in close proximity to Bon Echo Provincial Park. Any work that is required to occur on regulated Crown Land requires authorization under the Provincial Parks and Conservation Reserves Act, subject to the approval of the park superintendent.

3.0 METHODS

The scope of this Environmental Inventory/Existing Conditions report was designed to encompass a review of background information and a single site visit to ground truth site conditions of the Project and document aquatic and terrestrial environments in the immediate vicinity. Specific methods for the Background Review, Site Investigations and Evaluation of Significance are provided below.

3.1 BACKGROUND REVIEW

Terrestrial background data applicable to the Study Area were obtained through a review of existing documents and information available online. Background resources reviewed included:

- Land Information Ontario (LIO) database (MNRF 2017)
- Natural Heritage Information Centre (NHIC) database (MNRF 2017)
- Ontario Breeding Bird Atlas (Cadman et al. 2007)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2017)
- Atlas of the Mammals of Ontario (Dobbyn, 1994)
- Bon Echo Provincial Park OLL Additions Field Reconnaissance Report (Ontario Parks, 2001)

The MNRF LIO website was accessed to determine the presence and extent of designated natural features that may be located in the Study Area.

The Ontario Reptile and Amphibian Atlas, Ontario Breeding Bird Atlas and the Atlas of the Mammals of Ontario were accessed to identify species with known ranges that overlap with the Study Area, including species at risk and provincially rare species. The NHIC database was also accessed on the MNRF LIO website to identify records of species at risk and provincially rare species in the vicinity of the Study Area.

In addition to the background data described above, Information Requests were sent to the MNRF and MVCA for natural heritage data, including records of species at risk, provincially rare species, and natural features.

Fish and fish habitat data applicable to the Study Area were obtained through the review of existing documents and information available online. The following background resources were reviewed:

- Land Information Ontario Database (MNRF 2017)
- Fisheries and Oceans Canada Species at Risk Maps (DFO 2017)

- State of the Lake Environment Reports for Shabomeka Lake (MVCA 1998, 2003, 2008, 2013)
- Shabomeka Lake Website (www.shabomekalake.com)
- Shabomeka Spring Littoral Index Netting (SLIN) 2006 Summary Report (MNRF, 2006)
- Status of Shabomeka Lake Trout Recreation Fishery Report (MNRF, 2001)

In addition to the aquatic data described above, an Information Request was submitted to the MNRF and MVCA to request information pertaining to thermal regime of aquatic habitats, fish communities and sensitive habitats.

3.2 FIELD INVESTIGATIONS

Background information was supplemented with a field visit on August 4, 2017 to document existing conditions within the Study Area. The purpose of the field visit was to verify conditions from the desktop review exercise, including ground truthing preliminary observations made from the examination of aerial photography. No comprehensive botanical or faunal surveys were completed. Site photos were taken and representative photos are in Appendix C.

3.2.1 Vegetation Surveys

The vegetation survey included a review of existing vegetation communities associated with the control berm and the immediate surrounding environment.

Vegetation community assessments were conducted using the protocols outlined in the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al. 1998). 2008 ELC code updates were used to classify vegetation communities that were not listed in the 1998 manual.

3.2.2 Wildlife and Wildlife Habitat

No formal wildlife surveys were conducted, however opportunistic sightings of wildlife and/or sign were recorded during the August 4, 2017 site visit. This was determined to be acceptable given that the area of future construction disturbance will be focused on the dam and berm area.

3.2.3 Aquatic Habitat Assessment

During the August 4, 2017 site visit, aquatic habitat was surveyed along the Shabomeka Lake shoreline on the upstream side of the dam and in Semicircle Creek downstream of the dam. The habitat survey consisted of a reconnaissance review of the lake and creek, (i.e. observations of dimensions, bank stability, morphology) and identification of features that typically contribute to fish habitat (i.e. in-water and riparian cover, substrate). Fish collections were not completed as part of the assessment given the availability of background information. Photographs were

taken and *in situ* water quality parameters (dissolved oxygen, conductivity, pH and temperature) were measured and recorded upstream and downstream of the dam.

4.0 RESULTS

4.1 BACKGROUND REVIEW

4.1.1 Landscape Context

The Study Area is located on the southern edge of the Canadian Shield, with physiographic landforms characterized by bare rock ridges and shallow till.

Shabomeka Lake lies within the Middle Ottawa Section of the Great Lakes – St. Lawrence Forest Region (Rowe 1972), which is a transition zone between the southern deciduous forests and the coniferous boreal forests of the north. Common upland tree species of the section include Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), Yellow Birch (*Betula alleghaniensis*), Red Maple (*Acer rubrum*), Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*) and Red Pine (*Pinus resinosa*). Also common are Balsam Fir (*Abies balsamea*), White Spruce (*Picea glauca*), Trembling Aspen (*Populus tremuloides*), White Birch (*Betula papyrifera*), Red Oak (*Quercus rubra*), and American Basswood (*Tilia americana*) (Ontario Parks, 2001).

The park is within Ecodistrict 5E-11, which includes the area between Algonquin Park to the north and the edge of the Canadian Shield to the south, and from the Ottawa Valley in the east to Lake Simcoe in the west (Ontario Parks, 2001).

4.1.2 Designated Areas

According to the LIO database, and consultation with MNRF and Ontario Parks staff, the Bon Echo Provincial Park boundary abuts the north shore of Shabomeka Lake and Semicircle Creek The park has been given a "Natural Environment" classification, and provides opportunities for high and low intensity recreational activities, while conserving natural and cultural features inside the park's 6,644 hectares.

Other than Bon Echo Provincial Park, there are no provincially designated natural areas, including: areas of natural and scientific interest (ANSIs), provincially significant wetlands (PSWs), environmentally significant areas (ESAs), national parks, or conservation areas within 120 metres of the Project site. An unevaluated wetland is located approximately 25 m downstream of the Project site on Semicircle Creek and also along the shoreline of Semicircle Creek (**Figures 1 and 2, Appendix A**).

