Community Open House No.2
Whitby Coastal Flood Risk Assessment and Municipal Class Environmental Assessment – Town of Whitby

Date: October 30th, 2019  Location: 301 Watson Street West, Whitby, Ontario
Time: 6.00 PM to 8.00 PM

Please sign on the sheet provided. Then feel free to walk around and view the displays.

The purpose of this Community Open House is to present the results of Coastal Analysis, Wave Uprush and Flood Frequency Analysis, Shoreline Recession and Erosion Hazard Analysis, Dynamic Beach Analysis and Class EA study and to obtain your suggestions and comments.

If you have any questions, our representatives will be pleased to discuss the project with you.
Study Area and Past Relevant Studies

The study area is along the Lake Ontario shoreline from Lakeridge Road to Boundary Road within the Town’s limit. Several shoreline monitoring studies, and slope stability analysis have been performed along this shoreline in the past.

Study Area

Recommendations from Lake Ontario Shoreline Management Plan (1989):

• Every reach should be considered separately and measures should be taken based on the characteristics of each reach;
• Natural bluffs which are sources of sediments for the nearby reaches should be left uninterrupted;
• Low lying flood prone reaches can be used as parklands;
• Over designing and under designing should be carefully avoided.

Lake Ontario Shoreline Management Plan prepared in 1989
Study Area and Past Relevant Studies

The study area is along the Lake Ontario shoreline from Lakeridge Road to Boundary Road within the Town’s limit. Several shoreline monitoring studies, and slope stability analysis have been performed along this shoreline in the past.

Shoreline monitoring fieldwork completed in 2017

Slope stability and setback study in 2017
Reach Delineation and Environmentally significant areas

1. Environmentally Significant

2. Environmentally Significant

3. Environmentally Significant

Town of Whitby

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Central Lake Ontario Conservation

TOWN OF WHITBY
REACH DELINEATION
SCALE=1:8500

AHYDTECH Geomorphic Ltd.
Existing Erosion Concern

Erosion Marked in Three Categories

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Existing Erosion Concern.

Erosion Condition in Reach 1
Erosion Condition in Reach 2
Erosion Condition in Reach 3
Erosion Condition in Reach 4
Erosion Condition in Reach 6
Erosion Condition in Reach 7

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Wave uprush: The rush of water from a breaking wave onto a beach. Also called swash.

Wave Uprush Analysis is Performed for five different significant reaches which are chosen for flooding concern:

- **Reach 2:** Existing Property with failed concrete block wall
- **Reach 4:** Existing Property with Natural Shoreline
- **Reach 8:** Natural Shoreline near Whitby Yacht Club
- **Reach 9:** Whitby Harbor Sheet Pile Break wall
- **Reach 11:** Natural Shoreline near Rotary Sunrise Lake Park
- **Reach 14:** Major erosion concern with failed slope revetment
Wave Uprush analysis

Reach 08 - Natural shoreline

**Not to the scale**

**10-Year wave uprush**

<table>
<thead>
<tr>
<th>Method</th>
<th>Profile 1</th>
<th>Profile 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunt (1959)</td>
<td>0.39</td>
<td>0.42</td>
</tr>
<tr>
<td>Battjes (1974) and Lorang (2000)</td>
<td>0.20</td>
<td>0.22</td>
</tr>
<tr>
<td>Maximum Wave Uprush (m)</td>
<td>0.39</td>
<td>0.42</td>
</tr>
<tr>
<td>Maximum Wave Uprush Elevation (m)</td>
<td>76.39</td>
<td>76.42</td>
</tr>
</tbody>
</table>

**20 Year wave uprush**

<table>
<thead>
<tr>
<th>Method</th>
<th>Profile 1</th>
<th>Profile 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunt (1959)</td>
<td>0.43</td>
<td>0.47</td>
</tr>
<tr>
<td>Battjes (1974) and Lorang (2000)</td>
<td>0.22</td>
<td>0.24</td>
</tr>
<tr>
<td>Maximum Wave Uprush (m)</td>
<td>0.43</td>
<td>0.47</td>
</tr>
<tr>
<td>Maximum Wave Uprush Elevation (m)</td>
<td>76.43</td>
<td>76.47</td>
</tr>
</tbody>
</table>

Figure: Cross Shore Profile at Reach 08

**Figure: different water levels**

- 20 year wave uprush 76.47 m
- 100 year design water level 76 m
- Annual mean lake level 74.5 m

**Figure: Cross Shore Profile at Reach 08**

- Cross-shore PRF1
- Cross-shore PRF2
- 100 Year Design Water Level
- Annual Mean Lake Level
- 20 year wave uprush

