APPENDIX

D

CLASS EA DOCUMENTATION

NOTICE OF STUDY COMMENCEMENT

GLYNNWOOD TRIBUTARY AREA STORM SEWER SYSTEM CLASS ENVIRONMENTAL ASSESSMENT

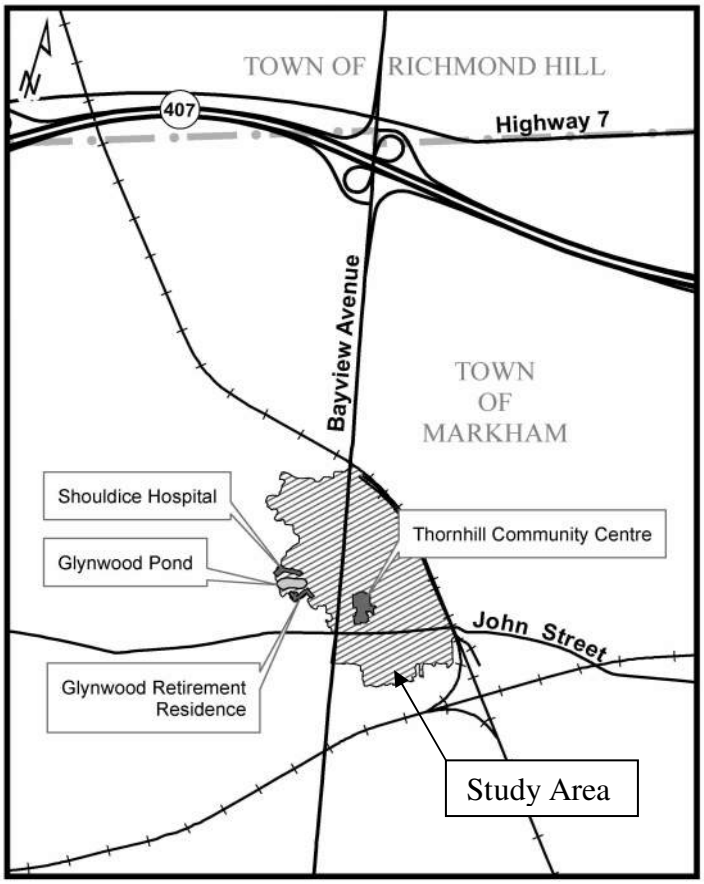
The Town of Markham is currently undertaking a Class Environmental Assessment (EA) of the Glynnwood Tributary area storm sewer system within the study area shown in the map.

The study has been initiated to address flooding issues that have occurred during intense rainfall events in the vicinity of Thornhill Community Centre on Bayview Avenue between John Street and Green Lane. The study also encompasses the existing Glynnwood Pond, located near the northwest corner of John Street and Bayview Avenue, which acts as a local drainage destination for storm runoff.

The study will follow the requirements set out in the Municipal Class EA document (amended 2007). It will define the problem, consider and evaluate alternative solutions, assess impacts of the proposed solutions, and identify measures to reduce any adverse impacts due to surcharging of the storm sewer.

The public will have the opportunity to participate through attendance at Public Information Centres that will be scheduled as the study proceeds.

For further information on this project, or if you wish to be put on the study mailing list, please contact:



Mr. Eugene Chen, P. Eng
Project Manager
Town of Markham
101 Town Centre Boulevard
Markham, Ontario
L3R 9W3
Phone: (905) 477-7000, ext 2451
Fax: (905) 479-7773

e-mail: echen@markham.ca

Mr. William Heywood, P. Eng
Consultant Project Manager
GENIVAR Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario
L3R 5K3
Phone: (905) 475-7270, ext. 18685
Fax: (905) 45-5994

e-mail: william.heywood@genivar.com

GENIVAR

MEETING SUMMARY

Glynnwood Tributary Sewer Surcharge Environmental Assessment
Project Progress Meeting #4

Date:	June 12, 2012	**Project:**	121-15461-00
Time:	1:30 p.m.	**Location:**	TRCA Office, Rouge Boardroom
Attendees:	Eugene Chen (EC)		Town of Markham
	Suzanne Bevan (SB)		TRCA
	Leslie Percy (LP)		TRCA
	Harsha Gammanpila (HG)		TRCA
	Dan Hipple (DH)		TRCA
	William Heywood (WH)		GENIVAR Inc.
	Mario Conetta (MC)		GENIVAR Inc.

