Conservation Halton

BOARD OF DIRECTORS

Meeting Number:	04 17
Date of Meeting:	**Thursday, May 25, 2017**
Time of Meeting:	1130 - 400 Tour 4:00 – 7:00 Meeting
Place of Meeting:	Kelso Conservation Area 5234 Kelso Road, Milton Telephone: 905.336.1158 x 2236

AGENDA

Tour Itinerary:

Please dress appropriately for this event. If you have safety boots/shoes they will be required at the Kelso Dam site.

11:30 – 12:30	Lunch at Kelso Summit – meet at winter rental shop parking area
1:15 – 2:00	Stewardship Projects in Halton Hills Allworth Property and Merrybrook Farm
2:30 – 3:00	Channel Design and Modern Subdivision Planning Framgard, Milton
3:20 – 3:45	Kelso Quarry Restoration Restoring former aggregate lands to provide enhanced natural spaces
4:00 – 4:30	Kelso Dam Behind the Scenes Tour and Planned Repairs
4:30 – 6:30	Board Meeting at Kelso Museum Building

Board Meeting

		Page
1.	**Acceptance of Agenda as distributed**	
2.	**Disclosure of Pecuniary Interest for Board of Directors**	
3.	**Consent Items**	
3.1	Roll Call & Mileage	
3.2	Approval of Board of Directors Minutes dated April 27, 2017	
3.3	Conservation Halton Ecological Monitoring Protocols	1-33
3.4	Briefing Notes:	
	Kelso Dam Update	34-35
	Letter from Resident and CH Response	36-39

4. **Action Item**

4.1	Budget Variance Report for the period ended March 31, 2017 Report #: CHBD 04 17 01	40-45
4.2	Electronic Commerce Services Report #: CHBD 04 17 02	46-49
4.3	Kelso Dam Contract Award Report #: CHBD 04 17 03	50-52
4.4	Green Infrastructure Feasibility Study – Administration and Kelso Land Holdings Report #: CHBD 04 17 04	53-54

5. **Other Business**

5.1 Verbal Briefing on changes to OMB and Coordinated Plan Review
Barbara Veale, Director, Planning & Regulations

5.2 Strategy Session on the use of Development Contributed Funds for park capital projects.
Facilitated by Mr. Pat Moyle

6. **Adjournment**

Conservation Halton
Administration Office
2596 Britannia Road West
Burlington ON L7P 0G3
905 336 1158 Phone
905 336 7014 Fax
Website: conservationhalton.ca

Memo

To: Conservation Halton Board of Directors

From: Kim Barrett, Associate Director, Science and Partnerships
905-336-1158 x 2229

Date: May 25, 2017

Subject: Conservation Halton Ecological Monitoring Protocols

This memorandum provides an overview of Conservation Halton's Ecological Monitoring Protocols (2017). The primary target audience for the document is biological consultants working on behalf of the development community. The impetus behind this document was the desire to provide better customer service in terms of clearly and consistently communicating expectations for development-driven monitoring programs. It is the formalization and publication of internal protocols that have been in use at CH for many years and previously shared externally in an *ad hoc* manner.

Background

Conservation Halton's Long-term Environmental Monitoring Program (LEMP) was first initiated in 2005. Since that time, staff have used science-based monitoring protocols, many of which are provincial standards, to monitor both the biotic and abiotic features within the aquatic and terrestrial ecosystems across the Conservation Halton watershed.

While the LEMP is effective in monitoring long-term changes at set monitoring stations, ecological information is lacking in areas that are currently most under threat from development and alteration in the watershed; a watershed that is specifically identified in the provincial *Places to Grow Act (2005)* as an area of settlement. While the *Places to Grow Act* recognizes the need to accommodate future population growth and support economic prosperity, one of the main purposes of the Act was to "enable decisions about growth to be made in ways that sustain a

robust economy, build strong communities and promote a healthy environment and a culture of conservation" (Province of Ontario 2005). In doing so, growth areas and natural landscapes must coexist together, without one element impacting the other. In order for this to happen, sound decision-making and planning must occur in order to ensure that ecological integrity is maintained.

Ecological inventories and monitoring provides the baseline information for these decisions to be made. Baseline studies to address aquatic and terrestrial species and their habitats, groundwater conditions, water quality conditions etc. are all used to ensure that the form and function of the natural environment is maintained. Similarly, long-term monitoring of the same parameters helps identify potential concerns and effects that may limit or decrease ecological health, which helps practitioners address concerns and learn from mistakes. Unfortunately, the monitoring and inventory component of a project is often not considered as important and instead is often thought of as a hindrance in moving projects forward in a timely and cost effective manner. Within the Conservation Halton watershed and across Southern Ontario, this has resulted in inadequate data collection to guide decisions through the planning process as well as the required information to assess impacts from landscape changes within the watershed.

In an effort to remedy this situation and to incorporate additional high quality data into Conservation Halton's Long-term Environmental Monitoring Program, Conservation Halton has developed this external guide of approved monitoring protocols and methodologies for data collection within the Conservation Halton watershed and where applicable, across Southern Ontario. The guide outlines the specific methodologies that are recommended for use in the Conservation Halton watershed, with additional details pertaining to how data should be collected, analyzed and provided to Conservation Halton as part of baseline inventories or long-term monitoring initiatives related to land use changes within the watershed.

Key Benefits

- Coordination of monitoring techniques between CH and others will allow for data to be compared. This strengthens the ability of all parties to interpret the results of their analyses, and in many cases the data are also submitted to provincial and/or national data repositories.
- The document provides consistency in what is requested of development proponents from one project to the next and fills a void that previously existed. This provides enhanced customer service to the development community.
- The use of standardized techniques allows for external data to be incorporated into CH holdings which further strengthens our decision-making abilities.
- The document facilitates connectivity and collaboration between the Science and Partnerships, and Planning and Regulations departments within CH.

Conservation Halton
Ecological Monitoring Protocols

Version 1.0

February 2017

Conservation Halton

Table of Contents

1 Introduction

Conservation Halton's Long-term Environmental Monitoring Program (LEMP) was first initiated in 2005 with the completion of the Sixteen Mile Creek monitoring project. Since that time, staff have used scientifically-based monitoring protocols to monitor both the biotic and abiotic features within the aquatic and terrestrial ecosystems across the Conservation Halton watershed. In doing so, ecological information has been collected to support planning initiatives within the watershed while also addressing the core monitoring question ***"Is the health of the Conservation Halton watershed changing over time?"*** (Conservation Halton 2005).To answer this question, Conservation Halton has incorporated scientifically-based monitoring protocols, many of which are provincial standards, into the monitoring program. After ten years of monitoring staff ecologists are starting to identify trends in watershed health and are investigating ways to reverse and prevent decreases in ecological health.

While the LEMP is effective in monitoring long-term changes at set monitoring stations, ecological information is lacking in areas that are currently most under threat from development and alteration in the watershed; a watershed that is specifically identified in the provincial *Places to Grow Act (2005)* as an area of settlement. While the *Places to Grow Act* recognizes the need to accommodate future population growth and support economic prosperity, one of the main purposes of the act was to "enable decisions about growth to be made in ways that sustain a robust economy, build strong communities and promote a healthy environment and a culture of conservation" (Province of Ontario 2005). In doing so, growth areas and natural landscapes must coexist together, without one element impacting the other. In order for this to happen, sound decision making and planning must occur in order to ensure that ecologically integrity is maintained.

Ecological inventories and monitoring provides the baseline information for these decisions to be made. Baseline studies to address aquatic and terrestrial species and their habitats, groundwater conditions, water quality conditions etc. are all used to both ensure that the form and function of the natural environment is maintained and healthy while also ensuring that risk to infrastructure is low and community safety remains a priority. Similarly, long-term monitoring of the same parameters helps identify potential concerns and effects that may limit or decrease ecological health, which helps practitioners address concerns and learn from mistakes. Unfortunately, the monitoring and inventory component of a project is often not considered as important and instead is often thought of as a hindrance in moving projects forward in a timely and cost-effective manner. Within the Conservation Halton watershed and across Southern Ontario, this has resulted in inadequate data collection to address both the needs to guide decisions through the planning process as well as the required information to assess impacts from landscape changes within the watershed.

In an effort to remedy this situation and to incorporate additional high quality data into Conservation Haltons Long-term Environmental Monitoring Program, Conservation Halton has developed this external guide of approved monitoring protocols and methodologies for data collection within the Conservation Halton watershed and where applicable, across Southern Ontario. The guide outlines the specific methodologies that are recommended for use in the Conservation Halton watershed, with additional details pertaining to how data should be collected, analyzed and provided to Conservation Halton as part of baseline inventories or long-term monitoring initiatives related to landuse changes within the watershed.

1.1 Monitoring Questions and Study Design

While the Conservation Halton Long-term Environmental Monitoring Program was developed to answer the question ***"Is the health of the Conservation Halton watershed changing over time?"***, the program was not intended to address other monitoring questions related to localized projects on the landscape (for e.g. whether a storm water management pond is having an immediate effect on water temperature and quality

in the immediate reaches downstream). These monitoring initiatives, specifically those related to urban, commercial or residential growth, require additional monitoring identified in the early stages of the project to address questions related to the specific project. Monitoring only to fulfil planning requirements is no longer adequate and does not provide a mechanism by which impacts can be clearly identified and improvements can be made. Instead, efforts to identify clear ***monitoring questions*** should be implemented. These questions should be developed up-front, in collaboration with stake holders, partners and those who will be evaluating the monitoring to ensure that the goals of the monitoring program fit the needs of the project. Similarly, the monitoring question will help to identify what features need to be monitored, how the monitoring will be completed, how the data will be analyzed and most importantly at what threshold the results indicate that an impact has occurred. This information will help guide the monitoring initiatives and when followed properly will help to identify impacts and as equally as important, help to identify what techniques work to on the landscape.

As part of the initial stages of any monitoring project, a thorough examination of the study design should be completed. This would involve a thorough understanding of the monitoring question, consideration of whether the monitoring study relates to temporal or spatial change and how the data will be analyzed. Only once these components of the study design have been determined, can data collection begin.

1.2 Inventories vs. Long-term Monitoring

Ecological "inventories" and "monitoring" terminology has been long been used as synonyms however, these two types of survey methodologies are quite distinct. Ecological inventories are typically used in the early stages of a project to characterize a site and obtain as much baseline information on the species, habitats and physical and chemical environments within a study area. While these inventories often used science-based monitoring protocols, they can also include random observations and searches for species and habitats, such as rare species, that are often missed using standardized monitoring protocols. Conversely, long-term monitoring programs are similar to inventories in the sense that they collect the same types of data and can use similar protocols; however data collected as part of a monitoring program is typically collected over a number of years at a number of set locations and limits the amount of random observations collected in an area. Long-term monitoring programs instead provide a thorough understanding of what is happening at a point in time, over a longer period of time and at a more specific location within a study area.

Both of these survey methodologies are important components of any project where change may occur within the local environment. In the initial stages, multiple inventories across an entire study area helps to characterize a site and identify any environmental, cultural of socioeconomic concerns within the area. This information is then used to assist land-use planners, ecologists and engineers in determining the best ways to help mitigate issues or concerns within the study area. Once baseline information is collected and projects move forward, monitoring of specific sites within the study area help identify whether change is occurring and information collected can help to direct those involved in the project to address impacts as they occur.

While inventories and monitoring programs may be different in scope, a well thought-out monitoring program can use the baseline inventories as "Year 1" of a long-term monitoring program. That is to say, that well-thought out inventories are the initial stages of long-term monitoring programs and as such, they should be initiated with an understanding of how the information can be collected, analyzed and used in subsequent monitoring programs. Similarly, how and where the inventories are completed within an area should also consider where future monitoring stations can be initiated.

While most baseline inventories can be used as the initial stages of a long-term monitoring program, it is recognized that randomized observations that are not collected according to protocol but are helpful in characterizing an area are not suited to long-term monitoring programs due to the random and non-repeatable nature of the survey type. However, very few inventories are truly random enough to not be

replicated in future years and as such, a thorough understanding of future goals, study designs and monitoring questions should be considered in the initial stages of a project when inventories are conducted.

1.3 Monitoring Protocols

The following sections outline a number of protocols recommended for use within the Conservation Halton watershed. While a number of other protocols may allow for sufficient data collection, the protocols recommended herein are those that are currently in use as part of Conservation Halton's Long-term Environmental Monitoring Program and as a result, parameters collected as part of the program follows those of the recommended protocols. Information collected as part of the LEMP can then be compared against similar local monitoring programs following the same protocols for data collection.

Data collected as part of the LEMP is available to provide background information for projects within the watershed. Available data holdings and a data request form can be found on the Conservation Halton website at: **http://www.conservationhalton.ca/mapping-and-data**

2 Aquatic Monitoring

2.1 Fish Community

Fish are often used as indicators of aquatic health as individual species have preferred habitats types, thermal requirements and sensitivities to disturbance. As a result, fish are often used as surrogates when information is lacking (e.g. coldwater species being indicative of ground water discharge). The presence or absence of species within a site can help one determine aquatic health and identify impacts.

Methodology

Fish community data can be collected through a variety of methods and high quality data may require more than one sampling methodology to be used in order to obtain a comprehensive understanding of the fish community present at a site. Alternative methodologies may also be required to minimize harm to species at risk in occupied, historical or potential habitats. As a result, it is recommended that the proponent complete both a thorough search to locate historical records and contact local and provincial agencies to obtain fisheries data prior to sampling.

