

Executive Summary

The Basement Flooding Protection Program (BFPP) Capacity Assessment Studies Project for Study Areas 46 to 61 and 63 to 67 seeks to characterize drainage system capacity and develop solutions to reduce the risk of basement and surface flooding within the remaining BFPP Study Areas in the City. The study areas have been grouped together in six Bundles across the City; Stantec Consulting Ltd. (Stantec) is undertaking the Bundle D and Bundle F assignments.

The study was carried out to assess the sanitary and storm/combined drainage systems to identify the potential factors, mechanisms and impacts of surface and basement flooding and to develop comprehensive flooding remediation plans that best meet the target level-of-service criteria of the City under 2041 growth conditions. Based on guidance from the City, the basement flooding protection level has been set to the equivalent of the May 12, 2000 storm event for the sanitary system and the 100-year design storm for the combined/storm minor and major systems.

The City has embarked on a new approach in an effort to meet this objective, incorporating lessons-learned and feedback from previous projects. The overall approach includes two distinct, yet integrated, phases of the project: the initial Study Phase, and the Preliminary Design Phase. The objective of this effort is to reduce the risk of future basement and surface flooding resulting from shortfalls in the capacity of the municipal drainage systems. In other words, the focus of flood remediation efforts is on publicly derived sources, such as back-up of City sewer systems, or surface flooding emanating from the public right-of-way (ROW).

The primary focus from the Study Phase was on the development of Schedule A/A+ assignments where feasible, recognizing there may be a need for additional Schedule B and/or C Environmental Assessment (EA) activities for more involved solutions negatively affecting the social or natural environments. One assignment, 47-17, was identified during the Study Phase to be a Schedule B undertaking due to proposed outfall upgrades that fall outside of the public ROW.

SCOPE OF STUDY

The focus of this EA is Assignment 47-17 in Bundle D, with the geographic context of the entire Study Area 47 presented in **Figure ES. 1** below. This EA Project File reviews the assessments completed through the Study Phase for Area 47 with focus on Schedule B Assignment 47-17, with further elaboration on activities completed after the Study Phase to satisfy the Schedule B EA requirements for the assignment.

The study was carried out to assess the sanitary and storm drainage systems to identify the potential factors, mechanisms and impacts of surface and basement flooding and to develop comprehensive flooding remediation plans that best meet the target level-of-service criteria of the City. To achieve this scope, the study included the following tasks:



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- Municipal Class EA project Phase 1 activities, including agency consultation and community questionnaire.
- Comprehensive review of background data and available information to confirm existing field conditions, supplemented as required with additional field investigations.
- Identification and prioritization of the factors contributing to basement and surface flooding including interaction of the storm, sanitary and overland systems.
- Development of a Geographic Information System (GIS)-based topographical model to help define the major system surface drainage patterns and identify and quantify low lying or other problematic areas.
- Development of sanitary and storm drainage system hydrologic and hydraulic modeling tools.
- Confirmation and identification of potential basement flooding areas.
- Evaluation of various flood remediation measures and development of comprehensive cost-effective flood remediation plans to achieve the targeted hydraulic performance under future projected population.
- Where alternative flood remediation measures were developed, an assessment was completed based on hydraulic, environmental, and socio-economic factors to determine the recommended flood solution.
- Development of opinions of probable costs, implementation sequencing, and mitigation measures.

ASSIGNMENT AREA CHARACTERISTICS

Assignment 47-17 is located within the northeast portion of Study Area 47. Area 47 is 1,280 ha in size and is divided into upper and lower portions. The upper portion is roughly bounded by Victoria Park Ave to the west and the TTC Subway Line 3 to the east. It borders with Study Area 30 (EA completed 2008) to the north, Study Area 52 (EA in progress) to the east, Study Area 34 (EA completed 2018) to the south, and Study Area 22 (EA completed 2014) to the east. It also contains segments of Wilson Brook, East Don River tributary, and Massey Creek.

The lower portion is surrounded by Study Area 46 to the west, Study Area 55 (EA in progress) to the north, Study Area 32 (EA completed 2012) to the south, and Study Area 34 (EA completed 2018) to the east. Study Area 1 also cuts into Study Area 47 from the east. The lower portion roughly encapsulates Curity Creek and Taylor / Massey Creek.

