

# Draft Proposed Port Darlington (West Shore) Shoreline Management Report



Prepared for: Central Lake Ontario Conservation (CLOCA)

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Version 1



Prepared By: Aqua Solutions 5 Inc.



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We also wish to acknowledge the contribution of members of the CLOCA and Municipality of Clarington Staff without whose assistance and support, this document would not have been possible.

This report was prepared by Aqua Solutions 5 Inc., for Central Lake Ontario Conservation Authority. Baird and Associates, the Central Lake Ontario Conservation Authority and Municipality of Clarington Staff also provided important input into the report. Planning Solutions Inc. was instrumental in providing support for the public process.

DRAFT

## Executive Summary

This document recommends policy and regulatory approaches for the Central Lake Ontario Conservation Authority (CLOCA) to take into consideration as they manage the future hazards along the Port Darlington (West Shore) Damage Centre. Certain recommendations will suggest implementation by others, including private landowners and the Municipality of Clarington.

CLOCA is required to adhere to its legislated mandate to protect human life and property from the adverse effects of natural hazards (both shoreline and riverine hazards). CLOCA is not only required to abide by its own statutory obligations through its Regulation and board adopted policy approaches but that it also participate in the land use planning process in a manner that ensures consistency or conformity with provincial land use legislation and policy.

Provincial legislation (primarily the Conservation Authorities Act and the Planning Act) and policy (primarily the Provincial Policy Statement, 2014 and associated technical guidance) places a responsibility on Ontario's conservation authorities to deliver on established provincial hazard policy. Conservation authorities also administer regulations issued under Section 28 of the Conservation Authorities Act and provide advice and guidance to its municipalities in keeping with its legislatively assigned responsibilities as an advisory agency under the Planning Act to ensure that;

- no new hazards are created;
- that existing hazards are not aggravated; and
- that adverse environmental impacts do not result.

This recommended Shoreline Management Plan for the Port Darlington (West Side) Damage Centre has been developed consistent with provincial law and policy so that the policies and procedure approaches being implemented by CLOCA under "Ontario Regulation 42/06 Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses", the Conservation Authorities Act and under the Planning Act are reflective of current regulations and provincial policy. An objective of the study is to provide a science-based platform upon which subsequent decisions related to shoreline management may be made. It has also been developed and is being shared with the public and all interested parties to provide recommendations for CLOCA's consideration providing direction to current shoreline property owners as well as those who may have an interest in the Lake Ontario shoreline in the future.

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Update of Port Darlington Flood Hazard Centre 2018**

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## 1.0 Introduction

### 1.1 Purpose

As a result of ongoing concerns within the Damage centre, historically extreme high water levels which occurred on Lake Ontario, Westside and Bowmanville creek and marsh flooding in the spring of 2017, a number of actions and initiatives were commissioned by the CLOCA Board of Directors and the Council of the Municipality of Clarington in order to understand and seek to address the implications of the severe Flooding and Erosion which occurred in the study area.



Severe Flooding and Erosion Occurring in the Study Area - Photo Courtesy of CLOCA

This report outlines the shoreline management issues in the study area along the west side of the Port Darlington Shoreline. The purpose of this project is to update and finalize the Port Darlington (West Shore) Shoreline and Flood Damage Centre Draft Report (2004) , Figure 1 for the Central Lake Ontario Conservation Authority (CLOCA).

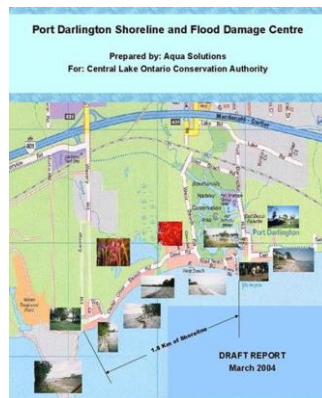


Figure 1 - Port Darlington (West Shore) Shoreline and Flood Damage Centre Draft Report (2004)

The original Draft Port Darlington Shoreline and Flood Damage Centre (Aqua Solutions 2004) study began to identify the hazardous areas (flooding, erosion, and dynamic beach) for the Port Darlington study area in order to precisely define and understand the natural hazards in the area in relation to existing and proposed development. The 2018 study will build upon and complete the 2004 draft study, informed by the recent historic water levels, climate change, and sediment transport. The study will also explore and evaluate shoreline management options including feasibility and consistency with provincial natural hazard management policy direction. (Newsletter #1, February 2018)

This study will update the planning and policy guidance for future development within the damage centre area by incorporating the most recent information available using the updated mapping provided by CLOCA. Additionally Baird and Associates carried out an overview of coastal processes, and developed concept level shore erosion protection alternatives for erosion protection works and an opinion of probable costs. Collaboration with Baird and Associates, CLOCA staff, and the Municipality of Clarington Staff, and information provided through staff and reports to council, were part of the preparation of this document. References to staff input will be made throughout the report. This report will also provide a brief summary of initiatives and the technical studies which were undertaken as part of CLOCA's resulting actions.

At their September 19, 2017 meeting, the CLOCA Board of Directors approved the following resolution:

***THAT staff take the necessary actions to complete the Port Darlington (West Shore) Damage Centre Study in consultation with the requested working committee as soon as practicable;***

***THAT the firm of Aqua Solutions be retained to complete the study work as per the previously approved Terms of Reference, amended to address issues associated with Climate Change, recent historic water levels, Sediment Transport, Current Provincial Policy Direction, Updated Mapping and further assessment of potential options to address risks associated with natural hazards;***

***THAT CLOCA staff be directed to report back to the Board of Directors with the completed study with options for implementation in conformity with the recommendations of the study and provincial Great Lakes shoreline natural hazard management policy;***

***THAT the Council of the Municipality of Clarington be so advised in response to Resolution C-203-17.***

In accordance with this resolution, this report as well as two additional reports have been prepared. The two additional reports include a CLOCA Draft Port Darlington Flood Study Report (November 2018) and a Baird & Associates, "Port Darlington Shore Protection Concepts" Report November 16, 2018. Additionally the Municipality of Clarington has taken a number of actions and one of the key items produced was the Municipality of Clarington Emergency Plan- April 27, 2018 document. This document specifically highlights the Emergency measures for the Port Darlington Damage Centre (See Appendix E b)).



## 1.2 Study Area

The study area is 1.8 km long and is located along the north shore of Lake Ontario shoreline in the Municipality of Clarington. The study area is part of a large dynamic beach barrier system west of the Mouth of Bowmanville Creek and east of St. Marys Cement lands (Figure 2). There are three main residential areas which are affected within the Damage Centre, Cedar Crest Beach Road, Cove Road and West Beach Road. The location of the Port Darlington Site and Study area is indicated below.



Figure 2 - Study Location

## 1.3 Background

The Central Lake Ontario Conservation Authority (CLOCA) works to reduce the risk to life and property from natural hazards such as flooding, dynamic beach, erosion and to promote the wise use of land and water resources for future generations.

Damage Centres are defined as areas of high risk due to flooding or erosion potential. They include low lying regions subject to flooding and areas where structures are located in close proximity to the shoreline. The Port Darlington Beach area was first identified by the Conservation Authority as an area requiring special consideration in the first Lake Ontario Shoreline Management Plan for the area commissioned by three conservation authorities along the north shore of Lake Ontario east of Toronto. The plan is known as the Sandwell Swan Wooster Report, 1990 (Sandwell Report). The purpose of the original Aqua Solutions 2004 study was to undertake a Port Darlington Shoreline Hazards Damage Centre Study along the western end of Port Darlington's shoreline for CLOCA in furtherance of certain

recommendations made in the Sandwell Report. By identifying the hazardous areas (flooding, erosion, and dynamic beach), specific options and policies were developed in order to assist CLOCA and The Municipality of Clarington in addressing future development applications within the Damage Centre.

- \* Port Darlington Erosion and Flood Damage Study was a result of recommendations that were made by the Sandwell Report (1990).
- \* The Port Darlington Beach area was identified as an area of high risk due to flooding or erosion potential.
- \* The Report recognized, "The Port Darlington Beach Damage Centre C4 (Reach #17)... This area is at risk from flooding of the river as well as from flooding due to wave activity on Lake Ontario"

The original 2004 study reviewed the hazard issues and made recommendations on how the flooding, erosion, and dynamic beach concerns could be addressed in the specific areas along the western side of Port Darlington's Shoreline. The draft study was presented to the Authority Board on April 20, 2004 and was received for information. However the report was not finalized and never brought to the Board for adoption and subsequent implementation.

Subsequently in May of 2006 "Ontario Regulation 42/06 Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses" was enacted. This new regulation, which replaced a previous regulation that was limited to riverine (or creek) related natural hazards, enhanced the Authority's regulatory powers to include erosion hazards, and specifically, Lake Ontario shoreline erosion hazards. In addition, the regulation was updated at this time to coordinate with the Provincial Policy Statement and Planning Act. In April 2013 the CLOCA Policy and Procedural Document for Regulation and Plan Review (PPD) was approved by the Board, which provides general policy direction and implementation for the administration of Regulation 42/06.

Subsequently, the Provincial Policy Statement was updated in 2014 and has continued to direct development and site alteration out of natural hazard areas. Specifically:

*Development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards. (3.0 Protecting Public Health and Safety)*

*It is equally important to protect the overall health and safety of the population. The Provincial Policy Statement directs development away from areas of natural and human made hazards. This preventative approach supports provincial and municipal financial wellbeing over the long term, protects public health and safety, and minimizes cost, risk and social disruption. Taking action to conserve land and resources avoids the need for costly remedial measures to correct problems and supports economic and environmental principles." (Part IV: Vision for Ontario's Land Use Planning System) and available in full at [Ontario.ca/pps](http://Ontario.ca/pps)*

The update and finalization of the Port Darlington Damage Centre report will take important planning and policy changes into consideration along with climate change, recent historic water levels and the updated CLOCA mapping.

## 2.0 Study Update

The report is intended to provide guidance and assistance to shoreline property owners, the CLOCA and Municipality of Clarington with respect to shoreline policy and management process. It is supported by the Great Lakes-St. Lawrence River System Technical Guide for Flooding, Erosion and Dynamic Beaches (MNR, 2001).

This Shoreline Management Plan (SMP) is based on a scientific, evidence-based approach. The updated recommendations have been developed by considering established provincial policy, including climate change implications for the Lake Ontario shoreline, examining natural shoreline processes, assessing current CLOCA and municipal planning policies and evaluating the approaches currently in place to address shoreline hazards in other jurisdictions across the Great Lakes Basin. The management approaches that are being recommended, have been specifically made for the west side of the Port Darlington shoreline within the CLOCA jurisdiction. The management approaches address the cumulative effect of each hazard concurrently, as required by law and policy.

This document advocates for a responsible shoreline management approach. Responsible management means that all applicable natural hazards to people and property are identified and addressed. This report recommends that CLOCA work collaboratively with the Municipality of Clarington, provincial and regional partners and, very importantly, with landowners to ensure understanding of existing natural hazards and the recommended policies. As recommended below, implementation of this report would provide for the protection of personal safety of people, including first responders. the minimization of risk and the location of development outside natural hazards to the extent possible.

### 2.1 Shoreline Legislation & Policy

#### Roles and Responsibilities in Lake Ontario Shoreline Management

A detailed summary of the Conservation, Municipal, Regional, Provincial and Federal Legislative Framework has been provided in Chapter 1.4 of CLOCA's Policy and Procedural document (April, 2014). A brief legislation summary is provided below, excerpted from a Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017.

*"At the federal level:*

- *The Department of Fisheries and Oceans Canada administers the Fisheries Act (Canada). The Fisheries Act requires that projects near water avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery.*
- *The Department of Transport Canada administers the Navigation Protection Act. This Act, regulates interferences with the public right of navigation by regulating works and obstructions that risk interfering with navigation in navigable waters. The Act also prohibits the depositing or throwing of materials that risk impacting navigation in navigable waters and the dewatering of navigable waters.*

- *The Department of Public Safety Canada administers the National Disaster Mitigation Program. This program seeks to provide funding for significant, recurring flood risk and costs related to risk assessments, flood mapping, mitigation planning, and investments in non-structural and small-scale structural mitigation projects. Funding applications and allocations are routed through the provinces.*

*At the provincial level:*

- *The Ministry of Municipal Affairs and Housing (MMAH) administers the Planning Act, which delegates authority for land use planning approvals and sets out in statute planning ‘matters of provincial interest’ and the associated statements of provincial policy, as currently articulated in the Provincial Policy Statement, 2014.*
- *MMAH also conducts the initial screening for proposals under the National Disaster Mitigation Program. Of note is the Ontario requirement that project proposals under the program address the natural hazard policies in the Provincial Policy Statement and associated technical guidelines.*
- *The Ministry of Natural Resources and Forestry (MNRF) is responsible for the preparation of implementation guidelines and technical manuals to explain the content and intent of natural hazards policy.*
- *MNRF administers the Public Lands Act, which is the statute that manages crown land including the lakebed of Lake Ontario and the Lakes and Rivers Improvement Act, which regulates the deposition of any materials in a lake. Any works on or near crown land or deposition of materials (such as sand) in Lake Ontario may need permission from MNRF.*
- *The Ministry of the Environment, Conservation and Parks (MECP) administers the Environmental Assessment Act including approving Class Environmental Assessment criteria and is the approval authority for environmental assessment studies.*
- *MECP also administers the Great Lakes Protection Act, 2015 and Plan including the funding for local great lakes cleanup and ecological restoration initiatives.*

*At the local level:*

- *The Region of Durham provides regional-scale land use planning for the Lake Ontario waterfront in the region and is involved in infrastructure and service delivery along the shoreline such as regional water supply plants, waste water treatment plants, public health monitoring and regional roads. In addition, the region has taken a lead role in local Climate Change mitigation and adaptation planning. The Region of Durham finances both the operational and capital budgets of CLOCA through the municipal levy process.*
- *Both the Municipality of Clarington and CLOCA share both policy development, regulation and implementation roles in a local and site specific context. The main tools at the municipal level are the Clarington Official Plan and implementing zoning by-law, the Building Code Act, 1992, and the various powers under the Municipal Act, 2001.*
- *As designated by the province through MMAH and MNRF, CLOCA is the local agent for the interpretation and implementation of natural hazard policy and site-specific regulation of development through Ontario Regulation 42/06.*
- *Shoreline management planning is also undertaken collaboratively between the region, municipality and conservation authorities. “*

*(Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017)*



### 2.1.1 Provincial Legislation and Policy

The Province has taken a lead role in the protection of public from natural hazards (i.e. Flooding, Erosion and Dynamic Beaches) for rivers/streams and Great Lakes St. Lawrence, and Large Inland Lakes Systems. The prevention of development within the Dynamic Beach Hazard has been prominent since 1994 when the first 'Comprehensive Set of Policy Statements' were brought into legislation, and it has continued throughout the subsequent *Provincial Policy Statements* including the latest 2014 document. The provincial government also continues to limit development within the Flooding and Erosion Hazards.

From the Staff Report 5538-17 to CLOCA board, Section 'Provincial Land Use Planning Policy' the following excerpt outlines the relevant provincial legislation which applies directly to the Port Darlington study area.

*"The current Provincial Policy Statement, 2014 establishes a strong obligation on development decision-makers for the protection of public health and safety with the following statements of provincial policy for Great Lakes shoreline natural hazards (emphasis added):*

***"Ontario's long-term prosperity, environmental health and social well-being depend on reducing the potential for public cost or risk to Ontario's residents from natural or human-made hazards.***

***Development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards.***

*Accordingly: development shall generally be directed to areas outside of: hazardous lands adjacent to the shorelines of the Great Lakes... which are impacted by flooding hazards, erosion hazards and/or dynamic beach hazards; hazardous lands adjacent to ... stream ... systems which are impacted by flooding hazards and/or erosion hazards...*

***Development and site alteration shall not be permitted within: the dynamic beach hazard; ... areas that would be rendered inaccessible to people and vehicles during times of flooding hazards, erosion hazards and/or dynamic beach hazards, unless it has been demonstrated that the site has safe access appropriate for the nature of the development and the natural hazard; and a floodway regardless of whether the area of inundation contains high points of land not subject to flooding.***

***Planning authorities shall consider the potential impacts of climate change that may increase the risk associated with natural hazards."***

*From Section 'Provincial Land Use Planning Policy' (Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017). See Appendix A for further PPS 2014 References.*

### 2.1.2 CLOCA Regulatory Authority

In the past CLOCA implemented its river and stream regulations under Section 28 of the Conservation Authorities Act prior to 2006, through the former Ontario Regulation 145, which addressed flooding and erosion (associated with the Westside Creek and Bowmanville Creek) along river and stream systems. This regulation did not include the Great Lakes shoreline hazards of Flooding, Erosion and Dynamic Beach.

In May of 2006, the 'Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses Regulation, Ontario Regulation 42/06, under the Conservation Authorities Act, was enacted. This new and enhanced regulation was enacted in order to support the Planning Act's, Provincial Policy Statement and to assist in bringing into alignment the Conservation Authorities shoreline policy and management of the Great Lakes-St. Lawrence River and Large Inland Lakes shoreline hazards across the province.

"Ontario Regulation 42/06 establishes a prohibition on development in the absence of a permit on all lands adjacent or close to the shoreline of Lake Ontario based on the shoreline hazard mapping prepared as part of the Sandwell Report. Presently, CLOCA has the ability to evaluate development proposals against the following expanded set of statutory tests: 'the control of flooding, erosion, dynamic beaches, pollution or the conservation of land. ' " (Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017).

The CLOCA Board of Directors approved the Policy and Procedural Document for Regulation and Plan Review (PPD) in April 2013. It provides the general policy direction for CLOCA under Ontario Regulation 42/06. Chapter 3 of CLOCA's Policy and Procedural document outlines the General Policies and the Lake Ontario shoreline hazards are found in Chapter 4. (PPD, April, 2013)

These policies are intended to guide the administration and the implementation of CLOCA Ontario Regulation 42/06 and its development plan review responsibilities under the Planning Act. The policies provide the foundation for the recommended policies in Section 4 of this report, which provide more specific direction and/or boundaries for development plan review issues.

Some applicable General Policies from Chapter 3 of the PPD, April 2013 are as follows:

- A precautionary approach to natural hazard management shall be taken, such that risk associated with natural hazards are controlled by prohibiting *development* and site alteration in areas where there is an unacceptable risk to public health or safety or of property damage;
- Where a regulated area pertains to more than one water-related hazard (e.g., lands susceptible to flooding that are part of a wetland), policies will be applied jointly, and where applicable, the more restrictive policies will apply.
- *Development* must not worsen or create natural hazards and must not increase risk to public safety or of property damage.

In Chapter 4.5.1 Policies for Development within the Dynamic Beach Hazard from PPD April 2014 document, there are specific policies related to the Dynamic Beach, Flooding and Erosion Hazards. Recommendations have been provided in this report (in Section # 4.0) that address the particular policy

issues effecting the Port Darlington Damage Centre area as they relate to the PPD Chapter 4 requirements.

**2.1.3 Municipality of Clarington Planning and Regulation Policy**

A through summary of the development of the area was provided in the Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017, portions of which are reproduced here. The full staff report outlines the ‘Historic development patterns in Port Darlington’ see Appendix F.

Additionally a historical Summary of the Development Regulation Timeline was provided by CLOCA staff and is outlined as follows. (CLOCA Staff Presentation March 3, 2018 Public Information Centre #1). Further historical information has been provided by CLOCA on the web site at the following link [www.cloca.com/port-darlington](http://www.cloca.com/port-darlington);

**1959**

- Port Darlington Area Zoned Agriculture
- Detached dwellings/cottages permitted

**1960's**

- CLOCA begins regulating certain stream-based hazards with a “Fill and Construction” regulation

**1973**

- CLOCA’s Ontario Regulation 824/73 enacted regulating Stream-Based Flooding Hazards in the Port Darlington Area

**1984**

- May: New Comprehensive Zoning Proposed for municipality following amalgamation in 1974
- Cedar Crest Beach, West Beach and East Beach proposed to be zoned “Environmental protection”

**1984**

- Sept.: Following meetings with residents, Residential Shoreline (RS) Zoning enacted
- Conversion of cottages to dwellings subject to street frontage and private servicing

**1994**

- First Provincial Great Lakes Shoreline Natural Hazard Policy introduced with a *Comprehensive Set of Policy Statements*. Development to be directed away from natural hazards, policy continued to the present via Provincial Policy Statement, 2014

**1990**

- Lake Ontario Shoreline Management Plan completed (Sandwell Report)
- Lake Ontario natural hazards mapped: Lake Ontario flood plain, erosion hazards
- Port Darlington identified as a 'Damage Centre' requiring detailed study

**1996**

- Clarington Official Plan adopted. Official Plan policies directing development away from a "regulatory shoreline" to be implemented through future Zoning By-law(s)

**2006**

- Changes to the *Conservation Authorities Act* and new CLOCA Regulation (42/06) enable CLOCA to regulate Great Lakes Based Natural Hazards using mapping and data from 1990 Lake Ontario Shoreline Management Plan

**2013**

- CLOCA adopts *Policy and Procedural Document for Regulation and Plan Review*, which guides CLOCA's review, commentary and advice on development applications.
- Incorporates provincial guidance for Great Lakes shoreline hazards

**2016**

- Clarington Official Plan municipal comprehensive review adopted bringing planning policy in conformity with 2014 *Provincial Policy Statement*.