The Ontario Stream Assessment Protocol (OSAP) Section 1 Module 3 is the recommended methodology used to sample the fish community (Stanfield 2005). According to this protocol, sampling stations are first identified by locating both an upstream and downstream crossover that are separated by a minimum of 40 metres and are comprised of at least one riffle/pool sequence. Once identified, the sampling station is sampled using a backpack electrofishing unit progressing across all available habitats from bank to bank. The amount of effort expended at each sampling station is dependent on the total area of the site. The stream area is then multiplied by two and five, to determine the minimum and maximum number of electrofishing seconds. This ensures that sampling is standardized ***at minimum,*** within the OSAP screening level assessments (Stanfield 2005). All fish captured are then bulk weighed and measured with the exception of any sport fish species, which are individually weighed and measured. The condition of the fish and any identifiable diseases are also noted. Voucher photographs with key identifying features clearly photographed are recommended for all species groups whereas voucher photographs and/or specimens are required for all unconfirmed species so they can be later identified by a certified taxonomist. For species at risk observations, voucher photographs with identifiable features are required. Once species documentation is complete, all fish are then released back to the stream.

Using backpack electrofishing to sample the local fish community

In instances where electrofishing is not appropriate (deep, wide etc.), seine netting of a reach is recommended. Seining in relatively still areas should progress from the downstream end of the reach progressing upstream with samplers on either bank to ensure that the entire stream is sampled. In large fast flowing rivers and when sampling for specific species, sampling should extend from the upstream limits of the station quickly to the downstream end in line or ahead of the speed of the current. All fish should be processed the same in the same way as electrofishing.

Data Management and Analysis

Fish unlike sedimentary aquatic organisms (e.g. benthic macroinvertebrates) have the physical ability to leave an area in response to a disturbance. As a result, species composition, numbers and overall biomass of a sampled community may change in response to a physical or chemical disturbance, both within the stream itself or within the drainage area. As a result, documentation of the following information is recommended:

- Full species list (in tabular format) of all fish caught including species names, number of fish caught, maximum and minimum lengths within a species group, total (bulk) weight of groups and individual lengths/weights for all sport fish.
- Voucher photographs (through viewing window) to confirm species identification and required for unconfirmed species or species at risk.
- Documentation of physical habitat, either observed or quantified, identifying habitat conditions, riparian habitat, instream habitat, substrate quality (sorting) and size. Adjacent landuse and habitat conditions according OSAP Section 1 Module 1 is also recommended.
- Documentation of sampling methodology including equipment used, date/time and effort (i.e. electrofishing seconds, # of seine hauls etc.).
- Mapped locations, descriptions and UTMs.

Smallmouth Bass (*Micropterus dolomieu*) captured during electrofishing surveys

Further analysis using an Index of Biotic Integrity may also be completed. Conservation Halton Fish community monitoring uses a modified Index of Biotic Integrity (IBI) first adapted to Southern Ontario Streams by Steedman (1988). This methodology measures fish community associations to identify the general health of a stream ecosystem based on its upstream drainage area. Steedman's original IBI utilizes ten different indices including indicator species, trophic composition, fish abundance and health. Although these metrics are useful indicators of stream health, all indices may not be suited to all streams. In order to use the IBI analysis for both warmwater and coldwater tributaries throughout the watershed, two sub-indices are modified to better reflect stream conditions. The first sub-index removed is the presence of blackspot, a common parasite of fish. Although this may affect stream fish, it does not necessarily reflect unhealthy stream conditions and as such is removed from the analysis. The second sub-index modified, the presence or absence of Brook Trout, is removed to better reflect stream conditions where Brook Trout would not naturally occur (i.e. warmwater tributaries with no historical evidence of Brook Trout). In order to account for the removal of these sub-indices, IBI scores for coldwater stations are based on nine sub-indices whereas warmwater stations are based on eight sub-indices and are standardized to be equally weighted for comparison with coldwater stations, as was done in the Humber River Fisheries Management Plan (OMNR and TRCA 2005).

Indices used to form the modified Index of Biotic Integrity are found below:

SPECIES RICHNESS

- Number of native species
- Number of darter and/or sculpin species
- Number of sunfish and/or trout species
- Number of sucker and/or catfish species

LOCAL INDICATOR SPECIES

- Presence or absence of Brook Trout (***historical reaches only***)
- Percent of *Rhinichthys* species

TROPHIC COMPOSITION

- Percent of sample as omnivores
- Percent of samples as piscivores

FISH ABUNDANCE

- Catch per minute of sampling

It should be noted that with the IBI methodologies, assessment appears to be sensitive to the capture of particular species such as darters, trout and suckers. Generally, a year catch that fluctuates by the number of darter, sucker or trout species could shift the IBI scores significantly. Scores may also fluctuate in response to catch per unit effort (CPUE) as annual changes in staff may affect catch efficiency. It is also important to note that if suitable information is not collected (i.e. the number or biomass of fish) IBI analysis cannot be completed. Table 1 provides a summary of IBI ratings and associated scores.

Table 1: IBI ratings and associated scores using the modified Index of Biotic Integrity (IBI)

IBI Rating	Modified IBI Scores
Poor	9 – 20
Fair	21 – 27
Good	28 – 37
Very Good	38 – 45

Additional analytical tools to assess fish communities are currently under development by Conservation Authorities in Ontario. Once completed, these methodologies will address species tolerance and issues related to richness/diversity in aquatic systems. These tools should be incorporated into the analysis once available.

2.2 Channel Morphology and Fish Habitat

Fish habitat assessments are often completed in conjunction with fish community assessments to give an overall characterization of fish utilization within stream reaches. Assessments can include detailed measurements of channel morphology to assess channel stability and habitat suitability and a number of other morphological characteristics and/or it can include visual observations throughout the study reach.

Methodology

Fish habitat and channel morphology measurements should be completed according to the Ontario Stream Assessment Protocol (OSAP) Point Transect Sampling for Channel Structure, Substrate and Bank Conditions (section 2 module 4). As part of this module, specific physical characteristics of stream channels are documented including, water depth, velocity, substrate type and size, cover types and amount, instream vegetation, woody debris, undercut banks and bank composition, riparian vegetation and bank angle. All these characteristics can provide insight into the physical conditions of streams on both a spatial and temporal level and may also identify the limiting features of a stream's physical habitat (Stanfield 2005). It should be noted that morphological assessments completed as part of the OSAP methodology is geared towards fish habitat use and additional surveys to monitor channel form, structure and stability from a fluvial geomorphology/engineering perspective may be required.

Data Management and Analysis

While more detailed engineering-based protocols are important to assess channel morphology and stability, these protocols do not provide a thorough understanding of fish habitat conditions within a stream. In addition to the OSAP Channel Morphology protocol and/or any engineering-based protocols additional information to assess fish habitat should include an evaluation of:

- under cut banks
- base flow conditions including water velocity, stream order, discharge, water depth, stream width and bankfull width
- water chemistry (dissolved oxygen, temperature, pH, conductivity, water colour and clarity) substrates (texture, presence of aquatic vegetation, odours/discolouration of the sediments)
- identification and classification of headwater drainage features (HDF's)
- in-stream riparian cover (presence and extent) and shading
- critical habitats (spawning, nursery or rearing grounds)
- groundwater discharge and upwellings (e.g. presence of watercress or iron floc)
- surrounding land uses
- identification of in-stream barriers to fish passage
- other measurements that indicate the quality of the habitat such as entrenchment, erosion etc.
- point source impacts
- degradation, debris, barriers, sources of pollution, etc.
- recreational opportunities
- rehabilitation opportunities

2.3 Benthic Macroinvertebrates

Benthic macroinvertebrates are often used as indicators of water quality and instream habitat because they are abundant, ubiquitous, sedentary and are sensitive to changes in the quality of the aquatic ecosystem (Jones *et al.* 2007). As a result, benthic macroinvertebrate communities at a given site can be used to determine the aquatic health of that site.

Collection of benthic macroinvertebrates through the OBBN kick and sweep method

Methodology

To sample the benthic macroinvertebrate community, the Ontario Benthos Biomonitoring Network Protocol (OBBN) is recommended. Similar to the OSAP protocol, sampling stations are first identified by locating both a downstream and upstream crossover that are separated by a minimum of 40 metres and are comprised of at least one riffle/pool sequence. At each station, three transects are sampled. Two transects are selected at stream crossovers (riffle habitat) at the upstream and downstream limits of the station and the third transect is selected to traverse pool habitat between the two crossovers.

Samples are collected using the kick and sweep method, whereby the sampler stands upstream of a 500µm D-net and excavates the top 10 centimetres of sediment with their feet. This allows any attached and free moving benthic macroinvertebrates to flow into the 500µm D-net and be collected. The sampler continues this action across each stream transect thereby sampling all available habitats. Once collected, live samples are taken back to the lab and randomly sub-sampled. A minimum of 100 organisms are collected per sub-sample (transect) and are preserved in 95% ethanol. Preserved specimens are then returned to the lab and identified to family or lowest practical level for analysis (Jones *et al.* 2007).

Habitat characteristics of the site are also recorded and included stream width, stream depth, maximum hydraulic head, canopy cover, presence of macrophytes and algae, presence of detritus and woody debris. Dominant substrate type is determined through random pebble counts at each transect.

Benthic macroinvertebrates being identified under a microscope

Data Management and Analysis

The benthic macroinvertebrate communities are analyzed using a variety of biological indices. Two richness indices are used where the total number of families present in a sample are counted. The richness indices includes EPT (Ephemeroptera, Trichoptera and Plecoptera) richness and taxa richness. One composition indices is used to look at the percent of each sample made up by a given family or group. This indice helps to define the species composition of a stream and assist in determining the likelihood that a stream has been impacted based on the amount of pollution tolerant taxa. The Hilsenhoff Biotic Index (HFI) is used to

determine the impact of organic pollution on each station. The HFI assigns tolerance values to each family based on its ability to survive in areas with varying amounts of organic pollution. Families with high pollution tolerance have high tolerance values; as a result, lower scores on the HFI indicate that a station has been less impacted by organic pollution (Hilsenhoff 1988). The Shannon-Weiner Diversity Index (SDI) uses both species evenness and species richness to score the diversity of a site. It is expected that healthy sites would be better able to support a variety of species and would result in higher diversity scores (Credit Valley Conservation 2010).

Each index is assessed separately against the target values as set out in Table 2. Final assessments of unimpaired, potentially impaired or impaired are based on the cumulative results of each individual metric in a manner similar to the Citizens Environmental Watch methodology (Citizens' Environment Watch 2009). All index values are added up and grouped into the three categories that define the health of the stream. The majority of the indices determine if it meets the criteria for an unimpaired, potentially impaired or impaired benthic community (i.e. if three of five indices are considered unimpaired, the site is categorized as unimpaired).

Table 2: Benthic Invertebrate Indices and Associated Classifications

Water Quality Index	Unimpaired	Potentially Impaired	Impaired
EPT Richness	≥10	5-10	<5
Taxa Richness	≥13		<13
% Insect	50-80	40-50 or 80-90	<40 or >90
HFI	<6	6-7	>7
SDI	>4	3-4	<3

Documentation of benthic invertebrates should include the following:

- A complete list of benthic invertebrates and numbers captured for each replicate sample (downstream riffle, pool and upstream riffle)
- Documentation of physical habitat, either observed or quantified, identifying habitat conditions, riparian habitat, instream habitat, substrate quality (sorting) and size. Use of the Ontario Benthic Biomonitoring network field sheet is recommended
- Mapped locations, descriptions and UTMs
- Documentation of sampling methodology including equipment used, date/time, water quality parameters etc.

2.4 Freshwater Mussels

Freshwater mussels (*Unionidae*) are one of the most endangered species groups within North America and their decline has been directly related to habitat alteration and degradation (Cudmore *et al.* 2004). Since 1994, after COSEWIC (Committee on the Status of Wildlife in Canada) expanded its mandate to include invertebrates, monitoring and inventory projects to identify these species have been implemented to minimize further impacts on this order.

Methodology

Since freshwater mussels are often observed within the substrate surface surveys are best conducted during summer low-flow conditions between July- September when there is maximum visibility within a stream reach and temperatures are below 16°C. Qualitative timed surveys are often completed looking for the presence/absence of live mussels and/or dead shells to first indicate potential presence at a site. Timed surveys of approximately 4.5 man hours should be conducted at each site according to the protocol outlines in Metcalfe-Smith *et al.* (2000) and Mackie *et al.* (2008).

Data Management and Analysis

Documentation of freshwater mussels should include:

- A complete list of freshwater mussel species and numbers collected at each site including documentation of live animals, dead shells and/or mussel beds.
- Documentation of physical habitat including substrate type, water depth, velocity etc.
- Mapped locations, descriptions and UTMs
- Documentation of sampling methodology including equipment used, date/time, water quality parameters etc.

Freshwater mussels observed in Grindstone Creek

2.5 Water Quality Monitoring

Surface water quality sampling is an integral component of monitoring aquatic systems as it helps provide an understanding of the chemical composition of aquatic systems and the potential effects of pollution that may result from the alteration of natural landscapes.

Methodology

In order to sample the surface water quality a combination of wet and dry drab samples should be collected between the months of April to October. Three wet samples, classified as those with > 2mm of rain within 24 hours, should be collected at minimum with one sample collected during the springs months in association with the spring freshet and the remaining samples collected during rain events through the summer and fall months. Dry samples, classified as those without any preciptiation within 48 hours should be sampled during periods of high stress largely from June to early September with one sample collected during the spring months (for comparison against the spring freshet). In intermittent systems, sampling should be attempted during periods of high stress (June to early September) however if the system runs dry sampling should focus in the spring and fall months where the chances of flowing water is more probable. All samples should be collected after the sampling containers have been rinsed in-stream three times. In addition to grab samples field measurements of of water temperature, conductivity, dissolved oxygen, pH and turbidity (where available) should be collected through the use of a *calibrated* water quality probe. Water quality samples should be stored in a cooler with ice until they are delivered to an accredited laboratory for analysis.

Data Management and Analysis

The Provincial Water Quality Objectives (PWQO) outlined by the Ministry of the Environment and Climate Change are recommended for use to assess surface water quality parameters to ensure the protection of the fresh water aquatic environment. If a parameter does not have a PWQO, the Canadian Water Quality Guidelines (CWQG) should be used (MOE 1999). Table 3 provides examples of select Provincial Water Quality Objectives and Canadian Water Quality guidelines.

