



Toronto and Region  
**Conservation**  
*for The Living City®*

# FLOOD CONTINGENCY PLAN

---

JANUARY 2016

In association with:

The Greater Toronto Area Conservation Authorities



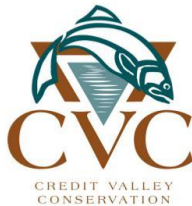
**Lake Simcoe Region**  
conservation authority



**Ganaraska**  
CONSERVATION



**KAWARTHA**  
CONSERVATION



**CVC**  
CREDIT VALLEY  
CONSERVATION



*Central  
Lake Ontario  
Conservation*



Conservation  
**Halton**

# FLOOD CONTINGENCY PLAN

## Table of Contents

---

|   |  |          |
|---|--|----------|
| <b>1.0</b>  | <b>INTRODUCTION</b> .....  | <b>1</b> |
| 1.1   | EMERGENCY MANAGEMENT AND CIVIL PROTECTION ACT .....                                  | 1        |
| <b>2.0</b>  | <b>ROLES AND RESPONSIBILITIES OF AGENCIES</b> .....                                  | <b>3</b> |
| 2.1   | MUNICIPAL ROLE .....   | 3        |
| 2.2   | CONSERVATION AUTHORITY ROLE .....  | 3        |
| 2.3   | PROVINCIAL ROLE (SURFACE WATER MONITORING CENTRE) .....                              | 3        |
| 2.4   | INTERACTION OF AGENCIES – OVERVIEW.....  | 4        |
| <b>3.0</b>  | <b>FLOOD MESSAGES</b> .....  | <b>5</b> |
| 3.1   | NORMAL.....  | 5        |
| 3.2   | WATERSHED CONDITIONS STATEMENT.....  | 5        |
| 3.3   | FLOOD WATCH.....   | 6        |
| 3.4   | FLOOD WARNING.....   | 6        |
| 3.5   | LAKE ONTARIO & GEORGIAN BAY SHORELINE HAZARD WARNING .....                           | 6        |
| 3.6   | COORDINATING ISSUANCE OF FLOOD MESSAGES .....  | 8        |
| <b>4.0</b>  | <b>FLOOD RESPONSE PROCEDURES</b> .....   | <b>9</b> |
| 4.1   | COMMUNICATIONS AND OPERATIONS RELATED TO MUNICIPAL EMERGENCY OPERATION CENTRES ..... | 9        |
| 4.2   | FLOOD PROTECTION AND MITIGATION PROGRAM .....  | 10       |
| <b>APPENDIX A: FLOOD AND WEATHER TERMINOLOGY</b> .....    | <b>11</b>  |          |
| A.1   | STANDARDIZED DESCRIPTION OF FLOOD MAGNITUDE .....                                    | 11       |
| A.2   | WEATHER FORECAST TERMINOLOGY AND DEFINITIONS.....                                    | 11       |
| <b>APPENDIX B: SAMPLE FLOOD MESSAGES</b> .....            | <b>14</b>  |          |
| B.1   | SAMPLE SPRING BREAKUP MESSAGE.....   | 14       |
| B.2   | SAMPLE WATER SAFETY WATERSHED CONDITIONS STATEMENT .....                             | 15       |
| B.3   | SAMPLE FLOOD OUTLOOK WATERSHED CONDITIONS STATEMENT .....                            | 16       |
| B.4   | SAMPLE FLOOD WATCH.....  | 17       |
| B.5   | SAMPLE FLOOD WARNING.....  | 18       |
| <b>APPENDIX C: PRIMARY CONSERVATION AUTHORITIES</b> ..... | <b>19</b>  |          |
| <b>APPENDIX D:</b>  |  |          |
| <b>APPENDIX E: FLOOD VULNERABLE AREAS</b> .....           | <b>22</b>  |          |

## List of Figures

---

|   |    |
|---|----|
| FIGURE 1: Local Conservation Authorities .....                    | 2  |
| FIGURE 2: Interaction of Agencies .....                           | 4  |
| FIGURE 3: TRCA Flood Risk Management Staff Responsibilities ..... | 26 |

## List of Tables

---

|  |    |
|--|----|
| TABLE 1: Critical Water Levels and Wave Heights for Lake Ontario ..... | 7  |
| TABLE 2: Wind Velocity Descriptions .....                              | 8  |
| TABLE A.1: Intensity of Rain Based on Rate of Fall .....               | 12 |
| TABLE A.2: Estimating Intensity of Rain .....                          | 12 |

## List of Revisions

| Revision Number | Summary of Changes                             | Revision Date |
|-----------------|--|---------------|
| 1.0             | Sections 1, 2, 3, 4<br>Appendix B & Appendix D | January 2016  |
| 2.0             | Section 3<br>Appendix B & Appendix D           | January 2016  |
| 3.0             | Sections 1, 2, 4<br>Appendix D                 | January 2016  |

## 1.0 Introduction

---

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 should 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.

This 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. This version of the Flood Contingency Plan provides general information on TRCA's Flood Forecasting and Warning program, as well as specific information and contacts for municipalities within TRCA's jurisdiction.

The Conservation Authorities of the Greater Toronto Area include Conservation Halton (HRCA), Credit Valley Conservation Authority (CVCA), Toronto and Region Conservation Authority (TRCA), Lake Simcoe Region Conservation Authority (LSRCA), Central Lake Ontario Conservation Authority (CLOCA), Ganaraska Region Conservation Authority (GRCA), Nottawasaga Valley Conservation Authority (NVCA) and Kawartha Conservation (KLCA).

### 1.1 Emergency Management and Civil Protection Act

Ontario's Emergency Management and Civil Protection Act (EMCPA, 2006) sets out requirements for the development, implementation and maintenance of municipal and ministry emergency management programs. These comprehensive emergency management programs are based on the five principles of emergency management: prevention, mitigation, preparedness, response, and recovery. The programs include the development of hazard identification and risk assessment (HIRA) for each of the 56 identified provincial hazards. The province describes six "pillars of preparedness"; each an essential component of an emergency management program, including:

1. Emergency Plans
2. Emergency Operations Centre
3. Training
4. Exercises
5. Emergency Information
6. Public Education

The province has assigned the responsibility of emergency response for flooding to the Ministry of Natural Resources and Forestry, which includes flood forecasting and warning as well as flood control operations. Where a Conservation Authority exists, the province relies on the Conservation Authority to assist them in their assigned responsibilities for flooding.

