

### Section III – Items for the Information of the Board

**TO:** Chair and Members of the Board of Directors  
Meeting #5/20, Friday, June 26, 2020

**FROM:** Sameer Dhalla, Director, Development and Engineering Services

**RE:** **PICKERING AND AJAX DYKE RESTORATION CONSERVATION ONTARIO  
CLASS ENVIRONMENTAL ASSESSMENT**  
Update on Progress

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#### KEY ISSUE

An update on the progress for the Pickering and Ajax Dyke Restoration Conservation Ontario Class Environmental Assessment.

#### RECOMMENDATION

**WHEREAS the Village East and the Notion Road/Pickering Village area is the fourth highest ranked flood vulnerable cluster within TRCA's jurisdiction in terms of flood risk;**

**AND WHEREAS Toronto and Region Conservation Authority (TRCA) has completed a number of technical studies, and last reported on flood risk in the Pickering Village/Notion Road area including next steps in pursuing an Environmental Assessment for dyke restoration at Authority meeting #5/18 held on June 22, 2018;**

**THEREFORE, LET IT BE RESOLVED THAT the Pickering and Ajax Dyke Restoration Conservation Ontario Class Environmental Assessment Update on Progress be received;**

**AND FURTHER THAT TRCA report back to the Board of Directors in the fall of 2020 to provide an update on the status of the project and next steps.**

#### BACKGROUND

The Village East and the Notion Road/Pickering Village communities in the City of Pickering (Ward 3) and Town of Ajax (Ward 1) are located within the regulatory floodplain of the Duffins Creek watershed. These neighborhoods, which were originally developed prior to modern land-use planning practices for natural hazard management, comprise one of the 41 Flood Vulnerable Clusters in TRCA's jurisdiction. This area has a long history of flooding with 634 buildings susceptible to flooding in the regulatory flood scenario and was ranked #4 in terms of flood risk and consequence according to the 2018 Flood Risk Assessment and Ranking study. Due to the flood vulnerability of the community, the area was designated as a Special Policy Area (SPA) to provide for the continued viability of existing uses and address the significant social and economic hardships to the community that would result from strict adherence to provincial policies concerning development in a floodplain. In addition, flood protection measures were constructed in the 1980's to provide flood protection up to and including the 500-year storm. The flood protection measures consisted of two flood protection dykes, one in each municipality. A location map of the study area is provided in **Attachment 1**.

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In 2007, a major erosion scar was identified in the Pickering Dyke and temporarily repaired with rip rap in 2008. In 2009, TRCA undertook a detailed fluvial geomorphic assessment of the reach and level of service study of the channel and dyke systems to identify a permanent erosion management solution. One of the key recommendations from the 2009 study was to undertake a detailed geotechnical assessment, including the drilling of boreholes within the dyke systems to quantify the structural competence of the materials used when the dykes were originally constructed. In response to the recommendations from the 2009 analysis, TRCA commissioned the Pickering and Ajax Special Policy Areas Two-Dimensional Hydraulic Model and Dykes Assessment Study. The study was completed in 2018 by Valdor Engineering. The objectives of the 2018 study included characterizing flood conditions within the SPA, assessing the level of service, and structural competency, and developing a preliminary restoration strategy for the Pickering and Ajax flood control dykes.

The following outcomes were identified through the 2018 study

- It was determined that the targeted level of flood protection to the 500-year event is not provided by the existing flood control dykes. The Pickering Dyke provides flood protection for the 100-year storm and the Ajax Dyke provides flood protection for the 50-year storm. The loss in service is associated with settling of the materials used to construct the dykes, informed by improved hydraulic modelling. An analysis of the modelling work completed during the original design process has confirmed significantly lower boundary conditions than TRCA's current hydraulic model.
- Additionally, it was determined that increasing the level of service of the dykes beyond what is currently provided, 100-year for the Pickering Dyke and 50-year from the Ajax Dyke, would constrain flows resulting in increased flood risk in nearby areas, as well as create adverse ecological and property impacts
- Several significant structural deficiencies were identified based on field and geotechnical investigations. The results of the geotechnical stability analysis indicate that the dykes do not meet current engineering design standards for stability. As such there is a high potential of dyke failure under an extreme storm event.