Table 3: Provincial Water Quality Objectives (PWQO) and/or desired objectives

Parameter	PWQO	Desired Objective (CWQG)
Chloride	N/A	<120 mg/L
Nitrate + Nitrite	N/A	<2.93 mg/L
Total Suspended Solids	N/A	<25 mg/L above background
Total Phosphorous (TP)	<0.03 mg/L	N/A
Copper	<5 µg/L	N/A
Lead	<5 µg/L	N/A
Zinc	<20 µg/L	N/A

Minimum data requirements for surface water quality monitoring include:

- Documentation of date/time of sampling events and documentation of precipitation events and amounts (wet vs. dry sampling and degree of rain events) from an approved nearby weather station
- Laboratory results from an accredited laboratory certified in completing required water quality samples
- Comparison of water quality results across sites, between sampling years and against Provincial Water Quality Objectives and/or Canadian Water Quality Guidelines.
- Mapped locations, descriptions and UTMs.

Further analysis using the Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI) is also recommended. This index uses measures of variance from a desired objective to classify a site's water quality into one of five categories based on a numerical index value (Canadian Council of Ministers of the Environment 2001). The five categories are described in Table 4.

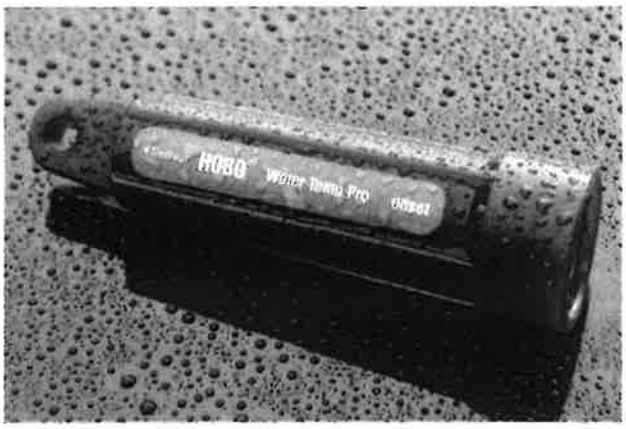
Table 4: Water Quality Index Classifications*

Category	CCME WQI Value	Description
Excellent	95-100	Water quality is protected with a virtual absence of threat or impairment; conditions very close to natural or pristine levels. These index values can only be obtained if all measurements are within objectives virtually all of the time
Good	80-94	Water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural or desirable levels
Fair	65-79	Water quality is usually protected but occasionally threatened or impaired; conditions sometimes depart from natural or desirable levels
Marginal	45-64	Water quality is frequently threatened or impaired; conditions often depart from natural or desirable levels
Poor	0-44	Water quality is almost always threatened or impaired; conditions usually depart from natural or desirable levels

*Table adapted from Canadian Council of Ministers of the Environment, 2001

2.6 Stream Temperature

Temperature is an important factor in determining the composition of aquatic communities. Species with that rely on cold water with high oxygen levels are typically less tolerant than species with able to withstand thermal stress and low oxygen levels. As a result, thermal monitoring provides insight into the health and stressors within an aquatic community.



Temperature datalogger used to collect instream temperatures (Onset)

Methodology

Water temperature monitoring should be conducted using automated samplers/temperature dataloggers (e.g. Hobo Water Temp Pro V2 dataloggers), set to record temperature ***at minimum*** every 30 mins. Loggers are to be installed at each monitoring location out of direct sunlight and at the bottom of a deep pool in order to reduce thermal radiation and to ensure that loggers are underwater for the duration of the study period. ***At minimum***, loggers are to be installed in late spring and left in place for the duration of the monitoring season (removed in September/October). Temperature dataloggers should be re-visited regularly to ensure that they remain under water at depth and out of direct sunlight. In instances where significant shading is not possible, radiation shields should be employed.

Analysis

Analysis of temperature data can provide valuable insight into the potential impacts and associated condition of the stream environment. As temperature data can be highly variable and reflective of weather conditions all data should be compared against air temperature and precipitation data from an appropriate and nearby climate station. In order to fully assess instream conditions the following information should be included:

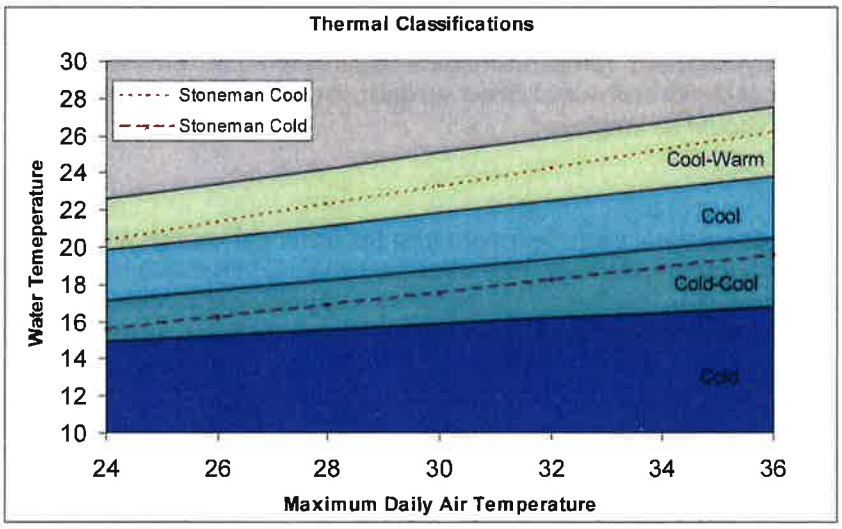
- Graph of raw temperature data against precipitation and air temperature for the duration of the sampling period
- Chart of the monthly average, maximum and minimum values
- Overall stream classification using the nomogram developed by Stoneman and Jones (1996) and/or Chu *et al.* (2009)
- Mapped locations, descriptions and UTMs.

The nomogram developed by Stoneman and Jones (1996) classifies stream sites based on their thermal stability. The nomogram uses point in time data and considers both water temperature and ambient air temperature in determining thermal stability. Conditions for the protocol are met between the months of July and August and the first week of September when the air temperature is above 24.5 °C and after 3 days of similar weather conditions. Water temperature readings are then recorded between the hours of 4:00 p.m. and 4:30 p.m., the times typically representative of the maximum daily water temperature of a stream. Once the thermal stability of a stream is known, it can be classified as a cold, cool or warmwater system.

The nomogram developed by Chu *et al.* (2009) essentially uses the same protocol but has identified 5 water temperature classifications including cold, cold-cool, cool, cool-warm and warm. In doing so, this nomogram better identifies transition zones and areas with potential groundwater input. It is especially helpful in identifying water temperature classifications in areas where temperatures previously overlapped categories and a definitive classification is not clear.

Figure 1 illustrates the nomogram completed by Chu *et al.* (2009). The dashed lines on the nomogram also indicate the coldwater and coolwater limits according to Stoneman and Jones (1996). In order to obtain an accurate assessment of thermal stability, all temperature values that met protocol conditions can be considered and graphed against the Chu *et al.* (2009) nomogram. Streams are then classified based on the overall proportion of values within each representative classification. It should be noted that although the classification is based on instream temperatures between July to September, temperatures outside of the range (including spring and fall months) should still be used to further assess thermal response to rain events, spring freshet/melt events and weather variations outside of the seasonal norms and in relation to climate change.

Figure 1: Water Temperature Nomogram. Chu et al. (2009)



3 Terrestrial Monitoring

3.1 Vegetation Communities

Classifying vegetative communities is important in understanding the ecological characteristics of an area. Understanding the larger vegetation community also provides insight into the the more detailed plants and animals that can be found. As these communities are able to respond to change (i.e. climate change, invasive introduction etc.) they are important features that help to determine management options and can be used to identify disturbance.

Mapping and documenting plant species during ELC surveys

Methodology

Conservation Halton uses Ecological Land Classification (ELC) to identify and classify vegetative communities in the watershed. ELC uses a hierarchical approach to identify recurring ecological patterns on the landscape in order to compartmentalize complex natural variation into a reasonable number of meaningful ecosystem units (Bailey *et al.* 1978). This facilitates a comprehensive and consistent approach for ecosystem description, inventory and interpretation (Lee *et al.* 1998).

ELC is first initiated by completing through air photo interpretation, which identifies and groups plant communities by Community Series. Community Series classifications are fairly broad descriptors distinguishing between the types of communities based on whether the community has open, shrub or treed vegetation cover as well as whether the plant form is deciduous, coniferous or mixed (Lee *et al.* 1998). A site visit is then completed to collect data for determining the Vegetation Type (e.g. Dry-Fresh Maple-Oak Deciduous Forest Type). Vegetation Types are the finest level of resolution in the ELC and include specific species occurrences within the site. As surveyors inventory each polygon, a complete list of all vascular plants observed should be collected.

Data Management and Analysis

Extensive data collection is usually completed as part of ELC inventories and as such proper documentation of vegetation communities and vascular plants is required. Data included as part of the ECL inventories should include:

- A detailed map, superimposed on an air photo, indicating all vegetation communities in relation to watercourses and other local natural heritage features
- Documentation of inventory details (date, time, surveyor etc.)
- Mapping of all federally, provincially and locally rare communities and species.

- Additional data related to specific community types and species observed should be documented as follows:

For each community type:

- An assessment of soil type(s), drainage regime and moisture regime.
- An identification, where possible, of the Ecological Land Classification unit (Lee et al., 1998).
- The element ranking for each ELC community types identified and local vegetation community ranks
- Calculation of the following floristic quality indicators (Oldham et al. 1996) by community: number of native species, number of non-native species, number of conservative species (conservatism coefficient >=7), mean conservatism coefficient and sum of weediness scores.
- A summary of tree species, with age and/or size class distribution
- A summary of disturbance factors, including their intensity and extent

For all vascular plaints:

- The extent of habitat for each species of conservation concern should be outlined.
- Details on the population size, condition and significance of the site for all species of concern
- Details on the rarity ranks for each species,
- Whether the species was planted or natural

3.2 Forest Health Monitoring

Conservation Halton monitors forest health as a way to ensure that we can best manage forested communities and ensure that these important ecosystems are sustainable. Through the use of indicator species such as forest birds and salamanders, one is able to evaluate species biodiversity and detect, identify and determine the extent of forest disturbances.

Methodology

Under the Ecological Monitoring and Assessment Network (EMAN) monitoring program, tree health, shrub and sapling regeneration, groundcover biodiversity, downed woody debris volume and plethodontid salamander abundance are monitored to gain an understanding of overall forest health. Plots are established following the protocols outlined in the EMAN program, using both 1 ha and stand-alone plots at appropriate sites. Plots are set up according to standard EMAN protocols outlined in Roberts-Pichette and Gillespie 1999.

3.2.1 Tree Health

Monitoring individual tree health conditions and stem defects is an important component in understanding the overall health of a forest and can provide early warning signs of a forest in decline. Furthermore the identification of forest pests and/or disease can assist with with early treatment and management of forests.

Methodology:

Tree health monitoring plots take place within established 20 m X 20 m plots. Within each plot, the health of each tree over 10 cm diameter at breast height (DBH) is monitored. Health of each tree is assessed based on the following parameters:

- tree status (alive, broken, dead standing, dead leaning, dead fallen),

- stem defects (i.e. fungus, open wounds, closed wounds, blights or cankers),
- crown class (place in the forest strata: dominant, co-dominant, intermediate or suppressed) and
- crown rating (amount of crown dieback).

DBH measurements are conducted every five years. Methodology follows standardized EMAN protocols (Roberts-Pichette and Gillespie 1999)

Data Management and Analysis

All data collected should be documented on the field sheets developed as part of the EMAN protocol to ensure that all data to be assessed has been collected. Minimum requirements needed to fully assess tree health within a plot should include:

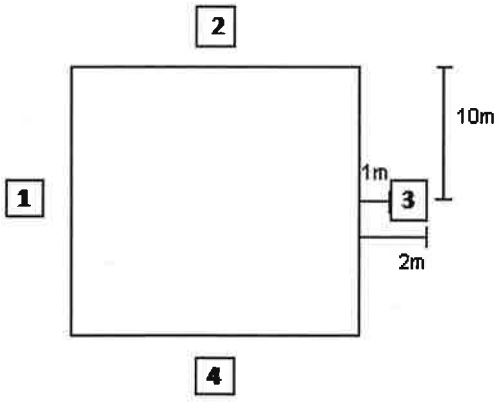
- All species names and health status (in tabular format) listed according to the parameters listed above
- UTM's and details related to any SAR or rare trees/plants observed during the surveys
- Plot mapping in relation to previously classified ELC communities
- Sampling details (date, sampler, location, mapping etc.).

Plots should be established and the first year of monitoring conducted prior to commencement of the project in order to obtain true baseline conditions for comparisons. Analysis of tree health data should include:

- annual tree mortality (and mortality rates from one year to the next)
- changes in crown health and abundance of stem defects
- tree abundance
- tree species richness
- dominance by basal area

3.2.2 Shrub and Sapling Regeneration

Shrubs and saplings are monitored as part of the forest health monitoring program as they are important indicators of succession within a forest ecosystem and can provide insight as to how well a forest is naturally regenerating.



EMAN plot set-up with ground cover and shrub and sapling subplots

Methodology

Shrub and sapling regeneration is measured within each plot using 2 x 2 m subplots. These are located outside of the main plot at the middle of each edge with the centre of each subplot placed 2 m out from the edge of the main plot and marked with a plastic pipe. Within the 1ha plots, the subplot is located within the plot, at the middle of each edge with the centre placed 2 m in from the edge. All trees and shrubs 0.16 – 2 m tall are recorded as seedlings in

various size classes, and those greater than 2 m are recorded as saplings. Methodology follows standardized EMAN protocols (Roberts-Pichette and Gillespie 1999).

