

Full Spectrum Flood Risk Management

TRCA activities to manage riverine and lake-based flood risk

Presented by: Rehana Rajabali
Senior Manager, Flood Risk Management

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Presentation Outline

Riverine Flood Risk Management

- The nature of flood risk in our region
- Flood risk management approaches and activities
- New tools and industry thought leadership

Toronto Islands Flood Risk and Mitigation

- Overview of Island flooding – 2017 and 2019
- Highlights from Flood Mitigation Report

Riverine flood risk in TRCA jurisdiction

>14,000 Hectares of floodplain

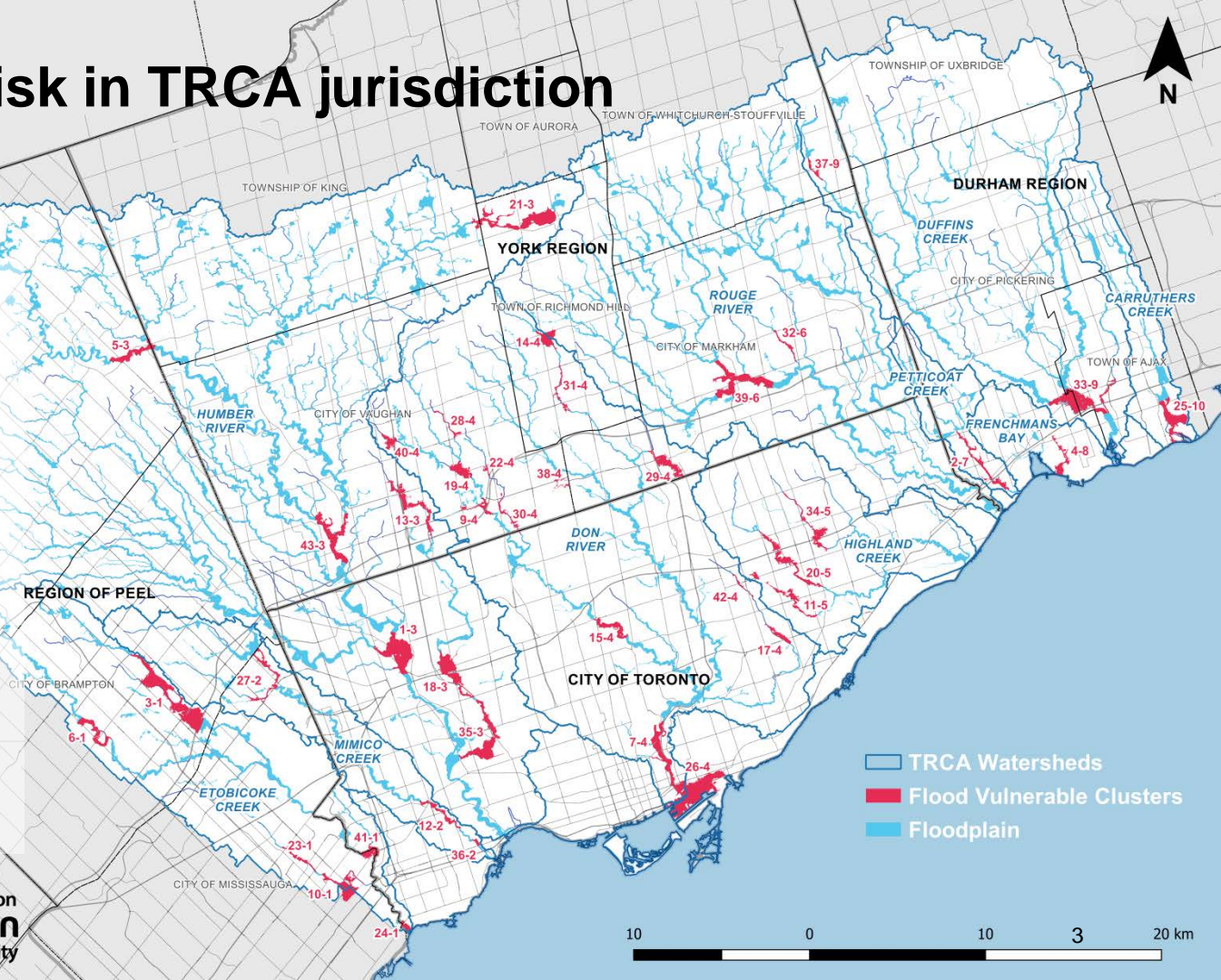
41 Flood-Vulnerable Clusters

>43,000 Residents affected in the Regulatory storm event

>41,000 Employees affected in the Regulatory storm event

>9,900 Buildings affected in the Regulatory storm event

195km of Impassible road segments in the Regulatory storm



Flooding can happen any time of year

Summer

- **Thunderstorms with significant rainfall** – within a short period of time, intense localized downpours from thunderstorms can produce flash flooding.

Fall

- **Seasonal weather systems** – large wet weather such as tropical storms, can last several days. Prolonged and heavy precipitation on top of already saturated soils causes rivers to rise.

Spring

- **Spring freshet** – accumulation of snow during the winter season can lead to flooding during the early spring, if conditions are right. When temperatures rise, snow melts and turns to runoff.

Winter

- **Ice jams** – when a rise in water level or a thaw in the ice breaks into large chunks, these chunks can become jammed at bridges or other obstructions. The rise will become backed up and can overflow its banks.



Riverine Flooding is the partial or complete inundation of the floodplain, caused by **bank overtopping** when the conveyance capacity of rivers and streams is exceeded. It falls under the mandate of Conservation Authorities.



Urban flooding is the inundation of a built environment, caused by rainfall **overwhelming the capacity of drainage systems**, such as storm sewers and roads. Also called pluvial flooding, it falls under the mandate of municipalities.



Who deals with floods?

