SUBJECT: Flood Study Update

TO: Development and Infrastructure Committee

FROM: Capital Works

Report Number: CW-48-16

Wards Affected: all

File Numbers: 155-08-2

Date to Committee: October 12, 2016

Date to Council: October 31, 2016

Recommendation:

Approve the extension of the plumbing permit fees grant program to the end of 2017 to offset the cost of plumbing permit fees for the installation of backwater valves, disconnection of foundation drains from the sewer system and the installation of sump pumps for homes qualifying under the Region of Halton's Basement Flooding Prevention Subsidy Program at an estimated cost of $50,000 to be funded from the Tax Rate Stabilization Reserve Fund.

Purpose:

Respond to staff direction from the July 6, 2015 Development & Infrastructure Committee meeting.

Background and Discussion:

Report CW-09-15 entitled "August 4, 2014 Flood Vulnerability, Prioritization and Mitigation Study Report – Update" was presented to the Development & Infrastructure Committee on July 6, 2015.

The report provided a status update of the Flood Vulnerability, Prioritization and Mitigation Study being undertaken by Amec Foster Wheeler, and a presentation of preliminary recommendations for stormwater infrastructure capital improvements and staffing requirements.

Updates were also provided regarding City staff's Creek Maintenance Program, coordination with Halton Region and Conservation Halton, highway authorities, railway authorities and the recommended next steps.

Report CW-48-16 provides a further update on all initiatives related to the City's work plan.

The following subsections detail the work which has been undertaken since staff report CW-09-15 was presented to the Development & Infrastructure Committee in July 2015.

1. Approved Recommendations from Report CW-09-15

Recommendation #1 *- Direct the Executive Director of Capital Works to include the Stormwater Infrastructure Improvements contained in Capital Works Department report CW-09-15 Table 4 at a total incremental estimated cost of $20.04M for consideration in the 2016 Capital Budget & 2017-2025 Capital Forecast.*

Action:

The following projects are included in the approved 2016 Stormwater Capital Budget & 2017-2025 Forecast, with the 2016 program underway:

Year	Project
2016-19	Tuck Creek Culverts Upgrade and Channelization (North of New Street to Spruce Avenue)
2016-21	Roseland Creek Flood Mitigation (New Street to Lakeshore Road)
2016	Stormwater Design Standards – Climate Change Study and Design Criteria Manual Update.
2015-17	Flood Mitigation Projects and Additional Projects (as listed below)

Financial details are included in the Financial Matters section, later in this report.

Tuck Creek Culverts Upgrade and Channelization (North of New Street to Spruce Avenue)

- Environmental Assessment (EA) initiated in 2015.

- EA includes recommendations to upgrade New Street, Regal Road and Spruce Avenue culverts/bridges as well as widening the creek channel to provide added flow capacity.
- EA finalized in July 2016.
- Detailed design to begin immediately after.
- Construction of Phase 1 (Regal Road culvert/bridge replacement and associated channel upgrades) projected to begin in 2017.
- Construction of Phase 2 (New Street culvert/bridge replacement and associated channel upgrades) projected to begin in 2018.
- Construction of Phase 3 (Spruce Avenue culvert/bridge replacement and associated channel upgrades) projected to begin in 2019.

Roseland Creek Flood Mitigation (New Street to Lakeshore Road)

- EA initiated in June 2016.
- EA includes review of New Street and Lakeshore Road culvert/bridges.
- EA is anticipated to be finalized in the spring of 2017.
- Detailed design to proceed in the summer of 2017.

Stormwater Design Standards – Climate Change Study and Design Criteria Manual Update

- Request for Proposals in October 2016.
- Project completion in early 2017.

Flood Mitigation Projects

The following are brief descriptions of the study outcomes:

- Brant Street @ Cavendish Drive
  - Problem – Flooding of homes and properties on Kirstie Court from the Dundas Street ditch and a drainage swale between Kirstie Court and Brant Street.
  - Mitigation – Berming to increase conveyance capacity; flood protection provided up to the Regional storm event. Overland flow route created through boulevard to Cavendish Drive.
  - Status – Construction complete.
  - Additional improvements are planned in coordination with Halton Region's future reconstruction of Brant Street/Dundas Street intersection.

- Grenallen Drive Hydro ROW
  - Problem – Undermining of ditch inlet structure due to erosion and watercourse heavily silted.
  - Mitigation – Repair of eroded area, dredging and reshaping of watercourse south of Upper Middle Road to improve stormwater flow.
  - Status – Construction complete.

- Bennett Road Hydro ROW
  - Problem – Rear yard flooding from the Hydro Corridor adjacent to the properties.
  - Mitigation – Re-grade Hydro corridor swale, cleanout ditch inlet catchbasin and install debris protection. Flood protection provided up to the Regional storm event with maintenance of the ditch inlet.
  - Status – Construction complete.

- Ingersoll Drive
  - Problem – Basement flooding due to overtopping of sidewalk into reverse-grade driveways. Contributory factors include reduced minor system capacity due to re-lining of the storm sewer under Highway 407 by 407-ETR.
  - Mitigation – Solution is to return the storm sewer under Highway 407 to its original capacity and raise the sidewalk grade in the boulevard to reduce risk of spilling into reverse-grade driveway.
  - Status – Sidewalk, boulevard and driveway have been raised to provide additional flood protection to house on Ingersoll Drive. Additional option including increasing inlet capacity will be reviewed during road reconstruction detailed design in 2017.
  - Status of 407-ETR – Design is underway by 407-ETR to re-establish the design capacity of the culvert under the highway. Construction in 2017.

- Overton Drive / Kirkburn Drive
  - Problem – Stormwater flow along Dundas Street overtopped the ditches and flooded residents to the south of Dundas Street.
  - Mitigation - Halton Region improvements made to ditch erosion protection. Additional work being done using armour stone in 2016. Berming to be provided east of Eaglesfield Drive to prevent ditch stormwater from flowing towards Kirkburn Drive.
  - Status – Construction being undertaken in the fall of 2016.