Data Management and Analysis

All data collected should be documented on the field sheets developed as part of the EMAN protocol to ensure that all data to be assessed has been collected. Minimum requirements needed to fully assess shrub and sapling regeneration within a plot should include:

- All species names listed in tabular format
- UTM's and details related to any SAR or rare plants observed during the surveys
- Plot mapping in relation to previously classified ELC communities
- Sampling details (date, sampler, location, mapping etc.).

Shrub and sapling regeneration should be analyzed using the five following indices:

- Floristic Quality Index (FQI)
- Mean Coefficient of Conservatism (MCC)
- Richness
- Shannon's Evenness
- Shannon's Diversity Index

Dominance is also analyzed for groundcover biodiversity because cover of each species within the quadrats is also recorded.

The Floristic Quality Assessment System for Southern Ontario (Oldham *et al.* 1995) assigns Coefficient of Conservatism (CC) scores to native vegetation in Ontario. These scores are based on a species' tolerance to disturbance and habitat fidelity (dependence upon a specific habitat type). Mean Coefficient of Conservatism is calculated by averaging the CC values for each species present at a site. Both the Floristic Quality Index (FQI) and Mean CC are measures of the floristic quality of a given site. The MCC value is based solely on the requirements of the species detected at the site, while FQI incorporates native species richness into the calculations (MCC x $\sqrt{}$native species richness). Richness refers to the total number of species present at a site and is useful for examining whether a site is able to support a variety of species. However, it does not take into account the abundance of a species and can be misleading when species composition within a plot is uneven (i.e. the plot has a high number of species, but only one species has a high number of individuals compared to low numbers of the other species species).

The Shannon's Index of Diversity (SDI) is based on species evenness and species richness and is used to determine how diverse a site is. A site with only one species present would have an SDI value of 0; as diversity increases, the SDI value increases as well. The Shannon's Evenness Index is used to determine how equal the abundance of a species is. Evenness is important for understanding if plots with similar richness have an even distribution of individuals among all species or an uneven distribution, with one or two species having the most numerous individuals. Values range between 0 and 1, with a value of 0 indicating that a plot is predominantly covered by few individuals and a value of 1 indicating that a plot is evenly covered by all individuals or few individuals are present. Ground vegetation quadrat data is used to measure these parameters because they require abundance values.

3.2.3 Ground Cover (Vegetation) Biodiversity

Ground cover vegetation monitoring provides important information to the health of a forest as ground vegetation with a forest floor is often diverse allowing for varying response to environmental change. It is also within the ground floor of a forest where invasive species are first observed and most easily tracked.

1 X 1 m groundcover quadrat

Methodology

Groundcover biodiversity is measured at each EMAN monitoring location using 1 x 1 m subplots marked by PVC pipe. The 1 x 1 m subplots are placed within the 2 x 2 m shrub and sapling subplots. These are re-located each year and a 1 x 1 m wooden square is laid with the PVC pipe in the centre, in the same location as previous years. All herbaceous vegetation (forbs, grasses, sedges, ferns) and trees and shrubs less than 16 cm in height are recorded along with the overall percent cover for each species within the 1 x 1 m subplot. Only species which originate from inside of the wooden square are counted. Stems which originate from along the edge of the wooden square are only counted on two sides of the square (west and north). Ground vegetation using quadrats is monitored annually, in spring. Methodology follows standardized EMAN protocols (Roberts-Pichette and Gillespie 1999).

In addition to the sub-plots, timed inventories of the plots are undertaken to more accurately capture the full complement of species within each plot (Bowers 2013). For 20 minutes, the plot is walked (in a concentric circle starting at the outer edge) and all vascular plant species less than 2 m in height are recorded. If a species cannot be identified in the field, a sample (from outside of the plot wherever possible) is taken to be examined in the lab. These surveys occur in the summer (July).

Data Management and Analysis:

Data management and analysis is completed as per section 5.3.2 above. In addition to the methodologies above ground cover biodiversity incorporates a timed inventory within each plot. The timed ground vegetation inventories are used to measure species richness, FQI and Mean CC as they do not rely on abundance values, and because the timed inventories better represent the full complement of species present. Ground vegetation quadrat data is used to measure Shannon's Diversity and Evenness as they require abundance values.

3.2.4 Plethodontid Salamanders

Plethodontid salamanders, or lungless salamanders, are useful indicators of forest heath for a number of reasons. They play an important role in the food chain in many forests, are typically found in high densities, are easy to be captured and handled without injuring the animal and most importantly they are sensitive to air and water pollution and their sensitivity can allow one to measure change within a forest ecosystem.

Methodology:

Conservation Halton's Artificial Cover Object (ACO) design is based on the MNR plethodontid salamander sampling protocol (OMNR 2001). Wooden boards, approximately 20 x 75 cm in size and 1 inch thick, are used. In the fall, prior to the first year of monitoring, the boards are placed on the forest floor in direct contact with the soil. This allows the boards to weather over one winter before the first field visit is conducted. Beginning in the spring when temperatures are a minimum of 5°C and snow is gone, the ACOs are surveyed for salamanders every other week for a twelve week period, for a total of 6 visits. Each visit is completed at the same time of day and the species and age class of each individual is recorded. Total number of salamanders under each board is also recorded.

Artificial cover objects (ACO) used to monitor plthodontid salamanders

Data Management and Analysis:

Information collected as part of the plethodontid salamander monitoring should include:

- All species names listed in tabular format
- UTM's and details related to any SAR/rare species observed during the surveys
- Plot mapping in relation to previously classified ELC communities
- Sampling details (date, sampler, location, mapping etc.) as well as ground and air temperature, precipitation in the last 24 hours, and Beaufort sky and wind codes

Analysis should include an assessment of overall abundance of salamanders within each plot area. Long term monitoring of plots should include analysis of soil temperatures for comparison against salamander abundance.

4 Wildlife Monitoring

4.1 Birds

Birds play an important ecological role on the landscape and are found in a wide variety of habitats. Habitat preferences, varying sensitivities to change and the ability to make observations by sight and/or sound makes birds excellent indicators to assess change across a variety of habitats.

4.1.1 Forest Birds

Methodology

Conservation Halton employs the Forest Bird Monitoring Program (FBMP), originally administered by the Ontario Region of the Canadian Wildlife Service, Environment Canada (Environment Canada 2006) to monitoring breeding birds within wooded areas. Information collected through the FBMP provides information on population trends and habitat associations of birds that breed in the forest interior. Surveys are performed twice yearly using 10 minute point counts at stations between late May and early July, identifying all birds by sight or song. The first visit is made between May 24 and June 17, and the second visit between June 13 and July 10, with at least 6 days between visits. The stations are visited in the early morning hours between 5:00 a.m. and 10:00 a.m. Surveys are conducted in calm to light winds (< 15kph) and in clear or slightly damp conditions. Surveys are not conducted in the rain. All stations within a site are completed on the same day. Stations are 100 m circular unlimited distance sampling areas; however birds are recorded as being either within or outside of the 100m and birds obviously not associated with the forest being sampled are not recorded.

Data Management and Analysis:

Information collected should include:

- All species names listed in tabular format, along with breeding evidence and number of birds observed. Details as to whether observations were within the 100m point count stations or fly-thrus should also be identified.
- Point count station locations and SAR/rare species in relation to previously classified ELC communities (UTM's and mapping)
- Sampling details (date, sampler, location, mapping etc.)

Forest bird diversity is assessed using the following indices:

- Species abundance
- Species richness
- Shannon's Diversity Index

Species richness refers to the number of species counted at each station and species abundance refers to the number of individuals.

Birds are also divided into guilds based on nesting and migratory behaviour as well as habitat assemblages. Proportion of species richness in each guild is analyzed, as well as total abundance within each guild.

4.1.2 Marsh Birds

Methodology

Surveys for marsh birds are completed using the Marsh Monitoring Protocol (MMP)

Conservation Halton marsh bird monitoring follows the Marsh Monitoring Protocol (BSC 2006b), which uses a "fixed distance" semi-circular sampling area. Surveys are conducted from a central point located on the edge of a 100 metre radius semi-circle sample area. Each marsh bird monitoring station is surveyed twice between May 20 and July 5, no less than 10 days apart. Routes are surveyed in their entirety, in the same station sequence each time. All surveys begin after 5 p.m. and end at or before sunset. Surveys are conducted in warm weather, with no precipitation, and with wind speed no more than a three on the Beaufort scale. As per the MMP protocol, each station is surveyed for 15 minutes and is comprised of a 5 minute silent (passive) period, followed by a 5 minute call broadcast period (using the official MMP broadcast recording), followed by another 5 minute silent listening period. All species within the 100m semi-circular station are recorded with any focal species observed, recorded within an unlimited distance semi-circle. Focal species for the MMP include American Bittern, American Coot, Black Rail, Common Moorhen, King Rail, Least Bittern, Pied-billed Grebe, Sora and Virginia Rail.

Data Management and Analysis:

When conducting marsh bird surveys all data should be recorded on the marsh monitoring sheets provided by the Marsh Monitoring Program. In doing so, all data required is collected and species mapped within the semi-circular station. Additional information to provide as part of the marsh bird monitoring should include:

- All species names listed in tabular format, listed as within the "fixed" station or within the unlimited distance station (for focal species). Additional observations outside of the survey area or "fly-thrus" are also noted
- Point count station locations and SAR/rare species in relation to previously classified ELC communities (UTM's and mapping)
- Sampling details (date, sampler, location, mapping etc.)

Analysis should include an assessment of species richness, relative abundance, richness of marsh obligates and proportion of marsh obligates calculated for each point and summarized for each site. Species richness refers to the number of species counted at each station and species abundance refers to the number of individuals. Richness of marsh obligates refers to the number of species recorded that breed exclusively in marsh habitats. The proportion of these species relative to non-marsh obligates is then determined.

The Index of Marsh Bird Community Integrity (IMBCI) is used to examine each marsh's ability to support indicator bird species. This index uses species characteristics (nesting habitat, foraging habitat, migratory status and breeding range) and the richness of marsh obligates to determine the health of a marsh ecosystem (DeLuca et al. 2004).

4.1.3 Additional Bird Surveys

Methodology

In habitats other than forests or marshes, bird surveys should be conducted using the Ontario Breeding Bird Atlas (OBBA) methodology (OBBA 2001). In doing so, 5 minute point counts are completed between dawn and 5 hours after dawn, within a 100m circular station, with the surveyor identifying all birds by sight and sound. Similar to the the FBMP protocol, birds are identified as being either within or outside of the 100m station with all breeding evidence noted. Two surveys conducted between May 24 and July 10, should be conducted and spread out over time to ensure that surveyors cover breeding periods for the highest number of bird species. Similar to other bird surveys, the OBBA methodology requires certain weather conditions to ensure the highest probability of detecting a variety of species. As a result, surveys should NOT be completed in thick fog or when winds are >3 on the Beaufort scale (over 19 km\h).

Data Management and Analysis:

When conducting bird surveys as per the OBBA methodology all data should be recorded on the OBBA point count forms. Additional information to provide as part of bird monitoring surveys should include:

- All species names listed in tabular format, listed as within or outside of the 100m station
- Point count station locations and SAR/rare species in relation to previously classified ELC communities (UTM's and mapping)
- Sampling details (date, sampler, location, mapping etc.)

Analysis should include an assessment of species richness, relative abundance, richness and proportion of obligate species (per habitat type) and calculated and summarized for each point within a site.

4.2 Amphibian Monitoring

Amphibians (frogs) are excellent indicators of environmental change as they are sensitive to changes in climate, atmospheric conditions and water quality and can be easily monitored through male calling. Their semi-terrestrial life cycle which consists of an aquatic larval stage and terrestrial adult stage also makes them sensitive to habitat alteration in both aquatic and terrestrial ecosystems.

Methodology

Amphibian monitoring is conducted following the Marsh Monitoring Program (MMP) (BSC 2006a). This protocol uses an "unlimited distance" semi-circular sampling area. Each amphibian station is visited on three nights, no less than fifteen days apart, during the spring and early summer. The visits are dictated by ambient air temperature as follows:

- The first visit is undertaken with a minimum night-time air temperature of at least 5°C and after the warm rains of spring have begun;
- The second visit is undertaken once the night-time air temperature is at least 10°C; and,
- The third visit is undertaken once the night-time air temperature is at least 17°C.

Each station is surveyed for three minutes and the surveys start one half hour after sunset and end before midnight. All surveys are conducted in weather conducive to monitoring amphibians (i.e. on a warm, moist night with little or no wind). All amphibians heard and their associated calling codes are documented to provide a general index of abundance. The call codes are as follows:

- Code 1 – Individuals can be counted; calls not simultaneous. This number is assigned when individual males can be counted and when the calls of individuals of the same species do not start at the same time.
- Code 2 – Calls distinguishable; some simultaneous calling. This code is assigned when there are a few males of the same species calling simultaneously. A reliable estimate of the abundance (rough number or range of individuals heard) should be made.
- Code 3 – Full chorus; calls continuous and overlapping. This value is assigned when a full chorus is encountered. A full chorus is when there are so many males of one species calling that all the calls sound like they are overlapping and continuous. There are too many for a reasonable count or estimate, therefore no abundance is recorded.

Data Management and Analysis

When conducting amphibian monitoring surveys all data should be recorded and mapped within the semi-circular stations on the field sheets supplied by the Marsh Monitoring Program (Bird Studies Canada). Additional information should include:

- All species names listed in tabular format and mapped on the field sheets within the semi-circular station.
- Point count station locations and SAR/rare species in relation to previously classified ELC communities (UTM's and mapping)
- Sampling details (date, sampler, location, mapping etc.)