Town of Whitby

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Wave Uprush analysis

Reach 14 - slope revetment

<table>
<thead>
<tr>
<th>Method</th>
<th>Profile 1 wave uprush (m)</th>
<th>Profile 2 Wave Uprush (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahrens and Heimbaugh (1988a) and Goda (1985)</td>
<td>2.01 2.30 2.16</td>
<td>2.58 2.56 2.57</td>
</tr>
<tr>
<td>Average Wave Uprush (m)</td>
<td>2.01 2.30 2.16</td>
<td>2.58 2.56 2.57</td>
</tr>
</tbody>
</table>

Annual mean Lake level 74.5m
100-year Design Water level 76.0 m
Design Wave uprush 78.57 m

Figure: different water levels
**Not to the scale

Figure: Cross Shore Profile at Reach 14
Shoreline Recession Analysis

- Shoreline Recession analysis was performed to find the trend of shoreline changes, and the factors attributed to the changes.

- The Digital Shoreline Analysis System (DSAS) in ArcGIS environment was used.

- The rates of shoreline change were calculated using the End Point Rate (EPR), Net Shoreline Movement (NSM), and Weighted Linear Regression (WLR) statistic in DSAS.

- According to the past studies Shoreline Recession Rates for Lake Ontario ranges between 0.1 m/year and 0.3 m/year. A rate of 0.3 m/year is the provincial default for all of the Great Lakes. The obtained results fall in this range.
Shoreline Recession Analysis: Erosion Allowance for Waterfront Trail

100 Year Erosion allowance obtained from slope stability analysis and recession analysis

100-year Erosion allowance (MAX)

100-year Erosion allowance (MIN)

Stable slope Allowance

Shoreline

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Shoreline Recession Analysis: Erosion Allowance for Waterfront Trail Observatory

100 Year Erosion allowance for Waterfront Trail Observatory

- Observatory
- Stable slope Allowance
- 100 year Erosion allowance (MAX)

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Dynamic Beach analysis

Morphology of beaches changes in response to the prevailing wave and water level conditions and due to this responsive behavior, the beaches are identified as dynamic. Appearance of these beaches vary greatly year to year. According to The Lake Ontario Shoreline Management Plan (1990) by Sandwell Wooster Inc. Reach 8 and Reach 11 are dynamic beaches. We also used a cross-shore on the eastern segment of reach 4 for our analysis purposes. Other reaches were not considered for at least one of the following reasons:

1) Presence of Seawall or other artificial features along the shoreline.
2) Large boulders or broken seawall along the shoreline.
3) Short Dynamic Beaches backed by high bluff.

Figure : Dynamic Beach (Reach 11)
Figure : Non-Dynamic Beach (Reach 06)
Dynamic Beach analysis

Charts displaying initial beach profile and post-storm profile for different Water Levels for an effective grain size of 0.5mm.

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Corporation of the Town of Whitby
Dynamic Beach analysis

Charts displaying recession of 5 contours for each of the 3 reaches during the most significant storm event (25-27th January, 1978) for varying Water Levels and an effective grain size of 0.5mm. The results assume the worst case scenario and are highly conservative.
Flooding Hazard limit

Flooding limit

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Flooding Hazard limit

Flooding limit for Reaches

AHDTECH Geomorphic Ltd.
Flooding limit for Reaches.
Potential Alternatives

**Alternative 1:** Do Nothing: Maintain the existing infrastructure, bluff, natural features, shoreline structures and water course outlets. This alternative does not solve the problem.

**Alternative 2:** Modification and Improvement of the existing municipal infrastructure.

**Alternative 3:** Modification and Improvement to bluff.

**Alternative 4:** Repair and Replacement of existing shoreline structures, such as seawall, revetment, sheet pile, groin and marina structures.

**Alternative 5:** Installation of new shoreline structures, such as seawall, revetment, sheet pile, groin and marina structures.

**Alternative 6:** Modification and Improvement to natural features, such as natural shoreline, wetlands, aquatic habitat and water course/creek outlets.

**Alternative 7:** Combination of Alternative 2 to 6.

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**Primary Preferred Solution**

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Study process

AHYDTECH Geomorphic and its project team followed the Municipal Engineers Association (MEA) Class EA – October 2000 (as amended 2007 and 2011) process. The Class EA document has identified five phases:

**Phase 1 – Identify the Problem or Opportunity**
- **Stage 1**: The problem or opportunity identification and description
- **Stage 2**: A Notice of Commencement for the entire study area and Public Consultation

**Phase 2 – Alternative Solutions**
- **Stage 1**: Inventory and description of the natural, social, economic and cultural environments in the study area.
- **Stage 2**: Identification of alternative solutions to the problem, their impact on the environment and mitigation measures
- **Stage 3**: Evaluation of the alternative solutions relative to the environmental features identified in Stage 2. Consultation with the public and review agencies.