4.1.3 Species at Risk and Provincially Rare Species

The search of various wildlife atlases identified 74 birds, 9 amphibians, 6 reptiles, and 34 mammals with ranges that have the potential to occur in the Study Area. Seven species at risk

and provincially rare species were identified as occurring in the square containing the Project site, as follows:

- **Birds:** Eastern Wood-Pewee (special concern)
- **Reptiles:** Common Five-lined Skink (Southern Shield population) (special concern);, Snapping Turtle (special concern), Blanding's Turtle (threatened)
- **Mammals:** Small-footed Myotis (endangered), Little Brown Myotis (endangered), Northern Myotis (endangered)

Four of these species are protected by the ESA: Blanding's Turtle, Small-footed Myotis, Little Brown Myotis and Northern Myotis. In addition to these, MNRF, in a response to an information request, indicated that Eastern Whip-poor-will (threatened) might be present in the area. The species is also protected by the ESA.

The complete list of wildlife, including scientific names, is provided in **Appendix B**.

The bird, mammal, reptile and amphibian range maps provided in the respective atlases are relatively coarse in nature and do not offer precise locations or information on concentrations / densities of records. For example, the Ontario Breeding Bird Atlas records are provided in 10 kilometre (km) by 10 km square grids. The NHIC database provides more precise mapping than the atlases (1 km by 1km squares) and is a better indicator of occurrence of significant species, particularly when used in combination with MNRF and MVCA correspondence. A review of the NHIC database identified records of the following species at risk/provincially rare (S3) species within 1 km of the Study Area (**Table 4-1**). Records in the NHIC database are considered historic (greater than 25 years old), as the last observations recorded were from 1954 for the two snake species, and from 1979 for the bladderwort. A review of the online NHIC records accessed through *Make a Map: Natural Heritage Areas* did not reveal any additional or new records associated with the Study Area.

Table 4-1 Species At Risk and Provincially Rare Species Records

Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status
Plant	Twin-stemmed Bladderwort	Utricularia geminiscapa	S3? S3?	END	END
Reptile	Eastern Ribbonsnake	Thamnophis sauritus	S3	SC	SC
Reptile	Eastern Milksnake	*Lampropeltis triangulum*	S3		SC

4.1.4 Aquatic Habitat Data

Shabomeka Lake reaches depths of approximately 32 metres at its deepest point and has a perimeter of approximately 14 kilometres. It is classified as supporting a cold-water fishery, with Lake Trout identified as a key species inhabiting the lake. Based on a review of data summarized in State of the Lake Reports prepared by MVCA for 1998, 2003, 2008 and 2013, the lake exhibits very good water quality and trends towards being oligotrophic, but has also occasionally exhibited characteristics associated with mesotrophic lakes. Oligotrophic lakes are deeper with very clear water, minimal nutrient inputs and subsequently little algae growth. Mesotrophic lakes are moderately enriched with some nutrient inputs, typically reflected in an increased level of algae and corresponding chlorophyll readings. Regardless of year to year variation in chlorophyll counts and sechhi disk readings, dissolved oxygen levels at greater depths remain high, which is a key component for optimal Lake Trout habitat.

Shabomeka Lake has been recognized by MNRF as key lake for Lake Trout (*Salvelinus namaycush)* management, and identifies the lake as a put-grow-take lake where stocking occurs to support recreational angling opportunities. Spawning habitat is available in the lake, however water level management surrounding the fall drawdown of the lake increases the possibility of exposure of potential spawning shoals which may affect the survival of eggs over the winter. There have been rehabilitation efforts on shoals along the south shore of the lake in the late 1980's, and Lake Trout were observed on one of the rehabilitation sites in 1990. From 2004 to 2006, additional efforts to encourage a native Lake Trout fishery were examined, including maintaining higher water levels during fall drawdown to keep potential spawning areas inundated to the extent possible. Follow-up monitoring suggested that modification to the water levels resulted in little change to the native population. Today, the lake continues to be managed as a put-grow-take fishery rather than a native fishery.

In addition to Lake Trout, data provided by MVCA, MNRF and information contained in State of the Lake reports indicates that the lake supports a variety of other fish species including:

- Lake Whitefish (*Coregonus clupeaformis*)
- Lake Herring (Cisco) (*Coregonus artedii*)
- Burbot (Ling) (*Lota lota*)
- Common White Sucker (*Catostomus commersonni*)
- Smallmouth Bass (*Micropterus dolomieu*)
- Largemouth Bass (*Micropterus salmoides*)
- Rock Bass (*Ambloplites rupestris*)
- Northern Pike (*Esox Lucius*)
- Sauger (*Sander Canadensis*)
- Yellow Perch (*Perca flavescens*)

- Pumpkinseed (*Lepomis gibbosus*)
- Northern Redbelly Dace (*Chrosomus eos*)
- Pearl Dace (*Chrosomus eos*)
- Brown Bullhead (*Ameiurus nebulosus*)

4.2 FIELD INVESTIGATIONS

4.2.1 Vegetation

The Study Area was characterized by a mixture of natural vegetation communities (forests and other treed areas, wetlands), and disturbed areas primarily associated with the dam and control berm, where the vegetation is maintained to prevent the establishment of deep rooting species that may compromise the integrity of the berm. The vegetation communities are summarized in **Table 4-2** and mapped on **Figure 2, Appendix A**. No provincially rare vegetation communities were identified.

