Oshawa Creek Watershed Plan

Central Lake Ontario Conservation

In partnership with:

Conservation Ontario
Natural Champions

DURHAM REGION

FINAL – February 2013

ACKNOWLEDGEMENTS AND SPECIAL THANKS

Many members of CLOCA's staff have played a role in the development of the Oshawa Creek Watershed Plan. The fulsome nature of this Watershed Plan is reflective of the significant effort undertaken by CLOCA's Natural Heritage, Engineering, and Groundwater teams who collected field data, analyzed the findings, ran models, prepared reports and reviewed the Plan and its components. Special mention goes to the work of CLOCA's GIS staff who have generated the maps, managed the data, produced display material, provided statistics, and contributed many hours to the creation, evaluation and analysis of various models. Other members of CLOCA staff have provided their support, which has been invaluable with the consultation and communication of the Plan. Sincere appreciation and gratitude is expressed to Debbie Vandenakker Watershed Planner, and to former CLOCA employee Tammy Chung. Their significant individual contribution to this Plan has been outstanding and is commended. Thanks also to Keith Isnor for providing some of the great pictures of CLOCA lands and other watershed features.

I also wish to thank those who have participated in the Oshawa Creek Watershed Plan consultation process. Your insightful comments and suggestions have positively contributed to this Plan.

Without the expertise, advice, support and knowledge provided from the many contributors, this Plan would not be what it is today.

Thanks to all!

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Director, Watershed Planning and Natural Heritage
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EXECUTIVE SUMMARY

The goal of watershed planning is to provide a framework to protect, restore and enhance a healthy and resilient watershed. A Watershed Plan examines the environment and human activities within a watershed area and assesses the relationships between these activities to determine how the ecosystems of the watershed should be managed to ensure they retain their ecological integrity and health in a sustainable manner.

The purpose of the Oshawa Creek Watershed Plan specifically is to be ***the definitive tool used by CLOCA, municipalities, planning authorities, agencies and all other stakeholders to guide decisions regarding the effective management of watershed resources in response to a changing environment.*** This Plan recognizes the unique urban, rural and natural environment conditions present in the watershed, considers future growth and planning policy, and recommends specific measures to protect our resources.

The goal of this Watershed Plan is to achieve healthy natural systems within the Oshawa Creek Watershed which can positively respond to landscape changes and watershed conditions while sustaining its ecological health and integrity. This Plan provides the framework that will protect, restore and enhance the natural resources in the watershed to ensure that it will continue to function as a system of healthy natural interactions in response to a quickly changing social, economic and natural landscape.

This Watershed Plan does not prescribe land use. Rather, at a watershed scale, it informs municipalities and makes recommendations regarding the natural features and functions necessary to achieve watershed health, which in turn helps protect the natural, social, cultural and economic capital of the watershed.

Implementation of the Watershed Plan will be carried out predominantly by CLOCA, the Region of Durham and the local municipalities through the Action Plans and policy recommendations described herein.

Sections 1, 2 and 3 – Preparing the Plan

The first three sections of this Watershed Plan provide introductory context, summarize the watershed's existing conditions and CLOCA's watershed plan development process. Together, these sections illustrate all of the background and process information regarding the development of the Watershed Plan.

Sections 4 through 8 – Managing the Watershed

Section 4 provides a look at a "Healthy Oshawa Creek Watershed" through the identification of watershed health targets that, if achieved, would indicate that the watershed has achieved the minimum standards of health. To achieve these targets a "Watershed Management Plan" has been developed, and is depicted as a map in **Figure 13**. This map illustrates the key components of the watershed for protection, restoration and

enhancement that will allow health targets to be met. Components include the delineation of the Oak Ridges Moraine, the Lake Iroquois Beach, a 1km buffer of the Lake Ontario Shoreline, High Volume Recharge Areas (HVRAs), Regional Wildlife Movement Corridors, the Natural Heritage System (NHS) and Manicured Greenspace. Together, these elements represent all of the fundamental aspects of meeting key watershed health targets, and have been amalgamated into one mapping product and translated into a Management Plan.

Section 5 – CLOCA Responsibilities describes CLOCA's strategic priorities for managing the watershed through the implementation of the Watershed Plan and describes 24 Action Plans for CLOCA to undertake that have been identified as necessary for achieving various watershed health targets. A summary table of the Oshawa Creek 1995 and 2002 Watershed Management recommendations is also provided in this section.

Section 6 – Municipal Partners includes policies that have been created as tools for our partner municipalities to incorporate into their Official Plan documents. These policies translate watershed goals, objectives and targets into municipal policy language so that our municipal partners have the effective policy instruments to implement the recommendations of this Watershed Plan.

Section 7 – Other Partners and Stakeholders provides strategic priorities for affecting positive changes in the watershed with residents, land owners, schools, community groups, business and the development community.

Section 8 – Unique Management Areas describes aspects of the Oshawa Harbour, the Goodman Flood Area and Montgomery Creek as these areas require special management consideration due to their unique characteristics.

Sections 9 and 10: Monitoring and Next Steps

These final two sections take us beyond watershed plan implementation, providing advice and guidance on performance monitoring and assessment of progress made in achieving the healthy watershed targets.

This Watershed Plan is built upon the foundation of knowledge compiled in the 1995 Oshawa Creek Watershed Plan undertaken by the City of Oshawa, the 2002 Oshawa Creek Watershed Plan undertaken by CLOCA, and the 2011 Addendum to the 2002 Watershed Plan (also undertaken by CLOCA) that updates the 2002 existing conditions information**.**

Through the implementation of this Plan, municipalities will be able to balance the environmental, economic and social/cultural needs of residents to ensure healthy, vibrant and sustainable communities into the future. The Conservation Authority can continue to fulfill its mandate to responsibly manage the resources of the watershed for all to enjoy, and all other stakeholders can benefit from the vast opportunities a healthy watershed offers for economic, social and cultural enrichment.

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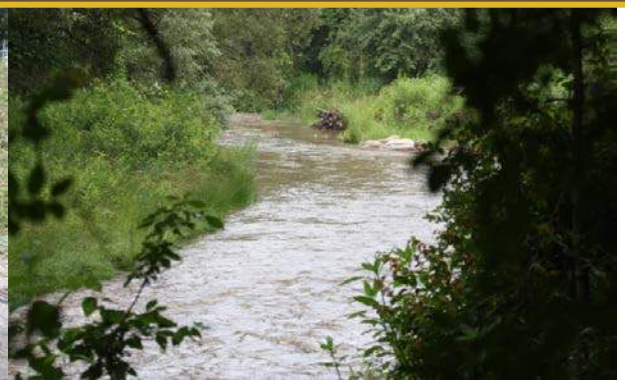
Part 1 – Preparing the Plan



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1 INTRODUCTION

The Central Lake Ontario Conservation Authority (CLOCA) is preparing updated Watershed Plans for each of the major watersheds within its jurisdictional boundaries. This document is a compendium of previous work completed in this watershed, including the *Oshawa Creek Watershed Study*, 1995 completed for the City of Oshawa, the *Oshawa Creek Watershed Management Plan, 2002* and the *Oshawa Creek Watershed 2011 Addendum to the 2002 Management Plan: Existing* Conditions (both authored by CLOCA).

The goal of this Watershed Plan is to achieve healthy natural systems within the Oshawa Creek Watershed that can positively respond to landscape changes and watershed conditions while sustaining its ecological health and integrity. This Plan provides the framework that will protect, restore and enhance the natural resources in the watershed to ensure that it will continue to function as a system of healthy natural interactions in response to a quickly changing social, economic and natural landscape. Through the identification of watershed goals, targets and recommendations, the resources of the watershed can be managed in a sustainable manner.

To support and direct watershed management, a detailed implementation plan, identifying key stakeholders and providing a suite of implementation tools is provided. These tools include policy direction and action items to be used to actively pursue the realization of watershed goals, recommendations and targets. The key stakeholders of this watershed include CLOCA, municipalities and other partners (residents, NGOs, volunteers etc.) who all have a role to play in watershed health. Implementation of the recommendations of this Watershed Plan is crucial for achieving watershed health and requires stakeholder commitment in the form of approval/endorsement, financial and in-kind support and sharing of resources.

WHY IS WATERSHED PLANNING IMPORTANT?

- Everything is connected. to everything else. Upstream activities affect the quality and quantity of water downstream.
- Surface and groundwater systems can be easily contaminated and have a limited tolerance for stress. Long- term problems can develop that are costly and difficult to deal with in the future so preventative actions are required now.
- Water and natural heritage resources can be protected more efficiently if watersheds are managed as whole ecosystems. By using a watershed approach to managing our resources, harmful impacts on the system can be identified quickly so that prevention, remediation or improvements can be carried out right away.

http://conservation-ontario.on.ca/watershed_management/index.html

By participating in the pursuit of watershed health targets, stakeholders can gain a stronger understanding and appreciation of the natural environment and the incredible opportunities available within this watershed. Municipalities will be able to balance the environmental, economic and social/cultural needs of residents to ensure healthy, vibrant and sustainable communities into the future. Through the execution of this Watershed Plan, the

Conservation Authority can continue to fulfill its mandate to responsibly manage the resources of the watershed for all to enjoy.

This document summarizes the background work conducted to prepare the Plan and presents it in Sections 1, 2 and 3. The Watershed goals and targets which provide the basis for sustainable watershed management are presented in Section 4. Direction on how to manage the watershed to achieve these goals and targets is set out in Sections 5, 6 and 7, with each Section dedicated to one of the three key stakeholders identified for Watershed Plan implementation. Section 8 describes three unique watershed management areas that have been highlighted due to their distinctive existing conditions or policy regime. The remaining two Sections move beyond watershed plan implementation, providing advice and guidance on performance monitoring and assessment of progress made in achieving the healthy watershed targets. Throughout the document, historical references are made to the past Watershed Plans and the recommendations of those plans to provide context and illustrate the consistency of recommendations to improve the health of this watershed over the last 18 years. Recognizing these past Plans and recommendations is a necessary component of understanding the full context and history of the watershed so that the best decisions can be made moving forward.

1.1 Purpose and Scope of the Watershed Plan

The goal of watershed planning is to provide a framework to protect, restore and enhance a healthy and resilient watershed. A Watershed Plan examines the environment and human activities within a watershed area and assesses the relationships between these activities to determine how the ecosystems of the watershed should be managed to ensure that they retain their ecological integrity and health in a sustainable manner.

The purpose of the Oshawa Creek Watershed Plan specifically is to be ***the definitive tool used by CLOCA, municipalities, planning authorities, agencies and all other stakeholders to guide decisions regarding the effective management of watershed resources in response to a changing environment.*** This Plan recognizes the unique urban, rural and natural environment existing conditions present in the watershed, considers past management actions and recommendations, takes into account future growth and planning policy, and recommends specific measures to protect our resources.

This Watershed Plan does not prescribe land use. Rather, at a watershed scale, it informs municipalities and makes recommendations regarding the natural features and functions necessary to achieve watershed health, which in turn helps protect the natural, social, cultural and economic capital of the watershed. Implementation of the Watershed Plan will be carried out predominantly by CLOCA, the Region of Durham and the local municipalities through the Action Plans and policy recommendations described herein.

The Oshawa Creek Watershed Plan is intended to be read and applied in its entirety as it is a comprehensive, integrated and long-term approach to watershed management.

1.2 History of the Development of the Oshawa Creek Watershed Plan

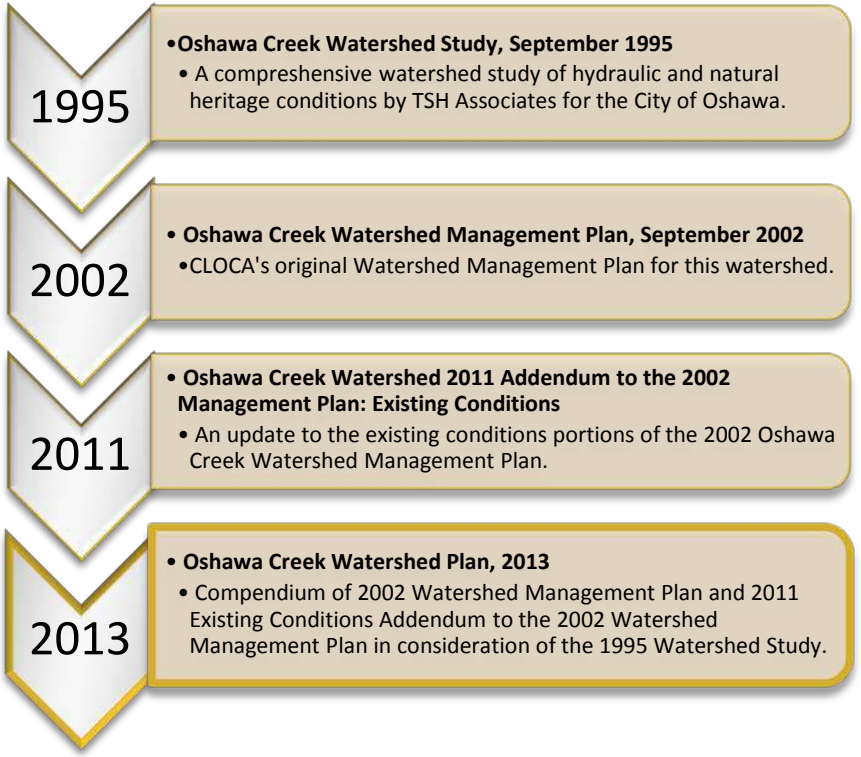
In 2002, CLOCA released the Oshawa Creek Watershed Management Plan using a foundation of knowledge gained from the *Oshawa Creek Study, MNR, 1973,* the *Oshawa Harbour Pollution Prevention, Environment Canada, 2000* report and the *Oshawa Creek Watershed Study* completed by the City of Oshawa (Totten Sims Hubicki Associates) in 1995.

In 2011, CLOCA released an addendum that updated several sections of the 2002 Plan to reflect the current watershed conditions and to address the watershed planning requirements of several new or amended policy initiatives. Recommendation #19 from the 2002 Plan 'Summary of Key Recommendations' states that "CLOCA undertake a review of the Oshawa Creek Watershed Management Plan within a 10 year time frame." This addendum fulfilled that requirement and focussed on updating the existing conditions within the watershed. As such, Section 5 of the 2002 Plan, being the Watershed Management Plan, was not revised.

This 2013 Oshawa Creek Watershed Plan is a compendium of the work to date, structured to reflect CLOCA's 2013 standardized framework for Watershed Plans and updated with the most recent data, information and management recommendations available. This Plan provides the history of the management of the Oshawa Creek Watershed and makes recommendations for the future protection, restoration and enhancement of watershed resources reflecting federal, provincial, municipal, and agency policy directions.

Exhibit 1 provides a timeline of key watershed planning work done for the Oshawa Creek Watershed and summarizes the content of each document. Every effort has been made to clearly incorporate previous watershed plan documentation into CLOCA's watershed planning template to ensure consistency, transparency and accountability in watershed planning in the Oshawa Creek Watershed.

EXHIBIT 1: HISTORICAL DEVELOPMENT OF OSHAWA CREEK WATERSHED PLANNING DOCUMENTATION



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1.3 How to Use This Plan

The main document has been separated into two parts. Part 1 discusses all aspects of preparing the Plan, while Part 2 provides the direction recommended for managing the Watershed. Hyperlinks have been provided throughout the document to direct electronic readers to either external additional documentation or as an internal re-direct to the glossary of this document when an uncommon word is used for the first time. The document has been structured for ease of use and reference by the reader. Electronic use is encouraged wherever possible to avoid excess paper use through hard copy printing.

2 Key Existing Issues in the Oshawa Creek Watershed

This section will provide readers with an overview of the notable existing conditions within the Watershed. Please see **Appendix A** for a detailed accounting of the existing conditions of the Oshawa Creek Watershed as compiled through the 2002 Watershed Plan and 2011 Addendum.

2.1 Study Area

The Oshawa Creek Watershed, including the Montgomery Creek and Goodman Creek subwatersheds, consists of 120 square kilometres, originates in the Oak Ridges Moraine, and outlets into Lake Ontario at the Oshawa Harbour. The Oak Ridges Moraine (ORM), Lake Iroquois Beach (LIB) and Lake Ontario Shoreline (LOS) all form east-west corridors across the watershed. **Figure 1: Study Area** illustrates that the watershed is primarily located in the City of Oshawa but also extends into the Municipality of Clarington, Town of Whitby, and the Township of Scugog. The Watershed consists of large areas of rural land cover in the north with significant existing urban and urbanizing land cover in the south.

It is important to note that the subwatersheds were re-named during the 2011 Existing Conditions Addendum process as follows (as some historical recommendations reference the former names of the subwatersheds):

Former Name	2011 Name
WN	Raglan
EN	Enfield
WS	Windfields
ES	Kedron
GC	Goodman
MB	Oshawa Main
Mont	Montgomery
H	Harbour

2.1.1 Montgomery Subwatershed (Formerly Mont)

The Montgomery Subwatershed is the second smallest of the subwatersheds. Intensive industrial and residential land use exert the greatest influence on the character of this Subwatershed.

Montgomery Creek flows southeast to Oshawa Harbour through a narrow, heavily influenced urban valley. The vegetated portions of this valley comprise the extent of the natural features found in this Subwatershed. Despite the highly urbanized nature of this Subwatershed, the well-established riparian vegetation found along

the valley serves numerous vital functions, such as filtration of overland water flow, moderation of creek temperature, provision of essential habitat for urban tolerant species, and stabilization of the valley during peak storm events. Historical land uses in this Subwatershed may be contributing to degraded water quality.

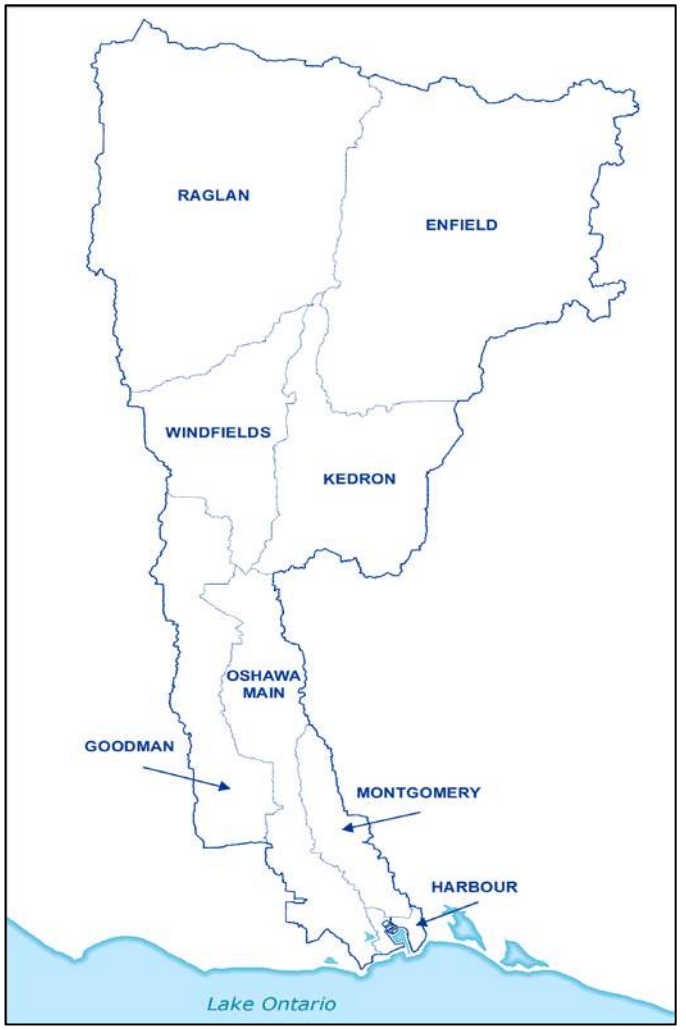
2.1.2 Oshawa Main Subwatershed (formerly Main Branch)

The Oshawa Main Subwatershed is centred along the single main channel of the Oshawa Creek. The Subwatershed is typical of many southern Ontario urbanized landscapes; the predominant land uses are residential and commercial, and the natural landscape reflects the influences of these developments. Valuable features include the riparian zone of the creek and forested areas within the valley.

2.1.3 Goodman Subwatershed (Formerly GC)

Goodman Creek is a small tributary of Oshawa Creek. This Subwatershed falls within the City of Oshawa urban area and as such the predominant land uses are residential and commercial. Despite the highly urban nature of this Subwatershed, natural cover exceeds 23%, most of which is concentrated in the north and includes portions of the provincially significant Whitby-Oshawa Iroquois Beach Wetland Complex. The Taunton North core habitat area is found in this Subwatershed and is associated with the Whitby-Oshawa Iroquois Beach Wetland Complex. This core habitat has strong connections with habitats to the west in the Pringle and Lynde Creek Watersheds. Lands north of Taunton Road in this Subwatershed are presently being studied for urban development opportunities.

EXHIBIT 2: OSHAWA CREEK SUBWATERSHEDS



2.1.4 Windfields Subwatershed (formerly WS)

The Windfields Subwatershed is located in the northwest portion of the City of Oshawa. Much of the area is subject to Planning Act applications for development. The Oshawa Creek begins to branch at this point in the watershed, and consequently the Subwatershed broadens. The natural heritage features in this Subwatershed are generally associated with the valleylands. Both the Taunton North core habitat area and the Whitby-Oshawa Iroquois Beach Wetland Complex extend from the Goodman Subwatershed into the Windfields Subwatershed providing an excellent and diverse habitat area important for maintaining overall diversity.

2.1.5 Kedron Subwatershed (formerly ES)

The Kedron Subwatershed represents part of the drainage area of the east branch of Oshawa Creek, and is located between the least stressed areas in the north and the most intensely pressured systems in the south.

While the south part of this Subwatershed is dominated by urban land uses, the northern half is predominantly agricultural, but like the Windfields Subwatershed, urbanization is imminent. The eastern extent of the Taunton North core habitat area lies within the southern part of this Subwatershed. The riparian corridors in this Subwatershed provide connectivity between the Oak Ridges Moraine and the southern half of this Watershed.

2.1.6 Raglan Subwatershed (formerly WN)

The Raglan Subwatershed contains the western headwater tributaries of Oshawa Creek, most of which originate in the Oak Ridges Moraine (ORM). The Subwatershed is almost exclusively characterized by agricultural land uses interspersed with small settlement areas. Lands south of Howden Road in this Subwatershed fall beyond the southern limits of the ORM and Greenbelt Policy areas and will eventually experience changes in land use. There are a number of large tableland woodlots and coldwater tributaries on, or originating from, the ORM. This Subwatershed has some of the highest forest cover (15%) and wetland cover (6.5%), and is a significant contributor to the Oshawa Creek Watershed's overall natural cover.

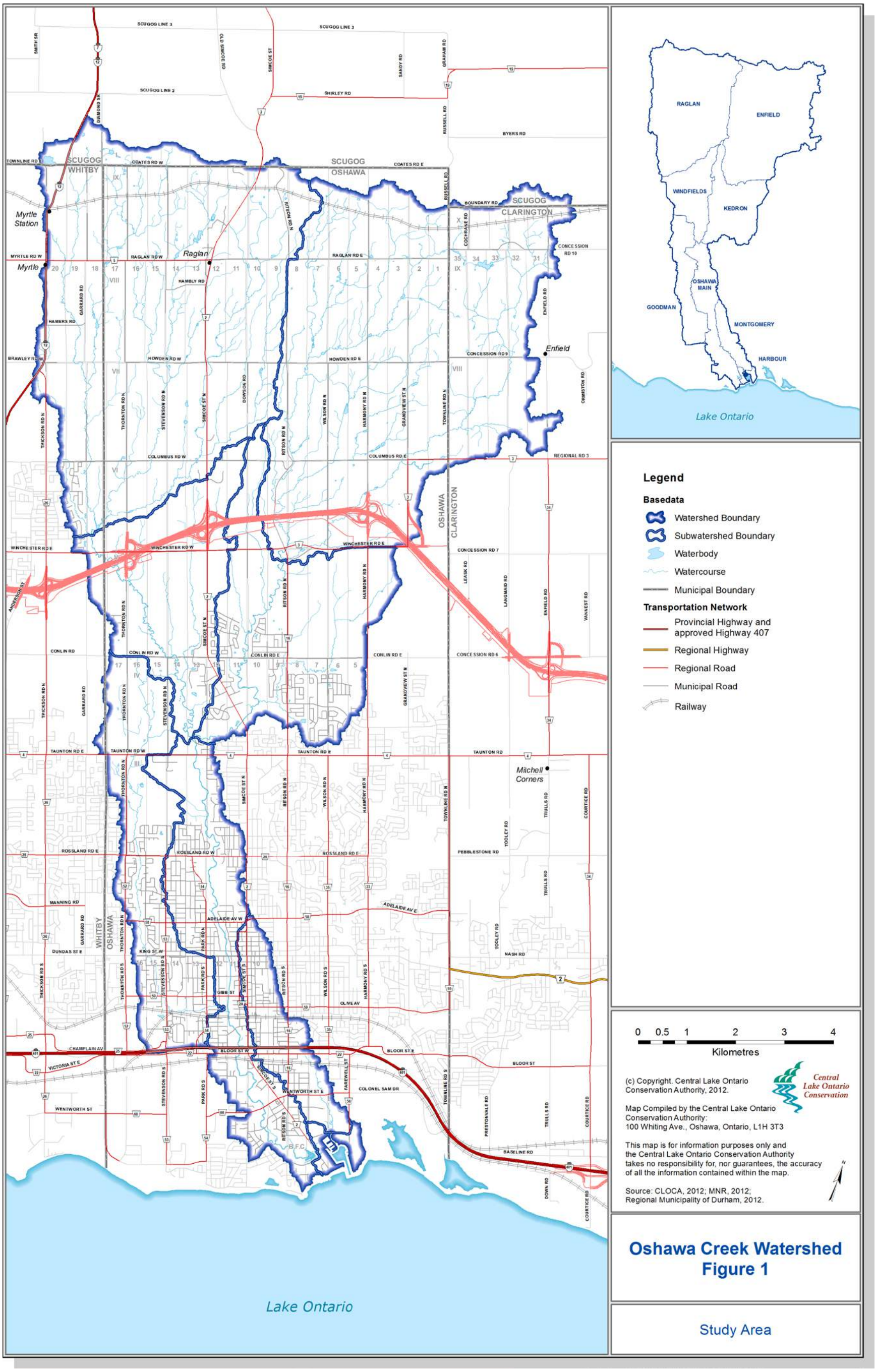
2.1.7 Enfield Subwatershed (formerly EN)

The Enfield Subwatershed is the largest Subwatershed and has both the highest percentage of natural cover (31%) and wetland cover (11%) of all the Oshawa Creek Subwatersheds. There are a number of large, high quality wetlands, including the provincially significant Enfield Wetland Complex, that serve as core areas with good natural connections to other features in the Subwatershed. The Enfield Subwatershed greatly contributes to the health of the watershed as a whole. The predominant land use is agriculture. The northern half of this Subwatershed lies within the ORM and Greenbelt and as such urbanization is not anticipated in these policy areas.

2.1.8 Harbour Subwatershed (formerly H)

The Harbour Subwatershed is located adjacent to the most southerly outlet of the Oshawa Main Subwatershed. The most distinctive characteristic of this Subwatershed is its location on the Lake Ontario Shoreline and the presence of the Oshawa Harbour, which is a major economic, social and environmental consideration for the City of Oshawa.

FIGURE 1: STUDY AREA



2.2 Water

Water is the cornerstone of protecting and enhancing a watershed. Every element of ecosystem health, and many elements of human health, depends on the strength of the ground and surface water systems to support each watershed component and to ensure a healthy and resilient system.

2.2.1 Groundwater Quality and Quantity

Groundwater is a hidden resource beneath the earth's surface, which helps to ensure that streams flow year round and maintains stream temperatures at levels conducive for fish and other aquatic life to survive.

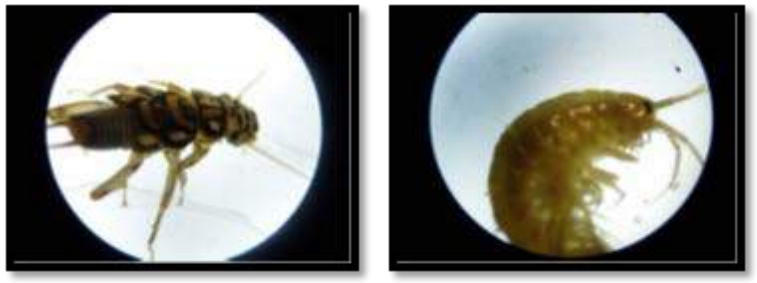
The following outlines key conditions found in the Oshawa Creek Watershed that impact groundwater quality and quantity:

- Higher rates of discharge occur in streams along the south flank of the ORM, areas of the South Slope physiographic region and throughout the Iroquois Beach area;
- There are approximately 1655 privately owned domestic water wells (2008);
- Current estimate of groundwater consumptive use constitute only 4% of the available groundwater supply of Oshawa Watershed;
- Two Provincial Groundwater Monitoring Network (PGMN) wells are located within the Oshawa Creek Watershed. Well W0000049-1, located at Raglan has been recording water levels since 2001 and W0000262-1, located just east of Columbus on Grass Grove Road, was commissioned in 2003. In the spring of 2008, a new well was constructed in the northern portion of this Watershed, at Purple Woods Conservation Area;
- During the summer of 2002 CLOCA undertook groundwater quality sampling on 894 domestic wells within CLOCA's jurisdiction, a number of which are located in the Oshawa watershed;
- Initial evaluations of chloride and sodium suggest that, for the most part, these chemicals originated from the natural environment with some impacts noted in shallow wells, potentially as a result of the use of road salt for de-icing purposes; and
- The 0.3 mg/L iron concentration limit under the Ontario Drinking Water Standard (OWDS) was exceeded in all of the 11 samples at W0000049-1 (Raglan) and one sample at W0000262-1 (Columbus). This was attributed to natural conditions and dissolution of minerals associated with the geologic materials.

2.2.2 Surface Water Quality

Surface water quality is a key indicator of watershed health and has particularly strong impacts on fish and other aquatic life. As all municipal drinking water within CLOCA is provided from Lake Ontario, the quality of the surface water flowing into the Lake from Oshawa Creek is important for human health as well. Different types of water quality information (biological and chemical indicators) have been collected by CLOCA and the Ministry of the Environment (MOE) through a number of programs including the Provincial Water Quality Monitoring Network (PWQMN) Program since 1964.

Biological Water Quality Specimens **© CLOCA**



The following outlines key conditions found in the Oshawa Creek Watershed that impact surface water quality:

- Historical biological water quality impairment evident in urban areas originated from untreated sewer discharge, contaminated stormwater, direct pollution, organic enrichment, nutrient enrichment from agricultural practices (e.g. livestock in the creek, pesticide application, and lack of riparian vegetation), and the cumulative effects of these stressors from upstream areas (which many lack sufficient Stormwater treatment);
- The best water quality in this watershed is typically found in areas dominated by natural land cover, including well vegetated valley sections;
- Despite degraded water quality in some areas of the watershed, Oshawa Creek continues to provide a productive fishery supporting many sensitive coldwater species;
- **Chloride:** Elevated concentrations of chloride have been occasionally observed at all surface water quality monitoring stations in Oshawa Creek. Exceedences of the 150 mg/L limit have only been recorded at SWQ2, which is located in the highly urbanized area of the lower reaches of the watershed;
- **Phosphorus:** Some exceedences of the prescribed limit of 30 µg/L has been recorded;
- **Nitrates:** At SWQ10 and SWQ11, there is not a satisfactory number of samples for valid statistical analyses. It is noted, however, that at least six samples from the historical data, and one following the program's re-initiation in 2003, were observed to exceed the 2.93 mg/L limit;
- **Copper:** Samples collected at SWQ2 historically exceeded the 5 µg/L PWQO limit. After 2003, only two samples at SWQ2 went beyond the prescribed limit while none of the samples from SWQ10 and SWQ11 recorded exceedences; and
- **Dissolved Oxygen (DO):** Presently DO concentrations are not critical. Historic concentrations however, occasionally fall below the critical level necessary to support aquatic life.

2.2.3 Surface Water Quantity

CLOCA maintains a network of monitoring stations at which water quantity data, such as rainfall and stream water level, are collected. These stations are permanent gauges that record information periodically. This information is used to identify trends and averages for each of the gauges. Within the Oshawa Creek there are 4 water level stations, 1 of which also monitors rainfall.

CLOCA's baseflow monitoring network was established in 2002 and consists of 138 stations jurisdiction wide, 39 of which are in the Oshawa Creek watershed. These stations are monitored manually during the summer months after 3 consecutive days with no rainfall.

In addition to stream and baseflow monitoring, CLOCA maintains a snow pack monitoring program, where snow depth and density is

Culvert Elevations Survey **© CLOCA**

obtained on a preset schedule of twice monthly. Within the watershed there is 1 snow pack monitoring station located at Coates Road in the Purple Woods Conservation Area. This information is used to assist in the development and calibration of the hydrology and hydraulic models.

Collected information and conducted modeling has determined that the Oshawa Creek Watershed experiences stress with respect to surface water quantity, particularly during the summer months.

2.2.4 Water Temperature

Water temperature is one of many criteria used to assess the water quality of a stream and the health of the aquatic habitat within it. Many organisms require particular thermal regimes to survive, and cannot tolerate extreme changes in water temperature. Water temperature at any given site is influenced by the cumulative effects of all landscape characteristics upstream, including the extent of the riparian vegetation, groundwater discharge and type of land use. Ambient air temperature also plays a role in water temperature.

In 2007, thermal regimes were assessed in Oshawa Creek as part of the CLOCA Aquatic Monitoring Program. Temperature data was collected using portable temperature loggers at 41 sites throughout the watershed. The results from the 41 loggers were analyzed in the spring of 2008. The following outlines key water temperature conditions in the Oshawa Creek Watershed:

- Although the range of coldwater habitat is much larger; coldwater sites are present in the mid to upper reaches of the watershed typically dominated by natural land cover and in areas with evidence of groundwater discharge;
- Coolwater habitat is present throughout the majority of the middle and lower reaches of the watershed where groundwater discharge is less evident and urban and agricultural impacts are greater;
- Warmwater sites are not present. During the warmer summer months, the coolwater temperatures indicate that habitat is still suitable for sensitive fish species like Salmon and Trout; and
- Stormwater input and a lack of stormwater management in the older urban areas, and high proportions of impervious cover, are contributing to the stream temperature degradation, particularly in the southern reaches.

2.2.5 Fluvial Geomorphology

Fluvial Geomorphology is the study of how waterways react and evolve to changes. Stable stream systems (despite the term) are dynamic, with erosion, sediment transport and deposition all occurring. These processes cause a stream to "migrate", although the rate of movement may be quite gradual.

The following outlines key conditions found in the Oshawa Creek Watershed describing fluvial geomorphology impacts:

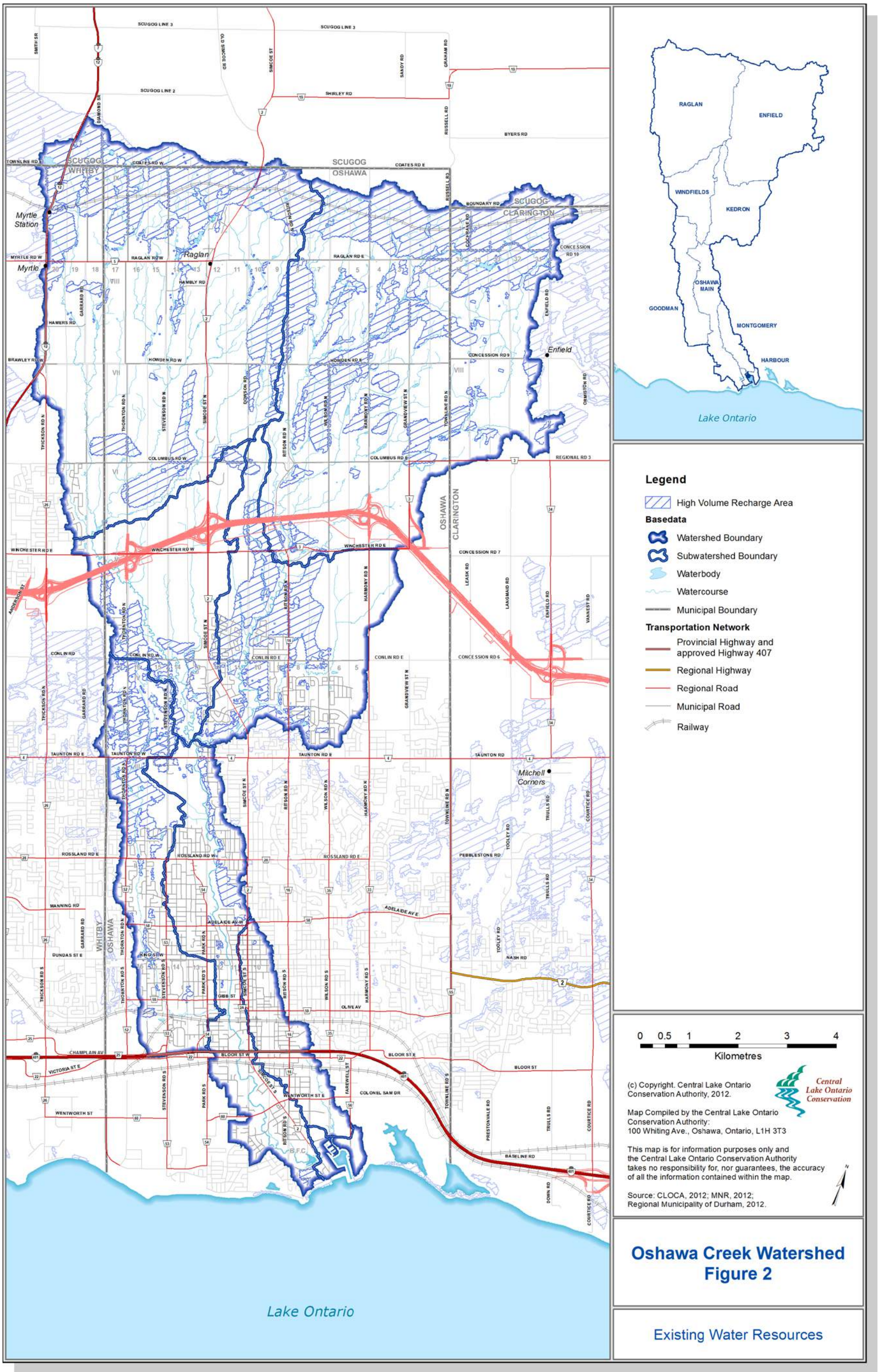
- The dendritic nature of Oshawa Creek gives rise to the majority of stream length as first-order tributaries; and
- First-order streams represent over half (59%) of the total stream length in the watershed. Of these first order tributaries 71% originate from the Oak Ridges Moraine, and 23% arise from the Lake Iroquois Beach, indicating substantial groundwater inputs from both physiographic regions.

Figure 2 illustrates the existing water resources in the Oshawa Creek Watershed.

Oshawa Creek Main Branch **© Keith Isnor**

Hardscaping in Oshawa Creek **© Keith Isnor**

FIGURE 2: EXISTING WATER RESOURCES



2.3 Natural Heritage Resources

The Natural Heritage resources in the watershed consist of both terrestrial resources, including wetlands, and fisheries and aquatic resources. These features, along with their associated functions, are interconnected and represent the pivotal components of a healthy watershed.

2.3.1 Terrestrial Natural Heritage

Terrestrial Natural Heritage includes plants, animals, wetlands and naturally vegetated communities. These elements are essential components of watershed health, contributing significantly to a watershed's biodiversity and have a strong influence on water quality and quantity. A healthy terrestrial natural heritage system contributes to the strength of Durham Region's social and economic vitality.

The following outlines the key conditions within the Oshawa Creek Watershed, and describes the existing terrestrial natural heritage resources:

- The Oshawa Creek Watershed contains 1 Life Science Area of Natural and Scientific Interest (ANSI) and all or part of 3 Provincially Significant Wetlands (PSWs);
- Excluding the Oak Ridges Moraine and the Lake Iroquois Beach, the Oshawa Creek Watershed has 10 Environmentally Sensitive Areas (ESAs), 8 of which are considered highly sensitive;
- The Oshawa Creek Watershed contains a moderate amount of natural cover (23%). This natural cover value is based upon all ELC vegetation communities mapped in the watershed (as shown in Figure 3). Despite the fact that most of this natural cover is forest (63%), the watershed only has 15% forest cover across its entire area. This falls well below Environment Canada's 2004 recommendation of 30% minimum forest cover in a watershed;
- The ORM and its south slope contain the largest forest blocks within the watershed, although few are in excess of 20 ha and many are somewhat fragmented;
- Between the Lake Iroquois Beach and the ORM, the valleys are moderately vegetated, and there are some valley sections robust enough to contain forest interior conditions;
- Oshawa Creek valleylands through the urban centre (from the Lake Iroquois Beach south to Highway 401) are moderately vegetated, with limited riparian cover as an expansive park system forms much of the urban valley. The valleylands south of Highway 401 to Lake Ontario provide the most vegetative cover within the urban area, and are also documented as an ESA;
- Approximately 33% of the existing vegetation is regenerating (roughly 8% of the landscape). Most of these areas are cultural meadows, thickets, and regenerating swamps, which will succeed into forest if left undisturbed. No true prairie-like habitats have been identified within this watershed; and
- Much of the watershed's interior forest habitat, and all of its deep forest interior habitat, is located within the Enfield – Purple Woods core habitat area. Approximately 75 ha of additional forest interior is scattered throughout the forest patches in this area.

2.3.2 Fisheries and Aquatic Habitat

Familiar examples of aquatic ecosystems are lakes and rivers, but they also include areas such as floodplains, wetlands and riparian corridors. Wetlands help improve water quality, reduce flood peaks and recharge groundwater aquifers. Fish are one of our most valued natural resources from ecological, economic, social and cultural perspectives. Healthy fish and environments result from protecting and/or restoring aquatic ecosystems.

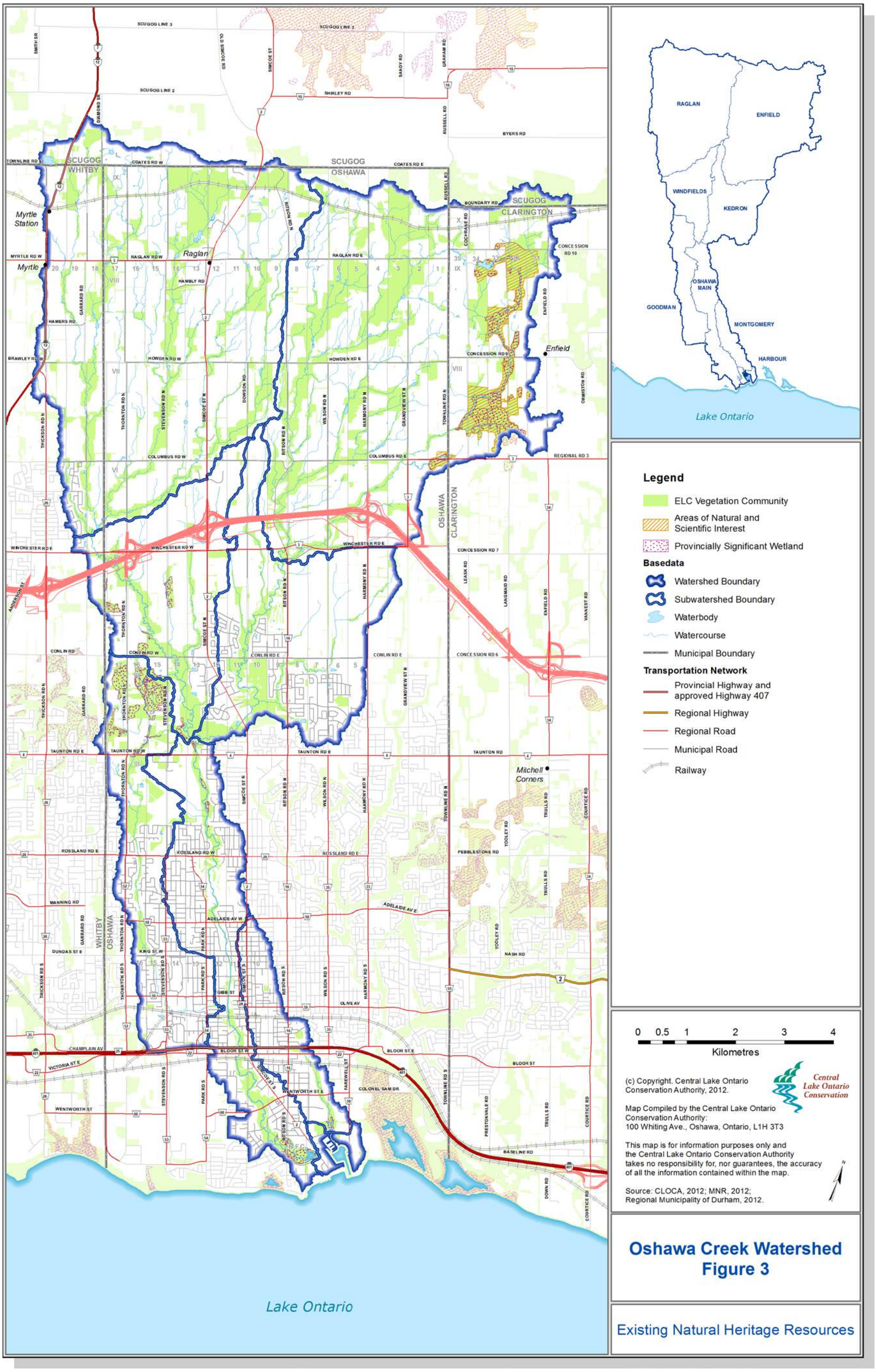
The following outlines key conditions found in the Oshawa Creek Watershed describing the existing fisheries and aquatic habitat systems:

- Total wetland cover is just under 7%, which is below Environment Canada's recommendation of 10% wetland cover per watershed;
- Wetland communities are relatively well-distributed within the valleys, but outside of the valleys there are virtually no wetlands. The vast majority of the wetlands are forested swamps, with marsh communities only represented along creek edges and in the Oshawa Creek coastal wetland complex;
- The Oshawa Creek Coastal Wetland Complex is a 20.2 ha wetland complex, comprised of 7 wetland units and is the watershed's only coastal wetland. This wetland provides aquatic habitat for fish, invertebrates, birds, amphibians and reptiles;
- There are 25 known instream barriers within the watershed;
- Riparian vegetation cover in the Oshawa Creek Watershed falls short of the Environment Canada guideline of 75%, as only 30% of the entire stream length has 30m riparian buffers (based on 2005 Orthophoto interpretation);
- Currently, there are 35 fish species, representing 14 families, known to occur within the watershed including those found only within the Oshawa Coastal Wetland or Oshawa Harbour;
- The watershed supports healthy fisheries including Chinook Salmon, Brook Trout, Brown Trout and Rainbow Trout populations, in addition to sensitive non-game species like Slimy or Mottled Sculpin;
- There are no fish species at risk known to currently exist within the Oshawa Creek Watershed;
- Invasive species present include Goldfish, Common Carp and Round Goby;
- Environmental stressors, including impacts from adjacent land uses, are negatively affecting the fishery resources and aquatic habitat in this watershed.

