

Section I – Items for Board of Directors Action

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: **BLACK CREEK AT ROCKCLIFFE SPECIAL POLICY AREA FLOOD
REMEDICATION AND TRANSPORTATION FEASIBILITY STUDY**

KEY ISSUE

Approval to adopt the Black Creek at Rockcliffe Special Policy Area Flood Remediation and Transportation Feasibility Study as prepared by Toronto Region Conservation Authority Engineering Services staff and Wood Environment and Infrastructure Solutions.

RECOMMENDATION

WHEREAS the Black Creek at Rockcliffe area is the highest ranked flood vulnerable cluster within TRCA's jurisdiction;

AND WHEREAS Toronto and Region Conservation Authority (TRCA) and the City of Toronto have completed Environmental Assessment studies, and most recently reported on flood risk in the Black Creek Rockcliffe area including next steps in pursuing flood remediation at Authority meeting #2/18 held on March 23, 2018;

THEREFORE, LET IT BE RESOLVED THAT the Black Creek at Rockcliffe Special Policy Areas Flood Remediation and Transportation Feasibility Study be received;

THAT TRCA staff be directed to develop and enter into an agreement with the City of Toronto to undertake, as a co-proponent in collaboration with the City, a Municipal Class Environmental Assessment that will finalize the flood remediation recommendations, while addressing transportation issues, along Black Creek and its tributaries within the Rockcliffe area;

THAT the Chief Executive Officer be granted delegated authority to approve the EA procurement process to further expedite study timelines in light of the September 2020 Board of Directors meeting;

AND FURTHER THAT TRCA report back upon completion of the Environmental Assessment study.

BACKGROUND

The Rockcliffe neighbourhood is located in Ward 5 (York South-Weston) of the City of Toronto and within the regulatory floodplain of Black Creek. Historical development in the floodplain and alterations to the river channel prior to modern floodplain management practices has resulted in significant risk. It is an area with a high concentration of structures in the floodplain, and is the highest ranked Flood Vulnerable Cluster in TRCA's jurisdiction in terms of flood risk and consequence, according to the 2018 Flood Risk Assessment and Ranking study results, which were received by the Board of Directors via Resolution #A180/19, on October 25, 2019. Development in the area is controlled by Special Policy Area (SPA) policies originally approved

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in 1991. Based on updated hydraulic modelling there are approximately 366 buildings located within the regulatory floodplain. Many of these structures have experienced surface and basement flooding during severe storms in July 2013, August 2018, and July 2019 due to both riverine flooding and/or pluvial flooding from the City's sewer systems.

TRCA and the City of Toronto have been coordinating efforts to reduce flooding risks in the Rockcliffe area. In 2014, the TRCA and the City completed two separate Environmental Assessment (EA) studies that examined options to reduce riverine and sewer system related flooding, respectively. These EA studies are:

- 1) Black Creek (Rockcliffe Area) Riverine Flood Management Class Environmental Assessment, completed in 2014 by Amec Foster Wheeler – this TRCA EA study investigated riverine flooding and recommended riverine flood remediation measures; and,
- 2) Basement Flooding Study Area 4 and Combined Sewer Overflow Control Environmental Assessment, completed August 2014 by XCG – this City of Toronto EA study investigated sewer system flooding and recommended sewer system improvements to reduce basement flooding.

Since the completion of the 2014 Class Environmental Assessment, TRCA has undertaken several technical modeling studies within the Black Creek and broader Humber River watersheds using new data, updated software and meteorological and flood information from the 2013 and 2018 storm events. These studies include a comprehensive watershed hydrology update resulting in new regulatory and design storm flow estimates for floodplain delineation (2015 Humber River Hydrology Update), and a high resolution two-dimensional (2D) hydraulic model leveraging detailed data inputs like LiDAR within the Rockcliffe community (2018 Black Creek at Rockcliffe 2D Model and Floodplain Mapping Update).

With many properties experiencing flood risk during more frequent storms and the recognition of the various riverine, pluvial, and transportation considerations at play, the results of TRCA's refined models and subsequent discussions with City of Toronto staff resulted in the need to re-assess and evaluate the feasibility of the recommended flood remediation alternatives developed in the 2014 Environmental Assessment. The reassessment of flood remediation solutions formed the basis for the "Black Creek at Rockcliffe Special Policy Area Flood Remediation and Transportation Feasibility Study" (Feasibility Study).