- Driftwood Park
  - Problem – Flooding of Driftwood Park as well as the properties and homes surrounding the park were caused by the collapse of a downstream storm sewer under Highway 407.

- Mitigation – 407-ETR has repaired the sewer. Detailed analysis has indicated that the storm sewer system downstream has capacity to convey the Regional Storm without causing flooding to the homes around Driftwood Park. No further flood mitigation works required.
- Status – Project complete.

- Beaufort Drive
  - Problem – Flooding of one home and several properties due to riverine spills upstream and downstream of Beaufort Drive.
  - Mitigation – Secure easements over the channel and upgrade the channel; degree of flood mitigation is contingent on the acquisition of easements and the size of channel that will be supported by residents.
  - Status – Negotiations ongoing with landowners.

- Auburn Crescent
  - Problem – Basement flooding related to minor system surcharge into reverse-grade driveways, and/or sanitary back-up. Major system grade is positive and likely not a contributing factor. August 4, 2014 storm generated peak flows that exceeded storm sewer capacity.
  - Mitigation – Residents to consider installing backflow valves, disconnecting roof leaders and ensuring local grading is directed away from the reverse grade driveways. Halton Region downspout disconnection program will benefit the sanitary system capacity.
  - Status – Following up with residents regarding mitigation measures.

- Bristol Drive
  - Problem - Sanitary sewer surcharging was the primary issue. Some stormwater basement flooding was reported in this area. Also, a low point exists on the roadway in the location where a resident reported basement flooding.
  - Mitigation – Capital Works to review the possibility of raising the sidewalk and boulevard grades. Halton Region downspout disconnection program will benefit the sanitary system capacity.
  - Status – analysis ongoing.

- Mullin Way
  - Problem - A home on Mullin Way experienced storm sewer surcharging which resulted in the heaving of the basement floor.
  - Mitigation – Lot grading was reviewed with resident. Backwater valve, disconnection of weeping tiles and installation of sump pump discussed with resident.

- Status – Mitigation actions taken by resident.

- Idlewood Crescent / Bridle Wood area
  - Problem - Both sanitary sewer surcharging and riverine flooding were reported issues in this area.
  - Mitigation - Improvements have been recommended for Appleby Creek. Halton Region downspout disconnection program will benefit the sanitary system capacity.
  - Status – The Appleby Creek EA is forecasted to begin in 2018 with construction in 2022. Halton Region's Downspout Disconnection Program is in progress.

- Hadfield Court
  - Problem – Surface and basement flooding. Further analysis required.
  - Mitigation – To be determined.
  - Status – Assessment ongoing.

- Ayr Place
  - Problem – Stormwater surface flooding related to lot drainage.
  - Mitigation – Following up with residents regarding mitigation measures.
  - Status – Ongoing.

- Itabashi Way
  - Problem – Flood waters were significant in the reported area of Itabashi Way, however analysis showed that the Itabashi Way culvert (Shoreacres Creek) is adequately sized. Local homeowners were canvassed and no home flooding was reported.
  - Mitigation – None required.
  - Status – Project complete.

- Ashland Drive
  - Reported flooding was all related to sanitary sewer surcharging in this area.
  - No further analysis by the City.

- Shoreacres Creek @ Hwy 407
  - Problem – A spill was observed to occur at the west branch of Shoreacres Creek whereby flow overtopped Highway 407 and was conveyed along the right-of-way in a westerly direction to a low

point on the highway at Tuck Creek. This may have contributed to flooding in Driftwood Park.
- Mitigation – To be determined. 407-ETR to lead and coordinate with the city.
- Status – Discussion ongoing with 407-ETR.

Additional projects (funded through previously approved Flood Mitigation Account) The following projects are either complete or underway:

- Appleby Creek erosion protection in Pinedale Park
  - Repairs to the storm outfall in Appleby Creek were completed in spring 2016.
- Shoreacres Creek @ Nelson Park Grading Improvements
  - Topographic survey completed. Detailed design for grading works to reduce flood risk currently underway.
- East Rambo Creek @ QEW Erosion Protection
  - Coordination with MTO, CN and Hydro One underway. Reconstruction of erosion protection wall required.
  - Design initiated in June 2016
  - Construction in 2017
- No. 2 Sideroad west of Guelph Line
  - Supplementary analysis to be undertaken, to augment 2008 analysis.
- Roseland Creek between Railway and North Service Road
  - Analysis to be undertaken to assess the viability for additional erosion protection and berming at the storm outlet south of the railway.
  - Topograhic survey completed. Design underway.

The following is a summary of the future works which are included in the 2017-2025 forecasted years of the approved 2016 Stormwater Capital Budget & Forecast:

Year	**Project**
2017,2019,2020	Tuck Creek Culvert Upgrades and Channelization (Rexway Drive and Rockwood Drive)
2018-22	Appleby Creek Flood Mitigation (Fairview Street to Pinedale Avenue)

2018- 23	Roseland Creek Flood Control Facility, north of QEW
2024	Falcon Creek Stormwater Management Predesign

Financial details are included in the Financial Matters section, later in this report.

Tuck Creek Culvert Upgrades and Channelization (Rexway Drive and Rockwood Drive)

- Class EA in 2017
- Detailed design in 2018
- Rexway Drive culvert upgrade construction projected in 2019
- Rockwood Drive culvert construction projected in 2020

Appleby Creek Flood Mitigation (Fairview Street to Pinedale Avenue)

- Class EA in 2018
- Detailed design in 2019
- Construction projected in 2022

Roseland Creek Flood Control Facility, north of QEW

- Proposed SWM Pond located on Leon's property.
- Location and design details to be determined
- Cost Sharing between property owner and City

Falcon Creek Stormwater Management Predesign

- Proposed SWM Pond proposed to be located upstream of currently developed section of watershed.
- Location and design details to be determined

Recommendation #2 *- Direct the Executive Director of Capital Works and Director of Finance to report back in the fall of 2015 with funding mechanism options to finance storm drainage operating and capital costs including a review of the experiences of other Ontario municipalities that have implemented a stormwater user fee and that the cost of this work estimated at $25,000, be funded from the existing balance in account SD0113 "Climate Change and Flood Mitigation Measures.*

Action:

Staff's initial research of the stormwater user fee included meeting with staff and elected officials in Waterloo, Guelph and Mississauga. From this initial assessment it was apparent that establishing a stormwater user fee is a significant undertaking and that

the circumstances and nature of such a fee are unique to each municipality. As such, it was decided that it would be best to defer future work on this to allow the focus initially to be on implementing the various structural and education/awareness recommendations arising from the August 2014 event and to revisit the question of a stormwater user fee during the next term of Council.