- Federal and provincial governments: Funding, policy guidance, MNRF direct responsibilities, weather warnings
- Conservation Authorities: Land-use, permitting, flood forecasting and warning (as delegated from the province), etc.
- Municipalities: Primary responsibility for all types of emergency response, including flooding (under Emergency Management and Civil Protection Act); storm drainage infrastructure and urban (pluvial) flooding
- Individuals: Personal preparedness and property-level measures
- Insurance: Financial risk mitigation

PREVENTION & MITIGATION

Limiting exposure to risk:

- Implementing TRCA's regulations and policies

Reducing risk:

- Operating a flood forecasting and warning program
- Maintaining flood control infrastructure
- Creating a flood protection strategy for vulnerable areas
- Implementing remedial works projects

Understanding the risks:

- Climate, geology, watershed response and potential for climate change

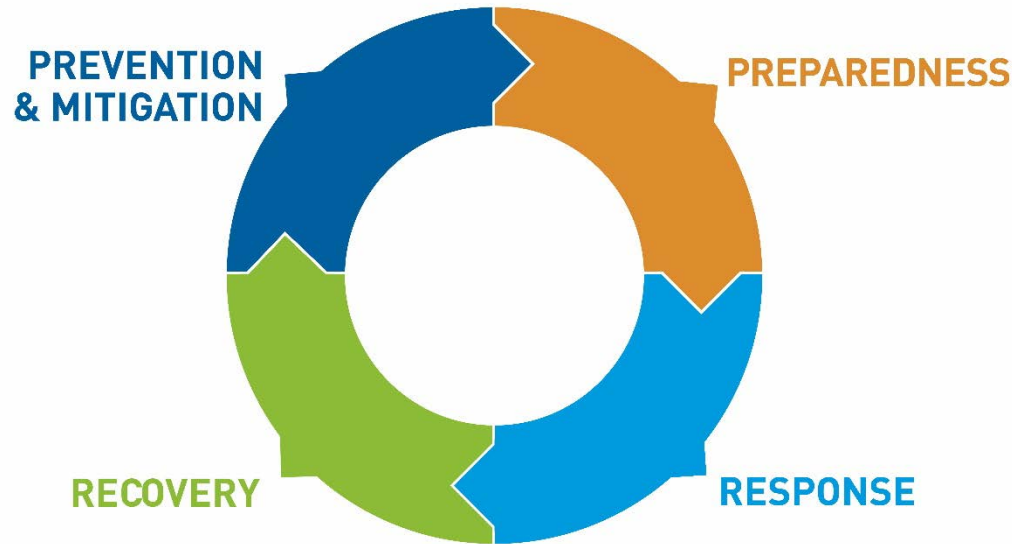
Documenting the risks:

- Floodplain mapping, identification of flood vulnerable areas

RECOVERY

- Flood event documentation and lessons learned
- Storm analysis

No silver bullets...



...but many bronze ones

PREPAREDNESS

- TRCA's Flood Contingency Plan
- Emergency Plans
- Emergency Operations Centre
- Training
- Public Education

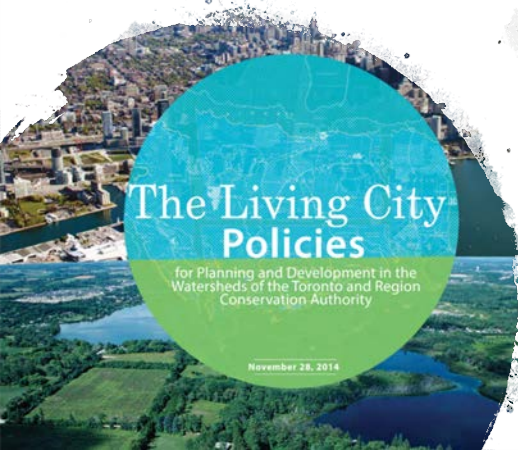
RESPONSE

- Provide Flood Forecasting and Warning (issuing flood messages)
- Operate flood control infrastructure
- Communicate information and advice
- Data management