**2017**

- Zone Clarington Comprehensive Zoning By-law review launched.

Supporting images include: a map of the Port Darlington area, a 'SANDWELL SWAN ROOSTER' map, an 'APPROVED Adopted Official Plan 2016' cover, and the 'ZONE Clarington' logo.

Relevant sections (3.7 Hazards) from the Clarington Official Plan 2018 are reproduced as follows;

“3.7.1 Hazard Lands, the Regulatory Shoreline Area, and Waste Disposal Assessment Areas, as identified on Map F, and Contaminated Sites, are lands which possess characteristics which could pose a threat to public health and safety or property and are considered unsafe for development.

3.7.7 The construction of new buildings or structures of any type within the Regulatory Shoreline Area shall not be permitted.

3.7.5 No new buildings or structures shall be permitted on lands identified as natural hazard lands.

3.7.6 The Regulatory Shoreline Area as identified on Map F, is that area along the Lake Ontario Waterfront which is subject to dynamic beaches, flooding and/or erosion. The extent and exact location of the Regulatory Shoreline Area shall be identified in the implementing Zoning By-law in accordance with the detailed Lake Ontario Flood and Erosion Risk Mapping of the relevant Conservation Authority.” (2018, Page 3-20, 3-21)

The current zoning classification is Residential Shoreline “RS” with an Environmental Protection or “EP” zoning classification running along the Lake Ontario Shoreline, as shown in Figure 3.





Figure 3 - Municipality of Clarington Official Plan –Current By-law 84-63 Zoning Schedule for the west Port Darlington

The Municipality of Clarington Official Plan Natural Hazards Map (Figure 4), defines the area as Regulatory Shoreline Area and Flood Plain.

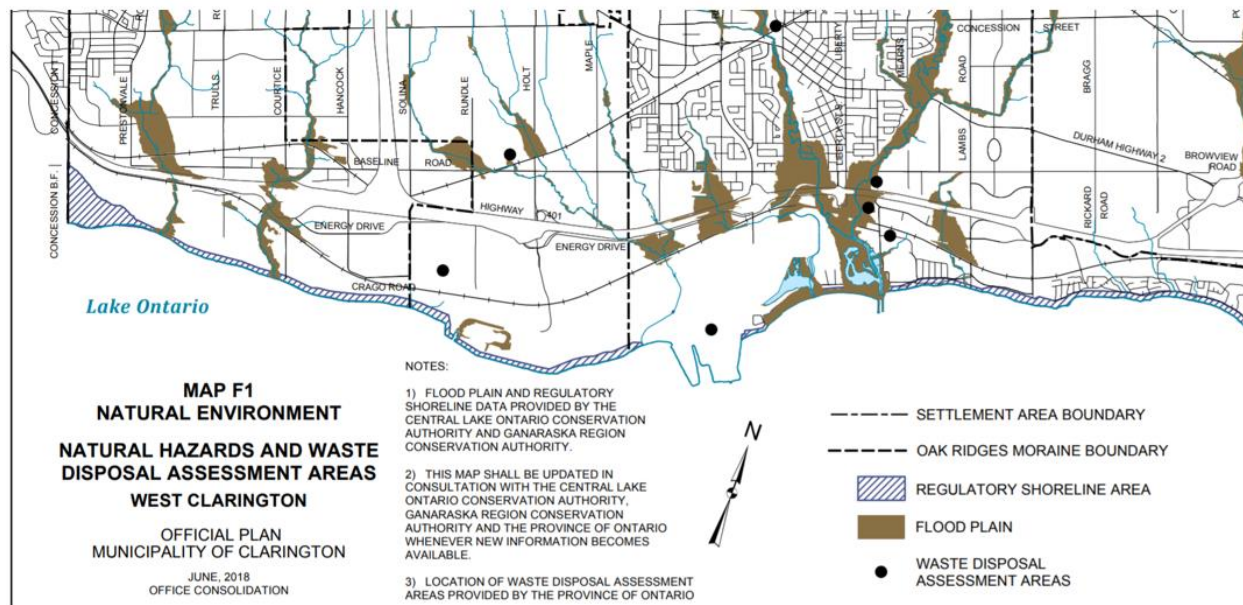


Figure 4 - Municipality of Clarington Official Plan – Natural Hazards Map

A Zoning By-Law Review has been initiated by the Planning Services Department to update the zoning regulations in order to conform to the new 2018 official plan.

The recommended hazards delineation in this report should be incorporated into the Zoning By-Law for the Municipality of Clarington in accordance with the Planning Act, the Provincial Policy Statement and

Clarington’s official plan requirements. Additionally, the particular policy and ‘Summary of Considerations – Guide for Development within the Hazardous Lands’ charts recommendations from this report should be reviewed in the context of eventually being put into the Zoning By-Law and into CLOCA’s Policy and Procedural Document, as appropriate.

### 3.0 The Hazards and Area Characteristics

The Key Hazard Issues occurring along the study area are:

- \* Flooding from Lake Ontario
- \* Erosion from Lake Ontario
- \* Dynamic Beach Hazards from Lake Ontario
- \* Flooding from Westside Creek Marsh/West side Creek, and
- \* Flooding from Bowmanville Marsh and Bowmanville Creek

The hazards that are occurring along this shoreline are extremely complicated and further compounded by the combination of overlapping or concurrent hazards which occur across the various sections of the study area.

All of these hazards will be addressed throughout this report as they are applied to each of the applicable shoreline areas. There is an overlap of the hazards occurring along the study area and the governing hazards were determine along the various shoreline areas. The following figure illustrates how the governing hazard criteria is determined. (Figure 5)

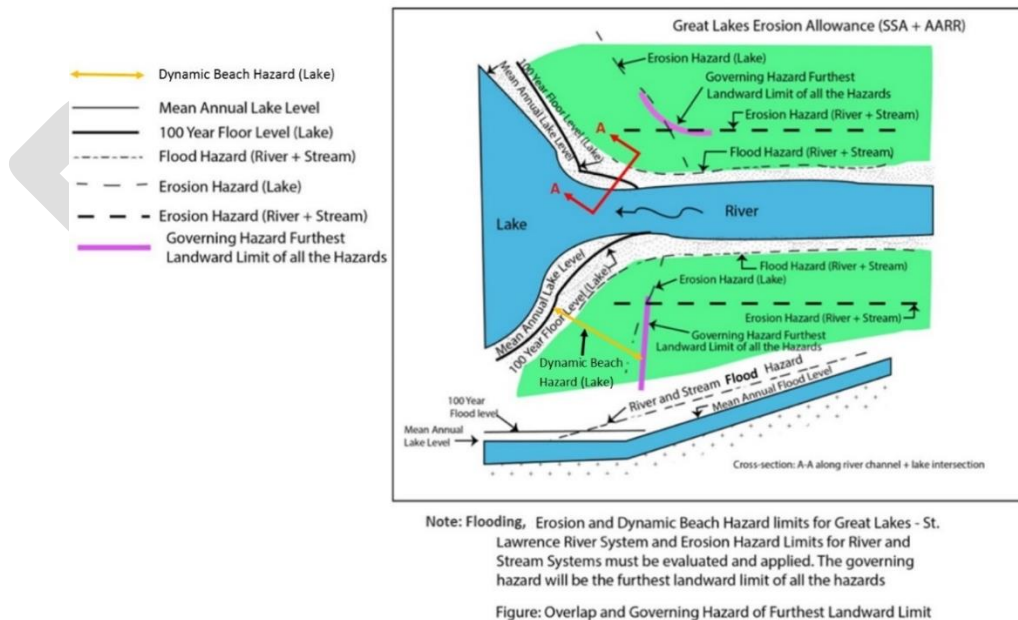


Figure 5 -Overlap of the hazards and the Governing Hazard

A detailed technical breakdown and discussion of each of the hazards was provided in the ‘Port Darlington (West Shore) Shoreline and Flood Damage Centre Draft Report’ (Aqua Solutions, 2004). The hazards are

based on the MNR {now Ontario Ministry of Natural Resources and Forestry (MNR)} Great Lakes – St. Lawrence River Technical Guide and Understanding the Hazards documents. The definitions, requirements and the physical science behind them are still applicable at present.

In Section 5 of this report, the shoreline is broken down into planning sections. Physical features identified and the associated hazards will determine what planning and policy tools are recommended for each of the sections.

The Port Darlington Flood Damage Centre has not only all three Lake Ontario hazards (Flooding, Dynamic Beach and Erosion) effecting it on the south side of the Dynamic Beach Barrier System but also flooding from the Creeks and Wetlands/Marshes to the north. These are common characteristics which define these natural Dynamic Barrier Beach Systems (Figure 6).

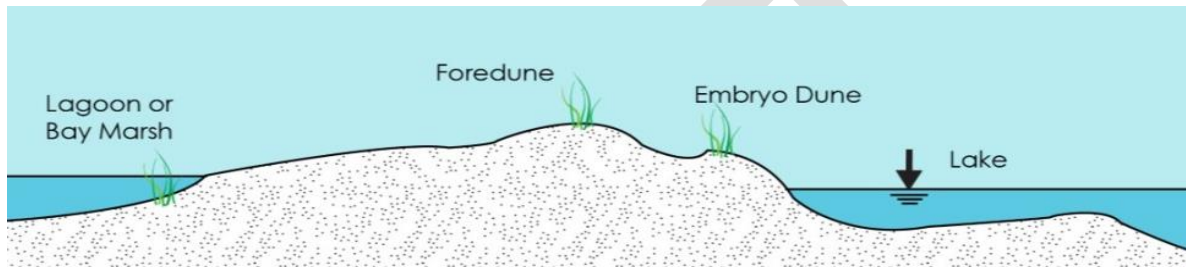


Figure 6 - Barrier Beach System

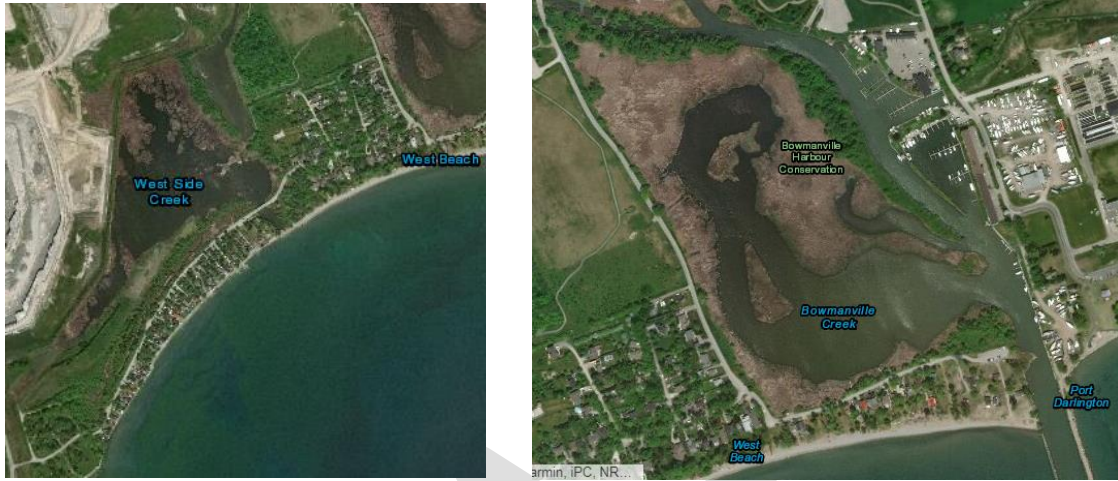
The hazards associated with these areas consist of the Lake and Marsh flooding. The uniqueness and importance of the Dynamic Barrier Beach and their features has been recognized by the Province and other government agencies. The PPS (2014) emphasizes the importance of these natural dynamic beach systems and excerpts from the document have been provided in Appendix A of this report.

At Port Darlington there are two creeks and Provincially Significant Coastal Wetland/Marsh systems. The Westside Creek Coastal Wetland Complex (Westside Marsh) and Bowmanville/Soper Creeks Coastal Wetland Complex (Bowmanville Marsh) (Figure 7).



Figure 7 - Provincially Significant Coastal Wetland Complexes

These are very important ecological systems. Both of these systems flow through the marsh areas before exiting through the mouths of the creek systems and entering Lake Ontario. Lake Ontario coastal process were instrumental in the creation of the natural dynamic Barrier beach systems which currently exist.



Portions of both barrier dynamic beaches and the Bowmanville Marsh are recognized as a provincially significant Areas of Natural and Scientific Interest (ANSI). The Bowmanville Coastal Marsh and Fen is a Candidate Area of Natural and Scientific Interest (ANSI) in the Life Science Category, (Figure 8). This further notes the importance and significance of these features from an ecological perspective at the provincial scale.



Figure 8 - Candidate Area of Natural and Scientific Interest (ANSI)

The majority of the coastal wetland areas are owned by CLOCA in the Bowmanville and Westside Conservation Area as indicated in the Figure 9 below.



Figure 9 - Coastal Wetland Areas (Bowmanville and Westside Conservation Area) lands owned by CLOCA.

The Municipality of Clarington Official Plan recognizes the importance of the study area and has designated it as 'Environmental Protection Area' (Figure 10). A municipally owned Community park is located at the east end of the study area.

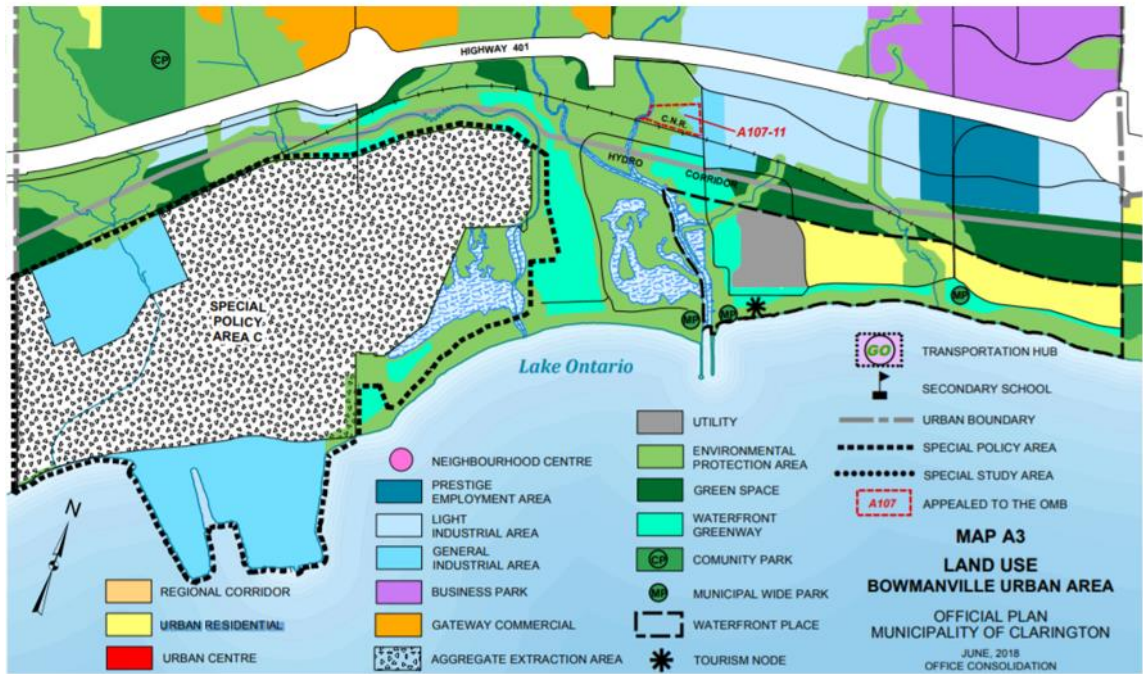


Figure 10 - Municipality of Clarington Official Plan - Land Use Map

### 3.0.1 2017 Lake Ontario Record High Water Levels

The spring of 2017 led to breaking the historic high water levels (i.e. 75.88 meters in May) on record since 1952 from 2.5 cm to 5.6 cm for Lake Ontario. The Port Darlington residents along Cedar Crest Beach Road and West Beach Road experienced these overwhelming conditions which caused severe flooding and erosion of their properties and protection works. Because Port Darlington Damage Centre is susceptible to not only the lake levels, properties were also flooded by the two Creek/Marsh Systems. Properties received floodwaters from the lake on the south and from heavy rainfall events causing flooding from the marshes on the north, inundating both sides of lots.



Cedar Crest Beach - May 25, 2017 (Photo courtesy of CLOCA)

“There was flooding of crawl spaces, the elevated Lake level also compromised the function of septic systems, and posed a risk to contamination of shallow wells. Roadways were also overtopped with flood water, making access and egress difficult.” (Report to the CLOCA Board (Report No. 5538-17), dated September 19, 2017)

‘Port Darlington In the News!’ on May 25, 2017 by Amara McLaughlin, of CTV News Toronto.

### **Bowmanville residents 'completely overwhelmed' by relentless flooding**



Fire crews and residents spent Thursday filling sandbags and creating a blockade around dozens of waterfront houses in Bowmanville's Cedar Crest Beach community. (CTV News Toronto)

A combination of high water levels and strong easterly winds on Sunday, April 30, 2017 led to a lake surge and flooding in Bowmanville’s Cedar Crest Beach Road area as lake levels remained at an all-time high.

Residents of a lakeside community in Bowmanville, Ontario were “completely overwhelmed” by relentless flooding after waves pummeled the shoreline, breaching the street. They spent weeks facing direct flood risks related to high waves, rising water levels from the lake and surrounding wetlands and heavy rain.



## **Bowmanville waterfront properties flooded due lake surge**

**Clarington fire fighters, police, operations staff and neighbours worked together to protect properties**

**NEWS** May 01, 2017 by [Jennifer O'Meara](#)  **Clarington This Week**



*A combination of high water levels and strong winds on Sunday, April 30 lead to a lake surge and flooding in Bowmanville’s Cedar Crest Beach Road area.*

“Clarington Emergency and Fire Services worked to help residents fight the flooding. The Red Cross was called to assist residents in need and Durham Regional Police were on site to direct traffic and keep onlookers away. Hundreds of sandbags were used to create protective barriers around properties and homes as high winds and heavy rains pounded the community.” (Clarington This Week, Jennifer O'Meara, 2017)



*BOWMANVILLE -- Residents of Cedar Crest Beach Road lined their properties with sandbags in preparation for an upcoming storm. High water levels in Lake Ontario have waterfront residents concerned with potential flooding. (Metroland, Ryan Pfeiffer. May 4, 2017)*

### 3.1 Flooding Hazards

A key issue which is occurring in the study area are the Flooding Hazards present.



CLOCA Engineered flood plain mapping provides the regulatory flood hazard areas and the associated elevations. The following maps and flooding elevations highlight the impact areas along the Port Darlington Study area, indicating the areas which would be inundated by water. The Maps are available from the CLOCA Darlington Flood Study Report and CLOCA's web site link: [www.cloca.com/port-darlington](http://www.cloca.com/port-darlington) (Figure 11).





Figure 11 - 1. Lake Ontario 100 year flood level (includes still water level + surge) + Wave Uprush

The flooding is occurring from both creek systems and Lake Ontario. The flooding criteria for the area has been computed through various studies and are as follows;

- Lake Ontario 100 year flood level (includes still water level + surge) + Wave Uprush is 76.34m (GSC) or 76.27m (IGLD 1955) (Sandwell Swan Wooster, 1990)
- Riverine Regulatory Flood Level for Westside Creek is 76.7m (GSC) (CLOCA, 2013)
- Riverine Regulatory Flood Level for Bowmanville Creek is 78.1 m (GSC) (Aquafor Beech Ltd., 2009)

### Flooding Hazard Assessment Summary by CLOCA Report

‘Port Darlington Community Shoreline Management Plan: Report on Flooding’ by CLOCA, (Draft Nov. 2018)

A flooding assessment and study was done by CLOCA in 2018, ‘Draft Port Darlington Flood Study Report’ and excerpts have been provided from the report in the following Sections.

*The purpose of the ‘Port Darlington Community Shoreline Management Plan: Report on Flooding’ was “to provide a critical assessment of the flooding conditions, and to investigate the potential for improvements that could be made to reduce the flood risk within the community. CLOCA completed a Flood Risk Assessment in March 2017 for all identified flood damage centres in the CLOCA watershed, including the West Beach Road and Cedar Crest Beach Road flood damage centres.’ The report reviewed ‘the flood conditions impacting the Port Darlington community, and assess potential protection measures and emergency response measures.’*

From Section 2.0 Flood Hazard Conditions (CLOCA Draft Nov. 2018), the following section has been provided:

*“On a scale of least severe to most severe, the hazards associated with flooding escalate as flood depth and the velocity of the flowing flood water increases. The hazards include:*

- **Homes are inundated with water and property damage occurs, well and septic systems impacted, leading to failure of these systems and possible resident health impacts.**  
*Water damage to home and property begin as water seeps into basement and crawl spaces through window and door openings, cracks in the foundation, and any other path that allows water to penetrate the foundation. Where wells and septic tanks and beds are relied upon for water and waste water, flood water can inundate septic systems and contaminate wells, leading to failure of these systems and possible resident health impacts. Water damaged home contents including furniture, flooring, and drywall may need to be replaced. Electrical hazards may be created.*
- **Inability to access or egress (escape) the community because flooding on roads prevents personal vehicle passage, [= or > 0.3 m depth ]**  
*At or above 0.3 meters depth, typical personal vehicles will be limited in the ability to pass through floodwater on roadways, as car exhaust systems and electrical systems will be prone to failure. At this flood depth, vehicles should not attempt to navigate roads because roads are no longer visible, and the possibility of roads being washed out exists. At greater depths, vehicles may become buoyant and be swept away. **Evacuation of the area that would become isolated from flooded roads would be advisable prior to depths exceeding this limit.***
- **Structural damage to homes, [> 0.8 m depth]**  
*Hydrostatic pressure caused by floodwater against buildings has the potential to cause structural damage. Typical residential framed structures can withstand about **0.8m of water depth** before structural damage occurs. Structural damage may be deflection, cracking, or complete and sudden failure.*
- **Threat to life from buoyancy and instability, [Depth 1m and velocity >0.4 m<sup>2</sup>/s]**  
*Water depth and velocity of flowing water pose buoyancy and lateral forces that pose a hazard to public safety. **Water depths greater than 1 metre** would be sufficient to float young children, and a product of water depth by water velocity of **more than 0.4 metres squared per second** will pose a risk of sweeping people away.*

CLOCA staff created a scale to visually provide these level of hazards throughout the assessment.