Purpose: Meeting with TRCA staff to discuss need for terrestrial / fishery inventories

Distribution: All in attendance

Prepared By: Mario Conetta

Checked By: William Heywood

The following meeting summary is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

1. Background

EC provided a brief background overview for this Schedule B, Class EA undertaking. He noted that this study has been initiated to investigate the occurrence of flooding at the recreational centre and library in the plaza east of Bayview Ave and also the Glynnwood residence on the south side of the Glynnwood Pond. He added that a previous study had been completed by another consultant but it investigated only three (3) alternatives and did not include the EA process.

EC also stated that the restoration of the Glynnwwod Pond, which TRCA has already issued a permit, is a separate project and deals with removal of accumulated sediments in the pond and stabilizing some areas at the edges of the pond. The construction for the restoration work will commence on July 3, 2012 and should be completed by mid-August 2012. The Town's project manager during the construction will be Daniel Chiu.

2. Alternative Remedial Measures

WH distributed handouts showing five (5) alternative remedial measures proposed to alleviate the flooding problem. He then proceeded to explain the concept related to each alternative. He also added that although an assessment of the alternatives has not been completed, at this time the preference appeared to be the diversion of the flow to the Glynnwood Pond. Concerns were raised about the capacity of this pond to handle the water quality control for the existing storm sewer system draining from the north-eastern part of the sewershed area.

WH noted that if the Glynnwood Pond is to be considered for water quality control, an orifice will need to be drilled into the existing outlet structure to maintain the permanent pool level at a lower elevation and provide extended detention storage for water quality /

quantity control. He added that no remedial measures are expected to be undertaken downstream of the pond.

3. Fishery and Terrestrial Inventories

MC pointed out that since the restoration work for the Glynnwood Pond will be in July /August 2012 he did not see the need to conduct a fishery inventory as the existing condition will be disturbed. LP responded that TRCA will not require a fishery inventory but a fish rescue plan. It was noted that Stantec will be preparing the rescue plan and that could be made available to GENIVAR through EC. Furthermore, the GENIVAR fishery biologist can be on-site for a short period of time when the rescue plan is being implemented to better understand the requirements. WH replied that he will inform the GENIVAR biologist.

Action: E. Chan / W. Heywood

With respect to the terrestrial inventory, LP noted that only a general inventory needs to be conducted of the area to develop a species list. WH replied that he will inform the GENIVAR biologist of this requirement.

Action: W. Heywood

4. Next Meeting

Following the meeting with TRCA staff, a short meeting was held between the Town and GENIVAR to discuss other project matters. It was decided that the next project progress meeting will be held in mid-July 2012. EC and WH will decide on specific date and time for the meeting.

Action: W. Heywood / E. Chan

Meeting adjourned at approximately 3:00 p.m.