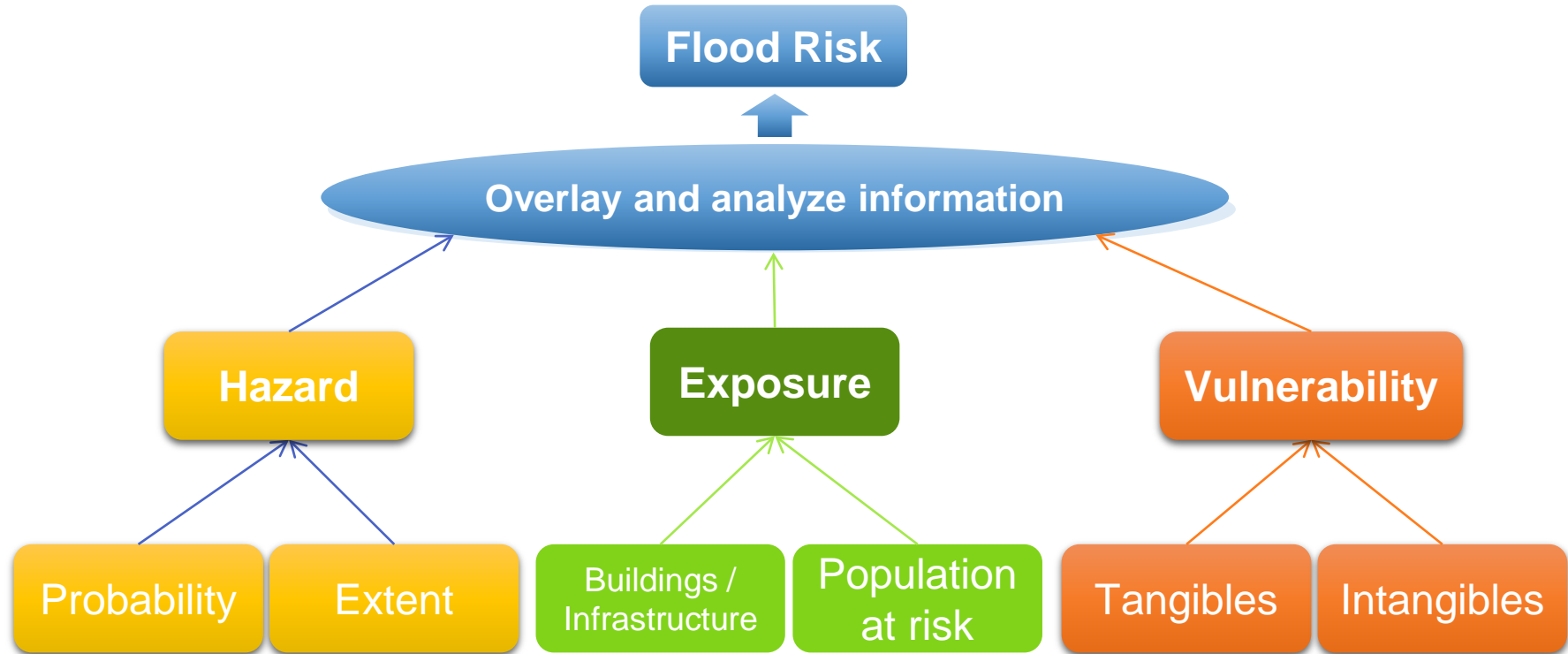
Prevention and Mitigation



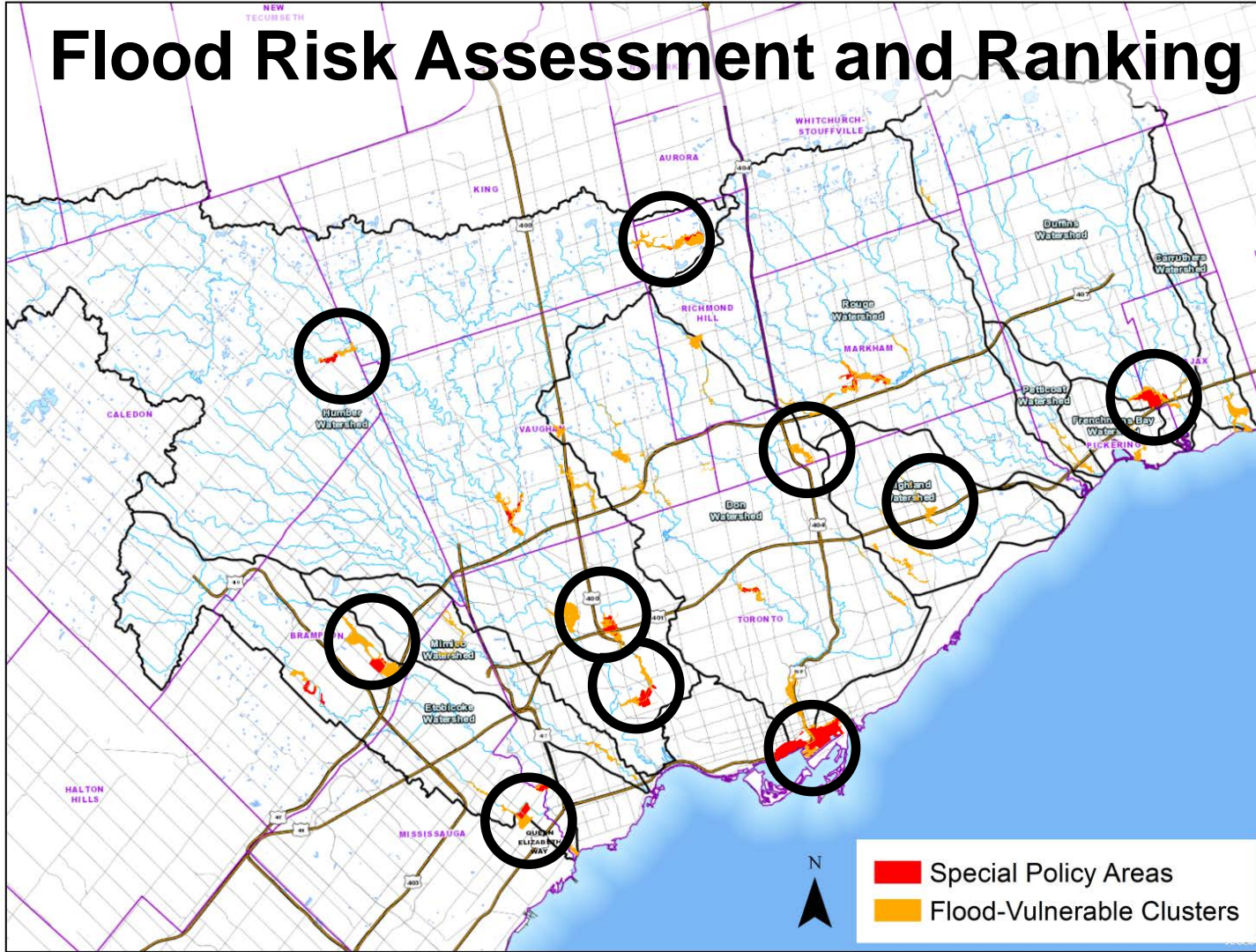
- Floodplain mapping and the engineering studies that support it
 - Hydrology
 - Hydraulics
- Flood Risk Assessment
- Land Use Management
 - Stormwater Management
 - Living City Policies
- Flood Control Infrastructure
 - e.g. G. Ross Lord Dam
- Capital works for flood protection
 - e.g. Port Lands Flood Protection



