



## The Corporation of the Town of Tecumseh

Public Works & Engineering Services

**To:** Mayor and Members of Council

**From:** Phil Bartnik, Director Public Works & Engineering Services

**Date to Council:** February 14, 2023

**Report Number:** PWES-2023-08

**Subject:** Shoreline Management Plan  
Town of Tecumseh Coastal Flood Risk Assessment Report

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### Recommendations

It is recommended:

**That** PWES-2023-08 Shoreline Management Plan – Town of Tecumseh Coastal Flood Risk Assessment Report, **be received.**

### Executive Summary

The Shoreline Management Plan has assessed the existing and future coastal flood risks and provides conceptual approaches to shoreline management and flood control along the Lake St. Clair shoreline. The study also investigated the potential influence of climate change on future coastal hazards due to changes in lake levels, storms, rainfall and ice cover.

Updated floodplain mapping was generated, along with conceptual adaptation options to address the coastal hazards. The ultimate goal of the study is to increase the resiliency of the Town of Tecumseh to coastal hazards through the development of potential short-term and long-term solutions.

## Background

At the June 26, 2018 Regular Meeting of Council, Council approved the recommendation to receive [Report PWES-2018-17](#) Flood Mitigation Strategy (Motion: RCM-194/18). The Flood Mitigation Strategy is a multi-step plan to reduce the impact of rising lake levels and more frequent and severe rainfall events to lessen the extent of damage to private and public property and critical infrastructure. Completion of a Shoreline Management Plan was one of the recommended flood mitigation strategies within said report, which would be incorporated within the five-year PWES Capital Works Plan.

### Flood Response Plan and Emergency Works in 2019 & 2020

In 2019 and 2020, lake levels in the Great Lakes basin had risen to break all-time record highs set more than 30 years ago in the mid-1980s. This, coupled with increasingly intense storms and rainfall, is seen as evidence that climate change is fueling the rapid swing of extreme lake levels and weather events.

In response to high lake levels, Town staff surveyed the elevations along Tecumseh's 4.6 kilometer shoreline along Lake St. Clair and the upper reaches of Pike Creek to identify low lying areas that could act as (potential) conduits for high lake levels to spill inland posing a significant risk to inland flooding.

In July 2019, the Town developed an emergency preparedness plan to coordinate emergency response in the event of inland flooding due to high lake levels on Lake St. Clair. The Town of Tecumseh Flood Response Plan is part of the Town of Tecumseh Emergency Response Plan. The Flood Response Plan was adopted by Council in July 2019 under Report [FS-2019-05](#) (Motion: RCM-204/19) in preparation of potential flood events.

A Declaration of Emergency was signed by Mayor McNamara on March 22, 2020 declaring an emergency respecting "Management of and to take actions necessary for municipal flood issues in accordance with the Tecumseh Emergency Plan" under section 4 of the Emergency Management and Civil Protection Act, R.S.O. 1990, c.E.9.

As part of the response, the Town identified properties along its shoreline with Lake St. Clair that were in need of shoreline flood mitigation measures to reduce the risk of flooding to not only the subject properties but to the larger surrounding area given the dangerously high lake levels at that time.

In April 2020, Tecumseh Council approved the revised the Emergency Response Plan including the amended Flood Response Plan contained in [Report FS-2020-05](#) that would permit emergency works on private properties to implement flood mitigation measures (i.e. permanent berms) in low-lying areas that pose a significant risk for inland flooding (Motion: SCM-10/20).

In spring 2020, the Town installed emergency clay berms along with site grading and restoration at 16 low-lying waterfront properties along Lake St. Clair in Tecumseh to serve as a permanent flood mitigation measure at the 1:100 year flood elevation of Lake St. Clair.

While the Town's past and proposed infrastructure modifications and improvements to mitigate the risk of flooding are significant, they alone will not guarantee that flooding will never occur again. In addition to the multi-step plan outlined in the Town's Flood Mitigation Strategy, previously referenced above, in 2021, the Town purchased a high water rescue vehicle capable of driving through the deepest anticipated flooding depth in the Town to provide immediate evacuation and emergency assistance to residents within the flooded areas.