Most of Study Area 47 is located in the Taylor / Massey Creek sub-watershed. Part of the East Don and sub-watersheds is also within the bounds of Study Area 47.

The general limits of Assignment 47-17 include Eglinton Ave to the south, Lawrence Ave to the north, Birchmount Rd to the west, and the railway corridor to the east. Storm sewers within Assignment 47-17 discharge to Taylor/Massey Creek.



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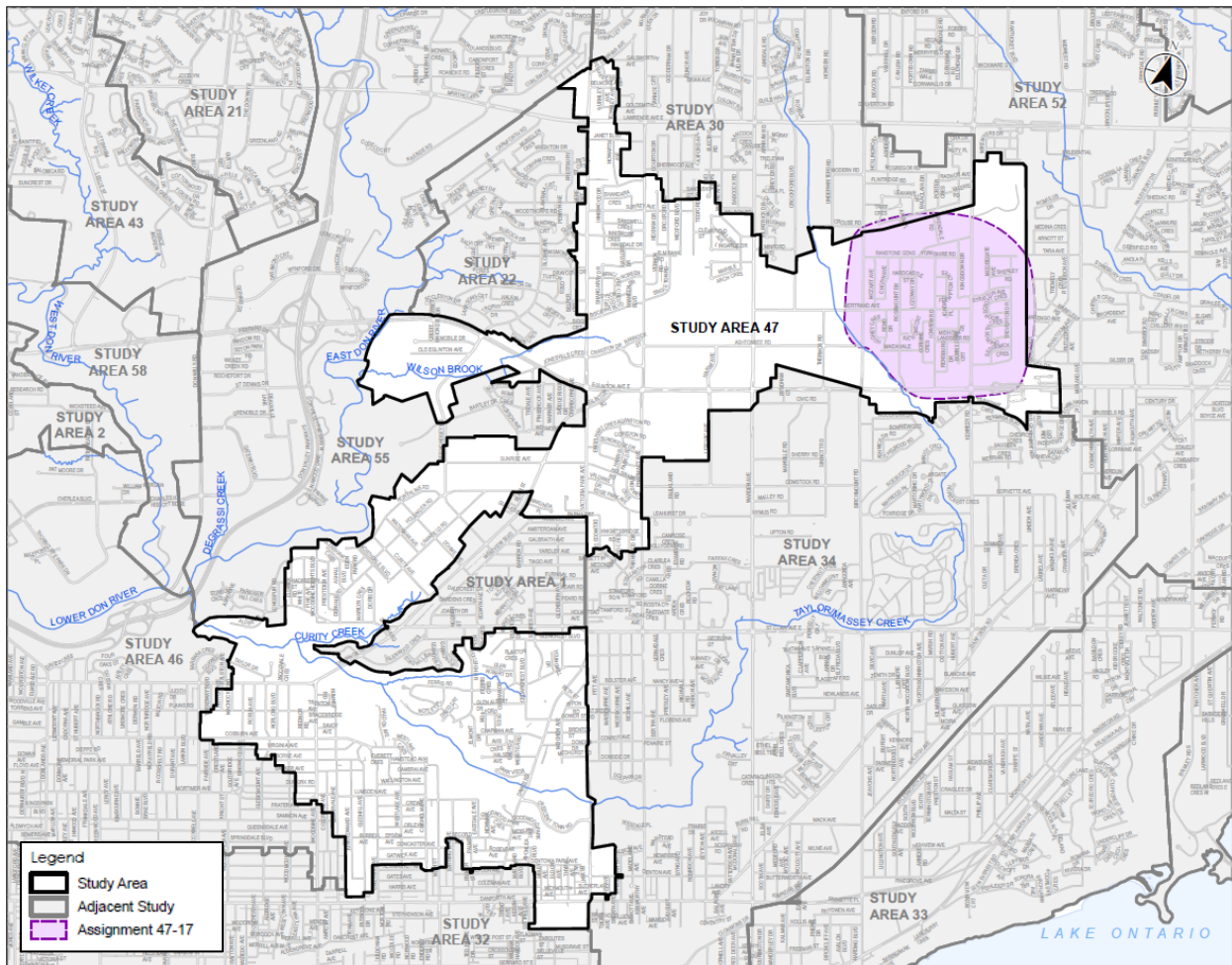


Figure ES. 1: Assignment 47-17 within entire Area 47

ASSESSMENT OF EXISTING CONDITIONS

System performance was assessed based on the Basement Flooding criteria and validated against flood records from historical events. The majority of reported flood issues are private-side related, and not chronic issues resulting from the capacity of the surface drainage or collection system. Some older flood complaints appear to have already been resolved by remediation works constructed after May 2000 and August 2005.