The TRCA Flood Forecasting and Warning program provides vital service to our municipal partners to ensure that the flood aspects of these components are met.

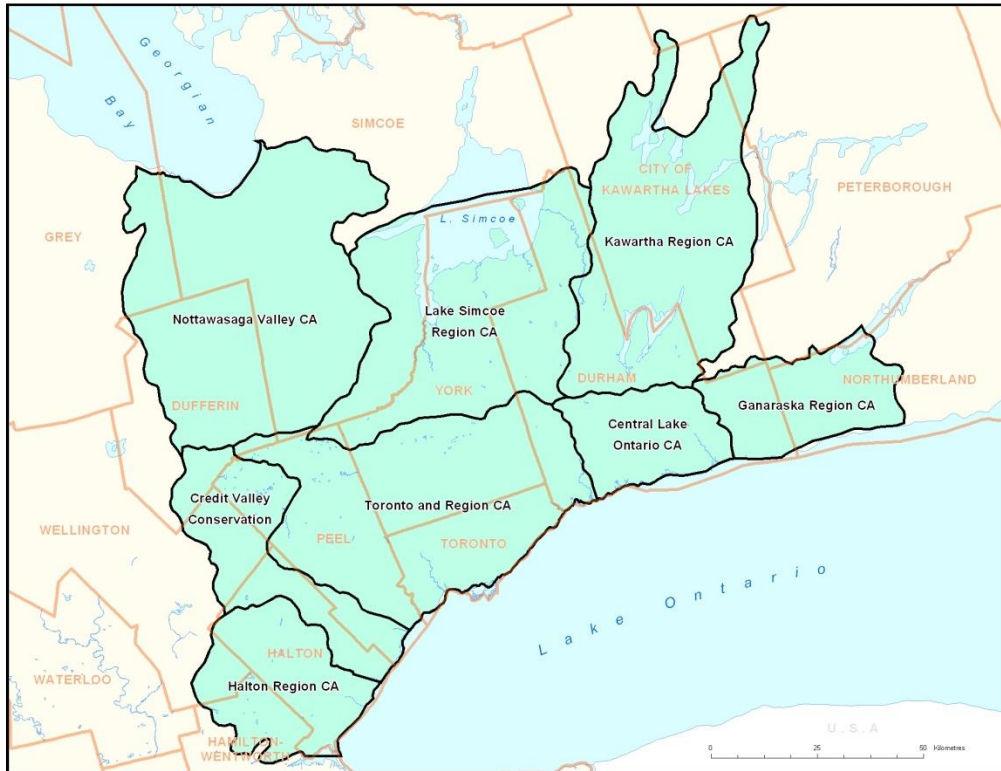


Figure 1: Conservation Authorities and Regional Municipalities of the Greater Toronto Area

## 2.0 Roles and Responsibilities of Agencies

---

### 2.1 Municipal Role

Under the Emergency Management and Civil Protection Act (Ontario Regulation 380/04), 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. In order to fulfill this responsibility, municipalities should ensure that emergency plans are kept current and tested on a regular basis.

Upon receiving a Flood Watch or Flood Warning municipalities shall:

1. Notify appropriate municipal officials, departments and agencies in accordance with their municipal emergency plan.
2. Determine the appropriate response to a flood threat and, if warranted, deploy municipal resources to protect life and property.
3. If required, declare a flood emergency and implement their emergency response plan.
4. Request provincial assistance under the Emergency Management and Civil Protection Act, if municipal resources are inadequate to respond to the emergency.
5. Maintain liaison with Conservation Authority Flood Duty Officers.

### 2.2 Conservation Authority Role

Conservation Authorities have several areas of responsibility for flooding and flood emergencies:

1. Support municipal flood emergency planning by providing technical advice pertaining to flood risk (e.g., hydrology, hydraulics, flood vulnerable areas, etc.) and engaging in flood mitigation projects to reduce flood risk prior to flood events.
2. Maintain a local network, 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.
3. Issue flood messages to municipalities and other appropriate agencies, including the media and the public, to advise of potential flooding when appropriate.
4. Operate Conservation Authority dams and flood control structures to reduce the effects of flooding when appropriate.
5. Maintain communications with municipalities and the MNRF Surface Water Monitoring Centre during a flood event.

### 2.3 Provincial Role (Surface Water Monitoring Centre)

1. Operate and maintain a provincial forecasting and warning system to alert MNRF District Offices and Conservation Authorities of potential meteorological events that could create a flood hazard.
2. Maintain communications with MNRF District Offices and Conservation Authorities regarding the status of provincial flood potential.
3. Receive messages from CAs, MNRF Districts and other agencies and provide analysis and information that is used to guide the MNRF's response to a flood.
4. Assists the MNRF Districts where CAs do not exist in the preparation of river response forecasts, daily planning cycle, and the monitoring of local storm conditions.