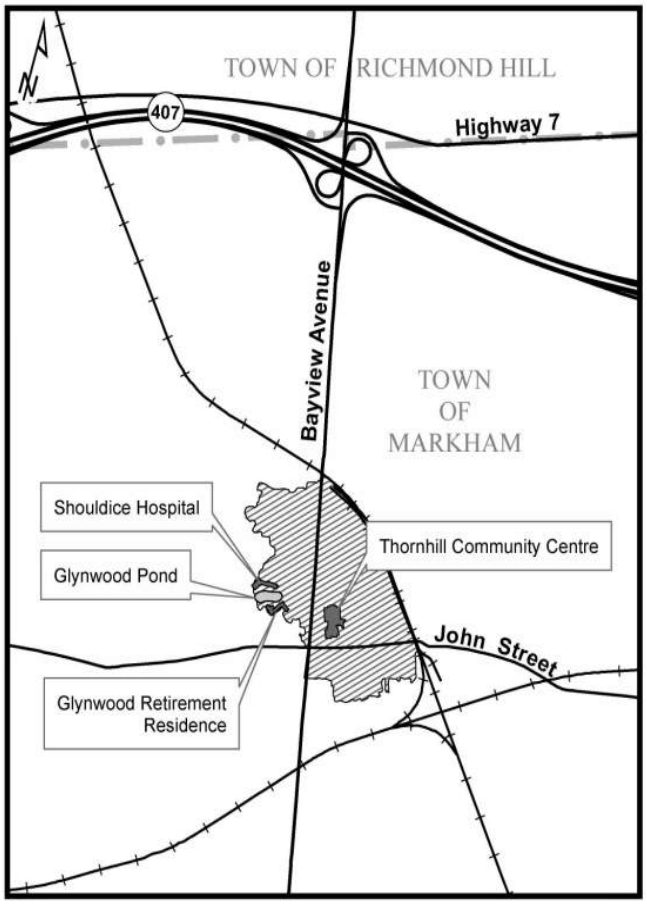
End of Meeting Summary

PUBLIC OPEN HOUSE

GLYNNWOOD TRIBUTARY AREA SEWER SURCHARGE AND GLYNNWOOD/SHOULDICE POND CLASS ENVIRONMENTAL ASSESSMENT

The City of Markham is currently undertaking a Class Environmental Assessment of the Glynnwood Tributary area storm sewer system to assess the potential solutions for the existing flooding problems in the Thornhill Plaza area. The flooding issues that have been identified occur in the vicinity of Thornhill Community Centre and the Glynnwood Retirement Residence on Bayview Avenue between John Street and Green Lane, specifically during intense rainfall events.

The study will also identify potential measures for enhancing the stormwater runoff water quality issues of the storm runoff and the impact on Glynnwood Pond. This study has assessed the need and justification for alternative solutions to alleviate the existing flooding, identify the effects on the environment and determine the preferred alternative. The study is following the Schedule 'B' Municipal Class Environmental Assessment (2007) process.



Please join us for our Public Open House to find out about the flooding and impacts of water quality in the study area, and learn more about our study approach and alternative solutions. You will have an opportunity to speak one-on-one with project staff, and view displays. Drop in anytime between 6:30 p.m. and 8:30 p.m. Details are as follows:

Date: **November 1, 2012**
Time: **6:30 p.m. to 8:30 p.m.**
Location: **Thornhill Community Centre**

Need More Information?

Contact us to be placed on the mailing list for future updates:

Mr. Eugene Chen, P. Eng
Senior Capital Works Engineer
City of Markham
101 Town Centre Boulevard
Markham, Ontario
L3R 9W3
Phone: (905) 477-7000, ext 2451
Fax: (905) 479-7773
e-mail: echen@markham.ca

Mr. Will Heywood, P. Eng
Consultant Project Manager
GENIVAR Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario
L3R 5K3
Phone: (905) 475-7270, Ext. 18685
Fax: (905) 45-5994
e-mail: william.heywood@genivar.com

Glynnwood Flood Study
Public Information Centre
November 1, 2012

NAME	Address	Contact Information	Comments
Sharon Stuart	112 Bowman Way	905-887-0378	
Wing Morse	205 Hendrecar	morsewi@rogers.com	- electronic copy please.
Valerie Burke	City of Markham		
Daryl Urquhart	5 Headdice Hospital		
Tim Wansbrough	Glynnwood		
Toinette Bezant	Bayview Glen Residents Association	bayviewglen@yahoo.ca	- Electronic copy - Budget - Capital - Reserves?
Evelyn Ellison	Ward One Thornhill Residents	VP@thornhillwardone.com	

Welcome

Investigation of Flooding and Stormwater Runoff Quality Control Glynnwood Tributary Area (Bayview Ave. / Thornhill Square Area)

Public Information Centre
November 1st, 2012

View displays and discuss the study with project staff

Feel free to ask questions and fill out a comment sheet

MARKHAM

Purpose of Tonight's Meeting

- Provide background on the study purpose and objectives.
- Present information on the causes of surcharging and the impacts of stormwater runoff.
- Present possible alternative solutions and criteria for evaluating the alternatives.
- Present the recommended Solution
- **Hear from you!** Your input is very important.
- Outline the next steps in the study process.

MARKHAM

Purpose of Our Study

- Examine existing stormwater drainage systems and identify the causes of basement flooding and/or surface flooding (severe ponding on streets during extreme storms).

- Assess control measures to improve the quality of stormwater surface runoff as per the City's Master Plan.

- Make recommendations to:

  - Reduce the risk of future flooding for Thornhill Square, Thornhill Community Centre and the Glynnwood Retirement Residence; and,

  - Improve the quality of stormwater runoff before it is discharged to the Pomona Mills Creek tributary.