Table 2.0: Flood related hazards (from CLOCA, Draft Nov. 2018)

Flood		Hazard
Depth	Depth x Velocity	
d>0.1m	n/a	Interior property damage, electrical hazards
d>0.3m	n/a	no access or egress by personal vehicles
d>0.8m	n/a	structural damage to homes
d>1.0m	d x v >0.4m <sup>2</sup> /s	personal safety



### 3.1.1 Lake Ontario

The flood hazard allowance is the horizontal extent of wave uprush calculated as the intersection of the existing flood allowance with the wave uprush limit.

The Flooding Hazard allowance consists of the following components (Figure 12):

- 100-year flood level (includes Still water level + Surge)
- Flood Allowance for Wave Uprush
- Flood Allowance for Other Water Related Hazards (Ice Piling, Ice Jamming, Ship-generated waves)
- Access Allowance

Total Flood Allowance = 1:100 year water level (which includes surge) + Wave Uprush and Overtopping allowance and Other Water Related Hazards

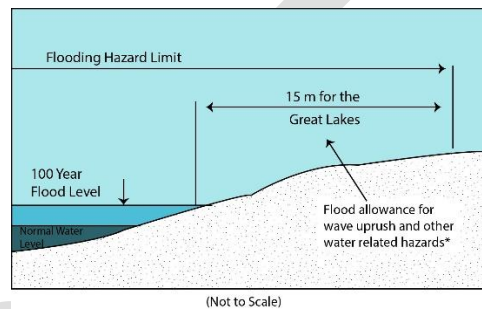


Figure 12 -Flooding Hazard Limit

This horizontal distance of 15 m is recommended for Wave Uprush and Overtopping allowance by the Provincial Policy Statement (PPS) Technical Guides which support Ontario Regulation 46/06 unless specific studies are carried out for an area. Specific studies were carried out in the 1990 Lake Ontario Shoreline Management Plan (Sandwell, Swan, Wooster, Inc.) and the 100 year Flooding Hazard elevation (including 100 year water level, surge, Wave Uprush and Overtopping) was determined for the Port Darlington Area.

The Lake Ontario 100 year flood level (includes still water level + surge) + Wave Uprush is 76.34m Geological Survey of Canada (GSC) or 76.27m International Great Lakes Datum (IGLD 1955). The elevations at West Beach Road are approximately 75.7m GSC and along Cedar Crest Beach Road are 76.0 m GSC. Therefore these areas are 0.6m to 0.3m below the 100 year Lake Ontario Flood level (including wave uprush and overtopping).

*“At this elevation, many of the homes on Cedar Crest Beach Road and West Beach Road would experience property damage, septic systems would be inundated, and well water contamination would be probable. Furthermore, the flood depth on the roadways would prevent access and egress to the homes, and evacuation would be recommended.” (CLOCA, Draft Nov. 2018)*



Figure 13 - 2. 2017 Lake Ontario Maximum Daily Mean Water Level



Flood and Erosion Hazards from Lake Ontario - Cedar Crest Beach Road Residents

### 3.1.2 *Flooding Impacts of the Creek Systems*

The Port Darlington Damage Centre is impacted by not only Lake Ontario but by two creek systems; Bowmanville/Soper Creek Floodplain and the Westside Creek Floodplain.



*“During the spring of 2017, Lake Ontario reached the highest water levels in recorded time, with the maximum static water level of 75.8 meters. On calm days, the high water level did not overtop the shoreline, although it is likely the prolonged high water level saturated the waterfront sand spit, and created problems with seepage into basements/crawl spaces, and fouled septic and well water systems. On stormy days, the combination of surge and wave runup pushed water over the sand spit at Cedar Crest Beach with water flowing from the Lake to the Westside Marsh. These water levels were approaching but slightly less than the calculated 100 year Lake Ontario Flood Limit.” (CLOCA, Draft Nov. 2018)*

With the Westside Creek wetland on the north and Lake Ontario on the South of the Dynamic Beach Barrier System flooding has potential to occur from both sides which was the case in 2017 for the study area.



Cedar Crest Beach Road (2017)

### 3.1.2. a) Bowmanville/Soper Creek Floodplain – West Beach Road Impacts

*“In this area, flooding events ranging from a **25 year return period storm** (4% probability of occurring in any year) will impact the West Beach Road residents. Generally, topographic mapping shows the ground elevations around the homes in the range of 76 metres to 77 metres. At the **100 year storm** (1% chance of occurring in any year) level, water depth on West Beach Road would **prevent access and egress** by personal vehicles. At the **Regional storm flood level**, depths would **structurally damage buildings and loss of life** would become a significant risk for anyone within the southern portion of West Beach Road.”*

West Beach Road, Bowmanville/Soper Creek Flood Elevations have been provided in Appendix B.



Figure 14 - Riverine Regulatory Flood Level

One of the only areas that will not be under water is the bridge over West Side creek and Cove Road. But access to and from this area will not be viable.

### 3.1.2. b) Westside Creek Floodplain – Cedar Crest Beach Road Impacts

The Westside Creek Flood elevations at Cedar Crest Beach Road (from CLOCA, Draft Nov. 2018) are provided in Appendix B.

*“In this area, flooding events larger than the 5 year return period storm (20% probability of occurring in any year) will result in flooding of Cedar Crest Beach Road. Generally, topographic mapping shows the ground elevations around the homes in the range of 76 metres to 77 metres. At the **25 year storm flood level** (4% chance of occurring in any year), water depth on Cedar Crest Beach Road would **prevent access and egress by personal vehicles**. During a **50 year storm flood event** (2% chance of occurring in any year), the combination of depth and velocity of flood water would create conditions that could result in **people being swept away and risk to public safety**. At the **Regional storm flood level**, depths would **structurally damage buildings and loss of life** would become a significant risk for anyone on Cedar Crest Beach Road.” (CLOCA, Draft Nov. 2018)*

### 3.1.2. b) Mouth of Westside Creek

The outlet to Westside Creek (Figure 15) in Lake Ontario is a Dynamic Barrier Beach System. A key characteristic of this dynamic system is that the outlet is constantly changing and under varying natural conditions the mouth of the outlet will form a barrier across the outlet and breach that barrier as part of its natural processes. These unique processes which occur with these systems were recognized provincially and as a result, a special designation of Dynamic Beach Hazard was identified to recognize and allow for these natural features and processes to occur.



Figure 15 - From Figure 2.3: Barrier beach at the mouth of the Westside Creek. (CLOCA, Draft Nov. 2018)

The ‘break’ events at the mouth of Westside Creek were analysed by CLOCA looking at the consistency in the water surface elevation difference (hydrostatic head) between the wetland and the Lake, studying the criteria when the ‘break’ events occurred. The study found that the hydraulic head varied on the break events studied (2006 and 2015) between 0.2m and 0.7m with an average value of 0.4m.



Municipality of Clarington assisted in opening up the mouth of Westside Creek – Photo courtesy of - Ryan Pfeiffer / Metroland. May 4, 2017.

*“On occasion, the barrier beach **has been opened mechanically because of the threat of flooding** in the Cedar Crest Beach community. The **elevation of Cedar Crest Beach Road is approximately 75.9m**. Using our finding that the barrier beach typically breaks with heads of 0.2m through 0.7m, it can be assumed that under average Lake Ontario water levels (winter low of 74.5m and summer high of 75.1m), the barrier beach would break before the water level in the wetland would overtop the Cedar Crest Beach Road elevation (summer Lake level of 75.1m plus 0.7m head = 75.8m). **It is only when Lake levels exceed 75.1m that the barrier beach may present a risk for flooding**. In recent times, a water level alarm has been developed for the Westside Marsh, and e-mail alerts are sent to CLOCA, Clarington, and St Mary’s Cement staff to alert of wetland levels exceeding 75.5m. Staff from these agencies will assess conditions and take actions as appropriate.” CLOCA (Draft Nov. 2018).*

Details of the analysis by CLOCA was provided in the Westside Marsh Barrier Beach Function report which can be found in the Appendix of the ‘Port Darlington Community Shoreline Management Plan: Report on Flooding’ by CLOCA, (Draft Nov. 2018).

### **3.1.3 Mitigation Measures**

Part of the CLOCA Flooding Study was to review if there were any mitigation measures that could be carried out that could help to reduce the impacts of the flooding events. A number of measures were looked at by CLOCA. The following highlights the recommendations from the Draft Port Darlington Flood Study Report (Nov. 2018).

#### **3.1.4 a) Raise Elevations**

Flooding is occurring from both the Lake and the creek systems, along Cedar Crest Beach Road and West Beach Road as the homes are being inundated by both the lake from the south and the creek systems from the north. ‘The CLOCA Port Darlington Community Shoreline Management Plan: Draft Report on Flooding, Nov. 2018 analyzed the existing and flood elevations along Cedar Crest Beach Road and West

Beach Road to see if something could be done to raise the elevation of the roadways ultimately decreasing the frequency of the smaller flooding events from the creek systems.

Flood mitigation measures in the form of raising the elevations of the roadways along Cedar Crest Beach Road and West Beach Road have been analyzed at a high level and recommendations made by CLOCA staff are that a detailed review of this measure be undertaken before consideration is given to move forward with this initiative, which will be subject to further consideration by the Municipality of Clarington as the road authority in this instance.

According to the CLOCA Flooding study, *“This is a complicated area where simple berming or dykes may not be possible or practical because of further problems that could be caused by these structures virtually barricading drainage and causing additional flooding from either the lake or the creek side. However raising the elevation of the existing roadway may provide some relief by allowing access to and from the residences during higher frequency events than is currently occurring (i.e. 2 year event), and not cause additional drainage problems.*

*It is possible to increase the level of flood protection from riverine events by raising Cedar Crest Beach Road. The potential level of protection which could be provided to the adjacent homes would **increase from a frequent 2 year flood event level to a less frequent 10 year storm event. Furthermore, safe access would be provided up to the 50 year storm level (76.0m road minimum elevation) or 100 year flood level (76.15m road minimum elevation).***

*This flood mitigation measure will not protect against regulatory events or Lake flooding events. **There is also potential that raising the road may make Lake events worse should shoreline flooding reach Cedar Crest Beach Road.***

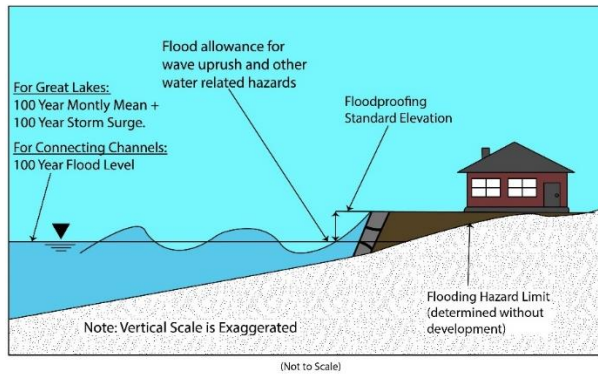
*The flood mitigation would reduce the riverine flood risk for the community, by **reducing the frequency of flooding events, although the community flood vulnerability would still be high because of the potential for significant flooding from regulatory riverine and Lake based events.**” (CLOCA, Draft Nov. 2018).*

Further analysis to review the details of the individual lot drainage would need to be carried out to make sure that the raised elevation would not cause other obstructions to the lots. Additionally along the West Beach Road the potential impacts to the upstream properties will need to be assessed as part of the analysis, as this information could affect the proposed roadway design elevations. The cost/benefit and the feasibility of these works will still need to be completed as part of the analysis. A detailed design and flood modeling would then be required for the next phase of the project. Again, such analysis and decision making would be subject to further collaboration between CLOCA and the municipality with final decision making by the Municipality of Clarington, as the road authority in this instance.

### 3.1.4. b) Floodproofing Elevations & Standards

Floodproofing is recommended and whenever possible dry floodproofing along Cedar Crest Beach Road and West Beach Road. Flood mitigation methods are also recommended by floodproofing individual homes. This may involve structural changes to elevate or protect the main floor and living space from the flood levels, waterproofing foundation walls, and removing all valuables and utilities from basements and crawl spaces. See Figure 16 and references in Appendix C for Floodproofing standards.





Note: Development not permitted within *Defined Portions* of the 100 Year Flood Level along connecting channels. Development must also meet other Policy requirements, including safe access.

MNR Technical Guide - Part 7: Figure 7.3 Elevation of Flood Prone Residence - Dry Passive Floodproofing (2001)

Figure 16 - MNR Technical Guide Floodproofing Standard

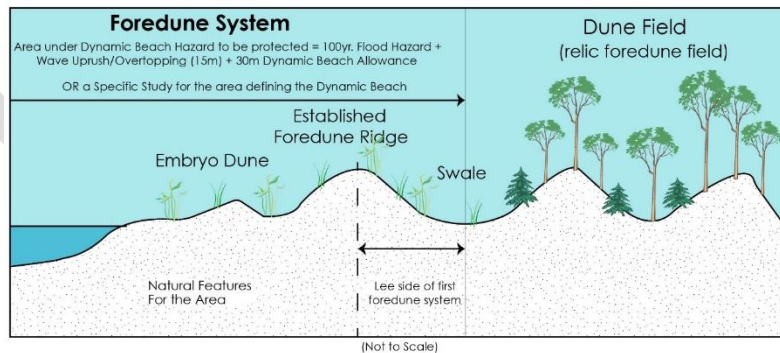
### 3.2 Dynamic Beach Hazard – Lake Ontario

Without site-specific studies the dynamic beach hazard is comprised of several components:

Lake Ontario Dynamic Beach Hazards Components:

- Flooding Hazard Limit
- A Horizontal Distance representing 100 times the Average Annual Recession Rate of the Beach
- A Dynamic Beach Allowance of 30 metres
- Access Allowance

Total Setback = 100 year Flood level + Wave Uprush/Overtopping Allowance + a 30m allowance for Dynamic Beach (Figure 17).



Base Figure taken from Davison-Arnott, Robin, 2010. Introduction to Coastal Process and Geomorphology, Cambridge University Press, ISBN #978-0-521-69671-5 Paperback, Pg. 232.

Figure 17 -Dynamic Beach Hazard Setback

### 3.3 Erosion Hazard - Lake Ontario

Lake Ontario Erosion Hazards Components (Figure 18):

- Erosion Allowance = 100-year Average Annual Recession Rate (AARR) over 100 years
- Slope Stability Allowance
- Access Allowance

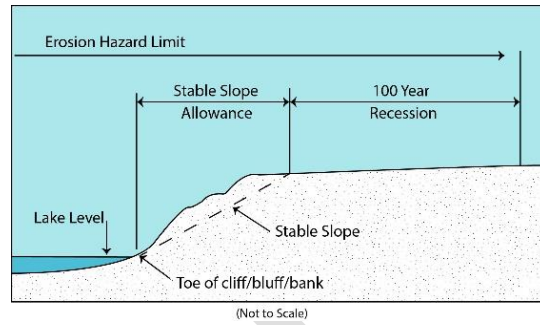


Figure 18 -Erosion Hazard



### 3.4 Safe Ingress/Egress & Emergency Response

The safety of the public is paramount and safe ingress/egress is a requirement under not only the CLOCA Regulation but also by the Province. Access to and from an area is a key component in any emergency plan. The Municipality of Clarington has prepared a comprehensive Emergency Plan, April 27, 2018 (See Appendix E) as a result of the sever flooding which occurred along the Port Darlington shoreline in 2017.



CLOCA staff have carried out an assessment of the Emergency Response for the area. A summary from Section 4 of the 'Port Darlington Community Shoreline Management Plan: Report on Flooding' by CLOCA, (Draft Nov. 2018) has been provided.

*"The responsibility for dealing with flood contingency planning in Ontario is shared by municipalities, Conservation Authorities (CAs) and the Ministry of Natural Resources and Forestry (MNRF), on behalf of the province. As with all emergencies, municipalities have the primary responsibility for the welfare of residents, and incorporate flood emergency response into municipal emergency planning. The Ministry of Natural Resources and Forestry and the Conservation Authorities are primarily responsible for operating a forecasting and warning system, and the province may coordinate a response in support of municipal action.*

*The Conservation Authorities of the Greater Toronto Area (GTA) have developed a Flood Forecasting and Warning program for the municipalities and residents within their collective watersheds and the shoreline of Lake Ontario and Georgian Bay. The purpose of this service is to reduce risk to life and damage to property by providing local agencies and the public with notice, information and advice so that they can respond to potential flooding and flood emergencies.*

*The Flood Contingency Plan is intended for all public officials and agency staff likely to play a role in the prevention, mitigation, preparedness, response and recovery pertaining to flood events. The Flood Contingency Plan provides general information on the Flood Forecasting and Warning program for CLOCA, as well as specific information and contacts for municipalities within CLOCA's jurisdiction.*

*Municipalities have the primary responsibility and authority for response to flooding and flood emergencies, and also for the welfare of residents and protection of property. They will determine the appropriate response to a flood threat and, if warranted, deploy municipal resources to protect life and property. Municipalities may also, if required, declare a flood emergency and implement their Emergency Procedures Plan.*

*The Municipality of Clarington has a Flood Response Plan included with their Clarington Emergency Plan, and has specific reference to Waterfront Flooding.*

*Conservation Authorities have several areas of responsibility for flooding and flood emergencies, but act primarily in an advisory capacity:*

- 1. Maintain a local network of stream and rain gauges, and snow courses; collect data, and monitor watershed and weather conditions daily in order to provide timely warning of anticipated or actual flood conditions (i.e., operate a flood forecasting and warning system). Provide updated forecasts and other supporting technical data pertaining to flood conditions under their jurisdiction during an event.*
- 2. Issue flood messages to municipalities and other appropriate agencies, including the media and the public, to advise of potential flooding when appropriate.*
- 3. Maintain communications with municipalities and the MNRF Surface Water Monitoring Centre during a flood event.*
- 4. Support municipal flood emergency planning by providing technical advice pertaining to flood risk (e.g., hydrology, hydraulics, flood vulnerable areas, etc.) and where possible, engage in flood mitigation projects to reduce flood risk prior to flood events.*

*St Mary's Cement has also worked with CLOCA and the Municipality of Clarington to establish a monitoring and maintenance plan for the Westside Marsh overflow channel, and have installed a water level gauging system with remote communication abilities in the west portion of the Marsh, owned by CLOCA, that is close to the northern portion of the emergency overflow channel. St. Marys has donated the remote system to CLOCA for operating as an additional component of the flood warning program. St. Marys, CLOCA, and Clarington staff will all receive email alerts from the remote system when the water elevation at the location of the remote system in the Marsh reaches a certain elevation, to be determined periodically by CLOCA (the "pre-set elevation") as a warning of high Marsh water levels. CLOCA also installed manual staff gauges in the Marsh closer to Cedar Crest Beach Road which will act as a verification and back-up for the remote system.*

*Both the barrier beach for the Westside Marsh and the St Mary's overflow channel will be assessed by the agencies, and measures including removing accumulated Lake Sediments will be taken when determined necessary.*

*Flood emergency preparedness is also a responsibility of everyone living in a flood damage centre."*  
(CLOCA, Nov. 2018)

### 3.5 Flood Mitigation Measures

Flood mitigation measures were also reviewed by CLOCA in the 'Port Darlington Community Shoreline Management Plan: Report on Flooding, Nov. 2018 Draft'.