Recommendation #3 *- Approve the extension of a grant program to the end of 2016 to offset the cost of plumbing permit fees for the installation of backwater valves, disconnection of foundation drains from the sewer system and the installation of sump pumps for homes qualifying under the Region of Halton's Basement Flooding Prevention Subsidy Program. The recommendation of $50,000 is proposed to be funded from the Tax Rate Stabilization Reserve Fund.*

Action:

This city's plumbing permit fee grant program has continued through 2016. Since the August 4, 2014 storm, 686 plumbing permits have been issued (as of September 20, 2016).

Further financial information is available in the Financial Matters section, found later in this report.

Recommendation #4 *- Direct the Executive Director of Capital Works to report back to Development & Infrastructure Committee annually on the progress of the Flood Vulnerability, Mitigation and Prioritization program, prior to the Capital Budget approvals.*

Action:

The works described in this report are included in the 2016 Capital Budget & 2017-2025 Forecast. Cost estimates could be adjusted based on Environmental Assessments and detailed designs.

This report is the 2016 annual progress report. The 2017 annual progress report is tentatively being scheduled for the fall of 2017.

Recommendation #5 - Direct the Executive Director of Capital Works to undertake public consultation and outreach as outlined in Capital Works Department report CW-09-15.

Action:

Updates continue to be posted on the City's website at www.burlington.ca/flood as well as on:

http://www.burlington.ca/en/services-for-you/Storm-Water-Management.asp and

http://www.burlington.ca/en/services-for-you/environmental-assessments-projects.asp

The Flood Mitigation projects have been progressing well. Resident consultations and neighbourhood meetings have taken place for individual projects.

The Tuck Creek Municipal Class EA project is nearing completion. Public consultation has included written, newspaper and website notifications to residents and a Public Meeting which was held on November 30, 2015.

The Roseland Creek Culvert Upgrade Municipal Class EA project has commenced. A similar public consultation process is being undertaken and a Public Meeting is scheduled for October 6, 2016.

City staff and Conservation Halton (CH) staff worked together in presenting a Healthy Neighbourhoods Workshop on March 7, 2016. This workshop provided an overview of CH operations, City stormwater management systems and Low Impact Development concepts. Guidance from experts was provided presenting steps to create landscape and gardening plans that are low cost and environmentally friendly.

In early 2016, the city was approached by the University of Waterloo's "Intact Centre on Climate Adaptation" (ICCA) regarding the development of the "Home Adaptation Assessment Program" (HAAP). HAAP is intended to help homeowners reduce the risk of basement flooding by providing a customized site assessment and prioritized action plan consistent with best practices.

On July 4, 2016, Council approved the staff report CW-04-16 recommendation for funding of $50,000 from "SD0113 – Climate Change & Flood Mitigation Measures", to support the promotion, delivery, evaluation and progress report associated with the implementation of a 2016 "Home Adaptation Assessment Program" (HAAP) Pilot. Other sources of funding will include the ICCA, homeowners contributions and the Province of Ontario.

The 2016 HAAP Pilot will provide 500 Home Adaptation Assessments from September 2016 – May 2017 in neighbourhoods identified by the City of Burlington. The city is currently working cooperatively with ICCA and Halton Region to finalize the details of the program. The intent of the pilot is to assess the application of the HAAP under diverse home and homeowner circumstances and to ultimately make this program available both provincially and nationally. It is very important that this program be strategically coordinated with Halton Region's current Basement Flooding Prevention Subsidy Program as well as their Voluntary Downspout Disconnection Program. Staff anticipate providing a status report to committee inspring of 2017.

In addition to the initial 500 homes, ICCA is proposing to undertake a larger scale pilot program in Burlington including the assessments of between 1,500-4,000 homes, dependent on final funding approvals. This program is planned to run through 2018.

Recommendation #6 *- Approve the addition of a full-time Stormwater Management Technician position in the Development and Environmental Engineering section of the Capital Works Department who is dedicated to stormwater works including responding to lot grading and drainage concerns, at an estimated annual cost of $95,000 and report back on the net impact of the city's overall human resources complement as part of the 2016 budget.*

Action:

A new full-time staff member was hired for the Stormwater Management Technician position in the Development and Stormwater Engineering section of the Capital Works Department in February 2016. Our new staff member has contributed to the administration of various capital and flood mitigation projects, the rural culvert replacement program, minor erosion projects, the SWM Pond rehabilitation program, the Stormwater Quality pilot project, the proposed revisions to the Stormwater Design Standards and has assisted in responding to residential lot grading and drainage concerns. The addition of this new staff member has been of great benefit to delivery schedule of our projects. Allocation for this additional FTE was approved in the 2016 Operating Budget.

2. Amec Foster Wheeler – Flood Vulnerability, Prioritization and Mitigation Study

Amec Foster Wheeler provided their final report to the City in the fall of 2016. This report will be available for viewing on the City of Burlington website.

The recommendations provided by Amec Foster Wheeler were critical in the establishment of our stormwater capital infrastructure enhancement program.

3. Creek Erosion and Maintenance Operations

3.1 Creek Debris Clean-up

Council approved an additional allocation of $100,000 in the 2015 Operating Budget as a base budget increase. These funds were used to complete debris removal at a number of creek locations and to purchase equipment attachments to improve the capabilities of staff to remove debris.