The 2018 study examined 9 options to rehabilitate the dykes to address the structural deficiencies. The preferred option consisted of installing a steel sheet pile wall part way down the existing wet side of the dyke. The retrofit of the Pickering and Ajax dykes based on this option would enable construction to be completed within the existing dyke footprint and would not require the acquisition of private property or easements. The estimated cost of the proposed construction works to rehabilitate the flood dykes to maintain the current level of protection was approximately \$6,200,000 for the Pickering Dyke and approximately \$2,400,000 for the Ajax Dyke.

To move forward on the rehabilitation plans, the 2018 study recommended that further study be undertaken by TRCA in accordance with the Conservation Ontario Class Environmental Assessment for Remedial Flood and Erosion Control Projects (EA).

Upon completion of the 2018 study, TRCA staff sought funding opportunities through the federal government and municipal partners. At the Committee of the Whole meeting on February 6, 2018, Durham Region Council committed to funding 50% of the project budget provided TRCA staff was successful in securing the remaining 50% through the National Disaster Mitigation Program (NDMP). In March of 2019 TRCA received notice from the NDMP that it had been successful in securing federal funding of \$250,000, which was matched by the Region of Durham for a total project budget of \$500,000.

### RATIONALE

#### **Environmental Assessment Process**

The Pickering and Ajax Dyke Rehabilitation Environmental Assessment (PADR EA) is being completed through the “Conservation Ontario Class Environmental Assessments for Remedial Flood and Erosion Control Projects” (COEA) process. The COEA process is specifically used by Conservation Authorities for flood and erosion control works and meets the requirements of the Environmental Assessment Act. Further the COEA process is similar in scope to a Schedule B project within the Municipal Class EA process which is commonly used by municipalities for infrastructure related projects.

The project objectives of the Pickering and Ajax Dykes Rehabilitation Conservation Ontario Class EA study have been to:

- Complete a Conservation Ontario Class Environmental Assessment and obtain approval of the Environmental Study Report (ESR);
- Identify the preferred alternative for the rehabilitation of the existing Pickering and Ajax Dykes to meet current engineering standards and factors of safety while maintaining the existing level of flood protection; and,
- Prepare 30% design level drawings, supporting calculations/modelling and construction cost estimate reflecting a feasible design of the preferred alternative.

The project included the following key components:

#### **1. Project Initiation**

The study team confirmed the project objectives, work plan and schedule. Available background information was reviewed and data gaps and methods to fill those gaps were identified. The study team developed a stakeholder registry and prepared and published the Notice of Intent to Undertake a Remedial Project in the local Ajax Pickering News Advertiser.

#### **2. Baseline Inventory**

Baseline conditions include existing physical, biological, cultural, socioeconomic, flooding and erosion characteristics. The study team documented the known baseline conditions and filled data gaps by undertaking investigations and collecting information from other sources. This included undertaking subsurface utility investigations and a review of existing infrastructure under/through the dykes. Also, a thorough geotechnical investigation was completed to further investigate existing dyke characteristics and potential material disposal options.

#### **3. Identify and Evaluate Alternative Solutions**

Based on the findings of the first 2 phases of the study, the project team developed new alternatives to address the dyke stability issues in addition to the nine alternatives identified in the previous 2018 study. All the alternatives were evaluated against robust criteria to identify the preferred solution which balances flood protection requirements, social and environmental needs, cost, and constructability. The study team have identified permit and approval requirements that will be required for design and implementation.

#### **4. Detailed Environmental Analysis of Alternative Design Concepts for the Preferred Solution**

The study team completed preliminary design of the preferred alternative to a 30% level of detail (i.e. established preliminary structure footprints). Multiple variations of the design were prepared based on construction methodology, materials and surface treatments. A preferred design concept has been identified that optimizes flood protection requirements, social and environmental needs, cost, and constructability.