"The management of lands susceptible to natural hazards involves a combination of three main program components:

1. Prevention of harm through land use planning and regulation of development
2. Protection by applying structural and non-structural measures and acquisition, and
3. Emergency response by flood forecasting/warning and flood/erosion disaster relief

Given the severity of the flood hazard, a concerted effort on all program components may be required to manage the flood risk for the Port Darlington community. " (CLOCA, Nov. 2018)

The CLOCA report identified a number of flood mitigation measures such as:

- Floodproofing of homes and properties whenever possible, and consider options that would mitigate the flooding and erosion hazards.
- Flood mitigation methods are recommended by floodproofing individual homes. This may involve structural changes elevate or protect the main floor and living space from the flood levels, waterproofing foundation walls, and removing all valuables and utilities from basements and crawl spaces.
- The Municipality of Clarington is responsible for emergency response during flooding and/or erosion conditions. They have completed a Waterfront Flooding Flood Emergency Response Plan and the link to their Emergency Services web site information is; <https://www.clarington.net/en/town-hall/emergency-planning.asp>
- Review and be familiar with the "Municipality of Clarington Emergency Plan", this document is current as of April 27, 2018. Link to the document; <https://www.clarington.net/en/town-hall/resources/Emergency-and-Fire-Services/Clarington-Flood-Response-Plan.pdf>
- Municipality of Clarington Emergency Preparedness web site; <https://www.clarington.net/en/town-hall/emergency-preparedness.asp>
- Home owners should review Environment Canada's flood ready website; <https://www.canada.ca/en/campaign/flood-ready.html> and prepare for a flood emergency.
- The Ministry of Natural Resources and Forestry (MNRF) provides a Flood Forecasting and Warning Program with information available to the public about the current conditions along the Great lakes. This Program prepares provincial and local authorities with information in the event of a flood and the web site can also be accessed by the public at; <https://www.ontario.ca/law-and-safety/flood-forecasting-and-warning-program>
- CLOCA provides the local Flood Forecasting and Warning for Lake Ontario and the two



creek/marsh systems along Port Darlington. Additionally CLOCA has collaborated with St. Marys to set up and has established a water level monitoring and warning station within the West Side Marsh. This station will be used to not only monitor the flooding elevations but also to check when it may be required to 'break' open the barrier beach at the mouth of West Side Creek and alert the Municipality of Clarington of the need to take action.

Flood mitigation measures in the form of raising the roadway along Cedar Crest Beach Road and West Beach Road have been analyzed at a conceptual level by CLOCA as a result of the study and analysis they undertook in the 'Port Darlington Community Shoreline Management Plan: Report on Flooding, Nov. 2018 Draft'. A detailed feasibility assessment of these possible mitigation measures will be required as the next step to move forward. Further analysis, detailed design and flood modeling will be required as the next phase of the project advances, subject to decision making by the Municipality of Clarington as the road authority in this instance. Additionally along the West Beach Road the potential impacts to the upstream properties will need to be assessed as part of the analysis, as this information could affect the proposed roadway design elevations.

#### **4.0 Policy and Management Considerations and Recommendations**

Protecting human life and property from the adverse effects of natural hazards including flooding, erosion and dynamic beaches is a legislative responsibility assigned to the CLOCA. Having shoreline policies in place that are reflective of current law and policy, that are implementable and, critically, that are defensible and based on sound science, offers a vital foundation for protecting the shoreline features and functions while guiding development that is safe and sustainable.

Keeping people and property safe from the effects of natural shoreline hazards is an important responsibility of all levels of government and residents. This updated Shoreline Policy for the west side of Port Darlington focuses on managing the shoreline to address public safety, that property damage is prevented or minimized. Implementation will depend upon collaboration and cooperation between CLOCA, the Municipality of Clarington, Region of Durham, provincial and federal partners as well as individual landowners.

#### **4.1 Summary Discussion**

In carrying out its mandated responsibilities, CLOCA and the Municipality of Clarington should focus first on preventing an increase in development within the portions of the study area that are within hazard lands and thereby limit risk to persons within the damage centre area from flooding, erosion and/or dynamic beach hazards. A 'prevention-first' philosophy is directly reflective of long-standing provincial statutory and policy direction and CLOCA's Regulation under the Conservation Authorities Act. Importantly, this approach must also be supported by the Municipality of Clarington whose Official Plan recognizes the importance of public safety and the need to protect property against natural hazards in the study area.

The recommendations of this study build upon many of the existing policies that have been in place at CLOCA for several years. This study calls for no new development within certain natural hazards and

provides detailed policy recommendations for existing development, major and minor alterations or changes to existing uses based on the type of natural hazard present. The 'no new development' principle, while preventing new development, would facilitate the continued use and maintenance of existing structures.

CLOCAs current approved policies permit minor additions subject to certain conditions. The recommendations in this report propose a policy position to reflect no increased development within the hazardous area, so that minor and major additions will also not be permitted. Interior alterations will continue to be permitted along with improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure), provided there is no increase in dwelling size, units, living space or occupancy, change or intensification of use of the existing structure. Shoreline erosion protection works would continue to be permitted but must be designed by a qualified coastal engineer in compliance with the latest MNRF standards.

The province recognizes that management of flood susceptible lands includes a number of components, one of which is land acquisition. On lands where there is no feasible opportunity to establish safe access, self-directed property disposition to public ownership is introduced as one of the options that a property owner may consider. Should this option be adopted by decision makers,, further analysis and details of such a program would need to be developed along with additional consultation with the community.

#### 4.2 General Policy and Management Recommendations

The assessment of the level of risk associated with of the combined natural hazards existing in the Port Darlington Damage Centre C4, have led to the current recommendations:

Self-Directed Disposition (based on the Hazards present)

**As noted Self-Directed Disposition has been introduced as one of the options that a property owner may consider in areas where it is not feasible to establish safe access. The intention is that this would be a property owner driven option and has been put forward with the intention of empowering the property owner to have the option of avoiding the personal and property risks that currently exist, particularly with respect to flooding and unsafe access.**

No *New development* of existing lots within the Hazards (both Lake & Creek Hazards)

No *infilling* of existing Vacant Lots within the Hazards (both Lake & Creek Hazards)

No *creation of new lot* (e.g. severance for increase in development)

*Interior Alteration/Renovations*

- Allowed provided there is No increase in dwelling size, units, living space or occupancy, change or intensification of use
- Advise of Long term Flooding and Erosion Hazard

*Exterior Repairs/Maintenance of dwellings.* Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure)

- Allowed, provided there is no increase in dwelling size, units, living space or occupancy, change or intensification of use.

*Replacement of dwelling destroyed by forces of flooding and/or erosion:*

- Not permitted – will need to consider acquisition in this context

*Replacement of dwelling destroyed by forces other than flood and erosion (e.g. fire)*

- Relocation if possible to reduce vulnerability to hazards
- Advise of Hazards
- Replace with same size or smaller and utilize the maximum lot depth for Erosion setbacks and Floodproofing Standards
- Provide the same or better ingress/egress as previous structure

*No redevelopment or expansion of existing development within the Hazards (both Lake & Creek Hazards)*

- Maintain the existing conditions, no increase in dwelling size, units, living space or occupancy, change or intensification of use, additions or change of building footprint.
- 'Like for Like'
- No basements, slab on grade (or raised for improvement to Floodproofing Conditions)
- *Floodproofing* is recommended for the residential structures plus the *Erosion Allowance*. CLOCA to review the Erosion Allowance and Floodproofing criteria (they would be addressed in accordance with the "Established Standards and Procedures).
- If Possible: Encourage Improvement to Floodproofing measures and mitigation. Dry Floodproofing is preferable but may not be possible in all areas.
- If Possible: Encourage an Increased Erosion Setback for structures

*Accessory Structures* - non-habitable, moveable structures (unattached garages, sheds, gazebos) with no utilities and maximum size of 14 m<sup>2</sup>

- Existing accessory structures, could be repaired and maintenance permitted.
- New structures may be permitted if they are kept out of the Hazards to ensure the protection of the slope/bluff and beach areas.
- Repairs and maintenance of existing structures are allowed.
- If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.

*Septic Systems*

No expansion of existing septic systems unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.

- Repairs and/or maintenance to existing septic systems permitted, but no expansion to system unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.



*Relocation of dwelling away from shoreline*

- Optional on part of owner but relocate outside of Erosion Hazard area & in accordance with the Floodproofing Standard. (Dry Floodproofing Preferred) where possible
- Provide improvements to ingress/egress access wherever possible

*Swimming pools*

- No In ground inside the hazard areas

*Protection Works*

- Permitted in Appropriate hazard areas (e.g. Erosion along Cedar Crest Beach Road but not on Dynamic Beach System along Cove and West Beach Roads where they are not necessary)
- Slope Stability works may be considered along Cove Road Bluff.

**5.0 Recommendations for Specific Shoreline Sections**

Additional recommendations were put forward for each of the distinct areas and the following section outlines each of the shoreline sections and the unique components of those areas.

**5.1 Western End of Shoreline- St Mary's to Watson Crescent.**

The western end of the study area starts at the east end of St. Marys and runs east parallel to Watson Crescent.



There is a fillet beach at the western end of the section by St. Marys Pier.



An exposed cohesive bluff consisting of sand, cobble and bolder material runs along the eastern half of the section.



There is a drainage channel at the west end of the section which was installed as part of the compensation works for Westside Creek Marsh by St. Marys Cement.



Drainage Channel - June 11, 2017



Sept. 12, 2017 Photos Courtesy of Tom Kara



The beach material also consists of sand, cobble and bolder material.



This shoreline section is owned St. Marys with the exception of a section of shoreline fronting Watson Crescent which is owned by the Municipality of Clarington as indicated in yellow in Figure 19.



Figure 19 - Lands Owned by the Municipality of Clarington

**5.1.1 a) Special Considerations for this area**

There are no residences within the hazard area along this section. Any future development in this area would be required to remain outside of the Dynamic Beach and Erosion hazards.

Self-Directed Disposition of Hazard Properties – It is recommended that existing undeveloped private shoreline lands in this area be ultimately transferred into public ownership along this section of shoreline.

There may be additional areas which are outside of the Hazard. It is anticipated that these lands will be zoned for Environmental Protection related uses in the Zoning By-law given the present land use designations in the Clarington Official Plan.

**5.1.1 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following two tables for the Section from St. Marys to Watson Crescent.

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Table Summary of Considerations- Guide for Development Within the Hazardous Lands - East side of St. Mary's to Watson Cres.

Development Activity		East side of St. Marys to Watson Cres. * Area is Dynamic Beach backed by Bluff (Erosion Criteria Governs along Bluff Area) There are no Residences in this area. Lands are owned by St.	
		<b>Erosion Hazard - Lake</b>	
		Stable Slope Allowance 3:1 PLUS	+ Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
EXISTING DEVELOPMENT			
<b>Existing Development- Overall Recommendations</b>		n/a (No existing structures in this area)	
<b>Existing Development- Overall Recommendations</b>		Self Directed Disposition of Hazard Properties- If existing privately owned land owners should decide to sell in the future then Public Acquisition is recommended for the Hazard Lands. One property is outside of the Hazard but does not have access during a flooding event, could also be considered for future public acquisition (e.g. Public Park)	
Shoreline Protection Works: Repairs/maintenance		n/a (No existing structures in this area)	
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure).Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.		n/a (No existing structures in this area)	
Interior Alterations of Residences and Habitable Structures - Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard		n/a (No existing structures in this area)	
EXISTING DEVELOPMENT			
Minor additions		n/a (No existing structures in this area)	
Major additions/alterations		n/a (No existing structures in this area)	
Redevelopment - existing structure removed and new structure erected		Not permitted	Not permitted
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).		Not permitted	Not permitted
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)		Not permitted	Not permitted
Relocation of habitable dwellings away from the shoreline		n/a (No existing structures in this area)	
Relocation of accessory buildings or structures away from the shoreline ( e.g. unattached garages, sheds, gazebos) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.		n/a (No existing structures in this area)	



Development Activity	East side of St. Marys to Watson Cres. * Area is Dynamic Beach backed by Bluff (Erosion Criteria Governs along Bluff Area) There are no Residences in this area. Lands are owned by St.	
	<b>Erosion Hazard - Lake</b>	
	Stable Slope Allowance 3:1 PLUS	+ Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
EXISTING DEVELOPMENT		
Non-habitable Accessory building/structures- moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	n/a (No existing structures in this area)	
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	n/a (No existing structures in this area)	
Swimming Pools - (In ground)	Not permitted	Not permitted
Expansion of existing septic systems,	n/a (No existing structures in this area)	
Repairs and/or maintenance to existing septic systems,	n/a (No existing structures in this area)	
NEW DEVELOPMENT		
New habitable buildings or structures	Not permitted	Not permitted
Infilling of Existing Vacant Lots	Not permitted	Not permitted
Creation of a new lot (severance, subdivision)	Not permitted	Not permitted

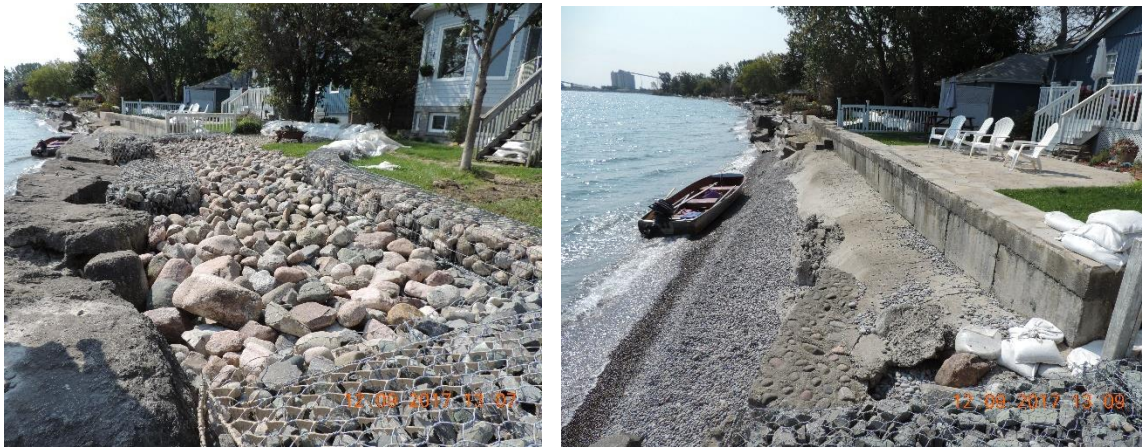
## 5.2 Cedar Crest Beach Road

Cedar Crest Beach Road was historically a dynamic barrier beach as one can see the West Side Creek Marsh behind the spit of land in the photo below (Figure 20).



Figure 20 - Historical Photo illustrating the Barrier Beach Systems along Cedar Crest Beach Road

It is currently an area where extensive erosion and flooding has occurred, resulting in the construction of shoreline works by the residents along this section in order to provide protection for their homes and properties.



A mix of shore protection works exist along this shoreline; armour stone, gabion and concrete walls, blocks, rubble and broken concrete materials.



The spring of 2017 was devastating for the residents as many of their existing shoreline protection structures were threatened or destroyed by the extreme lake levels causing severe erosion and flooding.



Photo Courtesy of Wayne May 25, 2017



Photo Courtesy of Wayne April 7, 2017

Only one of the properties is in public ownership. (Figure 21)

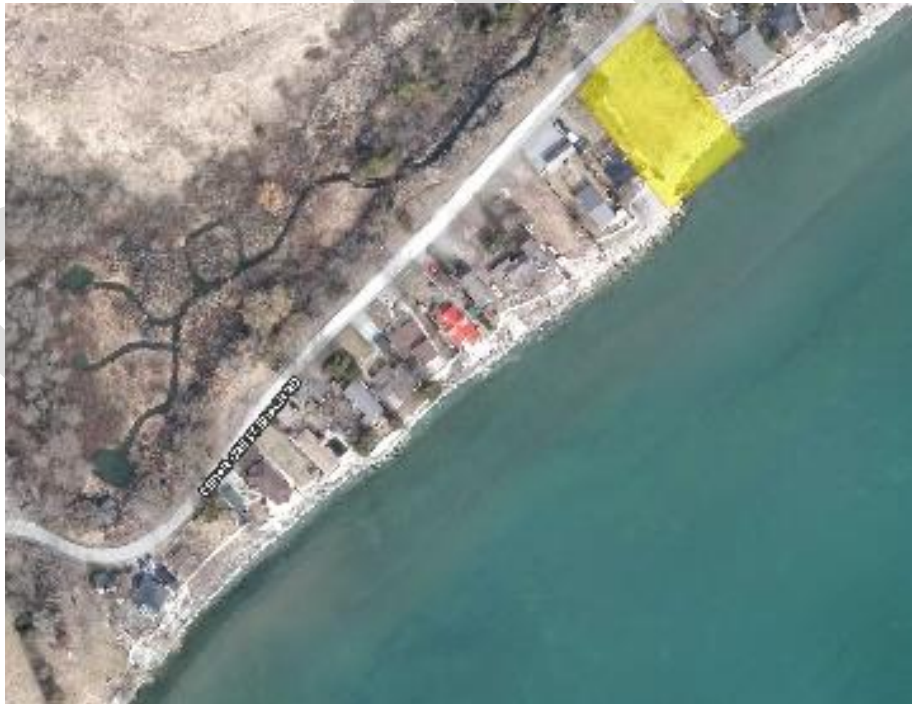


Figure 21 - One property is owned by the Municipality of Clarington



### **5.2.1 a) Special Considerations for this area**

The following protection works recommendations are for the Cedar Crest Beach Road location. As a result of the severe erosion which is occurring along this shoreline, it is the one area where private shoreline erosion protection works are allowed.

#### *Shoreline Erosion Protection Works:*

*New and/or repair/maintenance of protection works allowed provided.*

- They must be designed by qualified engineer and based on the latest standards and in accordance with; the Protection Works standards, CLOCA Chapter 4.6 Lake Ontario Shoreline Protection Works, PPD document (April 2013), and the provincial guidelines (Technical Guide For Great lakes – St. Lawrence River Shorelines) Part 7 Addressing the Hazards.

Ensure owners are aware that the installation of Individualized Protection Works along the shoreline will Not Address the long term Erosion Hazards (they will require on-going inspection and maintenance).

The owner should be advised that the shoreline protection works may assist with the Erosion Hazard and mitigate some of the Lake Shoreline Flooding (depending on the design and height of the structure) but it will NOT be able to fully address the Shoreline Flooding issues for Significant Lake Events OR Creek & Marsh Flooding. The natural land features along Cedar Crest Beach and West Beach are simply too low, to not be affected by a significant Flooding event.

#### *On-going Maintenance of Structures*

- The undermining and scouring of the structure will need to have on-going inspection and maintenance in order to ensure the future stability of the structure.

*Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).*

- Permitted if they are being used as perpendicular access to the shoreline and not at risk to slope stability or erosion hazard. If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.

Provide *upgraded ingress/egress access standards* whenever possible.

*No new, redevelopment or expansion of existing development within the Hazards*

- Maintain the existing conditions, no increase in dwelling size, units, living space or occupancy, change or intensification of use, additions or change of building footprint.
- 'Like for Like'
- No basements, slab on grade (or raised for improvement to Floodproofing Conditions)
- *Floodproofing* is recommended for the residential structures PLUS the *Erosion Allowance*. CLOCA to review the Erosion Allowance and Floodproofing criteria, they will be addressed in accordance with the "Established Standards and Procedures.
- If Possible: Encourage Improvement to Floodproofing measures and mitigation. Dry Floodproofing is preferable but may not be possible in all areas.
- If Possible: Encourage Increased Erosion Setback

**5.2.1 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following two tables for the Cedar Crest Beach Road section.

Table Summary of Considerations- Guide for Development Within the Hazardous Lands -Cedar Crest Beach Road			
Development Activity	Cedar Crest Beach Road		
	Flooding Hazard From Lake & Creek	Erosion Hazard - Lake	
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	Stable Slope Allowance 3:1 PLUS	+ Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
EXISTING DEVELOPMENT			
Existing Development- Overall Recommendations	Maintain Status Quo of Existing Development • 'Like for Like' • Maintain the existing conditions, No increase in dwelling size, units, living space or occupancy, change or intensification of use., additions or change of building footprint. <ul style="list-style-type: none"> <li>• No basements, slab on grade (or raised for improvement to Floodproofing Conditions)</li> <li>• Floodproofing is recommended for the residential structures PLUS the Erosion Allowance. CLOCA to review the Erosion Allowance and Floodproofing criteria, they will be addressed in accordance with the "Established Standards and Procedures.</li> <li>• If Possible: Encourage Improvement to Floodproofing measures and mitigation. Dry Floodproofing is preferable but may not be possible in all areas.                             <ul style="list-style-type: none"> <li>• If Possible: Encourage Increase Erosion Setback</li> </ul> </li> </ul>		
Existing Development- Overall Recommendations	Self Directed Disposition of Hazard Properties		
Shoreline Protection Works: Repairs/maintenance	Designed by qualified engineer, Upgrade to Latest Standards in accordance with "Protection Works Standards' & 'Established Standards & Procedures", If existing development is within the hazard zone then the Erosion and Flooding standards must be adhered to for any Protection works maintenance or installation.		
	Owners must be made aware that the installation of Individualized Protection Works along the shoreline will NOT ADDRESS the long term Erosion, Flooding and Dynamic Beach Hazards from Lake Ontario and also from the Creek and Marsh. Their properties are within the Hazardous Lands and the homeowners accept full responsibility for any damages or losses which occur as a result of locating within the Hazardous Area. Advise of hazards and ultimate potential loss of protection works.		
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure). Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.	Permitted provided, ' Like for Like' • Maintain the existing conditions, No increase in dwelling size, units, living space or occupancy, change or intensification of use., additions or change of building footprint.		
Interior Alterations of Residences and Habitable Structures - Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard	Permitted. Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of long term flooding hazards.	Permitted. Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of long term erosion hazards.	