Table 4-2 Ecological Land Classification (ELC) Vegetation Types

Property & ELC Vegetation Type	Community Description
SHORELINE COMMUNITIES	
OA Open Aquatic	These are the two open water areas, associated with Shabomeka Lake and Semicircle Creek, on either side of the control berm and dam structure.
MEADOW COMMUNITIES	
CUM1 Mineral Cultural Meadow	This community is present on the top and sides of the control berm and appears as a clearing between FOM to the north and FOD to the south. The community is forb-dominated, with aster (*Aster spp.*), milkweed (*Asclepias syriaca*), goldenrod (*Solidago sp.*), common primrose (*Primula vulgaris*), meadow rue (*Thalictrum sp.*), willow herb (*Epilobium sp.*), blackcurrant (*Ribes nigrum*), flowering raspberry (*Rubus odoratus*), common mullein (*Verbascum Thapsus*), thistle sp., Virginia creeper (*Parthenocissus quinquefolia*), with occasional shrubs of dogwood (*Cornus sp.*), alder (*Alnus sp.*) and whips of poplar (*Populus sp.*) and maple (*Acer sp.*). This area is subject to regular maintenance to prevent the establishment of woody vegetation.
FOREST COMMUNITIES	
FOM Mixed Forest	This upland forest community is extensive and widespread to the north of the dam and berm control structure (CUM1). A mix of coniferous and deciduous trees including maple, oak (*Quercus sp.*), white pine (*Pinus strobus*) and spruce (*Picea glauca*) typify this community. Staghorn sumac (*Rhus typhina*) grows along the edges associated with the disturbed control berm area.
FOD Deciduous Forest	This upland forest community is extensive and widespread to the south of the CUM1. It is dominated by deciduous species such as poplar, beech (*Fagus sp.*), maple, and oak intermixed with lesser numbers of white pine, cedar (*Thuja occidentalis*) and spruce.
MARSH COMMUNITIES	
MAS 3-1 Cattail Organic Shallow Marsh	This community extends along the north shoreline of Semicircle Creek to the northwest of the dam, and is mapped as an unevaluated wetland by LIO. It is dominated by narrow-leaved and broad-leaved cattails (*Typha sp.*) in variable proportions, established on organic soils.
MA Marsh	This is a small island in the mid-channel area of Semicircle Creek immediately downstream of the dam. The island supports growths of graminoid and forb vegetation

The CUM1 community associated with the control berm also contains some wetland species associated with the problem seepage areas on the creek side or western face of the dam. The seepage here is sufficient to provide a microenvironment for the establishment of species such as bracken fern (*Pteridium aquilinum*), sensitive fern *(Onoclea sensibilis)*, sedges (*Carex sp.*) and even occasional cattail. These species do not occur due to natural conditions, but rather are a

result of deficiencies in the dam structure, which will be corrected through the design and implementation of the preferred dam rehabilitation approach determined through the EA study.

4.2.2 Wildlife Observations

Two reptiles, or signs thereof, were observed during field investigations on August 4, 2017:

- Three Eastern garter snakes (*Thamnophis sirtalis sirtalis*) were observed within the top gabion basket on the south side of the dam control structure. In addition, MVCA field staff regularly see Northern water snakes around the dam during every inspection visit.
- Two turtle nests that had been predated were noted near the top of the control berm immediately south of the dam structure (**Figure 2, Appendix A**). The nest sites consisted of excavations and scattered egg shell fragments surrounding the opening. The species that created the nests is unknown.

4.2.2.1 Species at Risk and Provincially Rare Species

No targeted surveys were completed for species at risk given that the dam and berm are artificial structures subject to annual disturbance, and that habitat for rare species is not present on these structures.

Field investigations did not survey for presence / absence of endangered bat species, however they may use forested areas (FOD/FOM) in the Study Area for maternity roosts.

4.2.3 Aquatic Habitat Assessment

4.2.3.1 Shabomeka Lake

During the August 4 site visit, water levels in Shabomeka Lake were slightly elevated due to recent heavy rains. In the immediate area of the dam and berm, the shoreline is characterized by an approximate 3 m wide shallow shelf ranging in depth from 10 cm near the shore and sloping gradually to 40 cm at the extent of the shelf, where depth gradually drops off to 3 m in the central area approximately 15 m in front of the dam. In the shelf area, substrates consist of large fractured rock, smaller rounded cobbles and interspersed gravels. Off the south end of the berm exists an embayment where the shallow shelf extends approximately 15 m from the shoreline and deposition provides substrates suitable for the establishment of submerged and emergent aquatic vegetation.

Shoreline substrates are suitable for spawning areas for sunfish and cyprinids, and a single pumpkinseed was noted in the shallows just north of the sluice during the site visit. Although substrates in the shallows are suitable for smallmouth bass spawning areas, water depths, bass tend to prefer spawning areas in 1 to 5 m of water which are likely present in deeper water shoals offshore. They also tend to choose preferred substrates near some form of cover such as larger boulders or logs.

Water chemistry parameters were measured in situ within the entry sluice at a depth of approximately 1.5 m below surface and the following results were recorded:

- Temperature 23.7°C
- Dissolved Oxygen 8.8 mg/L
- Conductivity 65.9 µS/cm
- pH 7.66

In the entry sluice to the dam control structure, water depths are approximately 2 deep. Gabion baskets that line the sluice channel are filled with fractured rock that could provide some interstitial habitat for invertebrates. During the site visit, 7 smallmouth bass were observed holding in the sluice channel. The sluiceway does not provide any critical or specific habitat functions and the bass were likely holding in the area due to the current and possible feeding opportunities, such as seeking out small baitfish in the shallow shelves on either side of the sluice.