Field investigation and inspection were conducted to identify the specific characteristics of the study area and its drainage systems. An assessment was undertaken of the existing natural and built environments, as well as a review of available data sources and any previous studies. Historical flooding records and the public questionnaire results show that flooding incidents have occurred throughout the entire study area, but there are areas where flooding is clustered at numerous properties which may indicate temporary inadequacy of the sewer systems and/or surface drainage systems as opposed to site-specific issues.



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An integrated hydrologic-hydraulic simulation model of the storm and sanitary network was developed, calibrated to flow monitoring data, and validated against historic flood records.

The overall background review, field investigations, public consultation and hydraulic modelling analysis revealed that the issues within in the storm minor system that are likely due to a combination of the presence of undersized sewers, high creek water level assumptions, shallow pipes, reverse driveways and/or cross-connections from dual MHs. The presence of dual MH interconnections between the storm and sanitary systems influence the performance of the collection systems.

The resulting model was used as a tool to assess the hydraulic performance of the existing drainage systems, identify their current performance level, determine potential causes of deficiencies, and develop remedial measures for the basement and surface flooding issues resulting from public drainage system performance. The overland drainage system within the assignment area, while generally showing a large degree of capacity to convey large events in the ROW, does exhibit some issues along portions of arterial / collector roads, where maximum allowable depths are generally lower, triggering exceedances in more frequent events.

Collectively, these factors contribute to episodes of surface and/or basement flooding from the public system under extreme rainfall events that exceed the original design capacity. Additionally, private side drainage issues such as poor lot grading, blocked laterals, reverse-driveways, etc., can also contribute to individual property flooding.

STUDY PROCESS AND CONSULTATION

The framework of the project approach and Study phase followed the guidelines of the Municipal Class EA document disseminated by the Ontario MEA (2000, amended 2007, 2011 & 2015). By following these guidelines, the Study satisfied the requirements of the Ontario Environmental Assessment Act through completion of Phase 1 of the Class EA process and set the framework to undertake Phase 2 activities for projects identified as Schedule B or C.

From the Study phase, Assignment 47-17 was identified as a Schedule B undertaking where the following additional review and consultation measures were taken:

- Detailed alternative review, including development of an additional Alternative 3 solution;
- Public consultation; and
- Advancement in consultation with agency stakeholders.

This Project File document is intended as a summary report, documenting Phase 1 and 2 of the Class EA. A Notice of Completion is submitted to review agencies and the public to allow for comment and input on this Project File for at least 30 calendar days from date of notice. Subject to comments received and the receipt of the necessary approvals, the City of Toronto intends to continue with the preliminary/detailed design and construction of the flood remediation measures to mitigate the risk of basement and surface flooding in Assignment 47-17.



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AGENCY AND PUBLIC CONSULTATION

Consultation with agency stakeholders and the public was conducted with the following components:

- Notice of Commencement was issued September 15, 2022 on the City's webpage and in the September 22 and 29 Scarborough Mirror newspaper editions
- A public questionnaire was issued in Fall 2020 to addresses within the study area to help identify public-side flooding concerns.
- A notice of public consultation was issued to properties within the study area by Canada Post to notify them of the opportunity to review the study recommendations. Due to the Covid-19 pandemic, the City posted public consultation materials online from November 7, 2022 to November 25, 2022 as a virtual event hosted on a dedicated City website, including presentation materials with information pertaining to the study, EA process, existing conditions for Assignment 47-17, and alternatives and the preferred solution for the assignment.
- Through the Study Phase, the following groups were engaged: Mississauga's of the Credit First Nation, Toronto Parks, Forestry & Recreation, Toronto Water – Operations, Toronto Water – Stream Restoration Unit, Toronto Transportation Services, and Toronto and Region Conservation Authority (TRCA)
- Throughout the EA Phase, the following agency stakeholders were engaged: Toronto Hydro and TRCA

DEVELOPMENT AND EVALUATION OF ALTERNATIVES

The baseline conditions represented the starting point from which solutions were required. Baseline conditions are represented by the design storm results, incorporating projected 2041 population on the sanitary model and an assumed 75% Downspout Disconnection for the storm model reflecting the intentions of the Wet Weather Flow Management Master Plan for new development to control onsite stormwater discharges to better than pre-development conditions under large storms.