Development Activity	Cedar Crest Beach Road		
	Flooding Hazard From Lake & Creek	Erosion Hazard - Lake	
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	Stable Slope Allowance 3:1 PLUS	+ Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
<b>EXISTING DEVELOPMENT</b>			
Minor additions	Not permitted	Not permitted	
Major additions/alterations	Not permitted	Not permitted	
Redevelopment - existing structure removed and new structure erected	Not permitted	Not permitted	Not permitted
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).	Not permitted	Not permitted	Not permitted
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)	Not permitted	Not permitted	Not permitted
Relocation of habitable dwellings away from the shoreline	Permitted. Optional on part of the owner but relocate outside of the Erosion Hazard if possible and in accordance with the Floodproofing Standards. If possible dry floodproofing is preferred but may not be possible in all areas.		
Relocation of accessory buildings or structures away from the shoreline including unattached garages, sheds, gazebos) with no utilities.	Permitted. Optional on part of the owner but relocate outside of the Erosion Hazard if possible and in accordance with the Floodproofing Standards. If possible dry floodproofing is preferred but may not be possible in all areas		
<b>EXISTING DEVELOPMENT</b>			
Non-habitable Accessory building/structures-moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	Not permitted	Not permitted	New are permitted if they are kept out of the Erosion Hazard to ensure the protection of the slope/bluff and beach areas. Repairs and maintenance of existing structures are allowed. If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	Permitted if they are being used as perpendicular access to the shoreline and not at risk to slope stability or erosion hazard. If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.		
Swimming Pools (In Ground)	Not permitted	Not permitted	Not permitted
Expansion of existing septic systems	No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.		
Repairs and/or maintenance to existing septic systems	Permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.		
<b>NEW DEVELOPMENT</b>			
New habitable buildings or structures	Not permitted	Not permitted	Not permitted
Infilling of Existing Vacant Lots	Not permitted	Not permitted	Not permitted
Creation of a new lot (severance, subdivision)	Not permitted	Not permitted	Not permitted



### 5.3 Mouth of Westside Creek

The mouth of Westside Creek is at the east end of the Cedar Crest Beach Road development.



It is a dynamic barrier bar which consists of a sand and cobble materials. The photo below shows the bar when it is emergent and is blocking the flow of Westside creek. CLOCA has carried out a study on the elevations and conditions which occur in order for the bar to be breached, when the creek breaks through the barrier beach and exits, flowing through to the lake.



It is located at the east end of Cedar Crest Beach Road and west end of Cove Road. The majority of the lands are owned by the Municipality of Clarington, outlined in yellow (Figure 22) with two private properties within Hazard.



Figure 22 -Municipality of Clarington Ownership in Yellow

### **5.3.1 a) Special Considerations for this area**

Self-Directed Disposition and public ownership of the remaining hazard lands is recommended for this area as it is not only within the Hazards but also an Area of Natural and Scientific Interest (ANSI) and a Provincially Significant Wetland (PSW) - two ecological designations identified by the Ontario Ministry of Natural Resources and Forestry.

There are no habitable structures in this area. Note however there is 1 non-habitable structure within the Dynamic Beach Hazard. No repairs to this structure would be permitted, as it is within the Flooding and Dynamic Beach hazard, ANSI and PSW.

Controlled access points to the beach through the natural areas will be considered through the use of natural pathways (natural footpaths, roped path on natural beach areas, plantings) are encouraged.

Protection of the Natural Dynamic Barrier Beach system will be encouraged in order to provide the ability for the natural dynamic beach processes to continue. Protection of the natural areas and dune area will be encouraged through the use of plantings and vegetation.

### **5.3.1 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following two tables for the Mouth of Westside Creek section.

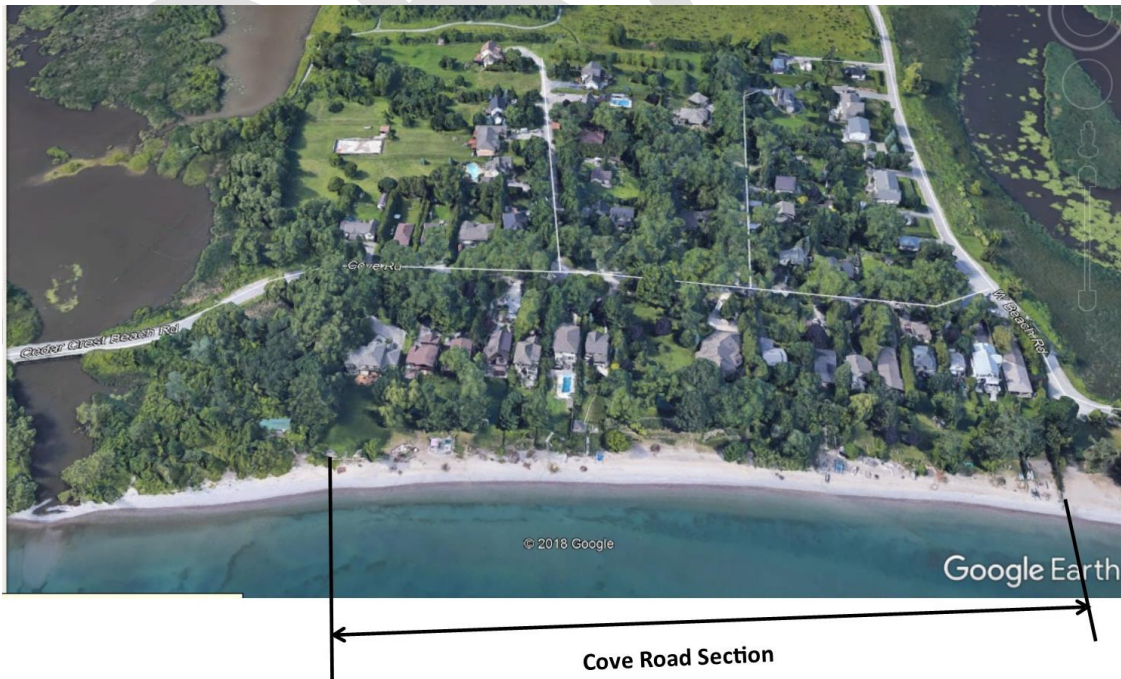
Table Summary of Considerations- Guide for Development Within the Hazardous Lands - Mouth of Westside Creek			
Development Activity		Mouth of Westside Creek - Dynamic Beach Hazard	
		Dynamic Beach Hazard -Lake & Regional Flood	
		Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	+ Defined Portion of Dynamic Beach Hazard 30 m = Dynamic Beach Hazard & Regional Flooding Hazard from West Side Creek
EXISTING DEVELOPMENT			
Existing Development- Overall Recommendations		Protection of the Natural Dynamic Barrier Beach system will be encouraged in order to provide the ability for the natural processes to continue.	
Existing Development- Overall Recommendations		Self Directed Disposition of Hazard Properties	
Shoreline Protection Works: Repairs/maintenance		n/a (No existing structures in this area)	
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure).Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.		There are no habitable structures in this area. Note however there is 1 dilapidated and inhabitable structure in the DBH, No repairs to this structure would be allowed to this structure	
Interior Alterations of Residences and Habitable Structures Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard		There are no habitable structures in this area. Note however there is 1 dilapidated and inhabitable structure in the DBH, No repairs to this structure would be allowed to this structure	
EXISTING DEVELOPMENT			
Minor additions		Not permitted	
Major additions/alterations		Not permitted	
Redevelopment - existing structure removed and new structure erected		Not permitted	
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).		Not permitted	
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)		Not permitted	
Relocation of habitable dwellings away from the shoreline		n/a (No existing structures in this area)	
Relocation of accessory buildings or structures away from the shoreline ( e.g. unattached garages, sheds, gazebos) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.		n/a (No existing structures in this area)	
EXISTING DEVELOPMENT			
Non-habitable Accessory building/structures- moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 does not include shoreline protection works.		n/a (No existing structures in this area)	



Development Activity	Mouth of Westside Creek - Dynamic Beach Hazard		
	Dynamic Beach Hazard -Lake & Regional Flood		
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	+ Defined Portion of Dynamic Beach Hazard 30 m	= Dynamic Beach Hazard & Regional Flooding Hazard from West Side Creek
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	Controlled access points to the beach through the natural areas will be considered through the use of natural pathways (natural footpaths, roped path on natural beach areas, plantings). Protection of the Natural Dynamic Barrier Beach system will be encouraged in order to provide the ability for the natural dynamic beach processes to continue. Protection of the natural areas and dune area will be encouraged though the use of plantings and vegetation.		
Swimming Pools (In ground)	Not permitted		
Expansion of existing septic systems	n/a (No existing structures in this area)		
Repairs and/or maintenance to existing septic systems	n/a (No existing structures in this area)		
NEW DEVELOPMENT			
New habitable buildings or structures	Not permitted		
Infilling of Existing Vacant Lots	Not permitted		
Creation of a new lot (severance, subdivision)	Not permitted		

#### 5.4 Cove Road – Dynamic Beach Backed by Bluff & Dynamic Beach

Cove Road is in the middle of the study area and separates the two communities of Cedar Crest Beach Road and West Beach Road. This area has three sections within it. The East and West ends of Cove Road are a Dynamic Beach and do not have a bluff behind them. The central section of Cove Road has a Dynamic Beach which is backed by a Bluff. The entire section of Cove Road is in private ownership.



**5.4.1 East and West Ends of Cover Road - Dynamic Beach without a Bluff**

East and West ends of Cove Road are a Dynamic Beach and do not have a bluff behind them. The beach consists of sand and cobble. The residences are set back but are still within the Dynamic Beach hazard.



Dyanic Beach at Western End of Cove Road. Photo courtesy of SJL Engineering (Nov. 2018)



Dyanic Beach at Eastern End of Cove Road. Photo courtesy of SJL Engineering (Nov. 2018)



Western End of Cove Road

Dynamic Beach Hazard



Eastern End of Cove Road



#### **5.4.1 a) Special Considerations for this area**

The special considerations for this Dynamic Beach Hazard area running along the east and west ends of Cove Road are as follows.

*No New development, infilling of vacant lots and creation of new lot* unless it is outside of the hazards.

*Interior Renovations* allowed provided there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.

*Exterior Repairs/Maintenance of dwellings.* Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure)

- Allowed, provided there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.

*Replacement of dwelling destroyed by forces of flooding and/or erosion:*

- Not permitted – Consider Voluntary Disposition in this context

*Replacement of dwelling destroyed by forces other than flood and erosion (e.g. fire)*

Permitted if Outside of the Hazard

- Relocation if possible to get out of the hazard area
- Replace with same size or smaller and utilize the maximum lot depth for Dynamic Beach setbacks, adequate hazard setback may be possible in some cases
- Provide access standard either the same or better

*No redevelopment or expansion of existing development within the Hazards*

- Maintain the existing conditions and there is No increase in dwelling size, units, living space or occupancy, change or intensification of use, additions or change of building footprint, unless it is outside of the hazard
- If Possible: Encourage Increase Dynamic Beach Setback unless it is possible to be outside of the hazard completely

Advise of Dynamic Beach Hazards and provide required *access standards*

*Accessory Structures* -non-habitable, moveable structures (e.g. unattached garages, sheds, gazebos) with no utilities and maximum size of 14 m<sup>2</sup>

- Existing accessory structures, can be repaired and maintenance permitted.
- If any accessory structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.
- New are permitted if they are kept out of the Dynamic Beach Hazard to ensure the protection of the dynamic beach areas.
- Should be moved away from Lake where applicable in order to protect the dune system which is degraded in some sections.

*Septic Systems*

- No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.
- Repairs and/or maintenance to existing septic systems permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.

*Relocation of dwelling away from shoreline*

- Optional on part of owner but relocate outside of the Dynamic Beach Hazard area and in accordance with the Floodproofing Standard. (Dry Floodproofing Preferred) where possible
- Provide improvements to ingress/egress and access standard wherever possible

*Swimming pools (In ground)*

- not permitted unless they are outside of the hazards

*Shoreline Protection works* should not be necessary in this area, as there is no protection works or development within the Dynamic Beach Hazard.

**5.4.1 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following tables for the Cove Road Section with the Dynamic Beach at East and West Ends.

Table Summary of Considerations- Guide for Development Within the Hazardous Lands - Cove Road East & West Ends	
Development Activity	East & West Ends of Cove Road- Dynamic Beach Hazard
	Dynamic Beach Hazard - Lake & Regional Flood
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping + Defined Portion of Dynamic Beach Hazard & Regional Flooding Hazard from Bowmanville Creek
EXISTING DEVELOPMENT	
<b>Existing Development- Overall Recommendations</b>	Protection of the Natural Dynamic Beach system will be encouraged in order to provide the ability for the natural processes to continue.
<b>Existing Development- Overall Recommendations</b>	Self Directed Disposition of Hazard Properties
Shoreline Protection Works: Repairs/maintenance	Protection works should not be necessary in this area, Maintain No protection works or development within DBH
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure). Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.	Permitted provided, 'Like for Like' • Maintain the existing conditions, No increase in dwelling size, units, living space or occupancy, change or intensification of use., additions or change of building footprint.
Interior Alterations of Residences and Habitable Structures - Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard	Permitted. Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of long term flooding hazards.
EXISTING DEVELOPMENT	
Minor additions	Not permitted unless outside of the Hazard Area
Major additions/alterations	Not permitted unless outside of the Hazard Area
Redevelopment - existing structure removed and new structure erected	Not permitted unless outside of the Hazard Area
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).	Not permitted
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)	Permitted if Outside of the Hazard <ul style="list-style-type: none"> <li>• Relocation if possible to get out of the hazard area</li> <li>• Replace with same size or smaller and utilize the maximum lot depth for Dynamic Beach setbacks, adequate hazard setback may be possible in some cases</li> <li>• Provide access standard either the same or better</li> </ul>
Relocation of habitable dwellings away from the shoreline	Permitted • Optional on part of owner but relocate outside of Dynamic Beach Hazard when possible <ul style="list-style-type: none"> <li>• Provide improvements to ingress/egress access wherever possible</li> </ul>
Relocation of accessory buildings or structures away from the shoreline ( e.g. unattached garages, sheds, gazebos) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	Permitted
EXISTING DEVELOPMENT	



Development Activity	East & West Ends of Cove Road- Dynamic Beach Hazard	
	Dynamic Beach Hazard - Lake & Regional Flood	
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	+ Defined Portion of Dynamic Beach Hazard & Regional Flooding Hazard from Bowmanville Creek
Non-habitable Accessory building/structures- moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	New are permitted if they are kept out of the Dynamic Beach Hazard to ensure the protection of the dynamic beach areas. Repairs and maintenance of existing structures are allowed. Should be moved away from Lake where applicable in order to protect the dune system which is degraded in some sections.	
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	Permitted if they are being used as dune cross-overs at selectd access points. Controlled access points to the beach through the dunes on public lands will be encouraged through the use of natural pathways (roped path on natural beach, plantings). Protection of the natural dune area will be encouraged though the use of plantings and vegetation.	
Swimming Pools (In ground)	Not permitted unless outside of the Hazard Area	
Expansion of existing septic systems	No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.	
Repairs and/or maintenance to existing septic systems	Permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.	
NEW DEVELOPMENT		
New habitable buildings or structures	Not permitted	
Infilling of Existing Vacant Lots	Not permitted	
Creation of a new lot (severance, subdivision)	Not permitted	

**5.4.2 The Central Section of Cove Road - Dynamic Beach backed by a Bluff**

The central section of Cove Road is where the dynamic beach is backed by a bluff (Figure 23). This small section of shoreline is unique within the study area because it may be possible to develop (on the road side) provided it is placed outside of the Erosion Hazard. Currently all of the properties are within the Erosion hazard but there may be limited opportunities for *New development, redevelopment or infilling outside of the Erosion Hazard.*

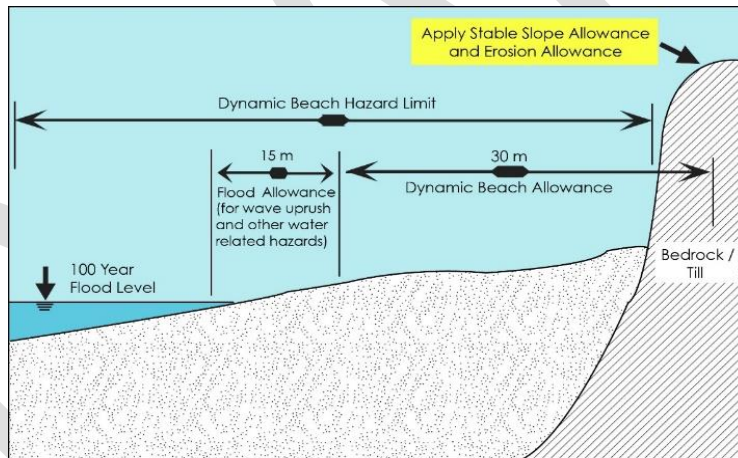




Figure 23 -Cove Road with contours indicating Bluff Area

The 'Dynamic Beach Backed by Bluff' criteria (as outlined in Figure 24) applies, the flooding and dynamic beach allowance, along with an erosion set back from the bluff/cliff area.

- \* The erosion setback of 36 m was determined by the Sandwell Swan Wooster Report (1990).
- \* The existing homes located along this section are **setback from the slope but are still within the Erosion Hazard Limit.**

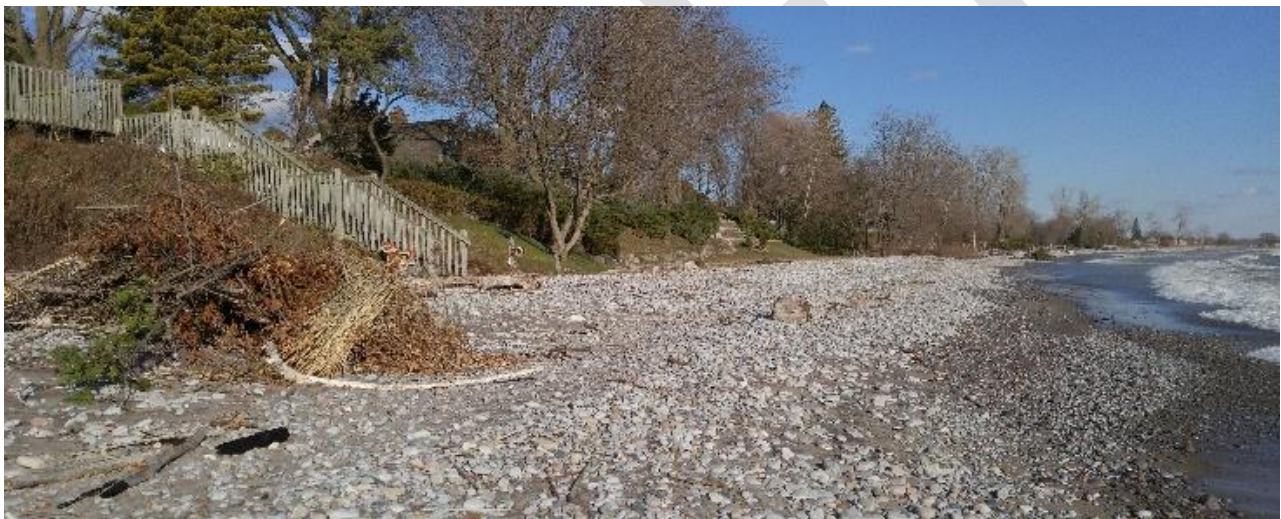


(not to scale)

Figure 24 - Dynamic Beach Backed by Bluff Hazard



Central Section of Cove Road: Dynamic Beach Backed by Bluff - Photo courtesy of SJL Engineering (Nov. 2018)



Central Section of Cove Road: Dynamic Beach Backed by Bluff

#### **5.4.2 a) Special Considerations for this area**

*New Development, redevelopment (existing structure removed and new structure erected) or Infilling:*

- Permitted provided it is outside of the Erosion Hazard Limit
- Any additions to existing structures must be outside of the Erosion Hazard.

*Interior Renovations* allowed provided there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.

Advise of the Erosion Hazards and provide required *access standards*

*Exterior Repairs/Maintenance of dwellings.* Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure)

- Allowed, provided there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.

*Replacement of dwelling destroyed by forces of flooding and/or erosion:*

- Not permitted – Consider Voluntary Disposition in this context

*Replacement of dwelling destroyed by forces other than flood and erosion (e.g. fire)*

Permitted if Outside of the Hazard

- Relocation if possible to get out of the hazard area
- Replace with same size or smaller and utilize the maximum lot depth for the Erosion setbacks, adequate hazard setback may be possible in some cases
- Provide access standard either the same or better

No *redevelopment or expansion of existing* development within the Hazards

- Maintain the existing conditions and no additional increase in size and occupancy, additions or change of building footprint or use unless it is outside of the hazard
- If Possible: Encourage Increase Erosion Setback unless it is possible to be outside of the hazard completely

*Accessory Structures* -non-habitable, moveable structures (unattached garages, sheds, gazebos) with no utilities and maximum size of 14 m<sup>2</sup>

- Existing accessory structures, can be repaired and maintenance permitted.
- If any accessory structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.
- New are permitted if they are kept out of the Erosion Hazard to ensure the protection of the slope/bluff and beach areas.
- Should be moved away from Lake where applicable in order to protect the slope areas.

*Non-habitable (i.e., garages, sheds, gazebo),* with no utilities and maximum size of 14 m<sup>2</sup>

- New structures should be kept outside of the Erosion Hazard Zone to ensure the protection of the slope stability slope/bluff areas.