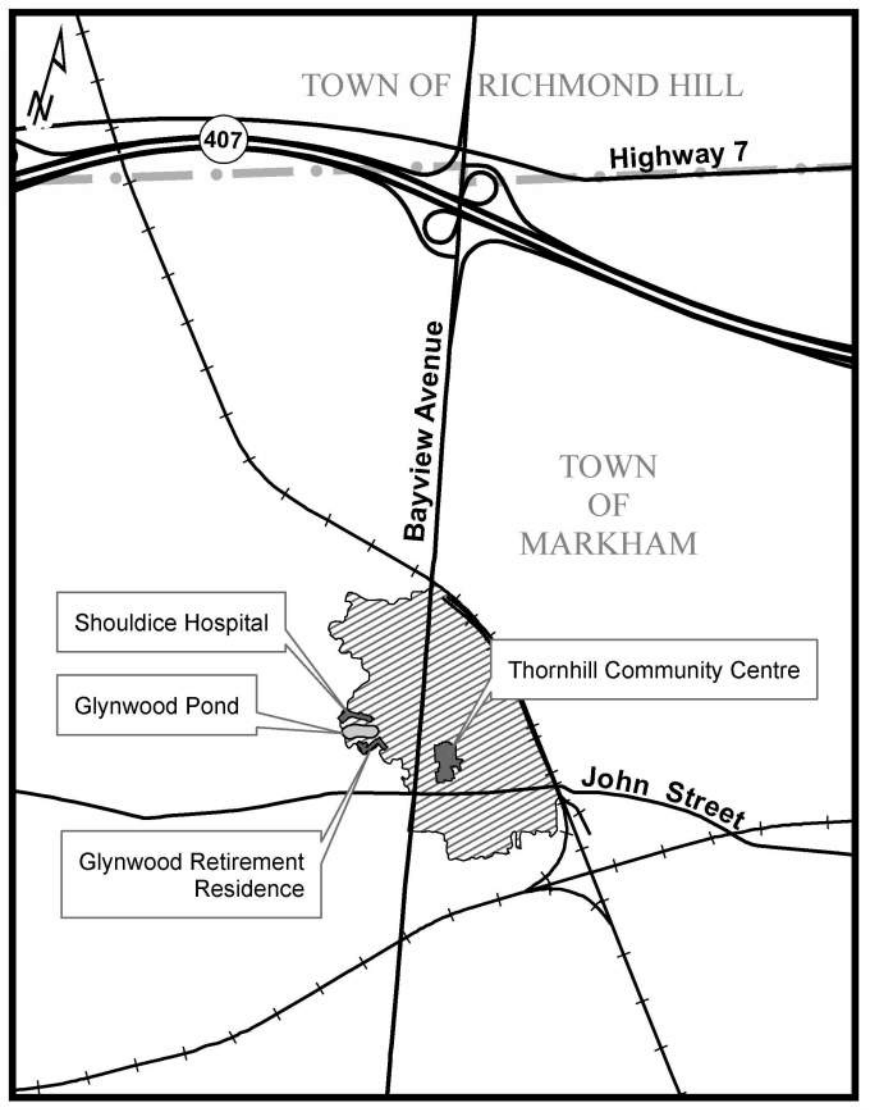
MARKHAM

Glynnwood Study Area

- The Glynnwood Flood Study Area is located in the area east and west of Bayview Ave., bounded by John St. to the South, Green Lane to the North, including the lands west of the CNR embankment, Thornhill Square, Shouldice Hospital and the Glynnwood Retirement Residence and the associated Glynnwood Pond.

- This area has been subject to surface flooding incidents during major historical storms as well as basement flooding within the Thornhill Community Centre and Glynnwood Retirement Residence.