Due to the survey methodology, abundance is represented through calling codes and as a result abundance of individual species is not reliable. As a result, typical analysis cannot be conducted on amphibian surveys. Instead an Index of Biotic Integrity (IBI) developed as part of the Great Lakes Coastal Monitoring Program is used to assess changes in biotic integrity at a site. The amphibian IBI uses the following metrics in its calculation:

- rTOT: Mean total species richness across survey stations in a wetland
- rWOOD: Mean species richness of woodland associated amphibian species across survey stations in a wetland
- pWOOD: Probability of detection of woodland-associated amphibian species across survey stations in a wetland

The IBI is than calculated based on the methodology outlined in the Great Lakes Coastal Wetlands Monitoring Plan (Great Lakes Coastal Wetland Consortium 2008). Scores are weighted out of 100, with higher scores indicating amphibian communities in better biotic condition.

4.3 Butterfly Monitoring

Butterflies are often used as indicator species as they are dependent on specific plants as part of their larval life stage and require diverse nectar sources to support their adult life stage. As a result butterflies can be used as indicators species for grassland and meadow habitats.

Methodology

Following the methods outlined by Pollard and Yates (1993), observers walk a transect within an identified station and record the species name and number of individuals detected during each transect survey. To ensure consistency, the observers only record butterflies within a $5m^2$ area while walking a consistent speed. If a butterfly cannot be initially identified on the wing, the survey will be "paused" and no sightings recorded while the observer investigates and identifies the butterfly. The surveyor may leave the set transect route to identify the butterfly. Once the butterfly is identified the surveyor will return to the location where the transect was "paused" and will resume walking at the set pace, recording observations. Ideally, the transects will be conducted between the first week of April to the last week of September repeated as close to every two weeks as possible. If weather is unfavorable during the designated survey date then the surveys could occur up to three weeks apart. In order to best detect butterflies, the surveys should be completed on warm, clear sunny days with little wind, with the following survey conditions being met:

- Temperature must be a minimum of 13 C°
- When temperatures are between 13 C° and 17 C°, cloud cover must be less than 50%
- When over 18 degrees C°, cloud cover can be marginally higher than 50% but more sun is preferred
- Wind should be a 3 or lower on the Beaufort scale

Butterfly monitoring transects should be implemented across different habitat types within a site.

Data Management and Analysis:

Butterfly monitoring information should include:

- All species names listed in tabular format,
- Transect locations and SAR/rare species in relation to previously classified ELC communities (UTM's and mapping)
- Sampling details (date, sampler, location, transect #, mapping etc.)

Butterfly transect counts should be used to calculate overall butterfly and/or species abundance within an identified habitat type. All butterfly species identified within the transects are analyzed independently of each other due to differences in flight periods and behaviours. Data collected through the use of transects can also be useful in identifying habitat and nectaring preferences between species.

4.4 Significant Wildlife Habitat

Wildlife habitat is an important natural heritage feature and is defined within the 2014 *Provincial Policy Statement* (PPS) as *"areas where plants, animals, and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations."* Areas considered to be significant under the PPS are those that are *"ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural Heritage System"*. Development and site alterations are not be permitted on or adjacent to these areas *"unless it has been demonstrated that there will be no negative impact on the natural features or their ecological functions"* (Ministry of Municipal Affairs and Housing 2014) identification of significant wildlife habitat is important when implementing any monitoring program related to the development or site alteration of natural lands.

Methodology

Numerous methodologies to identify significant wildlife habitat can be employed and may be dependent on the specific genera or species of interest. Randomized surveys and investigations outside of widely-used monitoring protocols are often required and as such no specific methodology is recommended for generalized wildlife habitat surveys.

Data Management and Analysis:

Significant wildlife habitat including but not limited to, any rearing habitat, dens, nesting , breeding, migratory stopover, spawning, nursery and overwintering areas should be identified and mapped according to the criteria outline in the *Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E* (OMNRF 2015). Additional wildlife

Other important wildlife areas should be identified and mapped accordingly. These habitats may include, but are not limited to, waterfowl staging areas, fish spawning and/or nursery habitat, herpetofaunal breeding or hibernacula areas, wintering grounds, areas that provide temporary shelter or feeding areas for migratory wildlife, areas that provide critical life cycle habitat, and wildlife corridors.

Information to provide as part of significant wildlife assessments includes:

- Mapping of habitat within previously classified ELC communities and superimposed on air photos
- List of species including number of species, associated rarity ranks and identification of ELC codes of habitat in which they were found.
- Number of observations across the sampling period (multi-year studies may be required)
- Sampling details (date, weather conditions, surveyor etc.)

4.5 Photomonitoring

Photomonitoring is often used to illustrate the extent of visual change largely associated with lands or projects undergoing significant change such as through restoration, naturalization, development etc. In order for photomonitoring to be effective, the photomonitoring standards and documentation methods must be stringently followed. Conservation Halton photomonitoring standards are as followed:

- Monitoring points should be located throughout study areas and should be established to provide multiple views of the feature being monitoring (i.e. upstream/downstream views etc.)

- When a photomonitoring point is established (and for any new points added from thereon), a new point location that allows a clear view in all directions should be chosen. A marker is installed and the distance and compass bearing to a nearby permanent object(s) in each direction that photos will be taken, is recorded on the field sheet. A diagram showing the marker location and any permanent objects is drawn. Where possible, the following six photos should be taken in order to properly document the photomonitoring location:
    - Field sheet: This allows for distinguishing between points once back at the office in order to accurately label the photos.
    - North of marker (0°)
    - East (90°)
    - South (180°)
    - West (270°)
    - Tripod location
- Permanent markers should be installed using PVC pipe spray painted and labeled with the point code. A tripod should be placed over the permanent marker such that the middle of the tripod is located directly over the marker. The tripod legs should be fully extended so that photos are always taken from the same height.
- A compass should be used to orient the camera in order to take photographs in all cardinal directions.
- After the camera is set up, images should be checked through the view finder in all directions to ensure images line up with previous years' photographs. Check and record the camera settings. Photos should be taken at the same zoom-level each time (i.e. photos should not zoom in or out from previous years)
- Baseline photos should be taken for all photomonitoring points prior to the commencement of works. Photomonitoring should then occur on an annual basis once the project has been implemented. Photos should be taken during late summer when weather conditions are conducive to taking clear photographs.
- A note of the order the photos are taken in is recorded on the field sheet. Record any notable objects, plants, etc. that may assist in reorientation. Pictures should be checked while still at the point to ensure that an appropriate image was captured. If it is necessary to retake photos, ensure that a note is made of which pictures have been retaken.
- Immediately after returning to the office, photos are uploaded and renamed according to the field sheet. This allows for errors in recording to be corrected as the visit is fresh in your mind. Photos are filed according to site and should be labeled according to date and view (e.g. STN5_upstream of road looking upstream_July12_2016).

All photos provided as part of a report should be properly referenced with the following information for each photograph:

- Station name (or feature)
- View
- Date

References

Bailey, R.G., R.D. Pfister and J.A. Henderson. 1978. Nature of land and resource classification: A review. Journal of Forestry 76: 650-655.

Bird Studies Canada (BSC). 2006a. Marsh Monitoring Program Guide to Amphibian Monitoring.

Bird Studies Canada (BSC). 2006b. Marsh Monitoring Program Guide to Bird Monitoring.

Canadian Council of Ministers of the Environment 2001. Canadian water quality guidelines for the protection of aquatic life: CCME Water Quality Index 1.0, Technical Report. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Conservation Halton 2006. Long Term Environmental Monitoring Program. March 2006.

Chu, C., N.E. Jones, A. R. Piggot and J.M. Buttle. 2009. Evaluation of a Simple Method to Classify the Thermal Characteristics of Streams Using a Nomogram of Daily Maximum Air and Water Temperatures. North American Journal of Fisheries Management 29: 1605-1619.

Citizens' Environment Watch. 2009. Water Quality Monitoring with Benthic Macroinvertebrates: Field Manual. Citizens' Environment Watch. Toronto.

Credit Valley Conservation. 2010. Monitoring Forest Integrity within the Credit River Watershed. Chapter 3: Forest Vegetation 2005-2009, Credit Valley Conservation. vi + 104 pp.

Cudmore, B., C.A. MacKinnon and S.E. Madzia. 2004. Aquatic species at risk in the Thames River watershed, Ontario. Can. MS Rpt. Fish. Aquat. Sci. 2707: v + 123 p.

DeLuca, W.V., C.E. Studds, L.L. Rockwood, and P.P. Marra. 2004. Influence of land use on the integrity of marsh bird communities of Chesapeake Bay, USA. Wetlands 24(4): 837-847.

Environment Canada. 2006. Ontario Forest Bird Monitoring Program (FBMP). Ontario Region of the Canadian Wildlife Service. http://www.on.ec.gc.ca/wildlife/newsletters/fbmp06-e.html [Accessed October 1, 2006]

Great Lakes Coastal Wetland Consortium. 2008. Great Lakes Coastal Wetland Monitoring Plan.

Hilsenhoff, W.L. 1988. Rapid field assessment of organic pollution with a family-level biotic index. Journal of North American Benthological Society 7:65-68.

Jones, C., K. Somers, B. Craig and T. Reynoldson, 2007. Ontario Benthos Biomonitoring Network Protocol Manual. Ontario Ministry of Environment, Environmental Monitoring and Reporting Branch, Dorset, Ontario.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section Field Guide FG-02. 225 pp.

Metcalfe-Smith, J., G.L. Mackie, J. Di Maio and S. Staton. 2000. Changes Over Time in the Diversity and Distributio of Freshwater Mussels (Unionidae) in the Grand River. Journal of Great Lakes Research. Volume 26, Issue 4, 2000, Pages 445–459

Mackie, G., Morris, T.J., and Ming, D. 2008. Protocol for the detection and relocation of freshwater mussel species at risk in Ontario-Great Lakes Area (OGLA). Can. Manuscr. Rep. Fish. Aquat. Sci. 2790: vi +50 p.

Ministry of Municipal Affairs and Housing. 2014. 2014 Provincial Policy Statement. Queens Printer for Ontario.

Ministry of the Environment. 1999. Water Management: Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment.

Oldham, M.J., W.D. Bakowsky, and D.A. Sutherland. 1995. Floristic Quality Assessment System for Southern Ontario. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. 29 pp.

Ontario Breeding Bird Atlas (OBBA). 2001. Guide for Participants. Atlas Management Board, Federation of Ontario Naturalists, Don Mills.

Ontario Ministry of Natural Resources (OMNR). 2001. A Sampling Protocol for Red-backed Salamander (Plethodon cinereus) Populations in Ontario: 2nd Pilot Study. Queens Printer for Ontario.

Ontario Ministry of Natural Resources (OMNR) and the Toronto and Region Conservation Authority (TRCA). 2005. Humber River Fisheries Management Plan. Published by the Ontario Ministry of Natural Resources and the Toronto and Region Conservation Authority. Queens Printer for Ontario.

Ontario Ministry of Natural Resources and Forests (OMNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. Regional Operations Division. Peterborough, Ontario.

Province of Ontario. 2005. Places to Grow Act. Ontario Regulation 415/05: Growth Plan Areas

Roberts-Pichette, P. and L. Gillespie. 1999. Terrestrial Vegetation Biodiversity Monitoring Protocols. EMAN Occasional Paper Series Report No 9. EMAN Coordinating Office. Burlington, Canada.

Pollard, E, and T.J. Yates. 1993 Monitoring Butterflies for Ecology and Conservation. Chapman & Hall, London, UK.

Stanfield, L. (Editor) 2005. Ontario Stream Assessment Protocol. Version 7, Fish and Wildlife Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 256 pp.

Steedman, R.J. 1988. Modification and Assessment of an Index of Biotic Integrity to Quantify Stream Quality in Southern Ontario. Canadian Journal of Fisheries and Aquatic Sciences 45:492-495.

Stoneman, C.L. and M.L. Jones. 1996. A Simple Method to Classify Stream Thermal Stability with Single Observations of Daily Maximum Water and Air Temperature. North American Journal of Fisheries Management 16:728-737.

Conservation Halton
Administration Office
2596 Britannia Road West
Burlington ON L7P 0G3
905 336 1158 Phone
905 336 7014 Fax
Website: conservationhalton.ca

Memo

To: Conservation Halton Board of Directors

From: Janelle Weppler – Associate Director, Engineering

Date: May 25, 2017

Subject: Kelso Dam Update

This briefing note is in response to the following resolutions that were made during the Conservation Halton Board of Directors meeting on April 28, 2016:

- The Conservation Halton Board of Directors **direct staff to provide monthly updates as to the status of Kelso Dam, including water levels, plume sightings, project progress and any remedial actions being undertaken;** and
- The Conservation Halton Board of Directors **direct staff to work with the Ministry of Natural Resources and Forestry, Halton Region and Hatch to expedite, to the extent possible, the permanent remedial measures required to mitigate the dam breach risk at the Kelso Dam.**

Kelso Reservoir Water Levels and Monitoring

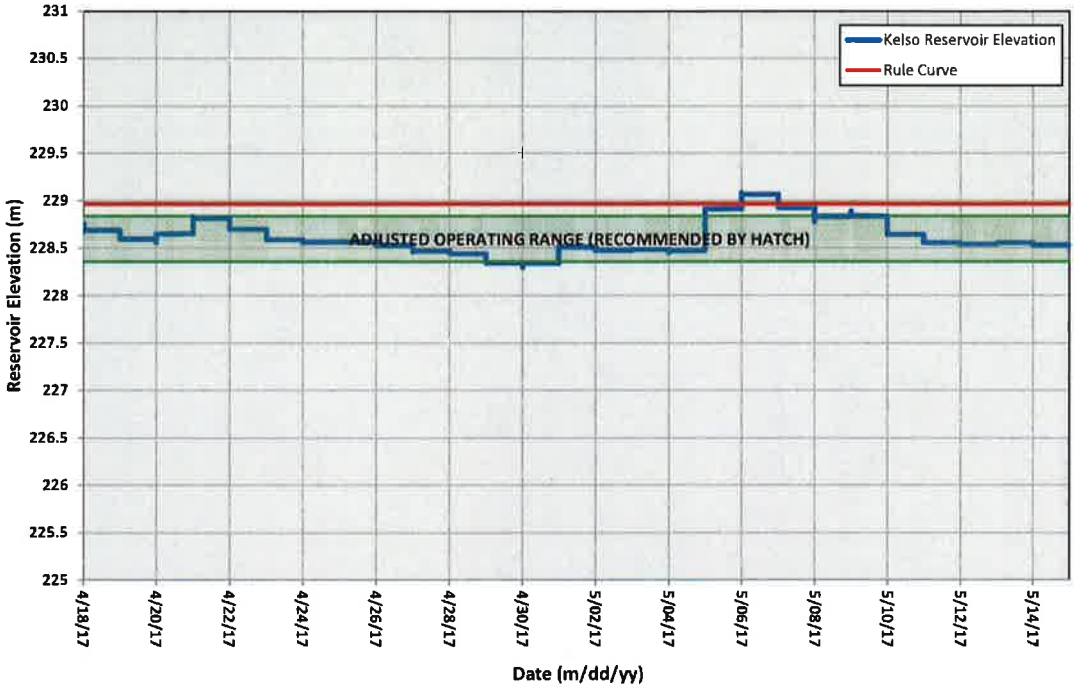
Conservation Halton staff have increased the frequency of conditions monitoring and recording at the Kelso Dam in response to the raised summer water levels, as follows:

- Bi-weekly piezometer (groundwater) readings within the earthen embankment;
- Four site visit inspections per day; and,
- Review of photographic records of the identified boil area taken every 30 minutes throughout the day (visible during daylight hours).