*Relocation of dwelling* away from shoreline

- Optional on part of owner but relocate outside of Erosion Hazard
- Provide improvements to ingress/egress access wherever possible

*Septic Systems*

- No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.
- Repairs and/or maintenance to existing septic systems permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.

*Swimming pools* (In ground)

- not permitted unless they are outside of the hazards

*Shoreline Protection works*

- Works should not be necessary in this area, as there is no protection works or development within the Dynamic Beach Hazard.

*Slope Stability Works:*

- The shoreline hazards should be naturally addressed along this section because of the Dynamic Beach at the toe of the bluff and through the enforcement of the Erosion Hazard Setback. Therefore the addition of erosion protection works to this area should not be necessary and shoreline protection works should not be built within the Dynamic Beach Hazard.
- If slope stability becomes an issue at any of the individual sites in the future, then the soils at the site must be looked at on an individual site by site basis and be assessed by a geotechnical engineer. If slope stability works are needed, then they should be designed by qualified geotechnical engineer in accordance with 'Established Standards & Procedures' and based on the latest standards and in accordance with the provincial guidelines (Technical Guide For Great lakes – St. Lawrence River Shorelines) Part 4 and The Hazardous Sites Technical Guide, 'Stable Slopes - Geotechnical Principles' for the Province of Ontario' (2001).

**5.4.2 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following tables for the Cove Road Bluff section.



Table Summary of Considerations- Guide for Development Within the Hazardous Lands - Cove Road Bluff	
Development Activity	Cove Road Central Area -Erosion Hazard -Area is Dynamic Beach backed by Bluff (Erosion Criteria Governs along Bluff Area)*
	<b>Erosion Hazard-Lake</b>
	Stable Slope Allowance 3:1 PLUS + Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
EXISTING DEVELOPMENT	
Existing Development- Overall Recommendations	* NOTE: The CENTRAL BLUFF Area of COVE ROAD is a small section of shoreline is UNIQUE within the study area because it may be possible to develop (on the road side) provided it is placed outside of the Erosion Hazard. Currently all of the properties are within the Erosion hazard but there may be limited opportunities for New development, redevelopment or infilling outside of the Erosion Hazard.
Existing Development- Overall Recommendations	Self Directed Disposition of Hazard Properties
Shoreline Protection Works: Repairs/maintenance	<p style="text-align: center;"><b>Shoreline Protection works</b></p> <ul style="list-style-type: none"> <li>Works should not be necessary in this area, as there is no protection works or development within the Dynamic Beach Hazard.</li> </ul> <p style="text-align: center;"><b>Slope Stability Works:</b></p> <ul style="list-style-type: none"> <li>The shoreline hazards should be properly addressed along this section because of the Dynamic Beach at the toe of the bluff and through the enforcement of the Erosion Hazard Setback. Therefore the addition of erosion protection works to this area should not be necessary and shoreline protection works should not be built within the Dynamic Beach Hazard.</li> <li>If slope stability becomes an issue at any of the individual sites in the future, then the soils at the site must be looked at on an individual site by site basis and be assessed by a geotechnical engineer. If slope stability works are needed, they should be designed by qualified geotechnical engineer in accordance with 'Established Standards &amp; Procedures'</li> </ul>
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure).Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.	Permitted provided, ' Like for Like' • Maintain the existing conditions, No increase in dwelling size, units, living space or occupancy, change or intensification of use., additions or change of building footprint.
Interior Alterations of Residences and Habitable Structures - Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard	Permitted. Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of long term erosion hazards.



Development Activity	Cove Road Central Area -Erosion Hazard -Area is Dynamic Beach backed by Bluff (Erosion Criteria Governs along Bluff Area)*	
	Erosion Hazard-Lake	
	Stable Slope Allowance 3:1 PLUS	+ Erosion Allowance ( 100 x AARR) = TOTAL SETBACK of 36m (Shoreline Reach 17 from 1990, SSW Report)
EXISTING DEVELOPMENT		
Minor additions	Not permitted	Not permitted unless outside of the Hazard Area
Major additions/alterations	Not permitted	Not permitted unless outside of the Hazard Area
Redevelopment - existing structure removed and new structure erected	Not permitted	Not permitted unless outside of the Hazard Area
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).	Not permitted	Not Permitted
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)	Not permitted	Permitted if Outside of the Hazard <ul style="list-style-type: none"> <li>• Relocation if possible to get out of the hazard area</li> <li>• Replace with same size or smaller and utilize the maximum lot depth for the Erosion setbacks, adequate hazard setback may be possible in some cases</li> <li>• Provide access standard either the same or better</li> </ul>
Relocation of habitable dwellings away from the shoreline	Permitted • Optional on part of owner but relocate outside of Erosion Hazard when possible <ul style="list-style-type: none"> <li>• Provide improvements to ingress/egress access wherever possible</li> </ul>	
Relocation of accessory buildings or structures away from the shoreline ( e.g. unattached garages, sheds, gazebos) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	Permitted	
EXISTING DEVELOPMENT		
Non-habitable Accessory building/structures-moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	Not permitted	New are permitted if they are kept out of the Erosion Hazard to ensure the protection of the slope/bluff and beach areas. Repairs and maintenance of existing structures are allowed. If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	Permitted if they are being used as perpendicular access to the shoreline and not at risk to slope stability or erosion hazard. If any structure is within 5 m of the stable slope crest, surcharge effects on slope stability be assessed by a geotechnical engineer.	
Swimming Pools (In ground)	Not permitted	Not permitted unless outside of the Hazard Area
Expansion of existing septic systems	No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.	
Repairs and/or maintenance to existing septic systems	Permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.	
NEW DEVELOPMENT		
New habitable buildings or structures	Not permitted unless outside of the Hazard Area	
Infilling of Existing Vacant Lots	Not permitted unless outside of the Hazard Area	
Creation of a new lot (severance, subdivision)	Not permitted unless outside of the Hazard Area	



## 5.5 West Beach Road

At the eastern end of the study area is the West Beach Road section.



This section consists of a sandy dynamic barrier beach with the Bowmanville Creek and Marsh on the north side of the road.



“The southern portion of West Beach Road is situated on the sand spit that separates the Bowmanville Marsh from Lake Ontario. A historic cottage community, portions of the spit have been acquired by the Municipality of Clarington, and converted to a public beach amenity. The remaining homes on the spit are within the floodplain of the Bowmanville/Soper Creek.” (CLOCA, Draft Nov. 2018)

Natural Dynamic Barrier Beach Shoreline exists along the eastern section of Port Darlington.



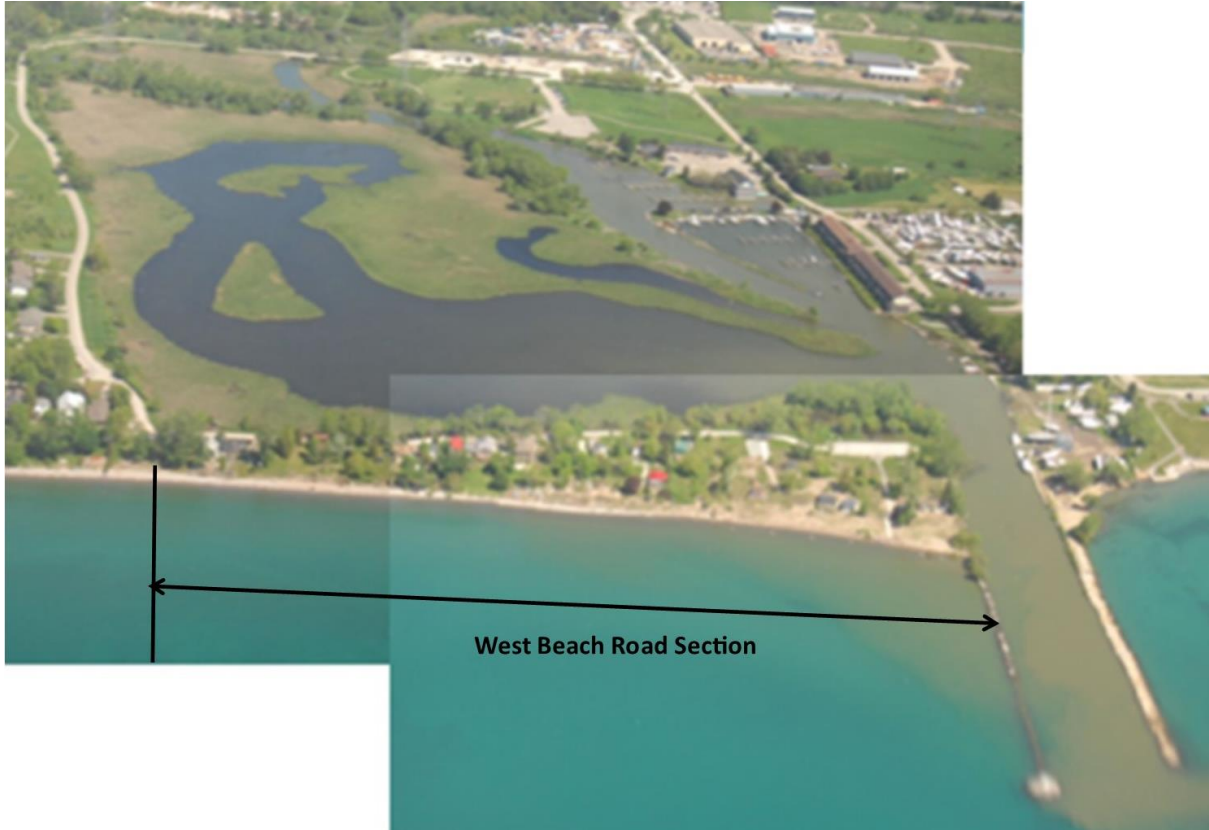
Many of the homes along West Beach Road have been setback an appropriate distance for the Dynamic Beach hazard but are still within the creek flooding hazard.



The Municipality of Clarington's Port Darlington West Beach Park is at the eastern end of the study area.



The Bowmanville Bowmanville/Soper Creek and Marsh area can create the highest Flood elevations in the study area.



Many of the hazard lands along West Beach Road are currently owned by the Municipality of Clarington as indicated in yellow in the following Figure 25.



Figure 25 -Municipality of Clarington Property Ownership in Yellow

Because of the severity of the flooding along this section, this would be a high priority area for Voluntary Acquisition.

**5.5.1 a) Additional Considerations for this area**

*Boardwalks, fixed walkways* (not connected to dwellings) permitted if they are being used as dune cross-overs at selected points.

- Controlled access points to the beach through the dunes on public lands will be encouraged through the use of natural walkways (e.g. roped natural beach area) and plantings

Protection of the natural dune area will be encouraged though the use of plantings and vegetation,

Protection of the natural dynamic beach system is encouraged

Provide *upgraded ingress/egress access standards* whenever possible.

**5.5.1 b) Summary of Considerations**

A Summary of Considerations for the recommended Guide for Development within the Hazardous Lands has been provided in the following tables for the West Beach Road section.

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Table Summary of Considerations- Guide for Development Within the Hazardous Lands - West Beach Road		
Development Activity	West Beach Road - Dynamic Beach Hazard	
	Dynamic Beach Hazard - Lake & Regional Flood	
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	+ Defined Portion of Dynamic Beach Hazard 30 m  = Dynamic Beach & Regional Flooding Hazard from Bowmanville Creek
EXISTING DEVELOPMENT		
Existing Development- Overall Recommendations	Protection of the Natural Dynamic Barrier Beach system will be encouraged in order to provide the ability for the natural processes to continue.	
Existing Development- Overall Recommendations	Self Directed Disposition of Hazard Properties	
Shoreline Protection Works: Repairs/maintenance	Protection works do not exist in this area, Maintain No protection works or development within DBH	
Exterior Repairs/Maintenance of Residences and Habitable Structures. Improvements to exterior details of a structure (e.g. Siding, Windows, doors, chimneys, cladding, roofing material, trim and other exterior details of a structure). Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use.	Permitted provided, 'Like for Like' • Maintain the existing conditions, No increase in dwelling size, units, living space or occupancy, change or intensification of use., additions or change of building footprint.	
Interior Alterations of Residences and Habitable Structures - Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of Long term Flooding and Erosion Hazard	Permitted. Where there is No increase in dwelling size, units, living space or occupancy, change or intensification of use. Advise of long term flooding hazards.	
EXISTING DEVELOPMENT		
Minor additions	Not permitted	
Major additions/alterations	Not permitted	
Redevelopment - existing structure removed and new structure erected	Not permitted	
Replacement of dwelling destroyed by Natural Hazards (Flooding, Dynamic Beach and/or Erosion).	Not permitted	
Replacement of dwelling destroyed by forces other than flooding, dynamic beach or erosion (e.g. fire)	Not permitted	
Relocation of habitable dwellings away from the shoreline	n/a	Permitted • Optional on part of owner but relocate outside of Dynamic Beach Hazard when possible • Provide improvements to ingress/egress access wherever possible
Relocation of accessory buildings or structures away from the shoreline ( e.g. unattached garages, sheds, gazebos) associated with existing uses with no utilities, maximum size of 14 m <sup>2</sup> - does not include shoreline protection works.	Permitted	
EXISTING DEVELOPMENT		



Development Activity	West Beach Road - Dynamic Beach Hazard		
	Dynamic Beach Hazard - Lake & Regional Flood		
	Regulatory flood levels from West Side Creek and/or 100 year Flood Level (includes Surge) + Wave Uprush & Overtopping	+ Defined Portion of Dynamic Beach Hazard 30 m	= Dynamic Beach & Regional Flooding Hazard from Bowmanville Creek
Non-habitable Accessory building/structures- moveable structures (unattached garages, sheds, gazebos,) associated with existing uses with no utilities, maximum size of 14 m2 - does not include shoreline protection works.	Not permitted	New are permitted if they are kept out of the Dynamic Beach Hazard to ensure the protection of the dynamic beach areas. Repairs and maintenance of existing structures are allowed. Should be moved away from Lake where applicable in order to protect the dune system which is degraded in some sections.	
Boardwalks, fixed walkways (not connected to dwellings) and/or natural pathways (natural footpaths, roped path on natural beach areas, plantings).	Not permitted	Permitted if they are being used as dune cross-overs at selectd access points. Controlled access points to the beach through the dunes on public lands will be encouraged through the use of natural pathways (roped path on natural beach, plantings). Protection of the natural dune area will be encouraged though the use of plantings and vegetation.	
Swimming Pools (In ground)	Not permitted		
Expansion of existing septic systems	No expansion of existing septic systems unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.		
Repairs and/or maintenance to existing septic systems	Permitted, but no expansion to system unless it is outside of the hazard, and/or unless there is a public health issue which has been identified by the Health Department. This would need to be determined by the regional Health Department.		
NEW DEVELOPMENT			
New habitable buildings or structures	Not permitted		
Infilling of Existing Vacant Lots	Not permitted		
Creation of a new lot (severance, subdivision)	Not permitted		

### 6.0 Shore Erosion Protection Concepts - Structural Alternatives: Baird & Associates

Baird and Associates carried out a shore protection feasibility and opinion of probable cost (i.e. 4 concepts were reviewed) with a high level assessment of the littoral process which are effecting the erosional area, (i.e. Cedar Crest Beach Road) along the west end of the study area. An objective of the study is to develop a professional characterization of current sediment processes and costs along with a high level opinion of sediment processes and the impacts along the western end where the erosion is occurring.

The study included the feasibility and development of concept level shore erosion protection options (e.g. revetment, offshore breakwaters) taking into consideration; unique local characteristics, climate change, waves, recent historic water levels and sediment transport. Alternatives that include beach development were considered as the community group has outlined “bringing back the beach” as an





important issue for the community. It is recognized that these shore protection alternatives will address erosion but will not address flooding and an opinion of probable cost was provided.

(The majority of Section 6 in this report, has been taken directly from the Baird report, Port Darlington Shore Protection Concepts, Nov. 16, 2018).

## 6.1 Coastal Processes

An overview of the bathymetry, water levels, sediment processes and general climate change impacts were reviewed as part of the assessment. The assessment was based on existing information and did not include field data collection or detailed analysis.

A high level opinion of sediment processes and the impacts of St. Marys Cement on the study area shoreline was included in the coastal process assessment provided by Baird. There were requests from the community for a historical assessment and analysis of the impacts of St. Marys Cement on the study area but a detailed assessment and analysis of the impacts was not within the scope of this study.

The summary overview of the key sediment process features Figure 26 (Figure 2.13 from Baird report) and Figure 27 (Figure 2.14 from Baird report) showing the erosion and accretion areas along with the net direction of longshore sediment transport have been provided.



Figure 26 (Figure 2.13 from Baird report) - Overview of the Key Sediment Process Features

*“The net longshore sediment transport is in an easterly direction from the bluff at the west end of the study area to the Bowmanville Creek mouth; and in a westerly direction from the bluff to St. Marys Cement. This is demonstrated by the fillet beaches that have formed at either end of the study shoreline.” (Page 22, Baird report, Port Darlington Shore Protection Concepts, Nov. 16, 2018).*

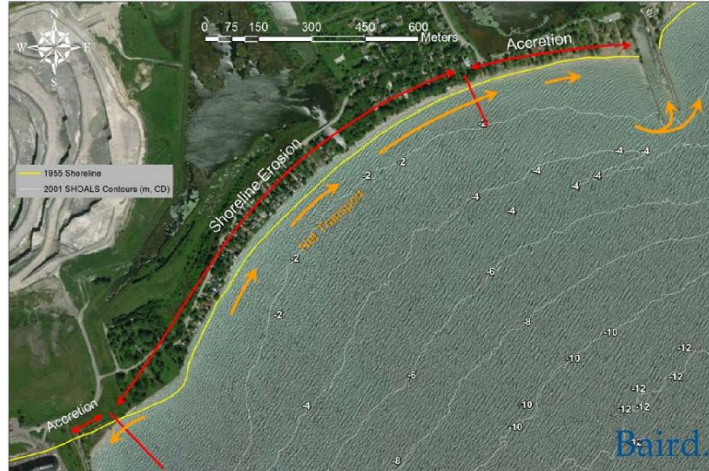


Figure 27 (Figure 2.14 from Baird report) - Erosion and accretion areas and net direction of longshore sediment transport

## 6.2 Development of Shore Erosion Protection Concepts

Baird developed four shore erosion protection concepts (e.g. anchored beaches with jetties, groynes with jetties, offshore breakwaters, and revetment). The following figures and section information is taken directly from the Baird report (Pages 14-17, Port Darlington Shore Protection Concepts, Nov. 16, 2018).

### 6.2.1 Concept 1: Sand and Cobble Beach with Jetties

*Concept 1, shown in (Figure 3.1 from Baird Report) includes construction of a sand and cobble beach in front of the properties along Cedar Crest Beach Road. “This concept includes a sand and cobble beach that provides some level of protection and reduced overtopping for the properties located along Cedar Crest Beach Road, but it does not provide full protection during high water levels, particularly at the narrower west end of the beach. Monitoring and beach maintenance would be required. It is likely that there would be some transport of sand to the east, and the beach would have to be re-nourished.”*

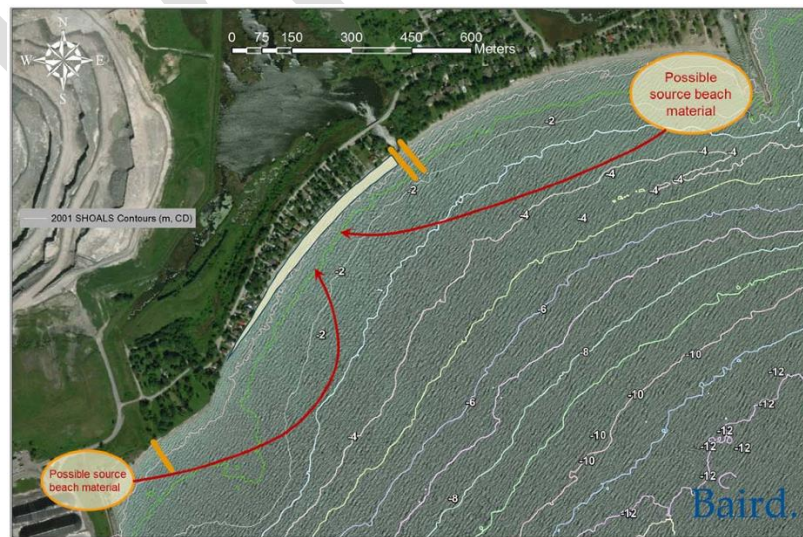


Figure 28 (Figure 3.1 from Baird Report) - Concept 1: Sand and Cobble Beach with Jetties

**6.2.2 Concept 2: Cobble beach, Groynes and Jetties**

*“This concept includes a cobble beach that provides a higher level of protection and reduced overtopping for the properties located along Cedar Crest Beach Road than Concept 1, but it does not provide full protection from flooding during high water levels. Cobble beaches are more stable than sand beaches and the beach stability increases with larger sized cobble. In general, however, beach users prefer smaller material as it is easier to walk on. The size of cobble and beach width would be determined during final design. Maintenance requirements would be significantly lower than for Concept 1.”*

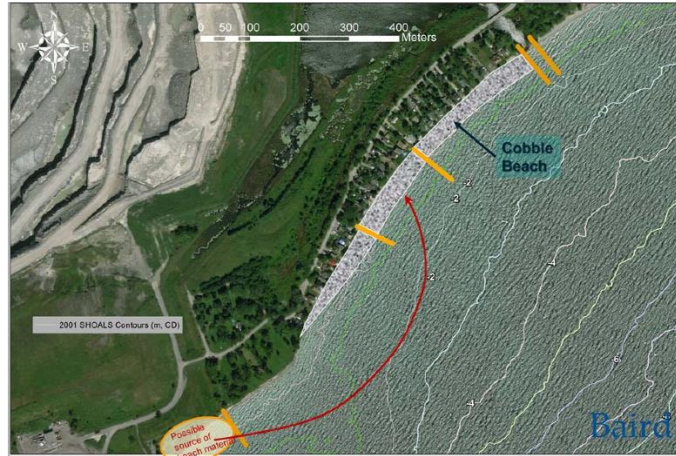


Figure 29 (Figure 3.2 from Baird Report) - Concept 2: Cobble beach, Groynes and Jetties

**6.2.3 Concept 3 – Sand and cobble beach with offshore breakwaters and jetties**

*“This concept includes the highest level of protection and reduced overtopping for the properties located along Cedar Crest Beach Road, but it does not provide full protection from flooding during high water levels. The sand beach is wider, and the offshore breakwaters provide additional protection. It is also the most costly concept presented; this is discussed further in Section 3.3. An added benefit of this alternative is the large beach amenity. Maintenance requirements would be lower than for Concept 1 and similar to Concept 2.”*



Figure 30 (Figure 3.3 from Baird Report) – Concept 3: Sand and cobble beach with offshore breakwaters and jetties

**6.2.4 Concept 4: Armourstone Revetment**

*“This option would involve replacing existing structures with an armourstone revetment along the properties on Cedar Crest Beach Road. It does not include jetties to impede sand bar formation at the mouth of Westside Creek and the flood drainage channel. This concept will mitigate further shoreline erosion, but it will do little to address flooding during high water levels. The backshore elevations are below the flood level, and the crest elevation would have to exceed the backshore elevation to address the flood hazard (e.g. runup and overtopping) from Lake Ontario. In doing so, it would trap flood water from inland (Westside Creek and Bowmanville Creek), exacerbating the inland flooding hazard.”*



Figure 31 (Figure 3.4 from Baird Report) – Concept 4: Armourstone Revetment

**6.3 Opinion of Probable Costs**

Baird developed an opinion of probable cost for the four concepts which were provided in Section 6.2 above. The following section information is taken directly from the Baird report (Page 18, Port Darlington Shore Protection Concepts, Nov. 16, 2018).