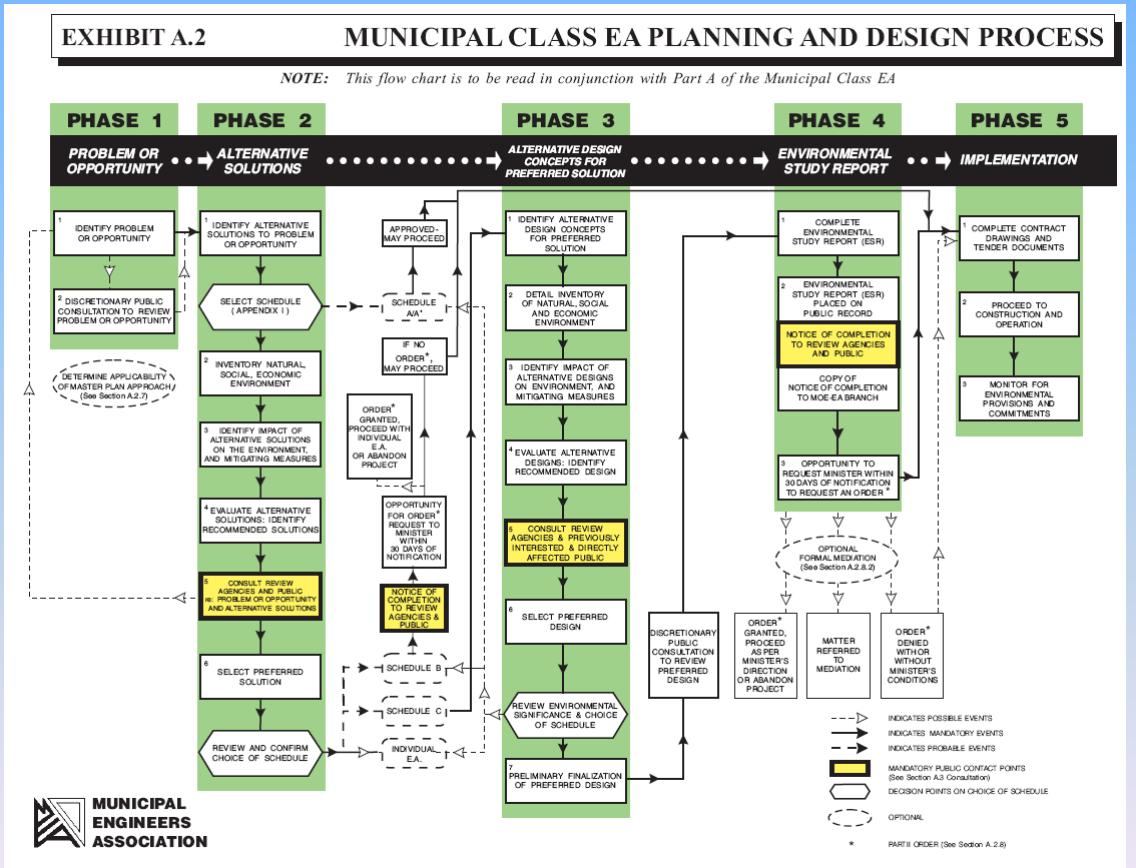
- Drainage from the contributing area drains either to the Glynnwood Pond or is conveyed via the Glynnwood Retirement Residence access road directly to the Tributary of Pomona Mills Creek, immediately downstream of the Glynnwood Pond.



Municipal Class Environmental Assessment (EA) Process

- The City of Markham must follow the Municipal Class Environmental Assessment (EA) process to meet the requirements of Ontario's EA Act for all infrastructure projects.
- The EA Act requires the "protection, conservation and wise management of the environment" while undergoing infrastructure enhancements.
- The EA process is also an opportunity for the public and agencies to provide input throughout the project.

This is a Schedule B Class EA study. It will complete Phases 1 and 2 of the Class EA process.



The Steps Involved in Our Study

Numerous steps are involved in the study before solutions can be recommended. This work includes:

- Collect and review background data on land use, population, soil conditions, storm drainage systems, flooding history, and operation / maintenance records;
- Conduct field surveys to identify the topographic constraints associated with proposed relief sewer and overland flow routes;
- Update the existing computer models to:
  - analyse the causes of flooding and to predict flows under various design storm events, and;
  - assess the impacts of stormwater runoff on water quality in Pomona Creek;
- Develop alternatives to address the issue of flooding in the study area, and improve stormwater runoff water quality before discharging to the Pomona Mills Creek Tributary;
- Present recommended solutions (Public Information Centre);
- Gather input from the community and review agencies and undertake further assessment and refinement of recommended alternative; and,
- Finalize the EA document based on input from the public and agencies.

MARKHAM

Our Findings on Flooding

Under normal rainfall events, the storm sewer and overland flow systems operate as designed. However, during extreme storms, the following takes place:

- Stormwater flow exceeds the storm sewer capacity and overloads the system, which is designed for the 5 year design flows.
- Water remains on the surface and flows along roads, channels and driveways, as well as ponds in parking lots.