2.4 Interaction of Agencies – Overview

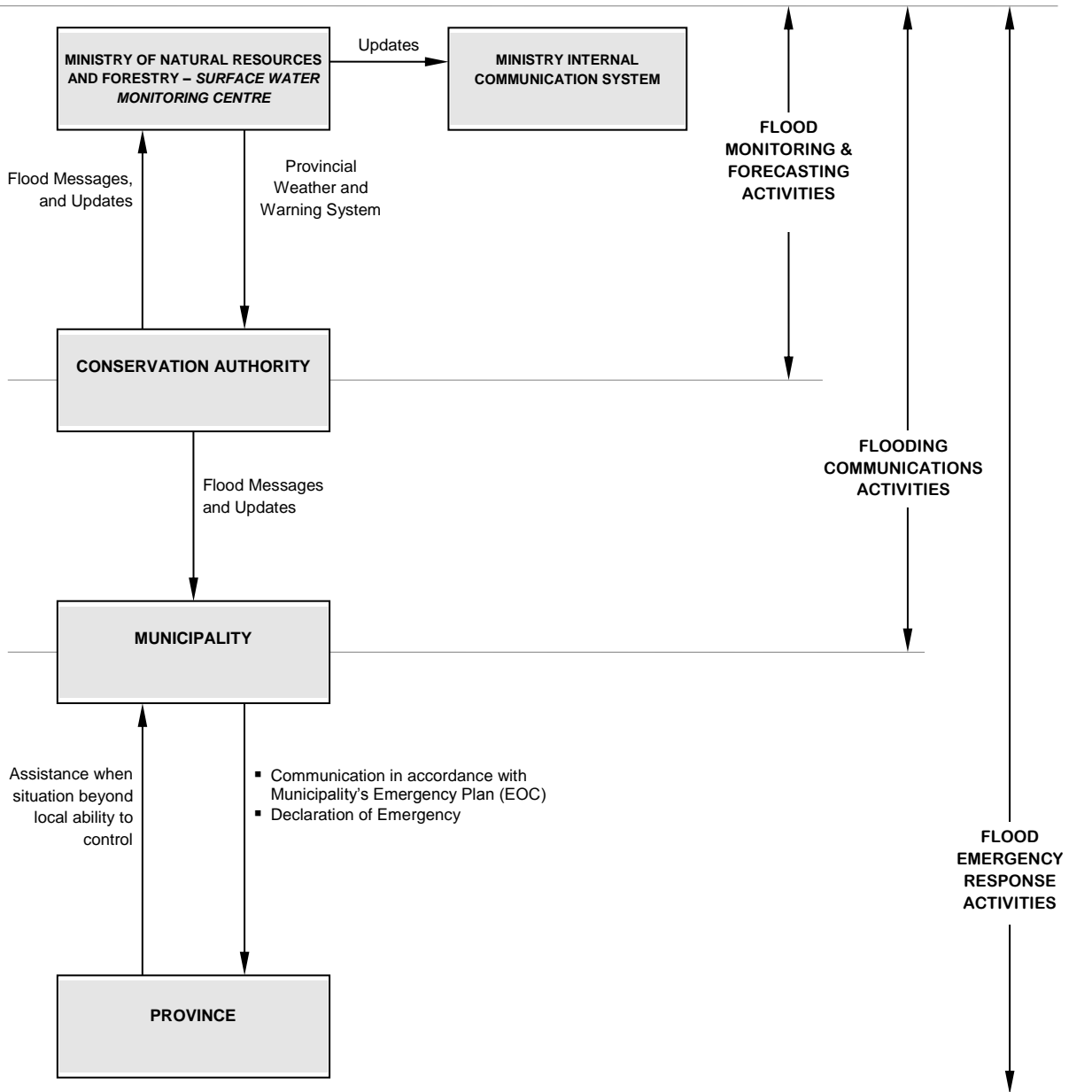


Figure 2: Interaction of Agencies

### 3.0 Flood Messages

---

A flood is defined as a situation where water levels in a watercourse exceed the channel banks. Each Conservation Authority operates a 24-hour flood forecasting and warning program that monitors weather forecasts and watershed conditions. This information is used to assess the potential for flooding. When spring melt or severe storms are anticipated, the Conservation Authority estimates the severity, location, and timing of possible flooding, and provides these forecasts to local agencies.

When conditions warrant, Conservation Authorities will communicate with local agencies using one of the following types of flood messages (Appendices A and B provide additional details): Watershed Conditions Statement, Flood Warning, or Flood Watch.

The standard content of a flood message includes:

- The date and time of issuance
- Identification of sender (Conservation Authority and name of Flood Duty Officer)
- General recipient list
- Summary of weather forecast (expected precipitation, temperature, timing, etc.)
- Description of potential flood magnitude, a general assessment of flooding implications, identification of potentially unsafe areas, or early notice of the potential for flooding
- Date and time of next update
- Conservation Authority contact for additional information

#### 3.1 Normal (Green)



A “Normal” condition is defined as a general notice that no flooding conditions exist.

#### 3.2 Watershed Conditions Statement (Yellow)

A “Watershed Conditions Statement” is defined as a general notice that potential conditions exist that pose a risk to personal safety or which have the potential to lead to flooding. Statements are primarily directed to the public, media and flood coordinators. The message reports on general watershed conditions and encourages public awareness of increased risk near riverine systems.

There are two variations of this message:



- *Watershed Conditions Statement – Water Safety Statement* is issued when high flows, unsafe banks, melting ice or other factors could be dangerous for recreational users such as anglers, canoeists, hikers, children, pets, etc. Flooding is not expected.





- *Watershed Conditions Statement – Flood Outlook Statement* is early notice of the potential for flooding based on weather forecasts calling for heavy rain, snow melt, high wind or other conditions that could lead to high runoff, cause ice jams, lakeshore flooding or erosion.

### 3.3 Flood Watch (Orange)



A *Flood Watch* is defined as a notice that flooding is possible in specific watercourses or municipalities. Municipalities, emergency services and individual landowners in flood-prone areas should prepare.

A Flood Watch may be updated depending upon weather and runoff conditions, and will be followed by a notice of cancellation once the potential for flooding has passed.

### 3.4 Flood Warning (Red)



A *Flood Warning* is defined as a notice that flooding is imminent or already occurring in specific watercourses or municipalities. Municipalities and individuals should take action to deal with flood conditions. This may include road closures and evacuations.

Flood Warnings may be updated depending on weather and runoff conditions, and will be followed by a notice of cancellation once the potential for flooding has passed.

### 3.5 Lake Ontario and Georgian Bay Shoreline Hazard Warning

A “Shoreline Hazard Warning” is defined as a notice that critical high water levels and waves are imminent and/or occurring, which could result in shoreline flooding and/or erosion. This warning shall be issued to the municipalities and emergency services. The following table outlines the criteria used to determine critical high water levels and wave heights.

Note that this type of warning is issued by neighboring Conservation Authorities (i.e. CLOCA), but is rare for TRCA.