4.2.3.2 Semicircle Creek

The Shabomeka Lake dam discharges into a short tailrace that flows into a shallow riffle/run approximately 2 m in depth which extends for a distance of approximately 10 m downstream of the dam. Beyond this distance, flow velocities slow considerably in a low gradient environment where the creek is flanked by a large depositional wetland on its north shore. Substrates immediately downstream of the dam consist of large rounded cobble and gravels where flows are swift and provide scouring during elevated discharges from the lake. Approximately 5 m downstream of the dam, a cobble ridge exists where water depths are much shallower at 15cm. This is a fording location utilized by ATV's and other vehicles accessing the north shore of the lake, where cottages are water access only and no formal road access is available. During the August 4 site visit, ATVs were observed fording the creek on two occasions. As a result of this activity, habitat associated with the riffle downstream of the dam is considered disturbed, and periodic vehicle access would be considered a disruption to fish habitat function.

Water chemistry parameters were measured in situ within the entry sluice at a depth of approximately 0.5 m below surface and the following results were recorded:

- Temperature 23.7°C
- Dissolved Oxygen 8.8 mg/L
- Conductivity 65.5 µS/cm
- pH 7.77

No fish were observed in the creek during the August 4 assessment, however it is expected that a typical assemblage of baitfish would utilize the area immediately downstream of the dam for

feeding, particularly given that dam discharges produce turbulent waters with high oxygen content. Smaller fish that feed on plankton would also be attracted to the discharge to feed on floating organisms in the current from the tailrace. Fish resting in the riffle zone would be subject to periodic disturbance associated with ATVS and other vehicles driving through the creek at this location.

5.0 NATURAL FEATURES AND SENSITIVIES

The following natural heritage features were identified during the Background Review and Field Investigations:

- **Designated Natural Features** – Bon Echo Provincial Park abuts the north shore of Shabomeka Lake and Semicircle Creek. A mapped unevaluated wetland and other unassociated wetland vegetation is present approximately 25 m downstream of the dam and control berm. No other designated features are present in the vicinity of the Project.
- **Fish Habitat** – is present in Shabomeka Lake and Semicircle Creek
- **Other features** – turtle nesting evidence is often present on the top of the control berm.

The existing dam and control berm structure are artificial structures, which as noted in Section 1.1, have been subject to various maintenance and rehabilitation activities over the years. Vegetation associated with the berm is annually disturbed by cutting to ensure that woody vegetation and its root structure does not take hold and compromise the integrity of the dam. The structure and its immediate surrounding environs are disturbed environments with decreased sensitivity to any planned reconstruction of the dam.

As a result of previous disturbances, and ongoing annual disturbances associated with dam and berm maintenance, no sensitive habitats exist in the vicinity of the project area. The preferred alternative for rehabilitation/reconstruction of the dam should include a number of mitigation approaches that will reduce the risk of impact to upstream and downstream environments during construction, and restoration measures should be employed with the intent of re-establishing any minor habitat functionality following construction and stabilization.

6.0 POTENTIAL IMPACTS AND MITIGATION RECOMMENDATIONS

The potential impacts to natural features that might reasonably be expected to occur as a result of the proposed dam improvements have been preliminarily identified and discussed in this section. Potential direct and indirect impacts, associated with the Project have been considered and appropriate mitigation measures recommended.

6.1 POTENTIAL IMPACTS TO VEGETATION

Direct loss will occur where vegetation removal is required to facilitate construction, including temporary work areas. Direct loss of vegetation will be restricted to areas within the dam and berm area and additional property requirements for staging (yet to be identified).

Other potential impacts associated with the Project are limited, but could include siltation and / or spills of deleterious substances into natural areas, in particular nearby downstream wetlands. Sedimentation and spills may alter species composition in adjacent areas by smothering vegetation and introducing toxins and other substances that are harmful to vegetation and wildlife. Additional disturbance may be required to facilitate clean-up activities. Where they occur, these impacts are expected to be localized to the construction area and adjacent areas. Standard mitigation measures are available to reduce these potential indirect impacts to the extent possible.).

6.2 POTENTIAL IMPACTS TO WILDLIFE

Reptiles and other ground-dwelling animals may enter work areas from time to time. Interaction with wildlife during construction may result in direct mortality. Based on field observations of predated turtle nests and garter snakes in the gabion baskets associated with the sluiceway structure, there is potential for direct mortality of reptiles during construction. Snakes are particularly vulnerable during hibernation emergence, re-entrance and basking activities. The gabion basket structures would not be considered candidate hibernacula, as they are set below the waterline for most of the year, and above ground and susceptible to freezing during the winter period when hibernacula are typically used by snakes for overwintering. Turtles are vulnerable during hibernation and during nesting, and migration to and from overwintering sites. Standard mitigation measures are available to reduce potential for interaction with reptiles and other wildlife.

6.3 POTENTIAL IMPACTS TO AQUATIC HABITAT

Potential impacts to fish habitat can include direct habitat loss or indirect impacts to habitat.

Direct impacts may result from the placement of structures or fill below the high water mark, including any modifications to the lake shoreline and river banks associated with dam and berm. If an increase in the Project footprint is required, impacts related to loss of habitat from the increased footprint may be offset by creating or enhancing habitat conditions elsewhere. This may include substrate enhancements to promote spawning habitat.

Indirect impacts may result from the potential for sediment transport from exposed soil surfaces, potential entry of construction debris (e.g. concrete slurry, dust, etc.) into the water and spills associated with refueling of equipment. Sediment introductions can affect fish due to increased turbidity of the water column, which can impair vision and subsequent feeding by fish that are sight-hunters. Suspended sediments can also abrade gill membranes leading to physical stress, and impact prey organism's behavioral changes (i.e. avoidance, etc.). Heavier sediments can deposit on bottom substrates that may be used for spawning, incubation of juvenile fish, or food production, thereby impacting those habitat functions.