- Water accumulates (ponds) on the surface at low lying areas and enters the sewer system. Where flows exceed the sewer's 5 year design capacity this can cause the sewers to surcharge and backup into basements/ underground garages (as occurred at the Thornhill Community Centre and Glynnwood Retirement Residence).
- Overland flows from the major system along Bayview Avenue, and Thornhill Square spill down the driveway access ramp to the underground parking and pathways within the Glynnwood Retirement Residence and backing up into ground floor units.

MARKHAM

Our Findings on Flooding

Thornhill Square Flooding

- During heavy rains, flows in excess of the internal storm sewer capacity pond in the parking lot;
- Surcharging of the sewers has historically resulted in the Thornhill Community Centre experiencing surcharging at the basement level of; and
- Storm flows in excess of the parking lot ponding spill to Bayview Avenue.

Glynnwood Retirement Home Flooding

- During heavy rainfall events, the flows captured by the sewer system contributing to the Glynnwood outlet sewer exceed the 5 year design capacity of the existing system;
- The major overland flow route from north and south along Bayview Avenue and overland flows from Thornhill Square spill down the Glynnwood Retirement Residence access road/City easement to the Pomona Creek tributary; and
- Due to local grading issues at the entrance to the upper parking lot some of these flows divert through the upper parking lot entrance with some flows spilling down the underground parking access to flood the basements/ground floor apartments.

MARKHAM

Our Stormwater Runoff Quality Findings

- There is currently no stormwater runoff quality control provided within the southern catchment except for the local controls provided for the Townhouse Development immediately east of the Thornhill Square.

- For the northern catchment the Glynnwood Pond does provide some stormwater quality control associated with the natural settlement of sediment for storm flows discharging to the upper pond through Shouldice.

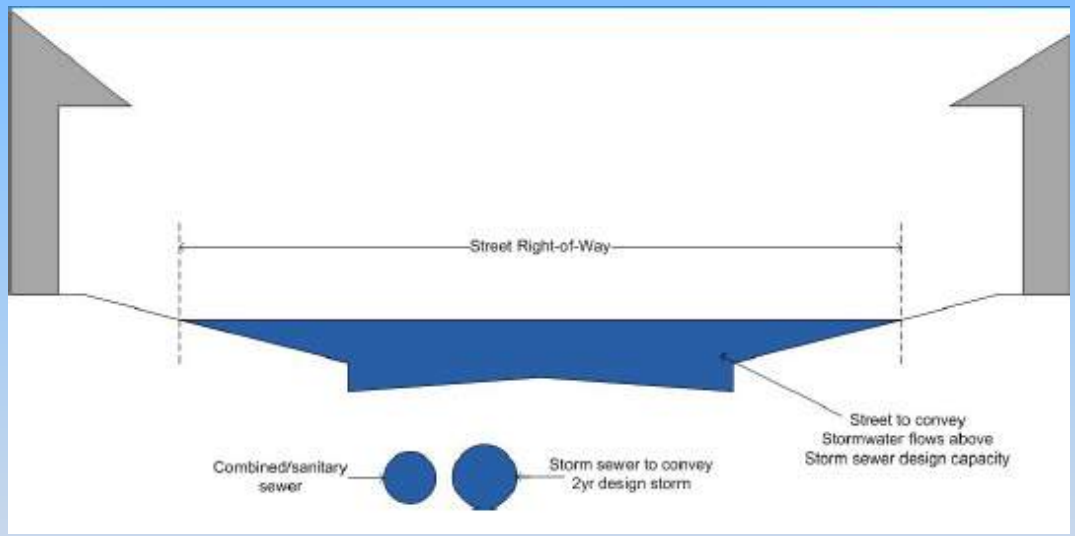
- Stormwater runoff often contains grit, oil/grease, heavy metals (zinc, lead, etc.), bacteria, nitrates / sulfates, salt and other pollutants.

- Pollutants in the stormwater runoff adversely impact the water quality of the receiving watercourse, which affects fisheries, wildlife, recreational uses, visual aesthetics, etc.

MARKHAM

Storm Drainage System

- Storm sewers (minor system) convey up to 1 in 5 year storms.
- Streets (major system) convey major storms that exceed the storm sewer capacity.
- Temporary ponding on streets and parking lots is expected during major rain storms.



