



Report to: General Committee

Meeting Date: September 18, 2017

SUBJECT: June - July 2017 Storm Events Review and Follow-up Activities

PREPARED BY: Robert Muir, Manager – Stormwater, Environmental Services

RECOMMENDATION:

- 1) That the report entitled “June-July 2017 Storm Events Review and Follow-up Activities” be received; and
- 2) That Council pre-approve the 2018 Capital Budget request, project #18273 “Flood Control Remediation – Study” in the amount of \$1,274,000 to be funded in the amount of \$1,109,000 from the Stormwater Fee Reserve and the remaining balance of \$165,000 from the Waterworks Reserve; and
- 3) That Council pre-approve the 2018 Capital Budget request, project #18281 “Sanitary System Downspout Disconnection Program – Phase 6” in the amount of \$250,000 to be funded from the Waterworks Reserve; and
- 4) That staff bring forward the corresponding Capital Budget Request Forms for each of the pre-approved projects as part of the 2018 Capital Budget process; and
- 5) That Council approve the expansion of the Phase 5 Sanitary System Downspout Disconnection Program to include additional areas in Royal Orchard Blvd/ Romfield Circuit, Willowbrook Road, Markham Village between Church St and Paramount Road to be funded from existing capital project #17221 “Sanitary System Downspout Disconnection Program – Phase 5”; and
- 6) That staff report back on a proposed interim Private Property Plumbing Protection Program including backwater valve and sump pump subsidy program for high risk areas, which will include program criteria, budget requirements, funding source and communication plan; and
- 7) That Staff be authorized and directed to do all things necessary to give effect to this resolution.

PURPOSE:

The purpose of this report is to:

- (i) Provide a summary of the June-July 2017 storm events that resulted in flooding in concentrated areas in the City;
- (ii) Provide a summary of activities undertaken and planned in response to reported flooding and erosion; and
- (iii) Obtain authorization from Council to proceed with activities to advance monitoring, analysis and design of flood risk reduction measures.

BACKGROUND:

(i) June – July 2017 Storm Events

The City experienced rainfall events on June 17th, July 7th and July 16th that were characterized by high rainfall intensities over short durations and moderate to high total storm volumes in local areas. Numerous flood reports were received including basement flooding related to storm sewer back-up, sanitary sewer back-up, and groundwater intrusion from foundation walls. Roadway and property flooding was also reported in local areas. High watercourse flow on local tributaries resulted in erosion and isolated damage to culverts/storm sewer outfalls, channel erosion lining and one private pedestrian

bridge crossing. Sewer and overland flooding was reported at the Thornhill Community Centre on June 17th and July 7th, 2017.

The following table summarizes recent storm characteristics and flood reports (as of August 2017) and compares this to the severe storm of August 19th, 2005.

Table 1: Severe Storm and Flood Report Summary

Characteristic	Storm Event			
	August 19, 2005	June 17, 2017	July 7, 2017	July 16, 2017
Rainfall Intensities (over 10 min.)	50-100 Year (191 mm/hr)	5-10 Year (126mm/hr)	25 Year (164 mm/hr)	10 Year (84 mm/hr)
Storm Volume (24 hour)	> 100 Year (113 mm)	5-10 Year (64 mm)	2-5 Year (55 mm)	5-10 Year (68 mm)
Area Affected by 100-Year Rainfall	Southern Markham	mostly West Thornhill (mid – south portion)	West Thornhill (north portion / Royal Orchard Area)	Markham Village / Cornell
Number of Flood Reports	230	40	104	207

(ii) Activities Undertaken/ Planned in response to 2017 flooding

The following activities were completed in response to the June and July storm and flooding events:

- Staff from Operations cleared debris from priority grates and inlets in advance as a result of severe weather forecasts.
- Staff responded immediately during the storm from both Operations and Environmental Services Department to clear any blockages at inlets and culvert grates and visited homes to investigate reasons of flooding.
- The Proctor Avenue culverts/storm sewer outfalls that were partially displaced were restored on a temporary basis.
- Staff worked with local councilors on developing consistent messaging and arranged for special garage pickup in the impacted areas.
- Calls and emails were directed to the Contact Centre for tracking purposes.
- Staff updated the City website to ensure information on procedures to take in case of property flooding is up to date.
- Claims have been received by City Clerks, and staff conducted site visits and is working with our insurance representative in response to the claims.