In general, potential impacts to aquatic habitat can be mitigated through site control measures, such as previously mentioned sediment and erosion controls, and other measures to prevent the entry of substances and debris into the water. If in-water work or access is required, construction timing windows can be employed to reduce the risk of impacts occurring during sensitive life periods such as spawning and emergence of young fish. For works in Shabomeka Lake or Semicircle Creek, no in-water work or access should take place from May 1 to July 15. Harm to fish can be reduced through isolation of work areas using coffer dams or other work area isolation techniques, removal of fish from the isolated area and performing works in the dry work area to reduce resuspension of sediments during construction. It may be preferable to schedule any dam reconstruction to the winter months, following the annual fall drawdown of the lake, when water levels are low and manageable. If active flow is present from the lake to Semicircle Creek, it can be maintained through a temporary culvert or pumping as required during construction activities.

6.4 ENVIRONMENTAL PROTECTION MEASURES

6.4.1 Sediment and Erosion Control

Mitigation measures for sedimentation, erosion, and dust control should be implemented to prevent sediment and dust from entering sensitive natural features. The primary principles associated with sedimentation and erosion protection measures are to: (1) minimize the duration of soil exposure; (2) retain existing vegetation, where feasible; (3) encourage re-vegetation; (4) divert runoff away from exposed soils; (5) keep runoff velocities low; and to (6) trap sediment as close to the source as possible. To address these principles, the following mitigation measures are proposed:

- Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas.

- No equipment should be permitted to enter any natural areas beyond the vegetation protection fencing.
- All exposed soil areas should be stabilized and re-vegetated, through the placement of seed and mulching or seed and an erosion control blanket, promptly upon completion of construction activities.
- Equipment should be re-fueled a minimum of 30 m away from the lake and creek to avoid potential impacts, in the event that an accidental spill occurs. Spill control materials, including absorbent barriers and mats, should be kept on site to quickly address any accidental spills immediately.
- In addition to any specified requirements, additional silt fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency.
- All sediment and erosion controls should be monitored regularly and properly maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is re-established.
- Disturbed natural areas should be restored to pre-construction conditions, or better.

6.4.2 Vegetation and Potential SAR Habitat

The primary mitigation strategy for direct loss of vegetation is to reduce the area of impact to the extent possible. Temporary removal of vegetation cover is mitigated using standard measures for erosion and sediment protection measures identified above, including use of construction barrier fencing along natural areas, and re-vegetation of all disturbed substrates using mixes of native seed suitable for site conditions.

Disturbance to nesting birds covered under the Migratory Birds Convention Act can be avoided through restriction of tree clearing activities between April 1 and August 31.

Suitable Habitat for SAR Bats

Suitable maternity roost habitat will be surveyed prior to construction to determine presence / absence of SAR bats. Surveys will include identification of suitable snag trees during leaf-off (winter months) and acoustic monitoring during the peak maternity season (June). If SAR bats are detected, consultation with MNRF is required to determine authorization requirements under the ESA. Mitigation may include tree removal outside the maternity season, and compensation for loss of snag trees via installation of bat boxes or similar.

6.4.3 Avoidance of Wildlife

Reptile barrier fencing should be installed before any construction activity is initiated if reptile movements into the construction zone pose a concern. Installation should occur before June 1 or after September 1 (i.e., during the reptile active season, and outside of turtle nesting season) to define work areas and inhibit the movement of reptiles into the area.

If construction is initiated during the turtle nesting season, the qualified biologist should also visually inspect the site for turtle nests and adult turtles and direct installation of barrier fencing whereby all nests are avoided. The site should also be inspected to identify and avoid potential snake hibernacula if possible. If potential snake hibernacula features cannot be avoided, a qualified biologist should inspect the feature to determine use by snakes during the suitable season. Typically snakes emerge on warm sunny days in the spring, bask in the sun on surrounding rocks (and potentially roads) to overcome the physiological effects of hibernation, and retreat to the hibernacula at night when temperatures are below freezing. After a few days or weeks, they begin to disperse to the summer range (SWHTG DSS; 2000).

A thorough visual search of the area should be conducted by construction contractors each day to avoid interaction with reptiles. Visual searches should include inspection of machinery and equipment, prior to starting equipment, particularly during the peak reptile activity period from April 15 to November 1. In the event reptiles are encountered during construction work at that location should be stopped until the reptiles are no longer present.

Specifications for reptile barrier fencing should follow Best Practices Technical Note – Reptile and Amphibian Exclusion Fencing (MNR 2013). A qualified biologist should be required as part of the construction contract to be onsite during the installation of reptile fencing to minimize potential for reptiles or habitat to be destroyed or disturbed during construction.

7.0 POTENTIAL AUTHORIZATION/APPROVAL REQUIREMENTS

Depending on the preferred design, a number of approvals or authorizations from various agencies may be required. The following provides a summary of potential approvals that should be considered, and will be determined more fully once the preferred design is selected.

7.1 FISHERIES ACT

The *Fisheries Act* prohibits projects causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to activities in or near waterbodies that support fish that are part of, or that support a commercial, recreational or Aboriginal (CRA) fishery. Since November 25, 2013, proponents can assess projects under DFO's Self-Assessment process. If the Self-Assessment criteria cannot be met, proponents should contact DFO to make a Request for Review which can lead to an advanced formal review of the project by a DFO biologist, resulting in a Letter of Advice or authorization under the *Fisheries Act*. The requirements for DFO involvement and the resulting process are usually determined at the detail design stage, when specific design elements that may potentially impact fish habitat are more clearly defined.

7.2 ENDANGERED SPECIES ACT

Authorization from MNRF is required for any work that may cause harm to ESA species. To determine authorization requirements under the ESA, an Information Gathering Form will be submitted to the MNRF for review and comment.

7.3 LAKES AND RIVERS IMPROVEMENT ACT

Under the Lakes and Rivers Improvement Act (LRIA), approval must be obtained from the MNR for:

- Dams;
- Water Crossings – Bridges, Culverts and Causeways;
- River Channels – Channelization of rivers, including dredging, diverting or enclosing a channel except for the installation or maintenance of a drain subject to the Drainage Act;
- Enclosures;
- Buried Pipelines and Cables – installing cables and pipelines where they will hold back, forward or divert water; or,
- Municipal and Other Drains.