Flood Risk Assessment and Ranking Project



Flood Risk Assessment and Ranking Project

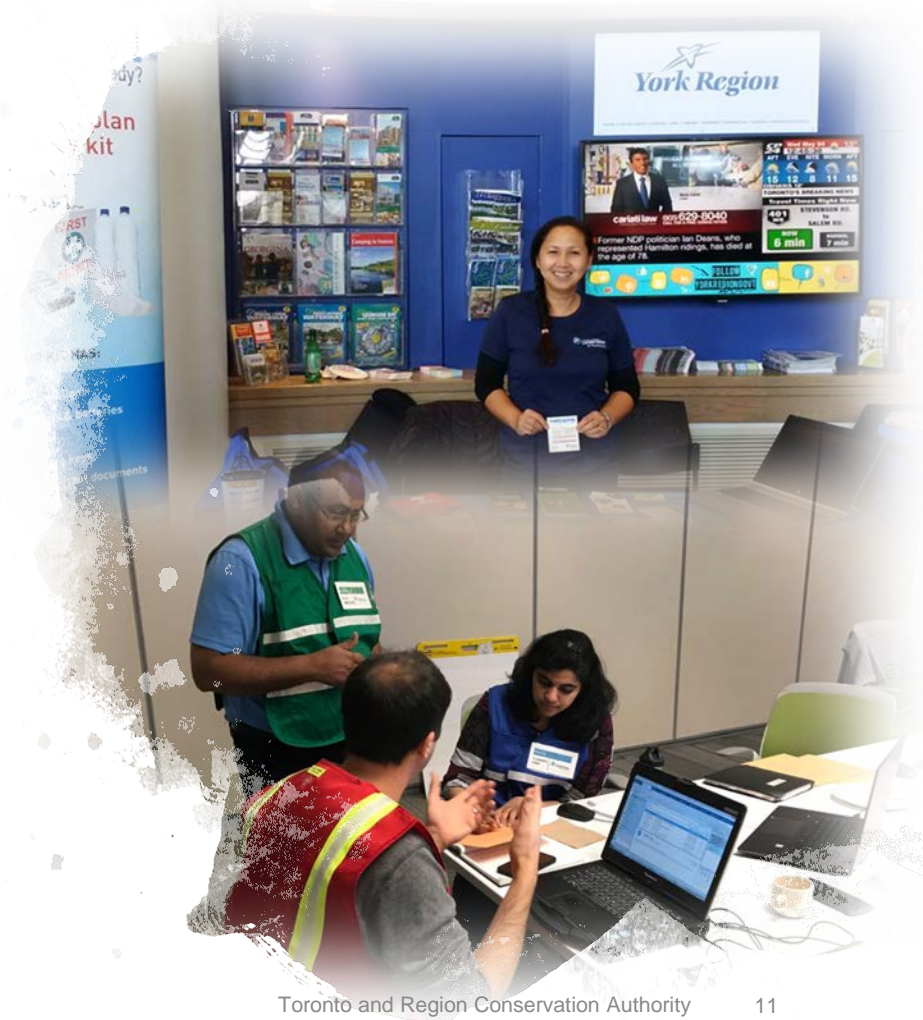


1. Rockcliffe
2. Jane-Wilson
3. Dixie-Dundas
4. Pickering Village
5. Bolton Core
6. Avondale/Spring Creek
7. Progress Business Park
8. Lower Don
9. Lake Wilcox
10. Markham Industrial (Don Mills Ditch)

Special Policy Areas
Flood-Vulnerable Clusters

Preparedness

- Emergency Management Planning
 - Flood Contingency Plan
 - Municipal emergency plans
 - IMS structure
- Training
 - Flood Duty Officer training
 - IMS training
 - Partnership with municipalities
- Public Education
 - Emergency Preparedness Week
 - Flood preparedness curriculum partnership with Education
 - Flood Risk Outreach Strategy
 - Floodplain information on the web



Flood Response

Conservation Authorities

- **Monitor** watershed and weather conditions and operate a **flood forecasting and warning system**
- **Issue** Flood Messages
- **Operate** Conservation Authority dams and flood control structures
- Provide **technical advice** to municipalities
- Maintain communications with municipalities and other agencies

Municipal Role

- **Notify** appropriate municipal officials, departments and agencies.
- Determine the appropriate response and **deploy municipal resources** to protect life and property.
- If required, **declare a flood emergency** and implement their emergency response plan.
- **Request provincial assistance** if needed



TRCA Flood Message Types



High flows, unsafe banks, melting ice or other factors that could be dangerous for recreational users such as anglers, canoeists, hikers, children, pets, etc. Flooding is not expected.



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.



Flooding is possible in specific watercourses or municipalities. Municipalities, emergency services and individual landowners in flood-prone areas should prepare.



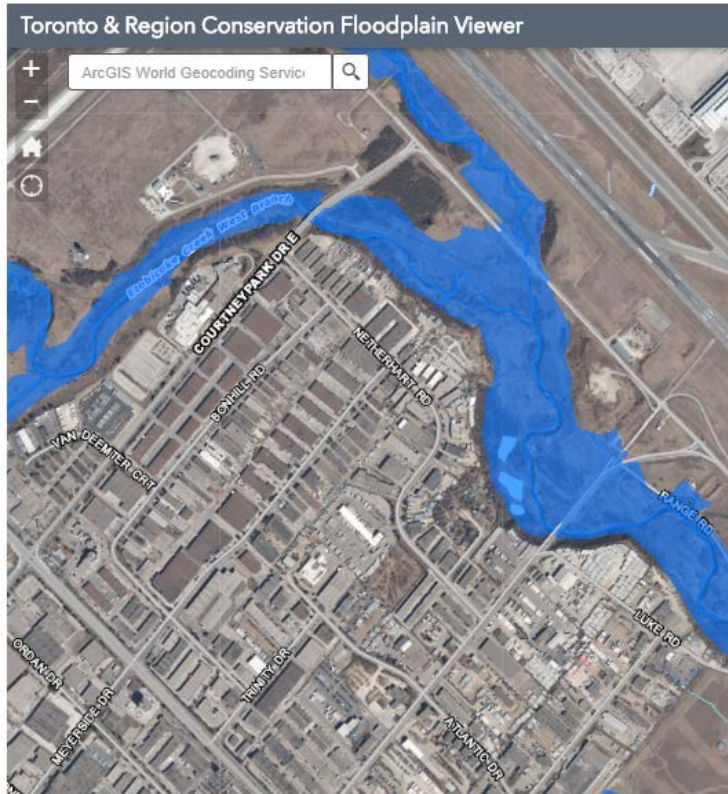
Flooding is imminent or already occurring in specific watercourses or municipalities.