There continues to be no visible observation of sedimentation from the boil area (i.e. no plume sightings) since the last Kelso Dam Update report for the Board of Directors, dated April 18, 2017.

The following chart illustrates the recorded water levels within the Kelso reservoir relative to the reduced water level operating range recommended by Hatch.

Kelso Reservoir Elevation
April 18, 2017 to May 15, 2017



Recent Work & Next Steps

Conservation Halton staff with the support of Hatch have undertaken the following work in support of the upcoming repair and rehabilitation works at the Kelso dam:

Groundwater Investigation
Drilling of boreholes for new piezometers within the proposed construction area was completed and new equipment is being used to collect data that will confirm soil characteristics and provide hydrogeological information required for pumping and dewatering during construction.

Utility Pole Relocation
Utility poles and associated services located within the Kelso dam construction footprint were relocated out of the proposed construction zone.

Kelso Dam Urgent Repairs and Rehabilitation Projects - Prequalification and Tendering
Conservation Halton staff together with Hatch have reviewed, evaluated and compared bids received from all four (4) prequalified contractors on April 20th, 2017. Conservation Halton staff have identified the qualifying bid for approval by the Conservation Halton Board of Directors through a separate report, provided with the agenda for the Board of Directors meeting on May 25, 2017.

Construction of the proposed works at the Kelso dam are estimated to commence June 2017 and end December 2017, subject to confirmation of the successful contractor and proposed milestones documented within the awarded contract by the successful bid. Construction timing is also subject to permitting and funding schedules.

Permitting and Approvals
Conservation Halton staff with the support of Hatch, continue to work with agencies on obtaining the required permits and approvals in preparation for the upcoming construction works at the Kelso dam.

Conservation Halton

905.336.1158
Fax: 905.336.7014
2596 Britannia Road West
Burlington, Ontario L7P 0G3
conservationhalton.ca

Protecting the Natural Environment from Lake to Escarpment

May 11, 2017

Alyson M. Henry

Dear Ms Henry:

Thank you for your letter of May 4, 2017 regarding your concerns for the trees, animals and plants on the east side of King Road, Burlington. We shall try to provide you with some information that will answer your questions.

Forterra Brick's Aldershot Quarry straddles King Road in North Aldershot, with the east cell being adjacent to our Waterdown Woods landholdings. Portions of the quarry fall within the Stewardship Lands of the Cootes to Escarpment EcoPark System. In 2015, Forterra provided notice that it intends to commence tree clearing to allow for shale extraction in the east cell. The City of Burlington Council Information Memorandum (July 20, 2016) provides additional background on the project.

CH staff have received several enquiries in regard to Conservation Halton's role or position with respect to the activation of operations within the east cell. We have consistently indicated that these operations are governed by the site plan associated with the licence, and as such Ontario Regulation 162/06 does not apply; furthermore, no planning approvals are required. Under these circumstances, regulatory authority over the forthcoming extraction phase rests solely with the Ministry of Natural Resources and Forestry (MNRF). As such, we have directed enquiries to the Ministry.

Conservation Halton has undertaken biological surveys on the property, with Forterra's express permission and approval. Endangered species are known on and adjacent to the site and the focus of our survey efforts in recent years has been on the Mottled Duskywing butterfly. However, CH is not directly involved in the development of mitigation plans as we have no jurisdictional authority in relation to the *Endangered Species Act*, and our role is to provide information to the responsible authority (MNRF). We maintain an open dialogue with MNRF in relation to this (and other) files.

CH will continue to focus efforts on providing the best possible information to decision-makers through our monitoring program, and offering the services of our stewardship and restoration group to assist Forterra with implementing whatever mitigation measures are prescribed by the regulatory authority, the Ministry of Natural Resources and Forestry. We will also continue to

work with Cootes to Escarpment EcoPark System partner agencies and organizations, including the City of Burlington, to highlight the ecological significance of the area in which Forterra Brick is located.

We hope this provides you with some answers and again, thank you for your inquiry.

Yours truly,

Hassaan Basit
CAO/Secretary-Treasurer

cc Gerry Smallegange, Chair, Conservation Halton Board of Directors
Conservation Halton Board Members
(May 25, 2017 Board Agenda)

Letter to Conservation Halton – sent by email pvickers@hrca.on.ca

May 4, 2017

Conservation Halton
2596 Britannia Road West
Burlington, ON L7P 0G3

ATTN: Board of Directors

We are pleased to see your April 25th announcement "Trees for Watershed Health 2017 event" on your website. This is an excellent way to help and promote our watershed at the Bayview Park in Burlington. Planting between 700 and 1,000 native trees and shrubs is a positive way to help the watershed.

On your website, you make excellent points about the watershed. Following are two quotes about healthy watersheds:

http://www.conservationhalton.ca/about-us

Your neighbourhood conservation authority, Conservation Halton, works to protect, restore and manage natural resources in your watershed from lake to escarpment. Our vision is to sustain a healthy watershed with clean streams, **vigorous forests**, abundant green space and balanced growth that results in strong livable communities.

http://www.conservationhalton.ca/benefits-of-healthy-watersheds

Benefits of Healthy Watersheds

Our natural ecosystems are made up of **forests**, wetlands, water sources, plants and animals, and provide multiple goods and services that contribute to a healthy economy, environment and people. Every day, we rely on ecosystem goods and services - they connect us to our environment.

Conservation Authorities deliver practical, cost effective programs that ensure healthy ecosystems which enable them to generate and maintain valuable goods and services, often preventing the need for costly technological solutions to environmental problems.

- **Human Health**: A healthy watershed provides safe drinking water, provides food, enables us to adapt to the impacts of climate change more easily by cooling the air and absorbing greenhouse gas emissions, and provides natural areas for people to keep active and recharge our batteries.
- **Ecological Health**: A healthy watershed conserves water, promotes streamflow, supports sustainable streams, rivers, lakes, and groundwater sources, enables healthy soil for crops and livestock, and also provides habitat for wildlife and plants.
- **Economic Health**: A healthy watershed produces energy and supplies water for agriculture, industry and households. Forests and wetlands help to prevent or reduce costly climate change and flooding impacts, manages drought, contributes to tourism, fisheries, forestry, agriculture and mining industries.

So my question is, isn't it important to also protect the watershed on the east side of King Road, namely the 9,000 trees in the east cell of the Forterra/Meridian quarry that is 50 meters from Westhaven Drive at the northeast end? Surely with your mandate you should not allow these trees and the animals and plants that live within this watershed to be destroyed for the sake of some bricks? It somehow doesn't seem right to be planting trees on the west side of the road and allowing the trees on the east side to be destroyed.

I understand that the license that was issued by MNR more than 40 years ago allows the current company to go ahead with the destruction. How can you help the residents of Westhaven Drive and the Tyandaga neighbourhood stop, delay or change the area of destruction? I look forward to a response to this letter outlining your actions.

Regards,

Alyson M. Henry
Tyandaga Resident

CONSERVATION HALTON
CHBD 04 17 01

REPORT TO: Board of Directors

FROM: Marnie Piggot, Director, Finance
905 336-1158 x 2240

DATE: May 25, 2017

SUBJECT: **Budget Variance Report for the period ended March 31, 2017**

Recommendation:

THAT the Conservation Halton Board of Directors **receive for information the staff report dated May 25, 2017 on the Budget Variance Report for the period ended March 31, 2017;**

AND FURTHER THAT the Conservation Halton Board of Directors **approve the transfer from the Watershed Management and Support Services Stabilization Reserve of $52,153 for the strategic planning software and the Finance function effectiveness assessment expenditures.**

Summary:
Attached is the Budget Variance Report for the period ended March 31, 2017. The Budget Variance Report provides the 2017 Projected Year-End Variances. According to the Total Summary, there is a potential for a shortfall in planning and permit revenues of $230,000. These revenues will be monitored by staff during the year and if required, a recommendation will be made in a future report for a transfer from Reserves.

The Conservation Areas' overall revenues are at 58.4% of the 2017 Budget target amount and are also within the three-year average revenue at this time. Revenues for Crawford Lake/Mountsberg are slightly below the three-year average due to a decrease in visitation to the maple syrup program because of less than optimal weather conditions. This shortfall is offset by increased annual pass sales and revenues from other parks. There is no budget variance expected for 2017 Conservation Areas revenue and expenditures.

The table below is a summary from the Budget Variance Report of the 2017 Budget amounts compared to the actual amounts for the first quarter period ending March 31, 2017:

	2017 BUDGET	ACTUAL MAR 31/17	% ACTUAL /BUDGET	2017 Projected Year-End Actuals	2017 Proj. Year-End Variance
Watershed Management & Support Services					
Revenue	$14,930,218	$ 4,069,036	27.3%	$15,029,717	$ 99,499
Expenditures	14,930,218	3,705,531	24.8%	15,259,717	329,499
Surplus (Deficit)	**$ 0**	**$ 363,505**	**100.0%**	**($ 230,000)**	**($230,000)**
Conservation Areas					
Revenue	$10,822,413	$ 6,320,219	58.4%	$10,822,413	$ 0
Expenditures	10,822,413	3,900,247	36.8%	10,822,413	0
Surplus	**$ 0**	**$ 2,419,972**	**1045.8%**	**$ 0**	**$ 0**
Capital Program					
Revenue	$ 7,503,000	$ 476,603	6.4%	$7,503,000	$ 0
Expenditures	7,503,000	476,603	6.4%	7,503,000	0
Surplus	**$ 0**	**$ 0**	**6.4%**	**$ 0**	**$ 0**

Watershed Management & Support Services - Operating

Note 1. Revenue	2017 Budget	Actual Mar 31/17	Projected Year-End Actuals
Provincial Funding (Source Protection & Land Management)	**$ 418,269**	**$186,796**	**$ 544,459**

Provincial funding for the Source Protection Program is projected to exceed the 2017 Budget amount by $126,190 as a result of funding carried over from the prior year, for numeric modelling services for two projects with the Greensville municipal water supply – wellhead protection vulnerability analysis and Tier 3 water budget and water quantity risk assessment. Expenditures are also projected to exceed the budget by the same amount.

Planning & Regulations	**$2,673,112**	**$815,595**	**$2,443,112**

Planning & Regulations revenues of $815,595 have been recognized based on an analysis of work completed in the first quarter of 2017. In addition to this, revenue of approximately $150,000 has been recognized where there has been inactivity for an extended period of time.

Based on the 2016 actual planning and permit revenues of $1.7M, and factoring in approved fee increases and $150,000 recognized from inactive files, the total 2017 Budget amount of $2,180,000 for these fees may have been set too high, which could result in a budget shortfall of $230,000. Staff will continue to monitor these fees.

Transfers from Reserves	**$ 15,000**	**$ 52,153**	**$ 218,309**

Transfers from Reserves is projected to exceed the budget by $203,309 for strategic planning software, the Finance function effectiveness assessment, staff development, and consulting services for the strategic plan and asset management plan. These transfers were not included in the 2017 Budget and were approved as transfers from the Watershed Management Stabilization Reserve at the March 2017 Board meeting. Actual costs incurred to March 31, 2017 are for the strategic planning software and the Finance function effectiveness assessment.

Note 2. Expenditures

People, Performance And Culture	**$2,067,237**	**$524,614**	**$2,152,237**

This program is projected to exceed expenditures by $85,000 for staff development costs approved to be funded by a Transfer from Reserves at the March 2017 Board meeting.