In 2016, the funding will be used to address creek maintenance needs including litter and debris removal, tree cutting and minor infrastructure repairs.

Conservation Halton staff is notified of clean-up locations and are consulted on the requirements of permitting. Their involvement as a partner agency is valued in this consultation, review and approval process.

3.2 Bi-Annual Creek Inspection Program

Best management practices include regular inspection of all creeks in order to identify debris and potential creek blockages. The objectives of this inspection program are to identify debris issues that can potentially increase the risk of flooding, to identify trees with a high risk of failure resulting in obstructions in the watercourses and to prioritize debris removal locations.

A Creek Condition Inventory Survey was completed by Capital Works in late 2015. Included in this survey were visual inspections of all creeks in the urban area, identification and prioritization of all creek bank and creek bed erosion sites, identification and measurement of all erosion protection infrastructure and identification of major debris locations. This survey, in coordination with the Bi-Annual Creek Inspections has established a more comprehensive inspection program for all urban creeks. The next Bi-Annual Creek Inspections will take place in 2017 and 2019.

3.3 Rural Ditch Maintenance

As part of the 2016 Operating Budget, $100,000 was approved for rural ditch maintenance. The reintroduction of a rural ditch maintenance program will improve public safety and reduce the risk of flooding damage to public and private property by reestablishing appropriate drainage channels. Removal of trees and vegetative materials from ditches will also reduce the risk of these trees falling and blocking roads, as was the case in December 2013 ice storm.

The 2016 work plan includes an assessment of all rural ditches, prioritizing locations and developing a multiyear ditch maintenance program.

4. Private Property Drainage and Lot Grading

The Private Property Drainage and Lot Grading subcommittee of the Flood Steering Committee reviewed the city's policies and practices related to resident enquiries. The result was a series of recommendations related to developing tools for logging and tracking calls, utilizing GIS, reviewing applicable By-laws, public education and outreach programs.

Staff has developed Standard Operating Procedures for residential drainage enquiries. These procedures include the use of an MS Access database for logging in requests and for tracking the response and actions. GIS and Image Site are being continually

updated with new infrastructure and drainage data to assist in the assessments. Also, we are in the process of formatting AMANDA to aid in the administration of drainage issues.

Capital Works and RPM staff recently undertook a Business Process Management review of the response protocols for private property, road allowance drainage and creek maintenance complaints. Staff cooperatively reviewed all details related to these matters.

Also, a city-wide customer service review is currently underway. The outcome is intended to be the implementation of a Customer Relationship Management (CRM) system. This will provide staff with a system which can be utilized for tracking drainage inquiries/complaints, inspections, follow-up actions and reporting. The implementation schedule is yet to be established.

5. Burlington Community Foundation (BCF) and Ontario Disaster Relief Assistance Program (ODRAP)

Of the 314 residential claims that were reviewed, 272 were found to be eligible for funding. Final payments were made in June, 2015. Provincial funding in the amount of $1.8 million was received to support the payment of the claims along with the $896k raised by the Burlington community. This resulted in $2.7 million of assistance being paid out to those affected by the flood. In February 2016, the City received full reimbursement from the province for the Disaster Relief Committee's expenses.

In August, 2015 the Ministry of Municipal Affairs and Housing announced two new programs for Disaster Relief Assistance for Municipalities to replace the ODRAP program. A key component of the new programs is that they removed the requirement for municipal volunteers to fundraise for matching provincial assistance.

6. Coordination with Partners

Halton Region

City staff is continuing to coordinate with Halton Region staff on the following three programs:

Program #1 – Enhanced Basement Flooding Prevention Subsidy Program

Halton Region has had a Basement Flooding Prevention Subsidy Program available to all homeowners in Halton for many years to assist them in reducing their risk associated with basement flooding due to sanitary sewer surcharging.

On June 15, 2016, Halton Region Planning & Public Works Committee approved the following recommendations from staff report PW-18-16. These approved recommendations are an enhancement of the previously approved Basement Flooding Prevention Subsidy Program.

1. THAT Council approve the Phase II Targeted Downspout Disconnection Program, as set out in Report No. PW-18-16 re: "Region Wide Basement Flooding Mitigation Program".

2. THAT the current Basement Flooding Prevention Subsidy Program be enhanced, as set out in Report No. PW-18-16, including:

- a 100 per cent subsidy for downspout disconnections up to a maximum of $500 increased from the current 50 per cent;
- a 100 per cent subsidy for weeping tile disconnections up to a maximum of $5,000 increased from the current 50 per cent;
- a lateral lining and repair subsidy of 50 per cent of the cost of a private lateral repair up to a maximum of $2,000.
- a list of qualified contractors for the weeping tile disconnection subsidyprogram, as set out in Report No. PW-18-16.

City staff is assisting Halton Region in the coordination of this program as follows:

- Planning and Building Department and Capital Works Department are expediting the permit approvals process for the disconnection of weeping tiles from sanitary laterals as well as the installation of sump pumps and back water valves.
- Building Department staff is performing plumbing inspections for the disconnection of weeping tiles from sanitary laterals, installation of sump pumps and back water valves.
- Capital Works staff is inspecting and approving sump pump discharge locations on-site with the contractors.
- Since the August 4, 2014 storm, residents have not been required to pay the City plumbing permit fee for these permits. 686 plumbing permits have been issued by the City, up to the end of July 2016.
- The grants for the plumbing permit fees are being funded from the city's Tax Rate Stabilization Reserve Fund. Refer to the Financial Matters section later in this report for a summary of the funding amounts.