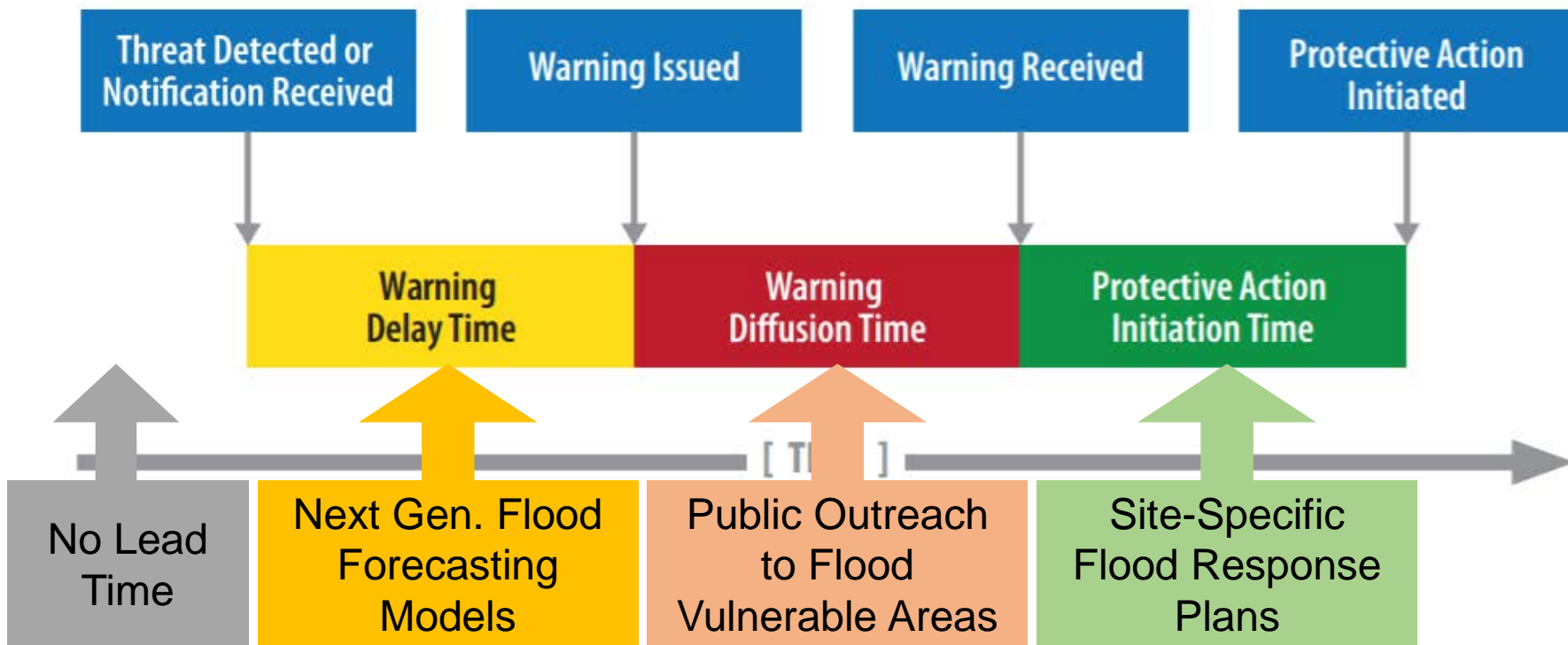
A notice that critical high water levels and waves are imminent and/or occurring, which could result in shoreline flooding and/or erosion