At Board of Directors Meeting #5/19, held on May 24, 2019, Resolution #A82/19 was approved as follows:

THEREFORE LET IT BE RESOLVED THAT Request for Proposal (RFP) No. 10009033 for engineering consulting services to undertake the Black Creek at Rockcliffe SPA Flood Remediation and Transportation Feasibility Study be awarded to Wood Environment & Infrastructure Solutions at a total cost not to exceed \$498,126 plus applicable taxes, to be expended as authorized by TRCA staff;

AND FURTHER THAT TRCA report back to the Board of Directors upon completion of the study.

RATIONALE

Flood Risk Management Activities in Rockcliffe

TRCA identifies and ranks areas at risk of riverine flooding through the Flood Risk Assessment and Ranking (FRAR) process. Areas with a high concentration of structures in the floodplain were grouped together as Flood Vulnerable Clusters (FVCs). Many of these areas correspond to historical Flood Damage Centres and provincially designated Special Policy Areas, where development occurred near rivers prior to land use planning for hazard mitigation and section 28 permitting regulations under the CA Act. Since 2008, the Rockcliffe area has been ranked among the top five priority areas for riverine flood risk, and with the most recent iteration of the risk assessment is currently ranked the highest priority area for riverine flood risk within TRCA's jurisdiction. Rockcliffe was the first flood risk priority area selected by the TRCA to commence an EA study to investigate riverine flooding and recommend solutions.

TRCA activities in flood risk management extend beyond capital works and land-use planning, and include emergency management planning with partner municipalities, flood forecasting and warning, and education and outreach. In addition to the 2014 TRCA EA study, actions taken by the TRCA to support the reduction of riverine flood risks in the Rockcliffe area include:

- The identification of the Rockcliffe area as a priority area for risk communications and flood education programs
- A dedicated real-time monitoring water level gauge, installed at Black Creek downstream of Alliance Avenue in 2016, as well as the installation of a real-time camera and precipitation gauge in the catchment to further enhance flood forecasting, warning, and emergency preparedness activities.
- The development of an updated two-dimensional hydraulic model (2D model), which provides enhanced riverine flood risk information (i.e., flood depth, velocity, risk to life parameters) that was used as the basis for the ensuing feasibility and conceptual design studies.
- The joint development of site-specific emergency response procedures together with the Toronto Office of Emergency Management and applicable City divisions.
- Continued investments for the operation and maintenance of flood infrastructure within the Black Creek watershed, namely:
 - Black Creek Dam Safety Review (2017)
 - Black Creek Reservoir Dredging and Maintenance Project (2017)
 - Black Creek Channel Restoration (2013 - 2016)
 - Black Creek Channel Guardrail Installation (2016)

In 2020, TRCA and the City collaboratively completed the Feasibility Study, which revisited the 2014 TRCA EA preferred solution using new modelling and a more thorough assessment of impacts to traffic and infrastructure. The sections below discuss the findings of the Feasibility Study in more detail.

Summary of Feasibility Study Alternatives

The objective of the Feasibility Study was a thorough re-assessment of the flood remediation alternatives developed in TRCA's 2014 EA, in light of model refinements, infrastructure considerations and flood observations. The study examined the performance of the recommended flood remediation solutions using a new MIKE FLOOD 2D hydraulic model, which explicitly considers the influence of the Lavender Creek tributary, as well as the updated

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watershed flows from the 2018 “Humber River Hydrology Update Addendum”. The Feasibility Study also comprehensively assessed traffic impacts (using Synchro and SimTraffic Models) and included site investigations (Boreholes and Sub-Surface Engineering).

Through the Feasibility Study, an improved flood remediation solution was identified, which significantly reduces the number of properties in the floodplain under all storm events (see **Attachment 1**). For example, in the 350-year storm event, the number of buildings in the floodplain drops from 215 to 3.

Revised flood mitigation alternatives were investigated for the various sections of the Rockcliffe cluster and are summarized below.