Program #2 - Downspout Disconnection Program

This program was initiated in the summer of 2015. Halton Region has reached out to 9,300 residents in the high priority areas of the City of Burlington, offering to disconnect their downspouts at no cost to the residents. Over 1,500 downspouts have been disconnected through the program and over 4,800 homes have already

disconnected their downspouts in the high priority areas of the City of Burlington. This downspout disconnection work will be finished by the end of 2016. Capital Works staff has been assisting as follows:

- Inspection of downspout disconnection locations to ensure no new drainage issues are being created.
- As of the end of July 2016, Capital Works staff has inspected 564 locations.
- Program completion is anticipated by the end of 2016.

Program #3 - Sanitary Sewer Improvements Program

This program was initiated in 2015 and will continue Region-wide over the next 10 years. Capital Works and Halton Region staff have been consulting to ensure this program is coordinated with the City's capital roads reconstruction and "Shave & Pave" programs.

The sanitary sewer improvements, in the high priority locations of Burlington are now complete.

Conservation Halton

In April 2015, Conservation Halton (CH), in association with Environmental Water Resources Group Limited (EWRG), finalized its "August 4th, 2014 Storm Event, Burlington" report. The report includes:

- Storm Characterization
- Flood Damage Characterization
- Watershed Response
- Recommendations

The following are CH's report recommendations. Capital Works staff is in agreement with the following four recommendations and are working cooperatively with CH to accomplish the following:

Recommendation # 1 *- An investigation should be conducted in partnership with the City of Burlington to determine what mitigation measures can be implemented to reduce future riverine flood damages along Tuck Creek upstream and downstream of New Street.*

Action*:*

The Tuck Creek Municipal Class EA was initiated last year and was finalized in July 2016. Detailed design started in the September 2016. A three year phased construction project is planned over 2017-19. CH has been closely involved throughout this project.

Recommendation #2 *- An investigation should be conducted in partnership with the City of Burlington to determine the extent of runoff diverted from Shoreacres Creek into Tuck Creek at Highway 407 ETR during the August 4th, 2014 storm event. Also, the investigation should determine what mitigation measures could be constructed to prevent or reduce any future spills from Shoreacres Creek into Tuck Creek in this location.*

Action*:*

This study is anticipated to be initiated in 2017. CH and the City will coordinate with 407-ETR regarding this project.

Recommendation #3 *- An assessment should be conducted in partnership with the Regional Municipality of Halton and the City of Burlington to inventory the number and location of telemetered rainfall and stream flow gauges within their respective networks to identify potential gaps. Expansions to the networks should be undertaken in a collaborative and coordinated manner to facilitate data sharing and enhance flood forecasting and emergency response capabilities within the City of Burlington. These improvements will help to better equip all agencies to respond to similar events in the future as more frequent short intense storms are expected as a result of a changing climate.*

Action*:*

CH staff have initiated this assessment. The City is committed to partnering with CH and Halton Region on our rainfall and stream flow gauge network.

The first action being undertaken is the replacement of the Mainway Arena rainfall gauge, which will take place in the fall of 2016.

Recommendation #4 *- Consideration should be given to updating the watershed studies for Roseland, Tuck, Shoreacres, Appleby and Sheldon Creeks in an effort to explore opportunities to reduce storm runoff rates and volumes.*

Action*:*

The watershed models for Tuck Creek, Roseland Creek and Sheldon Creek are in the process of being reviewed and updated. Shoreacres and Appleby Creeks model reviews will proceed following completion of the above projects.

In addition to the actions arising from the April 2015 report recommendations, Capital Works, RPM and Conservation Halton staff cooperatively developed new and improved authorization and permitting protocols for emergency and routine creek infrastructure maintenance works in regulated flood plains and watercourses. The result is a simplified and expedited approval process for:

1) Routine channel maintenance and debris clearing.
2) Emergency channel maintenance and debris clearing.

These protocols (see Appendix “A”) were formally adopted by Conservation Halton in September 2015. Both Conservation Halton and City staff are pleased with the improved protocols.

7. Coordination with Highway and Railway Authorities

407-ETR

i. Culvert crossing at Ingersoll Drive

407-ETR has confirmed the Ingersoll Drive culvert crossing will be modified to provide the original design capacity.Design is currently underway. A finalized design is anticipated in late 2016, with construction proceeding in 2017.

ii. Culvert crossing at Driftwood Park

407-ETR has completed extensive repairs to the storm sewer and culvert crossing at this location. The culvert pipe has been relined. According to Amec Foster Wheeler, this culvert has capacity to convey Regional Storm flows.

MTO

Staff have been meeting with MTO to discuss design and construction coordination for repair works of the QEW culvert crossings at Tuck Creek and Shoreacres Creek. MTO is planning to undertake culvert rehabilitation projects at these two locations in 2017.

Railway Authorities

60 cross culverts under railway tracks are located in Burlington. 11 agreements exist between the City and railway authorities related to these infrastructure crossings. A coordination meeting was held with CN to review these 11 agreements as well as the other 49 locations. The City and CN are working cooperatively, considering updates to these agreements and the sharing of data.

8. Infill Stormwater Design Standards

Design standards for high density and commercial/industrial infill developments continue to be a major focus for stormwater management. Controlling the 100 year post-development peak flows to the 2 year pre-development peak level provides a significant level of stormwater management to areas where it previously did not exist. The continued application of this policy will result in reduced post-development peak stormwater flows and improved storm system capacity/resilience.
In 2015, 15 major site plan developments were approved with this new stormwater management standard. In 2016, 4 site plan applications have similarly been processed.

9. Stormwater Design Standards

The city's stormwater management standards will be reviewed and the design criteria manual updated. This work is planned to begin in October 2016.

10. Stormwater Inlet/Outlet Improvements

1-2 stormwater inlet/outlet structure improvements have typically been budgeted in past years. Since July 2015, 5 storm inlets/outlets have been repaired/upgraded. In 2016, analysis and design are proceeding with 3 additional sites.

11. Updating Watershed Models

The watershed models for Tuck Creek, Roseland Creek and Sheldon Creek are in the process of being reviewed and updated.
Hager Creek and Rambo Creek watershed modelling, as well as a review of stormwater quality for the downtown area, will be initiated in the fall of 2016.