(iii) City-wide Flood Control Implementation Program

Markham has developed a Flood Control Program, a long term, City-wide initiative to improve storm drainage capacity and limit surface and basement flooding risks in urban areas. Improvements will provide a more consistent level of service across Markham and help protect both public and private property. The 30-year city-wide program will also make critical infrastructure more resilient to climate change and extreme weather.

Following the August 19, 2005 storm the City commenced a Municipal Class EA for West Thornhill and established an inter-municipal steering committee of residents, Council, staff and agencies (e.g., TRCA) to advance a program to address flooding issues. The City also initiated several wastewater system improvements including pipe upgrades and diversion to address constraints in capacity and mandatory sanitary downspout disconnection to eliminate stormwater into the wastewater system. An implementation strategy for West Thornhill storm system upgrades was approved by General

Committee on October 31, 2011 that identified phases of storm sewer improvements throughout West Thornhill, the area that was most-greatly impacted by the August 19, 2005 storm.

The 2011 implementation strategy also identified city-wide implications including the need for Municipal Class Environmental Assessment Studies in other areas affected by the 2005 storm, such as the Don Mills Channel area, and other City-wide areas with older limited drainage servicing standards (refer to Attachment “A”).

In order to minimize disturbance to local communities as a result of multiple construction projects and to provide potential value in terms of construction costs, watermain replacement and wastewater system upgrades are evaluated and completed in conjunction with storm sewer upgrades under the Flood Control Program. Watermain replacement improves the efficiency of the city’s water distribution system and improves reliability by replacing older cast iron watermain. Wastewater system upgrades can also improve flood resiliency, complementing storm sewer upgrades in areas where downspout disconnection and other inflow and infiltration control measures have limited effectiveness in reducing wet weather stresses.

Table 2 and 3 summarize the implementation status for West Thornhill and Don Mills Channel, respectively.

Most West Thornhill phases include watermain replacement as part of the storm sewer upgrade design and construction and some phases include wastewater system upgrades.

Table 2: West Thornhill Flood Control Program Project Status

Project / Phases	Status
West Thornhill	Class EA initiated in 2006, and approved in 2011
1A	Construction completed in Nov 2015
1B	Construction completed in Aug 2016
1C	Construction completed in Dec 2016
2A	Construction completed in Dec 2016
2B	Construction In Progress; Anticipated Completion June 2018
2C	Design 90% completed; Construction in 2018/2019
2D	Design 60% completed; Construction in 2019/2020
3A, 3B & 3C	Design Commenced in May 2017; Construction in 2020 - 2022

Table 3: Don Mills Channel Flood Control Program Status

Project	Status
Don Mills Channel	Class EA Study commenced in Jan 2016; Anticipated EA Study Completion April 2018; Planned Implementation 2021 - 2030

(iv) City-wide Sanitary System Downspout Disconnection Program

Markham’s Sanitary Downspout Disconnection Program complements the storm system’s Flood Control Program improvements. The disconnection program improves flood resiliency by reducing wet weather flow in sanitary sewers, helping to reduce the risk of wastewater back-ups. Program is in its fifth (5th) phase of implementation and will be expanded in 2017 to cover addition catchments affected by severe storms in 2017, and to other older servicing areas in 2018 (Phase 6) – these new and expanded phases of disconnection are recommended in this report (refer to Attachment “C”).