Fisheries and Aquatic Resource Monitoring © CLOCA

Figure 3 illustrates the existing Natural Heritage resources in the Oshawa Creek Watershed.

FIGURE 3: EXISTING NATURAL HERITAGE RESOURCES



2.4 Transboundary Issues / Anthropogenic Influences

The "boundaries" or "jurisdiction" of the watershed plan is based on the physical drainage system into the Oshawa Creek. There are, however, regional influences: indirect and direct human impacts that affect our watershed health but are not always bound by our watershed limits, and as such need to be looked at on a larger scale to fully understand the systems. Several components discussed below have impacts to other ecological systems but require focused discussion to adequately identify specific conditions and make recommendations to improve watershed health.

2.4.1 Impervious surfaces

Impervious surfaces interrupt the natural hydrologic cycle by preventing the infiltration of rainwater into the ground, increasing the volume, rate and temperature of stormwater runoff, and increasing the concentration of pollutants carried to the receiving watercourse. Cumulatively, these changes adversely impact aquatic and other biological communities.

The following outlines key conditions found in the Oshawa Creek Watershed describing existing impervious surfaces:

- The overall imperviousness for the Oshawa Creek watershed is approximately 13% (Environment Canada's guideline is less than 10% imperviousness on a watershed basis);
- The Harbour Subwatershed is the most impervious of the Oshawa Creek Subwatersheds with a value of 58%, followed closely by the Montgomery Subwatershed with an imperviousness value of 57%. These high levels of imperviousness are due mainly to urbanization, including the industrialization of these Subwatersheds;

Parking Lot Example of an Impervious Surface

- Urban areas predominate from Conlin Road south to Lake Ontario. Above Taunton Road, development is primarily confined to the easterly half of the watershed. The sum of paved roadway surfaces represents the majority of the remaining watershed impervious areas; and
- It is noted that the proposed Highway 407 will be crossing the watershed. The development of this infrastructure will alter the amount of imperiousness in the watershed and subwatersheds.

2.4.2 Stormwater Management

Stormwater management is the practice of controlling runoff to prevent downstream erosion, flooding and water quality degradation, as well as assist in maintaining groundwater recharge where relevant. It is a vital component of maintaining watershed health in a developing watershed. Stormwater management is not the sole responsibility of any one organization but must be considered by several planning agencies, and as such, CLOCA works with municipal partners to ensure that all development applications prepare a plan for managing runoff to ensure that the impacts of development are minimized.

The MOE has published a Stormwater Management Planning and Design Manual (SWMPDM) (MOE, 2003) that provides minimum design standards. In addition to the guidelines set by the province, CLOCA has its own watershed-specific guidelines. The CLOCA-developed guidelines were created considering the specific characteristics and needs of each watershed.

The following outlines key conditions found in the Oshawa Creek Watershed describing existing stormwater management facilities:

- Enhanced (Level 1) Protection is required by CLOCA, as the Oshawa Creek consists primarily of cool / cold water fisheries and drains to a provincially significant coastal wetland;
- A study of the thermal effects of stormwater management ponds is currently underway within CLOCA. One pond being studied is located within the Harmony Creek Watershed on Pondview Ct. in the City of Oshawa;
- Quantity control for the 2 through 100-year and Regional storm is not required on the main branch, but is required on all tributaries unless otherwise noted in master plans;
- There are sixteen stormwater management ponds (SWM ponds) and eleven known Oil Grit Separators (OGSs) within the Oshawa Creek Watershed; and
- The areas that are not receiving quality treatment are the older parts of Oshawa.

Kedron Park Stormwater Facility © CLOCA

2.4.3 Floodplains, Erosion and Natural Hazards

2.4.3.1 Floodplains

A pastoral stream system can turn into a raging floodplain when a significant weather event occurs. These events could be once in a lifetime floods, but can cause incredible damage and suffering. The Conservation Authorities develop floodplain mapping using computer models to simulate large flooding events. The Ontario Ministry of Natural Resources provides provincial guidance and has established standards for floodplain modeling and mapping.

For the CLOCA jurisdiction, flood plain mapping is based upon the greater of a 100-year storm or Hurricane Hazel. A 100-year storm is not an actual recorded event, but rather a statistically developed theoretical storm that considers assessing the intensity, duration, and frequency of precipitation events throughout the full period of weather records for our area, and attempts to predict the largest rainfall that would be expected to occur once every 100 years. Hurricane Hazel, an actual storm event which occurred in 1954, caused massive damage to the Toronto area, including the destruction of homes and loss of life. Hurricane Hazel was a 48-hour long rainfall event that saturated the watersheds over the first 36 hours, continuing to add a significant volume of rain through the last 12 hours. The recorded rainfall from Hurricane Hazel is used to simulate flooding.

Although Hurricane Hazel is generally considered to be a larger rain event than a 100-year storm, the two rain events respond differently to land uses. Hurricane Hazel fully saturated the landscape before adding the most intense rainfall. Because the ground could not absorb any more moisture, all the rainfall from the last 12 hours of the storm directly converted to run-off. Consequently, this storm is less sensitive to the land uses of the watershed, and as such Hazel produces similar flood conditions in rural or urban landscapes.

The 100-year storm, by comparison, is sensitive to land use. That is, rural areas that are able to absorb rainfall will produce less runoff in a 100-year storm than an urban area that has impervious surfaces such as roadways, parking lots, and rooftops. For this reason, when a new development occurs in a watershed, the 100-year floodplain may increase. In some urban areas, the flooding produced from a 100-year storm can be greater than the Hurricane Hazel flooding.

It is important to determine the extent of floodplain throughout a watershed so that we can ensure development is directed away from this hazard where there is an unacceptable risk to public health or safety or of property damage. Similarly, when new bridges and roads cross our stream valleys, flood analysis must be completed to ensure that flood waters can be safely passed through the structures without causing damage to the structures or the lands upstream and downstream.

Windfields Stormwater Management Facility **© CLOCA**

Oshawa Creek **© Keith Isnor**

Historical development is sometimes found within the floodplain. To better manage the flood hazard in these areas, flood plain management policies have been developed. In 1998, CLOCA endorsed the *Two Zone Flood Plain Management Policy for a Reach of the Goodman Creek* that provides specific policies for guiding CLOCA's permitting and development review process for this specific area. The 2 zone policy was developed because of historic development and because of the nature of the flood hazard being relatively low flood elevations and low velocities. This policy can be accessed at www.cloca.com as it is included in CLOCA's Regulation and Plan Review Policy Document.

2.4.3.2 EROSION

As a stream meanders through the watershed, the energy of the flowing water is able to pick up and transport sediment, and subsequently deposit the sediment where water flows more slowly. This process is on-going throughout the full reach of the stream, and generally stream banks erode on the outside meander bends, and sediment bars build on the inside of the meander bends. The position of the stream continuously moves through this sediment movement process. Spring freshets, large rainfalls, or disturbances, including beaver dams, all influence the rate of stream movement. When a stream meanders into a trail or structure, a hazard is created. Similar to the flooding scenarios outlined above, allowances must be provided to minimize the hazard created by a meandering stream. As a simple rule of thumb, the meander belt for a stream is typically about 20 times the bank full width of the stream. By plotting the meander belt, and keeping new developments out of this hazard, future problems can be minimized or avoided.

Similarly, in a contained valley, a stream will sometimes meander into the valley slope. Over time, the stream flowing against the toe of the valley slope will undermine the slope, and may lead to a collapse of the slope. It is therefore also important to provide allowances for a stream flowing in close proximity to the toe of the valley slope to ensure that developments are kept a safe distance away from the potentially hazardous slope.

Our valley systems are formed by erosion processes either from glacial melt waters or more recent stream erosion. Some valleys are left with very steep slopes that can be unstable. These steep slopes may not show any signs of failure for long periods of time, but a wet

season, or a dying tree may be all that is needed to destabilize a steep slope. Once again, allowances are needed to ensure developments are situated a safe distance from a steep slope hazard.

2.4.3.3 Flood Damage Centres

A flood damage centre is an area consisting of residential, commercial and/or institutional development that is adjacent to a creek and prone to flooding that endangers the safety and welfare of people, or threatens to damage public and/or private property. These Centres are determined using the floodplain mapping developed by CLOCA for each of its watersheds.

Information about the structures located within these Flood Damage Centres, along with the floodplain mapping data, is combined into a database that is available to Conservation Authority and municipal emergency management staff. During flooding events, agency staff has the ability to query the database and determine the structures that may require assistance. In the event of a flood emergency, CLOCA would continue to provide alerts and warnings to assist emergency response agencies with directing their efforts to the appropriate locations.

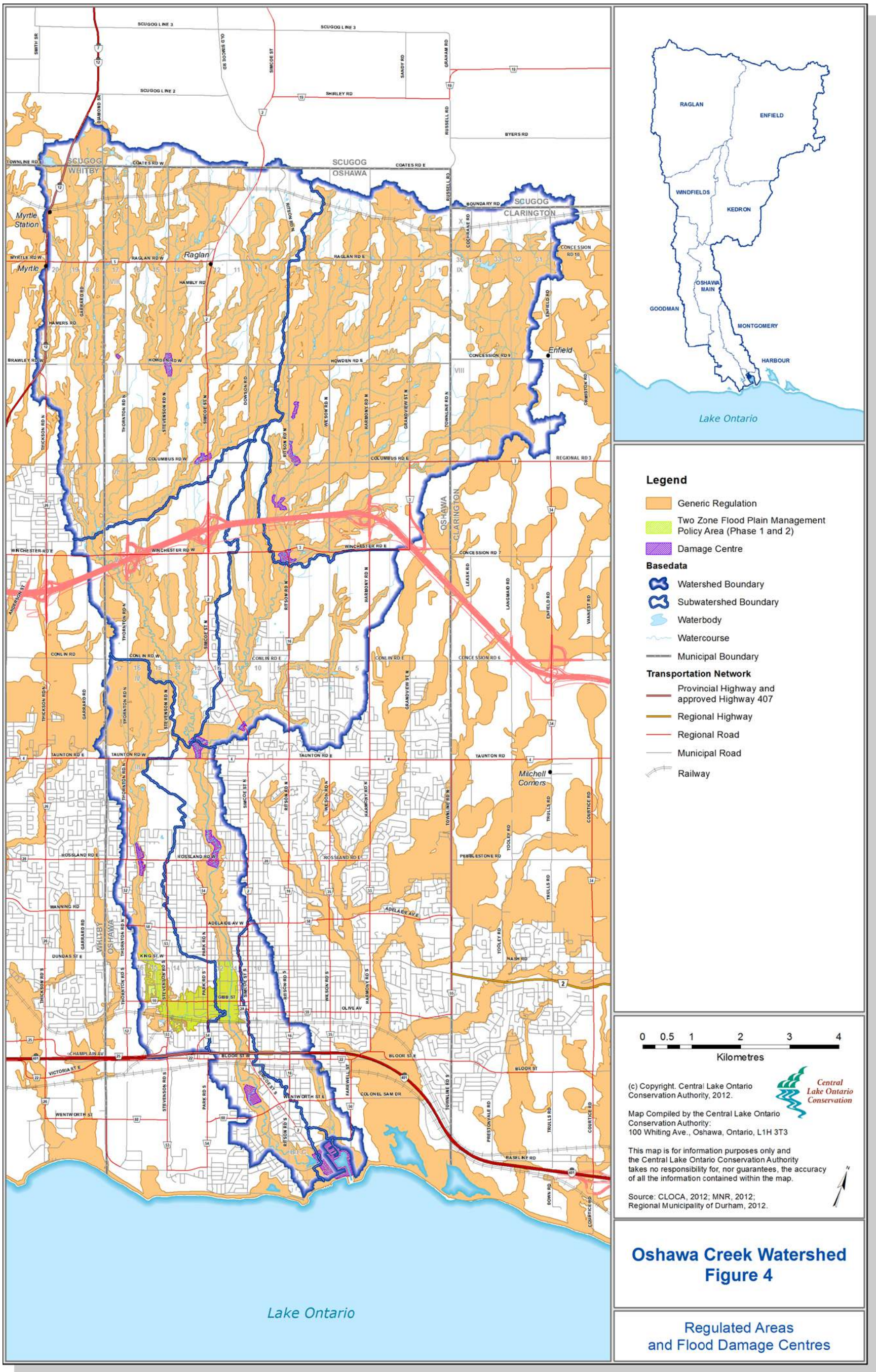
Figure 4 illustrates the Regulated Areas and Flood Damage Centres in the Oshawa Creek Watershed.

2.4.4 Air Quality

Air pollution is an on-going concern for people living in Ontario. Airborne pollutants come from a variety of sources including fixed sources such as factories and power plants, mobile sources such as planes, trains, and automobiles, and natural sources such as fires, dust and biogenic emissions. One of the key measures of air quality is the Air Quality Index, as per Environment Canada, that notifies residents of general air quality conditions. The following outlines key conditions found in the Oshawa Creek Watershed describing existing air quality conditions:

- Monitoring station in Oshawa had fewer air quality days rated as “moderate” to “poor” than the provincial average (88% very good, 12% moderate to poor); and
- Increasing trend of ground level ozone.

FIGURE 4: REGULATED AREAS AND FLOOD DAMAGE CENTRES



2.4.5 Climate Change

It is predicted that climate change could have the following impacts on our watershed over the next century:

- Stress on the forest community due to drier conditions, and increased pests, disease, and competition. New vegetation species and wildlife may shift into the area from the south;
- Less stream baseflow due to lower water table levels, leading to fewer permanently flowing tributaries, and the warming of stream temperature, thus increasing stress on cold water dependant aquatic species. The increased air temperatures and periods of hot weather will also stress cold water systems;
- More intense runoff events will affect stream channel stability and lead to increased erosion of the watercourses. As stream channels adjust to accommodate increased storm flow, the width of the channel may increase. If the base flow is conveyed through a wider channel, the wider, shallower, slower condition will allow for additional warming of the stream temperature; and
- Wetlands will be stressed by the change in precipitation and the lowering of the water table.

Overall, the impacts of climate change on our forests, wetlands, and fish populations could be extreme, and socio-economic impacts will be felt such as:

- longer growing seasons, but also risks to agriculture such as moisture deficits, pests, and disease, resulting in the need to re-evaluate crops;
- reduction in available freshwater, and lower water table;
- impacts on fish populations and cold water sport fisheries;
- projected changes in the occurrence and severity of extreme weather events, causing increased property damage and personal injury;
- increases in the frequency and severity of forest fires;
- more days when heat stress and air pollution adversely affect people's health; and
- low water levels in the Great Lakes, resulting in reduced commercial shipping capacity.

This field of research is dynamic in that new information, recommendations, plans and strategies are being developed regularly to keep up with advances in knowledge, science and technology. The recommendations of this Watershed Plan will outline steps to gather, assess and report baseline data of existing conditions specifically for assessing indicators of climate change (precipitation, surface run-off, evapotranspiration, infiltration and air temperature) as this information is not currently collected for this purpose.

2.4.6 Land Use and Policy

Through watershed plans, a unique perspective on the cumulative impact of development within an ecological unit is obtained. Adoption of Watershed Plan recommendations into municipal planning documents such as Official Plans (OPs) and Zoning By-laws will ensure implementation of Watershed Plan recommendations during the development approval process. Provincial environmental legislation, such as the Oak Ridges Moraine Conservation Plan (ORMCP) requires municipalities to incorporate the policies of the Watershed Plan into their Official Plans. This further elevates the importance of land use and policy directives as a tool for protecting the health of the watershed.

The following outlines key conditions found in the Oshawa Creek Watershed, and describes existing land use and policy:

- Two of the four ORMCP designations are represented within the Oshawa Creek Watershed: "Countryside Area" and "Natural Linkage Area". There are no "Natural Core Areas" within that portion of the ORM in the Oshawa Creek Watershed;

Windfield Farms **© Keith Isnor**

- The "Natural Linkage Area" designation runs along the upper reaches of the watershed and along the valleys of the Oshawa Creek and its tributaries providing corridors that facilitate both north/south and east/west wildlife movement;
- The Oak Ridges Moraine covers 3831 ha of land and represents 32% of the watershed;
- Approximately 48% of the Oshawa Creek Watershed is within the Greenbelt, and the majority is found in the Raglan (46% / 2645 ha) and Enfield (53% / 3021 ha) Subwatersheds;
- Large portions of the Greenbelt in the Oshawa Creek Watershed follow the watershed's stream valleys, connecting the northern and central portions of the watershed. These areas are identified as Greenbelt Natural Heritage System;
- For the City of Oshawa, the Region of Durham anticipates there will be an additional 43, 415 people living in the City by 2031, and that 22,500 more people will be working in Oshawa. This will bring the population of Oshawa by 2031 to 197,000 people (January 9, 2013 OMB order on DROP Amendment 128);
- In order to accommodate this anticipated growth, the Region identified additional urban lands that will result in approximately 45% of the Oshawa Creek Watershed being urbanized, a 9% increase in the amount of urban land in the Oshawa Creek Watershed;
- Presently, the majority of the Oshawa Main, Goodman and Montgomery Subwatersheds are developed and future growth is anticipated to predominantly be infill and intensification;
- Agriculture is the dominant land use within the watershed, primarily north of Conlin Road, followed by residential and natural areas. Of note are 5 aggregate extraction operations, not all of which are actively being operated;

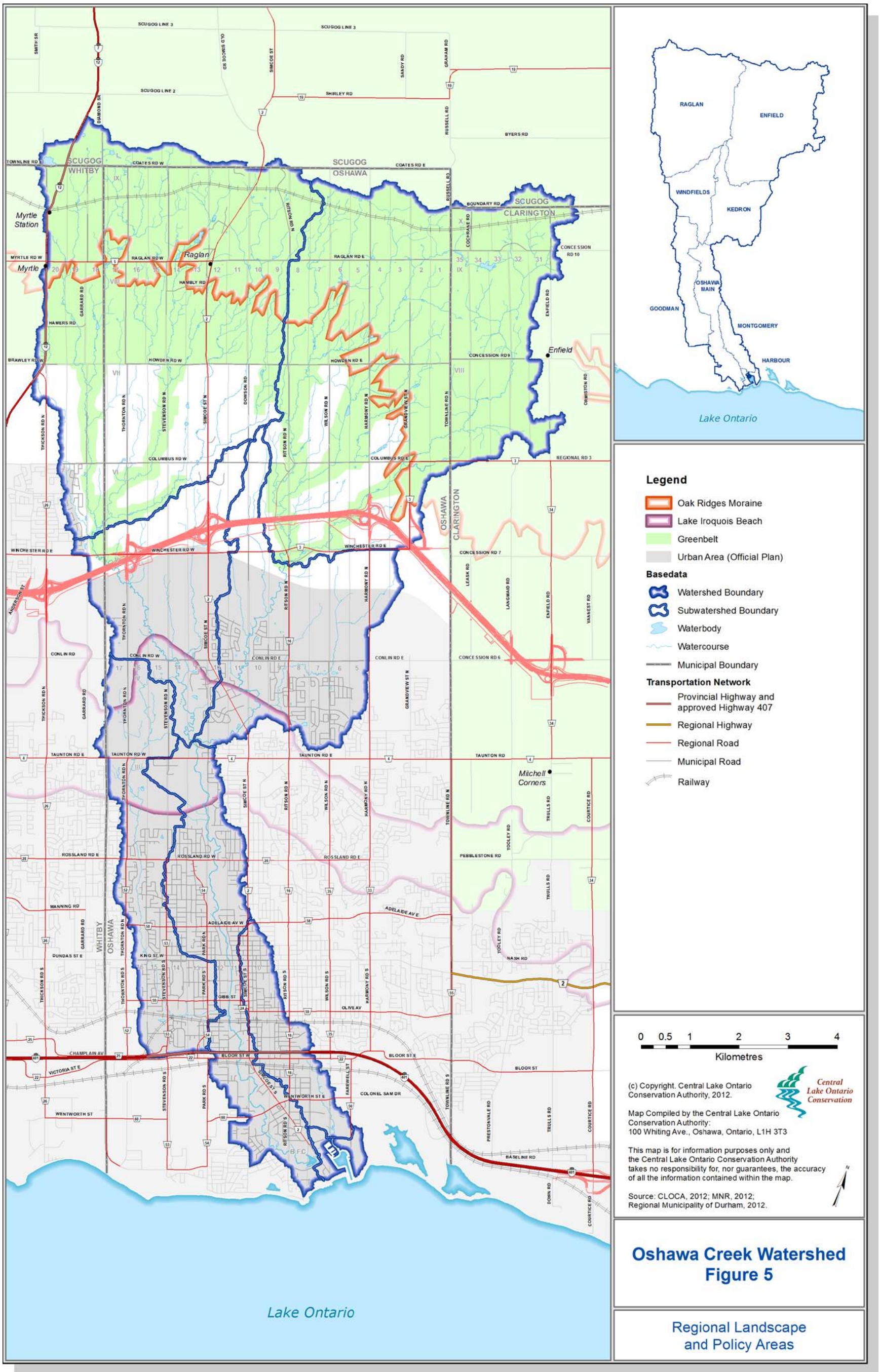
- There are 6 golf courses within the watershed, and a multitude of parks, almost all within the urban areas;
- There are commercial and industrial areas, found mostly within the urban areas of Oshawa;
- Substantial residential growth has occurred north of Taunton Road since 2002, including development of the University of Ontario Institute of Technology campus;
- With the exception of a small area in the Raglan and Windfields Subwatersheds, those portions of the watershed that are located in the Town of Whitby, Township of Scugog and Municipality of Clarington are not situated within the limit of urban development, and as such will not see major residential, commercial or industrial development;
- The approved Highway 407 will cross through the central portion of the watershed in the vicinity of Winchester Road, impacting the Windfields, Kedron and Enfield Subwatersheds. It is important that Highway 407 does not environmentally sever the Oshawa Creek Watershed and the subwatersheds through which it passes;
- Within the Oshawa Creek Watershed, 5593 ha of land falls within the area subject to Ontario Regulation 42/06, Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation. This accounts for 47% of the watershed;
- **Conservation Areas:** The Rahmani Tract is approximately 28 ha in size and is situated on the ORM, about 0.5 km west of the Purple Woods Conservation Area. Purple Woods is 17 ha in size and has long been operated as a sugar bush and is the site of CLOCA's annual Maple Syrup Demonstration program each spring. In 2012, the 37th annual Purple Woods Maple Syrup Festival showcased the newly built Heritage Hall, a 4600 sq. ft multipurpose building; and
- With the projected increase in population that will be experienced within the Oshawa Creek Watershed, there will be an increased demand for recreational opportunities, ultimately placing more stress on existing parks, trails and natural areas.

Figure 5 illustrates the regional landscape and policy areas of the watershed.

Purple Woods CA **© CLOCA**

Rahmani Tract CA **© CLOCA**

FIGURE 5: REGIONAL LANDSCAPE AND POLICY AREAS



2.4.7 Physical Geography

In the context of watershed planning, physical geography explores the physical characteristics of the land surface through the local physiography, topography and soils. The Oshawa Creek Watershed falls within three physiographic regions that, from north to south, include the Oak Ridges Moraine (ORM), the South Slope, and the Lake Iroquois Beach (including the shoreline and plain). From an ecological and hydrological perspective, the ORM plays an important role as a controlling environmental feature in the watershed.

The following outlines key conditions found in the Oshawa Creek Watershed describing existing physical geographical conditions:

- The headwaters of the Oshawa Creek are located on the Oak Ridges Moraine. The ORM is characterized by its hilly topography and extends from the Niagara Escarpment to the Trent River. The ORM is the ridge of land that separates watersheds draining southerly to Lake Ontario from watersheds draining northerly;
- The largest physiographic unit in the Oshawa Creek watershed is the Till Plain that extends from the Oak Ridges Moraine southerly to the former Lake Iroquois limit. The topography is notably more regular than the ORM, and has an average slope of almost 2 percent (the Iroquois Plain includes both sandy beach deposits and finer off shore silty clay deposits);
- South of the Lake Iroquois Beach, the surficial soils turn to sandy till, with patches of silt and clay till generally between the Highway 2 and Highway 401 corridor; and
- Category 1 and 2 Landforms represent approximately 8.68% and 11.97% respectively of the ORM area within the watershed; therefore 20.65% of the ORM within the watershed has been identified for added conservation measures through the ORMCP. It should also be noted that the Ontario Ministry of Natural Resources (MNR) has mapped hummocky terrain throughout the watershed. This information is based on land slope information, predates the ORMCP Landscape Conservation Area designations, and delineates slightly broader areas.

2.5 The Oshawa Harbour

The Oshawa Harbour Area is located on the Oshawa waterfront. Along the lakeshore the harbour is bordered by Lakeview Park to the west (a significant recreational area) and Oshawa Second Marsh to the east (a Provincially Significant Wetland). The Harbour Area has a long history and connection to the City, dating back to the time when some of the City's first settlers made their homes here and the French established a trading post on Gifford Hill (located on the east side of the Harbour near Oshawa Second Marsh). The Harbour was first established in 1840 and the Oshawa Harbour Commission Act was enacted in 1960.

Oshawa Harbour **© CLOCA**

The Oshawa Harbour is the main surface water outlet from the Oshawa Creek Watershed into Lake Ontario, and has recently been the subject of intense negotiation between the three main land owners and various levels of government. From a watershed planning perspective, the Oshawa Harbour has an integral function as an outlet for the watershed's surface water.

Currently, the lands surrounding the Oshawa Harbour are generally impervious, consisting of large industrial areas of land, serving as a community recreation area and has a long history of water quality degradation. This area will be experiencing intensive re-urbanization in the future. Consideration for improving habitat and water quality will be an important component in any future re-development.

2.6 Existing Conditions Data Gaps

The following is a list of opportunities for improvement of the Existing Conditions work to help future watershed plan updates and decision-making:

- An inventory of the locations of springs and seeps south of the ORM;
- Integration of recently commissioned stream flow gauging and low flow data into the model calibration efforts;
- Continued investigations and monitoring of the relationship between baseflow sites in an effort to identify stream reaches which are gaining groundwater (groundwater discharge) or are losing streamflow to groundwater (groundwater recharge);
- Further refinement of the tools regarding the assessment of potential impacts of existing and proposed local water takings;
- Continued biological and chemical monitoring of a full array of contaminants for trend analysis in future updates;
- The Ontario Biological Benthos Network (OBBN) protocol requires multiple minimally impacted reference sites to be tested annually. If this protocol is to be maintained, more resources are needed in order for CLOCA to comply;
- Development of a connected imperviousness percent cover;
- Monitoring of stormwater management facilities and oil/grit separators to determine performance and effectiveness of existing facilities;
- Additional/continued recording of daily temperature data. The lack of current in-stream temperature data precludes further refinement of the thermal classifications;
- Implementation of climate change monitoring; and
- Implementation of Lichen Mapping to establish baseline conditions of air quality within the watershed.

2.7 Existing Conditions Conclusions

Issues of concern in the watershed include water quality, warming stream temperatures, loss of habitat and corridors, flooding, decreased riparian cover and continuous increases in impervious surfaces. Additionally, it is anticipated that increased recreational demands, cumulative land management impacts, water resource demands and increasingly strenuous stresses and demands on natural systems will continue to negatively impact the health and resiliency of the Oshawa Creek Watershed.

3 CLOCA's Watershed Plan Development Process

The Oshawa Creek Watershed Plan has been built on the comprehensive watershed reports previously completed by the City of Oshawa in 1995 and CLOCA in 2002. This Watershed Plan uses the knowledge gained from these reports and supplements it with additional information and analysis as required by the ORMCP.

CLOCA's general process for developing watershed plans involves three distinct phases as shown below. These phases are designed to allow us to gather all of the background, technical, policy and consultation information necessary to assess various management options for the watershed, and develop the recommendations, strategies implementation and monitoring programs contained in Sections 5 through 8 of this Watershed Plan. Throughout this process, public and other stakeholder participation and input was encouraged.

3.1 Phase 1: Existing Conditions

The existing conditions of the Oshawa Creek Watershed are compiled from the 1995 and 2002 Watershed Plans as well as the 2011 Addendum, and provide an assessment of the state of the watershed by examining the following components: human heritage; green space; land use and policy; impervious surfaces; air quality; climate; physical geography; water budget; water temperature; surface water quality; surface water quantity; stormwater management; fluvial geomorphology; hydrogeology; aquatic habitat and fisheries; terrestrial natural heritage; and wetlands. Each component is briefly discussed in Section 2 of this Watershed Plan, and can be found in more detail in **Appendix A**. The 2011 Addendum is the basis for establishing the current state of the Oshawa Creek Watershed with other CLOCA studies supplementing some of the data to take full advantage of the most recent information available for creating this Watershed Plan.

EXHIBIT 3: CLOCA WATERSHED PLANNING PROCESS

Phase 1: Existing Conditions Report	• Provides an updated assessment of the existing state of the watershed building on the 1995 and 2002 watershed reports with an Addendum to the 2002 Watershed Plan completed in 2011 • A science-based report prepared by technical experts and available to stakeholders for comment and review
Phase 2: Scenario Analysis	• Establishes the Natural Heritage System and High Volume Recharge Areas in the watershed • Assesses various future growth scenarios to evaluate ecological impacts as per the requirements of the ORMCP
Phase 3: Watershed Plan	• Confirms the recommended management option (future scenario) utilizing the previously completed Watershed Plans as context for future management • Includes an implementation plan to protect, restore and enhance the ecological integrity of the watershed

3.2 Phase 2: Scenario Analysis

The ORMCP requires Authorities developing watershed plans to set watershed targets and develop management alternatives to assess whether or not the existing or predicted conditions within the watershed satisfy the targets identified. The examination of the management options is meant to evaluate the ability of each option to maintain, improve or restore water quality and quantity, ecological integrity, feasibility of the alternative, and implementation mechanisms (ORMCP Technical Paper #9). In compliance with these requirements, Phase 2 was undertaken in four steps::

Step 1: Set Watershed Health Targets;

Step 2: Develop computer models as tools to illustrate potential changes in the watershed;

Step 3: Develop Scenarios for use with the models to predict ecological changes in the watershed; and

Step 4: Analyze the scenarios with the data provided from the models to determine what future scenario(s) provides the opportunity to achieve the watershed health targets.

Appendix B provides a detailed list of the legislative requirements of this Watershed Plan, including the ORMCP.

3.2.1 Step 1 of Scenario Analysis: Setting Targets

It was first necessary to identify ecological targets to recognize the conditions that need to be achieved in a healthy watershed. A combination of guidance documents from the federal and provincial governments were used to set natural heritage, water and impervious surfaces targets.

It is important to note that these watershed targets are a broad representation of the minimum ecological standards necessary for a healthy watershed. More detailed targets for each watershed component that contribute to these broader health targets are discussed in Section 4 of this Watershed Plan.

3.2.1.1 Natural Heritage Targets

To establish natural heritage targets, Environment Canada's "How Much Habitat is Enough, A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern" (AOC Guidelines) was used as a reference to help establish forest cover, wetland and riparian targets.

Natural Cover

The AOC Guidelines recommend that 30% forest cover is needed to maintain a healthy watershed. Currently, the Oshawa Creek Watershed has 15% forest cover, so it is recognized that attempting to double the current amount of forest in an urbanizing watershed is very difficult. In light of this, a 30% natural cover target (currently, we have 17%) natural cover in the watershed – excluding cultural communities) was determined to be appropriate. In this watershed "natural cover" lands have the long-term ability to naturalize into forest cover if left undisturbed. Achieving 30% natural cover will support a diverse suite of natural communities that provide cumulative value to the terrestrial and aquatic natural systems in the watershed.

The AOC Guidelines also recommend 10% interior forest and 5% deep interior forest cover targets. Currently, there is 1% interior forest and <1% deep interior forest cover in the Oshawa Creek Watershed. These areas are by definition at least 100 m for interior and 200 m for deep interior forest away from the edge of the feature. These parameters are extremely difficult to achieve as they would require large tracts of additional forest cover lands added to existing features. In an urbanizing watershed characterized by an urban landscape in the southern portion, and a large transportation project crossing east-west through the watershed, the opportunities for achieving such interior forest areas are limited to the northern portions of the watershed. While these types of habitats will be encouraged, it is recognized that achieving the suggested AOC Guideline for interior and deep interior forest will be very difficult but nevertheless represents an important long-term target that supports a healthy watershed and is consistent with federal and provincial guidance.

Wetland Targets

10% wetland cover in the watershed is recommended in the AOC Guidelines and has been carried forward as a target for the Oshawa Creek Watershed. Currently, with 7% wetland cover in this watershed, strategic wetland restoration work will be required to meet this target.

Riparian Cover Targets

The AOC Guidelines recommend 75% adequate riparian cover along stream reaches throughout a watershed, which is described as a 30 m buffer along both sides of the stream. Riparian cover positively impacts water quality by reducing nutrients and suspended solids entering the stream. It protects stream temperatures and supports

SUPPORTING A SYSTEMS AND PRECAUTIONARY PRINCIPLE APPROACH TO WATERSHED MANAGEMENT

"Natural Heritage System: means a system made up of natural heritage features and area, linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state." (Provincial Policy Statement, 2005)

"…not only is a systems approach an appropriate approach to determining the boundaries of a [sic] NHS in developing urban area, it is the best approach. It is clearly the best approach given what experts now understand about environmental biology. No longer can society afford to look at the "natural environment" as isolated pockets of green which have been fortunate enough to have survived in an urban landscape. The Board is convinced by the evidence adduced in this hearing, that for the natural environment to have a chance of sustainability in developing urban areas, a systems approach must be taken to delineating boundaries… the use of a systems approach substantially increases sustainability of the natural environment in an urban context, by supporting the diversity of species and making the natural area more resilient to the effects of urbanization." (Ontario Municipal Board Decision by S.B. Campbell, 2008)

"The development of a natural heritage system should inform and support land use planning and resource management while providing a strategic focus for restoration, stewardship, securement and the conservation of biodiversity." (Natural Heritage Reference Manual, 2010)

"To protect the ecological function and biodiversity of natural heritage systems and the health and integrity of natural heritage features of their associated ecological functions for the long term, planning authorities should apply decision making approaches that incorporate the precautionary approach where appropriate". (Natural Heritage Reference Manual, 2010)

healthy fish populations and habitat. As only 30% of the watershed's stream lengths have been determined to have existing riparian cover, this target requires aggressive restoration efforts and robust policy protection to achieve. This recommendation has been carried forward at 75% because lack of adequate riparian cover will have significant ecological impact on the watershed. To support the accurate monitoring and reporting of riparian cover in future, efforts to update and standardize the methodology for calculating adequate riparian cover are currently underway. The results of this work will be used in the 5-year update of this Plan.

3.2.1.2 Water Quality and Quantity Targets

Water quality and quantity targets are dictated by provincial drinking water standards, the standards and technical Director's Rules behind the Clean Water Act for Water Budgets, and ecological requirements for streamflow and baseflow. For the purpose of the scenario testing, the focus was placed on providing adequate water quantity to support ecological features and functions in the watershed (as the Water Budget modeling work can help predict the potential impacts). It is not possible in this exercise to include water quality targets as such a modeling tool is not available for this level of work. The level of detail provided by the Water Budget work is sufficient to assess the management options. Recommendations from the scenarios were translated into more detailed ground and surface water quality and quantity targets in Section 4 of this Watershed Plan.

3.2.1.3 Impervious Surfaces Targets

The AOC guidelines and the ORMCP recommend a target of less than 10% imperviousness on a watershed basis and non-settlement areas on the ORM respectively.

Currently, the Oshawa Creek Watershed has 13% imperviousness with the most urbanized subwatersheds of Harbour, Montgomery, Oshawa Main and Goodman having 58%, 57%, 39% and 34% impervious surfaces respectively. Conversely, the northern subwatersheds of Winchester, Raglan and Enfield have 8%, 4% and 2% respectively. Kedron Subwatershed sits at 15% imperviousness. It was therefore determined to be appropriate to set imperviousness targets based on the ORMCP direction for the watershed's rural areas for a target of <10% imperviousness on the ORM and Greenbelt Lands. Additionally, every effort will be made to encourage and support retrofit opportunities, and to ensure that future development impacts are appropriately mitigated in the urban areas where impervious values are well past the 10% target.

3.2.2 Step 2 of Scenario Analysis: Developing the Models

CLOCA developed three computer models to scientifically represent key components of watershed health to be used as tools during the scenario analysis:

1. The Natural Heritage System;
2. The Water Budget ; and
3. An Imperviousness Analysis.

3.2.2.1 Model #1: The Natural Heritage System

The development of a Natural Heritage System (NHS) for managing natural resources has become a widespread tool used by Conservation Authorities and planning agencies. A NHS provides a scientifically defensible tool to manage watershed resources in accordance with the Conservation Authorities Act. A NHS can also be used by Municipalities to update municipal environmental policies, to inform the development of a municipal NHS, and the identification of significant features. The NHS CLOCA has developed offers a connected system consistent with the direction of other provincial land use plans, including the ORMCP and Greenbelt Plan, and can be used as support in the implementation of the Natural Heritage section of the Provincial Policy Statement (PPS). It can also be used for refinement of the Greenbelt NHS used in the Durham Region Official Plan.

CLOCA's NHS represents a healthy, self-sustaining, connected system that supports: a diversity of native terrestrial, wetland and aquatic species, communities and habitats; natural healthy fish and riparian habitats; and a natural and healthy watershed hydrological cycle. It is a connected system consisting of PSWs, provincially significant ANSIs, important aquatic habitat, riparian corridors, core habitat areas and wildlife corridors, woodlands ≥ 0.5ha, wetlands ≥ 0.5ha, Conservation Areas and areas identified for natural cover regeneration/restoration which will improve connectivity and habitat. This approach of identifying a NHS that includes existing features as well as regeneration/restoration lands is widely supported by provincial authorities and extensively referred to in the *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 Second Edition*. CLOCA has identified a NHS that, if protected, can achieve the minimum watershed health targets as set out in the Watershed Plan and provincial and federal policies. **Figure 6** below illustrates the components of the Natural Heritage System and **Appendix C** provides the full methodology for developing the NHS.

3.2.2.2 Model #2: The Water Budget

A Water Budget quantifies the major components of the hydrologic cycle, estimates where the water is within the watershed and how much water is in the system. It determines the water inputs, outputs and changes in storage. The water budget may be expressed as an equation with water inputs to the watershed equaling water outputs plus the change in water storage (as per the Ministry of Environment's Technical Paper #9 of the Oak Ridges Moraine Conservation Plan). A Water Budget will always balance according to this equation and in doing so identifies changes in each component of the equation resulting from land cover changes in the watershed.

The Water Budget work provided the information needed to consider the potential impacts to three hydrologic components (as discussed in **Table 2** as impact categories): surface run-off, baseflow and aquifer drawdown during the scenario analysis work. The Water Budget provided insights related to how the protection of High Volume Recharge Areas (HVRAs) would reduce impacts on water system health. HVRAs are areas with recharge higher than 15% of the average recharge of the study area. The identification, delineation and management of HVRAs is essential for the protection of drinking water sources and maintenance of water quantity and quality in streams, rivers and wetlands. **Appendix D** of this document provides a more in-depth discussion

of the Water Budget and all its detailed components as well as the impacts on each component based on the 8 scenarios identified in Table 1.

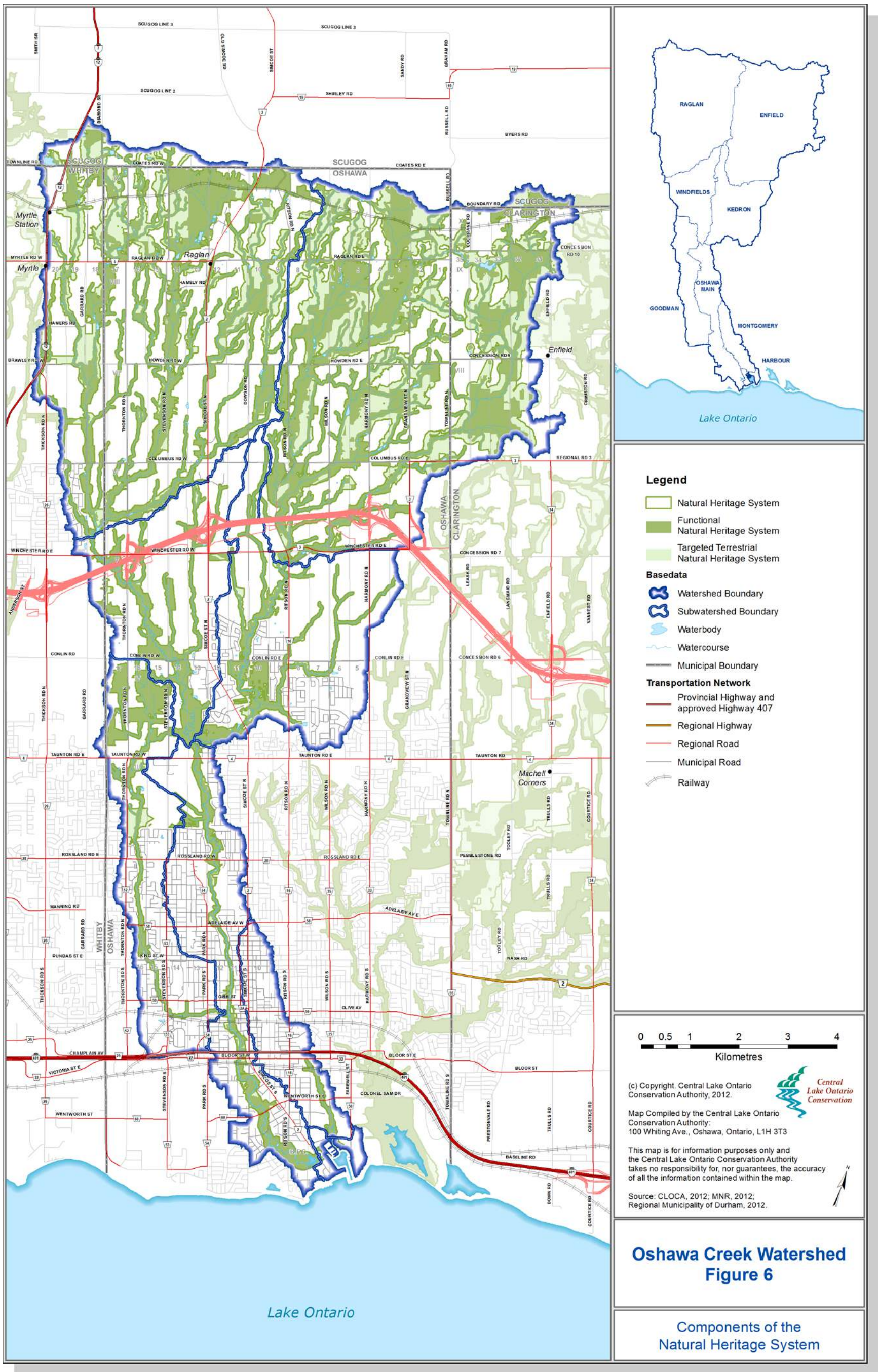
3.2.2.3 MODEL #3: IMPERVIOUSNESS ANALYSIS

Imperviousness is a key indicator of watershed health because of the severe negative impacts impervious surfaces have on ecological features and functions. CLOCA developed a model to quantify and map the existing surfaces in the watershed and to predict the impact of future development on levels of imperviousness as required by the ORMCP. This tool provides the ability to determine if impervious targets are being met and was used for the Water Budget work described above. It will be utilized in future monitoring and impervious Action Plans as discussed in Section 5. Essentially, the model provides an estimate of the level of imperviousness relative to the following watershed targets:

- <10% imperviousness on the Oak Ridges Moraine;
- <10% imperviousness on Greenbelt Lands; and
- A decreasing trend in imperviousness by landform, land cover, watershed and subwatershed (specific targets / levels will be determined for watershed updates).

Please see **Appendix E** for a full description of the model and how it was developed for use analyzing the watershed scenarios.

FIGURE 6: COMPONENTS OF THE NATURAL HERITAGE SYSTEM



3.2.3 Step 3 of Scenario Analysis: Developing the Scenarios

In order to predict future impacts to the watershed given planned and anticipated development, scenarios were developed to quantify potential impacts to inform decision-making on how the watershed can best be protected. The scenarios are predicated on two development possibilities – full build-out of the planned urban areas identified in Official Plans, and full build-out of the planned urban areas plus development of the Whitebelt lands. This analysis sought to determine what potential reduction in impacts to the watershed's natural resources would result from each development option if a) the Natural Heritage System was protected and b) if the Natural Heritage System and the pre-development recharge rates of High Volume Recharge Areas (HVRAs) were protected. Additionally, to examine Climate Change impacts, a scenario assessing potential effects on the watershed was added for information purposes moving forward. Existing Conditions were used as a comparison for each scenario. **Table 1** describes all eight scenarios used in the analysis, with Scenario 3a, 3b and 3c presented in **Figures 7, 8 and 9**.

It is noted that at the time this scenario development process was conducted, ROPA 128 (adopted by Durham Region Council in June 2009) was used as the basis for delineating urban areas as it was the most accurate available information. Recently (December 2012), ROPA 128 received Ministerial approval and some changes were made to the delineated urban areas, as well as the population and employment targets. While the revised population and

TABLE 1: SCENARIOS FOR ANALYSIS

Scenario		Description
1	Existing Conditions	2008 watershed conditions (provides baseline conditions for comparison)
2a	Full Official Plan (OP) Build-out	Conditions of the watershed if all of the development approved in the OP occurred
2b	Full Official Plan (OP) Build-out + Natural Heritage System (NHS)	Conditions of the watershed with full OP Build-out plus protection of the NHS
2c	Full Official Plan Build-out + the Natural Heritage System + High Volume Recharge Areas (HVRAs)	Scenario 2b + the protection of HVRA function
3a	Full Official Plan and Whitebelt Build-out	Scenario 2a + full Whitebelt development
3b	Full Official Plan and Whitebelt Build-out + the Natural Heritage System	Scenario 3a + protection of the NHS
3c	Full Official Plan and Whitebelt Build-out + the Natural Heritage System + the High Volume Recharge Areas	Scenario 3b + protection of HVRA function
3d	Full OP and Whitebelt Build-out under Climate Change conditions	Scenario 3a under Climate Change conditions

employment numbers have been updated in this Watershed Plan, the urban areas delineated in the scenario development and analysis has not been adjusted as per the recent Ministerial approval. CLOCA staff reviewed the recommendations arising from the Phase 2 work and determined there to be no impact regarding the scenario analysis work as a result of the approved urban area delineations. As such, no changes have been made to the scenario mapping or Watershed Plan Figures.