**Table 1: Critical Water Levels and Wave Heights for Lake Ontario & Georgian Bay**

| Section                                      | Critical Water Levels<br>(cm above chart datum, IGLD, 1985) | Wave height (metres) |
|--|---|----------------------|
| Niagara Region – Stoney Creek                | 160 cm  | >1.5 m               |
| Stoney Creek – Burlington                    | 130 cm  | >2.0 m               |
| Oakville – Port Credit                       | 170 cm  | >2.0 m               |
| Whitby – Bowmanville                         | 170 cm  | >2.0 m               |
| Port Hope                                    | 160 cm  | >2.0 m               |
| Port Hope – Presqu’ile                       | 170 cm  | >2.0 m               |
| Prince Edward County                         | 170 cm  | >2.0 m               |
| Georgian Bay – Collingwood /<br>Wasaga Beach | 130 cm  | >1.0m                |

Notes:

- Shoreline Hazard Warnings for the Hamilton/Burlington Beachstrip of Lake Ontario are issued if either critical water levels or wave criteria are met.
- Wave criteria apply only when Lake Ontario’s calm water level is 90 cm above chart datum, IGLD 1985.
- IGLD (International Great Lakes Datum) is the elevation reference system used to define water levels within the Great Lakes - St. Lawrence River system because of movement of the earth’s crust. The reference system is adjusted every 25-35 years.

Forecasted wind velocities are also used to predict potential shoreline flooding/erosion problems. The following chart displays the various terminologies and units usually used to describe wind velocity.

**Table 2: Wind Velocity Descriptions**

| Wind Speed | knots (kts) | miles/hour (mph) | kilometres/hour (km/h) |
|------------|-------------|------------------|------------------------|
| Light      | 1-14        | 1-16             | 1-26                   |
| Moderate   | 15-19       | 17-22            | 28-35                  |
| Strong     | 20-33       | 34-47            | 39-54                  |
| Gale       | 34-47       | 39-54            | 63-87                  |
| Storm      | 48-63       | 55-73            | 89-117                 |

The following terms are also used when describing wind velocities and their influence on critical wave heights.

|                        |   |
|------------------------|---|
| <i>Wind Direction:</i> | the direction from which the wind is blowing  |
| <i>Wind Setup:</i>     | the vertical rise above normal water level on the leeward side of a body of water caused by wind stresses on the surface of the water |
| <i>Leeward:</i>        | the direction toward which the wind is blowing, the direction toward which waves are traveling  |
| <i>Wave Height:</i>    | the amplitude measured from wave trough to wave crest, for offshore areas, outside the breaker line                                   |

### 3.6 Coordinating Issuance of Flood Messages

Conservation Authorities utilize an array of technologies to disseminate flood messages. TRCA issues messages using a web-based e-mail service, SMS text (using an e-mail to text service), Twitter, RSS feed, and website technologies. Messages are sent to designated individuals within municipalities and other local agencies. These individuals, in turn, are responsible for relaying the message to relevant individuals and departments within their organizations, and activating their role as defined by their organization's Emergency Response Plan.

Conservation Authority jurisdictions are based on watershed boundaries, not regional or municipal boundaries. Therefore, in many areas, local governments may be serviced by two or more Conservation Authorities. To streamline and coordinate communication with local agencies, a primary Conservation Authority has been assigned for each region and municipality. All Conservation Authorities will issue flood messages that are specific to their jurisdictions. However, during extreme weather events, when resources are stretched, the designated primary CA for each region and municipality will be responsible for direct communication and will coordinate incoming information from all relevant CA's to their primary region/municipality.

During most storm events, municipalities, local agencies, and residents requiring information or assistance should contact the local Conservation Authority having jurisdiction for the area of interest. Appendix C displays the principal Conservation Authority for each municipality in the GTA.

#### 4.0 FLOOD RESPONSE PROCEDURES

As previously mentioned, during an actual flood event the primary responsibility for the welfare of residents and protection of property rests with the municipality. Upon receiving a flood message, municipalities should monitor their local conditions and determine the appropriate action, which may include activating their Emergency Response Plan.

Where a flood emergency is beyond the capacity of a municipality, provincial assistance can be requested in accordance with the municipality's Emergency Response Plan.

During a flood, Conservation Authorities will continue to provide updated information as well as technical advice on flood mitigation.

During the emergency, the Conservation Authority representative will continue to advise the MNRF Surface Water Monitoring Centre of the status of the situation. The Surface Water Monitoring Centre will be responsible for updating and relaying information related to the emergency to MNRF district offices.

#### 4.1 COMMUNICATIONS AND OPERATIONS RELATED TO MUNICIPAL EMERGENCY OPERATIONS CENTRES

The Province of Ontario, through its Emergency Management and Civil Protection Act legislation, requires all municipalities to have valid emergency response plans and procedures in place. One component of this requirement is the need to have a defined Emergency Operations Centre (EOC) where municipal activities can be undertaken in the event of an emergency. Under normal flooding operations where there is no need to activate the EOC, each GTA Conservation Authority will provide information as requested by their local municipalities. This section defines how the GTA Conservation Authorities will operate (e.g., continue to provide advice and information to municipalities) in the case where EOCs are activated.

The primary Conservation Authority (as defined in Appendix C) will present one or more members of staff at the EOC (if resources permit). Staff will coordinate flood related information and advice on behalf of all of the CA's that service the given local and/or regional Emergency Operations Centre (EOC/REOC).

As several Conservation Authorities may manage watercourses within the jurisdiction of an individual municipality or region, the primary Conservation Authority staff assigned to attend the EOC/REOC will be required to provide advice on watersheds which would not be within their normal area of expertise. To ensure that this system of information coordination and sharing proceeds in a seamless manor, the following procedures are to be in effect during those occurrences:

1. The primary Conservation Authority will be responsible for coordinating communications between their assigned local or regional emergency preparedness staff and all other CA's with watercourses within the EOC service area. They will discuss the need to begin the emergency response process and whether a need exists for the regional/municipal EOC group to assemble. The decision to assemble the Emergency Control Group is determined by the local or regional emergency preparedness staff, and will be based on the level and degree of flood threat which may be affecting the municipality and/or region.
2. The primary Conservation Authority will coordinate with secondary Conservation Authorities to develop and schedule telephone conferences or discussions to ascertain specific flood related information as well as updated weather forecast information.
3. The secondary Conservation Authorities will consolidate flooding and weather information into a briefing note which will be forwarded to their representative at the Regional EOC at the agreed upon designated times (or as required).
4. All GTA Conservation Authorities will ensure that their internal operations manuals/procedures reflect the requirements outlined above.