## **Shoreline Management Plan**

In 2019, Council approved the recommendations within [Report PWES-2019-49](#) that authorized Administration to undertake a Shoreline Management Plan in 2020 (Motion: RCM-401/19). Accordingly, Zuzek Inc. was retained to complete the Shoreline Management Plan. As they were also currently completing a shoreline management plan for the Municipality of Lakeshore, there would be continuity between the two plans. The Plan will assess the existing and future coastal flood risks and provide conceptual approaches to shoreline management and flood control along the Lake St. Clair shoreline to reduce the extent of flooding due to high lake levels.

Zuzek Inc., along with their sub-consultants SJL Engineering Inc., Dillon Consulting and Foresight Management Consulting assessed the Town's existing and future vulnerability to lake flooding. The study area, depicted in the map provided in Attachment 1, includes the Lake St. Clair shoreline of Tecumseh and the portion of the Pike Creek located north of the VIA Rail.

The Shoreline Management Study also investigated the potential influence of climate change on future coastal hazards due to changes in lake levels, storms, rainfall and ice cover, including the associated challenges for the coastal community of Tecumseh. Updated floodplain mapping was generated, along with conceptual adaptation options to address the coastal hazards. The ultimate goal of the study is to increase the resiliency of the Town of Tecumseh to coastal hazards through the development of potential short-term and long-term solutions.

## **Public Consultation**

There was extensive public consultation throughout this project. Three Public Information Centers (PIC) were held virtually to ensure residents, stakeholders and Indigenous Communities had an opportunity to provide information, ask questions and participate in the process.

1. The first PIC, held October 29, 2020, provided an overview of the project and work plan, summarized the preliminary findings from the field work and presented examples of flood hazard mitigation, climate change adaptation and emergency response. There were 64 attendees, and the Town received a total of 14 comments.
2. PIC No. 2 took place on April 20, 2021 and provided the latest research on climate change, presented preliminary results of the flood risk analysis for lake and interior flooding and identified potential economic damages and potential adaptation options to reduce future flood risk. There were 45 attendees, and the Town received a total of 12 comments.
3. The final PIC was held August 18, 2021 and included a presentation of results from the flood risk analysis for lake and interior flooding, a summary of potential economic damages with different flooding scenarios and a presentation of conceptual adaptation alternatives to increase community resilience to coastal flooding. There were 29 attendees, and the Town received a total of 12 comments.

Each PIC provided a detailed presentation followed by participant interaction. The live presentations from each PIC were [recorded and posted](#) on the Town's website. A survey/comment sheet was also posted on the Town's website following each PIC which could be filled out and submitted to the Town.

## **February 14, 2023 Special Council Meeting Presentation**

Zuzek Inc. will be in attendance at the February 14, 2023 Special Meeting of Council to make a presentation that summarizes the results of the Shoreline Management Plan. The presentation includes details of the flood vulnerability assessment, presents modelling results for both existing and future scenarios with various conceptual mitigation strategies, outlines potential flood mitigation measures, and explains the potential economic costs of the various modelled flood scenarios. A copy of the presentation is provided in Attachment 2.

## **Comments**

### **Key Objectives of the Shoreline Management Plan**

The key objectives of Tecumseh's Shoreline Management Plan include the following components:

- Re-assessment of the 1:100-year Lake St. Clair flood elevations.

- Preparation of a detailed shoreline property inventory including topographic information for each shoreline property within the Town of Tecumseh.
- Determination of vulnerable flood locations along the shoreline.
- Determination of extent of inland flooding based on lake water conveyance through vulnerable areas.
- Assessment of potential impacts of climate change.
- Assessment of lake flooding plus rain generated runoff [integration with the 2D Storm Drainage Master Plan (2019) model].
- Damage value estimates for public and private properties.
- High level conceptual mitigation measures that could be considered in the next phases of the study.

Extensive field investigations and technical work was completed for this study. Study findings related to the condition of the existing shoreline, current and potential future shoreline hazards, and the associated shoreline hazard mapping, provide an overview of Tecumseh's current flood vulnerability.