Jane Street to Alliance Avenue

The 2014 TRCA EA identified Jane Street crossing as a major constriction to flow conveyance and recommended it be upsized to a 200 m span bridge. The revised modelling undertaken for the Feasibility Study examined three additional alternatives:

Alternative 1: 200 m span bridge and valley shaping as per the 2014 TRCA EA,

Alternative 2: lowered culvert invert (1.5m +/-)

Alternative 3: 102 m span bridge with 72 m minimum bottom width

Alternative 4: Two (2) 5.4 m diameter supplemental culverts in addition to the existing culvert

Attachment 2 shows the number of buildings still impacted by riverine flooding after the Jane Street crossing was upsized.

For the Jane Street crossing, additional modeling and geotechnical analysis found a 102 m span bridge (Alternative 3) would provide the same flood benefit as the 200m crossing while providing significant cost savings.

The Jane Street crossing hydraulic analysis revealed important information about the nature of flooding in this reach. Given the similar performance of the Alternatives for events with return periods equal to or less than 350 years, and the fact that the majority of buildings impacted by flooding are upstream of Rockcliffe Boulevard, it was clear that the existing bottleneck at the Jane Street crossing is not the only factor influencing riverine flooding within the area. As a result, flood mitigation measures were extended upstream. In addition to upsizing the Jane St crossing, the Feasibility Study recommends widening the channel between downstream of Jane St to Rockcliffe Blvd from 15.2 m wide to 55 m wide and upsizing the Rockcliffe Blvd crossing to a 52 m span bridge. Rockcliffe Court is proposed to be realigned to fit around the widened crossing. Upstream of Rockcliffe Blvd the channel is also proposed to be widened to 55m, before it is tied into existing grades downstream of Alliance Ave. Throughout this reach the widened channel is deepened for better hydraulic performance. In summary the flood remediation solutions for this reach are to:

- Replace the existing 10.7 m span structure at Jane Street with a 102 m span bridge.
- Naturalize, widen, and deepen Black Creek from Jane Street to Rockcliffe Blvd. (55 m top width).
- Upgrade the existing 15.2 m by 4.6 m Rockcliffe Blvd. bridge to a 52 m span by 4.9 m rise bridge with a lower invert.
- Naturalize, widen, and deepen Black Creek from Rockcliffe Blvd. to downstream of Alliance Ave. (55 m top width).

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The above noted mitigation strategy provides flood relief up to the 350-year event and is illustrated on Attachment 1.

Lavender Creek

The 2014 EA did not examine the impacts of Lavender Creek, however based on experienced flooding from the recent storm events after 2014, TRCA included a detailed flood analysis of Lavender Creek in the Feasibility study. Under existing conditions, the properties along Hilldale Drive are the most flood vulnerable locations in the study area due to their close proximity to Lavender Creek. The 0.9 m x 3.66 m culvert under Symes Road is undersized. Furthermore, the creek itself and the two driveway crossings downstream of Symes Road have limited flow capacity. The Feasibility Study, which utilized updated hydraulic modelling that explicitly accounted for Lavender Creek, examined this area under different scenarios. The scenarios ranged from realigning Lavender Creek to varying crossings and channel widths. The selected flood mitigation solution for Lavender Creek is to:

- Naturalize and widen Lavender Creek to 22.5 m top width from Black Creek to Symes Road
- Remove the south driveway crossing of Lavender Creek
- Replace Lavender Creek northern driveway crossing (4.8 m by 2.3 m) with a 20 m span by 3.87 m rise crossing
- Replace the existing Symes Road crossing (3.66 m by 0.90 m rise, 40.2 m long), with twin 5.4 m span by 1.8 m rise culverts

This solution was found to provide flood protection up to the Regional Storm along Hilldale Ave, while also minimizing property acquisition and infrastructure impacts, all while maintaining existing transportation routes. The 2014 TRCA EA had originally proposed flood protection berms along Lavender Creek; these berms are no longer required under the Feasibility Study flood solution, the proposed flood mitigation strategy for Lavender Creek is shown on **Attachment 3**.

Alliance Avenue to Weston Road

The Feasibility Study modelling demonstrated that with the downstream flood improvements implemented, the Black Creek channel between Alliance Ave. to Weston Rd. could convey the 350-year storm without overtopping. The study team completed a qualitative assessment of the channel requirements for the Humber Boulevard area and concluded that due to the amount of infrastructure within the Humber Boulevard right of way, any proposed flood remediation works would be extremely costly and difficult to implement. Discussions with the City confirmed that the level of riverine flood control service for the Rockcliffe area would be to a minimum the 350 year event. Given this high service standard, TRCA and the City decided that no additional flood mitigation works are required for this reach.