#### **5. Completion of Environmental Study Report**

The study team has prepared a comprehensive report documenting all findings, evaluations, public/stakeholder consultation and decisions made throughout the project. The report includes a detailed Environmental Monitoring Plan which is to be implemented during and after construction, and a long-term operation and maintenance plan for the dykes. The complete report will be presented to the Community Liaison Committee and made available for review by the general public, prior to approval of the project.

#### **6. Public Consultation Process**

Public consultation has been undertaken throughout the Class EA study at key milestones, as required by the Class EA process. These include:

- Publication of notices of the progression of the study and public information centers (PICs) in local media as well as direct notification to identified stakeholders/interested parties.
- Meetings with the broader public including two (2) PIC's as well as three (3) Community Liaison Committee (CLC) meetings comprised of local stakeholder representatives to inform the public of study findings and obtain public input and comments.
- Two (2) meetings each with the Technical Advisory Committee and an Executive Steering Committee (comprised of TRCA and municipal senior leadership members) to obtain technical review/input and senior level input, respectively.
- At the completion of the Class EA study the final report (Environmental Study Report) will be made available for public review and comment prior to approval of the project.

Due to Covid-19 and the provincial direction for public health during the pandemic, TRCA staff had to postpone the 2<sup>nd</sup> PIC in late March. Due to project timelines the study team decided to leverage digital conferencing technology and on April 28<sup>th</sup> TRCA hosted its first ever virtual PIC which was attended by over 30 participants. The virtual PIC was developed in consultation with the Ministry of the Environment, Conservation and Parks (MECP) and included considerations of a typical PIC, which included the ability to have one on one walkthroughs of panels outlining the study process and preliminary designs with study team members, a presentation by TRCA staff, and a question and answer period involving a panel of technical experts from the project management team.

In consultation with the MECP, the following First Nations were notified of the commencement of the PADR EA: the Huron-Wendat Nation, Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Mississaugas of Scugog Island First Nation, as well as the Coordinator for the Williams Treaties First Nations. These First Nations will continue to receive project updates and invitations to PADR public information centers (PIC).

### **Preferred Dyke Restoration Alternatives**

TRCA retained the KGS Group to provide consulting services to advance rehabilitation planning and design of the Pickering and Ajax Flood Control Dykes which will ensure that the dykes meet current engineering standards and factors of safety (FOS) and reduce the associated risk to public safety and loss of property.

While the original target level of flood protection, when the dykes were designed in the 1980's, was the 500-year storm flood, the 2018 study found that the current height of the dykes only allows protection up to a 100-year storm flood event (Pickering Dyke) and a 50-year storm flood event (Ajax Dyke). For greater flood events, including the 500-year and the Regulatory Flood, updated modeling has shown that flood waters would circumvent the Pickering dyke increasing flood risk within the area. Since the combined dykes alone cannot protect for these greater flood events, TRCA established that the objective for the dyke rehabilitation was to meet current engineering standards and FOS while providing at minimum the level of flood protection associated with the existing dyke crest elevations. However, due to technical considerations including updated flood modelling, the study team concluded that increasing the level of service for the Ajax Dyke would be a viable alternative without adversely impacting adjacent areas. As part of the Conservation Ontario Class EA, a baseline inventory of the Project Study Area was carried out that included consideration of the physical, natural and built environment, cultural and socioeconomic environment, as well as technical engineering aspects. The project included the definition and evaluation of alternative solutions for the dyke rehabilitation and their refinement into design concepts. These were evaluated with criteria that reflected the various considerations identified during the baseline inventory and consultation process. As noted previously a comprehensive consultation process was undertaken with stakeholder agencies, the public and three dedicated committees.

The preferred alternative solutions were:

- Hard Engineering Solution, consisting of dyke configurations that include a hard structural component like sheet piles (corrugated metal plates) driven through the dyke and rock embankments to ensure achieving the required stability factors of safety for the dykes. This was selected for those areas of the Pickering Dyke where there is limited space for the rehabilitation works between the creek and private properties. The design concept for the Hard Engineering Solution can be found on **Attachment 2**.
- Soft Engineering Solution, consisting of dyke configurations that do not include a hard structural component for stability; but instead rely on providing earthen embankment slopes that are stable and more gradual than those of the existing dykes. This was selected for areas of the Pickering Dyke where the space available for the rehabilitation work was wide enough to fit this solution without impacting private properties or the watercourses. This alternative solution was also selected as preferred for the entire Ajax Dyke. The design concept for the Soft Engineering Solution can be found on **Attachment 3**.