OPTIONS/ DISCUSSION:**Flood Assessment and Flood Control Implementation**

Staff has reviewed the reported flooding as a result of the June - July 2017 storms and determined that the majority of flooding was concentrated in areas constructed with relatively limited sanitary sewer and storm drainage design standards. Several areas have been identified for flow reduction investigation and implementation, and infrastructure upgrades as part of earlier flood risk reduction studies including the City's sanitary downspout disconnection program and storm system Flood Control Program. The City is currently constructing Phase 2B of the West Thornhill Stormwater Flood Remediation, representing the fifth (5th) stage of implementation to improve storm sewer system capacities in West Thornhill, and has initiated Phase 5 of the downspout disconnection program that has identified and mitigated excess sanitary system wet weather flows in various sewer sheds across the City.

June 6th and July 17, 2017 Storm Events

The June 17, 2017 storm flood reports were primarily in the West Thornhill - Phase 3 and Phase 4 areas and the July 7, 2017 storm flood reports were primarily in the West Thornhill - Phase 4 areas, with isolated flooding City-wide. Following the August 19, 2005 storm, sanitary sewer flood risk reduction activities were completed in parts of these areas including sewer diversions and upgrades, as well as sanitary downspout disconnection and sewer lining in the highest sanitary inflow and infiltration areas. Isolated flooding was reported in the Willowbrook Road area during the July 7, 2017 storm as well. Watercourse erosion resulted in isolated damage to infrastructure, including the Proctor Avenue culvert/storm sewer outlet where several outlet pipe segments were displaced as a result of the storm's high flows in the Phase 2B implementation area. The storm sewer outlet structure in Woodland Park (i.e., Pheasant Valley Court outlet in Phase 3 area) was also compromised by high flow rates in the receiving channel to the West Don River Tributary.

July 16, 2017 Storm Events

The July 16, 2017 storm flood reports were primarily in the Markham Village area with isolated flooding City-wide. The Markham Village area has been identified as a future storm sewer upgrade area in the City's Flood Control Program. Watercourse erosion due to high runoff rates resulted in an isolated bank failure on Milne Creek, and damage to channel rock lining and a private bridge crossing on Exhibition Creek.

Staff response to 2017 Flooding

In order to address flood risks identified as a result of the June 17th, July 7th and July 16th, 2017 storms the following activities are recommended:

- (i) Continue with Phase 3 West Thornhill Stormwater Flood Remediation design as awarded in May 2017;
- (ii) Continue with restoration at erosion sites on Milne Creek and Exhibition Creek under the existing 2017 Erosion Restoration Program for unplanned repair sites as part of existing account #17194 "Erosion Restoration Program";
- (iii) Continue with project #17200, "Watercourse Management Study" on dam safety evaluations for Toogood Pond Dam;
- (iv) Design permanent restoration and upgrade the culvert outlet structure of the Proctor Avenue culvert to increase long-term erosion resilience (i.e., construct headwall structure and outlet channel) as part of Phase 2B design contingency and request the replacement through Phase 2C implementation as part of the 2018 capital budget process;
- (v) Design replacement of storm sewer outlet structure at Woodland Park as part of Phase 3 design contingency and request replacement through Phase 2C implementation as part of the 2018 capital budget process;

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- (vi) Advance the West Thornhill Flood Control Implementation – Phase 4 Design to 2018 from 2019 and integrate sanitary sewer upgrades considering capacity or condition upgrade requirements. Project will be requested through the 2018 capital budget process;
 - (vii) Advance the technical studies to identify storm and sanitary infrastructure improvements in Markham Village and Unionville areas from 2027 to 2017 including functional design and Class Environmental Assessment studies, as required in identified flood clusters. The EA study is anticipated to take 2-3 years to complete and will coordinate stormwater drainage, sanitary sewer and watermain replacement needs.
 - (viii) Expand the 2017 Sanitary System Downspout Disconnection Program - Phase 5 area to include remaining West Thornhill Phase 4 stormwater implementation area, adjacent Willowbrook Road and Markham Village Church Street and Paramount Road areas. The work is to be fund through existing account #17221 Sanitary System Downspout Disconnection Program – Phase 5;
 - (ix) Initiate 2018 Sanitary System Downspout Disconnection Program in Markham Village and Unionville areas;
 - (x) Develop an program to isolate private properties from sewer back-up through the use of protective plumbing measures (e.g., backwater valves and, where required, foundation drain disconnection/sump pump installation) in areas with isolated flooding or where long-term system capacity upgrades may not be implemented for several years, including eligibility requirements and retroactive subsidy amounts for approved risk reduction measures.