To ensure the effectiveness of the above procedure, each GTA CA will develop a working relationship with the emergency management offices of each of their municipal/regional partners.

#### 4.2 Flood Protection and Mitigation Program

TRCA's Flood Protection and Remedial Capital Works Project involves the identification of flood risk (flood vulnerable areas) within our jurisdiction, and the development and implementation of tools and/or capital works projects that will reduce the risk to both life and property with respect to flooding. The identification of flood risk was addressed through the development of a Flood Protection and Remedial Capital Works Strategy. The strategy includes an analysis of flood mitigation options in order to prioritize areas or structures within the TRCA jurisdiction requiring remedial flood protection works and/or acquisition. Implementation is achieved through large scale capital remedial works, technological advances in forecasting, municipal outreach, public education and data management.

Recent advancements in technology have allowed for the development of improved forecasting tools, as well as the historical analysis of typical storm events in the GTA. This information is being used to gain a better understanding of the response of the watersheds to various types of rainfall events, which has a direct impact on emergency response plans.

*See Appendix E for Flood Vulnerable Area map.*

## Appendix A: Flood and Weather Terminology

---

### A.1 Standardized Description of Flood Magnitude

In order to improve the understanding of flood messages sent by the various Conservation Authorities, Flood Watches and Flood Warnings may include the following terminology to describe the magnitude of anticipated flooding.

|                           |  |
|---------------------------|--|
| <i>No Flooding:</i>       | Water levels remain within channel banks.  |
| <i>Nuisance Flooding:</i> | Flooding of low lying lands. However, road access remains available and no structures will be flooded.   |
| <i>Minor Flooding:</i>    | Potential for some structural flooding and sections of road access may be impassable. No evacuation is required.   |
| <i>Major Flooding:</i>    | Potential for significant basement flooding, some first floor flooding, and significant road access cuts. Evacuation possibly required.  |
| <i>Severe Flooding:</i>   | Potential for many structures to be flooded, major disruption of roads and services. Evacuation is required due to risk to life and major damages to residential, industrial, commercial and/or agricultural sites. The event may produce negative environmental impacts caused by spills of hazardous substances such as sewage, oils, chemicals, etc., that pose a threat to public safety and/or to the eco-system. |

### A.2 Weather Forecast Terminology and Definitions

A key component of a Conservation Authority's flood forecasting and warning system is the ability to interpret weather forecasts. Definitions of the most commonly used weather forecasting terms, related to precipitation are provided below

Terms such as drizzle, rain, or snow are used to indicate the occurrence of precipitation. The various forms of precipitation are defined as follows:

|                 |  |
|-----------------|--|
| <i>Drizzle:</i> | Fairly uniform precipitation composed exclusively of fine drops with diameters of less than 0.5 mm, falling very close together. Drizzle appears to flow while following air currents. |
| <i>Rain:</i>    | Precipitation, in the form of drops larger than 0.5 mm.  |
| <i>Snow:</i>    | Precipitation of snow crystals, predominantly in the form of six-pointed stars.  |

These terms may be accompanied by qualifying words and numbers to provide further detail regarding the intensity, amount and proximity of the precipitation. Qualifiers may be used in various combinations to describe weather phenomena.

## FLOOD CONTINGENCY PLAN

The intensity qualifiers that are used are: light, moderate, or heavy, in accordance with the following charts.

**Table A.1: Intensity of rain based on rate of fall**

| Intensity | Criteria   |
|-----------|--|
| Light     | Up to 2.5 mm per hour; maximum 0.25 mm in 6 minutes.       |
| Moderate  | 2.6 mm to 7.5 mm per hour; more than 0.75 mm in 6 minutes. |
| Heavy     | More than 7.6 mm per hour; more than 0.75 mm in 6 minutes. |

**Table A.2: Estimating Intensity of Rain**

| Intensity | Criteria   |
|-----------|--|
| Light     | From scattered drops that, regardless of duration, do not completely wet an exposed surface, up to a condition where individual drops are easily seen. |
| Moderate  | Individual drops are not clearly identifiable; spray is observable just above pavements and other hard surfaces.                                       |
| Heavy     | Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to heights of several inches is observed over hard surfaces.        |

It is often difficult to accurately forecast the amount of rain expected, due to the subjective nature of computer model interpretation, and the large areas for which computer models are applied.

The actual amounts of precipitation received are dependent on how the weather system reacts to the conditions and topography as it crosses a specific location. The presence of water bodies in particular will cause the weather to differ over relatively short distances.

For example, when a forecaster predicts that “south central Ontario will receive 25 mm today”, this does not mean that a specific area will receive exactly 25 mm, or even a maximum quantity of 25 mm. What this does mean is that, generally, over the area of south central Ontario, 25 mm are likely to fall over a location provided that current conditions remain the same.

When a range is given, such as 10-20 mm, this implies a degree of uncertainty on the part of the forecasters with respect to the exact tracking of a system. The various computer models used may not be in agreement with regards to the estimated rainfall. Therefore, the forecaster is covering each possibility by using a range.

The terms showers and thunderstorms are used to further qualify the type of precipitation and weather phenomena that are expected.

**Showers:** Precipitation that stops and starts again abruptly, changes intensity rapidly, and is usually accompanied by rapid changes in the appearance of the sky.

## *FLOOD CONTINGENCY PLAN*

*Thunderstorm:* A local storm produced by cumulonimbus clouds, and is accompanied by lightning and/or thunder. Thunder storms are essentially overgrown showers that produce thunder and lightning.

The probability of precipitation is another qualifier frequently used in forecasts. The probability of precipitation represents the likelihood of the occurrence of measurable precipitation at any point in the region. Thus a probability of 30 per cent means that out of 100 similar situations, precipitation should occur 30 times.