There are several storm sewersheds based on physical outfall location to watercourses or boundary conditions with adjacent Study Areas, and a number of sanitary subsewersheds connecting to the trunk. Within each sewershed, Problem Areas were defined based on the criteria infractions of the baseline condition models and became the initial basis for presentation and communication regarding solutions. These Problem Areas were in some cases compiled into Solution IDs when the problem areas and/or solutions were close in proximity or connected. Through the solutions development process and in planning for construction and solution implementation, these Solution IDs were then compiled into Assignments based on hydraulic connectivity.

The approach to solution development was premised on the principle of conveyance within the municipal ROW as a first iteration, to maximize the number of solutions that fall within the Municipal Class EA Schedule A or A+ categorization. Where the initial solutions were constrained by unfavourable requirements, fell outside of the ROW, or may lead to Schedule B/C implications, alternative solutions were reviewed and assessed. Alternatives were evaluated based on fourteen (14) criteria. Each criterion was ranked either high, medium, or low impact with a corresponding score of 1,2, or 3 respectively. A



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“low” ranking represents the lowest impact and most desirable, while a “high” ranking represents the highest impact and least desirable. Once each criterion was evaluated, the score from all criteria was totaled. Based on the total score, the most preferred alternative was the highest scored alternative and was selected for the Assignment ID.

SUMMARY OF ALTERNATIVES

Based on the performance of the storm and sanitary drainage system model, flood remedial measures were conceptually designed in the hydraulic model. Three alternatives were developed for Assignment 47-17 to relieve flooding and improve the storm system while meeting the City’s guidelines. All three alternatives involve increased storm inlet capacity, storm conveyance upgrades, redirected storm flows, sanitary and storm inline storage, dropping a section of pipe within the sanitary system on Mozart Ave, Bertrand Ave and Birchmount Rd to allow for storm upgrade, and include hydraulically disconnecting all dual MHs. Differences between the alternatives are summarized as follows:

- Alternative’s 1 and 3 include redirected storm flows on Maidavale Rd. to Rosemount Dr.
- Alternative 2 includes redirected storm flows on Birchmount Rd. and Bertrand Ave to Reno Dr.
- Alternative’s 1 and 3 include upgrades to two storm outfalls on Rosemount Dr and Birchmount Rd. Outfall pipe upgrade on Birchmount Rd north of Massey Creek connects into a 4 m diameter CSP culvert.
- Alternative’s 2 and 3 include redirected storm flows into offline storage within Maidavale Park.

Based on the evaluation criteria and ranking, Alternative 1 is the recommended solution that best mitigates surface and basement flood risks, considering impact to the public and natural environment. The effectiveness of the recommended solution in relieving surface and basement flooding problems under the target level of service was determined using the hydraulic model.

RECOMMENDED SOLUTIONS

The recommended solution for Assignment 47-17 corresponds to Alternative 1 and is presented in **Figure ES.2**. A summary of the recommended solution is outlined below:

- Increase storm inlet capacity & provide conveyance upgrades throughout;
- Provide storm inline storage along Kingsdown Dr, Yorkshire Rd, Rosemount Dr, Losoway Dr, Bertrand Ave, Maida Vale Rd, Ranstone Grdns, Birchmount Rd, Chopin Ave, Mozart Ave, Hughey Cres, Reno Dr, Corinne Cres, Ionview Rd, Bonny Lynn Crt, Kennedy Rd, Shenley Rd, Stratton Ave, Treverton Dr, and Eglinton Ave E;
- Provide sanitary inline storage along Ionview Rd;
- Redirect flows:
 - Maidavale to Rosemount Dr
 - Bertrand Rd west to Rosemount Dr
 - Bertrand Rd east to Birchmount Dr
 - Ionview Rd and Rensburg Dr south to Eglinton Ave E
 - Ionview Rd west to Bertrand Ave;
 - Upgrade and drop sanitary sewers on Rosemount Dr;



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- Drop section of sanitary system on Mozart Ave, Bertrand Ave and Birchmount Rd to allow for storm upgrades;
- Hydraulically disconnect all dual MHs; and,
- Upgrade two storm outfalls on Rosemount Dr and Birchmount Rd. Outfall pipe upgrade on Birchmount Rd north of Massey Creek connects into a 4 m diameter CSP culvert.