3.2.4 Step 4 of Scenario Analysis: Analyzing the Scenarios

To analyze the 3 models and the 8 scenarios, impact categories were identified. To assess watershed changes when applying the NHS, differences in land cover were measured (Urban, Agricultural, Natural Cover, Transportation, Landfill/Aggregate, Manicured Greenspace and Rural). Measuring the increase in urban land cover was used to quantify changes in imperviousness. Three components of the water budget work were considered in this analysis; run-off, baseflow and aquifer drawdown. **Table 2** identifies each impact category and describes its importance in determining watershed health.

In order to understand how the possible changes resulting from each scenario could impact the ecology of the watershed, the analysis assessed these impact categories to answer the following questions.

1. What is the baseline information for each impact category (Scenario 1)?

2. What will happen in each impact category if there is full OP build-out and we;
   a) don't protect the Natural Heritage System (Scenario 2a)?
   b) do protect the Natural Heritage System (Scenario 2b)?
   c) do protect the Natural Heritage System and the pre-development recharge rates of High Volume Recharge Areas (HVRAs) (Scenario 2c)?

3. What will happen in each impact category if there is full OP build-out + full Whitebelt build-out and we;
   a) don't protect the Natural Heritage System (Scenario 3a) ?
   b) do protect the Natural Heritage System (Scenario 3b)?
   c) do protect the Natural Heritage System and the pre-development recharge rates of High Volume Recharge Areas (HVRAs) (Scenario 3c)?

4. What will happen in each impact category if we have full OP build-out + full Whitebelt build-out, under predicted climate change conditions (Scenario 3d)?

The answers to these questions provided the information necessary to determine which scenario would serve to protect, enhance and restore the watershed in the fullness of time.

TABLE 2: IMPACT CATEGORIES AND WATERSHED HEALTH

Impact Category	Importance for Assessing Watershed Health
Urban Land Cover	Describes how much land in the watershed is covered by urban development (urban residential and industrial/commercial). This land cover category interferes with achieving watershed health as it impacts ecological integrity for features and functions; impedes achieving watershed targets for forest cover, wetlands etc.; increases impervious surfaces that increase run-off and stormwater management requirements; interferes with recharge and discharge functions; and impacts water quality in general. It is important to note that the purpose of the watershed plan is to protect the health and resiliency of the watershed while working in the context of economic, cultural and social objectives of each municipality.
Agricultural Land Cover	Describes how much land in the watershed is agricultural (crop/improved, pasture/unimproved). This is important for ecological health as agricultural land supports the natural systems of the watershed. Agricultural lands can become more beneficial to the health of a watershed through Best Management Practices that decrease potential negative ecological impacts and increase connections and healthy interactions with natural systems.
Natural Cover	Describes how much land in the watershed is woodlot, forest, thicket, lake or wetland. This is the most desirable land category for protecting, enhancing and restoring watershed health. This category represents several watershed targets such as 30% natural cover, 10% wetland cover, 10% imperviousness in the ORM and Greenbelt , and 75% 30 m riparian cover.
Transportation Land Cover	Describes how much land in the watershed is dedicated to transportation facilities. This is an important category for informing discussions on wildlife corridor barriers, run-off, impervious surfaces, water quality, recharge and discharge.
Landfill and/or Aggregate Land Cover	Describes how much land in the watershed is dedicated to landfills or aggregate operations. This is an important classification in that these uses impact ecological integrity and can have large impacts on water resources.
Manicured Greenspace Land Cover	Describes how much land in the watershed is used for recreation such as parks, golf-courses, ski hills, nature trails etc. These areas are impacted by human use but can provide some natural features and functions that contribute to watershed health.
Rural Land Cover	Describes how much land in the watershed is dedicated to rural development. This land cover category captures lands that are not in the urban areas but have some development on them.
Impervious Surfaces	Describes how much land in the watershed is impervious to water. This impact category is a key illustrator of the impacts of an urban landscape as it includes increased runoff and "flashiness" of flooding due to decreased infiltration and groundwater recharge, which in turn decreases stream baseflow and increases channel erosion and sedimentation, downstream flooding, stream water quality and stream temperature. The cumulative effects of impervious surfaces alter the aquatic habitat to a degraded state providing limited function.
Run-off	Describes the amount of run-off anticipated within the watershed based on impervious surfaces, stormwater management and natural cover functions that mitigate run-off.
Change in Baseflow	Describes if there is a change in the amount of baseflow to streams. This category indicates where there are groundwater impacts due to development.
Aquifer Drawdown	Quantifies the impact of a development on groundwater resources. A drawdown is depicted as a "zone of influence" that illustrates the depth and area of impact on groundwater storage in aquifers.

As per the requirements of the ORMCP and as a predictive tool, each of the 8 scenarios described in **Table 1** were analyzed and mapped to illustrate potential impacts to the watershed. The analysis offered insight into the effects each scenario's growth and watershed management options will have on the impact categories identified for the watershed. **Table 3** below provides summary results of each scenario.

TABLE 3: SUMMARY SCENARIO ANALYSIS BY IMPACT CATEGORY

Impact Category (% of Land Cover in Watershed)		**Scenario 1** (Existing Conditions)	**Scenario 2a** (Full OP Build-out)	**Scenario 2b** (Full OP Build-out + NHS)	**Scenario 2c** (Full OP Build-out + NHS + HVRAs)	**Scenario 3a** (Full OP and Whitebelt Build-out)	**Scenario 3b** (Full OP and Whitebelt Build-out + NHS)	**Scenario 3c** (Full OP and Whitebelt Build-out + NHS + HVRAs)	**Scenario 3d** (Full OP and Whitebelt Build-out in 2080 Climate Change conditions)
Natural Cover *		17%	15%	37%	37%	15%	36%	36%	15%
Urban Land Cover		17%	36%	32%	31%	41%	36%	35%	41%
Transportation		4%	6%	6%	6%	6%	6%	6%	6%
Rural Land Cover		3%	3%	3%	3%	3%	3%	3%	3%
Manicured Greenspace		4%	2%	1%	1%	2%	2%	2%	2%
Aggregate / Landfill		<1%	1%	1%	1%	1%	1%	1%	1%
Agriculture Land Cover		55%	37%	20%	20%	32%	16%	17%	32%
Impervious Surfaces		13%	25%	22%	20%	28%	25%	22%	28%
Surface Run-off (% change in run-off from S1)		N/A	26%	21%	16%	34%	24%	19%	42%
Change in Baseflow (% change in baseflow from S1)		N/A	-10%	-9%	-6%	-14%	-12%	-9%	14%
Aquifer Drawdown (% area where drawdown exceeds 0.5m)	ORM Aquifer Complex	N/A	22%	17%	14%	27%	22%	17%	10%
	Thorncliffe Aquifer Complex	N/A	28%	20%	12%	39%	30%	20%	8%
	Scarborough Aquifer Complex	N/A	20%	15%	9%	31%	26%	16%	5%

**** Natural Cover refers to: Scenario 1 – LU codes woodland/forest & lake/wetland; for Scenarios 2b, 2c, 3b, 3c the Natural Heritage System and any mapped ELC communities outside of the NHS.***

Figure 7 illustrates Scenario 1, the existing conditions of the watershed as a baseline for comparing the anticipated impacts of each scenario. As can be seen in **Table 3** above, failure to protect the NHS and HVRAs in either growth scenario (S2a and S3a) represents significant and likely irreparable harm to the features and functions of the watershed. **Figure 8** illustrates Scenario 2c, which includes the protection of the NHS and HVRAs in the context of full OP build-out. **Figure 9** illustrates Scenario 3c, which describes the protection of the NHS and protection of the recharge function of HVRAs in the context of full OP build-out + full Whitebelt build-out. This scenario has been chosen to carry forward for planning purposes to protect, restore and enhance the health of the watershed.

The precautionary principle is being applied in terms of managing the watershed, as full OP and Whitebelt Build-out is not a foregone conclusion but rather it represents the long-term largest impact to the watershed that CLOCA must be prepared to address and manage if it does eventually come to pass. Watershed Planning is a process that must consider the very long-term consequences of a changing landscape (growth, climate) on the natural heritage and water resources in the watershed.

From an ecological perspective, the scenario analysis revealed that the protection and preservation of the NHS and protecting the recharge function of the HVRAs can maintain a healthy watershed in the context of either full OP build-out or full OP build-out + Whitebelt build-out. Management of the Oshawa Creek Watershed will therefore focus on:

- ensuring the long-term protection, restoration and enhancement of the NHS;
- maintenance of groundwater recharge rates in HVRAs;
- supporting municipalities in their efforts to reduce the ecological impacts of existing urban areas; and
- supporting municipalities to ensure that new development and growth respects the recommendations of this Watershed Plan to protect watershed health in the long-term.

The **precautionary principle** denotes a duty to prevent harm, when it is within our power to do so, ***even when all the evidence is not in***. This principle has been codified in several international treaties to which Canada is a signatory.

Canadian Environmental Law Association:
http://www.cela.ca/collections/pollution/precautionary-principle

FIGURE 7: SCENARIO 1 - EXISTING CONDITIONS

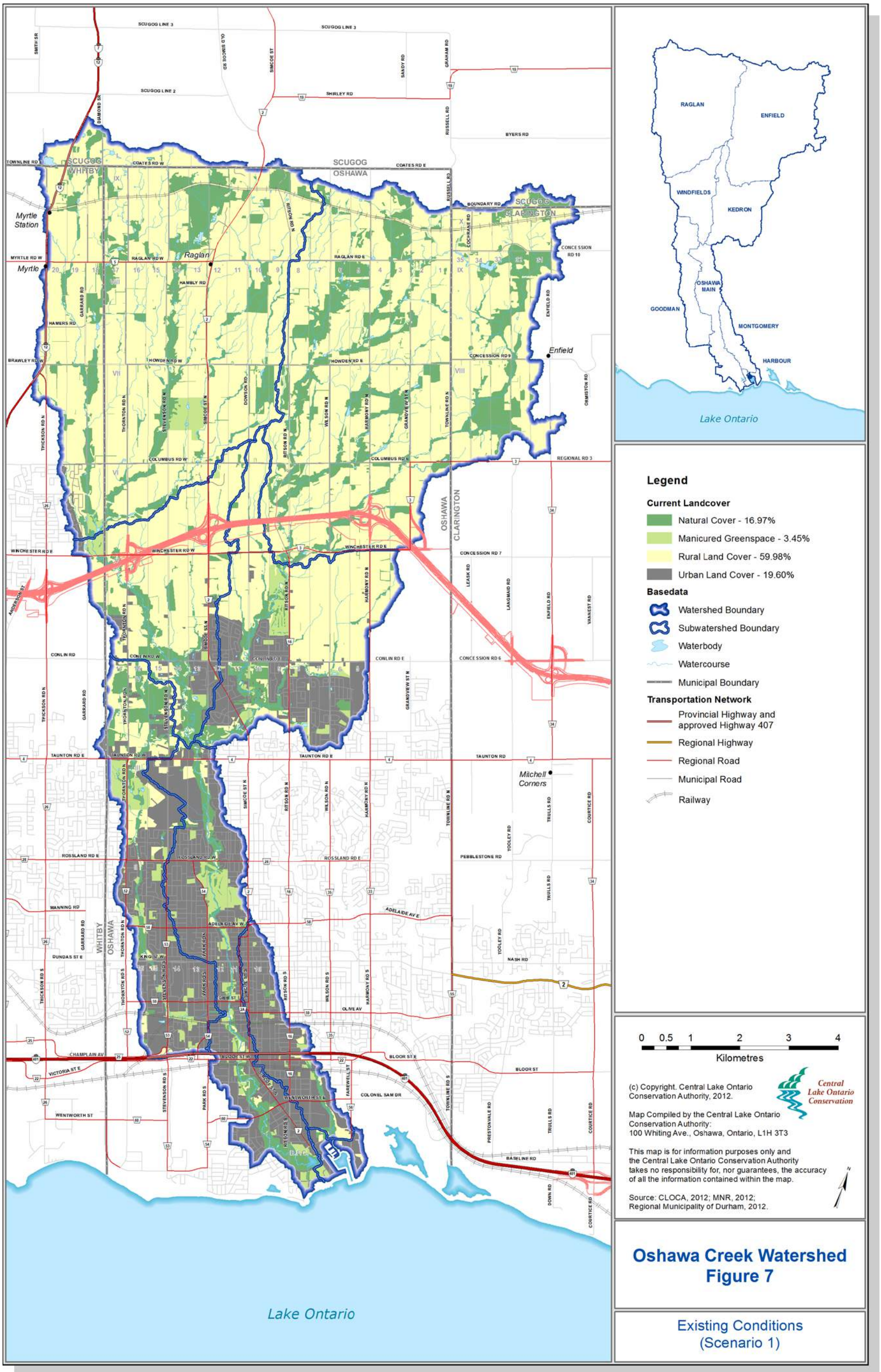


FIGURE 8: SCENARIO 2C - PROTECTION OF THE NHS, RECHARGE RATES OF HVRAS AND OFFICIAL PLAN BUILD-OUT

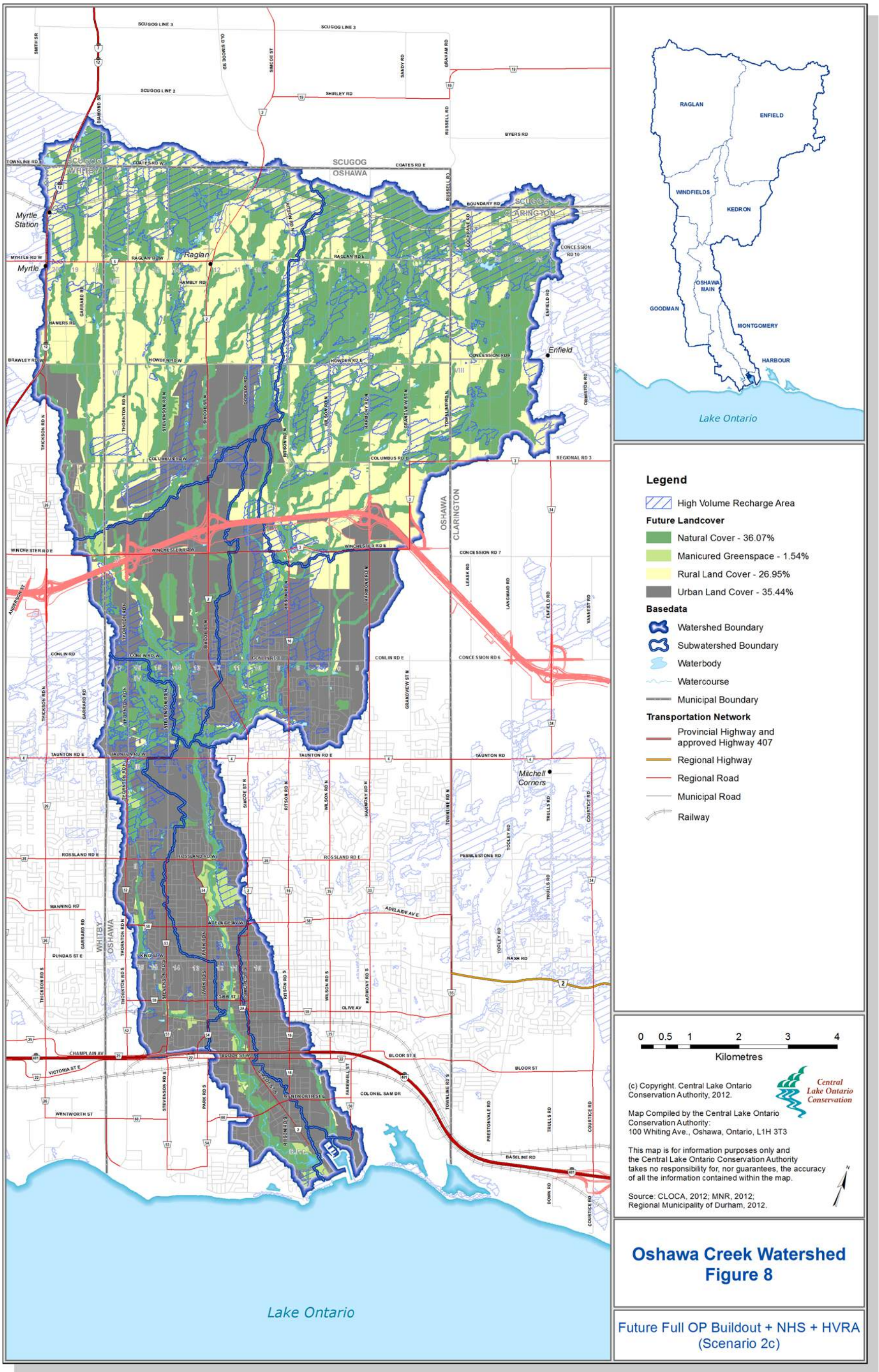
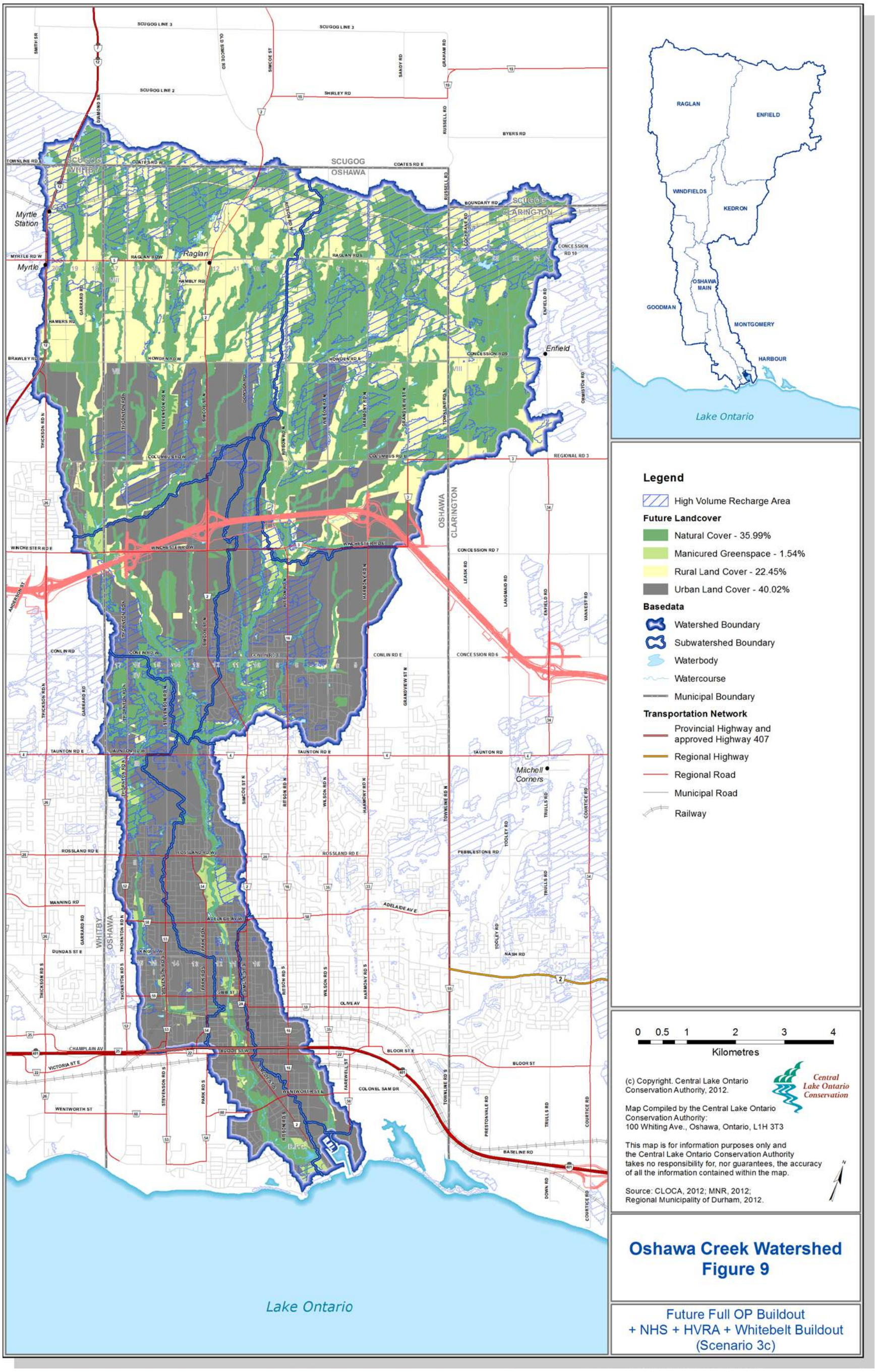


FIGURE 9: SCENARIO 3C - PROTECTION OF THE NHS, RECHARGE RATES OF HVRAS, OFFICIAL PLAN AND WHITEBELT BUILD-OUT



3.2.4.1 Climate Change Conditions:

As another predictive tool to assess potential impacts to the watershed, the "Climate Change" scenario represents the impact of full OP and Whitebelt build-out in the context of 2080 climate change conditions. Forecasted climate change data was extrapolated from the Hadley Center for Climate Change, and their Research model (CM3 model, scenario A1F1) was used to show the impacts of a 19% increase in precipitation and an increase in minimum and maximum temperatures by 7°C. This method of climate alteration does not consider the seasonal forecasted changes in climate; however, since the forecasted changes were applied to the observed weather patterns between 1980 and 1999, seasonality is preserved.

The impacts of climate change appear to increase all the hydrological components of the water budget; increased recharge equates to increased water availability to vegetation, and increased baseflow. Increased evapotranspiration may result in a more-humid climate, while increased summer/fall runoff may be mitigated through common stormwater management practices. Springtime decreases in runoff will likely have detrimental effects to aquatic and riparian ecosystems. For example, high instream flows currently experienced during the spring, otherwise known as the spring freshet, are critical in that they clean stream substrate, signal spawning times, and allow fish passage to areas that are not accessible during most of the year. Without the annual freshet, sediment quality will degrade and threaten microhabitat availability and instream health.

The climate change scenario, S3d, has shown an increase in groundwater recharge predominantly during the winter. This climate change scenario has greatly increased water levels in non-developed areas. Drawdowns in groundwater aquifers / resources continue to occur in the areas of proposed development. As detrimental as climate change may be to many parts of the world, the CLOCA jurisdiction appears to benefit from increased precipitation and temperature from a water supply standpoint.

3.3 Phase 3: Watershed Plan

The third and final phase of CLOCA's watershed planning process is the compilation of the Watershed Plan itself. This plan is based on the work completed in Phases 1 and 2 and is completed in compliance with provincial policies relating to watershed planning. **Exhibit 4** illustrates the 17 topics/components to be considered in a Watershed Plan according to the Oak Ridges Moraine Conservation Plan Technical Paper Series, #9 – Watershed Plans. All 17 requirements are addressed within this Watershed Plan and are described in more detail in **Appendix B**.

Various engagement techniques have been and will continue to be employed to ensure that all interested, affected and engaged stakeholders have access to the Plan, and CLOCA staff have been available to answer any questions and provide additional information where needed. This Watershed Plan has been written and structured to enhance implementation of the Watershed Plan policies, targets and strategies by CLOCA, municipalities and other stakeholders.

3.3.1 Consultation Efforts

On December 9, 2010 CLOCA staff held a Public Information Centre at the Legends Centre in Oshawa to present information to stakeholders regarding Phase1: Existing Conditions and Phase 2: Scenario Analysis. Display boards and hard copies of the report were available for viewing as well as a formal presentation. Copies of the presentation were made available at the meeting and were posted on the CLOCA website for easy download. Participants were encouraged to provide written feedback on both phases of work.

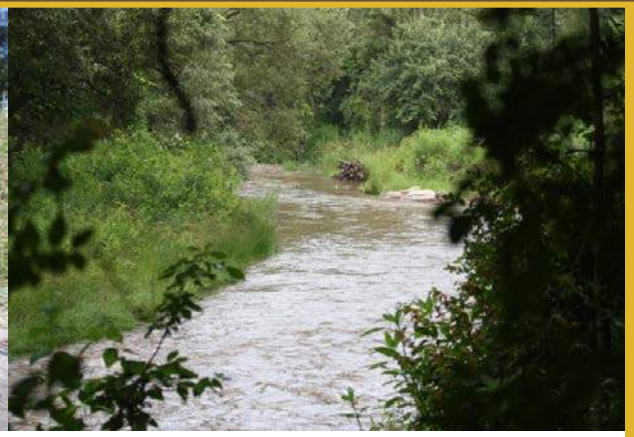
Prior to the December 2010 PIC, a presentation to our municipal partners as well as a separate meeting with the development community were undertaken to present the Phase 1 and Phase 2 information.

A third and final PIC was held on November 6, 2012 from 6:30pm to 8:30pm to present the Draft Oshawa Creek Watershed Plan. This PIC was held jointly with the Draft Black/Harmony/Farewell Creek Watershed Plan to present the content of the Plans and discuss any questions or concerns with stakeholders. A presentation was held at 7:00pm to present the key structure, findings and recommendations of both Watershed Plans and to allow for a question and answer period with CLOCA staff.

In addition to the PIC, municipalities were met with separately to present the Watershed Plans and solicit preliminary feedback. These meetings were held in advance of the PIC and formal comments were encouraged by the comment deadline of December 16, 2012. A presentation was also provided to the Oshawa Development Services Committee at the request of the City of Oshawa.

All feedback and comments received from the consultation process were considered and included in the Final Watershed Plans where appropriate.

EXHIBIT 4: TOPICS / COMPONENTS OF A WATERSHED PLAN AS PER THE ORMCP



Oshawa Creek Watershed Plan

Part 2 – Managing the Watershed

Central Lake Ontario Conservation

In partnership with:

Conservation Ontario Natural Champions

Durham Region

4 THE HEALTHY OSHAWA CREEK WATERSHED

Achieving a healthy watershed that is resilient with ecological integrity is a vital component of the environmental, economic, social and cultural success of a community. There is no doubt that protecting, restoring and enhancing the features and functions of the watershed will benefit all residents of and visitors to the Oshawa Creek Watershed. The challenge is to identify key targets of watershed health, develop a plan to reach these targets, and ultimately implement those plans to achieve a healthy watershed. The following sections outline the goals, objectives, indicators and targets for each component.

4.1 HISTORICAL WATERSHED TARGETS

The goals, objectives and targets of all of the Oshawa Creek Watershed Plans are based on the foundation of achieving a healthy watershed. In 2002, CLOCA's first intensive watershed planning exercise for the Oshawa Creek Watershed put the watershed health targets in the context of what characteristics the people, land and life in the watershed need to have to be considered "healthy". The 2002 Watershed Plan summarized the objectives of obtaining healthy people, land and life by outlining the following principles:

- *Protect What is Good*
- *Fix What is Bad*
- *Maintain it into the Future.*

It is important in watershed planning to set measurable targets for key indicators of a healthy watershed. The underlying principles of protecting what is good, fixing what is bad and maintaining healthy conditions underpin all of the representative targets of watershed health used in today's current best practices.

4.2 CURRENT WATERSHED TARGETS

Science and industry standards of practice allow numerical and measurable targets to be assigned to various aspects of a healthy watershed. These targets provide a benchmark of minimum ecological standards that must be in place to establish and maintain the healthy ecosystems of a watershed. They also allow for monitoring of progress towards the achievement of these targets in a quantitative way that is widely understood. Using these numerical representations of key aspects of a healthy watershed removes the need to make qualitative and subjective assessments.

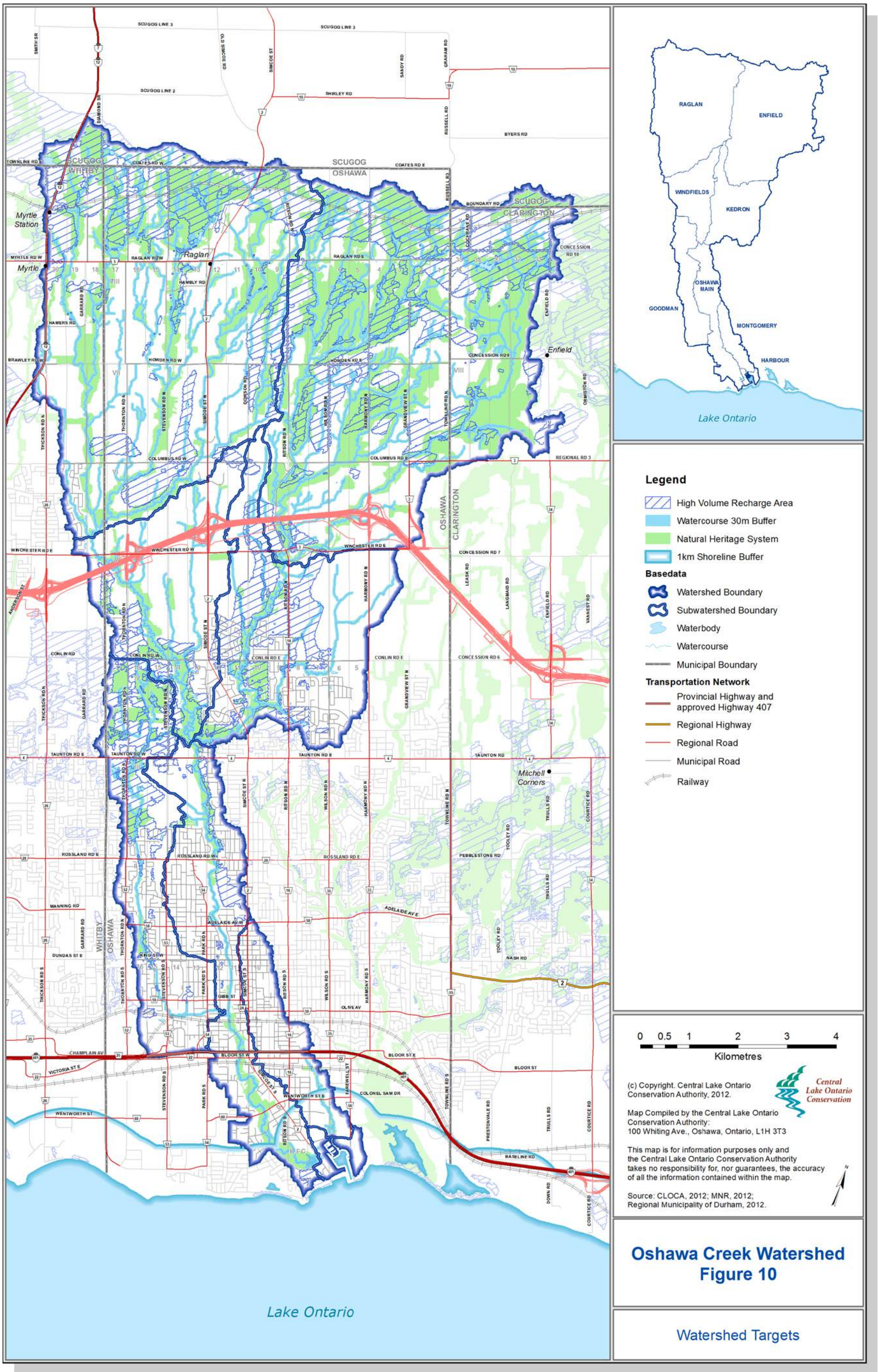
The targets set out below in **Table 4** represent a compilation of federal and provincial guidance tailored to the needs and realities of the Oshawa Creek Watershed. Symbols have been added beside each watershed target that will be used throughout the implementation plan to indicate how an action or recommendation supports the achievement of the target. These targets represent crucial aspects of achieving a connected and resilient watershed with ecological integrity.

TABLE 4: WATERSHED HEALTH TARGETS

30% Natural Cover: Supports the achievement of increased forest cover to 30%, 10% interior forest, 5% deep interior forest through long-term naturalization, provides run-off retention, erosion control, wildlife habitat, air quality improvements, social / cultural / economic benefits and climate change mitigation impacts.
10% Wetland Cover: Provides run-off retention, erosion control, water quality filtration, wildlife and fish habitat, social / cultural / economic benefits and mitigates impacts associated with climate change.
< 10% Imperviousness on the ORM and Greenbelt: Limiting impervious surfaces allows for better run-off retention, groundwater infiltration, ground and surface water quality and sediment filtration. Limiting built or paved areas can have a positive impact on the amount of natural areas contributing to ecosystem health.
75% Riparian Cover: Protecting, restoring and enhancing riparian cover provides run-off retention, improves water quality, fish habitat and diversity, and helps to decrease water temperature.
A Healthy Water System: Water quantity and quality to support ecological and human health as well as protect human life and property.
All Watershed Health Targets

Figure 10 below illustrates the Natural Heritage System and High Volume Recharge Areas in the watershed which support the achievement of the watershed health targets discussed above.

FIGURE 10: WATERSHED TARGETS



The following sections describe the goals, objectives, indicators and targets for achieving a healthy and resilient watershed within the context of each main component of the watershed.

4.2.1 Water

Groundwater Goal: A self-sustaining hydrogeological system consisting of sufficient groundwater quality and quantity to support: healthy aquatic and terrestrial ecosystems and their ecological functions; clean drinking water for rural watershed residents; and sustainable human use of groundwater resources for non-drinking water purposes.

Surface Water Quality Goal: A sustainable, functioning hydrological system consisting of surface water quality, that supports: healthy aquatic and terrestrial ecosystems and their ecological functions; clean water that will contribute to the maintenance of Lake Ontario as a domestic drinking water source; and sustainable human use of surface water resources for non-drinking water purposes.

Surface Water Quantity Goal: A sustainable, adaptable, functioning hydrological system consisting of sufficient surface water quantity, and natural flow regime/rates that supports: healthy aquatic and terrestrial ecosystems and their ecological functions; sustainable human use of surface water resources for non-drinking water purposes, having no adverse impact on ecological features and function and/or to Lake Ontario surface water intake zones, and; public safety and protection of infrastructure and private/public properties from unacceptable changes in flooding and erosion hazards as determined by the Conservation Authority.

Water Temperature Goal: To maintain/reduce water temperatures in surface water bodies in order to protect or enhance the quantity and quality of native/naturalized aquatic life.

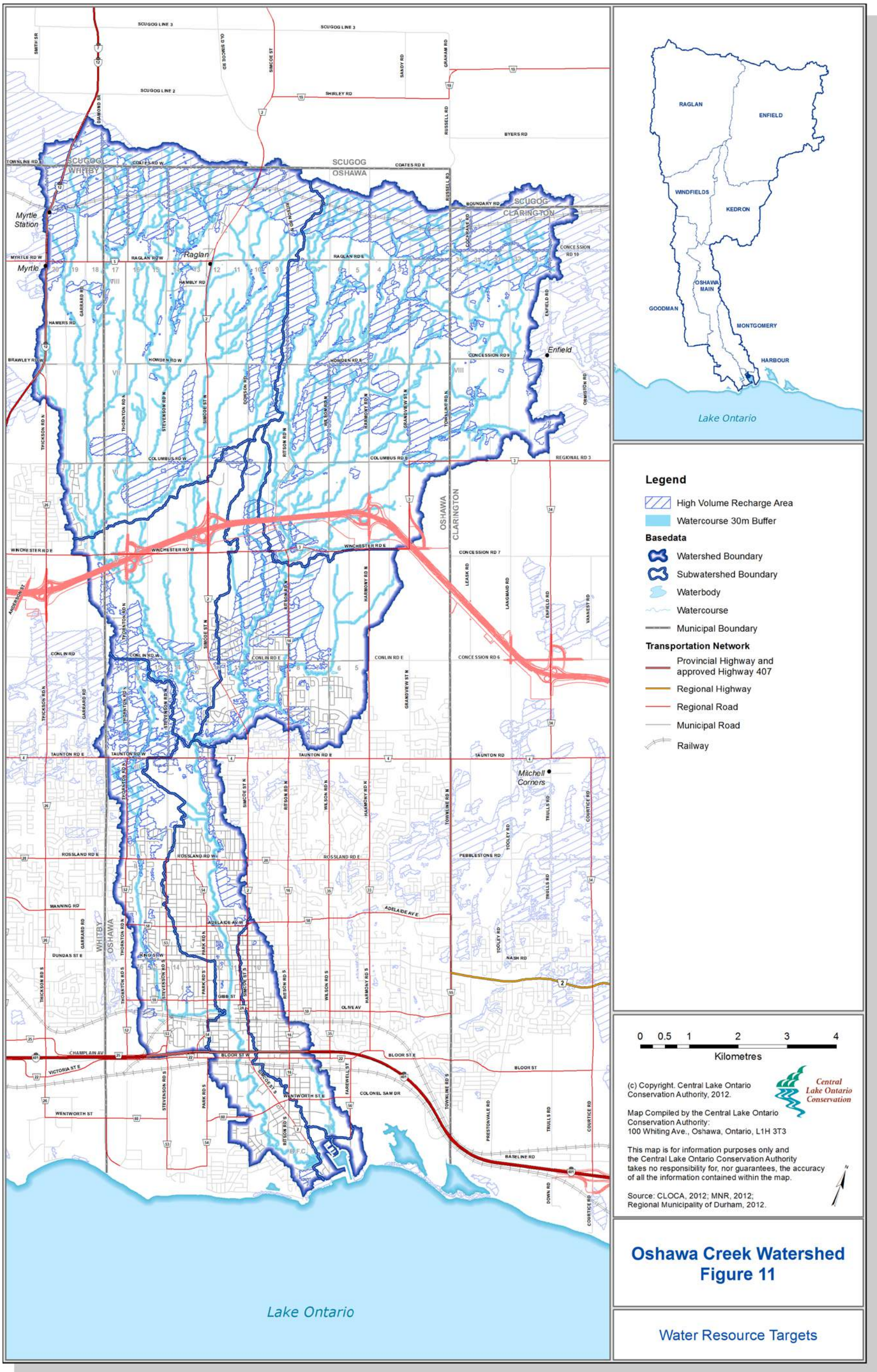
Fluvial Geomorphology Goal: Natural stream channels and corridors that allow for natural stream flow patterns and channel migration (where possible), support diverse aquatic habitat, limit sediment loadings and protect human life, property and infrastructure from risks associated with erosion and slope instability.

WATER		
Objectives:	**Indicators:**	**Targets:**
Protect and enhance public safety, private property and infrastructure from erosion and flooding	• Risk to public and private property	• Protect private / public property and public safety.
Protect, restore and enhance groundwater recharge and discharge features and functions	• High Volume Recharge Areas (HVRAs)	• Maintain pre-development infiltration / recharge rates.
	• Discharge Areas	• Maintain average annual baseflow rates.
Protect, restore and enhance groundwater quality	• Groundwater Chemistry (metals, chloride, nutrients)	• Meet Provincial Water Quality Standards. • Prevent future deterioration beyond recorded current / ambient background nutrient levels.
Ensure ground and surface water demand does not exceed calculated watershed thresholds for ground and surface water supply	• CLOSPA (Central Lake Ontario Source Protection Authority) Stress Assessment	• Reduce current Stress Assessment Level to "Low" vs. the current condition of "Moderate".
Protect natural baseflow	• Baseflow levels	• Maintain long-term average and seasonal baseflow levels.
Protect and restore surface water quality to meet approved (current) standards	• Benthic invertebrate community	• Improve all surface water benthic quality ratings to un-impaired.
	• Biological Oxygen Demand (BOD)	• Maximum BOD of 2 mg/L.
	• Dissolved Oxygen (DO)	• Maintain DO requirements needed to support fisheries. ➢ 4 – 7 mg/L in warm water streams. ➢ 5 – 8 mg/L in cold water streams.
	• Chloride	• <150 mg/L and/or a decreasing trend.
	• Phosphorus	• <30 µg/L for streams and <20 µg/L for lakes and/or a decreasing trend.
	• Nitrates (NO_3)	• <10 mg/L and/or a decreasing trend.
	• Copper	• 1-5 µg/L depending on hardness and/or a decreasing trend.
	• Suspended Solids	• Not currently available.

WATER		
Objectives:	**Indicators:**	**Targets:**
		See "CLOCA Action Plans" section of this report for more detail on future work to set targets.
Reduce / mitigate negative road salt impacts in sensitive areas of the watershed	• Water Quality	• Reduce / maintain historical / baseline water quality values.
Protect / restore / reduce stream temperatures to support aquatic life	• Stream Temperature	• Restore or maintain cold / cool water temperatures. • Restore and maintain seasonal temperature variations to natural fluctuations.
Protect, enhance and restore natural channel morphology and stability	• Rapid Geomorphic Assessment (RGA) and Rapid Stream Assessment (RSA)	• Achieve: ➢ Stability Index (SI) or <0.2 or "in regime" ➢ RSA health classification of excellent (40-50) or good (30-39)

Figure 11 below illustrates the healthy water resource targets in the watershed. These targets directly relate to the objectives for realizing each watershed component goal. For example, by maintaining pre-development infiltration / recharge rates, we will support the objective of "**Protect, restore and enhance groundwater recharge and discharge features"** that contributes to the goal of overall health of water quality and quantity. These more specific targets have been developed to provide specific actions that direct CLOCA's Action Plans as discussed in detail in Section 5 of the Watershed Plan. The High Volume Recharge Areas (HVRAs) are the identified indicator of these targets and will be used to measure progress during future updates of the Watershed Plan to ensure positive gains are being made towards achieving a healthy watershed. In this example, municipal policies have also been developed to support these targets as municipal policies are the most effective tool for dealing with HVRAs.

FIGURE 11: WATER RESOURCE TARGETS



4.2.2 Natural Heritage

Terrestrial Natural Heritage Goal: A healthy, self-sustaining, connected natural terrestrial system with ecological integrity. Development within the watershed shall not result in a net loss to the overall natural heritage system.

Fisheries and Aquatic Habitat Goal: A healthy, self-sustaining/resilient aquatic ecosystem that supports a diversity of native / naturalized fish and benthic communities; natural, healthy fish and riparian habitat; and the sustainable use of aquatic resources for recreational or commercial purposes that do not adversely affect the ecosystem.

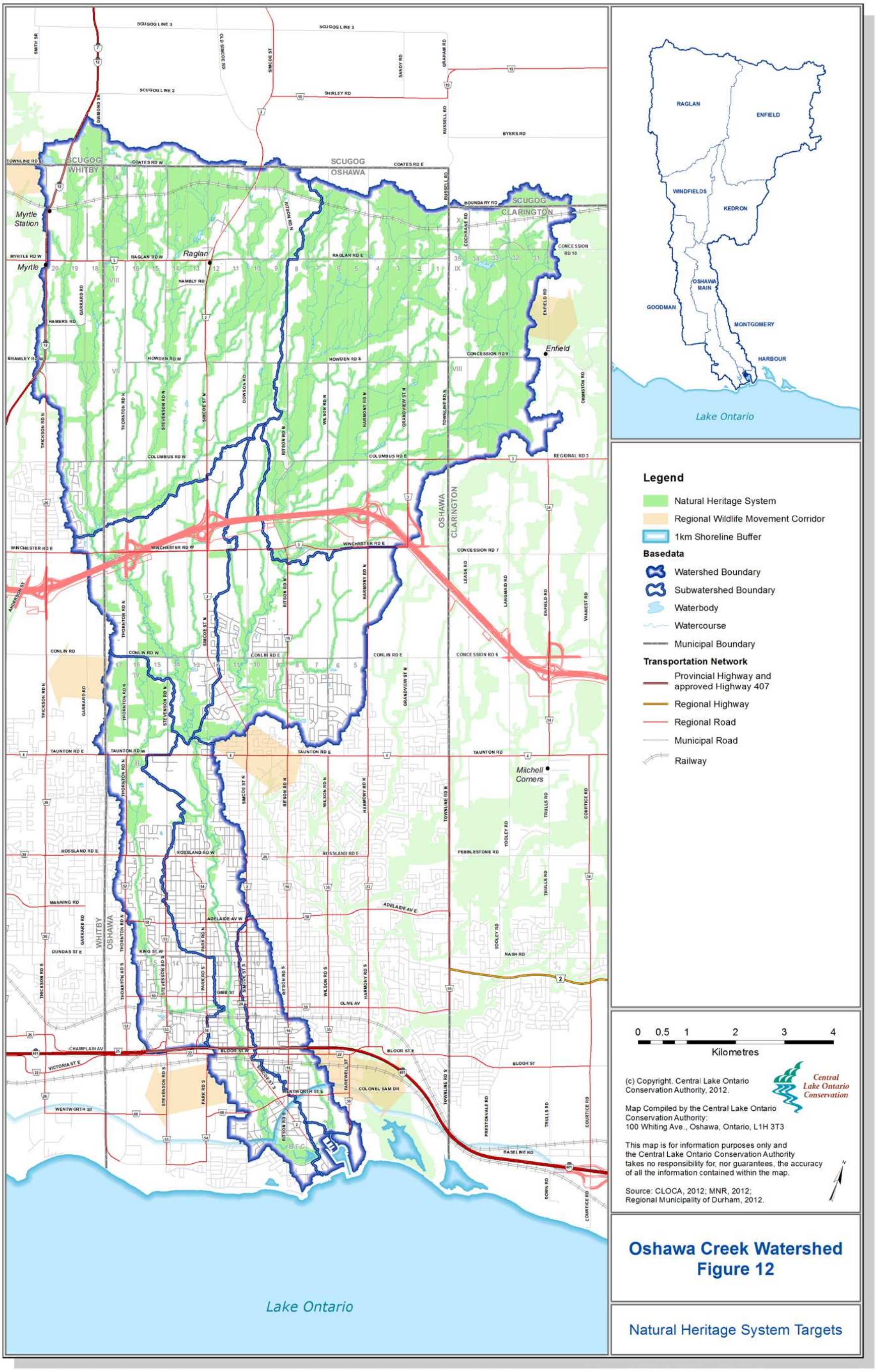
NATURAL HERITAGE		
Objectives:	**Indicators:**	**Targets:**
Protect, restore and enhance the ecological integrity of natural areas (including wetlands)	• Percent Natural Cover	• Achieve a minimum 30% natural cover in the watershed.
	• Percent Forest Cover	• Continual increases of forest cover to achieve the long term target of 30% forest cover in the watershed.
	• Percent Wetland Cover	• Increase existing wetland cover in headwater areas and achieve a no net loss of wetland cover in the watershed. • Achieve and maintain a minimum of 10% wetland cover in the watershed and greater than 6% wetland cover in each subwatershed.
	• Invasive Species	• Continual improvement in the mitigation of invasive species impacts. • Implement CLOCA's Invasive Species Management Strategy.
Protect, restore and enhance the ecological integrity of wildlife habitat (non-aquatic)	• Habitat Diversity	• No loss of Ecological Land Classification (ELC) system community series types.
	• Habitat Distribution	• Maintain and enhance even distribution of natural and forest cover throughout the watershed.
	• Habitat Quality	• Enhance habitat patches to have better shape vs. area ratios. • At least one 200 ha forest patch within the watershed that is a minimum of 500 m wide.
	• Percent Forest Interior and Deep Forest Interior	• Achieve and maintain greater than 10% interior forest in the watershed. • Achieve and maintain greater than 5% deep interior forest in the watershed.
	• Corridor width	• Achieve and maintain naturalized local corridors ≥ 60 m widewide. • Achieve and maintain naturalized landscape corridors ≥ 100 m wide.