It was also decided that these preferred solutions would be developed with the required dyke height to protect up to a 100-year storm for both the Pickering and Ajax Dykes, meaning the 100-year level of flood control service for the Pickering Dyke remains the same, however the level of service for the Ajax Dyke would be raised from a 50-year to a 100-year level of service. Further development of the preferred alternative solutions included the definition and evaluation of design concepts that advanced these solutions to a 30% level of design. Various concepts were evaluated using criteria that included consideration of the physical, natural and built environment, cultural and socioeconomic environment, as well as technical engineering

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aspects. These criteria incorporated feedback received during the consultation process. The preferred design concepts were:

- For the hard engineering solution of the Pickering Dyke: the rehabilitation of the dyke with side slopes similar to existing, enhanced with a granular toe drain on the dry side slope and internal sheet pile combined with a vegetated rock buttress on the wet side slope.
- For the soft engineering solution of both the Pickering and Ajax Dykes: the rehabilitation of the dyke with more gradual slopes of maximum 4H:1V, a wider dyke and the incorporation of a granular filter on the dry side slope.

Recommendations were provided for further development of the design concepts during the detailed design phase that would occur after the completion of this Environmental Assessment Project.

Additional design concepts that were considered but not selected as preferred included the use of various types of sheet piles, concrete walls, mechanically stabilized earth walls (MSE), and various seepage cut-off methods.

The estimated capital cost of the preferred design concepts, including contingency values appropriate for a 30% level of design, were:

- \$7.0 Million for the hard engineering solution on the segment of the Pickering Dyke with restricted space for the rehabilitation work
- \$3.0 Million for the soft engineering solution on the segment of the Pickering Dyke without restricted space for the rehabilitation work
- \$2.6 Million for the soft engineering solution of the Ajax Dyke

Preliminary dyke footprints for the Pickering and Ajax Dykes can be viewed on **Attachment 4**.

### **Next Steps**

The study team is currently completing the ESR which has been tentatively scheduled to be released to the public in early September. As per the direction of the Ministry of the Environment, Conservation and Parks, due to Covid-19, TRCA staff will increase the public review period from the typical 30-day review to a 60-day review period and will make hard copies of the ESR available for public review.

Staff will continue to work with the Region of Durham, City of Pickering, and Town of Ajax and senior levels of government to secure and identify funding opportunities to undertake the detailed design process and implementation. As a critical piece of flood control infrastructure, the restoration of the Pickering and Ajax Dykes represents an important example of a capital project focused in disaster risk reduction. Staff will continue to work with our Municipal partners to pursue funding opportunities, such as through the federal Disaster Mitigation and Adaptation Fund (DMAF) if and when a new intake opportunity under DMAF occurs. If funding is secured, TRCA staff can initiate the detailed design process which can be completed within a 12 to 16 month timeline. Construction can occur once the detailed design process is complete and all necessary permits have been obtained.

### **Relationship to Building the Living City, the TRCA 2013-2022 Strategic Plan**

This report supports the following strategies set forth in the TRCA 2013-2022 Strategic Plan:  
**Strategy 2 – Manage our regional water resources for current and future generations**

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### **Strategy 4 – Create complete communities that integrate nature and the built environment**

#### **FINANCIAL DETAILS**

In 2019 TRCA staff were successful in securing Federal National Disaster Mitigation Program (NDMP) funding to complete the Environmental Assessment project. Financial contributions for the PADR EA were provided by the Region of Durham and the NDMP through account 107-69, Pickering and Ajax Flood Control Dyke Restoration Environmental Assessment, which included staff time and consulting fees. Staff will continue to flag the importance of implementation funds for this project in budget discussions with Durham Region staff.

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**Attachments: 4**

Attachment 1: Project Location Map

Attachment 2: Hard Solution Design Concept

Attachment 3: Soft Solution Design Concept

Attachment 4: Preferred Solution Extents