Specific to dams, under Ontario Regulation 454/96, approval must be obtained from the MNRF to construct, decommission, alter, improve or repair a dam that holds back water in a river, lake, pond or stream to raise the water level, create a reservoir to control flooding or divert the flow of

water. The application under the *Lakes and Rivers Improvement Act* (LRIA) is required for all heights of dams on permanently flowing watercourses.

7.4 PROVINCIAL PARKS AND CONSERVATION RESERVES ACT

The Bon Echo Provincial Park boundary extends along the north shore of Shabomeka Lake and Semicircle Creek. The Study Area extends into the park boundary, and while the control structure is not within the park boundary, it appears that northern portions of the control berm may be. Any work that is required to occur on regulated Crown Land requires authorization under the Provincial Parks and Conservation Reserves Act, subject to the approval of the park superintendent. It is recommended that consultation be undertaken with Ontario Parks and the superintendent of Bon Echo Provincial Park during the design of the project and limits of any construction and staging areas to obtain clarification on the exact location of the park boundary in relation to the berm structure

8.0 SUMMARY

This Environmental Inventory/Existing Conditions report provides supporting documentation for the Project and describes vegetation communities, potential wildlife and aquatic habitat within the Study Area, and discusses various approvals that may be required for the Project.

The Study Area encompasses a mix of deciduous and coniferous forest environments flanking a disturbed cultural meadow area distinctly associated with the control berm. Subject to annual maintenance, the vegetation associated with the berm is common and widespread, and does not constitute a constraint to any construction activity.

Once the preferred alternative is selected, further recommendations regarding mitigation approaches will be provided, and any additional activities associate with pre-construction surveys such as to document presence / absence of snake hibernacula and / or turtle nesting areas in work areas, or the presence of bat maternity habitat in access road areas, can be identified.

9.0 REFERENCES

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APPENDIX A: FIGURES

Stantec

Legend

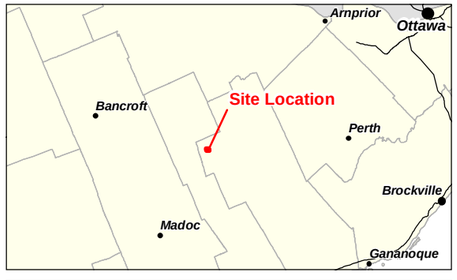
- Minor Road
- Watercourse (Intermittent)
- Provincial Park
- Wetland, Not evaluated per OWES

0 100 200 m

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery Date, 2008.



Project Location
Frontenac County

159100390 REVA
Prepared by PW on 2018-02-14
Technical Review by AW on 2018-02-14
Independent Review by SS on 2018-02-14

Client/Project

MISSISSIPPI VALLEY CONSERVATION AUTHORITY
SHABOMEKA LAKE DAM
ENVIRONMENTAL ASSESSMENT

Figure No.

1

Title

Project Location

Stantec

Legend

- Turtle Nesting Location
- Minor Road
- Watercourse (Intermittent)
- Provincial Park
- Wetland, Not evaluated per OWES
- ELC Vegetation Community

ELC Code	Description
CUM1	Mineral Cultural Meadow Ecosite
FOD	Deciduous Forest
FOM	Mixed Forest
MA	Marsh
MAS3-1	Cattail Organic Shallow Marsh Type
OA	Open Aquatic

0 25 50 m

1:1,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
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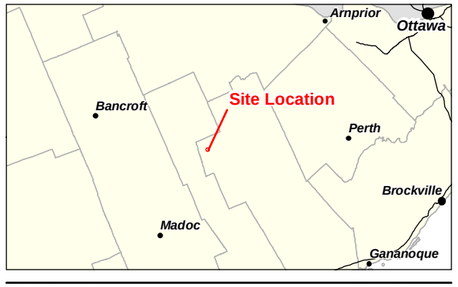