The opinion of probable costs for the recommended Assignment 47-17 flood solution is \$234,049,097 based on version 4.1 of the City's CET. This cost covers the total anticipated construction cost, includes 30% contingency and is exclusive of HST.

With the implementation of flood solutions, there is a change to the quantity of water discharging to Taylor-Massey Creek, attributable to the improvement in drainage efficiency to meet surface depth and pipe water level criteria, even with significant in-line storage implemented. During the 2-yr storm, there is a net reduction in peak flow of 3.03 m³/s, and during the 100-yr storm, there is a net increase of 0.71 m³/s.

Based on the Stage 1 Archaeological study completed for the area, the recommended solution with outfall upgrades to Taylor-Massey Creek is considered to retain archaeological potential and requires further investigation at detailed design. All other proposed solutions within the municipal ROW do not require Stage 2 archaeological works.

CONCLUSIONS

The following conclusions can be drawn from the completion of this EA Study:

- Through the initial Study Phase completed for the entire Area 47, several capacity issues were identified. Based on the review and interpretation of available background data, field investigations and resident input, the main causes of basement and surface flooding can be attributed to the following factors:
- Overloading of storm sewers, pipe bottlenecks, floodplain influence, presence of dual MHs, and lack of a continuous major system with trapped overland flow paths causing surface flooding.
- Alternative flood risk reduction solutions were identified at the Study Area-scale based on hydraulic connectivity (i.e., Assignments), and initially evaluated at a high-level including agency consultation to select the preferred solutions that would fall within the ROW. Through this process, one Assignment (47-17) was identified as potentially having greater environmental and social impacts due to proposed flood solutions outside of the ROW and proceeded to completion of the Schedule B EA process with additional agency/public consultation, alternative solution review/refinement, and evaluation, as documented in this Project File.
- Through the EA process, an additional flood solution alternative was developed (Alternative 3). All three alternatives were evaluated based on social, economic, environmental and constructability criteria using a scoring method. Due to its comparatively lower cost and maintenance requirements, improved level-of-service, and its limited social and environmental impacts, Alternative 1 was selected as the recommended alternative solution for Assignment 47-17.



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- With the implementation of the preferred flood remedial measures, the storm drainage system can convey both the major and minor systems during the 100-year design storm within the City surface depth and HGL criteria with limitations stemming from downstream watercourse levels only. Similarly, with the proposed flood remedial measures, the sanitary drainage system can convey the May 12, 2000, event.
- With the implementation of flood solutions, there is a change to the quantity of water discharging to Taylor-Massey Creek, attributable to the improvement in drainage efficiency to meet surface depth and pipe water level criteria, even with significant in-line storage implemented. During the 2-yr storm, there is a net reduction in peak flow of 3.03 m³/s, and during the 100-yr storm, there is a net increase of 0.71 m³/s.
- The recommended improvement works to help address the flooding problem in 47-17 is estimated at a total construction cost of \$234 million (2022 Canadian dollars) net to the City.
- Based on the Stage 1 Archaeological studies, the recommended solution with outfall upgrades to Taylor-Massey Creek is considered to retain archaeological potential (and requires further investigation at detailed design). All other proposed solutions within the municipal ROW do not require Stage 2 works.
- Protected properties and places of cultural heritage value or interest have been identified within the Assignment boundary. As such, additional assessment will need to be completed during the preliminary design phase to identify, evaluate, assess the impacts, and provide recommendation to mitigate the effects of the undertaking on cultural heritage resources including built heritage and cultural landscapes.
- The Municipal Class EA Master Planning process (Phases 1 and 2) has been fulfilled through public consultation including one public information event, agency consultation, and the submission of this Project File document.

It is recommended that the Assignment proceed to preliminary design, subject to City prioritization, additional agency consultation, and commence with implementation as Capital budgeting allows.