## Flood Mitigation Alternatives

Shoreline management recommendations and guidance in the design and implementation of shoreline protection structures are presented in Section 5 of the Coastal Flood Risk Assessment Report and are grouped into the following strategies: **Protect, Accommodate, Retreat and Re-align, and Avoid (PARA)**. The PARA framework was used to evaluate a wide range of flood mitigation strategies for Tecumseh.

1. **Protect:** The most common approach to address coastal hazards in Ontario for existing development and at-risk infrastructure. There are many types of shoreline protection structures that can reduce flood risk including flood berms, vertical seawalls, sloping rock structures, nature-based solutions (i.e. beaches) and hybrid grey-green designs.
2. **Accommodate:** Leverages a wide range of approaches to reduce coastal risk and permit continued occupation of communities on hazardous lands. Examples include floodproofing existing buildings, raising building foundations, upgrading components of an urban stormwater management system, upgrading emergency management fleet and completing preparedness planning.

3. **Retreat and Re-align:** Buildings can be moved further inland on existing lots or relocated to new lots further inland. Once the at-risk infrastructure has been removed, the land use can be transformed to more resilient options such as coastal wetlands. The necessary planning for this strategy is extensive and requires ongoing consultation with communities. Retreat is largely non-viable in Tecumseh given the dense land use and inability to move buildings further away from the lake on most lots.
4. **Avoid:** To locate new development away from flood prone lands. This planning strategy is best applied when locating development on greenfield sites but is also applicable for infill development. This is the most cost-effective hazard mitigation strategy but is not very applicable to Tecumseh, given the high density of existing coastal development and constrained lots along Riverside Drive.

There are many types of **Accommodate** and **Protect** strategies that are feasible for Tecumseh ranging from flood-proofing basement windows and doors to raising the crest elevations of existing seawalls to constructing a levee or berm. The implementation of improvements, whether part of a community-scale program or individual targeted upgrades to the most vulnerable properties, are key to protecting private and public property and infrastructure and reducing the risk to the health and safety of Tecumseh residents.

Conclusions from the study are presented in Section 7 of the Coastal Flood Risk Assessment Report, including risk assessment, flood mitigation alternatives, and next steps.

A copy of the Town of Tecumseh Coastal Flood Risk Assessment Report is provided as Attachment 3 to this report.

## Risk Assessment

Key findings include:

- The Town of Tecumseh is vulnerable to rainfall and coastal flooding.
- Coastal flooding requires the joint occurrence of high static lake levels and a severe storm surge event with large waves. As such, coastal flooding is less frequent than rainfall flooding. However, the spatial extent and magnitude of damages would be much greater for a coastal flood than a rainfall flood event.
- During the 1:100-year coastal flood, low-lying shoreline properties combined with low-crested shoreline protection structures result in extensive wave uprush and wave overtopping along the shoreline. These waters propagate inland between homes, along the road network and flood the interior. The potential economic damages to buildings and contents for the 1:100-year coastal flood is estimated

at \$24 to \$37 million. The flood waters would reach the exterior basement foundation walls of over 800 buildings. The potential economic damages to basements cannot be calculated at this time due to missing information on lowest opening. The 1:100 Year Flood Map is provided in Attachment 4.

- When higher lake levels due to climate change were considered, the potential economic damages to buildings and contents increased dramatically to \$124 to \$188 million. Over 2,200 basements could be impacted by coastal flooding, but basement damages and storm sewer surcharging could not be estimated for this study. In reality, the potential economic damages would be considerably higher than those presented herein if the 1:100-year coastal flood or the 1:100-year climate change coastal flood materialized in Tecumseh, especially given the recent increases in residential home values. The 1:100 Year Climate Change Flood Map is provided in Attachment 5.
- Technical studies are ongoing to continue upgrading the storm sewer infrastructure in Tecumseh, including pumping stations. These efforts should continue and consider the impacts of a changing climate.
- There is a very high risk of sanitary sewer surcharging during a coastal flood, which could lead to extensive basement flooding. Numerous programs are ongoing to reduce this threat. These efforts should continue.
- Due to the depth of flooding on Tecumseh roads, emergency ingress and egress will be challenged during a severe coastal flood. Further emergency planning with depth of flooding maps should be completed.