NATURAL HERITAGE		
Objectives:	**Indicators:**	**Targets:**
		• Maintain and enhance 1 km of naturalized habitat along the Lake Ontario Shoreline where possible.
	• Terrestrial and wildlife Species At Risk	• Support, in partnership, the protection, restoration and enhancement of the distribution of Species at Risk (SAR). • Support, in partnership, the identification, restoration and preservation of sensitive habitat as defined in species specific recovery strategies.
Protect, restore and enhance the ecological integrity of Coastal Wetlands	• Water quality	• Achieve and maintain a Water Quality Index (WQI) of 0 to 1 (good condition) or higher.
	• Sediment quality	• Maintain a Sediment Quality Index (SQI) score of 87.8 or higher (excellent condition).
	• Submerged Aquatic Vegetation (SAV) Community	• Achieve and maintain a Submerged Aquatic Vegetation (SAV) IBI of 40-60 (good condition) or higher.
	• Fish community	• Maintain a fish IBI of 47.8 or higher (good condition).
	• Bird community	• Maintain a bird IBI of 47.44 or higher (good condition).
	• Amphibian community	• Achieve and maintain an amphibian IBI of 40-60 (good condition) or higher.
	• Aquatic macroinvertebrate community	• Achieve and maintain a macroinvertebrate IBI of 40-60 (good condition) or higher.
Protect, restore and enhance the health and diversity of native / naturalized fish communities	• Diversity and Distribution of fish communities	• Continued presence and abundance of all native fishes. • Steady or increased abundance and distribution of Brook Trout.
	• Aquatic Species At Risk	• Support, in partnership, the protection, restoration and enhancement of the distribution of Species at Risk (SAR). • Support, in partnership, the identification, restoration and preservation of sensitive habitat as defined in species specific recovery strategies.

NATURAL HERITAGE		
Objectives:	**Indicators:**	**Targets:**
	• Invasive / non-native species (not applicable to naturalized species)	• Absence and/or decline in abundance and distribution of invasive / non-native species. • Implement Invasive Species Management Strategy.
Protect, restore and enhance fish habitat and riparian habitat	• Stream Barriers	• Remove in-stream barriers where appropriate in priority sequence. • Protection of the ability of Salmonids, as well as native non-jumping fish from Lake Ontario, to spawn upstream in the watershed.
	• Percent riparian habitat per stream length	• Increase quality and range of fish habitat to achieve a target of 75% riparian cover along streams with a minimum 30 m vegetated buffer on either side of the stream.

Figure 12 below illustrates the Natural Heritage targets for health in the watershed. This figure is a visual representation of the watershed health targets that will be achieved through the more detailed watershed component targets noted in the table above. These component targets directly relate to the objectives for realizing each watershed component goal. For example, by enhancing habitat patches to have better shape vs. area ratios, and realizing at least one 200 ha forest patch within the watershed that is a minimum of 500 m wide, we will be directly supporting the objective of "**Protect, restore and enhance the ecological integrity of wildlife habitat (non-aquatic)"** which contributes to the larger watershed health target of 30% natural cover (moving to 30% forest cover), 10% interior forest and 5% deep interior forest. These more detailed targets have been developed to provide specific actions that direct CLOCA's Action Plans as discussed in Section 5 of the Watershed Plan as well as municipal policies discussed in Section 6. Habitat quality is the indicator that will be measured in future updates of the Watershed Plan to ensure positive gains are being made towards the targets and goal.

FIGURE 12: NATURAL HERITAGE RESOURCE TARGETS



4.2.3 Transboundary Issues / Anthropogenic Influences

Impervious Surfaces Goal: To limit the amount of impervious surfaces in the watershed and mitigate negative impacts where possible.

Floodplains & Flood Damage Centres Goal: To model and predict the impact of severe weather events to protect human life and property.

Stormwater Management Goal: Effective, low impact management of stormwater run-off to protect the ecological health of the watershed and contribute to the protection of human life and property during storm events.

Air Quality Goal: To support programs to improve air quality levels that relate to ecological and human health.

Climate Change Goal: To establish a healthy, adaptable watershed that is resilient to the impacts of climate change.

IMPERVIOUS SURFACES		
Objectives:	**Indicators:**	**Targets:**
Limit impervious land cover in watershed	• Percent imperviousness	• < 10% on ORM and Greenbelt Lands, or reduction of the effect of existing imperviousness impacts in urban areas through retrofit stormwater management works. • Increase the use of Low Impact Development (LID) / green technologies for future development and retrofits to existing development where applicable.
	• Connected imperviousness	• TBD *See Section 5 of this report for more detail on future work to set targets.*
STORMWATER MANAGEMENT		
Objectives:	Indicators:	Targets:
Protect human life and property	• Flood Damage Centres	• Limit flood damages and prevent further flood damage centres. • All new infrastructure to have no impediment to natural overland / surface water flows.
	• Two-Zone Floodplain Management	• Effective implementation of CLOCA's Two-Zone Floodplain Management policies with respect to Oshawa and Goodman Creeks.
Protect & maintain existing watershed / subwatershed catchment boundaries	• Drainage patterns	• Maintain existing watershed boundaries and drainage patterns. • All new infrastructure to mitigate potential impacts and risk to human life and property from increased surface flows.

Manage stormwater runoff to maintain pre-development peak flow rates in receiving streams runoff	• Peak flow rates	• Peak flow rates on receiving streams to not exceed corresponding pre-development rates for the 1:2-year through 1:100-year storm events and the Regional Event (Hurricane Hazel).
Effective and efficient performance of Stormwater Management Facilities	• Existing and new facilities	• Achieve enhanced Level 1 requirements. • Reduce thermal impacts. • Achieve intended designed flow control. • Reduce the number of structures impacted by flooding. • Reduce the number of flooding complaints. • Improve existing stormwater management facilities to reduce adverse ecological impacts of development. • Employ multi-barrier approach (lot level, conveyance system, and end of pipe control) for new stormwater management systems to mitigate all impacts to water quality including stream temperature.
AIR QUALITY		
Objectives:	**Indicators:**	**Targets:**
Sustain healthy levels of air quality for human health	• Ground level ozone	• Reduction in average annual ground level ozone levels. • Monitoring of Nitrogen Oxides and Volatile Organic Compounds.
Sustain healthy levels of air quality for ecological health	• Lichens	• TBD *See Section 5 of this report for more detail on future work to set targets.*
CLIMATE CHANGE		
Objectives:	**Indicators:**	**Targets:**
Protect, restore and enhance existing natural conditions to mitigate negative climate change impacts	• Precipitation • Surface Run-off • Evapotranspiration • Infiltration • Air temperature	• N/A *Monitoring and climate change observations to be recorded to assist in future assessment of impacts and included in an adaptive management strategy. See "CLOCA Action Plans" section of this report for more detail on future work to set targets".*

4.3 Protecting the Natural Heritage System (NHS) and High Volume Recharge Areas (HVRAs)

Protection, restoration, and enhancement of a watershed's natural heritage and water resources will sustain a healthy and resilient ecological system. In the Oshawa Creek Watershed this is primarily achieved by protecting the NHS and HVRA recharge rates which also supports the attainment of other watershed health targets. For example, the protection, restoration and enhancement of the NHS will allow for the achievement of 30% natural cover and the 75% riparian cover targets (as well as others). Protecting the pre-development recharge rates of HVRAs will allow us to meet our groundwater quantity goals as well as ensure availability of water resources needed to support the NHS. Additionally, protecting the NHS and HVRA recharge rates represents a 15% decrease compared to other scenarios in surface water run-off in the watershed, which translates into significant cost savings for municipalities.

The extensive work completed to date to identify the NHS and HVRAs provides a solid, scientific foundation for advancing the health of the watershed. CLOCA can now strategically prioritize key areas of protection, restoration and enhancement that will provide the most strategic gains in watershed health. This approach of systems planning and protection offers opportunities and advantages well beyond protecting individual features, a practice from the past. We now have two very robust planning tools to help direct, focus and prioritize the protection of the natural resources of the watershed. These tools will serve not only CLOCA but our municipal partners who can use this to achieve environmental sustainability through systems planning. The NHS and HVRA mapping also provides a valuable tool for the development community, offering a clear illustration of the systems that require protection in the watershed. Additionally, residents, community groups, educators and other stakeholders of the watershed have the ability to visually understand how this watershed will be managed to ensure ecological integrity, and how it will be protected for their use and enjoyment into the future.

4.3.1 Managing the NHS

The NHS is a connected system of features and functions that represents attainment of watershed health targets. Protecting the NHS means achieving watershed targets that will:

- ensure adequate natural cover with a target of 30% (to be achieved within the NHS and will consist of an assembly of any of the following communities; forest, wetland, meadow and beach/bluff communities);
- protect, restore and enhance riparian buffers to achieve a target of 75% of stream length having adequate cover, which will be achieved through stream buffer requirements and stewardship initiatives;
- provide habitat for wildlife through the protection, restoration and enhancement of habitat areas and corridors;
- protect water quality for human and ecological purposes through the protection and enhancement of water features and functions;
- maintain the 7% wetland cover that currently exists in the watershed by protecting wetlands that provide specialized habitat for a variety of species and support habitat needs associated with various life cycle stages, and provide flood attenuation;

- protect life and property through the management of flooding, erosion and hazards and enhancement of natural cover for attenuating surface water flows;
- help to sustain ground and surface water quality and quantity, thereby supporting stream contribution, and aquatic habitat and fishery resources; and
- ensure that there is a connected natural system that supports biodiversity and ecological integrity while also contributing to the economic, social and cultural components of communities in this watershed.

Protecting the NHS is a critical means of ensuring that the Oshawa Creek Watershed will function with ecological integrity in the long-term. As such, CLOCA will reference the NHS, (in addition to other Authority generated information) to provide informed comments on development applications within this Watershed.

During watershed planning consultations, a need to provide guidance when dealing with the Natural Heritage System was identified. Specifically, the translation of the landscape-level Natural Heritage System mapping into site-specific confirmation of NHS limits was identified as a particular challenge. The following guidance has been provided to assist stakeholders in completing Environmental Impact Studies (EISs). This guidance is not meant to be an exhaustive checklist of requirements; rather it is a high-level list of considerations for stakeholders undertaking EIS work in this watershed and is based on the policy recommendations provided in Section 6. The following guidance is based on the premise that the analysis, conclusions and recommendations of the EIS satisfies the requirements of the Municipality and the Conservation Authority.

- An EIS will delineate the features and functions within and adjacent to the Natural Heritage System (as illustrated in this Watershed Plan).
- The EIS shall demonstrate no negative impact to a feature and its function.
- As supporting information, mapping will be provided by CLOCA upon request that identifies the subject lands, ELC, and the limits of both the Functional Natural Heritage System (FNHS) and the Targeted Natural Heritage System (TNHS) as described in **Appendix C** (representing the NHS).
- Where an EIS confirms and refines the ELC communities, and they are found to be different from the information provided by CLOCA, and the Authority concludes the findings of the EIS to be satisfactory, the ground-truthed conditions as reported in the EIS will be accepted.
- Where the findings of an EIS recommend a revision to the FNHS, the FNHS limits will be amended to the satisfaction of CLOCA to reflect the EIS delineation of the FNHS. Subsequently, revisions to the TNHS may be considered provided the EIS demonstrates that the change to the FNHS is significant enough to warrant a change to the limits of the TNHS to the satisfaction of CLOCA.
- With the exception of riparian buffers, buffers adjacent to features have not been mapped as part of the Natural Heritage System. In accordance with applicable legislation and policy, buffers are a required element of planning approval. The size of the buffer will equal the greatest extent of applicable legislation, policy, and EIS recommendations.
- Riparian buffers have been included as part of the Natural Heritage System as they are fundamental requirements to achieve connectivity and watershed health targets (i.e. riparian cover, water quality, natural cover). These corridors will be

protected with 30 m buffers on either side of the stream where the thermal regime is confirmed as cool / cold. Fifteen (15) metre buffers will be required where warm water regimes have been confirmed. The size of the buffer will equal the greatest extent of applicable legislation, policy, and EIS recommendations.

- Where ground-truthed features are larger than the NHS mapping indicates, the delineation of the feature will be recorded as an addition to the NHS.
- Where all other opportunities for development have been exhausted and the only remaining option for development is to proceed on lands identified for natural cover regeneration/restoration within the NHS, then the EIS shall identify:
  - additional lands to be added to the NHS, that will exceed the area of lands removed and be contiguous with the NHS on the subject lands and/or;
  - opportunities for connectivity to be enhanced/restored and protected.
- CLOCA will update the NHS map at the 5-year review of the Watershed Plan with the most recent ortho-photography and to reflect any refinements to the NHS limits resulting from site plan approvals based on EIS work. CLOCA will track changes (additions and removals) to the NHS throughout the 5 year implementation period of the Watershed Plan and then use these changes as inputs to the model during the update to accurately reflect ground-truthed areas of the watershed.
- The Landscape Analysis Model (LAM) will be re-run at the five-year update of the Plan to ensure that the changes in the landscape and NHS still allow for watershed health targets to be met. Following the execution of the LAM, CLOCA staff will undertake a review of the NHS and make any necessary manual edits to the system. It is not possible to re-run the model following every site-specific change in the watershed.

It is recognized that the NHS will require updates or confirmation to the limits of the system as development applications are put forward and other alterations to the landscape occur. It is important that the value of the Natural Heritage System as a whole is protected and preserved in order to reach long-term watershed health targets. **Table 6** below provides a sample of the provincial support provided for protecting a Natural Heritage System, from the *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 Second Edition,* as opposed to the historical approach of protecting individual features.

TABLE 5: PROVINCIAL SUPPORT FOR NATURAL HERITAGE SYSTEMS

Planning Concern	Description and Potential Natural Heritage System Benefits
Landscape fragmentation	Loss of landscape connectivity, commonly known as landscape fragmentation, refers to the process by which large, interconnected natural areas are converted to a series of smaller, often isolated natural areas. Fragmentation is a severe threat to the survival of many wildlife species, particularly area-sensitive species and/or those with large territorial home ranges. As habitat is lost or fragmented, residual habitat patches become smaller and more isolated from each other (measured as a reduction in total habitat area, reduction in patch size, increasing number of patches and distance between patches) (Bailey, 2007). The resultant isolation of one wildlife population from another can: • prevent, or make difficult or more dangerous, movement among areas used for feeding, shelter or resting; • disrupt seasonal movements needed to complete life cycles of some wildlife (e.g., amphibians, which overwinter in woodlands but migrate to ponds in the spring to breed); • prevent dispersal of juveniles to other habitats in the area where better habitat conditions may exist; • lead to inbreeding that, over time, may reduce the ability of the population to adapt to changing environments; and • prevent the recolonization of an area after local extinctions. Fragmentation limits the movement of species in several ways: (1) many species avoid or cannot cross boundaries; (2) species' ability and willingness to move between patches and the degree of success species have in doing so are affected by the distance between patches and by the nature and use of the intervening landscape matrix; and (3) species' ability to detect and successfully settle in a different suitable habitat patch is affected by the distance between patches (Baguette and Van Dyck, 2007). These fragmentation outcomes lead to habitat degradation and modification, edge effects, overcrowding and invasion by non-native species. Increased isolation of species, compounded with other stresses, puts them at greater risk of disappearing from a region (Wilderness Society, 2004). Planning for natural heritage systems addresses fragmentation by identifying and protecting core areas, ecological linkages and landscape features that contribute to a system. This facilitates not only the maintenance of ecological function and biodiversity, but also the restoration and improvement of these things through stewardship (e.g., by identifying ecologically appropriate areas for enhancement and/or reconnection).
Biodiversity	The effects of landscape fragmentation have been well documented and are recognized as one of the leading causes of biodiversity decline (Noss et al., 2006). Indicators of biodiversity loss include the numbers of species that are identified as "at risk" (i.e., extirpated, endangered, threatened or of special concern; see section 5) and the pace at which species are added to the at-risk categories. These indicators and other global measures suggest a worsening situation for biodiversity. With appropriate mechanisms for protection of the features and maintenance of the linkage aspects of natural heritage systems, biodiversity values can be protected for the long term.
Climate Change	Stress due to climate change forces organisms (including humans) to adapt or relocate. An increase in the frequency of extreme weather events (e.g., intense storms, drought) may affect habitats, particularly habitats that are localized (i.e., separated from other natural areas). Organisms (particularly those in localized habitats) that cannot adapt or relocate face extirpation or extinction.

	Protecting natural heritage systems – encompassing areas within which species can successfully carry out their life processes and potentially adapt, facilitating their movement to more suitable habitat, or enabling a destroyed habitat/population to be replenished – will improve species' ability to adjust to climate change.
Ecosystem health and healthy communities	Ecosystem health and healthy communities are inextricably linked, as is emphasized in Ontario's Biodiversity Strategy. Ecosystem health can be characterized as a measure of the level of distress in the ecosystem, its resilience and adaptability, the ability to sustain itself, the degree to which adjacent ecosystems are affected and the extent to which the ecosystem supports healthy human communities. To support the resource demands (e.g., food, water and shelter) of local communities, planning authorities need to maintain the ecological health of the natural environment to ensure that it can withstand the stresses that present and future human populations place on it. By protecting a natural heritage system that includes surface- and groundwater features (see section 3.2.1), planning authorities promote the resiliency of natural features to function for the long term and maintain overall ecosystem and human health. Healthy, resilient and diverse natural environments are important land use components that influence human activity, facilitate health and mental well-being and promote social interaction and inclusion (Ministry of Municipal Affairs and Housing and Ontario Professional Planners Institute, 2009).
Ecosystem Services	Ecosystem services are the benefits that people gain from ecological systems. These services are the basis for human well-being and the economic value of our landscape and economy (Troy and Bagstad, 2009). Natural heritage systems deliver essential ecosystem services such as clean water and air, productive soils and flood attenuation. Degradation of Ontario's ecosystem services can lead to unacceptable risks (e.g., soil erosion and flooding) to human well-being. Maintaining a natural heritage system is a precautionary approach that reduces risk and is more cost-effective than addressing problems after development has occurred and the ecosystem services are lost. At a basic level, natural heritage systems provide ecosystem services required for healthy, vibrant communities that include: • photosynthesis: capturing the sun's energy and converting it to biomass; • transpiration: cleaning the air and releasing clean water vapour into the atmosphere; to make rain and drive the hydrological cycle; and • nitrogen fixation: capturing nitrogen for plant growth; and decomposition: returning nutrients to the soil.
Planning process efficiencies	Natural heritage system planning can assist with the identification of the most important natural heritage features within a planning area (e.g., key features for achieving representation within the study area, key features that contribute to connectivity). Taking a comprehensive landscape-level approach allows planning authorities to identify and protect a community's environmental priorities and inform subsequent site-level planning, which can focus subsequent studies on the areas most likely to be sensitive to impacts. This comprehensive approach can also assist a planning authority to proactively identify significant natural heritage features and areas as part of being consistent with PPS policies 2.1.3, 2.1.4, 2.1.5 and 2.1.6.

Source: Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 Second Edition

4.3.2 MANAGING HVRAS

Using the best information available at the time of the Water Budget report, the following fundamental conclusions from the Water Budget work lead to the recommendation of protecting the pre-development recharge rate of HVRAs as a fundamental mechanism for ensuring watershed health:

- Increased runoff appears to be the most significant consequence of development for water resources (decreased stability and health of stream corridors);
- Unless water is somehow introduced into the aquifers, groundwater will be reduced from current levels due to development;
- The recharge function of HVRAs should be maintained everywhere to allow water to infiltrate from the surface into the ground to support groundwater recharge; and
- Preservation of the NHS, maintenance of the recharge function of HVRAs, and stormwater management practices offer the most beneficial solutions for mitigating runoff impacts as these measures benefit water recharge, enhance water quality, improve aquatic habitat, and manage sediment supply and channel form.

The Water Budget modeling identified a correlation between groundwater drawdowns and the recharge function of HVRAs. As groundwater drawdowns extended across multiple watersheds, it is difficult to determine the interconnectedness or relationship between a specific HVRA and the drawdown of the aquifer. As such, it is recommended that the recharge rate of all HVRAs be maintained. It is important to note that development in HVRAs is not prohibited, rather the proponent must ensure that pre-

CONTINUOUS IMPROVEMENT OF HVRA MAPPING

The Water Budget work was conducted as per the requirements of the Oak Ridges Moraine Conservation Plan (ORMCP) to document the amount of water coming into, leaving, and being stored in watersheds originating in the Oak Ridges Moraine. The protocol for establishing HVRAs was to use a threshold of recharge rates that are greater than 15% of the watershed average.

At approximately the same time as this work was being done, CLOCA was playing a major role in the characterization of water flows as directed by the province of Ontario as part of Source Water Protection Act work for drinking water. The original protocol for calculating areas of significant recharge was to use a watershed threshold. As a continuous improvement to the technical methodology to better reflect the inter-connectedness of groundwater flows, a recommendation to use a threshold of 15% above the jurisdictional average was ultimately made.

CLOCA has conducted a comparison of the impacts of both of these methodologies and determined that the more reflective threshold is the jurisdictional CLOCA average. Within CLOCA, there is a large amount of water infiltration and flow in the north-east quadrants of the jurisdiction that using a watershed threshold was masking the vast infiltration occurring in these areas and across the Lake Iroquois Beach in the eastern half of the jurisdiction. CLOCA has conducted a review of the Scenario Analysis results used in this Watershed Plan development process and determined that using the jurisdictional threshold does not change the basic trends used to assess the impacts of the watershed management scenarios and therefore does not change the original Water Budget work conclusions.

This decision has resulted in updated HVRA mapping being used as part of CLOCA's Watershed Planning and Plan Review processes to accurately reflect water flows and better inform decisions for the biological and ecological protection of the resources within all of CLOCA's watersheds.

development recharge rates can be maintained post development. Implementing measures to maintain pre-development recharge rates, such as the use of Low Impact Development (LIDs) designs can be considered as a viable option. It is recognized that implementing measures that achieve groundwater recharge, and protecting the NHS, are the best approaches to maintaining CLOCA's groundwater resources and ecosystems.

A Hydrogeological Impact Assessment (HIA) that will characterize the existing water balance and delineate the boundaries of the HVRAs, shall be prepared to the satisfaction of the Municipality and Conservation Authority. Development within HVRAs may be permitted if this study can demonstrate that there will be no loss to the recharge function as a result of the development.

The following guidance is provided to assist stakeholders in completing an HIA. This guidance is not meant to be an exhaustive checklist of requirements; rather it is a high-level list of guiding considerations for stakeholders undertaking hydrogeological work in this watershed and is based on the policy recommendations provided in Section 6.

- HIAs will confirm the extent of an HVRA where the undertaking is proposed within or adjacent to currently mapped HVRAs (as illustrated in this Watershed Plan);
- Mapping will be provided by CLOCA upon request that identifies the subject lands and the associated HVRA;
- All proposed work shall demonstrate no loss to the pre-development recharge rate of the HVRA through development design, mitigation methods such as LIDs and other appropriate techniques and technologies;
- Amendment of the HVRA limits shall be considered upon completion of the Hydrogeological Impact Assessment; and
- CLOCA will update the HVRA map at the 5-year review of the Watershed Plan based on HVRA mapping confirmations obtained from completed Hydrogeological Impact Assessment and other appropriate hydrogeological work undertaken in the watershed.

Surface Water **© CLOCA**

4.4 The Watershed Management Plan

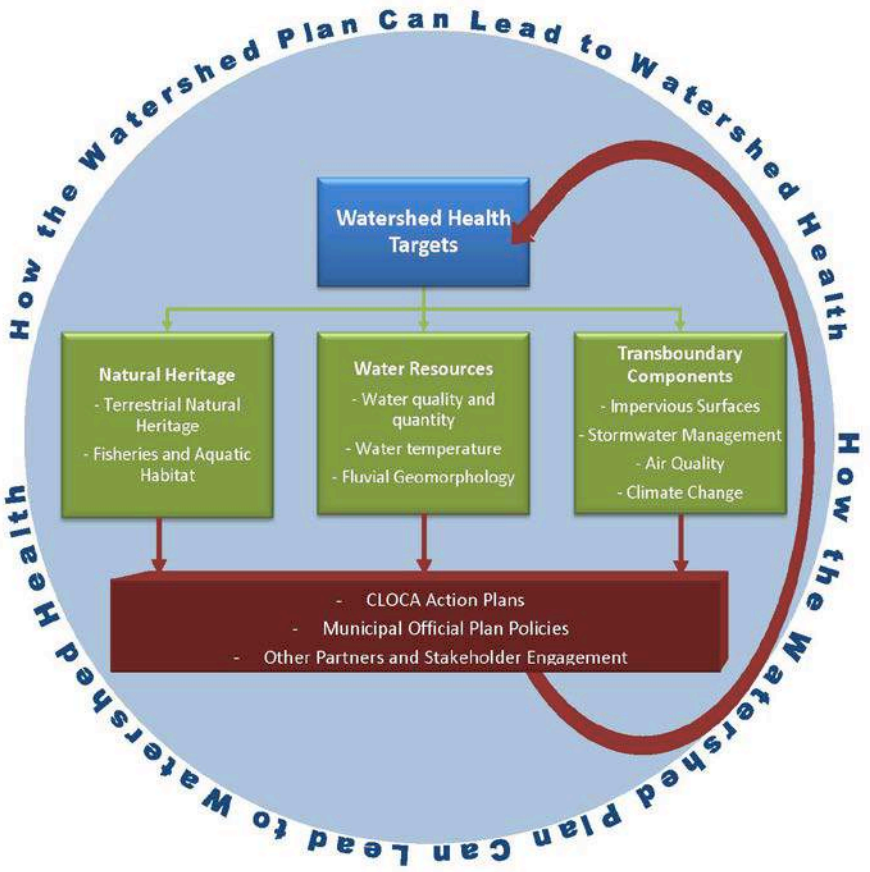
Figure 13 below illustrates the Watershed Management Plan that includes:

- the Natural Heritage System (NHS),
- the High Volume Recharge Areas (HVRAs),
- water bodies and watercourses,
- regional wildlife corridors on the Oak Ridges Moraine, Lake Iroquois Beach and the Lake Ontario Shoreline; and
- the 1 km buffer of the Lake Ontario shoreline.

The Watershed Management Plan visually represents the key ecological systems in the Oshawa Creek Watershed that will allow the watershed health targets to be met in the future. The CLOCA Action Plans outlined in Section 5, the recommended municipal policies provided in Section 6, and the recommendations in Section 7 for Other Stakeholder involvement were developed to ensure that the watershed targets can be realized within the challenging context of possible future growth and development pressures. Section 8 describes "Unique Management Areas" that require specific / additional management.

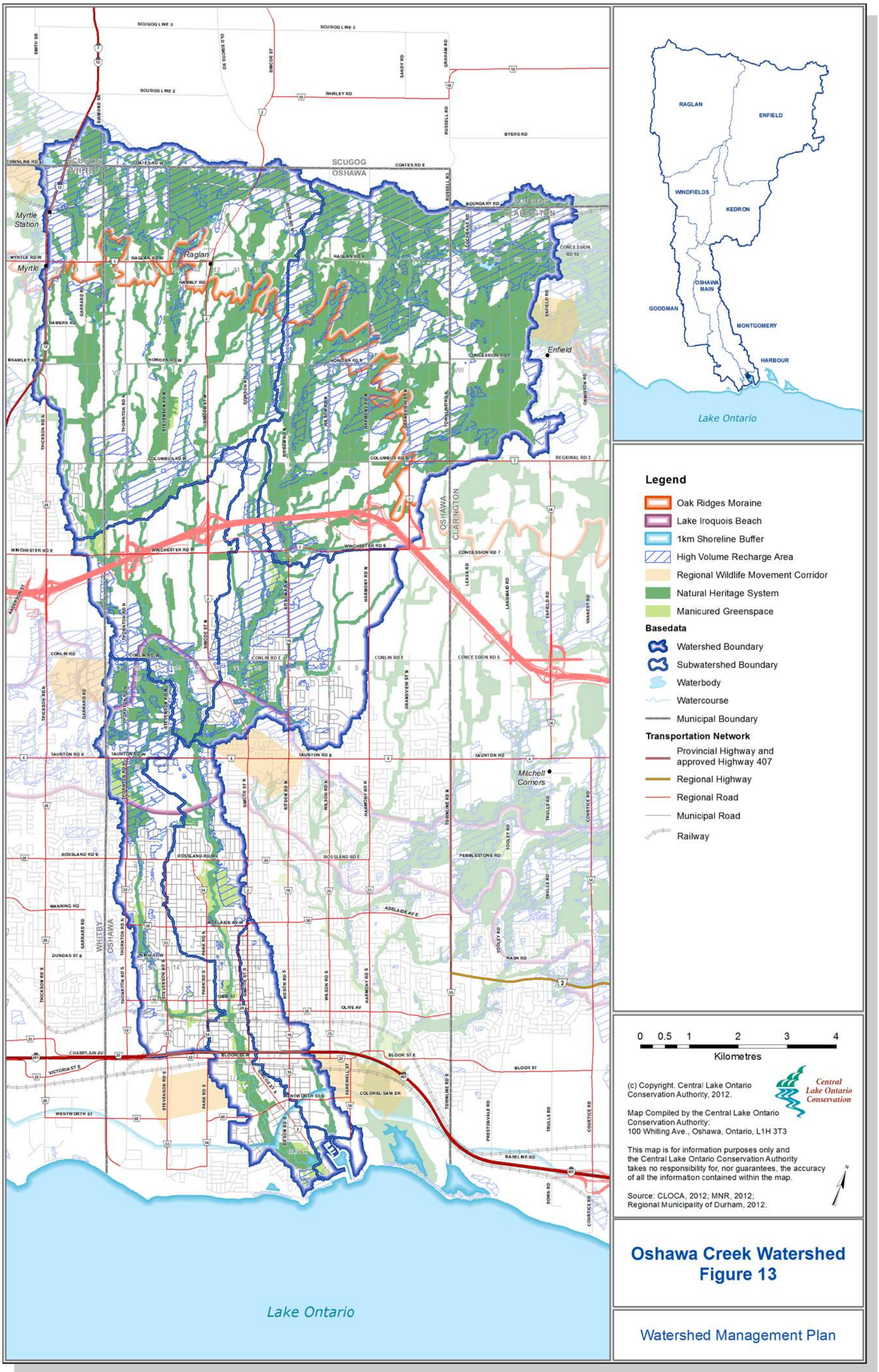
Exhibit 5 illustrates the process through which the Watershed Plan will be implemented using the various tools outlined in the following sections.

EXHIBIT 5: WATERSHED PLAN IMPLEMENTATION FOR WATERSHED HEALTH



Central Lake Ontario Conservation

FIGURE 13: THE WATERSHED MANAGEMENT PLAN



5 WATERSHED IMPLEMENTATION PLAN – CLOCA RESPONSIBILITIES

Seven strategic priorities have been identified to direct and focus work in this watershed over the next five years. These priorities will be reviewed over the next few years, updated to reflect any progress, and adapted to account for changes in conditions. **Appendix F** provides a review of the current programs and services offered by CLOCA through which we manage the resources in our jurisdiction.

1. **Protect, Enhance and Restore the Oshawa Creek Watershed To Be A Resilient Ecosystem with Ecological Integrity**

At the core of all of the work done to date, and the recommendations contained in this Plan, is the guiding vision of managing the Oshawa Creek watershed so it is resilient and continues to have ecological integrity. All efforts are focused on the multitude of tasks and dedication of resources required by CLOCA, municipalities and stakeholders to achieve this vision. One way CLOCA will manage the resources of the watershed will be through the protection, restoration and enhancement of the Natural Heritage System by ensuring that the significance, value and system as a whole is maintained with no significant losses to features or functions over time. The NHS will guide stewardship, education and engagement activities and priorities to further advance, focus and prioritize on-the-ground implementation. In that all the ecological components of the watershed are either directly or indirectly linked to the NHS, protecting and restoring the NHS will have positive impacts on both surface and groundwater resources, and will be beneficial in reducing and mitigating flood and erosion hazards.

2. **Implementation, Acceptance and Support for the Watershed Plan**

The success of this Watershed Plan is dependent upon the effectiveness of its implementation. To implement the Plan, it must first be accepted by municipalities with full support provided so that the recommendations of the Plan can be put into action through planning policy. Secondary to this priority, is the broader acceptance and understanding of the Plan by the development community, residents and other stakeholders. The structure of this Plan provides a focus on the end-user. The Watershed Plan contains: CLOCA Action Plans that detail how the Conservation Authority will be fulfilling the watershed goals and targets; municipal planning policies developed for ease of incorporation into Official Plan documents; and, a section dedicated to how other stakeholders can take action to achieve a healthy Oshawa Creek Watershed. The intention is that all stakeholders in the watershed will be able to easily access, understand and act upon the specific tasks to help us get closer to the long-term protection of our natural assets in the Oshawa Creek Watershed.

3. **Long-Term and Sustainable Funding**

Long-term protection requires long-term funding in order to sustain the level of work and commitment required to protect the natural systems that sustain our way of life in the Oshawa Creek watershed. Research is beginning to address ecological goods and services by putting dollar values on natural features and functions. For example, research conducted in the Credit River Watershed identified that the forests in that watershed provide a climate regulation service with an estimated value of $11.4 million annually, ecological services provided by their wetlands have an estimated

worth of $187 million per year, and natural features in north and south Mississauga provide an increase in property values of $255,446,966. (CVCA, Pembina Institute, 2009). There is a necessary shift in recognizing that the protection and restoration of natural capital is an economic investment that has proven to have good returns on that investment.

4. Consistent and Long-Term Monitoring

The landscape of the Oshawa Creek watershed is rapidly changing as our population continues to grow. In order to fully understand the impacts of these changes, consistent and long-term monitoring of our groundwater, streams, wetlands, natural cover (including forests) and wildlife is required. Future changes create cumulative impacts that require monitoring on a watershed scale to effectively track and assess watershed health trends, as well as to protect property and ensure the safety of its residents. Consistent and long-term monitoring is the only way to track the effectiveness of the Watershed Plan for affecting change.

5. Engaging Stakeholders through Stewardship & Education

Educating, engaging and inspiring action in residents and other stakeholders is critical to affect positive change in the watershed. All stakeholders, from grade-school students to seniors to property owners, have an essential role to play in protecting and preserving natural features and their functions through their everyday activities, volunteer efforts and community undertakings. Capitalizing on the knowledge and experience of our residents to enhance ecologically sound land use, water conservation and education efforts will provide the most effective means of ensuring a healthy watershed for generations to come.

6. Filling Data Gaps

Even though there is an immense amount of data available to assess components of watershed health, critical data gaps need to be filled in order to best arm decision-makers in the future for protecting the watershed as a whole. A key means of filling these gaps can be found in increasing coordination efforts between government agencies, academic institutions, municipalities, the development community and individual residents. Resources need to be dedicated to establishing data sharing networks and gathering efficiencies between all contributing parties. Technological advances in modeling, as well as increased standardized reporting of specific watershed components, are excellent opportunities for advancing our knowledge and reporting capabilities on the health of the watershed.

Purple Woods Conservation Area **© CLOCA**

7. **Public Land Acquisition**

Land securement is a tangible way of protecting valuable natural capital. It has been noted that even where costs of land securement are high, there are still positive economic returns in protecting the land through purchase (Marbek, 2010). Efforts to expand on the existing momentum for acquiring sensitive areas for protection in perpetuity need to continue as CLOCA has a very good foundation of success to build on. Acquiring land also offers the opportunity to enhance the environmental, social and cultural aspects of a community through initiatives that provide locally accessible, passive, recreational opportunities and environmental education and awareness programs.

5.1 Historical Recommendations

Much work and study has been undertaken in the Oshawa Creek Watershed. In 1995 the City of Oshawa released the Oshawa Creek Watershed Plan, which provided a number of recommendations for management, restoration and remediation within the watershed. Following this report, CLOCA released the 2002 Oshawa Creek Watershed Management Plan, which provided additional / complimentary management recommendations. These past recommendations provide interesting and insightful context regarding the evolution and consistency of watershed recommendations and set the foundation for measuring management success in this watershed. **Table 5** below provides a summary of these "historical" recommendations, a description of the actions that have been taken as a result of the recommendation and how / if the recommendation is being carried forward in this Watershed Plan.

TABLE 6: HISTORICAL WATERSHED RECOMMENDATIONS

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
GENERAL		
• Regulator controls will regulate land use in the flood plain to control development and redevelopment to minimize flood damages.	• CLOCA implements Ontario Regulation 42/06 Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses, to regulate development and alteration in flood and hazard areas. • As part of CLOCA's mandate, the effective forecasting and reporting of flooding conditions and "flood damage centres" is undertaken across the CLOCA watershed.	• CLOCA undertakes regular updating of hazard and regulation mapping, reflecting changing watershed conditions. • CLOCA has an agreement with the Ministry of Natural Resources to administer Section 3 of the Provincial Policy Statement for dealing with natural hazards. • An effort is currently underway (described in Action Plan #23) to improve accessibility of flood risk information for our municipal partners and emergency service providers. The work is coordinated through the Durham Region Flood Contingency Plan, and includes: ➢ Updating of floodplain mapping and provision of digital mapping products; ➢ Mapping of flood damage centres with associated database; ➢ Implementation of an effective on-line communication tool.
• Precipitation and Flow Instrumentation is recommended to more accurately calibrate the potential flood hazard and possibly assist to redefine and reduce the scope of the Regulatory Flood Plain. This should be a first priority for early implementation.	• In 2001, CLOCA completed a Water Monitoring Network Analysis that resulted in additional resources throughout the jurisdiction: six new full stream gauge stations; four new precipitation/meteorological stations; the addition of one and an adjustment to another snow course; and the creation of ten groundwater monitoring sites affiliated with the Provincial Groundwater Monitoring Network.	• See above comments. • CLOCA implements the "Two Zone Flood Plain Management Policy for a Reach of the Goodman Creek" and is in the process of getting approval for a "Two-Zone Management Policy for a Reach of the Oshawa and Goodman Creeks" immediately upstream of the CP Railway embankment considered to be a flood damage centre. • Continue operation of enhanced climate and stream flow gauging, and investigate opportunities for hydrologic model calibration.
• The Conservation Authority should continue to maintain the Fill and Construction Regulations to keep new development out of the Regulatory Flood Plain.	• CLOCA implements Ontario Regulation 42/06 Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses, being the legislative directive that CLOCA regulates land use in flood and hazard areas.	• See above comments.
• Consideration of stringent environmental safeguards are recommended at Highway 407 crossings of the East and West Branches of Oshawa Creek.	• CLOCA continues to work closely with the Ontario Ministry of Transportation and their consultant team during the detailed design process to recommend and encourage adequate environmental safeguards and monitoring for the Highway 407 East route through CLOCA's entire jurisdiction.	• Action Plan #22 will develop a post-construction monitoring plan to measure the effectiveness of the mitigation measures and ecological impacts of the project on the health of the watershed. • Recommended Municipal Official Plan Policy K7 has been developed to limit impacts from new transportation or infrastructure projects.
• The City of Oshawa practice of acquiring valley lands as a condition of development approval should continue.	• This practice has been continually encouraged.	• CLOCA has completed a Land Securement Strategy (2012) (Action Plan #11) that recognizes the importance of continued municipal securement of greenspace, including valley lands.
• Schedule "D" [sic: of the Oshawa OP] entitled Environmental Management should be amended to reflect the new information developed in this study.	• In 2000/2001 Oshawa approved an amendment to the Official Plan to include recharge areas on Official Plan Schedules. Also, environmental features situated within the ORM were identified through the ORM conformity amendment undertaken by the City of Oshawa.	• Section 6 provides Municipalities with policies which support municipal implementation of the Watershed Plan.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• Site plans / development plans that implement zoning amendments should be reviewed to ensure that the proposed development / redevelopment complies with the Subwatershed Plan. Where there is no Subwatershed Plan the applicant should prepare a Stormwater Management Plan as part of the Development Plan Submission.	• Stormwater Management Plans, Master Environmental Servicing Plans, Environmental Impact Studies, and Subwatershed Plans are still the industry standard for the appropriate level of study for development applications. CLOCA continues to strive for clarity and efficient communication with partners and applicants during the development application / approval process to ensure that applications are implementing Watershed Plans.	• Action Plan #4: CLOCA Regulation and Plan Review Policies and Procedures Manual is currently underway to: ➢ Outline the Authority's roles and responsibilities in relation to Ontario Regulation 42/06 and Plan Review Services; ➢ Define CLOCA's procedures for administering Ontario Regulation 42/06 and Plan Review Services; ➢ Provide clarity and policy direction on how CLOCA implements Ontario Regulation 42/06 and Plan Review Services; ➢ Communicate these policies and procedures to all clients; and, ➢ Provide transparency to the public regarding Authority process and service delivery standards.
• That the City of Oshawa be encouraged to action the recommendations of the Oshawa Creek Watershed Study (1995).	• CLOCA continues to encourage the City of Oshawa and all our municipal partners to "action" the recommendations of our Watershed Plans to further our mutually beneficial goals of healthy social, economic and environmental components of our watersheds.	• Section 6 of this Watershed Plan has been specifically developed as a tool to support our municipal partners in the implementation of the Watershed Plan recommendations.
• ***The City of Oshawa***: All watercourses and their riparian areas be shown in the Official Plan schedules and identified as "Hazard Lands" or "Environmentally Sensitive Areas" or included in the definition of watercourses contained in the Environmental Management policy 5.1.2 (d).	• Schedule 'D' of the City of Oshawa Official Plan does include watercourses and their riparian areas as well as shows Groundwater Recharge Areas, Hazard Lands, Environmentally Sensitive Areas, and High Potential Mineral Aggregate areas. • Environmental Management Policy 5.1.2(d) states that "Watercourses shall mean natural or man-made channels which accommodate runoff at any time of the year, and which are located within Hazard Lands.	• Policies contained within Section 6 (F4 & F6) support the identification of ground and surface water features in Municipal Official Plans. • Policies have been developed encouraging municipalities to incorporate the Natural Heritage data and Natural Heritage System developed through the watershed planning process into municipal Official Plans.
• That all Stewardship agencies acting within the watershed be encouraged to continue to support initiatives promoting landowner awareness in order to assist in protecting the watershed's existing valued features.	• There is on-going support for this recommendation.	• Action Plan #3: Community Engagement Plan will specifically address means and methods for increasing and promoting landowner awareness to assist in enhancing watershed health.
• That identified components of the natural heritage system of the Oshawa Creek watershed be reflected as a priority in land acquisition strategies implemented by public bodies, either alone or in partnership.	• There is on-going support for this recommendation.	• In 2012, the CLOCA Board of Director's approved CLOCA's Land Securement Strategy (Action Plan #11) that used the updated Natural Heritage System as a foundation for making recommendations.
• That valleyland/hazard land and tableland dedications to the local municipalities continue to be encouraged through the land use planning process to protect existing valued features and assist in developing further linkages.	• There is on-going support for this recommendation.	• General support will continue. • The completed Land Securement Strategy (2012) recognizes the importance of continued municipal securement of greenspaces, including valley lands.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• That CLOCA, and partners including individuals, schools, community groups, public lands managers, municipalities, private land stewardship agencies and conservation agencies, undertake Enhancement/Restoration projects in the watershed including: ***Montgomery Creek Subwatershed*** • retrofitting of developed areas with stormwater management facilities • further investigations of the point and non-point sources of elevated trace and major elements in the creek • develop a monitoring program of stormwater sewers in the watershed • removal of non-native and invasive plant species ***Oshawa Main Subwatershed*** • retrofitting of developed areas with stormwater management facilities • stream cleanup projects to remove garbage within and adjacent to the creek • riparian zone restoration • CPR Bridge redesign • restoration of the channel and riparian areas to more naturally meandering (and vegetated) conditions in areas north of Highway 401 • reduce amount and distribution of invasive plants ***Goodman Subwatershed*** • restore the channel and riparian area to reflect natural conditions (priority Rossland Road to Gibb Street) • natural channel design for the confluence of the Goodman and Oshawa Creeks • goldfish removed from Goodman pond and a program for prevention developed • retrofitting of developed areas with stormwater management facilities • stream cleanups to remove garbage within and adjacent to the creek riparian zone restoration • expansion of core habitats in the subwatershed. • corridor connections improved through planting and habitat protection. • creation of tableland forest in the eastern portion of this subwatershed. • corridor connections are needed to join the west branch of the Oshawa Creek with the Goodman Creek headwaters and linkages are required between the valley systems and tableland woodlots. • wetland creation or reclamation ***Kedron Subwatershed*** • riparian restoration • creation of habitat through plantings on upland areas currently lacking forest	• Work on many of these recommendations is on-going. Where specific focus is still needed, the historical recommendations have been included in Watershed Action Plans.	• The following Action Plan (APs) include historical recommendations for future work: AP #1: Natural Heritage System Restoration Plan AP#2: Riparian Corridors Restoration Plan AP#5: Wildlife Corridor Protection and Enhancement Plan AP#8: CLOCA Water Monitoring Program Review AP#9: CLOCA Urban Land Use Low Impact Development (LID) Retrofits Plan AP#10: Stewardship and Education Priorities and Plan AP#16: CLOCA Implementation of the Invasive Species Management Strategy AP#17: Oshawa Creek Watershed In-Stream Barriers Action Plan AP#21: CLOCA Stormwater Management Performance Monitoring and Maintenance Plan AP#23: Flood Damage Centres Upgrading

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
cover • redesigning the Camp Samac dam to allow fish passage • removal of old tires within the channel and along the banks of the creek west of Simcoe Street • wetland reclamation ***Raglan Subwatershed*** • riparian restoration • expansion of both core areas through restoration of adjacent wetlands and agricultural lands • wetland reclamation • redesign of structures to allow fish passage ***Enfield Subwatershed*** • revegetation of creek valley corridors • create connections to upland habitats • restore connections with adjacent watersheds • riparian restoration • redesign of structures to allow fish passage		
• That CLOCA continue to encourage the adoption of Best Management Practices by everyone in the watershed from individual landowners to corporate citizens to government agencies.	• There is on-going support for this recommendation.	• There is on-going support for this recommendation.
• That CLOCA design and implement a program to monitor key indicators within the Oshawa Creek watershed.	• There is on-going support for this recommendation.	• Section 9 of the 2013 Watershed Plan provides a monitoring plan focused on the implementation recommendations for each stakeholder as well as provides a key targets monitoring table to establish measurable progress between Watershed Plan updates.
• That CLOCA undertake a review of the Oshawa Creek Watershed Management Plan within a 10-year timeframe.	• In 2011, CLOCA updated the Existing Conditions component of the Watershed Plan as an Addendum to the 2002 Plan.	• The 2013 Oshawa Creek Watershed Plan uses the 2011 Addendum updated information as well as updates the management portions of the Watershed Plan.
• That CLOCA seek the endorsement of the Oshawa Creek Watershed Management Plan from the Region of Durham, the City of Oshawa, the Municipality of Clarington, the Town of Whitby and the Township of Scugog.	• The 2002 Oshawa Creek Watershed Management Plan was received by all watershed municipalities.	• Following the approval of the 2013 Watershed Plan by CLOCA's Board of Directors, each municipality will be contacted to seek formal endorsement / support for the Watershed Plan.
WATER RESOURCES		
• Watercourse buffer zones are recommended adjacent to watercourses for all new developments. Reforestation is encouraged throughout the watershed, particularly on private lands but also on public lands now void of any natural riparian zone vegetation.	• Through development approvals, appropriate riparian buffers are provided	• Policy F6 in Section 6 recommends riparian buffers between development and on both sides of the watercourse. • Policy V11 is Section 6 encourages the incorporation of natural cover on publicly owned lands.
• Non-Structural Slope and Bank Protection is recommended wherever possible to retain a natural stabilized slope for appearance, aesthetics and habitat benefits.	• There is on-going support for this recommendation.	• Recommended Official Plan Policy K4 deals with stable stream channels and habitat protection.
• Environmental Setbacks should be implemented to ensure preservation of	• Through development approvals, appropriate buffers are provided.	• Recommended Official Plan Policies F6, K8 and K9 deal with protecting