In order to address flood risks in isolated flooding areas where large-scale infrastructure improvements are not required and where implementation of improvements may be phased for construction over several years, City staff will develop a Private Property Plumbing Protection Program to assist in reducing property flooding risks by isolating properties from storm sewer and sanitary sewer back-ups. The details of the program including the type of acceptable protection measures, permitting requirements, subsidy amounts, and eligibility criteria will be developed in fall 2017 with a target implementation date of Q2, 2018 if approved by Council. Typical protection measures may include sanitary sewer line backwater valves, foundation drain isolation via sump pumps or backwater valves, or measures to improve the reliability and resiliency of plumbing protection measures, e.g., back-up power for sump pump systems. It is expected that the program will be offered on an interim basis and that retroactive subsidies for eligible measures would be considered subject to criteria, including securing of necessary building permits, and necessary documentation, etc. Staff will report back on the Private Plumbing Protection Program in Q1, 2018.

FINANCIAL CONSIDERATIONS AND TEMPLATE:

Flood Control Remediation – Study (City-wide) was part of the original scope work, when setting the stormwater fees in 2014 and the study has been advanced due to recent flooding.

Staff are requesting the pre-approval of the following 2018 Capital Budget requests:

- (i) Project #18273 “Flood Control Remediation – Study” in the amount of \$1,274,000 to be funded in the amount of \$1,109,000 from the Stormwater Fee Reserve and the remaining balance of \$165,000 from the Waterworks Reserve.
- (ii) Project #18281 “Sanitary Sewer Downspout Program – Phase 6” in the amount of \$250,000 to be funded 100% from the Waterworks Reserve.

The Department will submit individual capital budget forms for each pre-approved project identified above as part of the 2018 Capital Budget process.

HUMAN RESOURCES CONSIDERATIONS

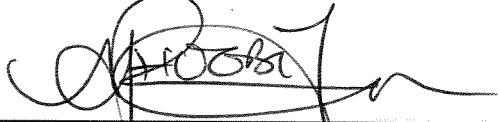
Resources are available within the affected Departments for ongoing programs. Additional resources to support advanced studies (Markham Village and Unionville will be identified in 2018 budget requests).

ALIGNMENT WITH STRATEGIC PRIORITIES:

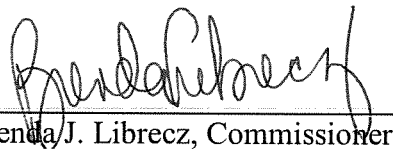
This project aligns with the Building Markham's Future Together Strategic Plan, improving the areas of Managing our Growth, Protecting our Environment and Excellence in Municipal Services. Improving flood resiliency through advancing and expanding programs to areas affected by recent flooding extensive and long-lasting economic and environmental benefits which include reduced property damage due to flooding, reduced inflow and infiltration into the sanitary sewer system, reduced energy costs for sanitary sewer pumping and treatment, enhanced ground water recharge, and water conservation, and reduced sanitary sewer overflows to receiving waters.

BUSINESS UNITS CONSULTED AND AFFECTED:

The Finance Department has been consulted and provided input and reviewed this report.

RECOMMENDED BY:

Phoebe Fu, M.Eng., P.Eng., PMP
Director, Environmental Services



Brenda J. Librecz, Commissioner
Community & Fire Services

ATTACHMENTS:

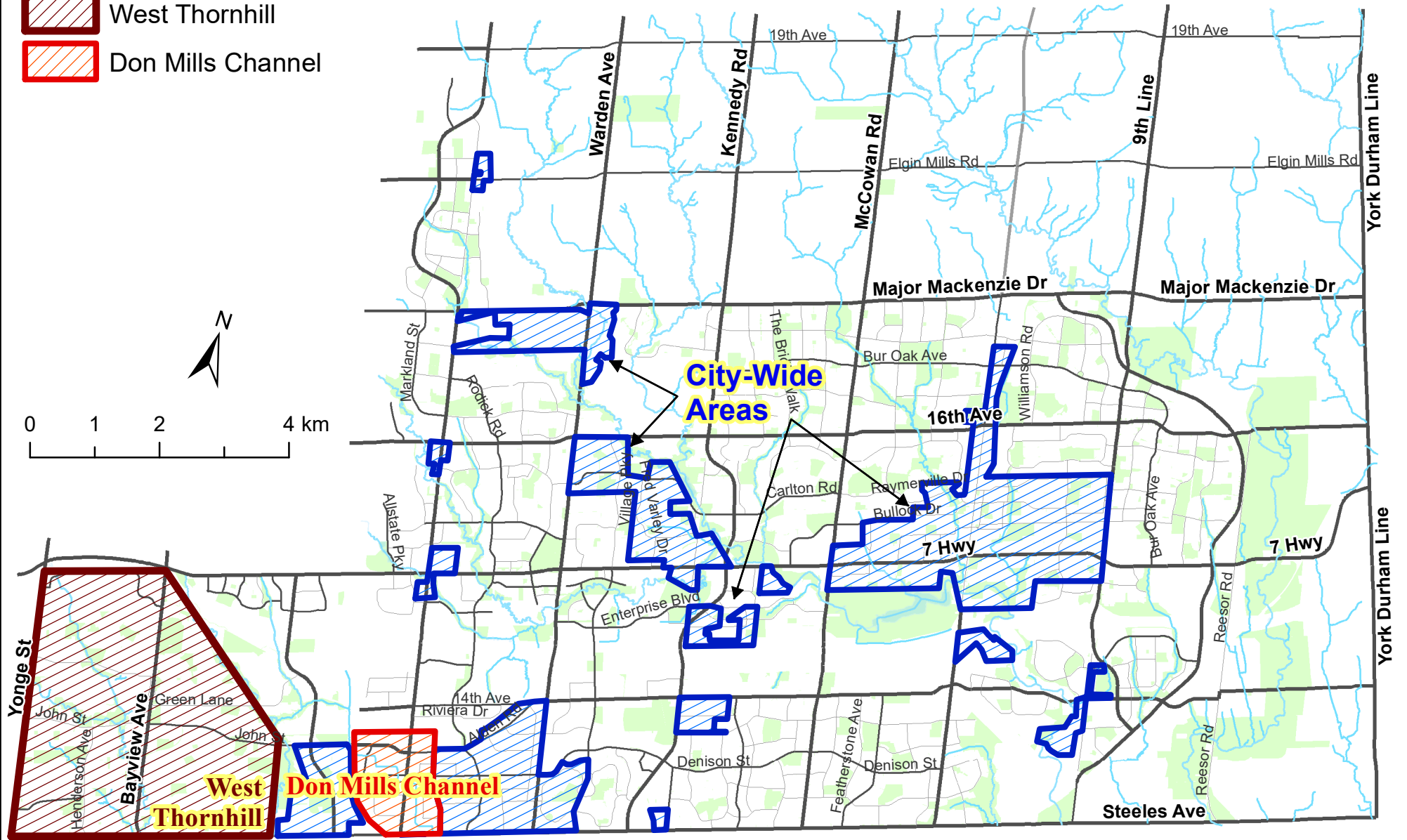
Attachment "A" – City-wide Flood Control Program Areas