Rain, snow, periods of rain, or intermittent rain or snow will normally appear with probabilities of 90 or 100 per cent, and indicate that a major weather system will affect the region. The amount of precipitation may vary.

The terms showers, flurries or occasional rain (or snow) imply that the precipitation will not be continuous, and any point in the region is likely to get a measurable amount. These terms are normally combined with probabilities in the 60 to 80 per cent range.

The term scattered is used to qualify the terms showers and flurries when only a portion of the region is expected to get measurable precipitation. The probabilities associated with scattered showers are in the 30 to 50 per cent range.

When isolated thunderstorms are forecast, a probability of precipitation of 10 or 20 per cent is normally applied. Only a small part of the region is likely to get rain, but those areas that do are likely to get intense heavy rain for short periods. Thunderstorms may occur during a continuous rain (i.e., embedded thunder storms). Hail, strong winds, and even tornadoes can result from severe thunderstorms.



Appendix B: Sample Flood Messages

---

B.1 Sample Spring Breakup Message



**MEDIA RELEASE**

For Immediate Distribution

**Spring Safety Message: Exercise Caution Near Waterways**

*-Toronto and Region Conservation urges residents to keep family members and pets away from the water's edge this spring-*

**(Toronto, March 10, 2015)** - Conservation Authorities are reminding residents of dangers that exist near streams, rivers, ponds and lakes around this time of year and urge people to keep family and pets away from the edge of all waterways.

Spring is quickly approaching and with warmer temperatures, people look forward to getting outdoors. Warmer temperatures, however, also bring: rain, melting snow and ice which can contribute to higher, faster flowing water in watercourses. Slippery and unstable stream banks and extremely cold water temperatures can also lead to very hazardous conditions close to any body of water. This year, there is a higher than normal amount of snow and ice cover in TRCAs watersheds and this means a higher chance of ice jams and localized flooding during the melting period. Extra caution is required.

Please keep family members and pets safely away from any water's edge and help make this an enjoyable spring.

For more information, contact your local conservation authority.

|   |                                  |
|---|----------------------------------|
| ◆ Lake Simcoe Region Conservation Authority   | (905) 895-1281                   |
| ◆ Toronto & Region Conservation Authority     | (416) 661-6514                   |
| ◆ Conservation Halton                         | (905) 336-1158                   |
| ◆ Credit Valley Conservation                  | (905) 670-1615                   |
| ◆ Central Lake Ontario Conservation Authority | (905) 579-0411                   |
| ◆ Ganaraska Region Conservation Authority     | (905) 885-8173                   |
| ◆ Nottawasaga Valley Conservation Authority   | (705) 424-1479                   |
| ◆ Kawartha Conservation                       | (705) 328-2271 or 1-800-668-5722 |

**Toronto and Region Conservation**

With over 55 years of experience, Toronto and Region Conservation (TRCA) helps people understand, enjoy and look-after the natural environment. Our vision is for The Living City®, where human settlement can flourish forever as part of nature's beauty and diversity. For more information, call 416-661-6600 or visit us at [www.trca.on.ca](http://www.trca.on.ca).

**Media Contact**

Elizabeth Oakley  
Supervisor, Media Management  
Toronto and Region Conservation  
Tel: 416-274-2036  
E-mail: [eoakley@trca.on.ca](mailto:eoakley@trca.on.ca)

B.2 Sample Watershed Conditions Statement – Water Safety



---

**WATERSHED CONDITIONS  
STATEMENT  
WATER SAFETY**

**DATE:** OCTOBER 28, 2015

**TIME:** 10:00PM

**ISSUED TO:** SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA



**Weather Conditions:**

Toronto and Region Conservation advises that the weather system that brought heavy rainfall to the Greater Toronto Area has passed. Showers will end this evening. However, the weather forecast has a chance of showers for overnight and into tomorrow morning.

**Issues:**

Localized flooding from the heavy rainfall today has ended, but the flows and water levels in the creeks and rivers of the Greater Toronto Area remain high, and conditions remain unsafe.

**Actions:**

Please exercise caution around all bodies of water. Please alert any children under your care of these dangerous conditions and supervise their activities.

Toronto and Region Conservation will continue to monitor the weather and watershed conditions and will issue further messages as necessary. This Water Safety Watershed Conditions Statement will be in effect through Thursday, October 29, 2015. For more information please contact the on-call Flood Duty Officer.

**Flood Duty Officer**

416-661-6514  
416-661-6600 ext.xxxx

**Chief Flood Duty Officer**

Note: A Water Safety Watershed Conditions Statement may be issued when there are high flows, unsafe banks, melting ice or other factors could be dangerous for recreational users such as anglers, canoeists, hikers, children, pets, etc. Flooding is not expected.

[www.trca.on.ca/flood](http://www.trca.on.ca/flood)



B.3 Sample Watershed Conditions Statement- Flood Outlook



---

**WATERSHED CONDITIONS  
STATEMENT  
FLOOD OUTLOOK**

**DATE:** TUESDAY OCTOBER 27, 2015  
**TIME:** 1:45PM  
**ISSUED TO:** SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA



**Weather Conditions:**

Toronto and Region Conservation advises that Environment Canada is forecasting a low pressure system associated with the remnants of Hurricane Patricia and will move through the Greater Toronto Area (GTA) in the early morning tomorrow. Heavier rainfall is expected Wednesday morning through to the afternoon. This weather system is expected to bring 45mm of rainfall with slightly more rain associated with potential thunderstorms before leaving the GTA tomorrow evening.

**Issues:**

Forecasted rainfall amounts will result in higher than normal water levels and flows. Rivers and streams will be faster flowing, creating unsafe and/or dangerous conditions. There may be flooding on roadways and in low-lying areas.

The combination of slippery and unstable banks will create hazardous conditions close to any river, stream or other water bodies.

**Actions:**

Please stay away from rivers and streams and exercise caution around all bodies of water. Please alert any children under your care of these dangers and supervise their activities.