Project Location
Frontenac County

159100390 REVA
Prepared by PW on 2018-02-14
Technical Review by AW on 2018-02-14
Independent Review by SS on 2018-02-14

Client/Project
MISSISSIPPI VALLEY CONSERVATION AUTHORITY
SHABOMEKA LAKE DAM
ENVIRONMENTAL ASSESSMENT

Figure No.
2

Title
ELC Vegetation Communities

APPENDIX B: WILDLIFE SPECIES LIST

Appendix B Wildlife Species List compiled from Background Review

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC
AMPHIBIANS					
Northern Redback Salamander	*Plethodon cinereus*	S5	G5		
American Toad	*Anaxyrus americanus*	S5	G5		
Western Chorus Frog (great lakes - shield)	*Pseudacris triseriata*	S3	G5	NAR	THR
Spring Peeper	*Pseudacris crucifer*	S5	G5		
Bullfrog	*Lithobates catesbeiana*	S4	G5		
Northern Green Frog	*Lithobates clamitans*	S5	G5		
Pickerel Frog	*Lithobates palustris*	S4	G5	NAR	NAR
Wood Frog	*Lithobates sylvatica*	S5	G5		
Northern Leopard Frog	*Lithobates pipiens*	S5	G5	NAR	NAR
REPTILES					
Snapping Turtle	*Chelydra serpentina*	S3	G5	SC	SC
Blanding's Turtle	*Emydoidea blandingi*	S3	G4	THR	THR
Five-lined Skink (south shield)	*Eumeces fasciatus*	S3	G5	SC	SC
Eastern Gartersnake	*Thamnophis sirtalis*	S5	G5		
Northern Watersnake	*Nerodia sipedon sipedon*	S5	G5T5	NAR	NAR
Smooth Greensnake	*Opheodrys vernalis*	S4	G5		
BIRDS					
Wood Duck	*Aix sponsa*	S5	G5		
American Black Duck	*Anas rubripes*	S4	G5		
Mallard	*Anas platyrhynchos*	S5	G5		
Hooded Merganser	*Lophodytes cucullatus*	S5B,S5N	G5		
Common Merganser	*Mergus merganser*	S5B,S5N	G5		
Ruffed Grouse	*Bonasa umbellus*	S5	G5		
Wild Turkey	*Meleagris gallopava*	S5	G5		
Common Loon	*Gavia immer*	S5B,S5N	G5	NAR	NAR
American Bittern	*Botaurus lentiginosus*	S4B	G4		
Great Blue Heron	*Ardea herodias*	S5	G5		
Osprey	*Pandion haliaetus*	S5B	G5		
Red-shouldered Hawk	*Buteo lineatus*	S4B	G5		NAR
Red-tailed Hawk	*Buteo jamaicensis*	S5	G5	NAR	NAR
Virginia Rail	*Rallus limicola*	S5B	G5		
Spotted Sandpiper	*Actitis macularia*	S5	G5		
American Woodcock	*Scolopax minor*	S4B	G5		
Mourning Dove	*Zenaida macroura*	S5	G5		
Ruby-throated Hummingbird	*Archilochus colubris*	S5B	G5		
Yellow-bellied Sapsucker	*Sphyrapicus varius*	S5B	G5		
Downy Woodpecker	*Picoides pubescens*	S5	G5		
Hairy Woodpecker	*Picoides villosus*	S5	G5		
Northern Flicker	*Colaptes auratus*	S4B	G5		
Pileated Woodpecker	*Dryocopus pileatus*	S5	G5		

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC
Eastern Wood-Pewee	*Contopus virens*	S4B	G5	SC	SC-NS
Least Flycatcher	*Empidonax minimus*	S4B	G5		
Eastern Phoebe	*Sayornis phoebe*	S5B	G5		
Great Crested Flycatcher	*Myiarchus crinitus*	S4B	G5		
Eastern Kingbird	*Tyrannus tyrannus*	S4B	G5		
Blue-headed Vireo	*Vireo solitarius*	S5B	G5		
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5		
Blue Jay	*Cyanocitta cristata*	S5	G5		
American Crow	*Corvus brachyrhynchos*	S5B	G5		
Common Raven	*Corvus corax*	S5	G5		
Tree Swallow	*Tachycineta bicolor*	S4B	G5		
Black-capped Chickadee	*Poecile atricapillus*	S5	G5		
Red-breasted Nuthatch	*Sitta canadensis*	S5	G5		
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5		
Brown Creeper	*Certhia americana*	S5B	G5		
Winter Wren	*Troglodytes hiemalis*	S5B	G5		
Sedge Wren	*Cistothorus platensis*	S4B	G5	NAR	NAR
Marsh Wren	*Cistothorus palustris*	S4B	G5		
Veery	*Catharus fuscescens*	S4B	G5		
Swainson's Thrush	*Catharus ustulatus*	S4B	G5		
American Robin	*Turdus migratorius*	S5B	G5		
Gray Catbird	*Dumetella carolinensis*	S4B	G5		
Brown Thrasher	*Toxostoma rufum*	S4B	G5		
European Starling	*Sturnus vulgaris*	SNA	G5		
Cedar Waxwing	*Bombycilla cedrorum*	S5B	G5		
Ovenbird	*Seiurus aurocapilla*	S4B	G5		
Northern Waterthrush	*Parkesia noveboracensis*	S5B	G5		
Black-and-white Warbler	*Mniotilta varia*	S5B	G5		
Tennessee Warbler	*Oreothlypis peregrina*	S5B	G5		
Common Yellowthroat	*Geothlypis trichas*	S5B	G5		
American Redstart	*Setophaga ruticilla*	S5B	G5		
Blackburnian Warbler	*Setophaga fusca*	S5B	G5		
Yellow Warbler	*Setophaga petechia*	S5B	G5		
Chestnut-sided Warbler	*Setophaga pensylvanica*	S5B	G5		
Black-throated Blue Warbler	*Setophaga caerulescens*	S5B	G5		
Pine Warbler	*Setophaga pinus*	S5B	G5		
Yellow-rumped Warbler	*Setophaga coronata*	S5B	G5		
Black-throated Green Warbler	*Setophaga virens*	S5B	G5		
Eastern Towhee	*Pipilo erythrophthalmus*	S4B	G5		
Chipping Sparrow	*Spizella passerina*	S5B	G5		
Field Sparrow	*Spizella pusilla*	S4B	G5		
Song Sparrow	*Melospiza melodia*	S5B	G5		