Upstream of Weston Road

Hydraulic modelling revealed that in the 350-year storm event, water overtopped Weston Road and flowed into the Rockcliffe SPA area. To address this, a number of alternatives were explored, such as enlarging the crossing size, constructing flood walls, and the combination of the flood walls and crossing upgrades. The Feasibility Study concluded that a 0.5 m high flood protection wall would be the most practical and feasible solution to prevent flooding into the neighbourhood from flow upstream of Weston Rd. in the 350-year event.

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Attachment 3 provides a map of the study area identifying locations of the flood remediation works developed through the feasibility study.

Costing

Cost estimates have been prepared based upon conceptual design assumptions and represent a preliminary estimate for the proposed works, which include a mix of structure works, channel works, as well as infrastructure. Through the subsequent MCEA, the conceptual cost estimates will be reviewed and refined as further details are determined.

The cost estimates for the preferred alternatives have been summarized in **Attachment 4**. The estimated capital construction cost for implementing all recommended alternatives is approximately \$57 million; it should be noted that these are preliminary estimates which include costing elements for the proposed structure works, channel modifications, municipal infrastructure, and utility considerations; at this time design, permitting and land costs have not been included in the estimate, these costs will be assessed at the next stage of planning.

Prioritization Plan/Phasing

A preliminary Prioritization Plan (suggested phasing of alternatives) has been developed based on the principle of being able to demonstrate action within flood risk areas early. The plan focuses on lower cost and less complex alternatives first which would work towards reducing flood risks, followed by those alternatives providing the greatest flood risk benefit, albeit more costly and more complex to implement. The following is the preliminary recommended phasing strategy and associated justification for the various flood mitigation alternatives.

1. Upgrade Symes Road Crossing of Lavender Creek and Widen/Deepen Lavender Creek to Southern Private Crossing

The primary focus of this phase would be to upgrade the Symes Road crossing of Lavender Creek and the associated channel widening/deepening to accommodate the new structure. The existing structure overtops and results in overland flooding during the 2-year event. Improving the conveyance capacity of this crossing will result in an immediate flood risk benefit related to high frequency flooding, which will be further improved through the implementation of the subsequent alternatives.

2. Remove Southern Private Crossing of Lavender Creek

The removal of the southern private crossing on Lavender Creek is proposed to be implemented as the crossing is not in use and does not require replacement, therefore the structure removal will mitigate any local hydraulic constraints.

3. Construct Flood Wall/Berm at Weston Road

The flood wall proposed at Weston Road is the lowest cost alternative, with limited impacts to municipal infrastructure and utilities. This alternative will provide a 350 year level of service (once downstream improvements are in place), by eliminating the overtopping of Weston Road, therefore reducing the overland flooding into the Cordella Avenue area of the neighborhood.

4. Upgrade Jane Street Crossing

The upgrade of the Jane Street crossing is the highest cost of the proposed alternatives, however, will provide significant flood risk benefit.

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5. Naturalize, Widen and Deepen Black Creek – Jane Street to Rockcliffe Blvd.

Black Creek is proposed to be naturalized and widened to approximately 50 to 55 m (top width) channel, to provide improved conveyance and accommodate the upgrade of the Jane Street bridge to a 102 m span. In addition to widening, the channel will also be lowered from Jane Street to Rockcliffe Blvd to provide a uniform bottom slope.

6. Upgrade Rockcliffe Blvd. Crossing

With the proposed channel works along Black Creek completed downstream of Rockcliffe Blvd, this can facilitate the construction of the proposed Rockcliffe Blvd bridge to a 52 m span structure. This should be completed subsequent to the Jane Street crossing upgrade and proposed channel works

7. Naturalize, Widen and Deepen Black Creek – Rockcliffe Blvd. to Alliance Avenue

The Black Creek channel works are proposed to continue upstream of the widened Rockcliffe Blvd. crossing, until downstream of Alliance Avenue. The creek bed slope will be maintained in the proposed channel works, to ensure a uniform slope from Alliance Ave to Jane Street.