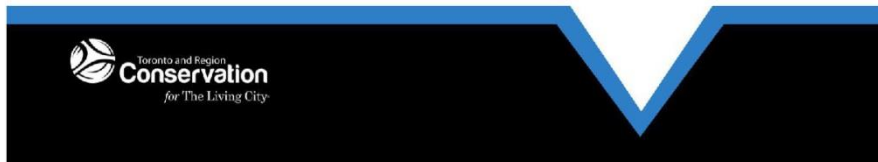
This Flood Outlook Watershed Conditions Statement will be in effect through to Thursday October 29, 2015. TRCA will continue to monitor streams and weather conditions closely. Further flood related messages will be issued as required. For more information please contact the on-call Flood Duty Officer.

**Flood Duty Officer**  
416-661-6600 ext. xxxx

**Chief Flood Duty Officer**

Note: A Flood Outlook Watershed Conditions Statement is an early notice of the potential for flooding based on weather forecasts calling for heavy rain, snow melt, high wind or other conditions that could lead to high runoff, cause ice jams, lakeshore flooding or erosion.

[Learn more: www.trca.on.ca/flood](http://www.trca.on.ca/flood)  
[Follow us on Twitter: @trca\\_FLOOD](https://twitter.com/trca_FLOOD)



B.4 Sample Flood Watch



---

## FLOOD WATCH

**DATE:** OCTOBER 28, 2015

**TIME:** 11:15 AM

**ISSUED TO:** SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA



**Weather Conditions:**

Toronto and Region Conservation advises that over 30mm of rainfall has fallen on parts of the GTA, with more heavy rainfall expected through the afternoon and evening. Toronto and Region Conservation authority advises that flooding is likely.

**Issues:**

All rivers within the Greater Toronto area will be experiencing high flows and water levels, resulting in unsafe conditions. The Don River has yet to peak and is still rising. Therefore, there is a potential for flooding of the Bayview Avenue extension. We are closely monitoring other transportation routes and sites adjacent to the Don River.

**Actions:**

Please exercise extreme caution around all bodies of water and avoid driving in low-lying areas and roadways particularly at underpasses. Please alert any children under your care of these dangerous conditions and supervise their activities. Be alert for possible transportation delays and road closures.

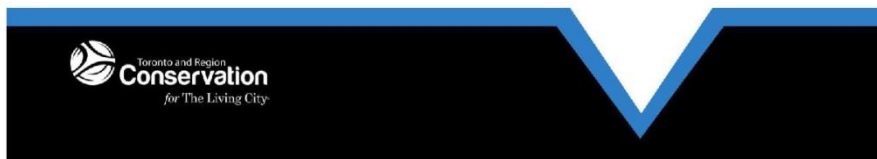
Toronto and Region Conservation will continue to monitor the weather and watershed conditions and will issue further messages as necessary. This Flood Watch will be in effect through Thursday October 29, 2015. For more information please contact the on-call Flood Duty Officer.

**Flood Duty Officer**  
416-661-6514 or  
416-661-6600 ext.xxxx

**Chief Flood Duty Officer**

Note: A Flood Watch is a notice that flooding is possible in specific watercourses or municipalities (due to stream conditions and expected weather). Municipalities, emergency services and individual landowners in flood-prone areas should prepare.

[www.trca.on.ca/flood](http://www.trca.on.ca/flood)  
[Follow us on Twitter @trca\\_FLOOD](https://twitter.com/trca_FLOOD)



B.5 Sample Flood Warning



---

## FLOOD WARNING

**DATE:** OCTOBER 28, 2015

**TIME:** 3:20 PM

**ISSUED TO:** SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA



**Weather Conditions:**

Toronto and Region Conservation advises that the Greater Toronto Area has received 25 - 50 mm of rainfall since early this morning. Environment Canada is forecasting another 15 mm of rainfall this afternoon.

**Issues:**

Flooding of the Bayview Extension and the Metrolinx rail line within the lower parts of the Don River watershed have been reported. With the additional rainfall, there remains a potential for flooding of low lying areas including the Don Valley Parkway.

The water levels and flow in TRCA's watersheds are higher than normal resulting in dangerous conditions. Flooding on roadways and underpasses may be experienced.

**Actions:**

Please stay away from rivers and streams and exercise caution around all bodies of water. Please avoid driving through flooded roadways in low-lying areas and at underpasses. Please alert any children under your care of these dangers and supervise their activities.

We will continue to closely monitor this system and will issue an update or cancellation to this Flood Warning by 10:00 am on October 29. For more information please contact the on-call Flood Duty Officer.

**Flood Duty Officer**

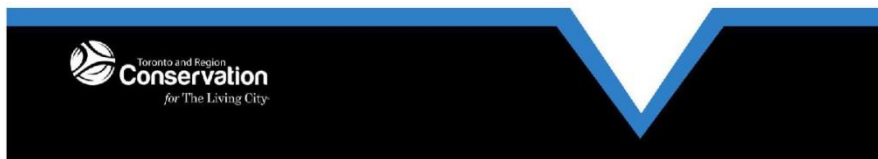
416-661-6514  
416-661-6600 ext.xxxx

**Chief Flood Duty Officer**

Note: A Flood Warning is a notice that flooding is imminent or occurring in specific watercourses or municipalities. Municipalities and individuals should take action to deal with flood conditions. This may include road closures and evacuations

[www.trca.on.ca/flood](http://www.trca.on.ca/flood)

[Follow us on Twitter @TRCA\\_FLOOD](#)



**Appendix C: Primary Conservation Authorities**

Key:

|       |  |
|-------|--|
| P     | <i>Primary Conservation Authority Contact for Watershed Conditions Statement, Flood Watch, Flood Warning Messages and Contact List Updates</i> |
| S     | <i>Secondary Conservation Authority shares a portion of a Municipality with Primary CA</i>   |
| KRCA  | <i>Kawartha Region Conservation Authority</i>  |
| HRCA  | <i>Halton Region Conservation Authority</i>  |
| CVCA  | <i>Credit Valley Conservation Authority</i>  |
| TRCA  | <i>Toronto and Region Conservation Authority</i>   |
| LSRCA | <i>Lake Simcoe Region Conservation Authority</i>   |
| CLOCA | <i>Central Lake Ontario Conservation Authority</i>   |
| GRCA  | <i>Ganaraska Region Conservation Authority</i>   |
| NVCA  | <b><i>NOTTAWASAGA VALLEY CONSERVATION AUTHORITY</i></b>  |