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
sensitive ecological features including wetlands and woodlots.		ecologically sensitive features, including wetlands and woodlots.
• Headwaters Protection is vital for the maintenance of base flow and associated water quality, fisheries, ecological and natural heritage benefits.	• There is on-going support for this recommendation.	• Recommended Official Plan Policies F3, F4, F5, F6 and K9 deal with protecting surface water.
• Channel Debris Removal is proposed as a routine program in the Goodman Creek and the Oshawa Main Branch, as indicated in the public questionnaire as the most preferred water management measure.	• Debris removal is undertaken as reported by partners, municipal staff oror the public.	• Debris removal is undertaken as reported by partners, municipal staff or the public.
• Erosion Stabilization is recommended to reduce bank erosion and sediment loading in central and upstream reaches of Oshawa Creek. Erosion works should consider biotechnical methods which utilize natural materials.	• The City of Oshawa continues to work on stream stabilization projects with an emphasis on bioengineering and natural channel design where appropriate.	• Policy V23 in Section 6 supports adoption and implementation of municipal watercourse improvement programs.
• Local Infiltration of back yard and park surface drainage is recommended particularly in the central watershed where the soils are favourable but the water table is vulnerable to contamination.	• There is on-going support for this recommendation.	• High Volume Recharge Areas (HVRAs) have been identified and mapped in the 2013 Watershed Plan as a tool for municipal implementation and the development plan review function of CLOCA. • Policy K15 in Section 6 supports the use of low impact management of stormwater.
• Sub-Surface Water Cooling techniques should be promoted for new development in the central watershed to ensure that cold water fisheries receiving streams are not negatively affected by heated urban stormwater.	• CLOCA and the City have continued to work collaboratively to reduce /limit impact on surface water quality from development.	• The Watershed Plan supports the use of alternative stormwater management technology, including LIDs, in an effort to maintain/improve upon water quality and quantity (Policy K15 & V18 in Section 6).
• Primary base flow sources in the headwater Oak Ridges Moraine and secondary base flows from the Lake Iroquois sand plain should be a high priority for environmental protection.	• The City, through its ORM conformity amendment, recognizes the importance of the ORM groundwater resources. • The Region of Durham OP also recognizes the significance of the groundwater resources associated with the Lake Iroquois Beach. • CLOCA continues to support the protection, maintenance and enhancement of these features.	• High Volume Recharge Areas (HVRAs) have been identified and mapped in the 2013 Watershed Plan as a tool for municipal implementation and the development plan review function of CLOCA. • Policy F7 in Section 6 supports the preservation of pre-development recharge rates of HVRAs.
• Local groundwater recharge areas must be protected against groundwater contamination.	• Efforts to protect groundwater quality and local groundwater recharge areas have been supported by recent legislation such as the ORMCP and Clean Water Act.	• High Volume Recharge Areas (HVRAs) have been identified and mapped in the 2013 Watershed Plan as a tool for municipal implementation and the development plan review function of CLOCA. • Recommended Official Plan Policy F7 supports the protection of recharge function.
• The City should continue its program for long-term reduction of heavy metal loadings to storm sewer systems.	• The City of Oshawa and CLOCA support the reduction of heavy metal loadings in storm sewer systems through the implementation of appropriate Stormwater management guidelines and design standards.	• The City of Oshawa and CLOCA support the reduction of heavy metal loadings in storm sewer systems through the implementation of appropriate Stormwater management guidelines and design standards.
• Continuation of the 1991/1992 branch monitoring of water quality is recommended.	• Continuous support has been provided for water quality monitoring.	• CLOCA continues to monitor water quality and will undertake a Water Monitoring Program Review process as Action Plan #8.
• Monitoring by City forces should be continued to establish whether sediment and debris is entering into the Main Branch of Oshawa Creek from the primary City snow dump site at Adelaide Avenue.	• City-led mitigation has occurred.	• CLOCA will continue to support City efforts to mitigate impacts from salt use and storage.
• That CLOCA continue to build upon the preliminary water budget provided in this watershed management plan to meet the recommended requirements of the Oak Ridges Moraine Conservation Plan.	• In preparation of the 2013 Oshawa Creek Watershed Plan a water budget, consistent with the ORMCP requirements, was completed and is a fundamental component of this plan.	• Recommendations, analysis and data from the "Water Budget Modeling for the Oak Ridges Moraine Conservation Plan in the Central Lake Ontario Conservation Authority Area, March 2011" have been incorporated in this 2013 Watershed Plan, including supporting protection of HVRA function.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• That the Region of Durham, City of Oshawa, Municipality of Clarington, Town of Whitby and Township of Scugog examine means to ensure that all new development within areas delineated as Iroquois Beach, Outwash Plain, or Oak Ridges Moraine undertake geotechnical studies to identify the role of the site in the hydrological cycle. As deemed necessary, a water balance may be required from -post development levels to pre- development conditions. Infiltration of Stormwater may be required to accomplish this condition.	• Municipalities recognize the importance of groundwater resources and have adopted policies to study, delineate and protect groundwater resources.	• This Watershed Plan reinforces the importance of protecting water resources as is demonstrated in Recommended Official Plan Policies F3, F4, F7 F14, K1 & K2.
• That the Region of Durham, City of Oshawa, Municipality of Clarington, Town of Whitby and Township of Scugog be requested to consider the implications of exceeding the threshold of 15% imperviousness of the land base in the Oshawa Creek watershed through long term planning exercises such as Official Plan reviews. (Studies have shown that this is the threshold that should not be exceeded in urban watersheds in order to maintain water quality and quantity and leave biodiversity unimpaired.) • In addition, any study undertaken to amend the designations should require an adequate level of protection for the following as currently provided by this area: o wetland features and functions; o core habitat (interior habitat); o groundwater recharge/discharge functions; o thermal water quality; o wildlife linkages west to Pringle Creek Woods; and o wildlife linkages to habitat in WS.	• Environmental requirements for limiting imperviousness are now supported by legislation (ORMCP) specifying a maximum of 10% watershed imperviousness. Municipalities, through their ORMCP conformity amendments, have adopted this maximum on the ORM. • NH features and functions are currently investigated, protected and buffered as a requirement of development proposals.	• Policy F2 in Section 6 sets the maximum imperviousness for lands within the ORM and Greenbelt at 10%. • Recommended Official Plan policies contained in Section 6 support protection, enhancement and restoration of the Natural Heritage System and Highly Vulnerable Recharge Areas (F3, F5, F6, F7, F10, F12, F14, K1, K2, K3, V1). • Connectivity with Pringle Creek has been identified for protection / rehabilitation.
• That CLOCA continue to participate in the review of the transportation crossings of the Oshawa Creek specifically to recommend design considerations that will address: • protection of the existing width of corridor in order to maintain the corridor functions of the 2 main valleys (wildlife crossings); • provision of fish passage at all watercourse crossings, and no net loss of fish habitat; • maintenance of water quality and thermal stability in receiving streams; • maintenance of groundwater recharge function within the Outwash Plain; • maintenance of flooding conditions and surface runoff conveyance; • maintenance of natural channel processes (erosion, deposition and flows); and • use of only native species for planting purposes	• CLOCA continues to participate, comment upon, and guide development including transportation crossings within the Watershed, and supports designs and plans which protect corridor functions (terrestrial and aquatic), water quality, hydraulic regime, and appropriate naturalization and restoration work.	• Recommended Official Plan policies contained in Section 6 support environmentally responsible transportation crossings (K1, V4 & V20).
NATURAL HERITAGE RESOURCES		
• Land Use Controls, particularly in the central watershed, will ensure that new development will have minimal impacts on sensitive watershed resources.	• As a component of a proposed development, natural heritage features and functions are studied and protected /maintained/ enhanced where appropriate.	• Recommendations of this Watershed Plan support the identification and protection of the NHS, non-connected features and HVRAs.
• Environmental Setbacks should be implemented to ensure preservation of sensitive ecological features including wetlands and woodlots.	• Standard buffers are provided adjacent to natural heritage features and functions. Legislation such as the ORMCP and Greenbelt identifies minimum required buffers.	• Recommended Official Plan policies K8 &K9 require buffers separating development from woodlands and wetlands.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• Headwaters Protection is vital for the maintenance of base flow and associated water quality, fisheries, ecological and natural heritage benefits.	• Identification of headwater drainage features and their function is an important component in the environmental scan undertaken. Use of the TRCA document "Evaluation, classification and Management of Headwater Drainage Features: Interim Guidelines, March 2009" has been a valuable protocol in identifying and describing the function of headwater drainage features.	• Recommended Official Plan policy F6 supports the protection of headwater drainage features where possible.
• Significant Forests and Wetlands Preservation is recommended to maintain suitable wildlife habitat corridors along all branches of the watershed, particularly in the central and headwater zones.	• The protection of forests, wetlands, and corridors has been accomplished through review of development applications and continues to be an important part of CLOCA plan review responsibilities.	• Included in the Oshawa Creek NHS are core habitat areas and appropriately sized corridors to support wildlife movement. Protection of the NHS, HVRAs and other environmental features are a fundamental component of this Watershed Plan.
• A program to maintain and enhance Oshawa Creek fisheries is recommended to include: o BMP water quality control facilities for new development; o Control of upstream nutrient enrichment; o Maintenance/enhancement of streambank cover; o Maintenance of fish passage opportunity, and; o Educational and interpretive facilities.	• CLOCA actively protects natural heritage features and functions including aquatic resources. The CLOCA Fisheries Management Plan (2007) supports the protection of all components of aquatic habitat and resources.	• A fundamental component of this Watershed Plan is the identification and protection of the NHS and HVRAs, supporting the protection of wildlife and aquatic resources.
• Maintenance / restoration of continuous vegetative buffer zones along watercourses is recommended to improve wildlife movement and fisheries opportunities.	• Through development approvals and stewardship activity, adequate riparian buffers are achieved. • Restoration of riparian buffers is encouraged.	• A goal of the Oshawa Creek Watershed Plan is to achieve 75% adequate riparian buffer. Recommended Official Plan policy F6 supports the attainment of riparian buffers.
• An aquatic habitat protection plan is recommended for major development applications located immediately adjacent to or upstream from known cold water fisheries stream sections.	• Assessment of risk to aquatic habitat is conducted for all development within or adjacent to aquatic habitat, and appropriate protection and mitigation is provided. Since 1998, CLOCA has been implementing the Fisheries Act on behalf of Department of Fisheries and Oceans (DFO), significantly streamlining the approvals process.	• Risk assessment is conducted in accordance with CLOCA's Level III Agreement with DFO for all development activity in and adjacent to water courses. • The Oshawa Creek Watershed Plan recommends the protection of aquatic habitat.
• ***The City of Oshawa***: Consideration of wildlife habitat features be completed in an Environmental Impact Study prior to consideration of any change in designation for lands which are designated "Open Space and Recreation" and identified as "Hazard Land" or "Environmentally Sensitive Areas" covering four areas of core habitat in the northern portion of the watershed.	• Consideration of wildlife habitat is a component of EISs.	• Wildlife habitat is an important component of the NHS with the inclusion of core habitat areas and terrestrial corridors. • EISs will continue to be required to consider wildlife habitat.
• ***The City of Oshawa***: It is recommended that the "Special Study Area" designation at the headwaters of the Goodman Creek not be amended until such time as a provincial wetland evaluation has been completed	• The City initiated the Northwoods study in 2004, since completion of that study, the Whitby-Oshawa Iroquois Beach wetlands were evaluated by MNR in 2005. The City is presently updating this study. The "Special Study Area" designation remains at this time.	• The Oshawa Creek Watershed Management Plan supports the protection and restoration of the NHS. The NHS in this area includes the PSW and supports a connected system through this area.
• ***The City of Oshawa***: Provision of a corridor should be required as a condition of any amendment to the "Agricultural" designation found on lands containing a local corridor in the most eastern extent of Concession 7 or linkages identified along tributaries and across tablelands to upland habitats.	• Highway 407 crosses through Concession 7 with urban development planned south of Highway 407. North of Highway 407 in this Concession is the ORM which supports the restoration/maintenance and creation of linkages. Both the City of Oshawa and the Municipality of Clarington have amended their Official Plans, implementing the provisions of the ORMCP. • The NHS includes connectivity to northern Enfield Wetlands,	• The NHS includes riparian corridors providing connectivity to the Enfield Wetlands and associated wildlife habitat.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
	consistent with the local corridors and linkages identified in the 2002 Watershed Plan.	
• ***The City of Oshawa:*** Consideration of wildlife habitat features be completed in an Environmental Impact Study prior to consideration of any change in designation for lands which are designated "Agricultural" containing upland habitats in the northern portion of the watershed.	• The consideration of wildlife habitat is a component of EISs.	• Wildlife habitat is an important component of the NHS with the inclusion of core habitat areas and terrestrial corridors. • EISs will continue to be required to consider wildlife habitat.
• ***The Municipality of Clarington***: The preparation of an Environmental Impact Study be required for core habitat areas found on lands adjacent to the Enfield Wetland Complex, as provided through policy 4.3.7 of the Clarington Official Plan (features and land characteristics presently not identified on Map C).	• The Clarington Official Plan identifies key natural heritage features and requires preparation of an EIS for lands within 120 m of a feature.	• The Oshawa Creek Watershed Management Plan supports the preparation of EISs and the examination of wildlife habitat as a component of the study.
• ***The Municipality of Clarington***: Provision of a corridor should be required as a condition of any amendment to the "Oak Ridges Moraine" and "Prime Agricultural Area" designation found on lands containing linkages and watershed corridors.	• Clarington's ORM conformity amendment includes support for the establishment/restoration of corridor functions.	• The NHS incorporates terrestrial and riparian corridors and the Watershed Plan supports the establishment and restoration of corridor functions.
• ***The Town of Whitby:*** Consideration of existing valued features (e.g., watercourses, local corridor and linkages) be completed in the required Environmental Impact Study prior to consideration of any development application for existing valued features found in areas which are "Hazard Land" and "Environmentally Sensitive Areas".	• As a component of a proposed development, natural heritage features and functions are studied and protected /maintained/ enhanced where appropriate.	• Recommendations of this Watershed Plan support the identification and protection of the NHS, non-connected features and HVRAs.
• ***The Town of Whitby:*** Provision of a corridor be required as a condition of any amendment to the "Agriculture" designation found on lands containing the linkage in Concession VII or the watershed corridor immediately north of Taunton Road.	• Support for this recommendation continues. The Town of Whitby is currently updating their Official Plan.	• The Watershed Plan and NHS supports connectivity across watershed boundaries and the Lake Iroquois Beach and ORM are identified as a Regional Wildlife Corridor. • The NHS supports a connected system through this area and is consistent with the recommendations of the 2002 Watershed Plan.
• ***The Town of Whitby:*** Consideration of wildlife habitat features be completed in an Environmental Impact Study prior to consideration of any change in designation for lands which are "Hazard Land" and "Environmentally Sensitive Areas" containing a large parcel of early regeneration habitat immediately east of the Hamlet of Myrtle Station.	• The consideration of wildlife habitat is a component of EISs.	• The NHS incorporates the connected natural features in this area. • EISs will continue to be required to consider wildlife habitat and other natural features and functions.
• That the Region of Durham, City of Oshawa, Municipality of Clarington, Town of Whitby and Township of Scugog be requested to consider the implications of exceeding the threshold of 15% imperviousness of the land base in the Oshawa Creek watershed through long term planning exercises such as Official Plan reviews. (Studies have shown that this is the threshold that should not be exceeded in urban watersheds in order to maintain water quality and quantity and leave biodiversity unimpaired.) • In addition, any study undertaken to amend the designations should require an adequate level of protection for the following as currently provided by this area: o wetland features and functions o core habitat (interior habitat); o groundwater recharge/discharge functions; o thermal water quality;	• Environmental requirements for limiting imperviousness are now supported by legislation (ORMCP) specifying a maximum of 10% watershed imperviousness. Municipalities, through their ORMCP conformity amendments have adopted this maximum on the ORM. • NH features and functions are currently investigated, protected and buffered as a requirement of development proposals.	• Policy F2 in Section 6 sets the maximum imperviousness for lands within the ORM and Greenbelt at 10%. • Recommended Official Plan policies contained in Section 6 support protection, enhancement and restoration of the Natural Heritage System and Highly Vulnerable Recharge Areas (F3, F5, F6, F7, F10, F12, F14, K1, K2, K3, V1). • Connectivity with Pringle Creek has been identified for protection / rehabilitation.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
o wildlife linkages west to Pringle Creek Woods; and o wildlife linkages to habitat in WS.		
• That CLOCA continue to participate in the review of the transportation crossings of the Oshawa Creek specifically to recommend design considerations that will address: o protection of the existing width of corridor in order to maintain the corridor functions of the 2 main valleys (wildlife crossings); o provision of fish passage at all watercourse crossings, and no net loss of fish habitat; o maintenance of water quality and thermal stability in receiving streams; o maintenance of groundwater recharge function within the Outwash Plain; o maintenance of flooding conditions and surface runoff conveyance; o maintenance of natural channel processes (erosion, deposition and flows); and o use of only native, locally sourced species for planting purposes.	• CLOCA continues to participate, comment upon, and guide development including transportation crossings within the Watershed and supports designs and plans which protect corridor functions (terrestrial and aquatic), water quality, hydraulic regime, and appropriate naturalization and restoration work.	• Recommended Official Plan policies contained in Section 6 support environmentally responsible transportation crossings (K1, V4 & V20).
ANTHROPOGENIC INFLUENCES / TRANSBOUNDARY ISSUES		
Impervious Surfaces:		
• That the Region of Durham, City of Oshawa, Municipality of Clarington, Town of Whitby and Township of Scugog be requested to consider the implications of exceeding the threshold of 15% imperviousness of the land base in the Oshawa Creek watershed through long term planning exercises such as Official Plan reviews. (Studies have shown that this is the threshold that should not be exceeded in urban watersheds in order to maintain water quality and quantity and leave biodiversity unimpaired.) • In addition, any study undertaken to amend the designations should require an adequate level of protection for the following as currently provided by this area: o wetland features and functions o core habitat (interior habitat); o groundwater recharge/discharge functions; o thermal water quality; o wildlife linkages west to Pringle Creek Woods; and o wildlife linkages to habitat in WS.	• Environmental requirements for limiting imperviousness are now supported by legislation (ORMCP) specifying a maximum of 10% watershed imperviousness. Municipalities, through their ORMCP conformity amendments have adopted this maximum on the ORM. • NH features and functions are currently investigated, protected and buffered as a requirement of development proposals.	• Policy F2 in Section 6 sets the maximum imperviousness for lands within the ORM and Greenbelt at 10%. • Recommended Official Plan policies contained in Section 6 support protection, enhancement and restoration of the Natural Heritage System and Highly Vulnerable Recharge Areas (F3, F5, F6, F7, F10, F12, F14, K1, K2, K3, V1). • Connectivity with Pringle Creek has been identified for protection / rehabilitation.
Floodplains & Flood Damage Centres:		

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• CLOCA is encouraged to upgrade their Flood Warning system.	• CLOCA has completed significant improvements to gauging systems, mapping (including flood damage areas), and information sharing systems.	• CLOCA undertakes regular updating of hazard and regulation mapping, reflecting changing watershed conditions. • An effort is currently underway to improve flood plain mapping and accessibility of information for our municipal partners and emergency service providers. The work will be coordinated through the Durham Region Flood Contingency Plan, and will include: ➢ Updating of floodplain mapping and provision of digital mapping products; ➢ Mapping of flood damage centres with associated database; • Implementation of an effective on-line communication tool. • CLOCA implements the "Two Zone Flood Plain Management Policy for a Reach of the Goodman Creek" and is in the process of getting approval for a "Two-Zone Management Policy for a Reach of the Oshawa and Goodman Creeks" immediately upstream of the CP Railway embankment considered to be a flood damage centre. • The need to continue to improve CLOCA data, analytical capabilities coordination and water monitoring program are acknowledged in Action Plan #7 and #8.
• Precipitation and Flow Instrumentation is recommended to more accurately calibrate the potential flood hazard, and possibly assist with the scope of the Regulatory Flood Plain. This should be a first priority for early implementation.	• Additional precipitation and flow gauging has been installed. An assessment of the cost/benefits of a calibration exercise should be completed.	• The need to continue to improve CLOCA data, analytical capabilities coordination and water monitoring program are acknowledged in Action Plan #7 and #8.
• Enlargement of the CP Rail Waterway Opening is recommended, to reduce the effects of the Regulatory Flood in the Main Branch of Oshawa Creek and in Goodman Creek.	• CP Rail continues to be a major flood obstruction that causes a significant number of structures to be within the floodplain. In the absence of a plan to enlarge the railway opening, 2-Zone floodplain policies have been applied to the area.	• CP Rail continues to be a major flood obstruction that causes a significant number of structures to be within the floodplain. In the absence of a plan to enlarge the railway opening, 2-Zone floodplain policies have been applied to the area.
• Flood-proofing is proposed as a site specific flood control measure for protecting buildings in the fringe of the Regulatory Flood Plain.	• The Two-Zone policies provide specific information for allowing alterations within the flood fringe.	• The Two-Zone Flood Plain Management Policy for a Reach of Goodman Creek (approved) and for a Reach of Goodman and Oshawa Creeks Policy (approval imminent) provide specific information for allowing alterations within the flood fringe.
• Hydraulic Structure Improvements should be considered when structures are scheduled for replacement. We recommend a detailed hydraulic analysis of the Thomas Street Bridge.	• Thomas St. bridge has been enlarged.	• Culvert or bridge replacements are regulated and assessed for benefits of hydraulic improvements.
• Channel Ice Maintenance including techniques such as ice jam prediction, ice pack monitoring, pilot ice trenches, ice pan removal and structural improvement may substantially reduce the ice jam flood threat at specific locations such as Thomas Street Bridge.	• Thomas St. bridge has been enlarged, and is no longer an ice jam/flood problem area. Although ice jamming does occur in the mouth of the Oshawa Creek, very little damage is caused because structures have been regulated out of the floodplain.	• Completed.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• That CLOCA require that Floodplain-mapping exercises include both peak flow rates for the 100-year and Hurricane Hazel Flood Event with the greater flood line considered the regulatory event.	• Updated floodplain mapping is underway with both 100-year and regional storms mapped, and the greater floodplain used as a regulatory event.	• This project is currently underway. The 2013 WSP supports the completion of this work.
• That CLOCA require that where stormwater control ponds are planned to maintain a 100-year flood level, and the 100-year flood level is the regulatory event (larger than the regional floodline) in the receiving stream reach, then the control pond will be designed as a flood control facility.	• CLOCA is part of a Conservation Ontario committee that reviews the possibilities of controlling regulatory flooding including both 100-year and regional events.	• Policy V18 in Section 6 supports collaborative efforts to study possibilities of using stormwater management ponds as flood control facilities.
Stormwater Management:		
• Stormwater Management Ponds are proposed for application to stormwater quantity / quality treatment for new developments. These should be planned at the Subwatershed or Stormwater Management Plan levels to be strategically located so as to minimize the number of pond locations to facilitate maintenance.	• Generally being implemented (Windfields Planning Area, Kedron Planning Area).	• Policies K15 and V25 in Section 6 supports use of stormwater management ponds for water quality and water quantity treatment
• Vegetative BMPs are recommended as elements of development stormwater treatment. These may include buffer and filter strips, vegetation swales and artificial wetlands.	• Stormwater must be addressed with combinations of lot level, conveyance, and end of pipe treatment measures. Low Impact Development manuals are available as a resource.	• Policy F6 in Section 6 recommends a 30 m riparian buffer along both sides of a watercourse. • Policy K15 in Section 6 supports the use of low impact management of stormwater.
• Local Infiltration of back yard and park surface drainage is recommended particularly in the central watershed where the soils are favourable but the water table is not vulnerable to contamination.	• Infiltration/exfiltration measures should be used where practical as part of the comprehensive stormwater treatment.	• Policy K15 in Section 6 supports the use of low impact management of stormwater.
• Sub-Surface Water Cooling techniques should be promoted for new development in the central watershed to ensure that cold water fisheries receiving streams are not negatively affected by heated urban stormwater.	• Stormwater ponds are known to cause the release of warm water. Measures must be provided to mitigate warm water releases.	• Policies V3, V25 and V26 in Section 6 support the elimination of impacts of stormwater management facilities on thermal regime of receptor stream.
• Subwatershed and Stormwater Management Plans are a recommended priority for the WS and ES subwatersheds, to establish floodlines in minor tributaries and appropriate setbacks for development.	• Subwatershed plans have been completed and floodlines established in Master Environmental Servicing Plans (MESPs) /Subwatershed Plans. Regulatory floodplain should always be assessed prior to expansion for intensification of urban land uses.	• Completed. • Policy K13 in Section 6 supports the assessment of flood conditions prior to approval of intensification of proposed urban land uses.
• Adequate flood conveyance capacity must be maintained along Goodman Creek upstream of Rossland Road.	• Flood vulnerable structures exist in the Bermuda Avenue area. Assessments have been completed to ensure that future upstream development (Northwoods area) will not increase flooding .	• Completed.
• Runoff controls are essential for planned future intensification in the headwaters of Goodman Creek (north of Taunton Road).	• Assessments have been completed to ensure that future upstream development (Northwoods area) will not increase flooding in this reach. Total imperviousness for the area has been controlled to prevent flooding increases.	• Completed.
• The City should continue its program for long-term reduction of heavy metal loadings to storm sewer systems.	• The City of Oshawa and CLOCA support the reduction of heavy metal loadings in storm sewer systems through the implementation of appropriate Stormwater management guidelines and design standards.	• The City of Oshawa and CLOCA support the reduction of heavy metal loadings in storm sewer systems through the implementation of appropriate Stormwater management guidelines and design standards.
• Stormwater Quality Management is required for all new development. BMP facilities in the central subwatersheds should focus on reducing identified priority water quality loadings.	• Stormwater quality treatment should include a comprehensive approach of low impact measures (lot level, conveyance, and end of pipe works).	• Policy K15 in Section 6 supports the use of low impact management of stormwater. • Policy V25 supports use of stormwater management ponds for water quality treatment.

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
• New development drainage systems should continue to provide both major and minor systems of drainage.	• Oshawa continues to promote a 1-year storm sewer with a foundation drain collector and major overland flow systems. Other municipalities generally use a 5-year storm sewer and overland flow systems.	• Policy V24 in Section 6 supports development that will not result in peak flows exceeding pre-development rates for 1:2year to 1:100 year design storm events including the Regional event (Hurricane Hazel). • Policy V21 and V22 support maintaining drainage catchments and confirmation of minor and major drainage systems.
• A major drainage system must be capable of conveying the larger of the 100-year design storm flow and the Regional storm flow without flooding new development.	• Major overland flow routes are provided and sized for the 100-year storm (the larger event in an urban area). Large downpour rain events are being experienced more frequently, and overland flow routes are tested more often.	• Policy V24 in Section 6 supports development that will not result in peak flows exceeding pre-development rates for 1:2year to 1:100 year design storm events including the Regional event (Hurricane Hazel).
• The City should continue its policy that the major system should reduce the extent of existing flooding for the larger of the 100-year and the Regional storm.	• See above.	• Policy V24 in Section 6 supports development that will not result in peak flows exceeding pre-development rates for 1:2year to 1:100 year design storm events including the Regional event (Hurricane Hazel).
• The storm drainage system must be designed to reduce the extent of flooding in the existing areas wherever possible and to prevent flooding of new development in all cases.	• Stormwater plans must be provided for new developments to demonstrate that external drainage systems are not compromised.	• Policies F15, K13, K14 and K15, V24 & V25 in Section 6 support implementation of stormwater management techniques.
• The potential effect of new developments on increasing flooding must be assessed at the subwatershed and stormwater management plan levels.	• An assessment of regulatory flood impacts must be included as part of any land use planning exercise that is proposing an expansion or intensification of urban land uses. The assessments should be completed at the Official Plan stage, and refined at subwatershed/stormwater plan stages.	• Policy K13 in Section 6 supports the assessment of flood conditions prior to approval of intensification of proposed urban land uses.
• Channel straightening, hard surface lining and enclosure of permanent watercourses should be discouraged.	• Watercourses have been maintained and improved with bioengineering treatments and landscaped buffers.	• Policies K3, K4, V3 and V22 in Section 6 support natural channel design, riparian buffers, and use of bioengineering.
• In-stream stormwater management ponds should not be permitted on the primary watercourses of the Oshawa Creek system.	• Stormwater works that would obstruct natural stream processes are not acceptable.	• Policy V28 in Section 6 discourages stormwater management ponds integrated in a watercourse.
• The Official Plan should be amended to add Environmental Management which would outline the Stormwater Management Objectives and Process to be included in the development and re-development of lands in the municipality.	• The City of Oshawa has not yet completed a comprehensive review of their Official Plan.	• Numerous Recommended Official Plan Policies contained in Section 6 support the assessment, evaluation, and management of stormwater.
• The issue of stormwater management should be addressed in conjunctions with any major intensification project.	• Intensification of land uses will require re-assessment of stormwater management and regulatory flood impacts.	• Policy K13 in Section 6 supports the assessment of flood conditions prior to approval of intensification of proposed urban land uses.
• Reference to Stormwater Management should be added to Section 9.0, Implementation, in the various subsections dealing with approvals in order to ensure that this aspect is referenced in all approvals reviews. The City's existing Interim Stormwater Management Guidelines should continue to apply.	• Both CLOCA and the City of Oshawa maintain Stormwater Management Guidelines.	• Numerous Recommended Official Plan Policies contained in Section 6 support the assessment, evaluation, and management of stormwater. • Policy K16 in Section 6 acknowledges the importance of stormwater management facilities, recognizing the need for regular monitoring and management of these facilities.
• Subwatershed Plans / Stormwater Management Plans should be required for all Part II Plans.	• Subwatershed plans have been completed for Part II Plans.	• Policies K13, K14 & K15 in Section 6 support the implementation of stormwater management.
• All plans of subdivision and condominium should be reviewed to ensure that the stormwater system complies with the Subwatershed Plan. Where there is no Subwatershed Plan, the applicant should prepare a Stormwater Management Plan as part of the Draft Plan Submission.	• Stormwater plans are reviewed by CLOCA and the municipality to ensure compliance with master plans and general requirements and guidelines.	• Policies K13, K14 & K15 in Section 6 support the implementation of stormwater management.
• As part of a plan of subdivision or condominium the development plan should be	• Stormwater plans are reviewed by CLOCA and the municipality to	• Policies K13, K14 & K15 in Section 6 support the implementation of stormwater

Historical Recommendation (1995 and 2002)	Summary of Implementation / Current Perspective on Recommendation	2013 Implementation
reviewed to ensure that the stormwater system complies with the Subwatershed Plan. Where there is no Subwatershed Plan the applicant should prepare a Stormwater Management Plan as part of the Development Plan submission.	ensure compliance with master plans and general requirements and guidelines.	management.
• The CCity's current (1992) Interim Stormwater Quality Control Guidelines should be reviewed and updated regularly.	• CLOCA supports using the most up to date and appropriate guidelines available.	• CLOCA supports using the most up to date and appropriate guidelines available.
• The existing Watercourse Committee should undertake to prepare the design guidelines referred to above. The committee should continue to act as a coordinating committee for review of Stormwater Management Plans and development applications.	• The Watercourse Committee no longer meets on a regular basis.	• BILT (Building Industry Liaison Team including City and CLOCA representatives) meets twice yearly to review development applications. Pre-consultation is a required component of plan review, and one in which CLOCA participates.
• The City should monitor closely the operations of stormwater facilities to evaluate the operational problems and revise the design guidelines to address these issues as they arise.	• An improved method of stormwater system monitoring and maintenance is needed, and should be coordinated between various municipal departments. Budgeting for costs must be part of the system.	• Policy K16 in Section 6 acknowledges the importance of stormwater management facilities, recognizing the need for regular monitoring and management of these facilities.
• The Development Charges By-Law should be reviewed to determine if the amount of money reserved for Stormwater Management as a result of new development and re-development is sufficient.	• Development Charges are reviewed.	• Development charges are a municipal responsibility.
• A capital forecast of stormwater expenditures should be prepared as the basis for future capital budgeting.	• Unknown.	• Policy K16 in Section 6 acknowledges the importance of stormwater management facilities, recognizing the need for regular monitoring and management of these facilities.
• The operational costs related to stormwater facility maintenance should be monitored as the basis for future budgeting and design decisions.	• An improved method of stormwater monitoring and maintenance is needed, and should be coordinated between various municipal departments. Budgeting for costs must be part of the system.	• Policy K16 in Section 6 acknowledges the importance of stormwater management facilities, recognizing the need for regular monitoring and management of these facilities.
• That CLOCA adopt a policy that all future development in hydrologic units W3, W2, W1.1, E3, E2, E2.1, E1.1, E1.2, G7, and G2 (as identified on Figure 8) provide stormwater management, designed with a capacity to control flows for all storm events (2 through 100-year) to pre-development levels.	• Stormwater quantity control is required where flood impacts could occur as noted by the hydrologic unit list. Regulatory flood impacts including the regional storm may also require control.	• Policy V24 in Section 6 supports development that will not result in peak flows exceeding pre-development rates for 1:2year to 1:100 year design storm events including the Regional event (Hurricane Hazel)
• That CLOCA require Level 1 treatment for stormwater quality and temperature control for the Oshawa Creek watershed.	• Level 1 enhanced stormwater quality treatment is required for all new development using a comprehensive stormwater approach.	• Policy V25 in Section 6 supports maintaining predevelopment water quality. Current CLOCA standards with respect to water quality are to achieve Level 1 enhanced water quality treatment.
• That CLOCA require Level 2 treatment for stormwater quality and temperature control for the Montgomery Creek watershed.	• Montgomery Creek is managed as a tributary of the Oshawa Creek and requires enhanced (Level 1) stormwater quality treatment.	• Policy V25 in Section 6 supports maintaining predevelopment water quality. Current CLOCA standards with respect to water quality are to achieve Level 1 enhanced water quality treatment.
• That CLOCA require all developments with a proposed impervious land area of 0.25 hectares or more to provide water quality treatment. For small sites, facilities may not be practical but source control, conveyance treatment or "best effort end of pipe" solutions should be examined.	• This recommendation is routinely practiced.	• This recommendation is routinely practiced as it is an industry standard.

5.2 CLOCA Action Plans

Priority Action Plans have been described and outlined below. Each of these Plans represents an undertaking to help achieve specific watershed health objectives and contribute to the fundamental goal of a healthy and resilient watershed. Many of the Action Plans can be undertaken on a CLOCA jurisdiction basis to gain all efficiencies possible, or they may be undertaken for a specific area (subwatershed, municipality etc.) where appropriate. All Action Plans will address individual watershed concerns, issues and actions. Some Action Plans will also compliment, support and / or inform Regional and Municipal programs, projects and corporate priorities. These Action Plans will provide a greater level of detail for achieving specific watershed goals and targets. The Action Plans will also provide the framework and implementation planning necessary to complete the on-the-ground monitoring, research, restoration and rehabilitation work in future.

To help communicate and describe the key watershed targets these plans will help achieve, the following symbols have been assigned to each Action Plan:

30% Natural Cover: Supports the achievement of increased forest cover to 30%, 10% interior forest, 5% deep interior forest through long-term naturalization, provides run-off retention, erosion control, wildlife habitat, natural system connectivity, air quality improvements, social / cultural / economic benefits and climate change mitigation impacts.

10% Wetland Cover: Provides run-off retention, erosion control, water quality filtration, wildlife and fish habitat, social / cultural / economic benefits and mitigates impacts associated with climate change.

< 10% Imperviousness on rural lands and decreasing imperviousness impacts in urban lands: Limiting impervious surfaces allows for better run-off retention, groundwater infiltration, ground and surface water quality and sediment. Limiting built or paved areas can have a positive impact on the amount of natural areas contributing to ecosystem health.

75% Riparian Cover: Protecting, restoring and enhancing riparian cover provides run-off retention, water quality, fish habitat and diversity, system connectivity, and water temperature benefits.

A Healthy Water System: Water quantity and quality to support ecological and human health as well as protect human life and property.

All Watershed Health Targets

#1: Natural Heritage System Restoration Plan

The watershed will be protected through policy and regulation, and enhanced through stewardship initiatives. This Action Plan will lay out the framework for restoring the Natural Heritage System as defined through our watershed planning process and identified in Figure 13 to achieve the overall targets of 30% natural cover, 75% riparian cover, less than 10% impervious surfaces on the ORM and Greenbelt lands, and 10% wetland cover. This Restoration Plan will at a minimum include the following work:

- Identify opportunities and priorities for wetland restoration with consideration given to restoring historical wetland cover when making restoration recommendations;
- Support the long- term Durham Region Coastal Wetland Monitoring Project (DRCWMP) work, including data collection and future restoration activities;
- Identify opportunities to rehabilitate existing forest communities to optimize forest distribution, size, shape, interior and deep interior habitat, and achieve forest cover quantity gains. This work will include consideration of and coordination with Conservation Area Land Management Plans where appropriate;
- Identify restoration and/or enhancement opportunities on lands within the NHS;
- Identify areas with high imperviousness values within or in close proximity to HVRAs or other sensitive features, and assess impacts. Results to be applied to or incorporated from the **Urban Land Use Low Impact Development (LID) Retrofits Plan,** the **Imperviousness Report Cards,** and the recommendations of the **Stormwater Management Performance Monitoring and Maintenance Plan;**
- Identify restoration opportunities within wildlife corridors in coordination with the **Wildlife Corridor Protection and Enhancement Plan**;
- Identify key riparian restoration priorities or opportunities in coordination with the **Riparian Corridors Restoration Plan**;
- Identify opportunities for land acquisition in coordination with the **CLOCA Land Securement Strategy;**
- Document any data gaps to be included in the **CLOCA Data / Analytical Needs and Coordination Assessment** document;
- Identify short and long-term stewardship opportunities based on the wetland, forest, corridor and sensitive area work noted above, and in coordination with the **CLOCA Stewardship and Education Priorities and Plan**;
- Ensure that restoration and enhancement recommendations include biodiversity considerations;
- Incorporate the recommendations of the **Highway 407 East Post-Construction Monitoring Plan**; and
- Coordinate recommendations with engagement efforts.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*
7. *Public Land Acquisition*

#2: Riparian Corridors Restoration Plan

Riparian corridors are part of the Natural Heritage System and, due to the various pressures on surface water systems in the watershed, and the substantial impact these corridors have on watershed health, a specific effort will be focused on achieving the 75% riparian cover target. The work will be done in coordination with the **Natural Heritage System Restoration Plan** and will include at a minimum the following work:

- Development of an updated methodology for reporting riparian cover as per Environment Canada's recommendations in "How Much Habitat is Enough";
- Development of an updated methodology for reporting "adequate" riparian cover for protecting stream health;
- Identification of best management and restoration opportunities for improving riparian corridors in urban, rural and agricultural properties; and
- Creation of a riparian corridors restoration opportunities map.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*
7. *Public Land Acquisition*

#3: CLOCA Community Engagement Plan

The development of a Community Engagement Plan has been identified as a priority for implementing the Watershed Plans. This plan is a fundamental tool for enhancing the success of all of CLOCA's strategic priorities for implementation and will include at a minimum the following work:

- Identification of strategic directions, key audiences, themes, messages, marketing methods, measurable metrics, tactics and priorities for engaging stakeholders;
- Identification of watershed specific audiences and a committed group of interested stakeholders to support / contribute to the implementation of Watershed Plan recommendations;
- Development of a stakeholder management system to manage stakeholder interactions;
- Development of standardized, recognizable templates for watershed planning communications; and
- A review of Regional, municipal and community group initiatives to identify opportunities suitable for cooperative efforts.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
2. *Implementation, Acceptance and Support of the Watershed Plan*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*
7. *Public Land Acquisition*

#4: CLOCA Regulation & Plan Review Policies and Procedures Manual

To formalize the policies developed through this Watershed Plan, existing regulation plan review policies and procedures, as well as the commonly accepted standards applied during the regulation and plan review process, CLOCA is in the process of completing a Regulation & Plan Review Policies and Procedures Manual. This document will be shared with municipalities and used as the internal review manual for all future regulation & plan review applications reviewed and commented on by CLOCA.

Consistent with Strategic Priority:

2. *Implementation, Acceptance and Support of the Watershed Plan*

#5: Wildlife Corridor Protection and Enhancement Plan

Wildlife corridors are mapped as part of the Natural Heritage System. Additional work is needed to identify wildlife crossing "hot spots" in the watershed at existing or approved future road crossings. Work is currently underway to: document the existing conditions in the watershed; conduct a corridor assessment and barriers to movement analysis; identify corridor enhancement, culvert improvement and stewardship opportunities; and develop key implementation tasks and priorities. This report will contribute to the **Natural Heritage System Restoration Plan** and inform the **Stewardship and Education Priorities and Plan**.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
6. *Filling Data Gaps*

#6: High Volume Recharge Area (HVRA) Case Study

As growth proceeds within CLOCA's jurisdiction, CLOCA can be proactive by investigating methods, technologies, techniques and tools for protecting High Volume Recharge Areas (HVRAs) within the watershed. CLOCA will research various approaches and prepare a discussion paper with recommendations regarding BMPs for the protection of HVRAs identified within the Oshawa Watershed. Recommendations will be specific to the soils/conditions within the Oshawa Creek Watershed, and will include monitoring suggestions to promote and encourage the ability to assess and report on the performance of the various measures. CLOCA will review relevant case studies to help establish local BMPs, and investigate local research opportunities for testing various methods. This project will provide recommendations for a future case study to assess the effectiveness of applied BMPs.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
4. *Consistent and Long-Term Monitoring*
6. *Filling Data Gaps*

#7: CLOCA Data / Analytical Needs and Coordination Assessment

It is recognized that there is a lot of very useful data available for protecting, enhancing and restoring the watersheds within CLOCA's jurisdiction. However, some significant data gaps have been identified as barriers to effectively advising decision-makers on ecological impacts.

Many opportunities exist for government agencies and the private sector to improve their efficiency by coordinating monitoring efforts and improving their data sharing capacity. This assessment of CLOCA's data needs and coordination opportunities will holistically look at what data we have, what we need, where to get it, how to share it and how to use it. The assessment will include, at a minimum, a look at the following issues:

- What information we currently have, the duration of data collection, how we access it, what we do with it and who we share it with;
- Identification of data gaps within the structure;
- Identification of opportunities to enhance current data or fill gaps including acquisition of data from public and private agencies;
- The need for a mechanism to collect localized information on the surficial geology through information sharing on a site specific basis (geotechnical borehole data);
- Updating geological maps using local geotechnical borehole data / models with local information in coordination with the YPDT (York, Peel, Durham, Toronto) team;
- Update and maintenance of numerical models;
- Developing data sharing protocols with the private sector where opportunities are identified;
- Gain a more comprehensive understanding of the 'water demand' component of the Water Budget, including updating permit data and assessing actual water use;
- Refining groundwater and surface water stress calculations for moderately stressed watersheds;
- Working with the MOE to provide permit 'conditions' information and update PTTW (Permit to Take Water) demand data to more accurately reflect actual water taking quantities;
- Liaising with MOE regarding the PTTW approval process;
- Updating ELC community mapping and data;
- Incorporating ELC data and mapping collected by other agencies or consultants into CLOCA's ELC dataset;
- Coordination and data sharing efforts between federal, provincial and CLOCA monitoring programs;
- Improving coordination with MNR and DFO to continue to identify and protect aquatic species at risk habitat within the Oshawa Creek watershed;
- Investigation of genetic work/research on Brook Trout isolated populations; and
- Partnering opportunities with academic institutions including Species at Risk.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#8: CLOCA Water Monitoring Program Review

Monitoring ecological trends in the watershed is the primary means of recognizing impacts to features and functions. Various provincial policies and the Clean Water Act have identified the need to monitor water resources to protect human and ecological health. In order for CLOCA to continue to advise municipalities on water-related issues, a comprehensive review of CLOCA's water monitoring is required. This should include an investigation of what additional water monitoring and resources are needed to fulfill the recommendations of policies and legislations within the province. This assessment will include at a minimum the following components:

- Review potential expansion of the Provincial Ground Water Monitoring Network (PGMN) in priority areas;
- Prepare PGMN program revision rationale and equipment needs proposal for submission and approval by the Province;
- Installation of new monitoring equipment and inclusion into the data management system including liaison with GIS for on-line retrieval;
- Discuss with the Province the potential for an increase in frequency of water quality testing as part of provincial monitoring protocols including PWQMN as well as the addition of event based monitoring;
- Installation of additional gauges in priority areas;
- Assess the need to expand surface water monitoring system to include upper stream reaches to better understand groundwater discharge patterns for ongoing maintenance of baseflow and stream sustainability;
- Review low flow data with modeling products to map stream recharge /discharge patterns and determine the need for additional monitoring;
- Additional biological monitoring to assess changes to un-impaired reaches;
- Determination of appropriate measurement/reporting methodologies for monitoring and implementing Suspended Solid Load (turbidity levels) to support Stormwater Management activities;
- Establish links between CLOCA's low water response program and SWP stress calculations and PTTW monitoring;
- Assessment of CLOCA water data storage and sharing mechanisms (CUASHI); and
- Expansion of water temperature monitoring network.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
6. *Filling Data Gaps*

#9: CLOCA Urban Land Use Low Impact Development (LID) Retrofits Plan

Since much of the southern portions of the watershed are already developed, retrofits become an important mechanism for restoring ecological function in these reaches. This report will identify LID opportunities based on existing land use and ecological conditions with priority assigned to undertakings that provide the most efficient and effective means of restoring or

rehabilitating aquatic function. This Retrofit Plan can be used by municipalities as a tool for mitigating impacts of older, developed areas. The report, at a minimum, will include:

- Analysis of stormwater run-off patterns, flows and impact areas as a means of identifying priority restoration areas;
- Identification / prioritization of impacted areas and LID opportunities and recommendations;
- Preparation of an impervious / HVRA identification map by land cover illustrating key retrofit opportunities by jurisdiction, municipality, watershed and landform;
- Recommendations for monitoring of impervious surfaces and stormwater quality and quantity; and
- Recommendations for stewardship and education material for development and distribution in targeted retrofit areas.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#10: Stewardship and Education Priorities and Plan

Stewardship Priorities:

It is clear that residents, landowners, community groups, business owners, educational institutions and other stakeholders can actively contribute to the achievement of watershed goals and health targets. As part of a comprehensive review of stewardship priorities and opportunities, this report will include at a minimum:

- Delivery of strong community stewardship programs on urban lands to promote watershed health, demonstrate restoration techniques and engage community volunteers;
- Development and delivery of a long term strategic private land stewardship program in rural communities to provide landowners with support to achieve watershed health goals;
- Coordination with Conservation Area Management Plans to enhance learning and volunteer opportunities;
- Establishment of a pre and post monitoring and reporting mechanism to assess the success of private and public land stewardship projects; and
- Integration of ecological recommendations from other Action Plans to pursue stewardship opportunities to achieve measurable, physical improvements within CLOCA.