12. Institute for Catastrophic Loss Reduction (ICRL) Municipal Advisory Committee

The ICRL has initiated a municipal advisory committee to bring together representatives from Ontario municipalities, utilities and insurance companies to provide assistance and guidance to the ICLR and to help ensure that the ICLR outputs are relevant and practical and to recommend appropriate projects and project areas. The focus is to be on extreme rainfall and other hazards as relevant.

The initial meeting took place in March 2016 and discussion included:

- mitigating urban flood risk in new residential subdivisions
- mandatory lot-level measures for management of urban flood risk in existing subdivisions
- lot-level practices to control urban flood risk and mitigate basement flooding in Canada

Capital Works staff is participating in this Advisory Committee.

13. International Council for Local Environmental Initiatives (ICLEI)

Starting in the fall of 2016, staff will be participating in the "Great Lakes Climate Change Adaptation Project". This purpose of this project/partnership is:

i. To build capacity for integrating adaptation across the municipality and wider community;
ii. To carry out local vulnerability and risk assessments with internal and external stakeholders;
iii. To create a network of adaptive communities located within the Great Lakes.

This not only supports the flood mitigation work already underway, but also promotes networking with stakeholders and other municipalities and will assist in the development of additional training materials for our residents.

14. Staff Direction: SD-34-14

On September 14, 2014 Council approved Staff Direction SD-34-14 which stated:

> DIRECTION TO REPORT BACK REGARDING A BY-LAW RELATED TO DOWNSPOUTS CONNECTED TO WEEPING TILES
>
> Direct the Director of Planning and Building to report back on a By-law requiring removal of downspouts from weeping tiles as part of a more comprehensive report regarding the August 4, 2014 flood in Burlington.

With respect to this staff direction, staff has reviewed this issue. As outlined earlier in this report on pages 13-15, details are provided regarding Halton Region's Downspout Disconnection Program which is currently being undertaken in priority areas within Burlington. Staff will continue to monitor and assess this program in coordination with Halton Region staff and report back on its status and effectiveness in next year's Capital Works Flood Study Update report.

Options considered

Climate Change adaptation is a major concern for stormwater infrastructure. Council's July 2015 approval of additional stormwater capital funding and staff resources has provided added capabilities to help address these needs.

Many projects have been initiated to move Burlington forward in Climate Change adaptation. Infrastructure renewal and enhancement projects, improved creeks and rural ditch maintenance works, improved inspection procedures and additional rainfall/creek monitoring are making this possible.

Financial Matters:

Total Financial Impact

The City's plumbing permit grant program has continued through 2016. The statistics at the end of March 2016 are as follows:

Year	# of Permits Issued	Total Amount of Grants Issued
2014 (after Aug 4)	489	$176,983
2015	176	$ 60,709
2016(YTD)	21	$ 9,869
TOTALS	**686**	**$247,561**

The following projects are included in the approved 2016 Stormwater Capital Budget & 2017-2025 Forecast, with the 2016 program underway:

Year	Project	Budget
2016-19	Tuck Creek Culverts Upgrade and Channelization (North of New Street to Spruce Avenue)	$6.73M
2016-21	Roseland Creek Flood Mitigation (New Street to Lakeshore Road)	$3.60M
2016	Stormwater Design Standards – Climate Change Study and Design Criteria Manual Update.	$0.06M
2015-17	Flood Mitigation Projects and Additional projects	Funded in 2015
TOTAL		**$10.39M**

The following is a summary of the future works which are included in the 2017-2025 forecasted years of the approved 2016 Stormwater Capital Budget & Forecast:

Year	Project	Forecasted Budget
2017-20	Tuck Creek Culvert Upgrades and Channelization (Rexway Drive and Rockwood Drive)	$2.74M
2018-22	Appleby Creek Flood Mitigation (Fairview Street to Pinedale Avenue)	$2.76M
2018- 23	Roseland Creek Flood Control Facility, north of QEW	$3.70M
2020-25	Falcon Creek Stormwater Management Predesign	$0.10M
TOTAL		**$9.30M**

Public Engagement Matters:

Public engagement has been undertaken in several ways. The following provides an overview of the communications which have taken place and which are ongoing:

- Continued interaction with residents regarding lot grading, drainage and creek maintenance issues.
- City website updates
- City Talk notices for yard and creek maintenance
- Direct interaction with residents in the locations where flood mitigation projects are taking place.
    - Phone calls, emails, on-site visits, consultations and inspections
    - On-site neighbourhood meetings
    - Notice letters
- Tuck Creek Municipal Class EA project
    - letter, newspaper and website notifications
    - public meeting
- Roseland Creek Municipal Class EA project
    - Initiated in May 2016

    - Similar process to Tuck Creek Municipal Class EA
- Healthy Neighbourhoods Workshop in coordination with Conservation Halton
- Home Adaptation Assessment Program (HAAP) in coordination with University of Waterloo's Intact Centre on Climate Adaptation and Halton Region

Staff remains committed to assisting residents with stormwater drainage issues and communicating news regarding our flood mitigation works and our stormwater infrastructure enhancement projects.

Conclusion:

The above actions are providing the construction of enhanced stormwater infrastructure as well as an improved level of service in the Storm Water Drainage program. The additional funding provided by Council in 2015 has provided the city with the capability to address the concerns of Climate Change and to progress with a focused capital program that will reduce the risk of flooding in our city.

Staff are recommending to continue monitoring Halton Region's voluntary Downspout Disconnection Program and report back on its status and effectiveness in next year's Capital Works Flood Study Update report.

Staff are also recommending to extend the grant program to the end of 2017 to offset the cost of plumbing permit fees for the installation of backwater valves, disconnection of foundation drains from the sewer system and the installation of sump pumps for homes qualifying under the Region of Halton's Basement Flooding Prevention Subsidy Program and the Home Adaptation Assessment Program.

Respectfully submitted,

Cary Clark, P.Eng.