Flood Risk Outreach Program and Site-Specific Flood Response Plans

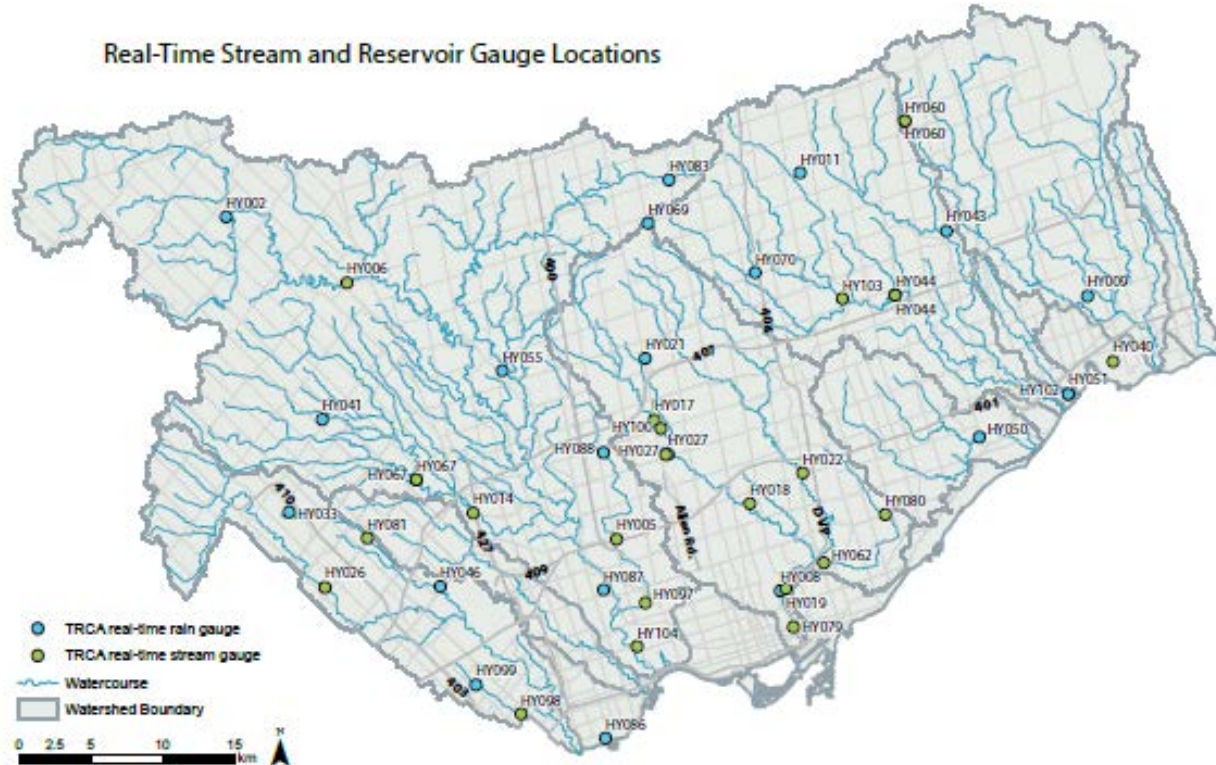
Flood Plain Map Viewer



Focus efforts on priming audiences



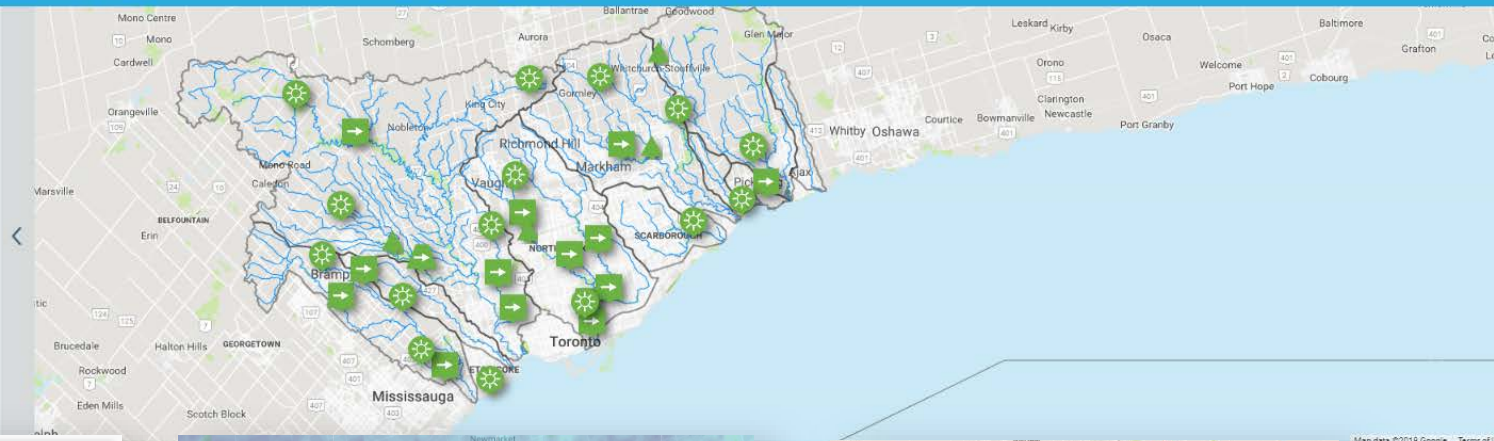
TRCA Flood Monitoring (Gauging) Network



RT @TorontoComms: Items damaged by flooding? Put them out on your regularly scheduled garbage collection day. Drywall, renovation waste and... [see more](#)

SHOW ME:

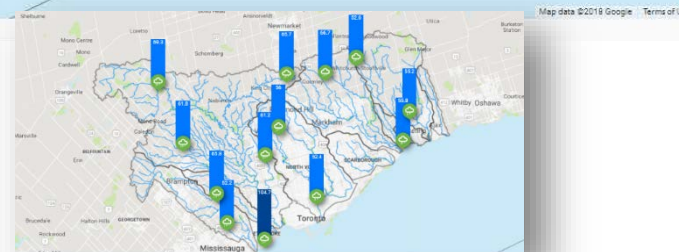
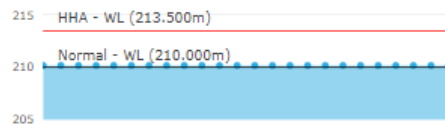
- ☒ Watershed Boundaries
- ☐ Flood Plain
- ☐ Flood Vulnerable Area
- ☒ Dam Gauges
- ☒ Stream Gauges
- ☒ Rain Gauges
- ☐ Weather Radar
- ☐ Precipitation Bars