Education Priorities:

A very important component of implementing this Watershed Plan is actively educating stakeholders through curriculum and non-curriculum programs and activities that focus on the positive and negative impacts of humans on the ecological integrity of CLOCA's watersheds. The comprehensive education plan will, at a minimum, include the following:

- Continued delivery and expansion of innovative and curriculum-linked experiential education programs that promote life-long learning;
- Building on existing and new relationships with the education sector to examine program opportunities;

- Develop and deliver hands-on workshops to include creation and distribution of new and existing printed and electronic information on current and priority issues like invasive species, well-water protection and species at risk; and
- Continued delivery of seasonal special events to meet the needs of individuals, students, seniors and families.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
2. *Implementation, Acceptance and Support of the Watershed Plan*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#11: CLOCA Land Securement Strategy

Through concentrated efforts, CLOCA has made great strides in acquiring land within its jurisdiction for the long-term protection of priority features and functions. As a continuation of the ongoing effort to grow CLOCA's land holdings, this report will at a minimum include the following:

- Identification of priority acquisition areas and opportunities;
- Identification of long-term funding strategies;
- Dissemination and coordination of plan, strategies and priorities with municipalities; and
- Identification of appropriate and achievable linkages and corridors.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
7. *Public Land Acquisition*

#12: Oshawa Creek Watershed Imperviousness Report Card

As the natural landscape is paved over, a chain of events is initiated that typically results in degraded water resources. Imperviousness is one of the most meaningful indicators of how healthy a watershed is as impervious surfaces affect water quality, quantity, temperature, sedimentation, erosion, fish habitat, soil composition / compaction and terrestrial growth. As development pressures continue to grow in combination with expected impacts of climate change (i.e. more intense storm events), tracking how much of our lands are covered with impervious surfaces, where these areas are, and how they are affecting surface-water run-off and groundwater recharge and discharge, becomes increasingly important. Equally important is the investigation of how to mitigate the impacts of already developed/impervious lands. This report card will at a minimum include work to:

- Document the % imperviousness of; urban areas, urbanizing areas, HVRAs, the ORM, the Greenbelt lands, subwatersheds, and the full Oshawa Creek Watershed;
- Establish a monitoring program and protocol to assess change in imperviousness in the above noted areas;
- Set out an information sharing protocol between CLOCA and municipalities;

- Identify and coordinate impervious mitigation priorities with the **Urban Land Use Low Impact Development (LID) Retrofits Plan;**
- Coordinate mitigation priorities with **Connected Imperviousness Best Management Strategy**; and
- Make recommendations for short and long term impervious mitigation strategies.

Consistent with Strategic Priorities:

1. Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity
3. Long-Term and Sustainable Funding
4. Consistent and Long-Term Monitoring
6. Filling Data Gaps

#13: CLOCA Connected Imperviousness Best Management Strategy

Connected imperviousness is a developing area of study that looks not only at the overall percent imperviousness of a given area, but at the amount of connected impervious surfaces in relation to the proximity of these connected areas to streams. It has been documented that "urban development that minimizes the amount of connected impervious surface and establishes undeveloped buffer areas along streams should have less impact than conventional types of development." (Wang, 2001). This Action Plan proposes to:

- Establish a Connected Imperviousness Methodology for documenting existing conditions and identifying priority restoration and mitigation areas;
- Document connected imperviousness values and results through a GIS mapping exercise to be incorporated into the **Imperviousness Report Card** discussed above;
- Set out connected impervious targets and include in the 5-year review of this Watershed Plan; and
- Identify priority mitigation measures and a best management strategy for the most connected urban impervious areas within the watershed.

Consistent with Strategic Priorities:

1. Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity
3. Long-Term and Sustainable Funding
4. Consistent and Long-Term Monitoring
6. Filling Data Gaps

#14: CLOCA Ecological Goods and Services Inventory

It is difficult to communicate or even calculate the "value" of natural resources. In a growing field of study, researchers are beginning to put economic dollar values on not only ecological features but the functions that these features play in our economic and social lives. The Credit Valley Conservation Authority, in cooperation with the Pembina Institute, is a great example of how Conservation Authorities are using this new understanding of natural capital to communicate value to partners and residents as a means of furthering ecological understanding.

The emerging research shows very clearly that it is a sound and necessary investment to protect, restore and preserve natural capital as a means of reducing costs from flooding, erosion, and degraded water quality, and increasing revenue resulting from increased property values and generated through culture and tourism opportunities. In an assessment of the value of protecting the Great Lakes Ecosystem, it was noted that "the most significant policy implication emerging from this analysis is that there are positive economic returns on restoration and protection of all habitat types evaluated." (Marbek, 2010).

Within the CLOCA jurisdiction, there exist many unique features such as the Oak Ridges Moraine (ORM), the Greenbelt, the Lake Iroquois Beach (LIB), coastal wetlands and Lake Ontario that can now be "valued" in a more traditional economic dollars and cents way. This information would put into perspective the value of protecting our existing features as well as the cost of restoring what has already been impacted by development. Using the methodology already established by the CVC and Pembina Institute, this work would involve at a minimum:

- Inventorying the existing NHS features and functions;
- Determining value estimates for landscape features such as the ORM, Greenbelt, LIB and coastal wetlands;
- Estimating the cost of restoring priority lands where appropriate as identified through the **Natural Heritage System Restoration Plan**;
- Developing priority protection and restoration areas in the context of the cost estimates and coordinating these conclusions with other Action Plans; and
- Preparing a report for municipalities illustrating the natural capital in the watershed.

Consistent with Strategic Priorities:

1. Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity
2. Implementation, Acceptance and Support of the Watershed Plan
3. Long-Term and Sustainable Funding
4. Consistent and Long-Term Monitoring
5. Engaging Stakeholders through Stewardship and Education
6. Filling Data Gaps
7. Public Land Acquisition

#15: CLOCA Salt Management Plan

Evidence of increasing sodium levels in ground and surface water in the Watershed has been documented. Erratic levels in ground and surface water concentrations warrant further investigation. While there are various natural and anthropogenic sources that may account for elevated sodium and chloride in water, road salt application and storage is considered the activity with the most potential to impact water quality. Municipalities are the leaders when dealing with salting practices in terms of addressing safety concerns and costs of both application and various products. In cooperation with municipalities, CLOCA will address the negative impacts of salt use as it relates to ecological features and functions, and find opportunities including the creation of a landowner education package to reduce these identified impacts. At a minimum, this work will include:

- Coordination of research on current Best Management Practices regarding salt storage, application and mitigation;
- Implementation of a CLOCA properties salt management strategy;
- Provision of mapping products and data associated with salt sensitive areas for municipal and provincial salt management decision making;
- Documentation of historical impacts;
- Development of recommended mitigation measures; and
- Development of a Private Lands Salting Best Management Practices Information Kit to be distributed to land owners and building tenants/managers outlining Salting Best Management Practices.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#16: CLOCA Implementation of the Invasive Species Management Strategy

Invasive Species are an on-going concern and threat across the Province of Ontario. It is now estimated that the spread of invasive species is second only to habitat loss as the major cause of biodiversity decline. In response to this threat, CLOCA has developed an Invasive Species Management Strategy that was approved and endorsed by the CLOCA Board of Directors in November 2010. An implementation plan is currently in development. The document sets out eight underlying strategies: Prevention; Communication; Best Management Practices; Prioritization; Implementation; Collaboration; Policy; and Research & Monitoring. Several items of the work-plan have already been completed including:

- Development of Best Management Practices for CA staff and construction workers;
- Invasive Species Removal Pilot Projects on CA lands;
- Communication outreach programs with local industries and organizations;
- Work with Federal, Provincial, Municipal and non-profit organizations to develop communication pieces on invasive species; and
- Installation of engaging and interactive communication pieces on CA lands.

The draft implementation plan sets out a five-year plan to address the actions listed within the strategy. Invasive Species management is a long term commitment, involving committed resources, partnerships and community involvement. Continued education, awareness and management are essential, and as such will be achieved through the continued implementation of the Invasive Species Management Strategy.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#17: Oshawa Creek Watershed In-Stream Barriers Action Plan

There are 25 known in-stream barriers in the Oshawa Creek Watershed. Each of these barriers will be investigated to confirm their impact, evaluate the need to maintain or remove the barrier based on the impacted systems, and prioritize the removal of barriers where appropriate.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*

#18: CLOCA Ecological Compensation Protocol

As compensation is required on development approvals where all other mitigation options have been exhausted, it is important to develop a standard protocol for use within CLOCA to ensure that compensation requirements minimize any negative impacts to the Natural Heritage System, HVRAs or groundwater quality or quantity, and maximize restoration potential. This protocol will support the policies in Section 6 of this Plan as well as the **CLOCA Regulations and Plan Review Policy and Procedures Manual** described as CLOCA Action Plan #4. Together, these documents will provide the guidance required by stakeholders involved in the planning, review and execution of development proposals for dealing with issues of "compensation".

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*

#19: CLOCA Lichen Pilot Project

Air pollutants cause adverse effects to global, regional and local ecosystems, to human health and in some cases property. Lichens are useful indicators of temporal change, spatial distribution, and ecosystem effects from air pollution that can help CLOCA more actively monitor air quality within the watershed. This Action Plan will develop a Lichen Map for the CLOCA jurisdiction to illustrate lichen populations, develop a long-term lichen monitoring program and reporting strategy, and make recommendations once enough monitoring data / map updates have been completed. The potential for stakeholder monitoring and reporting of lichens will be investigated.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#20: CLOCA Climate Change Monitoring / Adaptive Management Strategy

Climate change impacts require consistent and long-term monitoring to understand impacts from this global phenomenon. In 2011, Ontario released "Climate Ready: Ontario's Adaptation Strategy and Action Plan" that outlines 37 actions to be implemented throughout the province to ensure that Ontario is in a position to minimize negative impacts and capitalize on

opportunities resulting from climate change. CLOCA will develop a climate change monitoring and adaptive management strategy that will, at a minimum:

- Consider Climate Ready's recommended actions for the CLOCA jurisdiction;
- Continue monitoring basic indicators of climate change to establish baseline data (precipitation, surface run-off, evapotranspiration, infiltration, and air temperature);
- Coordinate with municipal, regional, provincial and Conservation Ontario initiatives where possible;
- Develop an adaptive management strategy to communicate to stakeholders ways to mitigate negative climate change impacts within the watershed;
- Develop a framework for a future Climate Change Report Card; and
- Assess the current monitoring abilities of CLOCA and make recommendations for future/additional monitoring where warranted.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
6. *Filling Data Gaps*

#21: CLOCA Stormwater Management Performance Monitoring and Maintenance Plan

Stormwater management (SWM) is a key component of protecting human life and property as well as protecting ecological features and functions. As such, CLOCA will undertake an exercise to identify underperforming and untreated areas and develop monitoring and maintenance recommendations to promote improved stormwater management performance. This work will build on the positive proactive approach taken by municipalities to identify untreated areas and take action to retrofit these areas to improve stormwater quality. This Plan will include at a minimum:

- An investigation into areas not treated for stormwater quality with consideration for work completed to date;
- Investigation of the need for stormwater management plans in areas where none currently exist;
- Mapping results showing untreated areas;
- Recommendations for a monitoring framework and performance indicators for existing SWM facilities; and
- Continued cooperation with municipalities to fund, update and implement retrofit programs on SWM facilities to improve stormwater catchment and treatment.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
4. *Consistent and Long-Term Monitoring*
6. *Filling Data Gaps*

#22: Highway 407 East Post-Construction Monitoring Plan

Highway 407 East is one of the largest highway construction projects ever to take place in Ontario. The project will extend Highway 407 from Brock Road in Pickering to Highway 35/115 in Clarington, with two north-south connections to Highway 401. The vast majority of this highway expansion will take place within CLOCA's jurisdiction.

CLOCA has been working with the Ministry of Transportation (MTO) and the East Development Group (EDG) to ensure that the protection of the natural environment is recognized and considered during the construction and operation of this roadway. CLOCA will develop a post-construction monitoring plan that will at a minimum:

- Monitor impacts on the watershed to ensure that mitigation measures of the highway design and operation are effective;
- Assess the impact of the facility on the opportunities for protecting, restoring and enhancing the ecological integrity of the watersheds within CLOCA's jurisdiction; and
- Develop implementation recommendations for specific restoration and enhancement opportunities, and include them as part of the **Natural Heritage Restoration Plan** and the **Stewardship and Education Priorities and Plan**.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
3. *Long-Term and Sustainable Funding*
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6. *Filling Data Gaps*

#23: Flood Damage Centres Upgrading

As part of CLOCA's mandate, the effective forecasting and reporting of flooding conditions and "flood damage centres" is undertaken across the CLOCA watershed. An effort is currently underway to improve flood plain mapping and accessibility of information for our municipal partners and emergency service providers. The work will be coordinated through the Durham Region Flood Contingency Plan, and will include:

- Updating of floodplain mapping and provision of digital mapping products
- Mapping of flood damage centres with associated database;
- Implementation of an effective on-line communication tool.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

#24: Montgomery Creek Restoration Plan

In 2000, Environment Canada completed *The Oshawa Harbour Pollution Prevention Study* that examined the concentrations of various chemicals in the surface water and sediments found within the Montgomery and Oshawa Creeks. The study concluded that Montgomery Creek is the major source of pollutants in the Harbour and that the entire Montgomery Creek is contaminated.

Due to Montgomery Creek's existing and historic intensive land uses, severe damage has been done to the quality of water resources throughout the entire creek. Piping of northern tributaries exacerbates the poor water quality conditions. Given the well-documented and historical understanding of this degraded subwatershed, Montgomery Creek is noted as a Unique Management Area. This Action Plan, will at a minimum:

- Identify priority restoration opportunities as a coordinated effort with interested stakeholders and partners; and
- Recommend actions which may include specific stewardship, remediation and restoration efforts to improve the water quality within Montgomery Creek as a direct water quality input into the Oshawa Harbour.

Consistent with Strategic Priorities:

1. *Protect, Enhance and Restore the Oshawa Creek Watershed to be a Resilient Ecosystem with Ecological Integrity*
4. *Consistent and Long-Term Monitoring*
5. *Engaging Stakeholders through Stewardship and Education*
6. *Filling Data Gaps*

5.3 Potential Barriers to Implementation

The above Action Plans represent a comprehensive and dedicated effort directed at achieving watershed health. The fundamental barrier to creating and executing each of these Action Plans is commitment. Regional and Municipal endorsement of the Watershed Plan, as well as support for resources is the level of commitment needed to effectively implement this Watershed Plan, and see measurable gains toward watershed health. CLOCA is well-positioned to undertake the majority of work with our current level of in-house expertise, but it is anticipated that additional staffing resources will be necessary to develop and execute all the Action Plans within the 5 year review period. The Watershed Plan will support the achievement of the City's corporate objective for sustainability / livable communities, satisfy Regional and Municipal natural heritage responsibilities, as well as integrate well with many environmental programs and services currently offered by our municipal partners.

As is the current standard of practice, CLOCA will continue to seek outside funding sources to supplement the available and required resources where appropriate. A comprehensive review of funding and other resource needs will take place upon completion of the Watershed Plan to investigate efficiencies that can be gained from external cooperation and internal scheduling and dedication of resources for each Action Plan.

5.4 CLOCA Guiding Principles

Watershed planning and management requires a holistic approach to dealing with current conditions and trends as well as planning for future ecological impacts. The following sections provide the guiding principles through which CLOCA will manage the protection, restoration and enhancement of ecological features and functions within the watershed. These principles are in addition to the municipal implementation policies provided in **Section 6.2** of this Watershed Plan and aim to support implementation initiatives by all stakeholders to achieve watershed health. CLOCA will continue to regulate and enforce ecologically appropriate actions within our Authority and jurisdiction as well as support municipal implementation of the Watershed Plan through the comment and review process for development approvals. The achievement of a healthy and resilient watershed with ecological integrity requires both CLOCA and our municipal partners to fully support and implement this Watershed Plan, its policies and recommendations.

TABLE 7: CLOCA GUIDING WATERSHED MANAGEMENT PRINCIPLES

Ref	Guiding Policy
WSP1	CLOCA supports the implementation of the Watershed Plan through incorporation of the municipal policies into Official Plans.
WSP2	CLOCA shall continue to be the guiding authority with respect to management of the watershed in an ecologically sustainable manner, providing the science, technical advice and leadership necessary to achieve a healthy watershed.
WSP3	CLOCA shall continue to engage the public and stakeholders in watershed stewardship and education initiatives for improving environmental awareness and encouraging positive action.
WSP4	CLOCA shall protect the Natural Heritage System as identified in **Figure 13** of this Plan to ensure "no net loss" to the watershed's Natural Heritage System in order to achieve watershed health targets.
WSP5	CLOCA shall protect the function of High Volume Recharge Areas (HVRAs) as identified in Figure 13 of this Plan by preserving pre-development recharge rates in these areas.
WSP6	CLOCA shall support all efforts to achieve 30% natural cover and to work towards 30% forest cover; 10% interior forest; 5% deep interior forest; 10% wetland cover; <10% imperviousness on the Oak Ridges Moraine and Greenbelt Lands; and 75% riparian cover along stream lengths.
WSP7	CLOCA shall continue to implement the requirements of Ontario Regulation 42/06 "Development, Interference with Wetlands and Alteration to Shorelines and Watercourses".
WSP8	CLOCA shall continue to adhere to and implement applicable legislation and regulations to protect human health and property and ecological integrity.

WSP9	CLOCA will continue to adhere to and implement all fisheries related legislation and policies, including the Federal Fisheries Act. CLOCA shall continue collaboration with the Department of Fisheries and Oceans Canada in accordance with the Level III agreement currently in place or in accordance with any future partnership agreements.
WSP10	CLOCA shall promote the implementation of appropriate buffers and set-backs from ecological features.
WSP11	CLOCA shall protect, restore or enhance significant geological, physiological and corridor features and functions within its jurisdiction.
WSP12	CLOCA shall conform to all internal protocols during the plan review process that protect the Natural Heritage System and enhance the ecological integrity of the CLOCA jurisdiction.
WSP13	CLOCA will continue to work with partners to acquire land for long-term protection.
WSP14	CLOCA shall monitor the key indicators of watershed health as appropriate and communicate existing and future trends to municipalities and partners.
WSP15	CLOCA shall endeavor to protect the quality and quantity of water resources through effective monitoring, reporting, plan review, conservation, and mitigation / restoration efforts to ensure human and ecological health.
WSP16	CLOCA shall continue to monitor and manage invasive species through the implementation of applicable management plans and strategies.
WSP17	CLOCA shall continue to manage Conservation Authority owned lands through established management plans that provide long-term protection and restoration recommendations. The enhancement of existing features of these lands supports the ecological health of the larger watershed.
WSP18	CLOCA shall encourage the use of best stormwater management techniques and technologies for protecting human safety and property as well as ecological health.
WSP19	CLOCA shall encourage all development to limit impervious surfaces within a watershed by encouraging Low Impact Development (LID), green technologies and any other suitable methods or tools.
WSP20	Lake Ontario is recognized as the ultimate drainage point of CLOCA's watersheds, with a fundamental ecological role to play in the environmental, social and economic health of the CLOCA jurisdiction. It is also recognized that Lake Ontario provides 100% of municipally supplied drinking water to residents. As such, CLOCA shall continue to strive to improve watershed conditions to support the features, function and overall health of Lake Ontario.
WSP21	CLOCA shall continue to support provincial and federal efforts to protect, manage and identify Species at Risk (SARs) and their habitat.

6 WATERSHED IMPLEMENTATION PLAN – MUNICIPAL PARTNERS

The success of a Watershed Plan is dependent on its effective implementation. This Watershed Plan has been written in a manner which directs practitioners to the specific recommendations and actions for which they are responsible to ensure a healthy and sustainable watershed. The previous section of this Plan provided recommendations and outlined actions that the Conservation Authority will be undertaking. This section provides municipalities with policies supporting municipal implementation of the Watershed Plan. These policies have been developed as tools to achieve the identified watershed targets, based on science and established through consultation.

These policies establish the necessary guidelines for protecting the features and functions of the NHS and HVRAs, which will allow municipalities to support their commitments for sustainability, biodiversity, protection of natural resources, conformity with provincial direction, and healthy, strong and vibrant communities. One of the many benefits of protecting the NHS and HVRAs is the predicted 15% reduction in anticipated surface water run-off from future development impacts. This reduction can translate into significant municipal savings by reducing the volume of stormwater requirements within the urban boundaries of the watershed and minimize flooding impacts.

These implementation recommendations are based on the extensive work completed in the 1995 Oshawa Creek Watershed Plan and the 2002 Oshawa Creek Watershed Plan. Together, these two previously completed documents provide an excellent foundation of recommendations for municipalities to play their crucial role in the protection, restoration and enhancement of their respective watersheds.

6.1 MEMORANDUM OF UNDERSTANDING WITH CLOCA

Currently, CLOCA has a Memorandum of Understanding with the Region of Durham that sets out the following goals with respect to natural heritage and hazard issues:

- To effectively address issues of provincial interest in the decision-making process on planning applications and planning documents for which the Region prepares, is the approval authority, or otherwise comments on;
- To ensure the implementation of Regional and Area Municipal Official Plan policies;
- To share information which would assist and expedite decision-making; and
- To ensure that each step of the Plan Review process is complementary and adds value to the decision-making process.

The Conservation Authority will provide advice and comments to the Region which shall include: recommendations from this Watershed Plan; flood plain management; the need for and adequacy of stormwater management plans; requirements under the Federal Fisheries Act; and information on the significance of natural heritage and hazard features and functions.

The Conservation Authority supports entering into similar Memorandums of Understanding with area municipalities to confirm the cooperation, support and partnership between the Authority and municipalities for implementing the Watershed Plan.

6.2 Historical Recommendations

Please refer to Section 5.2 of this Watershed Plan for a detailed table of historical recommendations from the 1995 and 2002 Watershed Plans. As the role of the Conservation Authority and our municipal partners is so intrinsically linked, the historical recommendations noted in the CLOCA implementation section of this Watershed Plan are applicable to our municipal partners as well.

6.3 Municipal Implementation through Policy Adoption

This Watershed Plan is a "science first" plan, documenting existing conditions, anticipating future changes and evaluating the impact these changes will have on the long term sustainability of the watershed. Goals, objectives and targets are set out in this Plan to ensure that the Oshawa Creek Watershed remains healthy and resilient in a changing landscape. Management recommendations are provided which will achieve the goals, targets and objectives identified in the watershed plan. Taking action to fulfill watershed plan recommendations cannot be done solely by CLOCA. Implementation relies on the participation of our partners, including Municipalities.

Direction is provided in provincial and municipal planning policy that watershed plans be implemented through municipal Official Plans (OPs). Official Plans set out the goals, objectives and policies to guide, manage and direct change (growth) over time in a responsible manner balancing social, economic and environmental needs. Durham Region's Official Plan guides future development throughout the

Watershed Planning Directions from the Durham Region Official Plan, 2008

2.3.8 The preparation and implementation of *watershed plans* is supported as an effective planning tool in the protection of the region's natural resources.

2.3.11 The Region, in co-operation with the conservation authorities, shall, where necessary, ensure that the appropriate policies to implement individual *watershed plans* are incorporated into the Regional and area municipal official plans.

Support for the development and protection of a Natural Heritage System from the Durham Region Official Plan, 2008

1.3.1 The goals of this Plan will be achieved through the following directions:

c) protecting significant features and functions of the natural environment;
d) encouraging development that will not have adverse cumulative impacts on the natural, built and cultural environments;
i) encouraging stewardship of land;
l) coordinating and managing the development of the Region in a manner that is consistent with provincial planning policies;
m) identifying and protecting resources in the Region;

2.3.2 The development of a connected and functional natural system comprised of the Greenlands System and additional linkages and corridors as identified in area municipal plans is encouraged.

Region and coordinates growth across 8 municipalities and 30 watersheds. Official Plans for the lower tier municipalities are more detailed, providing specific direction regarding community form, development type, location, density and design.

Adoption of the Oshawa Creek Watershed Plan into Municipal Official Plans makes certain that the goals, recommendations, and targets of the Watershed Plan will be implemented through development approvals triggered by the Planning Act.

Taking a "science first" watershed plan and ensuring that the goals and recommendations are effectively translated into planning policy is challenging. Since 2005, there has been significant effort by municipal planners and Conservation Authority planners to translate watershed plan recommendations into municipal plan policies. Using the *Watershed Planning – From Recommendations to Municipal Policies* document (as referenced in Technical paper series #9 of the ORMCP), CLOCA staff recommendations, policies developed by other Conservation Authorities, and through consultation with stakeholders, a suite of municipal planning policies translating the Oshawa Creek Watershed Plan goals, objectives and targets is offered in this Section as a tool supporting Municipal implementation of this Plan. The policies developed implement this Watershed Plan, CLOCA plan review and regulation policies. Municipalities will need to ensure that other environmental land use planning policies such as buffer setbacks established through the Greenbelt and Oak Ridges Moraine Conservation Plan are satisfied as these policy requirements have not been incorporated in the suite of policies offered. All recommendations of this Watershed Plan are predicated on meeting the specific health targets for the Oshawa Creek Watershed. Therefore, there may be instances where provincial or municipal policies are more restrictive than those recommended in this Plan. For instance, this Watershed Plan allows for a 10 m buffer to be provided from the dripline of a wooded area, whereas the ORMCP and Greenbelt Plan require a 30 m buffer from vegetated communities. It is the responsibility of the implementers of this Plan to ensure they are meeting all of their legislated planning requirements.

The various sections of this Watershed Plan are structured by Water Resources, Natural Heritage Resources and Transboundary / Anthropogenic Influences. To maintain consistency, the municipal policy recommendations follow this format as well as being further categorized as "Fundamental", "Key" and "Voluntary". This structure has been developed in response to consultation with our municipal partners, where it was suggested that municipalities would benefit from knowing which policies were fundamentally important for inclusion in official plan documents rather than those policies that could be used as guidance in other municipal documents. All "Fundamental" and "Key" policies are recommended to be included in upper and lower-tier municipal policies. "Voluntary" policy recommendations are generally more appropriate for lower-tier municipalities or other municipal guidance documents due to their level of detail, but can be applied in upper-tier OPs as well. Notes regarding specific implementation have been provided where appropriate to address any anomalies.

- **Fundamental** policies represent the high level goals and targets of this Plan. All upper and lower-tier municipalities should include these policies in their Official Plans as a minimum for achieving watershed health.

- **Key** policies are more detailed, directly impact the achievement of watershed health targets, and provide direct support for the fundamental policies. It is recommended that municipalities incorporate key policies wherever possible in their OPs to further strengthen the implementation of this Watershed Plan.
- **Voluntary** policies were developed to provide municipalities more specific policy guidance for dealing with detailed planning situations or operating standards. While these policies are fully supported by CLOCA for enhancing the implementation of the Key and Fundamental policies, they have been developed to provide specific guidance where additionally detailed policies were requested.

To illustrate how the policy relates to the watershed health targets identified through the development of the Watershed Plan, symbols representing broad health targets are provided beside each policy. Please note that the symbols are the same that have been used throughout the Plan as follows:


30% Natural Cover


10% Wetland Cover


< 10% Imperviousness on the ORM, and Greenbelt


75% Riparian Cover


A Healthy Water System

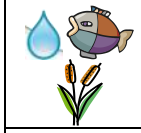

All Watershed Health Targets

It is fully understood that municipalities may alter some wording within the policies to better conform to their existing official plan wording. However, it is important that these revisions do not alter the meaning or intent of the provided policies.

For the most part, the existing official plans within the Oshawa Creek Watershed have strong environmental policies. An Official Plan review process offers an excellent opportunity to incorporate the recommendations of this Watershed Plan to ensure legislative compliance and provide full implementation support to achieve a healthy and sustainable watershed. Through the cooperative efforts of municipal partners, CLOCA and other watershed stakeholders, significant and tangible gains in watershed health can be made that enhance the natural, social, economic and cultural strength of watershed resources, municipalities and the Region.

TABLE 8: MUNICIPAL OFFICIAL PLAN POLICIES

Ref	Fundamental Municipal Official Plan Policies
Watershed Plan (General)	
F1	The Oshawa Creek Watershed Management Plan provides the foundation upon which to make environmentally sound decisions to maintain, improve, and enhance the watershed's future health. The goals, targets and recommendations for implementation and monitoring contained within this Watershed Plan shall be supported.
F2	To achieve a healthy watershed, the Municipality supports the following minimum watershed targets: 30% forest cover; 10% wetland cover; 10% interior forest; 5% deep interior forest; and 75% riparian cover along stream lengths. On lands within the Oak Ridges Moraine and Greenbelt, the percentage impervious surfaces shall not exceed 10%.
Water Resources	
F3	Water is recognized as a vital component of a healthy watershed and the protection of this valuable resource is necessary to ensure a sustainable, functioning hydrological and hydrogeological system consisting of sufficient water resources (quality, quantity and temperature) to support and protect: healthy aquatic and terrestrial ecosystems and ecological functions; clean drinking water for watershed residents; sustainable human use of groundwater resources for non-drinking water purposes; Lake Ontario as a drinking water source; and, human life, property and infrastructure from flooding and erosion hazards.
F4	Ground and surface water features include: • groundwater recharge areas including High Volume Recharge Areas (HVRAs); • groundwater discharge areas including seeps, springs, and baseflow contribution zones (baseflow to streams); • highly vulnerable aquifers; and • all watercourses including headwater drainage features, lakes, and wetlands. Watercourses, headwater drainage features, lakes and wetlands and some groundwater discharge areas are mapped as part of the Natural Heritage System. HVRAs are an important component of the Natural Heritage System, but for policy implementation, have not been incorporated into the mapped Natural Heritage System, but are identified on Schedule XX to this plan.

Ref	Fundamental Municipal Official Plan Policies
F5 	New development within watercourses, wetlands, and lakes is prohibited except flood and erosion control work and development permitted in accordance with applicable Provincial and/or Federal legislation.
F6	Development shall maintain a 30 m buffer from each side of the watercourse. A reduction in the buffer may be considered to a minimum of 15 m adjacent to warm water streams if it can be demonstrated that there will be no negative impact to the feature and function, and/or the Natural Heritage System, and that hazard and floodplain requirements can be met to the satisfaction of the Conservation Authority and the Municipality. The limit of the watercourse is describe as: • for a meandering stream with defined bed and banks, the line that connects the outside curve of the bank at bankfull stage; • for a non-meandering stream with defined bed and banks, the normal high water mark; • for lakes, the normal high water mark; • for an intermittent stream with no defined bed and bank, including headwater drainage feature, the centre line of a channel or depression that concentrates flow Where possible, headwater drainage features shall generally be protected. Notwithstanding, development may be considered provided the necessary technical studies are completed to the satisfaction of the Municipality and the Conservation Authority that assesses the aquatic, hydrologic and geomorphic attributes of the feature and function including management options.
F7	Removal or disruption to HVRAs will impact groundwater and surface water resources as well as those natural heritage features and habitat which rely upon groundwater inputs and surface water quality and quantity. Development within HVRAs may be permitted provided an Hydrogeological Impact Assessment is conducted which characterizes existing water balance and demonstrates that development will result in no loss to recharge functions attributed to the HVRA.
Natural Heritage Resources	
F8	Achieving a healthy, self-sustaining, connected Natural Heritage System is integral to ensuring a healthy and resilient watershed. Protection of this system is necessary to support ecological integrity including healthy terrestrial, wildlife, wetland and aquatic ecosystems.

Ref	Fundamental Municipal Official Plan Policies
F9 	The Natural Heritage System (NHS) as identified on Schedule XX of this Plan is a connected system consisting of PSWs, provincially significant ANSIs, important aquatic habitat, riparian corridors, core habitat areas and terrestrial corridors, woodlands ≥ 0.5 ha, wetlands ≥ 0.5 ha, and areas identified for natural cover regeneration/restoration that will improve connectivity and habitat. To achieve watershed targets, the Natural Heritage System shall be protected.
F10 	Development in the Natural Heritage System is generally restricted to: fish and wildlife management; conservation; forestry; existing uses; and, flood or erosion control projects except stormwater management facilities. Public trail development may be permitted provided there will be no negative impact to the features or functions of the Natural Heritage System, to the satisfaction of the Municipality in consultation with the Conservation Authority.
F11 	A connected natural system is vital to the health of the watershed. Regional, landscape, and local corridors are part of the Natural Heritage System, and are identified on Schedule XX of this Plan. The Municipality is committed to supporting the connectivity and continuity of wildlife corridors and ensuring that the function of these corridors will be preserved, enhanced and restored.
F12 	Lands within 1 km of the Lake Ontario Shoreline are identified as important ecological areas containing natural heritage features and functions including: • coastal wetlands; • migratory stopover sites; • beach/bluff communities; • shoreline processes including dynamic beaches; • habitat for endangered, threatened, and/or special concern species; and • a regional wildlife movement corridor offering unique habitat and movement opportunities. New development within 1 km of the Lake Ontario Shoreline shall incorporate site design criteria which limits development impact on: migratory species; resident species; important natural heritage features and functions; nearshore drinking water intakes, and wildlife movement corridors. Where development currently exists, the Municipality shall support education, restoration, rehabilitation and retrofit efforts to enhance natural features and functions.

Ref	Fundamental Municipal Official Plan Policies
F13 	In areas identified as habitat of an endangered /threatened /special species of concern, development shall only be permitted in accordance with the Endangered Species Act, 2007.
Transboundary Issues / Anthropogenic Influences	
F 14 	The Oak Ridges Moraine, Lake Iroquois Beach and Lake Ontario Shoreline are important landscape features, acting as large-scale wildlife corridors that support east-west movement, and connect with the north-south movement corridors in each of the watersheds. All effort shall be made to maintain and/or restore continuous corridor function within and between these features. The Oak Ridges Moraine and the Lake Iroquois Beach are significant physiographic regions that are important groundwater recharge areas, and the Municipality shall make every effort to ensure groundwater recharge and discharge functions are protected, including limiting, or prohibiting where appropriate, the introduction and/or expansion of impervious surfaces.
F15 	Development shall not result in any downstream impacts such as increased flood levels, stream erosion, or reduction in baseflow. Where every management measure has been taken and downstream impacts persist, alternative stormwater controls may be considered by the Municipality and the Conservation Authority.

Ref	Key Municipal Official Plan Policies
Water Resources	
K1 	Generally, development within or adjacent to significant groundwater discharge areas shall not be permitted unless an Environmental Impact Study and/or Hydrogeological Impact Assessment, demonstrating to the satisfaction of the Municipality in consultation with the Conservation Authority, that there will be no negative impact to the volume of baseflow function, and/or groundwater quality.

Ref	Key Municipal Official Plan Policies
K2	If any groundwater and/or surface water feature is identified within or adjacent to a proposed development area, but is not shown on Schedule XX, the feature shall be delineated and an Environmental Impact Study and/or Hydrogeological Impact Assessment shall be conducted as a requirement of development to the satisfaction of the Municipality in consultation with the Conservation Authority.
K3	The Municipality supports restoration of riparian areas and corridors to protect fish and aquatic resources. Development in riparian areas shall be restricted to: fish and wildlife management; conservation; forestry, existing uses, and flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted provided there will be no negative impact to aquatic habitat to the satisfaction of the Conservation Authority. Riparian areas shall be managed to achieve a naturalized, vegetated condition.
K4	The Municipality supports natural stable stream channels and corridors that: allow for natural stream flow patterns; support diverse aquatic habitat; limit sediment loadings; and protect human life, property and infrastructure from risks associated with flooding, erosion and slope instability. Where in-stream work and/or stream realignment is proposed, the principles of natural channel design and use of biological engineering techniques and technologies, to the satisfaction of the Conservation Authority, shall be incorporated in the final design and construction.
Natural Heritage Resources	
K5	An Environmental Impact Study (EIS), prepared to the satisfaction of the Municipality and the Conservation Authority, shall be required where a natural heritage feature is identified within or adjacent to a proposed development area, but beyond the limits of the Natural Heritage System. The EIS shall delineate the feature and function, determine the significance of the feature and function, assess its contribution to the ecological system including the Natural Heritage System, and evaluate whether it shall be protected or if mitigation can be provided to address any loss to the feature and/or function.
K6	Development adjacent to the Natural Heritage System may be permitted subject to submission of an Environmental Impact Study to the satisfaction of the Municipality in consultation with the Conservation Authority that demonstrates no negative impact to the feature/function and appropriate buffers between development and the Natural Heritage System are identified.

Ref	Key Municipal Official Plan Policies
K7	Where possible, new transportation and infrastructure projects shall avoid wildlife corridors, and/or demonstrate that there will be no barrier to wildlife crossing functions. Where every reasonable effort has been taken and wildlife barriers will result, adequate wildlife crossing provisions must be provided as part of the approval, to the satisfaction of the Municipality in consultation with the Conservation Authority. Improvements to existing infrastructure, including roads, shall incorporate measures to eliminate barriers to wildlife movement and include measures to accommodate enhanced wildlife movement.
K8	A minimum buffer of 10 m past the drip line of wooded areas shall be protected. Development in the buffer is restricted to; fish and wildlife management, conservation, forestry, existing uses and flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted in the buffer provided it is demonstrated to the satisfaction of the Municipality in consultation with the Conservation Authority that there will be no negative impact to the features and/or functions.
K9	A minimum 30 m buffer shall be provided from provincially significant features within the Natural Heritage System, and a minimum 15 m buffer shall be provided from all other wetlands in the Natural Heritage System. Development in the buffer is restricted to; fish and wildlife management, conservation, and flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted provided it is demonstrated to the satisfaction of the Municipality in consultation with the Conservation Authority that there will be no negative impact to the features and/or functions.
K10	Invasive species and the spread of invasive species represent a significant threat to watershed health. The Municipality supports best management practices for controlling invasive species including: a) ensuring native or non-invasive species plantings are used on all publicly owned lands; b) ensuring vegetation plantings associated with development approvals use only native or non-invasive species plantings; c) prior to development, site reconnaissance is undertaken to identify and delineate all on-site invasive species and a management/removal plan be prepared in consultation with the Conservation Authority; and implementing best management practices for control/removal and management of invasive species.
Transboundary Issues / Anthropogenic Influences	
K11	When opportunities for public ownership arise, all reasonable effort will be made to support the acquisition and/or conveyance of lands within the Natural Heritage System.

Ref	Key Municipal Official Plan Policies
K12	That new development and redevelopment within the Two Zone Flood Plain Management Policy Area, as shown on Schedule XX for the Goodman and Oshawa Creeks, shall be consistent with CLOCA's Two Zone Flood Plain Management Policies.
K13	Prior to approval of intensification of proposed land uses, in addition to other municipal requirements, a thorough assessment shall be completed to ensure flooding conditions will not be exacerbated for upstream and/or downstream properties.
K14	Prior to approval of urban boundary expansions, in addition to other municipal growth requirements, a thorough assessment shall be completed to ensure flooding conditions will not be exacerbated for upstream and/or downstream properties.
K15	The Municipality supports effective, low impact management of stormwater run-off to protect the ecological health of the watershed and contribute to the protection of human life and property during storm events, including incorporation of a best management treatment train approach with increased emphasis on lot level/source, Low Impact Development (LID) technologies and conveyance methods in addition to traditional end-of-pipe methods. Alternative stormwater management designs and practices should be explored for all new developments to minimize and attenuate runoff volumes, peak flow rates to pre-development levels and appropriate temperatures of stormwater discharge to streams. Stormwater management measures that meet multiple objectives (e.g. water quantity, water quality, erosion control, water temperature, infiltration etc.), and meet or exceed stormwater development standards set by the Municipality and the Conservation Authority are expected.
K16	Stormwater management facilities are a vital component of municipal infrastructure requiring regular monitoring and management. The Municipality will adopt and maintain a Stormwater Performance Monitoring and Maintenance Plan that sets out a regular performance monitoring and maintenance plan; a retrofit plan for existing facilities; and, the identification and prioritization of untreated areas for future stormwater management improvements and upgrades. To support this program, a municipal fund may be established to ensure dedicated funding is available to support the recommendations contained within the Stormwater Performance Monitoring and Maintenance Plan.

Voluntary Municipal Policies	
Water Resources	
V1 	High Volume Recharge Areas (HVRAs) are identified on Schedule XX to this Plan. Removal or disruption to these areas will impact groundwater and surface water resources as well as those natural heritage features and habitat that rely upon groundwater inputs and surface water quality and quantity. Development within HVRAs may be permitted provided that a hydrogeological impact assessment is conducted which demonstrates that development will result in no net loss to recharge functions attributed to the HVRA. A hydrogeological impact assessment shall: • identify recharge areas on-site and on adjacent lands; • identify the function and importance of the groundwater system for on-site and adjacent natural heritage features (wetlands, vegetation communities, aquatic habitat and fisheries), surface water quality and quantity, and groundwater discharge areas including seeps, springs, and baseflow contribution zones; • identify groundwater characteristics and linkages between the on-site aquifer system and broader regional surrounding groundwater system including: flow regime and connection to surface water features and functions; relationship to major and local aquifers; water table levels; aquifer vulnerability; and ground and surface water quality; • identify existing and proposed local consumptive groundwater uses including location and use of wells within 1 km of the site; • characterize water demand using information attained through Permits to Take Water for a 5km radius of the site; • identify local geologic units, including soil substrates, and assess the role these units have in the hydrogeological system; • confirm water budget/balance, and include a detailed water balance on a catchment area basis for existing and post-development conditions; • ensure that development will maintain or enhance pre-development groundwater recharge rates; • ensure that hydraulically connected features, including groundwater discharge (baseflow) features, are not adversely affected; • confirm that groundwater quality is not impacted; • confirm that impervious surfaces are minimized and measures to increase infiltration are incorporated in site design; and • ensure adaptive management, mitigation and monitoring strategies to ensure ground and surface water integrity. For minor development, such as an addition to an existing structure, it shall be determined that the development will have no net loss on the recharge function of the HVRA.
V2 	Development and site alternation will be set back from both sides of a watercourse in accordance with the flood or erosion hazard limit, as defined by the MNR Technical Guides, and shall include the erosion access allowance.

Voluntary Municipal Policies	
V3 	Development impacts affecting stream temperature shall be mitigated through methods such as: providing adequate vegetated riparian buffers; limiting impervious surfaces; providing effective and efficient stormwater management techniques and facilities; and protecting groundwater discharge areas and baseflow to stream. These practices shall be encouraged and incorporated into site designs wherever possible.
V4 	Infrastructure and transportation projects shall demonstrate that there will not be any impediment to stream flow, fish movement or aquatic habitat. Improvements to existing infrastructure, including roads, shall incorporate measures to eliminate any existing and/or future impediment to stream flow, fish movement or aquatic habitat. Where existing instream barriers exist, the Municipality and the Conservation Authority will work together to determine the best method of removal or preservation.
V5 	New facilities where contaminants may be stored in large quantities, including fuel, DNAPLS, pesticides, herbicides and road salt, and new Municipal snow storage facilities shall not be permitted within HVRAs. Exception may be permitted where it can be demonstrated that there will be no negative impact to groundwater quality. Opportunities to retrofit existing facilities, including municipal snow storage facilities, to minimize potential impacts shall be encouraged. New Municipal snow storage facilities shall not be located within 30 m of a waterbody, including wetlands. Exceptions may be permitted where water quality run-off is mitigated through buffers or treatment demonstrating that there will be no negative impact to water quality in receiving streams and/or wetlands. The Municipality will consider undertaking improvements to existing municipal snow storage facilities located within 30 m of a waterbody and/or wetland that will mitigate or eliminate untreated runoff to the waterbody/wetland.
V6 	The Municipality supports the Region of Durham water conservation practices.
V7 	While maintaining public safety, the Municipality will support minimizing road salt usage on public roads in the Natural Heritage System, and areas adjacent to waterbodies and wetlands. The Municipality supports site design of parking lots that reduces the need for salt application and encourages the study and use of alternative methods or technologies on public lands to reduce salt usage.
Natural Heritage Resources	
V8 	An Environmental Impact Study, prepared to the satisfaction of the Municipality and the Conservation Authority, shall be required to confirm the extent of the Natural Heritage System (NHS), boundaries of natural features within the NHS, determine the ecological function of these features including significance with respect to the Natural Heritage System, demonstrate no negative impact to the feature/function, and identify appropriate buffers between the development and the NHS.

Voluntary Municipal Policies	
V9	Where every possible alternative has been considered and no other option exists, development may be considered on lands within the Natural Heritage System (NHS) that have been identified for natural cover regeneration/restoration provided it can be demonstrated through an Environmental Impact Study, prepared to the satisfaction of the Municipality and Conservation Authority that: • the area of additional lands to be added to the NHS will exceed the area of lands removed and the added lands will abut other portions of the NHS on the subject lands; and/or, • corridor connectivity will be enhanced/restored and protected.
V10	The Conservation Authority has a Level III agreement with the Department of Fisheries and Oceans Canada for the review and approval of proposals/projects where Section 35 of the Canada Fisheries Act is applicable. The Municipality supports the continued collaboration between the Conservation Authority and the Department of Fisheries and Oceans Canada.
V11	Where possible, greenspace areas on publicly owned lands will incorporate natural cover and be managed to achieve a naturalized vegetated condition.
V12	To protect natural features and functions and to limit potential damage to property and human life, the splitting or partitioning of natural areas and/or hazard lands through lot creation will not be permitted. In cases where a lot-line adjustment is proposed and both existing lots contain portions of a natural hazard, natural feature and/or the natural heritage system, the Authority may support a lot-line adjustment provided the proposal: • is not for the purpose of facilitating a building envelope which would encroach upon the NHS or any natural hazard or natural heritage feature; • will not necessitate or encourage any new or upgraded crossings of the features for the purposes of site access or egress; and • existing crossings are sufficient for the intended land use.
V13	The aquatic system includes fish and fish habitat, watercourses and waterbodies, riparian areas, and groundwater resources. The quality, quantity and health of these components influence the overall health of the aquatic system. The Municipality recognizes the aquatic system as an important ecological component of watershed health which shall be protected.
V14	Improvements to existing infrastructure located within the Natural Heritage System shall reduce, and where possible, eliminate impacts generated by existing infrastructure. Improvements to infrastructure through the use of appropriate technologies and mitigation measures, as well as opportunities to remove or decommission existing infrastructure, shall be investigated.