Manager of Development & Stormwater Engineering

905-335-7600 x7672

Appendices:

a. Conservation Halton Emergency Works Protocol for Municipal Infrastructure and Conservation Halton Routine Channel Maintenance Works Guide

Notifications: (if none delete section)

Name:	Mailing or E-mail Address:
Jim Harnum – Halton Region	jim.harnum@halton.ca
Kathy Menyes – Conservation Halton	kmenyes@hrca.on.ca

Report Approval:

All reports are reviewed and/or approved by Department Director, Director of Finance and Director of Legal. Final approval is by the City Manager.

Appendix A

Conservation Halton Emergency Works Protocol for Municipal Infrastructure

and

Conservation Halton Routine Channel Maintenance Works Guide

Conservation Halton

Conservation Halton Emergency Works Protocol for Municipal Infrastructure

Regional Municipality of Halton

Regional Municipality of Peel

City of Mississauga

City of Hamilton

Township of Puslinch

September 24, 2015

Table of Contents

PURPOSE

- The objective of the Emergency Works Protocol is to facilitate timely response to situations where the Municipality must take immediate action to prevent or alleviate an *emergency* situation that occurs within an area regulated by Conservation Halton.
- With this protocol in place, the Municipality can respond to *emergency* situations in a timely and appropriate manner in partnership with Conservation Halton.
- The onus is placed on the Municipality to contact all other required authorities (e.g., Ontario Ministry of Natural Resources and Forestry (MNRF); Fisheries and Oceans Canada (DFO)) *as soon as reasonably possible* in order to proceed with the necessary reviews and legislative approvals, and to take all necessary precautions to protect the environment.
- This protocol has been developed with input and advice from municipalities within Conservation Halton's jurisdiction.
- This protocol does not apply to routine channel maintenance works or other non-emergency works or activities undertaken by the Municipality nor is it intended to circumvent the permitting process under Ontario Regulation 162/06.

DEFINITIONS

As soon as reasonably possible: means where emergencies occur outside of regular work hours, due diligence must be taken in order to contact the appropriate agencies in a timely fashion (i.e., 9 a.m. the next working day, or phone message left).

Emergency: means an *unexpected situation* where there is deemed an *imminent (immediate) threat* of injury to persons, loss of life, loss of property, or damage to the environment.

Emergency work(s): means reparative works required to prevent or alleviate an *emergency* situation. In order to facilitate review by all agencies, it is recommended that temporary remediation works be proposed for immediate implementation while agencies are reviewing the ultimate design.

Imminent threat: means where injury to persons, loss of life, loss of property, or damage to the environment will occur if actions are not undertaken immediately.

Unexpected situation: means an unforeseen situation arising from a recently-occurring event, not a recognized chronic problem.

The Protocol

If the Municipality deems a situation to require *emergency work* (i.e., situations where there is an *imminent threat* of injury to persons, loss of life, loss of property, environmental damage), the following will occur:

For emergency works that are structural in nature:

1. The Municipality will arrange a site visit with CH (and other agencies as required) *as soon as reasonably possible* to assess the situation. CH will make the site visit a priority. If it is deemed that there is the potential for immediate loss of life or property, the Municipality should initiate some works prior to the site visit to make the site safe. The work that is completed will be documented and provided to CH as part of the formal Permit application for the final works.
2. On site, the Municipality and CH will decide the nature and extent of *emergency work*. CH staff will indicate what additional information is required at the site or in a follow-up email if not all CH staff are able to attend the site visit. CH will send the follow-up email to the Municipality immediately following the site meeting confirming what additional information is required and providing any conditions/advice.
3. The Municipality will carry out temporary *emergency works* to alleviate the *emergency* in accordance with the conditions/advice of CH (and other agencies as required).
4. CH and the Municipality will agree to work towards the development and approval of permanent restorative works to replace the temporary *emergency works*. The Municipality will submit formal permit applications to CH (and other agencies as required) immediately after completion of the *emergency works* for the final works (Appendix 1). Should temporary works remain in place for a significant amount of time while Municipal staff prepares the ultimate design, CH may require as-built construction drawings to be submitted with the application.

For emergency works such as the removal of debris during a storm event (not routine maintenance):

1. The Municipality will notify CH of the need to remove debris/blockages *as soon as reasonably possible*. If possible, the Municipality will arrange a site visit with CH (and other agencies as required) to assess the situation prior to any works being undertaken. On site, the Municipality and CH will decide the nature and extent of emergency work. The work that is completed will be documented and provided to CH.
2. If there is potential for immediate loss of life or property, the Municipality will initiate clean up/removal. The Municipality will contact CH *as soon as reasonably possible* to discuss actions already taken and any additional actions that may help to alleviate the flood risk. If required, the Municipality will undertake further actions as recommended by CH. The work that is completed will be documented and provided to CH.

APPROVAL REQUIREMENTS

Conservation Halton

Approvals may be required under the Development, Interference to Wetlands and Alterations to Shorelines and Watercourses Regulation (*Ontario Regulation 162/06*). Conservation Halton regulates alterations to shorelines and watercourses; development within hazard lands (flood plains, lands susceptible to erosion, valleys, dynamic beaches; hazardous sites); and allowances as specified in *Ontario Regulation 162/06*.

Development means:

- the construction, reconstruction, erection or placing of a building or structure of any kind,
- any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- site grading, or
- the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere (*Conservation Authorities Act, R.S.O. 1990, c. 27, s. 28 (25)).*

Conservation Halton has provided mapping, either in digital or paper form, to each municipality, which shows the approximate limit of the regulated area. This mapping is only a guide for preliminary screening purposes as all boundaries are approximate. The ultimate determination of the regulated limit is defined in the text of the regulation and refined through technical studies.

Fisheries and Oceans Canada (DFO)

Where the Municipality contemplates works in and around water to address an *emergency*, an authorization under the *Fisheries Act* may be required. The Municipality should contact DFO to apply for an Emergency Authorization. More information is available at http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/authorization-autorisation-eng.html.