Attachment "B" – West Thornhill Flood Control Implementation Phases

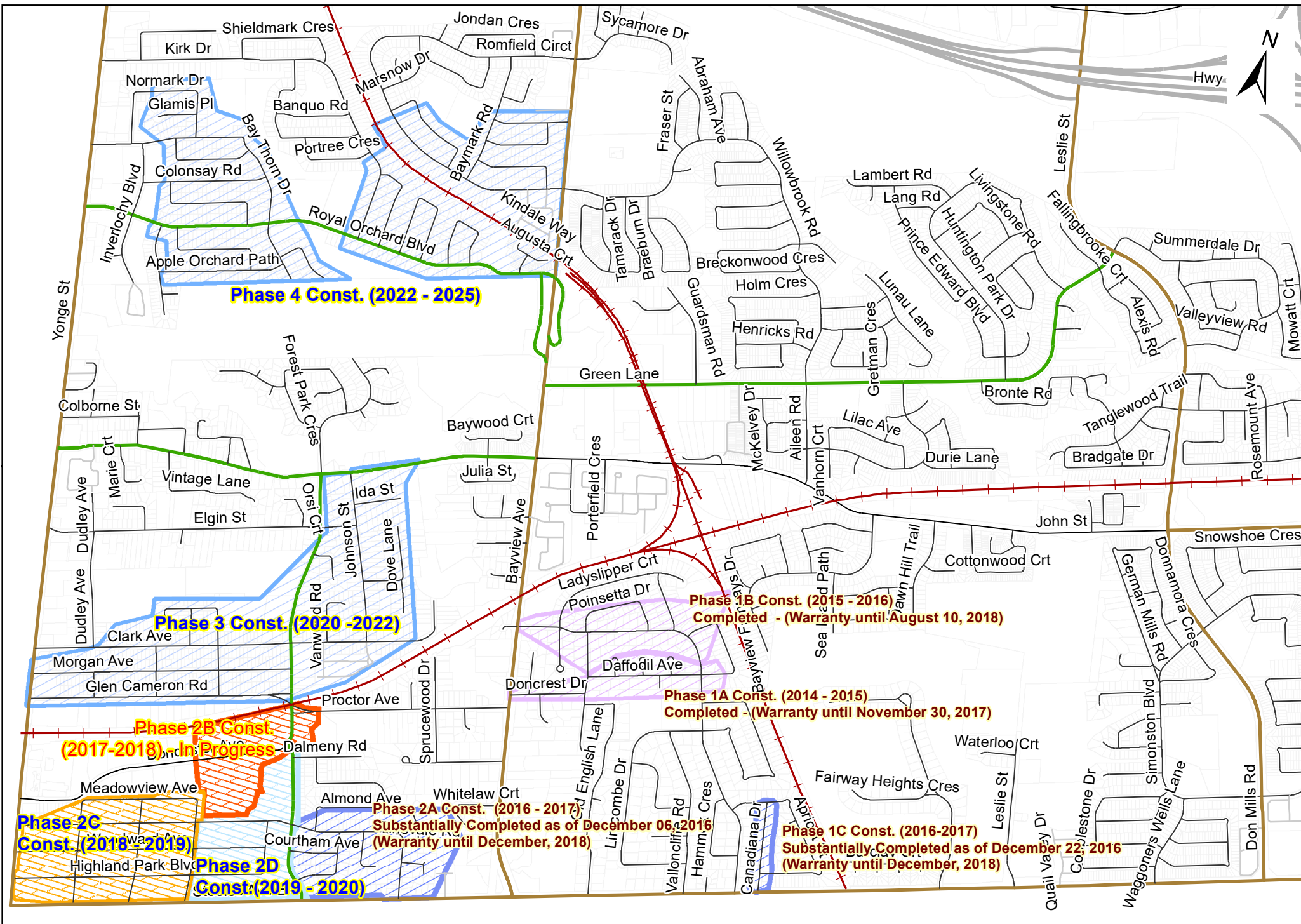
Attachment "C" – Sanitary System Downspout Disconnection Program Phases

Flood Control Program Areas

-  City Wide Areas
-  West Thornhill
-  Don Mills Channel








ATTACHMENT "B" - WEST THORNHILL FLOOD CONTROL IMPLEMENTATION - PHASES



ATTACHMENT "C" – SANITARY SYSTEM DOWNSPOUT DISCONNECTION PROGRAM PHASES

Program - Areas

-  Phases 1-4 (Completed)
-  Phase 5 - 2017 (Existing Scope)
-  Phase 5 - 2017 (Expansion)
-  Phase 6 - 2018 Markham Village & Unionville
-  Developer Funded I & I Reduction Areas