Prepared by:

Marnie Piggot
Director, Finance

Respectfully submitted:

Sheryl Ayres
Senior Director, Finance and Strategic Initiatives

Approved for circulation:

Hassaan Basit
CAO/Secretary-Treasurer

CONSERVATION HALTON
Budget Variance Report
For the Period Ended March 31, 2017

TOTAL SUMMARY

		2017 Budget	Year To Date Actual Mar 31/17	2017 Projected Year-End Actuals	2017 Projected Year-End Variance	
Revenue						
Program revenue	**Note 1.**	$13,650,521	$7,211,318	$13,420,521	($230,000)	-1.7%
Provincial Funding - Operating	**Note 1.**	718,580	261,874	844,770	126,190	17.6%
Municipal Funding - Operating		8,596,587	2,149,147	8,596,587	0	0.0%
Other Grants and Partnership Project Funding		1,592,343	446,989	1,592,343	0	0.0%
Internal Chargebacks		1,179,600	267,805	1,179,600	0	0.0%
Transfers from Reserves	**Note 1.**	15,000	52,123	218,309	203,309	1355.4%
Total Operating Revenue		**25,752,631**	**10,389,256**	**25,852,130**	**99,499**	**0.4%**
Total Capital Revenue		**7,503,000**	**476,603**	**7,503,000**	**0**	**0.0%**
Total Revenue		**$33,255,631**	**$10,865,859**	**$33,355,130**	**$99,499**	**0.3%**
Expenditures						
Salaries and Benefits		17,514,780	5,019,526	17,514,780	0	0.0%
Materials and Supplies		2,384,319	965,112	2,384,319	0	0.0%
Purchased Services	**Note 1. & 2.**	3,518,636	1,248,969	3,848,135	329,499	9.4%
Financial and Rent		347,200	94,184	347,200	0	0.0%
Internal Chargebacks		1,079,600	277,988	1,079,600	0	0.0%
					0	
Debt Financing Charges - Principal		390,352	0	390,352	0	0.0%
Debt Financing Charges - Interest		79,353	0	79,353	0	0.0%
Total Debt Financing Charges		469,705	0	469,705	0	0.0%
Transfer to Reserves		207,000	0	207,000	0	0.0%
Total Operating Expenditures		**25,521,240**	**7,605,779**	**25,850,739**	**329,499**	**1.3%**
Total Capital Expenditures		**7,503,000**	**476,603**	**7,503,000**	**0**	**0.0%**
Total Expenditures		**33,024,240**	**8,082,382**	**33,353,739**	**329,499**	**1.0%**
Excess of Revenue over Expenditures (Operating)		**$231,391**	**$2,783,477**	**$1,391**	**($230,000)**	**-99.4%**

CONSERVATION HALTON
Budget Variance Report
For the Period Ended March 31, 2017

Watershed Management & Support Services - Operating

SUMMARY (BY PROGRAM)		2017 Budget	Year To Date Actual Mar 31/17	2017 Projected Year-End Actuals	2017 Projected Year-End Variance	
Revenue						
Municipal Funding - Operating		$8,404,233	$2,091,441	$8,404,233	$0	0.0%
Provincial Funding (MNRF Operating)		300,311	75,078	$300,311	0	0.0%
Provincial Funding (Source Protection & Land Management)	Note 1.	418,269	186,796	$544,459	126,190	30.2%
Operations - Property Management and Forestry		252,500	53,601	$252,500	0	0.0%
Planning & Regulations	Note 1.	2,673,112	815,595	$2,443,112	(230,000)	-8.6%
Watershed Strategies & Integration (2016 Watershed Management Admin.)		458,100	133,911	$458,100	0	0.0%
Engineering & Flood Forecasting & Operations		85,000	0	$85,000	0	0.0%
Science & Partnerships (2016 Watershed Services)		137,962	41,845	$137,962	0	0.0%
Administration		1,028,000	274,133	$1,028,000	0	0.0%
Partnership Projects		1,157,731	344,513	$1,157,731	0	0.0%
Transfer from Reserves	Note 1.	15,000	52,123	$218,309	203,309	1355.4%
Total Operating Revenue		**$14,930,218**	**$4,069,036**	**$15,029,717**	**$99,499**	**0.7%**
Expenditures (by Program)						
Operations		$2,974,739	$687,496	$2,974,739	$0	0.0%
Planning & Regulations		3,229,728	829,410	$3,229,728	0	0.0%
Watershed Strategies & Integration (2016 Watershed Administration)		1,254,255	278,766	$1,254,255	0	0.0%
Engineering & Flood Forecasting & Operations		863,642	187,959	$863,642	0	0.0%
Science & Partnerships (2016 Watershed Services)		994,459	268,003	$994,459	0	0.0%
Source Water Protection	Note 1.	391,869	216,283	$518,059	126,190	32.2%
People, Performance & Culture	Note 2.	2,067,237	524,614	$2,152,237	85,000	4.1%
Finance		797,499	188,161	$797,499	0	0.0%
Strategic Initiatives	Note 1.	0	52,123	$118,309	118,309	100.0%
Administration		604,354	128,203	$604,354	0	0.0%
Partnership Projects		1,157,731	344,513	$1,157,731	0	0.0%
Debt Financing Charges		469,705	0	$469,705	0	0.0%
Transfer to Reserve - Debt Financing Charges		0	0	$0	0	0.0%
Transfer to Reserves		125,000	0	$125,000	0	0.0%
Total Operating Expenditures		**$14,930,218**	**$3,705,531**	**$15,259,717**	**$329,499**	**2.2%**
Excess of Revenue over Expenditures		**$0**	**$363,505**	**($230,000)**	**($230,000)**	**100.0%**

CONSERVATION HALTON
Budget Variance Report
For the Period Ended March 31, 2017

Conservation Areas - Operating

SUMMARY (BY PROGRAM)	2017 Budget	Year To Date Actual Mar 31/17	2017 Projected Year-End Actuals	2017 Projected Year-End Variance	
Revenue					
Conservation Areas - Annual Passes	$550,000	$146,428	$550,000	$0	0.0%
Conservation Areas - Other	12,500	0	$12,500	0	0.0%
Kelso / Glen Eden	7,580,250	5,630,858	$7,580,250	0	0.0%
Crawford Lake / Mountsberg	1,820,000	411,810	$1,820,000	0	0.0%
Rattlesnake Point / Hilton Falls / Mount Nemo	667,309	73,417	$667,309	0	0.0%
Sub Total	10,630,059	6,262,513	10,630,059	**0**	0.0%
Municipal Funding - Education Program	192,354	57,706	192,354	0	0.0%
Total Operating Revenue	**10,822,413**	**6,320,219**	**10,822,413**	**0**	**0.0%**
Expenditures					
Administration, Vehicle and Equipment Operations	$389,390	$75,354	$389,390	$0	0.0%
Kelso / Glen Eden	6,572,205	2,858,620	$6,572,205	0	0.0%
Crawford Lake / Mountsberg	2,011,998	571,476	$2,011,998	0	0.0%
Rattlesnake Point / Hilton Falls / Mount Nemo	644,229	132,787	$644,229	0	0.0%
Internal Chargebacks - Support Services	973,200	262,010	$973,200	0	0.0%
Total Operating Expenditures	**10,591,022**	**3,900,247**	**10,591,022**	**0**	**0.0%**
Excess of Revenue over Expenditures	**$231,391**	**$2,419,972**	**$231,391**	**$0**	**0.0%**

CONSERVATION HALTON
Budget Variance Report
For the Period Ended March 31, 2017

CAPITAL PROJECT SUMMARY

	2017 Budget	Year To Date Actual Mar 31/17	2017 Projected Year-End Actuals	2017 Projected Year-End Variance	
Revenue					
Municipal Funding - Capital	$562,500	$211,083	$562,500	$0	
Ministry of Natural Resources and Forestry - Capital	1,325,000	167,768	$1,325,000	0	
Municipal Debt Financing	2,632,500	38,809	$2,632,500	0	
Foundation Funded Capital Projects	100,000	0	$100,000	0	
Other Funding	1,900,000	11,224	$1,900,000	0	
Transfers from Reserves for Capital Projects-Debt Fin. Vehicles & Eqpt.	308,000	0	$308,000	0	
Transfer from Reserves for Capital Projects - Conservation Areas	675,000	47,719	$675,000	0	
Capital Projects Funding	**$7,503,000**	**$476,603**	**$7,503,000**	**$0**	**0.0%**
Expenditures					
Dams and Channels Maintenance Projects	$385,000	$48,833	$385,000	$0	
Dams and Channels Major Repair Projects	5,265,000	286,702	$5,265,000	0	
Flood Forecasting and Warning Program Upgrades	110,000	0	$110,000	0	
Facility and Major Maintenance	0	38,809	$0	0	
Information Technology Infrastructure	80,000	43,316	$80,000	0	
Foundation Funded Capital Projects	100,000	0	$100,000	0	
Master planning	0	10,632	$0	0	
Vehicle & Equipment Replacement	308,000	0	$308,000	0	
Conservation Areas Capital Projects	675,000	48,311	$675,000	0	
Capital Projects Expenditures	**$7,503,000**	**$476,603**	**$7,503,000**	**$0**	**0.0%**

CONSERVATION HALTON
CHBD 04 17 02

REPORT TO: Board of Directors

FROM: Gene Matthews, Director, Operations 905-336-1158 x2224 and Craig Minnett, Manager, Information Technology x2269

DATE: May 25, 2017

SUBJECT: **Electronic Commerce Services**

Recommendation

THAT the Conservation Halton Board of Directors **approve entering into a formal agreement with Accesso for the provision of electronic commerce services to be funded as noted in the staff report dated May 25, 2017.**

Summary

Conservation Halton operates an electronic commerce system on site that administers a substantial amount of revenue for the organization. It is the goal of Conservation Halton to enhance and develop this e-commerce system to promote greater revenue in sales, improve website functionality, and to improve visitor experience.

In 2009, the Conservation Halton Board of Directors approved the award to Sirusware for the investment in an enterprise point of sale system. The Siriusware e-commerce module was purchased and deployed by Conservation Halton in 2010. The point of sale system costs the Conservation Areas approximately $38,000 US per year or $51,000 Canadian for annual maintenance fees that are funded by park operating revenues. Although staff are pleased with the functionality of the point of sales system, the Siriusware e-commerce system has had many challenges since its inception that are related to volume, functionality, and user experience. Consequently, Conservation Halton staff looked for another option for running the e-commerce platform. The option selected must be compatible with the Siriusware back end database and application programming interface. The only compatible option that will work with Siriusware in this manner is Accesso Passport. Any other options would involve redesigning the existing system or moving away from Siriusware altogether, resulting in significant costs.

Accesso, a leader in point of sale and e-commerce solutions, has recently acquired Siriusware. Accesso has a more robust e-commerce product called Passport. Passport offers several enhancements that will help staff mitigate ongoing challenges with the existing e-commerce platform. Additionally, since Accesso acquired Siriusware, the company has been migrating some of their clients from the Siriusware platform to the Accesso Passport platform. Consequently, Passport is now completely compatible with the Siriusware technical framework.

Conservation Halton staff are recommending the sole source award to Accesso and migrating from Siriusware ecommerce to the Accesso Passport platform to realize the online e-commerce sales goals and ensure compatibility to the existing point of sale system.

All Accesso fees are priced in US dollars and are therefore subject to foreign exchange fluctuations. The US exchange rate applied for cost projection purposes has been conservatively estimated using a rate of C$1.40. Additional costs and fees are associated with the Accesso Passport platform and are expected to be offset by additional revenue for the respective online programs. The increased rates may be effective at the time of implementation

which could be potentially as early as fall 2017. Any rate increases will be considered as part of a longer term fee strategy to ensure affordability for visitors, competitive pricing and financial sustainability.

Report

Conservation Halton operates seven e-commerce websites via software called Siriusware. These websites are responsible for sales of various items and generate substantial revenue. In 2016, Conservation Halton generated almost $2.4 million in sales via the e-commerce websites which was a lower sales volume year with the shorter Glen Eden season. Based on early bird Glen Eden sales in March 2017 and sales estimates for the balance of the year, 2017 on line sales are projected to be $2.8 million. Items for sale online include memberships, passes, events, donations, Christmas Town lottery, camps, camping and ski/snowboard lessons. It is the goal of Conservation Halton to enhance and develop this e-commerce system to promote greater revenue in sales and to improve the guest experience when visitors go online to purchase products.

Conservation Halton has had various challenges since the inception of the current e-commerce system. The main challenges with Siriusware as an e-commerce platform are related to volume, upgrades to the software, and guest/user experience. Siriusware e-commerce does not handle Conservation Halton's periods of high volume well. For example, when Christmas Town went live for selling tickets in 2009 and 2010, the e-commerce system 'crashed'. Consequently, we have had to move to a lottery system to sell tickets for Christmas Town. This lottery results in increased labour costs, as more staff intervention is required with Christmas Town operating as a lottery.

Accesso has recently acquired Siriusware. Accesso has their own e-commerce product called Passport and administers over US$1 Billion in sales and has sold over 30 million tickets online with key industry players such as Ripley's Aquarium, Six Flags parks, Cedar Fair Entertainment, and Palace Entertainment. Passport offers several enhancements over our current e-commerce provider:

- Passport is a Software as a Service (SaaS) application. This means that Accesso will host our web server in the Cloud eliminating the need for Conservation Halton CH to host and maintain its own webserver for e-commerce purposes.

- Passport being a SaaS solution, can guarantee a 99.998% percent up time as they host their servers at Rackspace. Rackspace is the largest managed cloud provider, offering expertise across the world's leading clouds.

- Since Accesso has acquired Siriusware, Accesso has ensured that Passport is completely compatible with the Siriusware software point of sale, back end platform.

- Included in Accesso's business model are all maintenance costs, backup processes, and upgrades. Therefore, there will be less demand on CH staff to maintain an e-commerce platform.

- With at least half of visitors now using their mobile devices to make online purchases, Passport's platform is fully responsive and adaptive based on the type of device a visitor chooses to use.

- The Accesso passport ecommerce platform offers robust functionality to quick-sell, up-sell and cross-sell products to drive incremental revenue and maximize the guest experience.

- Passport is Payment Card Industry Data Security Standard (PCI-DSS) compliant. Because Accesso is a SaaS product, all credit card transactions occur on Accesso's system in the Cloud. Therefore, a move to Passport from Siriusware e-commerce will remove the payment process from Conservation Halton's PCI-DSS scope essentially reducing the organizations liability for accepting online payments.

- Accesso will design the CH e-commerce site so that it integrates seamlessly with current informational websites. Therefore, guests will enjoy a seamless experience that moves from browsing to purchase.