8. Widen and Deepen Lavender Creek from Southern Private Crossing to Confluence with Black Creek & Upgrade Northern Private Crossing

The channel widening and deepening of Lavender Creek from the southern private crossing to the confluence with Black Creek would be the final stage. With the proposed channel works, the northern private crossing can be upgraded to accommodate the 22.5 m top width of the channel. The proposed works for this section of Lavender Creek should be completed once the flood mitigation alternatives for Black Creek have been implemented as the backwater conditions from Black Creek significantly influence the flooding conditions and hydraulic performance of Lavender Creek.

Flood Remediation Plan Next Steps

In addition to identifying feasible solutions to reduce flood risk within the Rockcliffe community, the study team was also tasked with identifying subsequent phases of study, including Environmental Assessment (EA) and Detailed Design requirements, a prioritized list of flood remediation works focusing on highest risk areas, and developing preliminary implementation costs. Combined, these considerations provide TRCA and the City with a road map towards implementing a viable flood remediation plan for the Rockcliffe community.

Future Study Requirements

The study team has confirmed that a new Environmental Assessment, including public consultation for the Rockcliffe community would be required to be completed in order to fulfill the EA Act requirements. Undertaking a new EA for the area is also a reflection of the new list of flood remediation solutions, which are considerably different from the previous preferred solutions identified in TRCA's 2014 EA.

As many of the proposed works involve modifications to crossings, which are municipal infrastructure, much of the flood remediation works identified through the feasibility study fall within the Municipal Class Environmental Assessment (MCEA) process. The study team also notes that none of the proposed flood remediation works would be precluded from the Conservation Ontario Class Environmental Assessment (COEA) process which would also allow TRCA to advance an EA for the community independent of the City, if required. The feasibility study further recommends that the EA be completed under a Schedule C EA process which includes the following key components;

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- Notice of Study Commencement (MCEA) / Notice of Intent (COEA)
- Establish Mailing List (MCEA)/Establish Community Liaison Committee (COEA)
- Environmental Inventory
- Evaluate Alternatives
- Determine Preferred Recommended Solution(s)
- Prepare Environmental Study Report
- Publish Notice of Completion (MCEA) / Notice of Filing (COEA) for Review

Given TRCA's extensive knowledge of managing flood risk and its ability to effectively deliver flood remediation projects and complex environmental assessments, the City has requested that TRCA undertake the EA process as the study lead with the City as Co-proponent. The TRCA and the City are currently developing a Service Level Agreement (SLA) for the EA study which will strengthen TRCA's ability to deliver the EA through; defining rolls and responsibilities of each organization and the project management team, establishing effective communications protocols including Board and Council reporting, and study budget.

TRCA and City staff have estimated the project budget to be approximately \$2.9 million which includes consulting fees and staff time. Following a competitive procurement process for a multi-disciplinary consulting team, the EA study will commence in October 2020 and will take approximately 18 months to complete, assuming no complications and the timely receipt of agreements and agency comments with no Part 2 Order requests. Upon completion of the EA, detailed design work would be required. Pursuant to additional discussions with the City, capital budget would need to be allocated to implement the EA findings from 2022 onwards.

TRCA and City staff are collaborating on ways to potentially accelerate the phasing of works in consultation with the Minister of the Environment Conservation and Parks

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

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 feasibility study project. Financial contributions for the Black Creek at Rockcliffe SPA Flood Remediation Feasibility Study were provided by the City of Toronto through TRCA's Black Creek at Rockcliffe Flood Remediation Phase 3 EA and Design Project account 133-36, and NDMP account 107-72, Black Creek at Rockcliffe SPA Flood and Transportation Feasibility Study, which included staff time and consulting fees.

Discussions are underway with City staff on the costing for the integrated EA, detailed design and future potential capital budget requirements for this project. TRCA and the City will continue to apply for senior government funding through the Disaster Mitigation Adaptation Fund and other applicable programs.

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Attachments: 4

Attachment 1: Summary of Affected Buildings

Attachment 2: Comparison of properties that experience flooding with Jane Street alternatives

Attachment 3: Location of Feasibility Study recommended flood protection measures

Attachment 4: Preferred Alternatives cost estimate