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC
Swamp Sparrow	*Melospiza georgiana*	S5B	G5		
White-throated Sparrow	*Zonotrichia albicollis*	S5B	G5		
Scarlet Tanager	*Piranga olivacea*	S4B	G5		
Indigo Bunting	*Passerina cyanea*	S4B	G5		
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5		
Common Grackle	*Quiscalus quiscula*	S5B	G5		
Baltimore Oriole	*Icterus galbula*	S4B	G5		
Purple Finch	*Haemorhouspurpureus*	S4B	G5		
American Goldfinch	*Carduelis tristis*	S5B	G5		
MAMMALS					
Pygmy Shrew	*Sorex hoyi*	S4	G5		
Northern Short-tailed Shrew	*Blarina brevicauda*	S5	G5		
Star-nosed Mole	*Condylura cristata*	S5	G5		
Small-footed Myotis	*Myotis leibii*	S2S3	G3	END	
Little Brown Myotis	*Myotis lucifugus*	S4	G5	END	END
Northern Myotis	*Myotis septentrionalis*	S3?	G4	END	END
Eastern Cottontail	*Sylvilagus floridanus*	S5	G5		
Snowshoe Hare	*Lepus americanus*	S5	G5		
European Hare	*Lepus europaeus*	SNA	G5		
Eastern Chipmunk	*Tamias striatus*	S5	G5		
Woodchuck	*Marmota monax*	S5	G5		
Grey Squirrel	*Sciurus carolinensis*	S5	G5		
Red Squirrel	*Tamiasciurus hudsonicus*	S5	G5		
Beaver	*Castor canadensis*	S5	G5		
White-footed Mouse	*Peromyscus leucopus*	S5	G5		
Muskrat	*Ondatra zibethicus*	S5	G5		
Meadow Vole	*Microtus pennsylvanicus*	S5	G5		
Porcupine	*Erethizon dorsatum*	S5	G5		
Coyote	*Canis latrans*	S5	G5		
Grey Wolf	*Canis lupus occidentalis*	S4	G4	NAR	NAR
Red Fox	*Vulpes vulpes*	S5	G5		
Black Bear	*Ursus americanus*	S5	G5	NAR	NAR
Raccoon	*Procyon lotor*	S5	G5		
Marten	*Martes americana*	S5	G5		
Fisher	*Martes pennanti*	S5	G5		
Ermine	*Mustela erminea*	S5	G5		
Long-tailed Weasel	*Mustela frenata*	S4	G5		
Mink	*Mustela vison*	S4	G5		
Striped Skunk	*Mephitis mephitis*	S5	G5		
River Otter	*Lutra canadensis*	S5	G5		
Lynx	*Lynx canadensis*	S5	G5		NAR
Bobcat	*Lynx rufus*	S4	G5		

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC
White-tailed Deer	*Odocoileus virginianus*	S5	G5		
Moose	*Alces alces*	S5	G5		

SUMMARY	
Total Amphibians:	***9***
Total Reptiles:	***6***
Total Birds:	***74***
Total Mammals:	***34***

SIGNIFICANT SPECIES	
Global (G1-G3):	***1***
National (SC, THR, END):	***7***
Provincial (SC, THR, END):	***7***

Explanation of Status and Acronyms

COSSARO: Committee on the Status of Species at Risk in Ontario

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

REGION: Rare in a Site Region

S1: Critically Imperiled—Critically imperiled in the province (often 5 or fewer occurrences)

S2: Imperiled—Imperiled in the province, very few populations (often 20 or fewer),

S3: Vulnerable—Vulnerable in the province, relatively few populations (often 80 or fewer)

S4: Apparently Secure—Uncommon but not rare

S5: Secure—Common, widespread, and abundant in the province

SX: Presumed extirpated

SH: Possibly Extirpated (Historical)

SNR: Unranked

SU: Unrankable—Currently unrankable due to lack of information

SNA: Not applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species

S#B- Breeding status rank

S#N- Non Breeding status rank

?: Indicates uncertainty in the assigned rank

G1: Extremely rare globally; usually fewer than 5 occurrences in the overall range

G1G2: Extremely rare to very rare globally

G2: Very rare globally; usually between 5-10 occurrences in the overall range

G2G3: Very rare to uncommon globally

G3: Rare to uncommon globally; usually between 20-100 occurrences

G3G4: Rare to common globally

G4: Common globally; usually more than 100 occurrences in the overall range

G4G5: Common to very common globally

G5: Very common globally; demonstrably secure

GU: Status uncertain, often because of low search effort or cryptic nature of the species; more data needed.

GNR: Unranked—Global rank not yet assessed.

T: Denotes that the rank applies to a subspecies or variety

Q: Denotes that the taxonomic status of the species, subspecies, or variety is **questionable**.

END: Endangered

THR: Threatened

SC: Special Concern

2, 3 or NS after a COSEWIC ranking indicates the species is either on Schedule 2, Schedule 3 or No Schedule of the Species At Risk Act (SARA)

NAR: Not At Risk

IND: Indeterminant, insufficient information to assign status

DD: Data Deficient

6: Rare in Site Region 6

7: Rare in Site Region 7

Area: Minimum patch size for area-sensitive species (ha)

H- highly significant in Hamilton Region (i.e. rare)

m- moderately significant in Hamilton Region (i.e. uncommon)

L1- extremely rare locally (Toronto Region)

L2- very rare locally (Toronto Region)

L3- rare to uncommon locally (Toronto Region)

HR- rare in Halton Region, highly significant

HU- uncommon in Halton Region, moderately significant

* The Pileated Woodpecker will incorporate smaller woodlots into its homerange, therefore it may not be a true area-sensitive species (Naylor et al. 1996)

LATEST STATUS UPDATE

Odonata: April 2015

Butterflies: July 2014

Bumble Bees: January 2016

Other Arthropods: July 2014

Terrestrial Molluscs: January 2016

Amphibans: July 2014

Reptiles: April 2015

Birds: January 2016

Mammals: January 2016

S and G ranks and explanations: December 2011

NOTE

All rankings for birds refer to breeding birds unless the ranking is followed by N

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COSEWIC Status

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APPENDIX C:
SITE PHOTO LOG

Stantec

Berm south of sluice structure.

Berm north of sluice structure.

Cut vegetation on berm north of sluice structure.

Shoreline substrates looking at staff gauge in lake.

Lake embayment at end of south berm.

Entrance to sluice.

Turtle nest and egg fragments on south berm.

Eastern garter snake on south gabions.

Semicircle Creek immediately downstream of sluice.

Wetland fringe on Semicircle Creek

ATV trail to stream crossing south of dam. Note seepage along edge of berm.

Seepage along front edge of north berm. Note wetland vegetation (sedges).

ATV fording location in front of dam.

ATV crossing Semicircle Creek downstream of dam.

Berms flanking sluice structure, taken from south berm looking north.

All photos taken August 4, 2017.