- Accesso Passport boasts a superior design and intuitive web interface, which makes sense to guests and is easy to navigate. In visiting sites that are managed by Accesso, you are confronted by beautiful, dynamic web pages that fully capture the spirit and essence of the business passport is representing.

Financial Impact

One time fees

Accesso charges a base fee of US$5,000 per venue. Conservation Halton has two venues, being Conservation Halton and Glen Eden. The total US$10,000 base fee, converted to C$ assuming an exchange rate of $1.40, of $14,000 includes all development and product configuration.

Product fees

Accesso charges a 5% per product fee, with a maximum ceiling price of US$5 per product and a minimum floor price of US$0.90 per product. For example, if a family of four purchases 5x7 passes at $246 apiece, 5% of each item purchased is $17.22 for a total potential fee of $68.22. However, because of the US$5 ceiling, using an exchange rate of C$1.40, the transaction fee is limited to C$7 for each of the items that are purchased. Since there were four items in their shopping cart, the total in service fees will be C$7 per item for a total of C$28 in fees rather than $68.88. This business model motivates Accesso to continually enhance their offerings to allow their clients to adapt to ever-changing market conditions and increase sale opportunities. Therefore, Accesso is a firsthand stakeholder in Conservation Halton's online success.

What is also important to note in the Accesso business model, is that the per product fees of 5% with the US$5 ceiling on all items purchased from e-commerce represent the only costs that are required for Passport. Included in Accesso's schedule of costs are PCI compliance, a fully hosted web server in the cloud, disaster recovery, 24/7/365 monitoring and management of the entire system, 99.998% uptime, backups and maintenance, and Passport is scalable to meet growing bandwidth demands

Projected Accesso costs (Canadian dollars)

In evaluating 2016 e-commerce sales totals under the proposed model, annual fees in Canadian dollars, using an exchange rate of $1.40, are estimated at $166,000. Based on projected sales for 2017 of $2.8 million the annual fees would be approximately $201,000. With a potential implementation date of September 2017, and based on estimated sales from September to December, Accesso fees for 2017 could be approximately $121,000.

Accesso has indicated that they have seen increased sales generated as a result of the implementation of the Passport e-commerce platform in other organizations. Based on 3% sales growth for 2018 and an additional 3% for increased e-commerce traffic, on line sales could increase to $3,050,000 with associated Accesso fees of $214,000.

Siriusware is still needed as a programming interface (API) in order for Accesso to work properly with Siriusware and as a result there will be no cost savings from Siriusware with the implementation of Accesso Passport. Staff cost savings associated with streamlined program registration processes for Christmas Town and Glen Eden ski and snowboard lessons will be minor.

For the 2018 Conservation Halton Budget, staff will be determining and recommending increased rates as part of a longer term fee strategy to accommodate the increase in expenses related to the improved online sales system. Recommended rate increases to offset Accesso costs will be applied to larger program items, in terms of volume of sales and price per product offerings. These are anticipated to include: Annual Park memberships, Glen Eden season passes, Glen Eden snow school programs, Ways of the Woods summer camp programs, and Mountsberg Christmas Town. Fee increases may be dispersed across the entire amount of a particular program, not solely the amount of a particular program sold through e-commerce. For instance:

Total 2016/17 Glen Eden pass products sold via e-commerce:	4,593
Total 2016/17 Glen Eden pass products sold in person:	4,079
Total:	8,672
Potential fee increase if solely applied to ecommerce sales:	$7.00 / pass
Potential fee increase if applied to all pass products:	$3.70 / pass

For context, this will increase an adult Glen Eden annual pass from $390 to $393.70. This approach will mitigate the impact of fee increases on visitors related to Accesso charges.

Prepared by:

Craig Minnett
Manager, Information Technology Services

Gene Matthews
Director, Operations

Approved for circulation:

Hassaan Basit
CAO/Secretary-Treasurer

CONSERVATION HALTON
CHBD 04 17 03

REPORT TO: Board of Directors

FROM: Teresa Labuda, Coordinator, Coastal Program & Watershed Capital Projects
905-336-1158 x 2234

DATE: May 25, 2017

SUBJECT: **Kelso Dam, Urgent Repair and Rehabilitation Projects Prequalification and Tender**

Recommendation

THAT the Conservation Halton Board of Directors **award the *Kelso Dam, Urgent Repairs and Rehabilitation Projects* to Dufferin Construction Company at an estimated cost of $3,548,545.00 plus HST and an additional $85,050 plus HST for Optional Items, subject to an actual contract award contingent on National Disaster Mitigation Program (NDMP) funding initiation.**

Policies and Procedures

Reference is made to the Conservation Halton's water management program and associated operation and maintenance of the Kelso Dam and reservoir.

Report

The Kelso Dam has been subjected to a number of dam safety inspections, assessments, investigations, evaluations and reviews. Various studies identified a number of dam safety deficiencies related to seismic loading, the lack of energy dissipation downstream of the concrete spillway structure and the potential for the emergency spillway flows to cause erosion that might threaten the dam embankment. In addition, on June 11, 2015 and June 23, 2015, a boil and evidence of turbid discharge was observed in the channel, immediately downstream of the outlet works.

Hatch was immediately retained following the turbid discharge observation on June 11, 2015, to complete investigations and to provide engineering advice and recommend mitigation measures that included lowering of the water level within the reservoir and monitoring through site visits, cameras and onsite equipment.

Hatch has since provided repair and rehabilitation designs and completed tender documents for the *Kelso Dam, Urgent Repairs and Rehabilitation Projects*. The scope of work associated with this project involves the following:

- Construction of a reinforced concrete stilling basin, downstream of the spillway, to dissipate the energy within the spillway flow releases and avoid significant erosion at the toe of the dam that could lead to dam failure;
- Remedial grouting within the body of the dam, immediately adjacent to spillway structure to improve the seal between the concrete box culvert and the adjacent sheet pile cut-off wall;

- Construction of erosion protection adjacent to the flow path from the emergency overflow spillway at the existing parking lot to ultimately direct the flows away from dam embankment;
- Removal and realignment of existing precast concrete erosion protection blocks located on the upstream slope of the dam, adjacent to the spillway structure on both sides;
- Decommissioning of 11 existing piezometer instruments in the dam embankment which are out of service and installment of 11 replacements;
- Asphalt resurfacing on the embankment dam crest;
- Local replacement of grouted rip-rap erosion protection on the upstream face of the dam; and
- Optional work including asphalt resurfacing of dam crest, replacement of grouted rip-rap near sluiceway and upgrade to fully automated piezometers.

Selection of the contractor for the upcoming construction works at the Kelso dam followed a two-step process that included prequalification of potential contractors followed by submission to the RFT from successfully prequalified contractors.

Conservation Halton staff, with support from Hatch and KD Enterprises (procurement advising consultant), prepared prequalification documents and posted for interested contractors on February 9, 2017, then closed on February 23, 2017. Conservation Halton received submissions from 10 interested contractors and the top four (4) were selected by Conservation Halton staff and Hatch, based on a weighted scoring of criteria including; experience with similar type and size of projects, ability to manage schedules/budget/change orders, project & professional references, and corporate history.

The Request for Tender (RFT) documents were issued to the four (4) prequalified contractors on March 10, 2017 and closed on April 20, 2017.

Bids were received from all four (4) prequalified contractors and were publicly opened on April 20, 2017 and later evaluated by Conservation Halton staff and Hatch. The submitted bids were as follows:

1.	Dufferin Construction Company	$3,548,545.00 plus HST
2.	Metric Contracting Services Corporation	$3,554,937.50 plus HST
3.	Maple Reinders Constructors Limited	$4,411,775.00 plus HST
4.	Rankin Construction Incorporated	$4,491,653.75 plus HST

Dufferin Construction Company has complied with the tender submittals as required per tender documents and presented the lowest bid. The project has been scheduled to start in June 2017, subject to received funding and required permits from the Niagara Escarpment Commission (NEC) and the Ministry of Natural Resources and Forestry (MNRF), and is scheduled to be completed by the end of December 2017.

Financial Impact

Favourable pricing received through the tender process results in an estimated savings of $42,450 on the construction portion of the budget for the Kelso Dam rehabilitation. Due to the significance of the works to be completed and the uncertainties that could be encountered, it is recommended that the savings remain in the project budget as a contingency until the project is complete.

The construction portion of the budget for the repair and rehabilitation works at Kelso Dam is summarized in the following table.

	Approved Budget	Projected Actual (Incl. non-recoverable HST)	Variance
Cost			
Construction Expenditure (Construction Base Bid)		$3,611,000	
Optional Items		$86,550	
Total Cost	$3,740,000	$3,697,550	$42,450
Funding			
Municipal Debt Financing	$1,870,000	$1,848,775	$21,225
NDMP*	$1,500,000	$1,500,000	$0
WECI**	$370,000	$348,775	$21,225

**Awaiting finalization of Bilateral Contribution Agreement (BCA) between Provincial (MMA/MHO) and Federal Funding (Public Safety Canada) partners*
***Confirmation of approved funding from MNRF received on May 18, 2017*

Summary

Conservation Halton staff recommend that the Conservation Halton Board of Directors award the construction of the *Kelso Dam, Urgent Repairs and Rehabilitation Projects* to Dufferin construction Company at an estimated cost of $3,548,545.00 plus HST and an additional $85,050 plus HST for Optional Items, subject to an actual contract award contingent on National Disaster Mitigation Program (NDMP) funding initiation.

Prepared by:

Teresa Labuda
Coordinator, Coastal Program &
Watershed Capital Projects

Respectfully submitted:

Janelle Weppler
Associate Director, Engineering

Approved for circulation:

Hassaan Basit,
CAO/Secretary-Treasurer

CONSERVATION HALTON
CHBD 04 17 04

REPORT TO: Board of Directors

FROM: Nigel Finney, Watershed Restoration Planner
905-336-1158 x 2305

DATE: May 25, 2017

SUBJECT: **Green Infrastructure Feasibility Study – Administration and Kelso Land Holdings**

Recommendation

THAT the Conservation Halton Board of Directors **direct Conservation Halton to develop a Green Infrastructure Feasibility Study for the Administration Building, Kelso Conservation Area and Crawford Lake Conservation Area that will address stormwater quality and quantity at the lot level that will include specific tasks, who will accomplish them and when they will be implemented, estimated costs and an implementation and monitoring strategy.**

AND FURTHER THAT the **Conservation Halton Board of Directors commit $13,444 of in-kind staffing costs from the existing operating budgets for 2017/18 towards the costs of this initiative.**

AND FURTHER THAT **Conservation Halton staff be supported to work with member municipalities on this initiative to demonstrate municipal commitment.**

Summary

Municipalities for Climate Innovation Program (MCIP), administered by the Federation of Canadian Municipalities (FCM), provides funding to help Canadian cities and communities of all sizes adapt to the impacts of climate change and reduce greenhouse gas (GHG) emissions.

Through MCIP, they provide funding to municipalities for plans, studies, demonstration projects and support for staff salaries to plan and implement climate change adaptation projects. Focus areas include energy, water, waste, transportation, asset management, GHG reductions and reducing vulnerability to climate change impacts. In 2017, the list of eligible recipients was broadened and now includes Conservation Authorities as lead applicants.

Conservation Halton is seeking board resolution to support the submission of a Climate Change adaptation plan for the Administration Office, Kelso Conservation Area and Crawford Lake Conservation Area land holdings.

Green Infrastructure Feasibility Study

The funding program supports the development of feasibility studies and detailed designs to determine the most appropriate green infrastructure technology to maximize return on investment. The study would recommend priority green infrastructure opportunities to improve stormwater treatment and management at the lot level and provide detailed designs on innovative demonstration projects that benefit the community.

This initiative supports the Strategic Plan Activity which indicates Conservation Halton will develop and implement a plan for showcasing green infrastructure techniques on CH properties (i.e. demonstration areas) for educational purposes of municipalities, the development community and the public at large.

Staff have been completing internal consultation on prioritization of green infrastructure opportunities. In order to complete technical studies to demonstrate the improvements to stormwater management, detailed feasibility studies are required to be completed.

Results from this and the proposed feasibility study will be incorporated into the forthcoming Kelso Conservation Area Master Plan, the Administration Building Landscape Master Plan as well as future planning in relation to Crawford Lake Conservation Area.

To be eligible for funding, Conservation Halton must apply in partnership with a municipal government to demonstrate their commitment to the initiative. The municipal commitment to the project must demonstrate 10% of the overall budget to be supported through cash or in-kind contributions and must be endorsed by their council.

Green Infrastructure, as defined by the *Green Infrastructure Ontario Coalition*, is defined as the natural vegetative systems and green technologies that collectively provide society with a multitude of economic, environmental and social benefits. This includes:

- Urban forests and woodlots;
- Bioswales, engineered wetlands and stormwater ponds;
- Wetlands, ravines, waterways and riparian zones;
- Meadows and agricultural lands;
- Green roofs and green walls;
- Urban agriculture;
- Parks, gardens, turf, and landscaped areas.

It also includes soil in volumes and qualities adequate to sustain green infrastructure and absorb water, as well as technologies like porous pavements, rain barrels and cisterns, which are typically part of green infrastructure support systems. The green technologies in this definition replicate the functions of ecosystems, such as stormwater storage and filtration.

Climate Change Adaptation is the process of modifying or updating infrastructure and community practices in order to address issues related to climate change. Climate change adaptation is of great importance to watershed management given the increase in climate related events such as excessive rainfall which has caused damage to infrastructure and natural systems. Steps to adapt grey infrastructure to green infrastructure can assist in avoiding the negative impacts from climate change.

Prepared by:

For

Nigel Finney
Watershed Restoration Planner

Approved for circulation:

Kim Barrett
Associate Director, Science and Partnerships

Approved for circulation:

Hassaan Basit
CAO/Secretary-Treasurer