*“These costs are concept level costs and a 30% contingency has been included. Costs for engineering, permitting, engineering services during construction, landscaping, maintenance and monitoring are not included.”*

**Table 3.1: Opinion of probable capital cost for concepts**

Concepts	Cost (\$CND)	Length of Shoreline Protected (m)	Cost Per Metre of Shoreline Protected
Concept 1	\$4.3 million	650	\$6,600/m
Concept 2	\$10.4 million	700	\$14,900/m
Concept 3	\$16 million	750	\$21,300/m
Concept 4	\$3.7 million	650	\$5,700/m

*The capital costs for the concepts range from \$3.7 million for Concept 4 (Revetment) to \$16 million for Concept 3 (Sand and Cobble Beach with Offshore Breakwaters). Maintenance costs would be highest for Concepts 1 and 4;*

*Concept 1 does not include structures to anchor the beach, and regular beach maintenance will therefore be required;*

*Concept 4 does not include jetties at the creek and drainage outlets and maintenance dredging will be required to maintain flow.*

*In general, 0.5% to 1 % of capital costs per annum should be budgeted for maintenance, to be undertaken periodically. Maintenance requirements and design life will vary with the wave, water level and ice conditions to which the protection is exposed.*

*The design life is typically in the range of 25 to 50 years.”*

A general evaluation of the concepts were carried out and details can be found on Pages 18-19 of Baird's Report.

#### **6.4 Baird's Study Summary**

*“Properties along the shoreline between the mouth of Bowmanville Creek and St. Marys Cement are located within the Lake Ontario flood, erosion and dynamic beach hazard limits. The Regulation Limit for flooding from Westside Creek and Bowmanville Creek also extends through these properties. Concepts have been developed to address erosion along the shoreline backed by Cedar Crest Beach Road, the shoreline with the highest erosion and overtopping rates. Some of the concepts also mitigate flooding due to wave uprush from Lake Ontario, though it is important to state that none of the concepts presented fully address the flood hazard from Lake Ontario. Neither do they address flooding from inland.*

- Four shore protection concepts were developed with a focus on the development of a beach amenity that also protects the shoreline from erosion and mitigates wave overtopping. A concept level opinion of probable cost was developed for each concept. The concepts were then evaluated on the basis of technical, cost, socio-economic impacts and environmental impacts.*
- The capital costs for the concepts ranged from \$16 million for Concept 3 which includes a sand beach anchored with offshore breakwaters, and jetties to mitigate sedimentation at the mouth of Westside Creek and the overflow channel; to \$3.7 million for Concept 4, an armourstone revetment. These are equivalent to \$21,300/metre for Concept 3 and \$5,700/metre for Concept 4.*
- Concept 3 received the highest ranking overall, based on the criteria evaluated. Concept 3 provides the highest level of protection against erosion and provides some reduction in flooding due to wave uprush from Lake Ontario. It is also the highest cost concept. In terms of socio-economic benefits, it provides a public beach that people can walk on. It has been assumed that habitat enhancement would be provided at the breakwaters, for example aquatic reefs.*
- The rankings are presented for discussion purposes. There are many different ranking systems that could be used, considering different criteria and weights that could be applied to the criteria.*
- Out of the four concept designs, Concept 3 provided the highest benefit when considering the evaluation criteria. Concept 2 was a close second, while Concept 1 ranked third and Concept 4 ranked fourth.*
- It is emphasized that the concepts presented do not fully protect the shoreline from flooding from Lake Ontario; during high water levels overtopping will occur. Nor do they provide any protection from flooding from inland creeks.”*

(Section 6.4 of this report is taken directly from Page 22 of the Baird report, Port Darlington Shore Protection Concepts, Nov. 16, 2018).

## 7.0 Public Involvement and Engagement

A key step in the development of the recommendations is the inclusion of the public, shoreline community and stakeholders throughout the study process.

### 7.1 Engagement with the Public

Engagement with the community has been in place through communications with key stakeholders and the community group and it is assumed this will continue throughout this study process with additional communication as follows;

- Web site updates (CLOCA and Municipality of Clarington),
- CLOCA Newsletter updates,
- Ongoing communication with Resident Community Members through the Association and with the individual land owners.
- The individual land owners were encouraged to meet with the CLOCA staff members in order to discuss the specifics of their sites.

Ongoing discussions with CLOCA and the Municipality of Clarington Staff, and the Cedar Crest Beach Working Group with updates and/or any other comments and issues will be incorporated into the study information throughout the project process.

### 7.2 Public and Community Engagement Process

An extremely important component of the overall study which was recognized from the onset of the project, was the community engagement.

The community had put forward a petition in 2016 to the Municipality of Clarington, expressing their concerns with the erosion that was occurring along the study area, requesting assistance in coordinating a unified mitigation plan. The Council of the Municipality of Clarington agreed to resolutions put forward by the residents and were committed to taking action on reviewing and assessing the hazard issues that were occurring along the study area.

The community voiced clearly that they are not only concerned with the extreme hazardous events that can occur, but also the “every day events” which are of major concern to the community. (S. Delicate, PIC#2, Dec. 1, 2018) The community is also looking for action on how to address these every day events.

“Process is as important as product. This is an exercise that focuses on developing a new Shoreline & Flood Damage Centre Study as a foundation for taking informed action to address shoreline management issues. It is therefore imperative that the community be engaged, and that the emphasis be placed on advancing a collaborative planning model that is solutions-focused.” (1<sup>st</sup> Newsletter, March 2018)

A number of initiatives were undertaken by CLOCA. The first online survey which was available from February to December of 2018. A second online survey was posted to receive comments and input on the Technical documents and studies that were carried out. There were Public Information Meetings

and Listening Sessions on March 3, 2018 and Dec. 1, 2018. Newsletters were posted on the web site (February and October 2018) and they will continue to be issued as new information becomes available.

A commitment was made by CLOCA at the first public meeting on March 1, 2018 to keep the Public and stakeholder's notified as the latest information became available. In keeping with that commitment, the posting of newsletters, technical reports as they became available, and setting up web site information and a Full Story Board with Project information available was initiated in the spring of 2018.

### **Web Site:**

The Storyboard Presentation materials are on-line at the following URL link: <https://goo.gl/Y4WzSc>  
Please note that the Google Chrome web browser is required in order for the presentation to be viewed on your device.

### **CLOCA Web Site Story Map Links available:**

- [Full Story Map](#) -
- Fly-Through Video - [Max. Daily Mean Water Level 2017](#) (YouTube)
- Fly-Through Video - [Riverine Regulatory Flood](#) (YouTube)
- Fly-Through Video - [Lake Ontario 100 Year Flood](#) (YouTube)

In order to help bring all of the numbers and elevations into a practical aspect of what did and could potentially occur with the Flooding Hazards from both Lake Ontario and the two creek systems, Fly-Through Video's were produced by CLOCA staff in order to better demonstrate from a 'birds eye view' of what did actually occur during the 2017 Lake Ontario Extreme Water Levels and what could potentially happen in the future flooding from the creeks and lake along the Port Darlington study area shoreline. <https://camaps.maps.arcgis.com/apps/MapSeries/index.html?appid=46de993ad0ff43afa983bff1c1ab3df0>

### **On Line Survey**

The first Online Survey was provided on CLOCA's web site. The following summarizes the key questions and input for the survey. (Appendix D)

**The Issues Facing the Shoreline:** What Are Your Thoughts? What Have You Seen? What Are You Experiencing? WE WANT TO HEAR FROM YOU!

1. Have you experienced flooding along the shoreline? If so, where?
2. Are you aware of others who have experienced flooding along the shoreline? If so, where?
3. Have you experienced erosion along the shoreline? If so, where?
4. Are you aware of others who have experienced erosion along the shoreline? If so, where?
5. Have you experienced other shoreline-related issues?
6. Are you aware of others who are experiencing shoreline-related issues and concerns?
7. What solution will best address shoreline erosion?
8. Are there recommendations that you believe should be included in the 2018 Shoreline Study?
9. Is there specific action that you believe needs to be taken? If so, when and who in your view should be responsible?

A second survey has been uploaded for comments and input on the technical studies and recommendation which have been posted. Comments can still be provided by completing the electronic online survey.

## Public Information Centre Meetings:

### First Public Information Centre Meeting: PIC #1

The first Public Meeting/Workshop was held on March 3, 2018 and was facilitated by Karen Wianecki, M.Pl., MCIP, RPP of Planning Solutions. It was from 8:30 am – 12:00 pm and " the purpose of the meeting was to:

1. Introduce the 2018 Shoreline Study and the Consulting Team.
2. Share background information about the Shoreline Study, the process, timing and deliverables.
3. Allow participants to share concerns (flooding, shoreline erosion, other).
4. Provide attendees with an opportunity to ask questions about the Shoreline Study.
5. Provide a forum to ensure those in attendance are able to share their ideas and solutions to address the shoreline issues.

The Public Meeting & Information Session created a space for meaningful conversation about shoreline flooding and erosion in the Study area. Close to 80 people attended. Presentations were provided by Aqua Solutions 5 Inc. Judy Sullivan, CLOCA staff Chris Jones and Perry Sisson.

There were many excellent questions, comments and suggestions that came forward from the community. A summary of the presentations and key messages are included in the 1<sup>st</sup> and 2<sup>nd</sup> Newsletter found on the CLOCA Port Darlington web site at; [www.cloca.com/port-darlington](http://www.cloca.com/port-darlington).

### **Key Messages from the 1<sup>st</sup> Community Meeting**

Karen Wianecki from Planning Solutions, provided a recap of the key learnings and statements that emerged from the Survey and meeting as follows:

1. "This is a critical issue for all of us – for residents, community leaders, CLOCA, municipal staff and the consulting team. This issue is also inherently complex.  
For the residents, this is real!
2. This is a special place. The area has become increasingly diverse. It is a strong, solid, tightly-knit community.
3. We need to leverage historical data and explore all the information available, particularly as it pertains to the pier (e.g. erosion data for that period of time that pre-dates the installation of the pier).
4. Take a holistic and systemic approach to the Study. Look at and explore how the barrier beach affects the marsh and overflow channel; what would happen if the pier were expanded.
5. The right information must be communicated to the right people, in the right way. Internet connectivity is a huge issue for the community. This needs a solution.
6. St. Marys has secured the services of a consultant to complete a forensic study of the channel. CLOCA will continue to work with St. Marys to monitor the overflow channel and ensure that it is maintained and continues to be functioning effectively and efficiently.
7. The real issue is wave energy and the damage that it can cause in normal conditions.
8. There has been a significant evolution in the geography of the study area over time, but also a significant evolution in the policy, planning and regulatory landscape.
9. We need a solution in the short-term that will address resident concerns over the long-term.
10. Collaborative action is needed – we need to work together. Let's be certain that we don't repeat history. Let's find a solution that will address all of our concerns.



11. “We have nothing natural here anymore. We have a massive pier that has impacted littoral drift.”
12. Action was taken by homeowners to protect their shoreline properties.
13. The 2018 Shoreline Study needs to consider both sides of the pier (erosion and accretion) – east and west.
14. To date, residents feel that they have been left to manage the issues on their own. Residents need help – this is a major issue and a major concern that has been devastating and hugely disruptive for many.”

A second newsletter was published in October of 2018, Vol. 1 Issue 2, and it is available on the CLOCA web site at [https://docs.wixstatic.com/ugd/053230\\_0217b68bada347298d82bdcd08a74ca0.pdf](https://docs.wixstatic.com/ugd/053230_0217b68bada347298d82bdcd08a74ca0.pdf).

#### Second Public Information Centre Meeting: PIC #2

The second Public Information meeting was held Dec. 1, 2018. Both meetings were facilitated by Karen Wianecki, M.Pl., MCIP, RPP of Planning Solutions. Presentations were provided by Aqua Solutions 5 Inc. (Judy Sullivan), Baird and Associates (Fiona Duckett) and CLOCA staff (Chris Jones and Perry Sisson). Baird and Associates and CLOCA presented the findings from their reports which were posted on the CLOCA web site November 2018.

#### 8.0 Future Recommendations

The following recommendations have been provided for additional works that would support this initiative and the Port Darlington Study.

- The recommended hazards delineation in this report should be incorporated into the Zoning By-Law for the Municipality of Clarington in accordance with the Planning Act, the Provincial Policy Statement and Clarington’s official plan requirements.
- Particular policy and ‘Summary of Considerations – Guide for Development within the Hazardous Lands’ charts recommendations from this report should be reviewed in the context of being incorporated into the Municipality of Clarington’s Zoning By-Law.
- Particular policy and ‘Summary of Considerations – Guide for Development within the Hazardous Lands’ charts recommendations from this report should be reviewed in the context of being incorporated into the CLOCA’s Policy and Procedural Document.
- It would be helpful to develop an evaluation or rating system to determine the most severe hazards in order to identify priority areas which would assist in managing the risks throughout the study area. Advance West Beach Road and Cedar Crest Beach Road flood mitigation works to a feasibility assessment
- Explore funding possibilities for possible shoreline erosion mitigation concepts
- Investigate voluntary acquisition program arrangements
- Advance West Beach Road and Cedar Crest Beach Road flood mitigation works to a feasibility assessment
- Explore funding possibilities for possible shoreline erosion mitigation concepts
- Investigate voluntary acquisition program arrangements.

## 9.0 Closing

In closing, we respectfully submit the above report in support of proposed policy approaches for the Central Lake Ontario Conservation Authority (CLOCA) to take into consideration as they manage the future hazards along the Port Darlington (West Shore) Damage Centre.

This report was prepared by Aqua Solutions 5 Inc. If you have any questions, please contact Judy Sullivan at 905-604-1295.

Respectfully Submitted,



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President: Judy Sullivan, P. Eng.  
**Aqua Solutions 5 Inc.**



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## References

Aqua Solutions, 2004. Port Darlington Shoreline and Flood Damage Centre. Draft report prepared for Central Lake Ontario Conservation Authority, dated March 2004.

Boyd, G L., 1981. Canada/Ontario Great Lakes Erosion Monitoring Program 1973-1980, Final Report. Bayfield Laboratory for Marine Science and Surveys, Ocean Science and Surveys, Department of Fisheries and Oceans, Burlington, Ontario. Unpublished manuscript.

Central Lake Ontario Conservation Authority, 2017. "Lake Ontario Shoreline Management at Port Darlington, Municipality of Clarington" Staff Report (R. Perry Sisson, Director, Engineering and Field Operations, and Chris Jones, Director, Planning and Regulation) to the Chair and Members of the CLOCA Board of Directors, FILE: # PSSG4177, PSSG212 and S.R.:# 5XXX-17, September 19, 2017.

Central Lake Ontario Conservation Authority, 2013. CLOCA Policy and Procedural Document for Regulation and Plan Review. April.

Davidson-Arnott, R., 2010. Introduction to Coastal Processes and Geomorphology. Cambridge University Press. ISBN 978-0-521-87445-8 Hardback, ISBN 978-0-521-69671-5 Paperback. Figure 9.2

Environment Canada-Ontario Ministry of Natural Resources, 1975. Coastal Zone Atlas: HARAS, W.S., and TSUI, K.K. (ed.).

Jones, C. (2018), CLOCA Presentation at Public Information Centre Meeting #1. Mar. 3, 2018.

McLaughlin, A. and Leathong, S., 2017. CTV News Toronto, Port Darlington In the News! Published Thursday, May 25, 2017 10:57PM EDT.

Ministry of Municipal Affairs and housing, 2014. Provincial Policy Statement, 2014.

Ministry of Natural Resources (MNR), 2002. Technical Guide River and Stream Systems: Flooding Hazard Limit.

Ministry of Natural Resources (MNR), 2001. Great Lakes — St. Lawrence River System and Large Inland Lakes Technical Guides (1996) for flooding, erosion and dynamic beaches in support of Natural Hazards Policies 3.1 of the Provincial Policy Statement (1997) of the Planning Act. Published by Watershed Science Centre, Trent University Peterborough, Ontario, Canada Copyright © 2001 The Queen's Printer for Ontario.

Ministry of Natural Resources (MNR), 2001. Hazardous Sites Technical Guide, 'Stable Slopes - Geotechnical Principles' for the Province of Ontario, prepared by Terraprobe Ltd. and Aqua Solutions. Published by Watershed Science Centre, Trent University Peterborough, Ontario, Canada Copyright © 2001 The Queen's Printer for Ontario.

Ministry of Natural Resources (MNR), 2001. Understanding Natural Hazards. Great Lakes – St. Lawrence River System and Large Inland Lakes, River and Stream Systems and Hazardous Site. An Introductory Guide for Public Health and Safety Policies 3.1 - Provincial Policy Statement. Published by Queen's Printer for Ontario. Printed in Ontario, Canada. Copyright © 2001 The Queen's Printer for Ontario.





**Appendix A - PROVINCIAL POLICY STATEMENT - 2014**

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PROVINCIAL POLICY STATEMENT, April 30, 2014,

Page 1

## Part II: Legislative Authority

The Provincial Policy Statement is issued under the authority of section 3 of the Planning Act and came into effect on April 30, 2014.

In respect of the exercise of any authority that affects a planning matter, section 3 of the Planning Act requires that decisions affecting planning matters “**shall be consistent with**” policy statements issued under the Act.

Page 4 & 5,

The Province’s natural heritage resources, water resources, including the Great Lakes, agricultural resources, mineral resources, and cultural heritage and archaeological resources provide important environmental, economic and social benefits. The wise use and management of these resources over the long term is a key provincial interest. The Province must ensure that its resources are managed in a sustainable way to conserve biodiversity, protect essential ecological processes and public health and safety, provide for the production of food and fibre, minimize environmental and social impacts, and meet its long-term needs.

It is equally important to protect the overall health and safety of the population. The Provincial Policy Statement directs development away from areas of natural and human made hazards. This preventative approach supports provincial and municipal financial wellbeing over the long term, protects public health and safety, and minimizes cost, risk and social disruption. Taking action to conserve land and resources avoids the need for costly remedial measures to correct problems and supports economic and environmental principles.