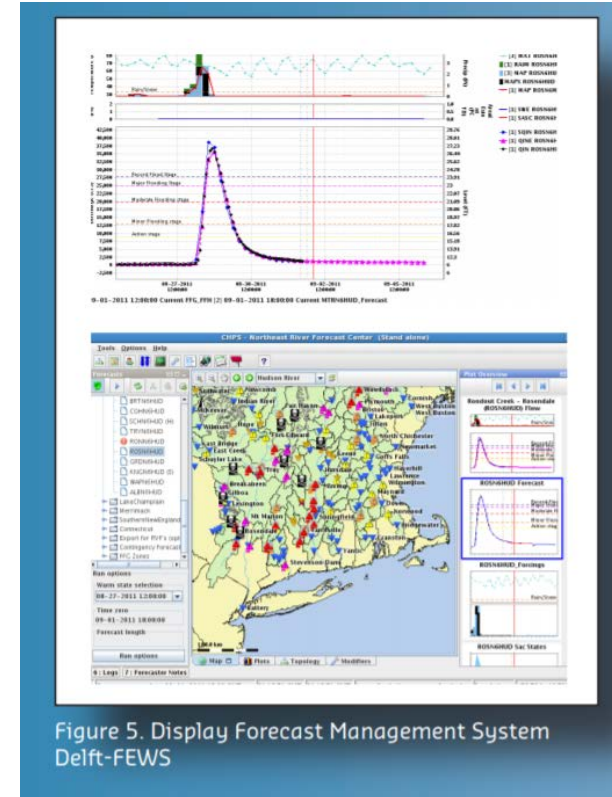
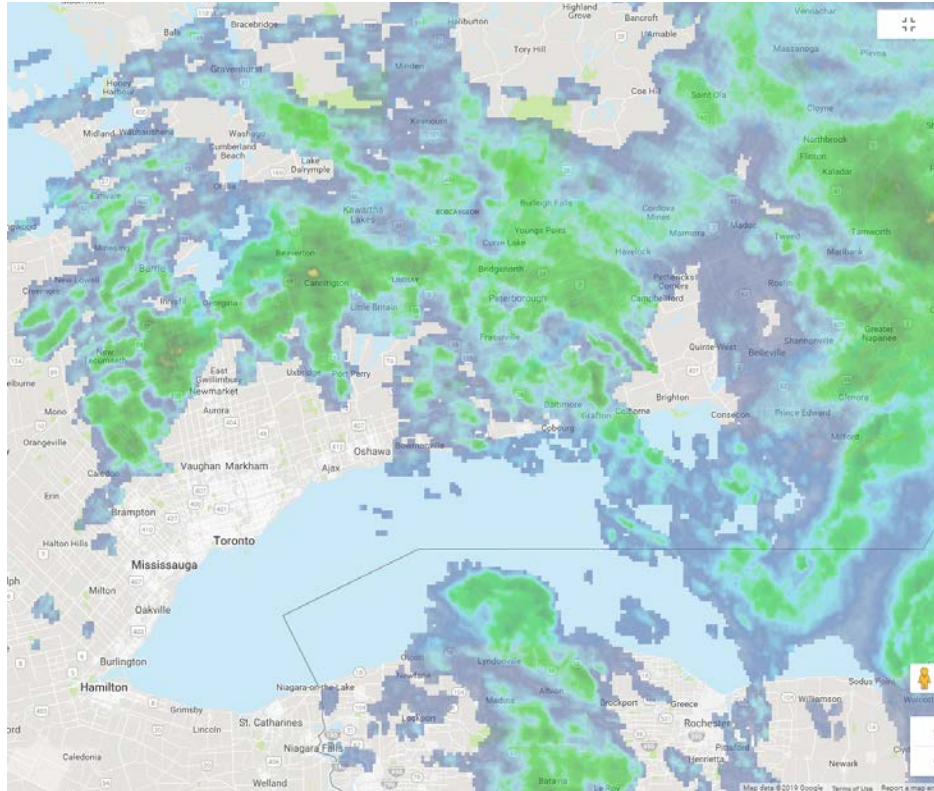
→ **ETOBICOKE CR AT BRAMPTON**
2018-10-23 ID# HY026

210.170m 210.170m 210.170m 210.171m
11:00 AM 10:45 AM 10:30 AM
11:15 AM

 Download Tabular Data (last 72 hours)