**Phase 3 – Alternative Design Concepts for a Preferred Solution**
- **Stage 1**: Preliminary identification of a preferred solution
- **Stage 2**: Consultation with the public and review agencies
- **Stage 3**: Confirmation of the preferred solution

**Phase 4 – Environmental Study Report**

**Phase 5 – Implementation**

Considerations

We have identified and evaluated the potential alternative solutions in order to assist the Town in the selection of a preferred alternative solution.

The alternative methods are evaluated considering the following evaluation categories:

- **Physical/Natural Environment**: Hydrology, Hydraulic and Flooding, Coastal Process, Acquisition of Private Property, Integration with Existing Environment, Integration with Existing Infrastructure, Groundwater/ Hydrogeological, Natural Heritage, Wildlife and Vegetation, Aquatic Species, Habitat.

- **Social/Cultural Environment**: Landowner acceptance, Public Health & Safety, Utility Lines.


- **Economic Environment**: Timing Constraints, Operation and Maintenance, Capital Cost and Lifecycle Cost.
## Class EA Study

Preliminary preferred solution for different reaches

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach Name</td>
<td>Do Nothing</td>
<td>Modification and improvement of the existing municipal infrastructure</td>
<td>Modification and improvement to bluff</td>
<td>Repair and replacement of existing shoreline structures, such as seawall, revetment, sheet pile, groyne and marina structures</td>
<td>Installation of new shoreline structures, such as seawall, revetment, sheet pile, groyne and marina structures</td>
<td>Modification and improvement to natural features, such as natural shoreline, wetlands, aquatic habitat and water course/creek outlets</td>
<td>Combination of Alternative 2 to 6</td>
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<td>Reach 01</td>
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<td>Reach 08</td>
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<td>Reach 09</td>
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<td>Reach 09_a</td>
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<td>Reach 09_b</td>
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<td>Reach 10</td>
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<td>Reach 11</td>
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<td>Reach 12</td>
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<td>Reach 13</td>
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<td>Reach 14</td>
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<td>Reach 15</td>
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**Town of Whitby**

**Central Lake Ontario Conservation**

**AHYDTECH Geomorphic Ltd.**
## Municipal Class Environmental Assessment (EA) Process

<table>
<thead>
<tr>
<th>Class EA Phase 1</th>
<th>Class EA Phase 2</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem or Opportunity</strong></td>
<td><strong>Site Inventory/Investigation</strong></td>
<td><strong>Evaluation of Alternatives</strong></td>
</tr>
<tr>
<td>• Identify Problems and opportunities.</td>
<td>• Investigate the natural, social and economic environments.</td>
<td>• Identify alternative solutions to the problem or opportunity.</td>
</tr>
<tr>
<td>• Initiate consultation with the public and agencies.</td>
<td>• Identify and categorize the areas based on erosion concern.</td>
<td>• Identify the impacts of the alternative solutions on the environment and required mitigation measures.</td>
</tr>
<tr>
<td>• Notice of commencement.</td>
<td>• Perform structural assessment.</td>
<td>• Evaluate alternative solutions and identify the preliminary preferred solution.</td>
</tr>
<tr>
<td></td>
<td>Community Open House No. 1 (Present Existing Conditions)</td>
<td></td>
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<tr>
<td></td>
<td><strong>Preliminary Design / Project File Report</strong></td>
<td><strong>Detailed Design / Implementation</strong></td>
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<tr>
<td></td>
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<td>• Refine and confirm the preferred solution.</td>
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<tr>
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<td>• Preliminary design of preferred alternative.</td>
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<td>• Recommendations to mitigate impacts of the preferred solution during and following construction.</td>
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<tr>
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<td>• Recommendation for further study, if required).</td>
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<tr>
<td></td>
<td></td>
<td>• Prepare the project file report.</td>
</tr>
<tr>
<td></td>
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<td>• Notice of completion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 30 Day Public Review.</td>
</tr>
<tr>
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<td></td>
<td>• Detailed design of the proposed works.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Obtain permits and approvals.</td>
</tr>
<tr>
<td></td>
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<td>• Prepare contract drawings and tender documents.</td>
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<tr>
<td></td>
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<td>• Construction and operation of the works.</td>
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<td></td>
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<td>• Post-construction monitoring.</td>
</tr>
</tbody>
</table>

We are here

**Central Lake Ontario Conservation**

**AHYDTECH Geomorphic Ltd.**

**Town of Whitby**
Thank you for attending.

We are interested in receiving any comments that you may have about the project. Should you have any questions, comments, require further information or wish to be added to the project mailing list, please contact either Antony, Perry or Bahar.

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Project Manager
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Conservation Authority
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Telephone: 905.579.0411 x118
Email: psisson@cloca.com

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Managing Director
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Telephone: 519.400.0264
Email: bahar@ahydtech.ca

Please note the information gathered throughout the study is being collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments received become part of the public record and may be included in study documentation which will be available for public review.

Town of Whitby

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