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### 1.1.3 Settlement Areas

1.1.3.3 Planning authorities shall identify appropriate locations and promote opportunities for intensification and redevelopment where this can be accommodated taking into account existing building stock or areas, including brownfield sites, and the availability of suitable existing or planned infrastructure and public service facilities required to accommodate projected needs. Intensification and redevelopment **shall be directed in accordance with the policies of Section 2: Wise Use and Management of Resources and Section 3: Protecting Public Health and Safety.**

1.1.3.4 Appropriate development standards should be promoted which facilitate intensification, redevelopment and compact form, **while avoiding or mitigating risks to public health and safety.**

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### 1.1.5 Rural Lands in Municipalities

1.1.5.1 When directing development on rural lands, a planning authority shall apply the relevant policies of Section 1: Building Strong Healthy Communities, as well as the policies of Section 2: Wise Use and Management of Resources **and Section 3: Protecting Public Health and Safety.**

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### 1.5 Public Spaces, Recreation, Parks, Trails and Open Space

1.5.1 Healthy, active communities should be promoted by:

- a) planning public streets, spaces and facilities to be safe, meet the needs of pedestrians, foster social interaction and facilitate active transportation and community connectivity;
- b) planning and providing for a full range and equitable distribution of publicly-accessible built and natural settings for recreation, including facilities, **parklands, public spaces, open space areas, trails and linkages, and, where practical, water-based resources;**
- c) **providing opportunities for public access to shorelines; and**
- d) **recognizing provincial parks, conservation reserves, and other protected areas, and minimizing negative impacts on these areas.**

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### 2.0 Wise Use and Management of Resources

Ontario's long-term prosperity, environmental health, and social well-being depend on conserving biodiversity, **protecting the health of the Great Lakes, and protecting natural heritage, water,** agricultural, mineral and cultural heritage and archaeological resources for their economic, environmental and social benefits.

**Accordingly:**

#### 2.1 Natural Heritage

**2.1.1 Natural features and areas shall be protected for the long term.**

2.1.2 The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

2.1.3 Natural heritage systems shall be identified in Ecoregions 6E & 7E1, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas.

**2.1.4 Development and site alteration shall not be permitted in:**

**f) coastal wetlands in Ecoregions 5E, 6E and 7E1 that are not subject to policy 2.1.4(b)**

**unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.**

Note: Ecoregions 5E, 6E and 7E are shown on Figure 1. (PPS 2014)

Figure 1. from PPS 2014



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**3.0 Protecting Public Health and Safety**

**Ontario's long-term prosperity, environmental health and social well-being depend on reducing the potential for public cost or risk to Ontario's residents from natural or humanmade hazards.**

**Development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards.**

Accordingly:

**3.1 Natural Hazards**

**3.1.1 Development shall generally be directed to areas outside of:**

**a) hazardous lands adjacent to the shorelines of the Great Lakes - St. Lawrence River System and large inland lakes which are impacted by flooding hazards, erosion hazards and/or dynamic beach hazards;**



**b) hazardous lands adjacent to river, stream and small inland lake systems which are impacted by flooding hazards and/or erosion hazards; and**

c) hazardous sites.

**3.1.2 Development and site alteration shall not be permitted within:**

**a) the dynamic beach hazard;**

b) defined portions of the flooding hazard along connecting channels (the St. Marys, St. Clair, Detroit, Niagara and St. Lawrence Rivers);

**c) areas that would be rendered inaccessible to people and vehicles during times of flooding hazards, erosion hazards and/or dynamic beach hazards, unless it has been demonstrated that the site has safe access appropriate for the nature of the development and the natural hazard;**

and

**d) a floodway regardless of whether the area of inundation contains high points of land not subject to flooding.**

3.1.3 Planning authorities shall consider the potential impacts of climate change that may increase the risk associated with natural hazards.

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3.1.4 Despite policy 3.1.2, development and site alteration may be permitted in certain areas associated with the flooding hazard along river, stream and small inland lake systems:

b) where the development is limited to uses which by their nature must locate within the floodway, including flood and/or erosion control works or minor additions or passive non-structural uses which do not affect flood flows.

3.1.5 Development shall not be permitted to locate in hazardous lands and hazardous sites where the use is:

a) an institutional use including hospitals, long-term care homes, retirement homes, pre-schools, school nurseries, day cares and schools;

b) an essential emergency service such as that provided by fire, police and ambulance stations and electrical substations; or

c) uses associated with the disposal, manufacture, treatment or storage of hazardous substances.

3.1.7 Further to policy 3.1.6, and except as prohibited in policies 3.1.2 and 3.1.5, development and site alteration may be permitted in those portions of hazardous lands and hazardous sites where the effects and risk to public safety are minor, could be mitigated in accordance with provincial standards, and where all of the following are demonstrated and achieved:

- a) development and site alteration is carried out in accordance with floodproofing standards, protection works standards, and access standards;
  - b) vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies;
  - c) new hazards are not created and existing hazards are not aggravated;
- and
- d) no adverse environmental impacts will result.

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**Appendix B - CLOCA Port Darlington Flood Study Report**

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**Bowmanville/Soper Creek Floodplain – West Beach Road Impacts**

“In this area, flooding events ranging from a **25 year return period storm** (4% probability of occurring in any year) will impact the West Beach Road residents. Generally, topographic mapping shows the ground elevations around the homes in the range of 76 metres to 77 metres. At the **100 year storm** (1% chance of occurring in any year) level, water depth on West Beach Road would **prevent access and egress** by personal vehicles. At the **Regional storm flood level**, depths would **structurally damage buildings and loss of life** would become a significant risk for anyone within the southern portion of West Beach Road.”

West Beach Road, Bowmanville/Soper Creek Flooding Elevations have been provided in Table 2.2 below from CLOCA Draft Port Darlington Flood Study Report.

Table 2.2 Bowmanville/Soper Creek Flood elevations at **West Beach Road** (from CLOCA, Draft Nov. 2018)

Storm	Flood			
	Elevation (m)	Depth (m)	velocity (m/s)	depth x velocity
2 year	75.3	0	1.3	0.0
5 year	75.6	0	1.7	0.0
10 year	75.8	0	1.9	0.0
25 year	76.1	0.1	2.2	0.2
50 year	76.2	0.2	0.5	0.1
100 year - Prevent access and egress	76.4	0.4	0.5	0.2
Regional- Loss of Life & Structural Damage	78.1	2.1	0.7	1.5

\*West Beach Road elevation: approximately 76.0m

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**Westside Creek Floodplain – Cedar Crest Beach Road Impacts**

“In this area, flooding events larger than the 5 year return period storm (20% probability of occurring in any year) will result in flooding of Cedar Crest Beach Road. Generally, topographic mapping shows the ground elevations around the homes in the range of 76 metres to 77 metres. At the **25 year storm flood level** (4% chance of occurring in any year), water depth on Cedar Crest Beach Road would **prevent access and egress by personal vehicles**. During a **50 year storm flood event** (2% chance of occurring in any year), the combination of depth and velocity of flood water would create conditions that could result in **people being swept away and risk to public safety**. At the **Regional storm flood level**, depths would **structurally damage buildings and loss of life** would become a significant risk for anyone on Cedar Crest Beach Road.” (CLOCA, Draft Nov. 2018)



Table 2.3 Westside Creek Flood elevations at Cedar Crest Beach Road (from CLOCA, Draft Nov. 2018) - \*Cedar Crest Beach Road elevation: approximately 75.9m

Storm	Flood			
	Elevation (m)	Depth (m)	velocity (m/s)	depth x velocity
2 year	75.9	0	0.6	0.0
5 year -Flood Road	76.1	0.2	0.8	0.2
10 year	76.1	0.2	0.9	0.2
25 year- Prevent access and egress	76.2	0.3	1.0	0.3
50 year-People Swept Away & Risk to Public Safety	76.3	0.4	1.0	0.4
100 year	76.4	0.4	1.1	0.4
Regional- Loss of Life & Structural Damage	76.7	0.8	1.5	1.2

=====

### Mouth of Westside Creek

The outlet to Westside Creek in Lake Ontario is a Dynamic Barrier Beach System.

“On occasion, the barrier beach **has been opened mechanically because of the threat of flooding** in the Cedar Crest Beach community. The **elevation of Cedar Crest Beach Road is approximately 75.9m**. Using our finding that the barrier beach typically breaks with heads of 0.2m through 0.7m, it can be assumed that under average Lake Ontario water levels (winter low of 74.5m and summer high of 75.1m), the barrier beach would break before the water level in the wetland would overtop the Cedar Crest Beach Road elevation (summer Lake level of 75.1m plus 0.7m head = 75.8m). **It is only when Lake levels exceed 75.1m that the barrier beach may present a risk for flooding.** In recent times, a water level alarm has been developed for the Westside Marsh, and e-mail alerts are sent to CLOCA, Clarington, and St Mary’s Cement staff to alert of wetland levels exceeding 75.5m. Staff from these agencies will assess conditions and take actions as appropriate.” CLOCA (Draft Nov. 2018).

Details of the analysis by CLOCA was provided in the Westside Marsh Barrier Beach Function report which can be found in the Appendix of the ‘Port Darlington Community Shoreline Management Plan: Report on Flooding’ by CLOCA, (Draft Nov. 2018).

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### Raise Elevations

Since flooding is occurring from both the Lake and the creek systems, the Dynamic Beach Barrier system where the residence’s reside are being inundated by both sides. This is a complicated area where simple



berming or dykes may not be possible or practical because of further problems that could be caused by these structures virtually barricading drainage and causing additional flooding from either the lake or the creek side. However raising the elevation of the existing roadway may provide some relief by allowing access to and from the residences during higher frequency events than is currently occurring (i.e. 2 year event), and not cause additional drainage problems.

According to the CLOCA Flooding study, “It is possible to increase the level of flood protection from riverine events by raising Cedar Crest Beach Road. The potential level of protection which could be provided to the adjacent homes would **increase from a frequent 2 year flood event** level to a less frequent 10 year storm event. Furthermore, **safe access would be provided up to the 50 year storm level** (76.0m road minimum elevation) or 100 year flood level (76.15m road minimum elevation).

A preliminary analysis was completed to determine the approximate level of protection which could be provided should it **be possible to raise the existing roadway low points between 76.0m and 76.15m**. The flood elevations which would result from increasing the minimum Cedar Crest Beach road grade are provided in Table 3.1 below.

Table 3.1: Cedar Crest Beach Road Modifications (from CLOCA, **Draft Nov. 2018**)

	Cedar Crest Beach Road - Minimum Elevation (m)		
Flood Event	Existing (75.8m)	76.0m	76.15.
2 year	75.9	75.9	75.9
5 year	76	76	76
10 year	76	76	76.1
25 year	76.1	76.1	76.2
50 year	76.1	76.1	76.2
100 year	76.4	76.4	76.4
Regional	76.7	76.7	76.7
Roadway flooding			
No safe access			

If this flood mitigation concept is pursued, a detailed design process would need to be completed to ensure lot drainage is not obstructed with proposed road profile adjustments, and there are no other negative impacts to the existing lots. It is also recommended a cost-benefit analysis is completed to ascertain if this approach provides an overall benefit to the community.

This flood mitigation measure will not protect against regulatory events or Lake flooding events. **There is also potential that raising the road may make Lake events worse should shoreline flooding reach Cedar Crest Beach Road.**

The flood mitigation would reduce the riverine flood risk for the community, by **reducing the frequency of flooding events, although the community flood vulnerability would still be high because of the potential for significant flooding from regulatory riverine and Lake based events.**” (CLOCA, Draft Nov. 2018).



## Appendix C – Floodproofing

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## Chapter 5.5 Floodproofing from PPD April 2014, Pages 63-66

### 5.5 Floodproofing

All *development* proposed within the flood hazard limit must be floodproofed.

Floodproofing means structural changes and/or adjustments incorporated into the basic design and/or construction or alteration of individual buildings, structures or properties to protect them from flood damage. In many situations, floodproofing involves non-conventional design of the structural, drainage and electrical/mechanical systems of the building. Accordingly, for certain applications, the services of a licensed professional engineer will be a requirement.

Where buildings can be approved, but the services of a licensed professional engineer are required by this policy, the designer shall produce a summary or “owner’s manual” for the owner (and for subsequent owners) such that measures to be taken prior to, during and following a flood event are defined to ensure the building’s suitability for ongoing human habitation and to outline ongoing maintenance responsibilities and requirements.

#### ***Floodproofing Methods***

The following describes the basic options available for floodproofing typical structures and the policies of the Authority in circumstances where *development* may be permitted. It should be recognized that for some situations one or more of the following options may prove to be technically or economically impractical. Recognizing the required floodproofing measures are the minimum standard, where feasible, CLOCA will require the most effective floodproofing measures in an effort to reach the maximum protection possible. The placement of fill within a floodplain of a river or stream valley for the purpose of floodproofing may be considered provided it can be demonstrated that the placement of fill is less than 1 % of the flow area for the valley cross section, the placement of fill does not extend beyond flood depths greater than 0.8m and the existing stage-storage of the regulatory floodplain is maintained.

#### a. wet floodproofing

- Wet floodproofing involves designing a building or structure using materials, methods and design measures that maintain structural integrity by avoiding external unbalanced forces from acting on buildings or structures during and after a flood, to reduce flood damage to contents, and to reduce the cost of post flood clean up.
- Wet floodproofed full height basements are not permitted.
- Underside of habitable main floor shall be at least 300 mm above the regulatory flood level;
- Drawings must clearly indicate the means by which hydrostatic pressure is to be equalized on either side of the foundation walls and slab;
- At least two openable windows shall be provided on opposite sides of building;
- Top of window sills to be not less than 150 mm below finished exterior grade (to allow flood waters into the structure relieving hydrostatic pressure as soon as flooding of the surrounding land commences);
- Areas below the first floor are to remain unfinished and contain no habitable space or utilities and all mechanical and electrical equipment, heating/cooling units and ductwork are all to be located above regulatory flood level;
- Construction material must withstand alternate wetting and drying such as concrete, pressure treated wood etc.



- Be securely anchored.
- Sump pump may be required (to facilitate clean-up);
- The vertical height within the enclosed space under the building between the underside of the floor assembly and the ground cover directly below shall be no greater than 1800 mm.

b. dry floodproofing (active and passive)

- Active dry floodproofing includes techniques such as installing water tight doors, seals or floodwalls to prevent water from entering openings below the level of the flood hazard.
- Passive dry floodproofing is the use of fill or design modifications to elevate structure or openings in the building at, or above, the level of the flood hazard.
- Underside of main floor shall be at least 300 mm above the regulatory flood level;
- All openings (windows, vents, doors) and electrical must be located at least 300mm above the regulatory flood level.
- Structural details of foundation elements and specifications for fill materials and compaction procedures must be prepared or approved by a qualified professional engineer at the applicant's expense;
- The responsible professional engineer shall certify in writing that the design has taken into account regulatory flood (velocity and depth of flow) and site (soil type, bearing capacity, etc.) conditions encountered at the specific location of the development; and,
- the professional engineer's certificate must confirm that the foundation and building are designed to withstand hydrostatic pressures and/or impact loading that would develop under water levels equivalent to the design storm plus (minimum) 0.3 metres of freeboard;
- The responsible professional engineer must also identify all operation and maintenance requirements to be met in order to ensure the effective performance of the floodproofing measures over the design life of the structure.

## 5.6 Safe Access/Egress

The ability for the public and emergency operations personnel (police, firefighters, ambulance, etc.) to safely access the floodplain during regulatory flood events is a paramount consideration in any application for *development* within the riverine floodplain.

Ingress and egress should be "safe" pursuant to provincial floodproofing guidelines (MNR, 2002a). Depths and velocities should be such that pedestrian and vehicular emergency evacuations are possible on a municipal roadway or private right of way. For *minor additions* and re-development on existing lots as a minimum, access should achieve the maximum level of flood protection determined to be feasible and practical based on existing infrastructure. Redevelopment and *minor additions* should not be permitted if it results in greater risk to safe access.

Access/egress shall remain dry at all times for institutional buildings servicing the sick, the elderly, the disabled or the young and in buildings utilized for public safety (i.e. police, fire, ambulance and other emergency measures) purposes.

### **Safe Access for New Development**

Safe access to and from a site may only be achieved where the following depth and velocity criteria for pedestrians and automobiles are met:

- a. For depths up to and including 0.2 metres, the velocity must be less than or equal to 4.5 metre/second (based on the flood hazard); and,
- b. For depths greater than 0.2 metres and less than or equal to 0.3 metres, the velocity must be less than 3.0 metres/second and for depths between 0.3 and 0.4 metres, the velocity must be less than or equal to 0.6 metres/second (based on the flood hazard).

Notwithstanding the above depth and velocity criteria, where the proposed *development* requires access onto an existing flooded roadway or access to a roadway is subject to flooding where the depth and velocity criteria for safe access cannot be met, the *development* may be permitted provided the following is addressed:

- a. Access to/from the site must have flood depths and velocities less than or equal to those experienced on the existing roadway; and,
  - b. Safe alternate or secondary access for pedestrians and emergency vehicles that is appropriate for the nature of the *development* and the natural hazard is provided.
- or
- c. Where the affected municipal emergency services provides confirmation that acceptable provisions for emergency ingress/egress, appropriate for the nature of the *development* and the flood hazard, are available for a site and/or the nature of the *development* is such that a significant risk to property damage and human health is not created.

For existing *development*, safety risks are a function of the occupancy of the structure, the flood susceptibility of the structure and the access routes to the structure. For *minor additions* or *reconstruction* of an existing structure, the following factors will be considered:

- the degree of risk with the use of the existing access
- the ability to modify the existing access or construct a new safe access;
- the ability to find and use the access during an emergency; and
- the ability and willingness of emergency vehicles to use the access.

**Appendix D – Survey Questions**

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## **The Issues Facing the Shoreline**

**What Are Your Thoughts? What Have You Seen? What Are You Experiencing?**

### **WE WANT TO HEAR FROM YOU!**

1. Have you experienced flooding along the shoreline? If so, where?
2. Are you aware of others who have experienced flooding along the shoreline? If so, where?
3. Have you experienced erosion along the shoreline? If so, where?
4. Are you aware of others who have experienced erosion along the shoreline? If so, where?
5. Have you experienced other shoreline-related issues?
6. Are you aware of others who are experiencing shoreline-related issues and concerns?
7. What solution will best address shoreline erosion?
8. Are there recommendations that you believe should be included in the 2018 Shoreline Study?
9. Is there specific action that you believe needs to be taken? If so, when and who in your view should be responsible?

Your comments are important to us. Please take the time to share your thoughts, comments and concerns with us.

**Please provide your comments by completing the electronic survey...the survey weblink follows:**

<https://www.surveymonkey.com/r/6KYKRNK>





## Highlights From....Municipality of Clarington Emergency Plan- April 27, 2018

### 5.1. Waterfront Flooding Risk

The Central Lake Ontario Conservation – Watershed Flood-Risk Assessment (WFRA2017) methodology assessed “flood damage centres” (FDC) that are defined within the Lake Ontario Shoreline Management Plan as “areas of high risk due to flooding or erosion potential and include shorelines subject to high erosion rates, low-lying regions prone to flooding and areas where structures are located in close proximity to the shoreline”.

Each of the 92 FDC’s identified was assessed based on three factors including vulnerability, flood event likelihood, and impacts resulting from flood events (evaluated as social, business, economic and environmental factors). The locations of the Flood Damage Centres within the Municipality of Clarington are shown in Figure 1.

The Flood Damage Centres along Clarington’s waterfront are detailed in Figure 2.

The WFRA-2017 identifies two FDC’s along the shore of Lake Ontario that are the primary focus of this CFRP. Damage centre BS1, which includes the area of Port Darlington and west including Westbeach Road, has a total risk score of 200 which rated as the sixth highest total risk score of the 92 centres assessed. Damage centre WS1 which includes the Cedar Crest Beach Road area has a total risk score of 140 which is the same overall risk rating as five other identified damage centres. This places the WS1 damage centre as one of the fourteenth highest total risk scores of the 92 centres assessed. Damage centre WS1 and BS1 are identified in Figure 1 and Figure 2.

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3 Ministry of Community safety and Correctional Services – Hazard Based Planning - Guideline for the Development of a Municipal Flood Emergency Plan

[https://www.emergencymanagementontario.ca/english/emcommunity/program\\_resources/hazardbasedplanning/flood\\_guideline.html?\\_ga=2.153259837.482113672.1502808436-315735041.1471871939](https://www.emergencymanagementontario.ca/english/emcommunity/program_resources/hazardbasedplanning/flood_guideline.html?_ga=2.153259837.482113672.1502808436-315735041.1471871939)

Figure 1: Municipality of Clarington Flood Damage Centres (CLOCA)  
(Source: Figure 3 – Central Lake Ontario Conservation Watershed Flood-Risk Assessment, April 2017)

Figure 2: Municipality of Clarington Waterfront Areas and Flood Damage Centres  
(Source: Figure 3 – Central Lake Ontario Conservation Watershed Flood-Risk Assessment, April 2017)

In addition to the WFRA-2017, Engineering Services Report EGD-015-17 dated June 19th, 2017 provides an overview of the flooding history along the shore of Lake Ontario, and specifically the beach west of Port Darlington, which includes the Westbeach Road and the Cedar Crest Beach cottage/residential development.

Of importance to the education, preparedness and emergency response elements of this CFRP are the flooding hazards presented in Report EGD-015-17. These include the following:

- Seasonal fluctuations in lake level typically average about 0.6 to 1.1 metres between the summer and winter months;

- By far, natural phenomena (e.g., rainfall, evaporation, wind, storms, etc.) are the greater cause of flooding along the Lake Ontario shoreline than human intervention (i.e., diversions, water control structures, etc.) although the flood control measures in Cornwall to regulate levels does also contribute to the high water levels; and
- Storm winds can cause periods of significantly larger magnitudes of lake level changes and induce the added hazard of wave run-up (the uprush movement of a wave breaking on a shoreline), which can flood low-lying areas behind erosion barriers.

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**Appendix F – Staff Report to CLOCA Board, September 19, 2018**

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