Voluntary Municipal Policies	
Transboundary Issues / Anthropogenic Influences	
V15 	The quality of the air we breathe is an important factor in human health. Air quality also plays a role in ecological health. The impact of development on air quality shall be considered during review of development applications.
V16 	The Municipality shall encourage efforts to adequately monitor air quality changes, trends and impacts that could impact human and ecological health.
V17 	The Municipality shall support the Conservation Authority's efforts to document baseline indicator conditions and track future changes in conditions to assess impacts of climate change. If negative impacts are identified or predicted through this monitoring work, adaptive management strategies will be created in coordination with the Conservation Authority where appropriate.
V18 	The Municipality, in consultation with the Conservation Authority shall consider the need for adaptive stormwater management measures including alternative stormwater management facilities and designs to address anticipated increases in storm frequency and magnitude as a result of climate change.
V19 	The Municipality supports the Conservation Authority's implementation of the requirements of Ontario Regulation 42/06 "Development, Interference with Wetlands and Alteration to Shorelines and Watercourses". In accordance with this regulation, development proposed within the regulated area requires permission from the Conservation Authority. Within the regulated area, the Conservation Authority shall be consulted for: development activities proposed adjacent or close to the shoreline of the Great Lakes and river system and inland lakes that may be affected by flooding, erosion, dynamic beaches; river or stream valleys; hazardous lands; lands in and adjacent to wetlands; and the straightening, changing, diversion or interference in any way with a watercourse.
V20 	Municipal transportation plans shall support reducing the number of stream crossings and fragmentation of natural heritage features wherever possible.

Voluntary Municipal Policies	
V21	Diversion of water from an existing drainage catchment to another catchment is discouraged and every effort shall be made to maintain drainage patterns and watershed boundaries.
V22	All new infrastructure shall respect natural drainage patterns, and approval will require confirmation of appropriate minor/major systems, management of external drainage, and discharge to appropriate outlets.
V23	The Municipality will manage Watercourse Improvement Programs and respond to stream erosion where structures and services are at risk.
V24	Applications for development shall include an assessment of hydrologic impacts to demonstrate that peak flow rates will not exceed pre-development rates for the 1:2 year through 1:100 year design storm events and the Regional (Hurricane Hazel) Event. Where possible, appropriate mitigation measures may be considered by the Municipality and the Conservation Authority.
V25	Stormwater quality and quantity, and run-off will be controlled and treated to the satisfaction of the Municipality in consultation with the Conservation Authority. Pre-development runoff rates, flow paths, water quality and stream temperature shall be maintained. Where appropriate, the Municipality and the Conservation Authority may determine that stormwater quantity controls are not required, but in no case shall stormwater quality controls not be in place.
V26	Discharge of stormwater to a receiving watercourse must be outletted in a manner that does not adversely impact channel morphology, stream bank erosion or natural water temperature regimes of the receiving stream /feature. A geomorphological investigation shall be conducted to ensure that the impacts of stormwater discharge on streambank erosion are minimized.
V27	Road, transit and other infrastructure projects that include expansion of an existing service shall incorporate appropriate stormwater management for new and existing services/facilities.
V28	Stormwater management ponds that are entrenched within a watercourse will not be permitted, and support will be provided to Conservation Authority efforts to remove these stormwater management ponds from the system.
V29	Where stormwater management facilities do not exist or provide limited water quality treatment, efforts will be made to retrofit all areas with approved stormwater management facilities using the most recent technologies and best management practices.

Voluntary Municipal Policies	
V30	Redevelopment and infill development shall provide measures to improve water quality and quantity controls, including where possible, treatment of run-off from existing adjacent development.
V31	The Municipality shall investigate opportunities to provide quantity control in areas identified to have undersized pipes/culverts that could impede water conveyance.
V32	Environmental Management Plans for major infrastructure at the detailed design stage shall be required to address details of mitigation measures during construction.
V33	Major recreation uses such as golf courses, ski facilities and other private/public recreational facilities shall adopt Best Management Practices for pesticides, herbicides, nutrient and water use including water conservation practices.
V34	A Subwatershed Plan shall be prepared prior to undertaking a Secondary Plan. The recommendations and policies contained within this Plan will provide guiding environmental and land use planning principles to be used in the development of the Secondary Plan. The Subwatershed Plan shall characterize existing subwatershed conditions, identify opportunities and constraints for development, assess impacts of development on the health of the subwatershed, and provide protective measures, restoration opportunities, mitigative methods and opportunities to manage impacts from development including cumulative development impacts. Specifically, the plan shall: • Identify, evaluate and model existing conditions including natural heritage features and functions, natural hazards, hydrogeology, fluvial geomorphology, hydrology and shall: - confirm the extent of the Natural Heritage System; - determine natural heritage features/functions beyond the subwatershed to identify connections with the larger watershed Natural Heritage System; - identify natural heritage features/functions within the subwatershed outside of the Natural Heritage System; - identify significant groundwater resources and prepare a hydrogeologic impact assessment; - confirm the extent of HVRAs and pre-development recharge rates; - conduct a water budget/balance to include detailed water balance on a catchment area basis for existing conditions; - delineate natural hazards; and - prepare or update existing hydraulic and hydrology work including hydrological modeling for existing and future stormwater runoff including 2, 5, 10, 25, 100 and regional storm events, and prepare updated flood line mapping where required. • Conduct opportunities and constraints analysis to identify and address impacts of development on the Natural Heritage System, ground and surface water resources including: - how natural ecological systems and processes, including groundwater and surface water resources, will be maintained and improved;

Voluntary Municipal Policies	
	- identification of areas requiring additional buffers to protect the sensitivity of the feature/function; - preparation of a water budget/balance for post development conditions; - identification of opportunities to support infiltration and recharge at pre-development rates; - measure change in imperviousness and run-off, and prepare a stormwater management plan; - identify areas requiring further detailed study prior to site development; and - identify cumulative impacts to all the natural resources within, adjacent to, upstream and downstream of the study area as a result of the proposed development. Prepare a plan to ensure subwatershed health is not negatively impacted by the development, which can include protective measures, restoration opportunities and mitigation methods.
V35 	The Municipality supports opportunities to reduce the amount of impervious surfaces, increase infiltration, and implement design standards for all new developments and redevelopments including municipal facilities and lands, that incorporating LIDs, green design standards, and other available techniques to support sustainable environmental design.
V36 	At a minimum, as a condition of approval, all development will be required to apply, or maintain, a minimum application of 300 mm of topsoil, which can be amended with compost, during final site grading. It shall also be required that scarification of subsurface soils on all lands other than the building footprint be undertaken prior to final grading. Additional soil treatments shall be encouraged where appropriate to mitigate construction compaction impacts and support water infiltration and run-off retention.
V37 	During construction, topsoil stripping shall be restricted until draft approval is obtained. At no time shall the entire site be stripped, rather removal of topsoil shall be phased to allow site stabilization and re-vegetation to occur as soon as possible. Appropriate erosion prevention and sediment controls shall be in place prior to topsoil stripping.
V38 	Where it has been demonstrated to the satisfaction of the Municipality and Conservation Authority that the impact of development cannot be sufficiently addressed, and there is no other reasonable alternative to fully mitigate impacts, compensation may be considered in addition to mitigation efforts as a means of ensuring a net gain to the overall Natural Heritage System.
V39 	Opportunities for public acquisition of lands along Highway 407 corridor shall be investigated as potential compensation for ecological losses incurred due to development, use, operation and maintenance of Highway 407.
V40	The potential of archaeological resources within 300 m of a waterbody or stream shall be considered prior to development and the Province shall be contacted for guidance in this matter. *(Included as per Ministry of Culture request to recognize in Watershed Plans)*

7 WATERSHED IMPLEMENTATION PLAN – OTHER PARTNERS AND STAKEHOLDERS

Protecting, restoring and enhancing watershed health requires the cooperation of all stakeholders. Every person has an impact on the environmental, social and economic health of the watershed through their everyday lives and actions. This section of the Watershed Plan outlines the key ways in which our major stakeholder groups, in addition to our municipal partners, can work with us to achieve a healthy Oshawa Creek Watershed.

7.1 STRATEGIC PRIORITIES FOR STAKEHOLDER ENHANCEMENT OF WATERSHED HEALTH

Priorities for our other partners and stakeholders are provided in the context of CLOCA's Strategic Priorities over the next five years, the policies provided to municipalities for incorporation into Official Plan documents, and as a reflection of the Action Plans as discussed in **Section 5** of this Watershed Plan.

1. Active Engagement and Participation

Actively engaging and participating in the protection, restoration and enhancement of the watershed is crucial. Personal observations and insight add to the local knowledge base that can help create uniquely appropriate and creative solutions for local problems and opportunities. Restoration opportunities within the watershed largely occur on private lands, providing many diverse opportunities for stakeholders to directly and positively enhance watershed features and functions. Participation by residents, land owners, schools, community groups and the development community ensures that a holistic, appropriate, beneficial and tailored management approach can be achieved in the watershed. A fundamental active engagement principal is to encourage learning and participation in our young stakeholders. Children have an immense capacity to create changes when they develop an understanding of their connections, contributions and impacts on their environment.

2. Continuous Learning and Increasing Awareness

Watershed and resource management actions are constantly evolving as conditions, science and technology change. It is important for stakeholders to continue to learn new facts and lessons about the ecology of the watershed, and how conditions are changing so they can be prepared to interpret and incorporate the information into their daily lives and activities. It is equally important to raise the awareness of stakeholders not yet engaged in beneficial watershed activities.

CLOCA offers many programs and opportunities to encourage and enhance learning for residents and students. Please see **Appendix F** for a list of programs offered, encouraged and participated in by CLOCA as well as contact information for future involvement or questions.

3. Information and Data Sharing

Data and information is the foundation for managing a watershed. By sharing available information, data and sources with CLOCA, stakeholders can make a very real contribution to watershed health. This information informs actions, planning and decision-making so that all environmental, social and economic factors are represented and considered during the planning and implementation stages of watershed management.

4. Partnering and Coordination of Resources

Community partners are a very important part of protecting, restoring and enhancing the ecological integrity of a watershed. Partners can offer the funding, volunteers and donations essential for completing many projects to enhance watershed health. Coordinating resources can also gain efficiencies, not only for CLOCA, but for schools, academic institutions, community groups and businesses to further their goals. CLOCA values each of its partners, and is committed to working with all interested parties in cooperative efforts that protect, preserve and enhance the watershed

5. Responsible Land and Resource Stewardship Practices

A cornerstone of achieving a healthy watershed is the responsible use of land and resources. Every resident, land owner, business and guest in this watershed has an impact on its ecological features and functions. Through messaging this concept, positive changes will protect our watershed for generations to come. There are numerous opportunities to reflect this belief in daily life in the context of things like: lawn care and gardening practices; building techniques and technologies; water consumption rates and interactions; transportation alternatives; and consumption and disposal of goods. CLOCA offers education, support and resources for all stakeholders to practice responsible land and resource stewardship.

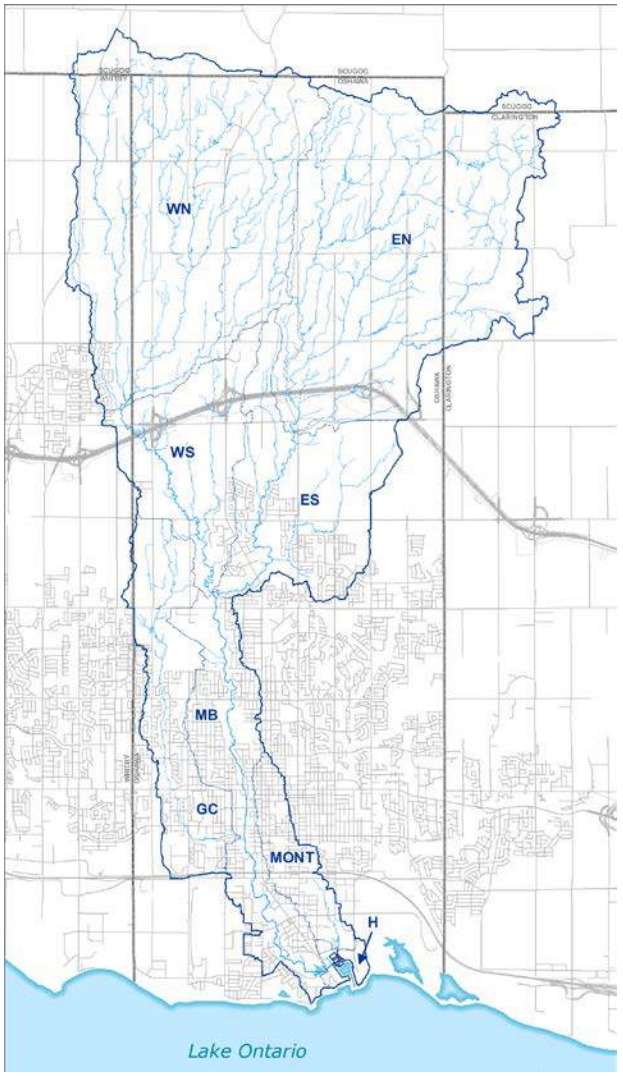
7.2 Historical Recommendations

During the development of the 1995 Oshawa Creek Watershed Plan a substantial public consultation process was undertaken, including a public questionnaire from 1992. Exhibit 1 of that Watershed Plan is the 'Summary of Public Questionnaires', and it provides significant insight into the thoughts, assumptions and concerns of the stakeholders in the Oshawa Creek Watershed. Below summarizes the feedback from the questionnaires, and **Exhibit 6** shows the subwatershed names as they were at the time of the survey. The results provide an interesting historical perspective on watershed management and its importance to the community.

Enjoy / Need to Improve Leisure Outdoor Activities

- *Higher than average use of walkways is indicated for MB and GC, with significant need for improvement indicated for ES and WN.*
- *Use of bike paths is well above average in MB, above average in GC and average in WN. EN and ES indicate low use of bike paths, with no use indicated by WS. Significant need for bike path improvement is indicated for ES.*
- *GC and MB both indicate above average use of park areas. WN is above average in terms of use, with MB and EN at average and ES and WN slightly lower. In terms of need for improvement of natural areas, WN reports high need for improvement, with above average need in ES.*
- *Picnicking is a highly ranked activity in EN, and near average in ES, MB and GC.*

EXHIBIT 6: SUBWATERSHED NAMES FROM THE 1992 PUBLIC SURVEY



- *From a recreational fishing perspective, WS and MB place a slightly higher than average emphasis on existing use. WN and ES place a high importance on improvement to recreation fishing opportunity.*

Water Management Preferences

- *In terms of numbers of weighted responses on a system-wide basis, preference for various water management measures is as follows, ranked top to bottom from most favoured to least favoured:*
    - *Clearing channel debris and obstructions*
    - *Headwater protection*
    - *Channelization*
    - *Land use controls*
    - *Water quality controls*
    - *Reservoir storage*
    - *Flood control structures (dams, dykes)*
    - *Flood warning systems and flood proofing*
- *Weighted preference for clearing channel obstructions, at the top of the scale, is 20 times stronger than for flood warning systems, at the bottom of the scale, with the rest fairly equally distributed in between.*
- *In terms of clearing obstructions, GC, WS and MB, in downstream and middle reaches prefer this option, where WN, ES and EN have below average interest.*
- *MB and WS favour channelization for water management. WN is average, and GC, ES and EN indicate less than average support.*
- *EN is highly in favour of headwater protection. GC has no expressed interest, and the remaining sub-basin responses are just below average.*
- *Respondents in MB and EN strongly favour land use controls as a water management option. Preference is average in WN and ES, quite low in GC and WS indicates zero preference.*
- *Regarding flood storage ponds or reservoirs, MB is well above average, GC is above average, the East Branch (ES and EN) are below average and the West Branch (WN and WS) show no support for this water management approach.*
- *Stormwater quality controls are highly favoured in MB, preferred above average in ES and well below average in EN. On the west of the watershed, GC indicates below average preference, with WS and WN showing zero preference for water quality runoff control.*
- *MB highly favours flood control structures, such as dams and dykes. GC and ES have above average interest, and WS, WN and EN indicate zero preference for these measures.*
- *Questionnaire results are quite interesting concerning preference for flood warning as a water management measure. Only two of six subwatersheds had a preference – MB with 67% of total and EN with 33%. All others had zero preference.*

Pollution

- *Subwatershed responses regarding who has primary responsibility to keep pollution out of the Oshawa Creek system were reported as follows:*
  - *Landowners received the highest response*
  - *CLOCA was a close second*
  - *MNR / MOE / City of Oshawa virtually tied, and*
  - *The Developer with the lowest pollution responsibility.*
- *Regarding Landowners, WN indicated strong pollution responsibility, with ES and MB slightly above average, EN and GC at average and WS below average.*
- *CLOCA is cited as having above average responsibility for keeping the stream unpolluted by MB, GC, and WN. WS, and ES are below average.*
- *MNR responsibility for a pollution-free creek is highlighted by WS and, to a lesser degree, MB. GC is average, with EN and ES showing lower than average response.*
- *MOE is cited strongly by GC and also by WN for pollution-free responsibility to keep pollution out of the Oshawa Creek system. EN is average, ES is quite low and WS has no response.*
- *Developers are identified most strongly in WN and MB as having responsibility to keep pollution out of the waterways. EN and GC are average, where the central subwatersheds ES and WS place little to no responsibility on developers.*

Environment

- *From an overall system viewpoint:*
  - *Erosion Management is the highest priority,*
  - *Vegetation protection is second,*
  - *Shoreline building is next,*
  - *Stormwater runoff management is fourth,*
  - *Fish/Wildlife protection is fifth,*
  - *Flood control is next,*
  - *Water withdrawal is the lowest concern.*
- *Concern for erosion management is fairly evenly spread across all sub-basins.*
- *Concern for vegetation protection is strongest in the lower MB and GC urban subwatersheds, with average to lower than average concern north of Taunton Road.*
- *Building along shorelines is a very high concern on the West Branch at WN and, to a lesser degree, at WS. EN, GC and MB are near average, with ES well below average.*
- *Stormwater Runoff Management is a high concern in the WS and MB. GC and ES have average watershed concerns with headwater areas at WN and EN having quite low interest.*
- *Fish and Wildlife Protection interest is highest in the MB, GC and WN, average at ES and well below average at EN. WS indicates zero need for more fish/wildlife protection information, policies or guidelines.*
- *Flood control is of high interest along MB and above average concern at GC. Central subwatersheds at WS and ES show below average interest, with WN and EN in the headwater showing very low interest.*

- *Concern about Water Withdrawals is above average for WN, below average for ES and EN and near average for MB, GC, and WS.*
- *General concerns include:*
    - *Stream pollution in the MB and GC lower reaches;*
    - *Ice flooding at Thomas Street Bridge and lower MB;*
    - *Erosion in the Kaiser Crescent area along MB;*
    - *Snow dumping on the bank of MB, north of Adelaide Street;*
    - *Erosion and flooding concerns adjacent to Cabot Street in GC;*
    - *Flooding at Dundee Park, on GC north of Adelaide Street; and*
    - *Camp Samac dam blocks fish spawning passage in ES.*

Recognizing that these comments are from the 1992 survey, the benchmark of stakeholder concerns is interesting and provides valuable insight into what the stakeholders in this watershed found important and/or concerning from a watershed planning perspective. These comments will be used as input into developing the CLOCA Community Engagement Plan as they provide a set of reference concerns as context and input into the plan to engage stakeholders in future.

7.3 Applying the Watershed Plan on Private Property

Private landowners play a key role in ensuring that we have healthy watersheds now and for the future; caring for our land, air and water sustains the natural processes on which life depends. How we treat our land impacts not just ourselves, but also our neighbours and future generations.

There are a variety of ways that CLOCA can support private land owners when they want to make ecological improvements to their property. Most commonly, CLOCA implements existing stewardship programs funded by third parties / partners. As these programs change and evolve, it is suggested that private owners interested in stewardship work on their lands contact CLOCA directly for up to date information and guidance. Additionally, there are Best Management Practices available for rural and urban land owners to increase the ecological integrity of their lands. These guidelines can be obtained from CLOCA, and advice is available for interested stakeholders.

Through the Watershed Plan, CLOCA will be increasing contact with private land owners in the identified Natural Heritage System to determine if there is interest in working with the Authority on various stewardship programs designed to increase the health of the watershed.

When a private resident wishes to build on or change the “use” of their property, approval may sometimes be necessary from their municipality and / or CLOCA to undertake the work. This process can be overwhelming for the inexperienced, as both the

municipality and CLOCA have some unique roles, responsibilities and legislative requirements to fulfill.

The information below has been provided to offer some clarity and general guidance for private land owners interested in CLOCA's approval / permitting process. This guidance is not exhaustive, and it is recommended that residents speak with planning staff at CLOCA and//or their municipality for more in-depth information. Interested stakeholders should also read CLOCA's Regulation and Plan Review Policy and Procedural Guideline available at www.cloca.com or by contacting CLOCA staff.

7.3.1 CLOCA's Roles

One of the fundamental roles of CLOCA focuses on water-related natural hazard prevention and management, and the protection of natural heritage features and water resources. In this regard, CLOCA undertakes the following roles and activities:

i. **Resource management agency** - CAs are local watershed-based natural resource management agencies and in accordance with Section 20 and 21 of the Conservation Authorities (CA) Act, develop programs to sustainably manage the natural resources in their jurisdiction.

ii. **Regulatory authority** - under Section 28 of the CA Act, CLOCA is responsible for implementing and enforcing Ontario Regulation 42/06 to prohibit, restrict, regulate or give required permission for certain activities in and adjacent to watercourses, floodplains, hazard lands, shorelines and wetlands.

iii. **Delegated 'provincial interest' in plan review** - CLOCA has been delegated responsibilities from the Minister of Natural Resources to review and provide comments on municipal policy documents (official plans and comprehensive zoning by-laws) and applications submitted pursuant to the Planning Act as part of the provincial one-window plan review service.

iv. **Public commenting body** - pursuant to the Planning Act, CAs are 'public commenting bodies' that provide input on and planning and development applications.

v. **Technical advisory role -** CLOCA has a partnership memorandum with the Region of Durham which acknowledges our watershed management expertise and provides guidance in carrying out plan review. With regard to providing input, the Authority shall provide comments and advice in the context of a number of Provincial Acts and Legislation, the Federal Fisheries Act, watershed plans, water resources, flood & erosion control, natural hazards, stormwater management and management of natural heritage resources.

vi. **Service provider -** CLOCA has a level 3 agreement with Fisheries and Oceans Canada (DFO) to review proposed works for potential harmful alteration, disruption or destruction of fish habitat pursuant to Section 35 of the Federal Fisheries Act.

vii. **Landowner –** CLOCA, as a landowner, manages its lands to ensure that the natural heritage values are protected, and environmental education opportunities are made available. Also, the Authority may become involved in the planning and development process, either as an adjacent landowner or as a proponent.

7.3.2 Permits from CLOCA

CLOCA's permitting process is mandated under Section 28 of the Conservation Authorities *Act*. The regulation currently administered by CLOCA is Ontario Regulation 42/06: Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Pursuant to this Regulation, a permit is required from CLOCA prior

to any of the following works taking place within defined regulated areas:

- Straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream or watercourse, or for changing or interfering in any way with a wetland; and
- Development.

Development is defined in Section 28 of the Conservation Authorities Act as:

- The construction, reconstruction, erection or placing of a building or structure of any kind,
- Any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- Site grading,
- The temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere.

Extensive mapping of the regulated area has been undertaken by CLOCA in support of Ontario Regulation 42/06. The general regulated area is delineated by mapping and identifies the area of interest, not the development limit. The regulated area includes flooding and erosion hazards associated with riverine systems and the Lake Ontario shoreline, hazard lands, along with wetlands, and areas of interference around the wetlands.

It is important to note the mapping is not definitive in terms of identifying areas subject to Ontario Regulation 42/06. There may be features described in Ontario Regulation 42/06 that are not mapped but are still subject to the Regulation.

Before work/development (filling, grading/site alteration, or construction) can proceed in an area regulated by CLOCA, a permit must be issued. Application forms are available at CLOCA's administration office and on the website (www.cloca.com). The complexity of the permitting process can vary depending on the type and location of works proposed.

7.3.3 Plan Review By CLOCA

When a land owner wants to make a change to their property that requires a planning approval from their municipality, CLOCA provides technical assistance in the plan review process. In accordance with the Memorandum of Understanding with the Region of Durham, CLOCA plan review services include the following:

- Attending pre-consultation meetings for the purpose of determining study requirements and compliance issues related to the environmental/hazard related policies of this document, provincial legislation, plans and guidelines;
- Reviewing and commenting on planning applications and documents within the context of the Conservation Authorities Act, the Planning Act, the PPS, the Environmental Assessment Act, the Fisheries Act, the Oak Ridges Moraine Conservation Act and Plan, the Greenbelt Act and the Greenbelt Plan, and the Clean Water Act;
- Reviewing and commenting on planning applications and documents within the context of the identification, function and significance of natural heritage and hydrological features

and systems and the review of studies which assess impacts on these features and areas;
- The need for and adequacy of stormwater management plans from a watershed management perspective; and
- Information and analysis of natural hazards and water management.

7.4 How to Get Involved

Any stakeholder idea, suggestion or plan to help achieve watershed health will be considered and supported if possible. All stakeholders that would like to become involved or more involved in protecting the watershed should visit our website and/or contact or visit CLOCA's office and speak to reception for direction to the most appropriate person and department to investigate how we can work together. We very much look forward to working with our existing partners as well as any new stakeholders who would like to contribute to watershed health.

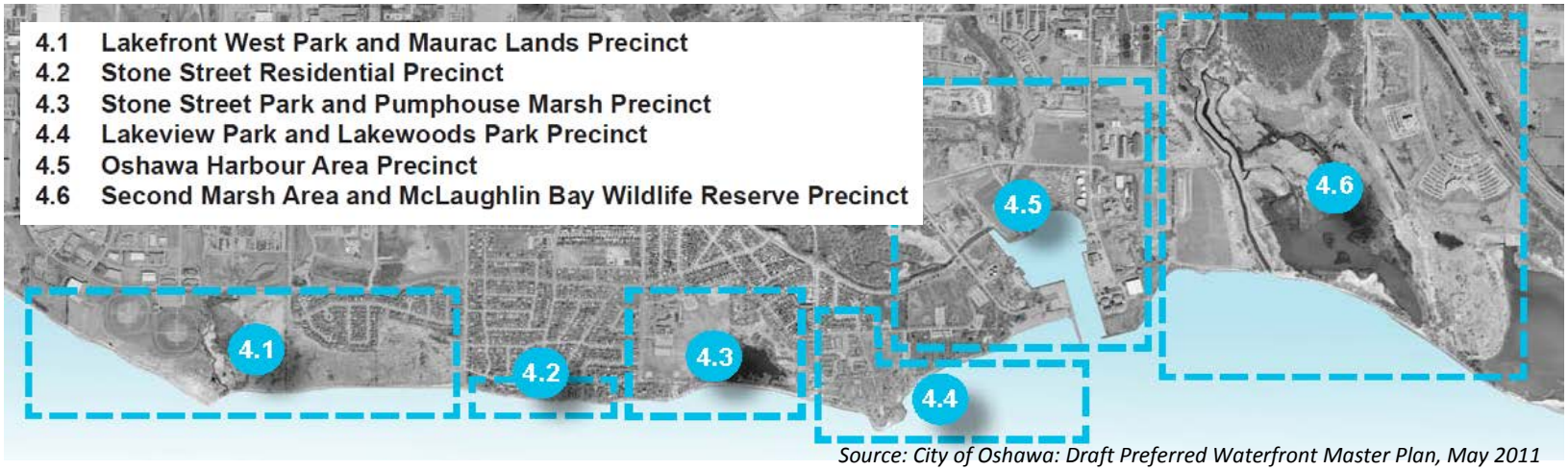
Central Lake Ontario Conservation Authority (CLOCA)
100 Whiting Avenue
Oshawa, ON L1H 3T3
Phone: (905) 579-0411 Fax: (905) 579-0994
www.cloca.com

8 WATERSHED IMPLEMENTATION PLAN – UNIQUE MANAGEMENT AREAS

8.1 THE OSHAWA HARBOUR

In May 2011, the *City of Oshawa: Waterfront Master Plan – Draft Preferred Waterfront Master Plan* was released providing a comprehensive waterfront vision and implementation strategy for the entire City of Oshawa waterfront. CLOCA participated as a commenting stakeholder during the development of this draft Master Plan. This draft Waterfront Master Plan and the Oshawa Creek Watershed Plan converge at the Oshawa Harbour, where the Oshawa Creek outlets into Lake Ontario via the drowned river marsh known as the Oshawa Creek Marsh. **Exhibit 7** below shows the Oshawa Waterfront Master Plan Precincts, and the draft preferred option of the Oshawa Harbour Area Precinct is provided in Section 4.5.4 of the draft Oshawa Waterfront Master Plan. This option recognizes that the Oshawa Harbour has long been a commercial and industrial focal point along the Lake Ontario Shoreline, and proposes to balance the historical uses with new uses, creating an "urban centerpiece", yet continuing to recognize the important environmental areas. Implementation of the preferred option is guided by principles and strategies, 3 of which are consistent with guiding principles echoed repeatedly throughout the Oshawa Creek Watershed Plan as a basis for ensuring healthy watersheds, being "connected", "sustainable" and " balanced". CLOCA supports the establishment and use of these 3 principles, particularly from a watershed planning perspective along the Oshawa waterfront and within the Oshawa Creek Harbour Precinct.

EXHIBIT 7: DRAFT OSHAWA WATERFRONT MASTER PLAN PRECINCTS



Source: City of Oshawa: Draft Preferred Waterfront Master Plan, May 2011

The Oshawa Harbour is an important component of the Oshawa Creek Watershed and represents a significant element in the overall health of the Oshawa Creek Watershed. There are a number of activities that CLOCA would like to work with the City of Oshawa to implement for the achievement of our mutually beneficial Watershed Plan and Master Plan goals. The re-development of the Oshawa Harbour provides an excellent opportunity for improving the health, longevity and vitality of this extremely important economic, social and environmental area in the City of Oshawa. Through cooperative efforts, this re-development can significantly enhance the natural cover and water quality of the Oshawa Creek Watershed.

8.2 Two-Zone Flood Plain Management Policy Areas

CLOCA currently implements a two-zone flood management strategy in the urban area of the City of Oshawa with limits reaching King Street in the north, the CP rail line in the south and encompassing the lands surrounding Gibb Street **(Exhibit 8).** These policies were developed in two phases:

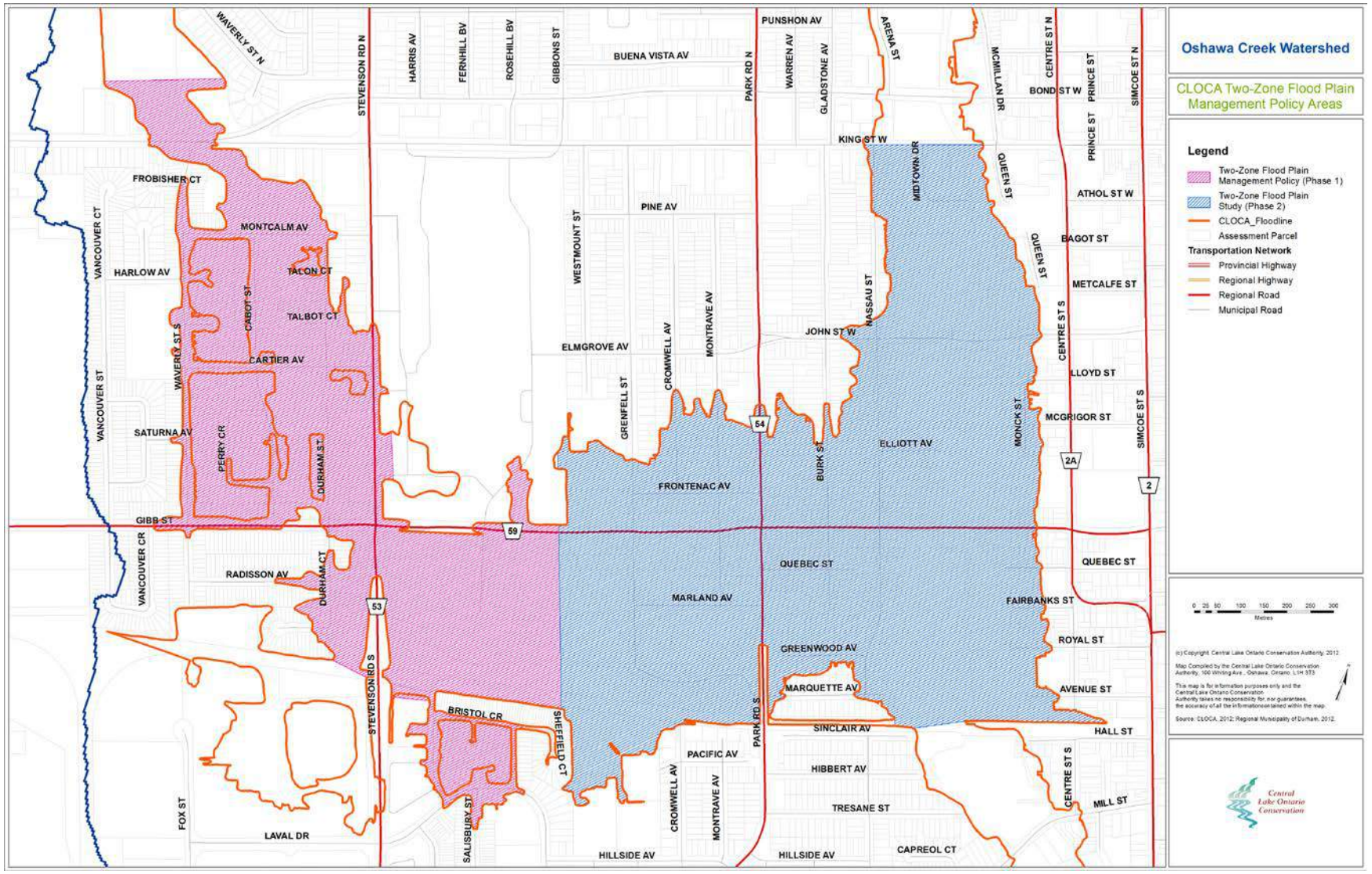
1. Two Zone Flood Plain Management Policy For a Reach of the Goodman Creek (Phase 1); and
2. Oshawa and Goodman Creek Two Zone Flood Plain Management Policy Phase 2 – Immediately upstream of the Canadian Pacific Railway.

In 1998, the CLOCA Board of Directors adopted the Two Zone Flood Plain Management Policy For a Reach of the Goodman Creek. The Oshawa and Goodman Creek Two Zone Flood Plain Management Policy Phase 2, immediately upstream of the Canadian Pacific Railway, is pending imminent approval by the CLOCA Board of Directors as part of the Regulation and Plan Review Policy and Procedural Guideline.

These policies provide direction on the type, form and location of development that may be permitted within this area based on the identification of a floodway, a flood fringe area and safe access. The floodway is defined as the inner portion of the flood plain representing the area required for the safe passage of flood flow and/or that area where flood depths and/or velocities are considered to be such that they pose a potential threat to life and/or property. The flood fringe is the outer portion of the flood plain where flood depths and velocities are less severe and where development may be permitted subject to certain established standards and procedures.

The policies outline certain standards and procedures that must be addressed in the flood fringe areas, and these policies differ from the specific policies for implementing CLOCA's Regulation 42/06 with respect to flooding hazards associated with a river and stream valleys (one-zone systems).

EXHIBIT 8: TWO-ZONE FLOOD PLAIN MANAGEMENT POLICY AREAS



8.3 Montgomery Creek Subwatershed

Montgomery Creek flows southeast to Oshawa Harbour through a narrow, urban influenced valley **(Exhibit 9).** There is well established riparian vegetation along the creek valley that serves numerous vital functions, such as filtration of overland water flow, moderation of creek temperature, provision of essential habitat for urban tolerant species, and stabilization of the valley during peak storm events.

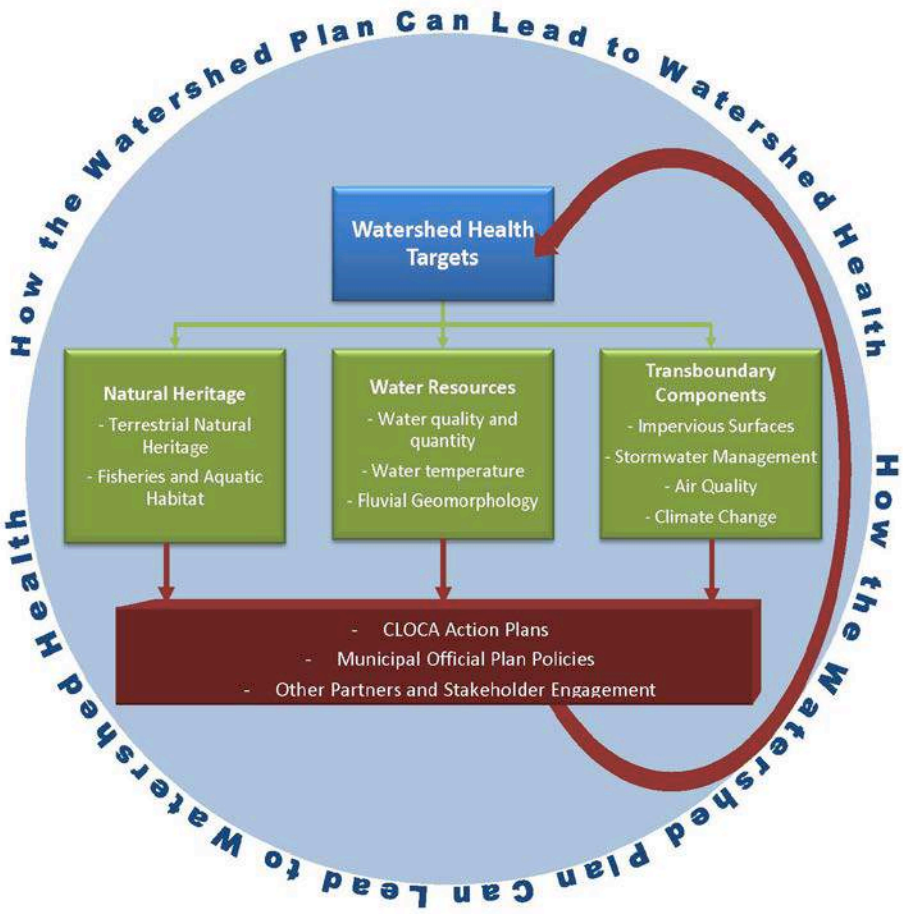
The Montgomery Creek Subwatershed is the smallest of the subwatersheds and has the smallest portion of the NHS. Intensive uses such as residential areas and industrial lands exert the greatest influence on the character of this Subwatershed. In 2000, Environment Canada completed *The Oshawa Harbour Pollution Prevention Study* that examined the concentrations of various chemicals in the surface water and sediments found within the Montgomery and Oshawa Creeks. The study concluded that Montgomery Creek is the major source of pollutants in the Harbour, and that the Montgomery Creek is contaminated.

Due to Montgomery Creek's existing and historic intensive land uses, severe damage has been done to the quality of water resources throughout the entire creek. Piping of northern tributaries exacerbates the poor water quality conditions. Given the well-documented and historical understanding of this degraded Subwatershed, the Montgomery Creek is noted as a Unique Management Area as it requires some specialized approaches to stewardship, remediation and restoration efforts as described in Action Plan #24 – Montgomery Creek Restoration Plan.

EXHIBIT 9: MONTGOMERY CREEK SUBWATERSHED

9 MONITORING AND EVALUATING SUCCESS

Watershed Plans are updated every five years from the date they are finalized to reflect the constantly changing conditions, pressures and trends in a watershed. It is important to be able to determine if the recommendations and Action Plans contained in this Watershed Plan have been effective so that decisions are made moving forward on how to best continue protecting, restoring and enhancing the watershed. In order to do this, the following basic monitoring and evaluation structure has been developed. The Watershed Plan update, when developed, will refine this structure to ensure that all aspects of the Implementation Plan are considered in order to effectively evaluate success.



9.1 WATERSHED HEALTH TARGETS

To determine if watershed health is improving, it is important to monitor and report on each of the watershed targets outlined in the Existing Conditions Work. **Table 9** below outlines the watershed components that will continue to be monitored for change, as well as some quantitative indicators that contribute to the complete picture of watershed health. The table includes data from the 1995 conditions, the 2002 conditions and the updated 2011 conditions. Future updates of this Watershed Plan will continue to track these key indicators of watershed health as a means of assessing the success of programs, the health of the watershed and to make policy and program recommendations.