**DESIGNATED CONSERVATION AUTHORITIES**

| Municipality                   | HRCA | TRCA | CVCA | NVCA | LSRCA | CLOCA | GRCA | KRCA |
|--------------------------------|------|------|------|------|-------|-------|------|------|
| <b>DUFFERIN COUNTY</b>         |      |      | P    |      |       |       |      |      |
| Town of Orangeville            |      |      | P    |      |       |       |      |      |
| Township of East Garafraxa     |      |      | P    |      |       |       |      |      |
| Township of Mono               |      | P    | S    |      |       |       |      |      |
| Township of Mulmur             |      |      |      | P    |       |       |      |      |
| Township of Melancthon         |      |      |      | P    |       |       |      |      |
| Township of Amaranth           |      |      |      | P    |       |       |      |      |
| <b>GREY COUNTY</b>             |      |      |      |      |       |       |      |      |
| Municipality of Grey-Highlands |      |      |      | P    |       |       |      |      |
| Town of the Blue Mountains     |      |      |      | P    |       |       |      |      |
| <b>DURHAM REGION</b>           |      | S    |      |      | S     | P     | S    |      |
| Town of Pickering              |      | P    |      |      |       | S     |      |      |
| Town of Ajax                   |      | P    |      |      |       | S     |      |      |
| Township of Brock              |      |      |      |      | P     |       |      |      |
| Township of Uxbridge           |      | S    |      |      | P     | S     |      |      |
| Township of Scugog             |      |      |      |      | S     | S     |      | P    |
| Town of Whitby                 |      |      |      |      |       | P     |      |      |

**FLOOD CONTINGENCY PLAN**

| City of Oshawa                       |      |      |      |      |       | P     |      |      |
|--------------------------------------|------|------|------|------|-------|-------|------|------|
| Municipality                         | HRCA | TRCA | CVCA | NVCA | LSRCA | CLOCA | GRCA | KRCA |
| Municipality of Clarington           |      |      |      |      |       | P     | S    |      |
| <b>HALTON REGION</b>                 | P    |      | S    |      |       |       |      |      |
| City of Burlington                   | P    |      |      |      |       |       |      |      |
| Town of Halton Hills                 | S    |      | P    |      |       |       |      |      |
| Town of Milton                       | P    |      | S    |      |       |       |      |      |
| Town of Oakville                     | P    |      |      |      |       |       |      |      |
| CITY OF HAMILTON                     | P    |      |      |      |       |       |      |      |
| <b>NORTHUMBERLAND COUNTY</b>         |      |      |      |      |       |       | P    |      |
| Township of Hope                     |      |      |      |      |       |       | P    |      |
| Town of Port Hope                    |      |      |      |      |       |       | P    |      |
| Town of Cobourg                      |      |      |      |      |       |       | P    |      |
| Township of Hamilton                 |      |      |      |      |       |       | P    |      |
| Township of Haldimand                |      |      |      |      |       |       | P    |      |
| <b>PEEL REGION</b>                   |      | S    | P    |      |       |       |      |      |
| City of Mississauga                  | S    | S    | P    |      |       |       |      |      |
| City of Brampton                     |      | S    | P    |      |       |       |      |      |
| Town of Caledon                      |      | S    | P    |      | S     |       |      |      |
| Township of Millbrook North Monaghan |      |      |      |      |       |       | P    |      |
| <b>SIMCOE COUNTY</b>                 |      |      |      | S    | P     |       |      |      |
| Township of Adjala-Tosorontio        |      | S    |      | P    |       |       |      |      |
| Town of Innisfil                     |      |      |      | S    | P     |       |      |      |
| Town of New Tecumseth                |      |      |      | P    | S     |       |      |      |
| Town of Bradford West Gwillimbury    |      |      |      | S    | P     |       |      |      |
| City of Barrie                       |      |      |      | S    | P     |       |      |      |
| Township of Oro-Medonte              |      |      |      | P    | S     |       |      |      |
| Township of Ramara                   |      |      |      |      | P     |       |      |      |
| Township of Springwater              |      |      |      | P    |       |       |      |      |
| Township of Clearview                |      |      |      | P    |       |       |      |      |
| Town of Wasaga Beach                 |      |      |      | P    |       |       |      |      |
| Town of Collingwood                  |      |      |      | P    |       |       |      |      |
| Township of Essa                     |      |      |      | P    |       |       |      |      |
| <b>CITY OF TORONTO</b>               |      | P    |      |      |       |       |      |      |

*FLOOD CONTINGENCY PLAN*

|                                |             |             |             |             |              |              |             |             |
|--------------------------------|-------------|-------------|-------------|-------------|--------------|--------------|-------------|-------------|
| <b>CITY OF KAWARTHA LAKES</b>  |             |             |             |             |              |              |             | P           |
| <b>WELLINGTON COUNTY</b>       | S           |             | P           |             |              |              |             |             |
|                                | P           |             |             |             |              |              |             |             |
| <b>Municipality</b>            | <b>HRCA</b> | <b>TRCA</b> | <b>CVCA</b> | <b>NVCA</b> | <b>LSRCA</b> | <b>CLOCA</b> | <b>GRCA</b> | <b>KLCA</b> |
| Town of Erin                   |             |             | P           |             |              |              |             |             |
| <b>YORK REGION</b>             |             | S           |             |             | P            |              |             |             |
| Town of Markham                |             | P           |             |             |              |              |             |             |
| City of Vaughan                |             | P           |             |             |              |              |             |             |
| Town of Richmond Hill          |             | P           |             |             | S            |              |             |             |
| Town of Whitchurch/Stouffville |             | P           |             |             | S            |              |             |             |
| Town of Georgina               |             |             |             |             | P            |              |             |             |
| Township of King               |             | S           |             |             | P            |              |             |             |
| Town of Aurora                 |             |             |             |             | P            |              |             |             |
| Town of Newmarket              |             |             |             |             | P            |              |             |             |
| Town of East Gwillimbury       |             |             |             |             | P            |              |             |             |



Appendix E: Flood Vulnerable Areas (see section 4.2)