## **Flood Mitigation**

As stated previously, protect, accommodate, retreat or avoid (PARA) are community options for flood disaster risk reduction and flood resilience. Given the existing developed area in Tecumseh is close to the shoreline, various types of Accommodate and Protect strategies that are feasible were reviewed, including:

- Floodproofing basement windows and doors;
- Coordination of a community program could be developed to notify landowners based on the flood modelling results presented herein; or an information campaign could also be developed to share alternatives with interested parties.
- A wide range of shore protection upgrades could be implemented across the Tecumseh shoreline including, raising the crest elevation of existing seawalls and sloping rock revetments, building secondary walls or flood berms for existing beach shorelines (to preserve shoreline access), etc. While different options could be adopted by individual landowners based on their lot-specific conditions

and personal preference, a standard level of flood protection would be established as part of the community scale program.

## **Next Steps**

The Town of Tecumseh is actively working to reduce its vulnerability to rainfall and coastal flooding. The findings from this study are particularly relevant to the coastal flood risk related to wave uprush and overtopping across the waterfront lots. Due to the conveyance of floodwaters over shoreline properties and throughout the low-lying road network, significant inland areas are also affected by the 1:100-year coastal flood. Recommendations for next steps include:

1. Continue with design work and construction plans to upgrade storm sewer infrastructure and capacity (e.g. pumping stations) to address rainfall flooding.
2. Continue with a multi-faceted approach to reducing the potential for basement flooding from sanitary sewer surcharging during rainfall flooding.
3. Develop new guidance for landowners to reduce the threat of basement flooding during a coastal flood event, such as floodproofing vulnerable windows and doors.
4. Further engagement on the feasibility of a community standard for flood protection should be investigated with the landowners and stakeholders of Tecumseh. If there is support for a community-scale upgrade program, further steps should be pursued with landowners and stakeholders, including planning, concept development, evaluation of funding models, final design, and construction.
5. Share technical data and outcomes generated through this Coastal Flood Risk Assessment Report with the Essex Region Conservation Authority and collaborate on further studies to update the existing 1976 Coastal Regulatory Flood Hazard Limit Mapping for Tecumseh.

Future reports to Council on the foregoing steps will advise of progress, propose upgrades that should form part of the PWES 5-year capital plan, share opportunities for public engagement and seek Council consideration of any proposed community standards or upgrade programs.

## **Consultations**

Financial Services  
Development Services  
Dillon Consulting Ltd.



Foresight Management Consulting  
SJL Engineering  
Zuzek Inc.

## Financial Implications

There are no financial implications associated with this administrative report.

As part of the additional consultation and implementation initiatives identified under Next Steps, further details on the selected level of service, those associated costs, and whether the works will be private, public or a private/public partnership still need to be analyzed and presented to Council at a future date.

## Link to Strategic Priorities

Applicable	2019-22 Strategic Priorities
<input type="checkbox"/>	Make the Town of Tecumseh an even better place to live, work and invest through a shared vision for our residents and newcomers.
<input checked="" type="checkbox"/>	Ensure that Tecumseh's current and future growth is built upon the principles of sustainability and strategic decision-making.
<input type="checkbox"/>	Integrate the principles of health and wellness into all of Tecumseh's plans and priorities.
<input checked="" type="checkbox"/>	Steward the Town's "continuous improvement" approach to municipal service delivery to residents and businesses.
<input checked="" type="checkbox"/>	Demonstrate the Town's leadership role in the community by promoting good governance and community engagement, by bringing together organizations serving the Town and the region to pursue common goals.

## Communications

Not applicable

Website

Social Media

News Release

Local Newspaper

This report has been reviewed by Senior Administration as indicated below and recommended for submission by the Chief Administrative Officer.

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<b>Attachment Number</b>	<b>Attachment Name</b>
1	Map: Study Area
2	Presentation
3	Town of Tecumseh Coastal Flood Risk Assessment Report
4	1:100 Year Flood Map
5	1:100 Year Climate Change Flood Map