TABLE 9: WATERSHED TARGET MONITORING

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
WATER COMPONENTS OF WATERSHED HEALTH							
Protect and enhance public safety, private property and infrastructure from erosion and flooding	• Risk to public and private property	• Most serious flood hazard identified in the mainstream Oshawa Creek-Goodman Creek confluence bounded by the CP Rail line to the south, John Street to the north, Stevenson Road to the west and Simcoe Street to the east (impact to 668 buildings).	• See 1995 conditions.	• See 1995 conditions.	• Protect private / public property and public safety.	•	•
Protect, restore and enhance groundwater recharge and discharge features	• High Volume Recharge Areas (HVRAs)	• Most significant recharge is north half of watershed in the Iroquois Sand Plain Aquifer and is vulnerable to contamination.	• Northern half of watershed – Oak Ridges Moraine (280 to 300mm recharge300300 mm recharge per annum). (p63)	• Oak Ridges Moraine and Lake Iroquois Beach. (p81)	• Maintain pre-development infiltration / recharge rates.	•	•
	• Discharge Areas	• Most predominantly in the Lake Iroquois Sand Plain.	• Most predominant on south slope and Lake Iroquois Beach.	• Most predominant on south slope and Lake Iroquois Beach.	• Maintain average annual baseflow rates.	•	•
Protect, restore and enhance groundwater quality	• Groundwater Chemistry (metals, nutrients)	• N/A	• Note: The Provincial Groundwater Monitoring Network (PGMN) only started monitoring groundwater quality at CLOCA in 2002. Laboratory results became available in 2003.	• 2 monitoring wells (part of the Provincial Groundwater Monitoring Network - PGMN). • One well at Raglan in ORM aquifer complex at 1616 m (W0000049-1) and second east of Columbus in ORM aquifer complex at 1919 m (W00000262-1). • Chloride and sodium concentrations in W0000049-1 are at the levels found in the natural environment. Chloride concentrations show increasing trend but still below the ODWS prescribed limit. Sodium occasionally exceeds the Aesthetic Objective (AO) limit. Cl has mean concentration value (MCV) of 3.02 mg/L; increasing trend. Na has MCV of 31.85 mg/L (exceeds AO); no trend. • The levels of chloride and sodium at W00000262-1 are within the ODWS prescribed limits of 250 mg/L and 20 mg/L, respectively. Cl has MCV of 9.18 mg/L; Na has	• Maintain groundwater levels in water table and deeper aquifers. • Meet Provincial Water Quality Standards. • Prevent future deterioration beyond recorded current / ambient background nutrient levels.	•	•

<table>
<tr><th>Objectives:</th><th>Indicators:</th><th>1995 Conditions:</th><th>2002 Conditions:</th><th>2011 Conditions:</th><th>Targets:</th><th>5 Year Review Conditions:</th><th>Explanation of Change:</th></tr>
<tr><td></td><td></td><td></td><td></td><td>MCV of 4.92 mg/L. Both have no trend.
• 0.33 mg/L iron concentration was exceeded in all samples from W0000049-1.</td><td></td><td></td><td></td></tr>
<tr><td>Ensure sustainable supply of groundwater for consumptive use and ensure surface water demand does not exceed surface water supply</td><td>• CLOSPA (Central Lake Ontario Source Protection Authority) Stress Assessment</td><td>• N/A</td><td>• N/A</td><td>• Quantity Recharge: 0.589 m^3/s
• Quantity In: 0.197 m^3/s
• Quantity Supply: 0.786 m^3/s
• Quantity Reserve: 0.0650 m^3/s
• Quantity Demand: 0.0300 m^3/s
• % Annual Consumption: 4.17
• Groundwater Stress Level: Low
• PTTWs: 1655 permits
• Surface Water Stress Level: Significant
• Trends: decreasing streamflow</td><td>• Reduce current Stress Assessment Level to “Low” vs. the current condition of “Moderate”.</td><td>•</td><td>•</td></tr>
<tr><td>Protect natural baseflow</td><td>• Baseflow levels</td><td>• 10 stations measuring baseflow
• Average baseflows increase over late summer/fall from about 0.6868 m^3/s in August to about 1.00 m^3/s in mid-November (p45).
• Lake Iroquois Sand Plain provides baseflows to southerly reaches and the ORM for northern reaches.</td><td>• Data from Taunton Road stream gauge – 160160 mm/yr based on a 30 year streamflow record. (p67)</td><td>• 39 stations in Oshawa Creek (138 stations within CLOCA) (average flow per station - refer to Figure 13 p 38).</td><td>• Maintain long-term average and seasonal baseflow levels.</td><td>•</td><td>•</td></tr>
<tr><td>Protect and restore surface water quality to meet approved (current) standards</td><td>• Benthic Communities (aquatic insects)</td><td>• 11 quality monitoring stations
• Upper reaches had best quality, mid reaches recorded good to fair and lower reaches fair to poor conditions (using the BioMap methodology.
• Water quality degradation in the downstream portion of Oshawa Creek and at Goodman Creek.
• Water quality in the headwaters of Oshawa Creek shows less water quality degradation than in midstream or downstream locations.
(Exhibit D, p34)</td><td><table><tr><th>ite</th><th>Description</th><th>Condition</th></tr><tr><td>OA01</td><td>Oshawa Harbour, Urban</td><td>I mpaired</td></tr><tr><td>A02</td><td>Oshawa Harbour / Montgomery Creek, Urban</td><td>I mpaired</td></tr><tr><td>A03</td><td>Oshawa Harbour / Oshawa Creek Mouth, Urban</td><td>I mpaired</td></tr><tr><td>A04</td><td>Montgomery Creek, south of Wentworth St., Urban</td><td>I mpaired</td></tr><tr><td>A05</td><td>Main Branch, close to Oshawa Harbour, Urban</td><td>I mpaired</td></tr><tr><td>A06</td><td>Main Branch, north of Hwy 401, Urban</td><td>Se asonally Impaired</td></tr><tr><td>A07</td><td>Goodman Creek, north of CPR tracks, Urban</td><td>U n-impaired</td></tr><tr><td></td><td>Main Branch, south of Adelaide St.,</td><td>U</td></tr></table></td><td>• Historical biological impairment evident in urban areas.</td><td>• Improve all surface water benthic community quality ratings to un-impaired.</td><td>•</td><td>•</td></tr>
</table>

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
			<table><tr><td>A08</td><td>Urban</td><td>n-impaired</td></tr><tr><td>A09</td><td>Main Branch, north of Taunton Road, Wildland</td><td>U n-impaired</td></tr><tr><td>A10</td><td>East Branch, north of Conlin Road, Agriculture</td><td>U n-impaired</td></tr><tr><td>A11</td><td>West Branch, south of Winchester Road, Agriculture</td><td>U n-impaired</td></tr><tr><td>A12</td><td>East Branch, south of Winchester Road, Agriculture</td><td>U n-impaired</td></tr><tr><td>A13</td><td>West Brach, north of Columbus Road, Wildland</td><td>U n-impaired</td></tr><tr><td>A14</td><td>West Branch, north of Columbus Road, Wildland</td><td>U n-impaired</td></tr><tr><td>A15</td><td>West Branch, north of Columbus Road, Agriculture</td><td>I mpaired</td></tr><tr><td>A16</td><td>Road, Agriculture</td><td>I mpaired</td></tr><tr><td>A17</td><td>West Branch, north of Howden Road, Agriculture</td><td>I mpaired</td></tr><tr><td>A18</td><td>East Branch, north of Columbus Road, Agriculture</td><td>I mpaired</td></tr></table> Study shows that water quality is impaired at the downstream portion south of Hwy 401, unimpaired from Hwy 401 to Columbus Road, and impaired northward within the agricultural areas. Major contributors to pollution in urban areas are industrial waste, sewage, and untreated Stormwater. Nutrient enrichment is the cause in agricultural areas. *Note: Results from 2000 CLOCA Biological Water Quality Monitoring using BioMap*			
	• Biological Oxygen Demand (BOD)	• Negligible to low for north and mid reaches. • Moderate levels in Goodman, increased levels after rainfall in Main Branch.	• BOD at SWQ2 (1964-1997) has decreasing trend.	• SWQ2 – no data after 1997. • SWQ10 – no data. • SWQ11 – no data. (p50-51)	• Maximum BOD of 22 mg/L.	•	•
	• Dissolved Oxygen (DO)	• Low levels at several mid-stream stations.	• SWQ2SWQ2 (1964-1997): DO has mean concentration value of 9.8 mg/L. *Note: Surface water monitoring was revived only in 2002 under the PWQMN*.	• SWQ2 (2002-2008) mean concentration value is 9.78 mg/L; no trend. • SWQ10 (2002-2008) mean concentration value (MCV) is	• Maintain DO requirements needed to support fisheries. ➢ 4 – 77 mg/L in warm water streams. ➢ 5 – 88 mg/L in cold water streams.	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
				10.45 mg/L; no trend. • SWQ11 ((2002-2008) MCV is 11.96 mg/L; no trend. (p50-51)			
	• Chloride	• Variable levels depending on flow. • Moderate to high levels in Goodman and Main Branch.	• Increasing trend.	• SWQ2 (2003-2010) MCV is 68.2 mg/L; no trend. • SWQ10 ((2003-2010) MCV is 33.8 mg/L; no trend. • SWQ11 ((2004-2010) MCV is 25.1 mg/L; no trend. (p50-51)	• <150150 mg/L and/or a decreasing trend.	•	•
	• Phosphorus	• 14 PWQO exceedences from SW1, SW2, SW3, SW6, SW8, SW9, SW10, SW11 (throughout watershed).	• Exceedences from: OA01, OA02, OA03, OA04, OA05, OA06, OA07, OA08, OA09, OA10, OA11, OA13, OA14. (p58)	• SWQ2 ((2003-2010) MCV is 27 µg/L; no trend. • SWQ10((2003-2010) MCV is 19 µg/L; no trend. • SWQ11((2004-2010) MCV is 25 µg/L; no trend. (p50-51)	• <30 µg30 µg/L for streams and <20 µg20 µg/L for lakes and/or a decreasing trend.	•	•
	• Nitrates (NO_3)	• Variable levels. • Additive from headwater contributions.	• OA16 West Branch, north of Columbus Road, site impaired, high level of nutrient enrichment from direct livestock access, pesticide application and lack of riparian vegetation. • OA17 West Branch, north of Howden Road, site impaired, high level of organic enrichment from livestock access to the creek. • OA18 East Branch, north of Columbus Road, site impaired, high level of organic enrichment from animal access to creek at nearby zoo. • OA15 West Branch, north of Columbus Road, site impaired, high level of nutrient enrichment from agricultural practices. • OA07 Goodman Creek north of the CPR tracks, site impaired, organic and nutrient enrichment from untreated stormwater. • OA01, OA02, OA03 at Oshawa Harbour, impaired sites, organic enrichment, untreated sewage and contaminated stormwater. • OA04 Montgomery Creek south of Wentworth Street, site impaired, high level of organic	• SWQ2((2003-2010) MCV is 1.9 mg/L; no trend. • SWQ10((2003-2010) MCV is 1.0 mg/L; no trend. • SWQ11((2004-2010) MCV is 1.1 mg/L; no trend. (p50-51)	• 1010 mg/L and/or a decreasing trend.	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
			enrichment. *Source: CLOCA Biological Water Quality Monitoring of Oshawa Creek Watershed, 2000)*				
	• Copper	• 10 PWQO exceedences at SW1, SW8, SW9, SW10 SW11 (one on Winchester Road and all others recorded south of that point).	• Exceedences from: OA01, OA02, OA03, OA04. (p58)	• SWQ2((2003-2010) MCV is 1.6 µg/L; no trend. • SWQ10 (2003-2010) MCV is 0.55 µg/L; no trend. • SWQ11((2004-2010) MCV is 0.70 µg/L; no trend. (p50-51)	• 1-5 µg5 µg/L depending on hardness and/or a decreasing trend.	•	•
	• Suspended Solids	• Not available.	• Not available.	• Not available.	• Not currently available. *See "CLOCA Action Plans" section of this report for more detail on future work to set targets".*	•	•
Mitigate negative road salt impacts in sensitive areas of the watershed	• Road salt use in High Volume Recharge Areas (HVRAs) resulting in increased stream contaminant levels	• Elevated levels recorded through winter road salting period and into summer.	• Not available.	• Not available.	• Reduce / maintain historical / baseline water quality values as related to anthropogenic impacts) Some of the levels are natural because of dissolution..	•	•
Protect / restore / reduce stream temperatures to support aquatic life	• Stream Temperature	• Water quality and stream temperatures are generally within an acceptable range for the cold and warm water fish species. • Headwater/ midstream temperatures were well within the tolerable range (<20°C) for cold water species, and downstream temperatures were marginally acceptable. (p56) • West-2 and East 6 tributaries appear to maintain cool temperatures well downstream (reference map on p55).	• Temperatures are warming. • Intense land uses, on-line ponds, and removal of riparian vegetation result in downgrading of thermal stability. • Groundwater input areas have lower water temperatures during the summer and higher in the winter. (p79)	• Temperature collected in 2007 using hobo loggers at 41 sites. • Cold water sites present in mid to upper watershed. • Cool water habitat present in middle and lower watershed. • Warm water sites absent in the comprehensive dataset. (p109)	• Restore or maintain cold / cool water temperatures. • Restore and maintain seasonal temperature variations to natural fluctuations.	•	•
Protect, enhance and restore natural channel morphology and stability	• Rapid Geomorphic Assessment (RGA) and Rapid Stream Assessment (RSA)	• 18 high priority erosion sites identified. • 9 medium priority erosion sites identified. (p42)	• RGA: classification of 11 sites – 7 unstable, 3 stressed, 1 in regime. (p48) • RSA: classification of 11 sites - 6 fair health, 5 good health. (p50)	• No data provided. • Since 2002 sites 1, 3 and 10 have been improved using live crib walls, vegetated boulder treatments, native plantings. (p39)	• Achieve: ➢ Stability Index (SI) or <0.2 or "in regime" ➢ RSA health classification of excellent (40-50) or good (30-39)	•	•
NATURAL HERITAGE COMPONENTS OF WATERSHED HEALTH							
Protect, restore and enhance the ecological integrity of natural areas (including wetlands)	• Percent Natural Cover	• N/A	• Highest concentrations across the Oak Ridges Moraine and the Lake Iroquois Beach. (p86)	• 23% natural cover. (p139)	• Achieve and maintain a minimum of 30% natural cover in the watershed. • No decline in % natural cover.	•	•
	• Percent Forest Cover	• N/A	• 13% forest cover. (p86)	• 15% forest cover. (p139)	• Continual increases of watershed forest cover to achieve the long term target of 30% forest cover in the watershed.	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
	• Percent Wetland Cover	• 12 ESA's or ANSI's identified.	• Marsh and swamp only wetland types found. • Largest remnant wetlands located on Iroquois Beach, smaller wetlands present in headwater and riparian areas. (p88) • 2.5% wetland cover. (p111)	• 7% wetland cover. (p139)	• Increase existing wetland cover in headwater areas and no net loss of wetland cover in the watershed. • Achieve and maintain a minimum of 10% wetland cover in the watershed and greater than 6% wetland cover in each subwatershed.	•	•
	• Invasive Species	• N/A	• N/A	• N/A	• Continual improvement in the mitigation of invasive species impacts. • Implement CLOCA's Invasive Species Management Strategy.	•	•
Protect, restore and enhance the ecological integrity of wildlife habitat (non-aquatic)	• Habitat Diversity	• 9 locations in the watershed were identified as having superior potential to support wildlife populations. • Comprehensive biological study of the area has not been undertaken. (p58-59)	• Although watershed is entirely within a settled landscape, the diversity of habitats available for wildlife is relatively high. (p.94)	• 20 vegetation communities present and distribution shown figure 49. (p141)	• No loss of existing(?) Ecological Land Classification (ELC) system community types.	•	•
	• Habitat Distribution	• Increased habitat in north, but relatively good north-south distribution. • Connectivity gaps present.	• 8 wildlife habitat communities identified. (for distribution refer to Fig. 21, p95)	• 20 vegetation communities present. (for distribution refer to Fig. 49, p141)	• Maintain even distribution of natural and forest cover throughout the watershed.	•	•
	• Habitat Quality	• 9 locations in the watershed were identified as having superior potential to support wildlife populations. • Most serious issue is impact associated with proposed Hwy 407 location (loss of natural forested areas and associated wildlife inhabitants). (p60)	• Quality of habitat increases from the south to the north. • In south: forested valley systems are major habitat network for edge generalist and urban--tolerant species (eg. Raccoon and grey squirrel). • In north: farm woodlots and well forested valleys provide a good network of habitats for species (eg. Coyote, mink, white-tailed deer). (p94)	• 3 core habitat areas. • Oshawa Valleylands: southern region, very high habitat diversity. • Taunton North: good habitat diversity. • Enfield – Purple Woods: very high habitat diversity. (p146)	• Enhance habitat patches to have better shape vs. area ratios. • At least one 200 ha forest patch that is a minimum of 500500 m wide.	•	•
	• Percent Forest Interior and Deep Forest Interior	• N/A	• 1.4% 100m interior habitat. • 0.3% 300m habitat. (p112)	• 75% of forest interior and 100% of deep forest interior found in Enfield- Purple Woods in the north. (p146) • Approximately 7575 ha of forest interior.	• Achieve and maintain greater than 10% interior forest in the watershed. • Achieve and maintain greater than 5% deep interior forest in the watershed.	•	•
	• Corridor Width	• N/A	• 2 landscape corridors exist following the east and west branches of Oshawa Creek. • Local corridors present within most subwatersheds. • Three regional watershed corridors. • Amount and quality of	• Regional Corridors: 3 running east to west along Lake Ontario Shoreline, Lake Iroquois Beach, and Oak Ridges Moraine. • Landscape Corridors: corridor that connects Lake ON to Taunton North is highly fragmented. South of Bloor St.	• Achieve and maintain local corridors 60 m wide or greater. • Achieve and maintain landscape corridors 100 m wide or greater • Maintain and enhance 1 km of naturalized habitat along the Lake Ontario Shoreline where possible.	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
			• decrease from north to south. • Corridors in eastern half of watershed more extensive and valuable than those in western half. (p107-109)	and north of Rossland Rd corridor is high quality with width of 100100 m. Windfields and Raglan subwatersheds have continuous corridors with high quality vegetation. Kedron and Enfield subwatersheds corridors are robust with some fragmentation. • Local corridors: several local corridors with many being continuous and exceeding 100100 m. (p149-150)			
Protect, restore and enhance the ecological integrity of Coastal Wetlands	• Water Quality	• N/A	• N/A	• -1.23 (Very degraded).	• Achieve and maintain a Water Quality Index (WQI) of 00 to +1 (good condition) or higher.	•	•
	• Sediment Quality	• N/A	• N/A	• N/A	• N/AN/A	•	•
	• Submerged Aquatic Vegetation (SAV) Community	• N/A	• N/A	• 00.8 (Poor condition).	• Achieve and maintain a Submerged Aquatic Vegetation (SAV) IBI of 20-40 (Fair condition) or higher.	•	•
	• Fish Community	• N/A	• N/A	• 4040.86 (Good condition).	• Maintain a Fish IBI of 4040-60 (Good condition) or higher.	•	•
	• Bird Community	• N/A	• N/A	• 3434.1.	• Maintain a Bird IBI of 4040-60 (Good condition) or higher..	•	•
	• Amphibian Community	• N/A	• N/A	• 88.13 (Poor condition).	• Achieve and maintain an Amphibian IBI of 20-40 (Fair condition) or higher.	•	•
	• Aquatic Macroinvertebrate Community	• N/A	• N/A	• 1313.73.	• Achieve and maintain a Macroinvertebrate IBI of 20-40 (Fair condition) or higher.	•	•
Protect, restore and enhance the health and diversity of native / naturalized fish / aquatic communities	• Diversity and Distribution of fish communities	• 9 monitoring stations. • 15 fish species captured and identified in 1991/92 field program. (p55) ➢ American Brook lamprey, Coho and Chinook Salmon and Brook Trout observed ➢ A mix of cold and warm water species in Oshawa Creek (Brook Trout in upper headwaters only) ➢ Spring spawning rainbow trout are an established reproductive species	• 20 native fish species identified during 2000 field study. (p82)	• 35 fish species, representing 14 families present. (p121)	• Continued presence and abundance of all native fishes. • Steady or increased abundance and distribution of Brook Trout.	•	•
	• Aquatic Species At Risk	• N/A	• N/A	• No species at risk known to currently exist. (p121)	• Support, in partnership, the protection, restoration and enhancement of the distribution of Species at Risk (SAR). • Support MNR to achieve compliance with the Redside Dace Ontario Recovery Strategy, MNR,	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
					2009 and the 2011 MNR Habitat regulation. • Provide support to responsible authorities to apply habitat regulation for Eastern Pond Mussel. • Support, in partnership, the identification, restoration and preservation of sensitive habitat as defined in species specific recovery strategies.		
	• Invasive / non-native species (not applicable to naturalized species)	• N/A	• 4 non-native species identified during 2000 field study (rainbow trout, brown trout, Chinook salmon, and goldfish). (p 83)	• A number of aquatic invasive species present, including Goldfish and Common Carp. • Non-native species that are not invasive: rainbow trout, brown trout, Chinook salmon, Green Sunfish. (p 121)	• Absence and/or decline in abundance and distribution of invasive / non-native species. • Implement Invasive Species Management Strategy.	•	•
Protect, restore and enhance fish / aquatic habitat and riparian habitat	• Stream Barriers	• Private fishing groups remove beaver dams during spawning season. • Report recommended that no further permanent in-stream obstructions be permitted. • Numerous dams and culverts currently obstruct upstream migrations of lake-run salmonids and local movement of resident species.	• 15 permanent structures considered obstacles to fish migration in form of dams, weirs, culverts, and berms. (p79)	• 25 known in stream barriers, many of which do not restrict the movement of migratory species. (p111)	• Remove in-stream barriers where appropriate in priority sequence. • Protection of the ability of Salmonids as well as native non-jumping fish from Lake Ontario to spawn upstream in the watershed.	•	•
	• Percent riparian habitat per stream length	• In-stream cover and bank stability noted as "adequate". • Streambank vegetation and overhead canopy in many cases was absent or sparse. • Northern reaches have better riparian cover.	• North-south oriented valleys are generally well vegetated. • Oshawa Creek Valley lands through the urban centre are moderately vegetated with limited riparian cover.	• 30% of entire stream length has 3030 m riparian buffers based on 2005 Orthophoto interpretation. (p115)	• Increase quality and range of fish habitat (75% riparian stream target) with a 3030 m vegetated buffer on either side of the stream.	•	•
TRANSBOUNDARY COMPONENTS OF WATERSHED HEALTH							
Limit impervious land cover in watershed	• Percent imperviousness	*Note: Imperviousness and connected imperviousness values were assigned based on land use categories as predictive inputs into the scenario analysis, but not presented as a % cover statistic for the watershed. See Exhibit A – Hydrology Report, pg7 for a list of imperviousness values assigned to land use.*	• N/A	• Categorized by subwatershed: ➢ Oshawa Main: 39% ➢ Harbour: 58% ➢ Goodman: 34% ➢ Montgomery: 57% ➢ Winchester: 8% ➢ Kedron: 15% ➢ Raglan: 4% ➢ Enfield: 2% • Overall: 13% (p71)	• < 10% on ORM and Greenbelt Lands. • < existing % cover in urban areas. • < existing % cover on HVRA lands. • Increase the use of Low Impact Development (LID) / green technologies for future development and retrofits to existing development where applicable.	•	•
	• Connected imperviousness		• N/A	• N/A	• TBD *See "CLOCA Action Plans" section of this report for more detail on future work to set targets".*	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
Protect human life and property	• Flood Damage Centres	• 4 houses north of Columbus, 10 houses north of Taunton, extensive flooding above the CP rail main line, ice jamming at Thomas Street, extensive flooding due to CP rail back water, nuisance flooding in backyards in Goodman, overtopping of banks in Goodman and significant increases in hazards north of the Goodman detention pond.	• See 1995 conditions.	• See 1995 conditions. • Mapping is currently being updated.	• Limit flood damages and prevent further flood damage centres. • All new infrastructure to have no impediment to natural overland / surface water flows.	•	•
Protect and maintain existing watershed / subwatershed catchment boundaries	• Drainage patterns	• Total drainage area is 120.22 km² • West Branch -area: 49.66 km², basin slope: 1.5%, channel length: 13.22 km • East Branch – area:49.1717 km², basin slope: 2.5%, channel length: 11.77 km • Goodman Creek – area: 9.99 km², basin slope: 0.7%, channel length: 6.33 km • Main Branch – area: 11.44 km², basin slope: 0.5%, channel length: 10.99 km • Exhibit B, p.7	• On-going monitoring is in place.	• On-going monitoring is in place.	• Maintain existing watershed boundaries and drainage patterns. • All new infrastructure to mitigate potential impacts and risk to human life and property from increased surface flows.	•	•
Maintain pre-development peak flow rates from stormwater runoff	• Peak flow rates	• Larger at the upper end of the main branch than at the outlet because the local drainage areas react faster than the hydrograph from the upper watershed; also, the flood is attenuated by the channel and floodplain storage. Exhibit B, p10.	• West branch: decreased flow of 4% for the 2-year storm and an increase in flow of 2.7% for the 100--year storm • East Branch: decrease from 8.5% to 3.2% for (Refer to table on p46 for peak flows existing conditions). • both 2yr and 100yr storms • Goodman Creek: increased 53% to 68% • Oshawa Creek: increased between 0.63% and 0.84% for both 2yr and 100yr storms. (p46)	• See 2002 conditions. • Information is currently being updated.	• Peak flow rates on receiving streams must not exceed corresponding pre-development rates for the 1:2-year through 1:100-year design storm events and the Regional Event (Hurricane Hazel) *Note: exceptions include areas in proximity to Lake Ontario or where Master Plans exist and state otherwise.*	•	•
Effective and efficient performance of Stormwater Management Facilities	• Existing and new facilities	• N/A	• Scenario testing indicates that Stormwater management can accommodate anticipate peak flows. • All future development in hydraulic units W3, W2, W1.1, E3, E2, E2.1, E1.1, E1.2, G7 and G2 (as per Figure 8 in 2002 WSP by CLOCA) provide stormwater	• 16 SWM ponds and 11 OGS. (p64)	• Achieve enhanced Level 1 requirements. • Reduce thermal impacts. • Achieve intended designed flow control. • Reduce the number of structures impacted by flooding. • Reduce the number of flooding complaints. • New stormwater management facilities to mitigate all impacts to water quality including stream temperature.	•	•

Objectives:	Indicators:	1995 Conditions:	2002 Conditions:	2011 Conditions:	Targets:	5 Year Review Conditions:	Explanation of Change:
			management for all storm events (2 through 100 years). • Future developments that will drain directly to the Main Oshawa Creek, East Tributary or West Tributary may discharge without stormwater quantity control.		• Improve existing stormwater management facilities to reduce adverse ecological impacts of development.		
Sustain healthy levels of air quality for human health	• Ground level ozone	• N/A	• N/A	• Increasing trend.	• Reduction in average annual Ozone levels. • Monitoring of Nitrogen Oxides and Volatile Organic Compounds.	•	•
Sustain healthy levels of air quality for ecological health	• Lichens	• N/A	• N/A	• N/A	• TBD *See "CLOCA Action Plans" section of this report for more detail on future work to set targets".*	•	•
Protect, restore and enhance existing natural conditions to mitigate negative climate change impacts	• Precipitation	• Mean annual rainfall = 864 mm and 1651 mm of mean annual snowfall for the Lake Ontario shore climatic region.	• Prediction for future – precipitation events less frequent, but more severe. • Potential for more frequent and extended summer droughts will increase. (p40)	• 733 mm/year. (p26)	*Monitoring and climate change observations to be recorded to assist in future assessment of impacts and included in an adaptive management strategy. See "CLOCA Action Plans" section of this report for more detail on future work to set targets".*	•	•
	• Surface Run-off	• One gauge at mouth of Windfields and Kedron Subwatersheds (02HD008: Oshawa Creek at Oshawa).	• Prediction for future– less frequent, more intense precipitation cause more flooding and stream erosion. • Snow accumulation and melt patterns more frequent. (p40)	• 167.68 mm/ year. (p26)	• N/A		
	• Evapotranspiration	• N/A	• Prediction for future – rate increase. (p40)	• 396 mm/ year. (p26)			
	• Infiltration	• N/A	• Prediction for future – climate change will have negative impacts on infiltration – lowering of water tables and loss of groundwater discharge in areas. • 16% drier. (p40)	• 167.73 mm/ year. (p26)			
	• Air temperature	• N/A	• Prediction for future – expected to increase. (p40)	• Average annual temperature is 6.9°C. (p26)			

QUALITATIVE COMPONENTS OF WATERSHED HEALTH			
Objective:	**Indicator:**	**Target:**	**Description of Changes to Date:**
Protect, Enhance and Restore the Oshawa Creek Watershed to a be a Resilient Ecosystem with Ecological Integrity	• Enhancement of watershed health based on a holistic look at ecosystem health on a watershed basis, rather than by component.	• Increase in the majority of watershed component targets.	• "Much of the urban pollution in Oshawa Creek has been documented to result from industrial waste, sewage waste and untreated stormwater. The northern portion of the watershed, although classified as uncontaminated, it was observed as receiving some nutrient contamination from uncontrolled grazing and fertilizer runoff. The results of past studies indicate that there is a trend of decreasing chemical contamination in all parts of Oshawa Creek. However, despite this trend, there are still many areas of concern within the watershed." (pg. 57, 2002 CLOCA Watershed Plan).
Implementation, Acceptance and Support of the Watershed Plan	• Incorporation of recommended Official Plan policies, endorsement and support by all municipalities within the watershed.	• Incorporation of Watershed Plan policy recommendations into all appropriate Official Plans.	• The City of Oshawa has a long history of supporting watershed planning, beginning with the commission of the 1995 Oshawa Creek Watershed Plan undertaken by TSH. CLOCA will continue to seek the same level of municipal support for the CLOCA completed Oshawa Creek Watershed Plans (both the 2002 and 2013 versions) to continue the City of Oshawa's record of supporting Watershed Plans.
Long-Term and Sustainable Funding	• Increased commitment for long-term funding.	• Increase in sustainable, long-term funding for priority protection, restoration and enhancement programs.	• Long-term, stable funding exists for CLOCA core programming. Additional sustainable funding will continue to be sought to increase watershed health through the work being completed on the Action Plans described in this Watershed Plan.
Consistent and Long-Term Monitoring	• Increased ability to dedicate resources to long-term monitoring plans and objectives.	• Increase in long-term monitoring commitments for priority watershed components.	• More detailed requirements will be assessed and described in the appropriate Action Plans and then translated into resource needs for increased long-term monitoring commitments to meet CLOCA's current monitoring requirements.
Engaging Stakeholders through Stewardship and Education	• Increased engagement, participation, cooperation, education and communication with stakeholders.	• Dramatic increases in stewardship and education efforts with private stakeholders. • Development of a Communication and Marketing Plan to guide Watershed Plan implementation. • Increase in partnerships and cooperative efforts.	• CLOCA continues to struggle with funding and the appropriate level of resources required to effectively increase stewardship and education efforts within our jurisdiction. Additional planning and detailed requirements will be documented through the completion of Watershed Action Plans to support the future enhancement of these programs.
Filling Data Gaps	• Improvement in existing data gathering, management and sharing processes.	• Demonstrable filling of identified data gaps.	• Data gaps will be fully identified along with plans to fill priority gaps through the completion of various Action Plans.
Land Acquisition	• Continued increase in the acquisition of lands.	• Continued acquisition of priority lands for long-term protection, restoration and enhancement.	• CLOCA has a very strong land acquisition program that is further supported by the 2013 endorsement of a CLOCA Land Acquisition Strategy.

9.2 CLOCA Action Plans

Twenty four (24) Action Plans (APs) have been described in Section 5 of this Watershed Plan. These APs are the result of recommendations made by CLOCA staff for achieving the watershed component targets set out in **Table 9**, which in turn support the broader watershed health targets (30% natural cover, 10% wetland cover etc.). For each AP, the following questions are to be answered and scored according to the provided scale. Scores over 5 indicate a "successful" AP that should then be evaluated to determine if future enhancements to watershed health would result from the continuation of the AP. APs having scores of 3-5 will be evaluated to determine where improvements are necessary or could have been made, and to establish positive outcomes. Any AP scoring less than 3 will be considered "unsuccessful". "Lessons Learned" from the development and implementation of each AP will be communicated in the Watershed Plan update to help inform decisions regarding future or continued APs. Connections between successful APs and specific watershed targets outlined in **Table 9** above will be identified to help further assess future work to enhance watershed health. Action Plans that were not completed as anticipated will undergo a qualitative assessment to determine if they merit continuation in the next 5 years of implementation.

TABLE 10: CLOCA ACTION PLANS MEASURING SUCCESS

Question	Score		
1. Was the Action Plan Completed?	Yes = 2	Partially = 1	No = 0
2. Was the Action Plan supported through implementation?	Yes = 2	Partially = 1	No = 0
3. Has the Action Plan satisfied / contributed to the achievement of its strategic priorities?	Yes = 2	Partially = 1	No = 0
4. Has the Action Plan resulted in any gains to watershed health?	Yes = 2	Partially = 1	No = 0
5. Has the Action Plan resulted in any negative impacts to watershed health?	Yes = -2	Partially = -1	No = 0
	Total Score:		

9.3 Recommended Municipal Official Plan Policies

A series of Municipal Official Plan policies were recommended as part of the implementation plan of this Watershed Plan. For each policy, the following considerations will be assessed to determine if the policy is successful as recommended or if modifications to existing policies or additional policies are needed to support watershed health from a municipal perspective.

1. Was the policy incorporated into Official Plans?
2. Was the policy incorporated in other municipal procedures, programs or policies?
3. What type of feedback was received regarding this policy?
4. What would enhance this policy's ability to support watershed health?
5. What, if anything, is preventing this policy from effectively supporting watershed health?
6. Are modifications to the policy necessary to increase its effectiveness?
7. Does this policy require a supplemental / additional policy for incorporation into Official Plans, programs, procedures, or policies to increase effectiveness?

Municipalities will be consulted to seek feedback on the implementation of the Watershed Plan over the five years as well as for requesting advice and recommendations for future watershed management activities and planning.

9.4 Other Stakeholder Engagement

A qualitative assessment of the engagement of other stakeholders in the watershed will take place to determine if the approach recommended in this Watershed Plan and the resulting recommendations from applicable Action Plans is effective for engaging stakeholders. The following questions need to be asked in the context of the work undertaken during the five years of implementation time to determine the most effective means of continuing to engage stakeholders.

1. Has there been an increase in active engagement and participation in the watershed? What worked well, what did not work as anticipated?
2. Is there evidence of continuous learning by and with stakeholders in the watershed? What programs offered the best opportunities for continuous learning?
3. Has there been effective information and data sharing by and with stakeholders in the watershed? What lessons have been learned that will support the continued sharing of data and information?
4. Has there been an increase in partnering with stakeholders and in the coordination of resources to help achieve watershed health? What good examples can be used to highlight effective partnerships? What examples illustrate lessons learned that will be avoided in future endeavors?
5. Has there been evidence of responsible land and resource stewardship practices in the watershed? What examples can be provided to illustrate how stakeholders have continued or increased responsible stewardship initiatives?

10 KEY MESSAGES MOVING FORWARD

The Oshawa Creek Watershed has many unique features that need to be protected for future generations to enjoy. The Oak Ridges Moraine and Lake Ontario are just two examples of the unique attributes of this watershed that not only support a variety of ecosystems, but also enhance the quality of life for residents of the watershed. All stakeholders in the Oshawa Creek Watershed have the opportunity to experience these and other great natural areas. This Watershed Plan is a key step in ensuring that future residents and visitors will have this same opportunity.

10.1 EVERYONE HAS A ROLE IN WATERSHED HEALTH

Watershed planning is about more than knowing where our trees, animals and fish are. It is about how guidance, based on the ecological features and functions of an area, can be provided for decision-makers so that a healthy watershed remains a priority as an area grows and develops. The majority of this Watershed's Implementation Plan focuses on what CLOCA will do over the next 5 years to lead the charge towards a healthier and more ecologically resilient watershed, as well as how municipalities can endorse, support and enforce watershed policies. That does not mean that other stakeholders don't have an extremely important role to play in improving watershed health. As you have read, there is a lot of restoration and enhancement work to be done that will help us achieve our targets. The fact is that most of these opportunities are on private land, which means that we need urban and rural residents, land owners, farmers, the development community and businesses to join with us to voluntarily get some substantial on-the-ground work done in the watershed. CLOCA prides itself on its strong customer service approach and aims to work collaboratively with various partners.

As noted above, one stakeholder group that needs to be highlighted is school children. This stakeholder group has enormous potential to achieve and maintain watershed health if they are engaged early and consistently. The recycling program is an example of how educating children is a very effective way to affect change in daily life: it fundamentally shifted the habits of an entire generation such that today, throwing an aluminum can into the garbage is unthinkable. The possibilities for eliciting behavioural changes that positively impact the watershed are endless, ranging from lawn care procedures, to water conservation, to energy consumption, transportation choices and everything in between.

10.2 Implementation = Action = Success

This Plan is a guiding document that has been developed and written to be consistently and repeatedly used by all stakeholders for activities that impact the watershed. The focus has been placed on the user for implementation of recommendations and strategies that will achieve watershed health. Much work needs to be done to achieve the watershed targets. It is not enough to simply identify where we need and want to go for watershed health, rather, we have to systematically take action on each of the priorities in order to realize the benefits that a healthy and resilient watershed will provide for the health, well-being and prosperity of its residents.

Some of the identified watershed targets will be harder to achieve than others simply based on how much degradation has occurred to each watershed component to date. However, all targets can be achieved through effective and efficient cooperation between stakeholders to make the protection, restoration and enhancement of this watershed a priority.

10.3 This Watershed Plan Can Affect Change

Not only is watershed planning generally accepted as the best way to keep our resources healthy, it is a legal requirement through the Oak Ridges Moraine Conservation Plan, and recommended in many other federal and provincial guiding documents.

This Plan is intended to be the authoritative guidance document for watershed planning to be used by decision makers, residents, land owners, farmers, community groups and the development community to work together to achieve the ultimate goal of a healthy, resilient watershed in the context of our changing landscapes.

This plan can affect change through: the enforcement of watershed recommendations at the municipal level; protection, restoration and enhancement work; stewardship, education and awareness activities in the community; and participation in the process of achieving watershed targets by the development community through innovative design and conformity to policy. This Watershed Plan can lead all efforts to achieve and maintain a healthy watershed.

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GLOSSARY OF TERMS

Adjacent Lands: Lands contiguous to a specific natural heritage feature or area where it is likely that development or site alteration would have a negative impact on the feature or area. The extent of the adjacent lands may be recommended by the Province or based on municipal approaches which achieve the same objectives.

Agricultural Uses: The growing of crops, including nursery and horticultural crops; raising livestock; raising of other animals for food, fur or fibre, including poultry and fish; aquaculture; apiaries; agro-forestry; maple syrup production; and associated on-farm buildings and structures, including accommodation for full-time farm labour when the size and nature of the operation requires additional employment.

Anthropogenic: Created by a human or by human influence.

Aquatic Habitat: An area that provides the physical and/or chemical features needed to sustain aquatic life which can include, but shall not be limited to, flow, temperature, quality and/or nutrients. Areas required for various life stages which aquatic species depend upon directly or indirectly (feeding, reproduction, rearing, migration routes, riparian zones) are considered necessary habitat.

Aquifer: An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay).

Bank Full Width: The point on each bank from which width is measured - usually indicated by a definite change in vegetation and sediment texture.

Benthic: Bottom dwelling organisms that spend all or part of their life cycle in water and are used as indicators of environmental conditions.

Best Management Practices (BMPs): Methods, facilities and structures which are designed to protect or improve the environment and natural features and functions from the effects of development or interference.

Biodiversity: the variability among living organisms from all sources, including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Bioengineering: A natural engineering technique for bank stabilization that incorporates the use of native plants together with natural materials (logs, live stakes, live brush bundles, etc.) to increase slope stability.

Bodies of Water/Waterbody: A body of water which may or may not flow such as a lake, pond, wetland, watercourse but does not include a pool or puddle.

Buffers: An area or band of permanent vegetation, preferably consisting of native species, located adjacent to a natural heritage feature, surface water feature, HVRA and/or the Natural Heritage System, and usually bordering lands that are subject to development or site alteration and creating a physical separation that will discourage encroachment. The purpose of the buffer is to protect the feature and its function(s) by mitigating the impacts of the proposed land use and allowing an area for edge phenomena to

continue. A buffer may also provide an area for a recreational trail. The vegetation within a buffer can be managed (e.g., trimmed, cut, thinned, but not cultivated) providing that the integrity of the buffer and the feature/function it is protecting is not negatively impacted

Confined River or Stream System: A watercourse located within a valley corridor, either with or without a floodplain, and is confined by valley walls. The watercourse may be located at the toe of the valley slope, in close proximity to the toe of the valley slope (less than 15 m) or removed from the toe of the valley slope (more than 15 m). The watercourse can contain perennial, intermittent or ephemeral flows and may range in channel configuration, from seepage and natural springs to detectable channels.

Connectivity: The degree to which key natural heritage features or key hydrologic features are connected to one another by links such as plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs.

Conservation of Land: The protection, management, or restoration of lands within the watershed ecosystem for the purpose of maintaining or enhancing the natural features and hydrologic and ecological functions within the watershed.

Cumulative Effects / Impacts: The combined effects of all activities in an area over time and the incremental effects associated with individual projects in an area over time.

Demand Stress Level: The level of stress a groundwater system is under due to demand for the groundwater resources.

Development (1) as defined by the Provincial Policy Statement**:** Means the creation of a new lot, a change in land use, or the construction of buildings or structures, requiring approval under the Planning Act, but does not include:

- activities that create or maintain infrastructure authorized under an environmental assessment process;
- works subject to the Drainage Act.

Development (2) as defined by the Conservation Authorities Act:

- the construction, reconstruction, erection or placing of a building or structure of any kind;
- any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure;
- site grading; or
- the temporary or permanent placing, dumping or removal of material, originating on the site or elsewhere.

Note: The PPS definition of development is used generally within the Watershed Plan. Where "Development" is used in the context of where CA regulations apply, the Authority will be implementing the definition of development in accordance with the CA regulation as noted above.

Drainage Area: The area that contributes runoff to a point.

Ecological / Ecosystem Goods and Services: Consumable products provided by ecosystems, such as food, fuel or building materials. Most ecosystem goods are traded in the marketplace and have explicit prices. Ecosystem Services are non-material benefits provided to humans by nature's ecosystems, such as replenishing and protecting water supplies or providing recreational opportunities. Most ecosystem services do not have markets to be

traded in and, therefore, do not have explicit prices assigned to them.

Ecological Function: The natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.

Ecological Integrity: Means the condition of ecosystems in which,

a) the structure, composition and function of the ecosystems are unimpaired by stresses from human activity,
b) natural ecological processes are intact and self-sustaining,
c) the ecosystems evolve naturally, and
d) includes hydrological integrity.

Ecosystem: Systems of plants, animals and micro-organisms together with non-living components of their environment, related ecological processes and humans.

Endangered Species (federal): A wildlife species that is facing imminent extirpation or extinction, listed in Schedule 1 of the Species at Risk Act as updated and amended from time to time, by order in council.

Endangered Species (provincial): A species that is classified by COSSARO (Committee on the Status of Species at Risk) as "endangered species" living in the wild in Ontario but is facing imminent extinction or extirpation.

Enhance: To improve, augment, intensify or increase in quality, value, or functionality.

Environmental Impact Study: A report prepared to address the potential impacts of development or interference on natural features and ecological functions.

Erosion Hazard: The loss of land, due to human or natural processes, that poses a threat to life and property. The erosion hazard limit associated with confined river and stream systems is determined using considerations that include an allowance for toe erosion, an allowance for slope stability, and an allowance for access. The erosion hazard limit associated with unconfined river and stream systems is determined using considerations that include the flooding hazard limit or the meander belt width, whichever is greater, plus an allowance for access.

Fill: Includes earth, sand, gravel, rubble, rubbish, garbage, or any other matter whether similar to or different from any of the aforementioned materials, whether originating on the site or elsewhere, used or capable of being used to raise, lower, or in any way effect the existing grade (does not include herbaceous or woody plant material).

Fish Habitat: Spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes. Also includes the necessary physical and/or chemical features needed to sustain aquatic life which can include, but shall not be limited to, flow, temperature, quality and/or nutrients.

Flood Damage Centre: An area consisting of residential, commercial and institutional development that is adjacent to a creek and prone to flooding that threatens the safety, welfare of people, and damage to public and/or private property.

Flooding Hazard: The limits of an area of inundation under a flood resulting from the rainfall experienced during the Regional Storm (Hurricane Hazel event) or the 100-year flood, whichever is greater.

Floodplain: The area, usually low lands, adjoining a river, stream or small inland lake system, which has been or may be subject to flooding hazards.

Frequent Flooding: A site that is subject to the 1:25 year flood event or a more frequent flood event.

Hazardous Lands (1) as defined by the Conservation Authorities Act**:** Means land that could be unsafe for development because of naturally-occurring processes associated with flooding, erosion, dynamic beaches, or unstable soil or bedrock.

Hazardous Lands (2) as defined by the Provincial Policy Statement**:** Means property or lands that could be unsafe for development due to naturally occurring processes. Along the shorelines of the Great Lakes - St. Lawrence River System, this means the land, including that covered by water, between the international boundary, where applicable, and the furthest landward limit of the flooding hazard, erosion hazard or dynamic beach hazard limits. Along the shorelines of large inland lakes, this means the land, including that covered by water, between a defined offshore distance or depth and the furthest landward limit of the flooding hazard, erosion hazard or dynamic beach hazard limits. Along river, stream and small inland lake systems, this means the land, including that covered by water, to the furthest landward limit of the flooding hazard or erosion hazard limits.

Note: The PPS definition of hazardous lands is used generally within the Watershed Plan. Where "Hazardous Lands" is used in the context of where CA regulations apply, the Authority will be implementing the definition of hazardous lands in accordance with the CA regulation as noted above.

Headwater Drainage Feature: Means ill-defined, non-permanently flowing drainage features that may offer permanent, seasonal or contributing fish habitat providing important sources of food, sediment, water, nutrients and organic matter to downstream reaches

Hydrologic Function: The functions of the hydrologic cycle that include the occurrence, circulation, distribution and chemical and physical properties of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere, and water's interaction with the environment including its relation to living things.

Hydrologic Study: A report prepared to characterize the hydrologic functions of a wetland or other natural feature and to address the potential impacts of development and interference on the wetland or natural feature.

Indicators: scientific variables that help to simplify large amounts of complex information. They are a guide used to determine if environmental quality or health is good or bad.

Infrastructure: Means physical structures (facilities or corridors) that form the foundation for development or resource use and may include: sewage and water systems, sewage treatment systems, waste management systems, electric power generation and transmission including renewable energy systems, communications/telecommunications, transit and transportation corridors and facilities, oil and gas pipelines and associated facilities, but does not include "community infrastructure" or trails.

Impervious: Any surface that is not 100% pervious including all paved surfaces, building footprints, and areas compacted by equipment during construction activity.

Integrated Treatment Train Approach: Refers to a planned sequence of methods of controlling stormwater and keeping its impact to a minimum by techniques including, but not limited to:

- source controls, such as green roofs;
- lot-level controls such as rain gardens;
- conveyance controls such as grassed swales; and
- end-of-pipe controls such as wet ponds at the final discharge stage.

Invasive Species: Species of plants, animals, and micro-organisms introduced by human action outside their natural past or present distribution whose introduction or spread threatens the environment, economy, or society.

Meander Belt: The area of land in which a watercourse channel moves or is likely to move over a period of time.

Mitigate: To prevent, modify, or alleviate impacts (negative) on the natural environment. Mitigation also includes any action intended to enhance beneficial effects.

Natural Cover: Consists of lands that are existing forest (coniferous forest, mixed forest, deciduous forest, cultural plantation, cultural thicket, cultural savannah, cultural woodland, coniferous swamp, mixed swamp, deciduous swamp), wetland (open fen, shrub fen, treed fen, open bog, shrub bog, treed bog, meadow marsh, shallow marsh, submerged shallow aquatic, mixed shallow aquatic, floating-leaved shallow aquatic, thicket swamp, open water aquatic), meadow and beach/bluff patches (open tallgrass prairie, tallgrass savannah, tallgrass woodland, cultural meadow, inactive aggregate, open beach/bar, shrub beach/bar, treed beach/bar, open bluff, shrub bluff, treed bluff, open cliff, shrub cliff, treed cliff) as defined by the Ecological Land Classification system.

Natural Heritage Features: Features and areas including all wetlands, significant woodlands, significant valleylands, aquatic habitat, fish habitat, watercourses and bodies of water, significant habitat of endangered and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area; part of an ecologically functional corridor or linkage between natural areas; or, any other features or areas that are considered ecologically important in terms of contributing to the quality and diversity of an identifiable geographic area or natural heritage system.

Natural Heritage System (specific to this Watershed Plan)**:** A healthy connected system comprising existing natural heritage features and areas, corridors, and those areas identified for natural cover regeneration which improve connections and habitat patches necessary to achieve and maintain minimum targets of ecological integrity.

Note: In the Phase 1 and Phase 2 Watershed Plan work, the Natural Heritage System was referred to as the Ultimate Natural Heritage System.

Negative Impacts:

a) Degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions;
b) in regard to fish habitat, the harmful alteration, disruption or destruction of fish habitat; and

c) for other natural heritage features and areas, degradation that threatens the health and integrity of the natural feature or ecological function for which an area is identified.

No Net Loss: Balancing the loss of natural cover due to development, to be achieved through preservation, restoration, mitigation and compensation efforts. The overall percentage of natural cover, including, but not limited to forests and wetlands, will remain constant or increase over time.

Precautionary Principle / Approach: an approach to protect the environment that where there are threats of serious or irreversible damage, scientific uncertainty shall not be used to postpone measures to prevent environmental degradation.

Regulated Area: Those areas within the jurisdiction of the CLOCA defined in Ontario Regulation 42/06 Development, Interference with Wetlands and Alteration to Shorelines and Watercourses.

Restore: The re-establishment or rehabilitation of a former or degraded system or feature with the goal of returning natural functions and characteristics that have been partially or completely lost or damaged.

Riparian Area: The transitional area between land and a waterbody which is permanently vegetated, preferably consisting of native species to provide run-off retention, sediment and erosion controls, water temperature regulation, maintain or improve water quality, support fish life processes and protect fish habitat. The vegetation can be managed (e.g., trimmed, cut, thinned, but not cultivated) provided that the integrity of the riparian area and the waterbody is not negatively impacted

Riparian Vegetation: The plant communities in the riparian area, often characterized by hydrophilic plants.

Special Concern Species: A species that is classified by COSSARO (Committee on the Status of Species at Risk) as a "special concern species" if it lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered.

Stakeholder: A person, group, or organization that has direct or indirect stake in the natural resources of the watershed, watershed planning or Watershed Plans.

Surface Water Feature: Refers to water-related features on the earth's surface, including watercourses, bodies of water, wetlands, headwater drainage features seepage areas, discharge areas, springs, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics.

Thermal Impact: The impairment of water quality through temperature increase or decrease. Changes in temperature can also effect species composition of plants, insects and fish in a water body.

Threatened Species: A species that is classified by COSSARO (Committee on the Status of Species at Risk) as "threatened species" living in the wild in Ontario which is not endangered but is likely to become endangered.

Toe of Valley Slope: The base of an inclined surface of a hill.

Ultimate Natural Heritage System: see Natural Heritage System.

Unconfined River or Stream System: A watercourse not located within a valley corridor with discernible slopes, but within relatively

flat to gently rolling plains and is not confined by valley walls. The watercourse can contain perennial, intermittent or ephemeral flows and may range in channel configuration, from seepage and natural springs to detectable channels.

Valley or Valleyland: Land that has depressional features associated with a river or stream, whether or not it contains a watercourse.

Water Budget: Quantifies the major components of the hydrologic cycle and estimates the amount of water and where the water is within the watershed. It determines the water inputs, outputs and changes in storage.

Watercourse: An identifiable depression in the ground in which a flow of water regularly occurs. A watercourse also includes a municipal drain.

Watershed: An area that is drained by a river and its tributaries.

Wetland: Means land that:

a) is seasonally or permanently covered by shallow water or has a water table close to or at its surface;
b) directly contributes to the hydrological function of a watershed through connection with a surface watercourse;
c) has hydric soils, the formation of which has been caused by the presence of abundant water; and
d) has vegetation dominated by hydrophytic plants or water tolerant plants, the dominance of which has been favoured by the presence of abundant water;

but does not include periodically soaked or wet land that is used for agricultural purposes and no longer exhibits a wetland characteristic referred to in clause (c) or (d).

Wildlife habitat: Areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species.

Woodlands: Treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as wildlife habitat, erosion prevention, hydrological and nutrient cycling, and provision of clean air and the long-term storage of carbon. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial level.

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