Ontario Ministry of Natural Resources and Forestry (MNRF)

Where *emergency works* involve construction or improvements to a dam, a work permit under the *Lakes and Rivers Improvement Act O. Reg. 454/96 Section 2 (a)* may be required (see 2011 Lakes and Rivers Improvement Act Administrative Guide: https://dr6j45jk9xcmk.cloudfront.net/documents/2705/stdprod-088408.pdf). Similarly, where *emergency works* entail dredging or filling on the bed of a navigable body of water, a work permit under the *Public Lands Act under O. Reg. 335/00 as Amended, Section 2 (1) (c) and (d)* (see Crown Land Work Permits: http://www.ontario.ca/page/crown-land-work-permits). In addition, if *emergency works* are required which may impact the habitats of species at risk (including Redside Dace), a permit or authorization may be required under the *Endangered Species Act* (see How to Get an Endangered Species Act permit or authorization: http://www.ontario.ca/environment-and-energy/how-get-endangered-species-act-permit-or-authorization).

CONSERVATION HALTON CONTACTS

After business hours (between 4:00 p.m. and 8:00 a.m.), municipalities are encouraged to initiate immediate action in case of emergencies and to contact Conservation Halton *as soon as reasonably possible.* If the emergency requires coordination with Conservation Halton, staff can be contacted using the 24-hour emergency telephone number:

(289) 635-5354

Emergency contacts are listed below and can be reached during office hours.

Charles Priddle

Coordinator Regulations Program

Phone: (905) 336-1158 ext. 2276

Cell: (905) 299-5784

Email: cpriddle@hrca.on.ca

Barbara Veale

Manager Planning and Regulations Services

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The following chart has been compiled to assist municipalities in determining when routine channel maintenance works require approval from Conservation Halton (CH) pursuant to Ontario Regulation 162/06. CH can also be contacted about inquiries related to Species at Risk (SAR) pursuant to the Endangered Species Act (ESA) however approvals under this Act are issued by the Ministry of Natural Resources and Forestry (MNRF). This chart is a guideline. If uncertainty arises, consult with CH staff.

Conservation Halton no longer reviews projects for the Department of Fisheries and Oceans (DFO). Unless authorized by the Minister of Fisheries and Oceans Canada, the Fisheries Act requires that projects avoid causing serious harm to fish. This applies to works conducted in or near water bodies supporting fish that are part of or support a commercial, recreational or Aboriginal fishery. For further information, see the DFO website http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html or contact DFO at 1-855-852-8320 or email fisheriesprotection@dfo-mpo.gc.ca. To assist proponents with DFO's updated Fisheries Protection Policy Statement, CH staff offers advice to assist in mitigating impacts which may result in serious harm to fish.

Areas of Work	Description of Works	Permit Not Required	Permit Required.
Creek Channels, Inlet Structures, Outfalls to Creeks	Removal of garbage and debris dams obstructing the water flow in creek channels and removal of floating and non-floating debris against inlet structures and outfalls to creeks.	No permit is required for work carried out by hand. No permit is required for work carried out by machine, where public access to the site is used (e.g., public trail) and no restoration works are required.	A permit is required for removal by machine in an area where access and/or restoration works are required. A site visit with CH staff is recommended prior to the submission of a permit application.
Creek Channels	Removal of fallen or cutback of overgrown trees within the banks that may cause an obstruction or provide an area for debris to collect (by hand, tree stumps to remain)	No permit required.	
Inlet Structures	Removal of sediment (between 10- 20m upstream and usually undertaken with machinery). When a machine is used works should be done from the creek banks; not in the creek.		A permit is required. A site visit with CH staff is recommended prior to the submission of a permit application.
Inlet Structures Outfalls to Creeks Outfalls to Shoreline Culverts or Bridges	Minor concrete repairs (e.g., patching to the inlet structure)	To Be Determined.	To determine whether or not a CH is required, a site visit with CH staff is required. CH staff will assess whether or not a permit is required in consultation with municipal staff.
Culverts or Bridges	Stabilizing of eroding embankments by placing rip-rap or other materials at wing walls or at the inlet (and outlet) end of culverts.		A permit is required. A site visit/pre-consultation with CH staff is recommended prior to the submission of a permit application.

Conservation Halton

Operational Statement for Routine Channel Maintenance Work Not Requiring CH Approval

General

- Minimize disturbance to watercourse banks through the following measures:
  - Operate machinery on land above the high water mark [is this a good reference?]
  - Bring machinery on site in a clean, washed condition and maintain it free of fluid leaks.
  - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water (outside of the regulated area) to avoid any deleterious substance from entering the water.
  - Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
- Develop a response plan to be implemented immediately in the event of a sediment release or spill of a deleterious substance
- Minimize disturbance to riparian vegetation (riparian vegetation is important for protecting stream banks from erosion, promoting water absorption and storage, recharging groundwater reserves, regulating stream flow and thermal fluctuations, and filtering sediment and contaminants. It also provides habitat and food sources for wildlife). Use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. Minimize impacts to access routes. When practical, prune or top the vegetation instead of grubbing/uprooting.

Timing

- Time routine maintenance to protect fish and fish habitat. Adhere to provincial fisheries timing windows.
- Contact Conservation Halton for the No-Instream Construction Work Window.

Erosion and Sediment Control

- Install effective sediment and erosion control measures before starting work to prevent sediment from entering the waterbody. Inspect them regularly during the course of construction to ensure they are functioning properly. Make all necessary repairs if any damage is discovered.
- Use shrouding/wrapping/screening to trap and prevent construction materials from entering the watercourse.
- Remove erosion and sediment control materials once site has been stabilized.

Debris Removal

- Limit the removal of accumulated material (i.e., branches, other woody materials, garbage, etc.) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage.
- Remove accumulated material and debris slowly to allow water to pass and reduce the amount sediment-laden water going downstream. Gradual dewatering will also reduce the potential for standing fish in upstream areas.

Restoration

Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.