Flood Forecasting Decision Support System



Recovery

- Impact Tracking
- Post-event analysis
- Data collection
- Lessons learned





Toronto Islands Flooding and Mitigation

Photo credit: Sean Tamblyn

Toronto and Region Conservation Authority

Lake Ontario High Levels



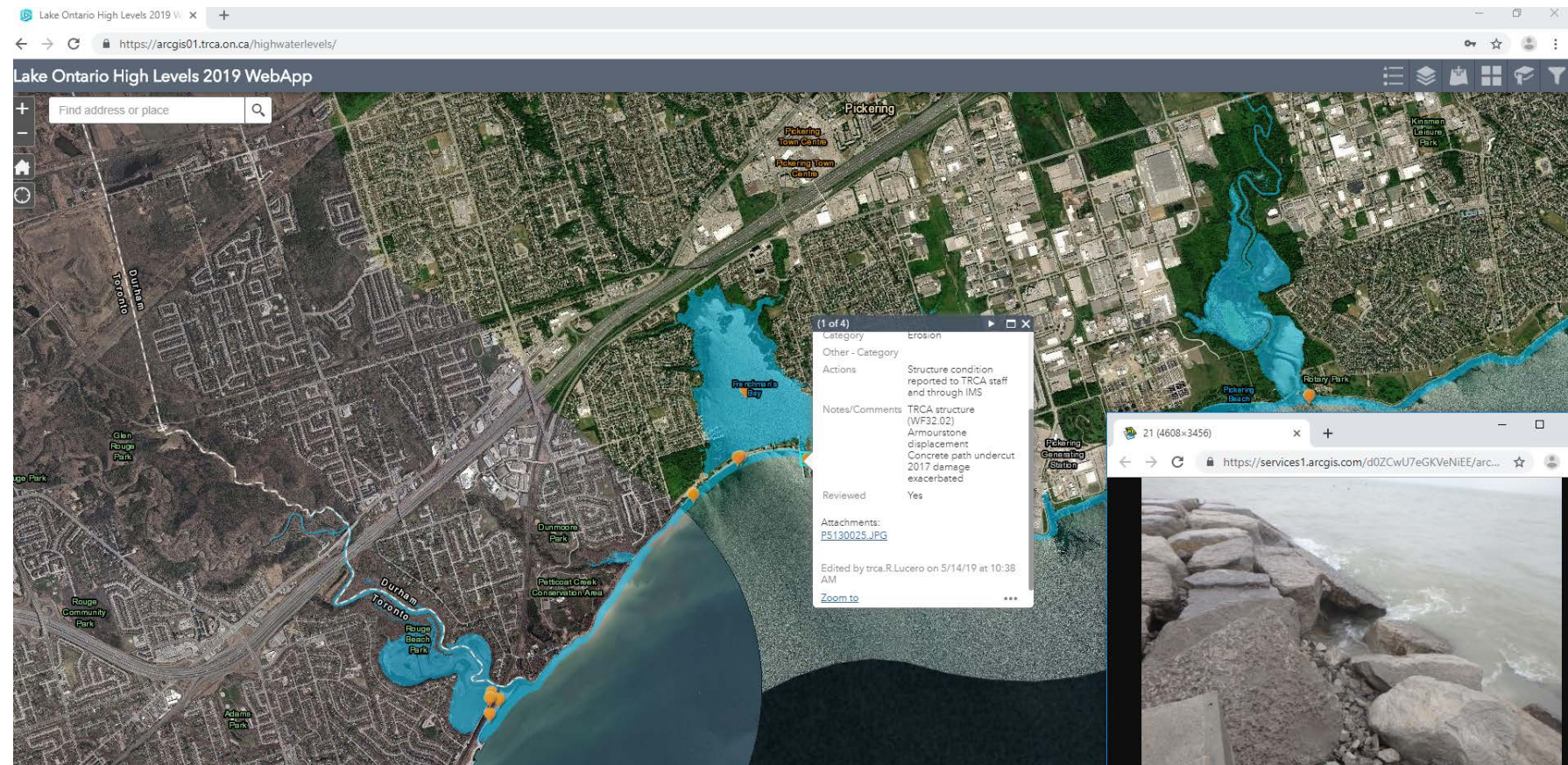
TRCA support for flood response

Lake Ontario High Levels 2019 WebApp

Find address or place

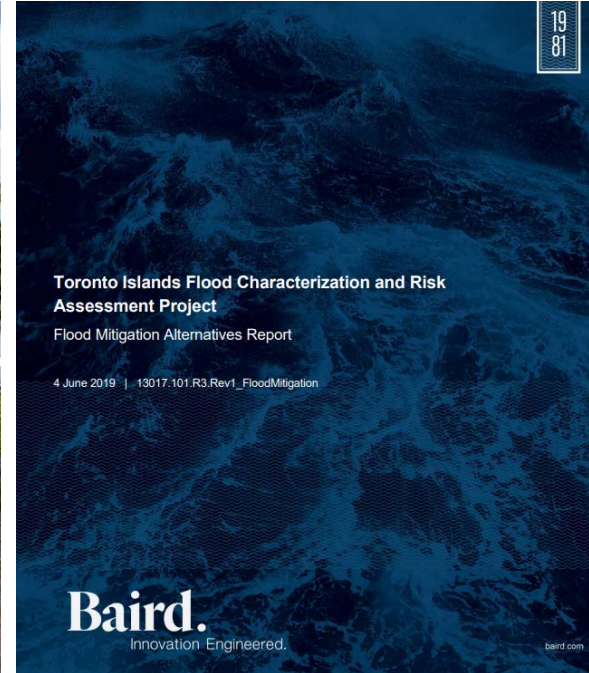
Category: Erosion
Other - Category: Structure condition reported to TRCA staff and through IMS
Actions: TRCA structure (WF32.02) Armourstone displacement Concrete path undercut 2017 damage exacerbated
Reviewed: Yes
Attachments: P5130025.JPG
Edited by trca.R.Lucero on 5/14/19 at 10:38 AM
[Zoom to](#)

21 (4608x3456)
<https://services1.arcgis.com/d0ZCwU7eGKVeNiEE/arc...>



The screenshot displays the 'Lake Ontario High Levels 2019 WebApp' interface. The main map shows a satellite view of the Pickering area, with flood zones highlighted in blue. A search bar at the top left allows users to find addresses or places. A pop-up window provides detailed information for a selected location, including its category ('Erosion'), a description of the issue ('Structure condition reported to TRCA staff and through IMS'), and a list of actions taken ('TRCA structure (WF32.02) Armourstone displacement', 'Concrete path undercut', '2017 damage exacerbated'). The window also shows that the location has been reviewed and includes an attachment named 'P5130025.JPG'. An inset image in the bottom right corner shows a close-up of a rocky shoreline with waves crashing against the rocks, illustrating the impact of high water levels.

Leveraging lessons learned from 2017



Long-term mitigation measures



WARD'S ISLAND - OPTION 4

TORONTO ISLANDS FLOOD AND RISK ASSESSMENT

0 12.5 25 50
GRAPHIC SCALE METRES



Scale: 1:10,000
13017,101

Date: 2019-04-30

Multi-functional flood protection



Next Steps

- Update Flood Characterization to account for this year's water levels
- Sort recommendations into short-term, medium-term, and long-term, and confirm whatever additional studies may be required (ie: confirmatory soils studies, Environmental Assessments, etc.)
- Work with City of Toronto to pursue DMAF and other funding sources and to move towards implementation of preferred solutions



Thank you

Rehana Rajabali, P.Eng., MUDS

Senior Manager, Flood Risk Management
Development and Engineering Services

Rehana.Rajabali@trca.ca

www.trca.ca



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