Design Standards:

- Water level in the sewer is below basement elevation.
- Street flow depth should not exceed the street right-of-way limits.
- Parking lot ponding not to exceed 0.3m depth.

MARKHAM

Potential Solutions – Conveyance Control

Options being considered in the study areas include:

Replacement of existing storm sewers

Adding new sewers (Twinning)

Existing storm sewers with inadequate capacities to convey the required flows are replaced with larger pipes.

Existing sewer pipes remain in place and another sewer pipe is installed in parallel to provide additional flow capacity.

These options help to reduce the risk of basement flooding.

MARKHAM

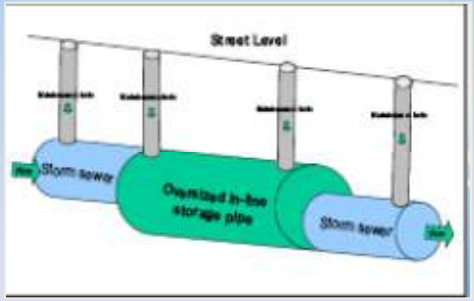
Potential Solutions – End of Pipe Control

Options being considered in the study areas include:

Underground Storage Tanks/Shafts

Parking Lot Storage

Oversized Pipes



Temporary storage of flows can be provided underground by using tanks/shafts or oversized pipes, or on the surface using depressed areas of parking lots. Once there are adequate flow capacities in the sewer systems, the flows from these storage facilities will be gradually released.

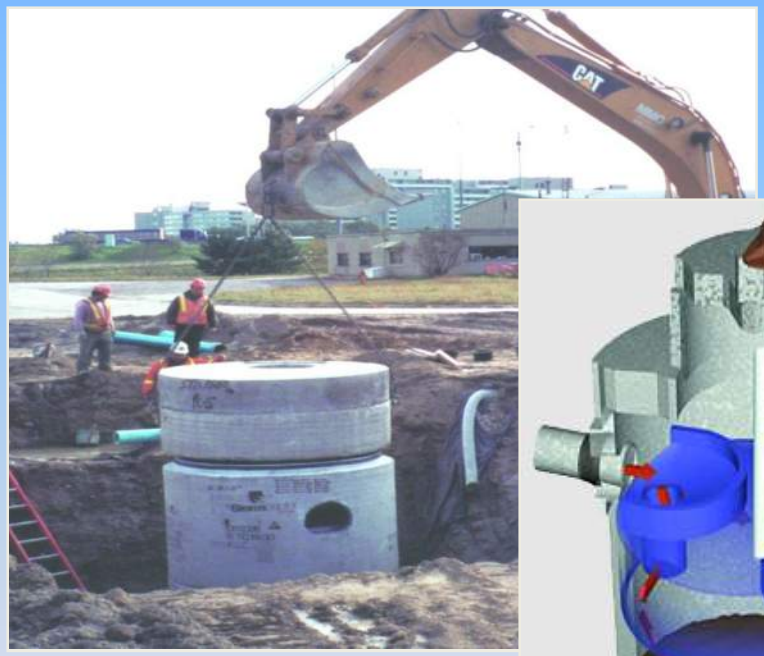
These options help to reduce the risk of sewer surcharging and basement flooding. Underground storage tanks or shafts also provide treatment for stormwater through settling.

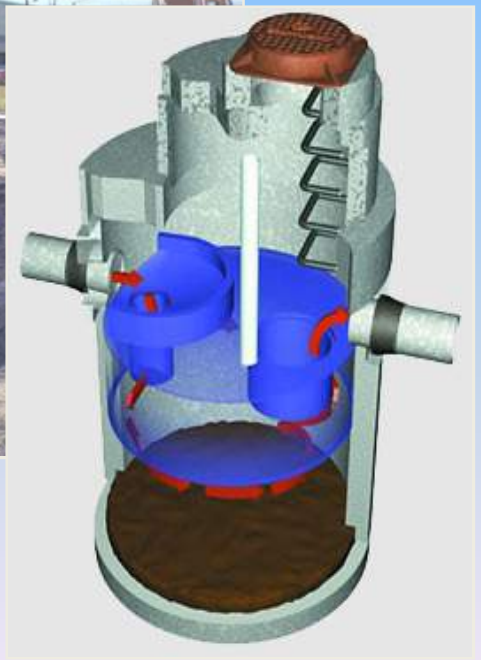
MARKHAM

Potential Solutions – End of Pipe Control

Options being considered in the study areas include:

Oil/Grit Separator





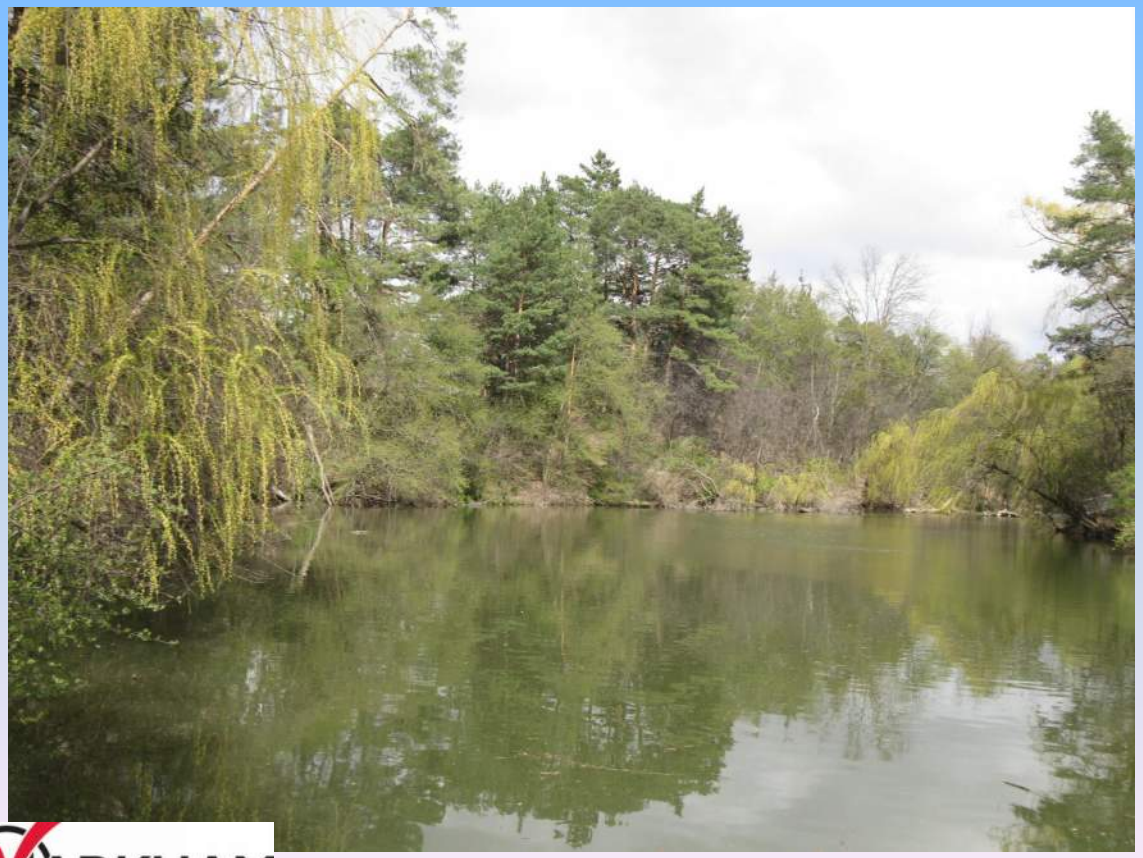
An oil / grit separator is an underground structure connected to the storm sewer to improve stormwater quality by removing contaminants from the stormwater such as grease, oil, mud, sand and trash.

MARKHAM

Potential Solutions – End of Pipe Control

Options being considered in the study area include:

Modify Existing Wet Pond Outlet to provide Extended Detention Control



Wet ponds are basins that have a permanent pool of water throughout the year to store runoff during and after storm events. They treat and filter stormwater runoff through settling and through nutrient uptake by plants and other aquatic organisms.

MARKHAM

Potential Solutions

Options being considered in the study area include:

- Flood Control Options
  - Do Nothing.
  - Underground storage in Thornhill Square & relief sewer along existing easement on Glynnwood Access Road for excess flows.
  - Relief Sewer conveying excess flows along existing easement on Glynnwood Access Road.
  - Diversion Sewer conveying low flows direct to Glynnwood Pond, excess flows using existing sewer combined with overflow to Glynnwood Pond.

MARKHAM

Potential Solutions

Options being considered in the study areas include:

- Stormwater Quality Control Options

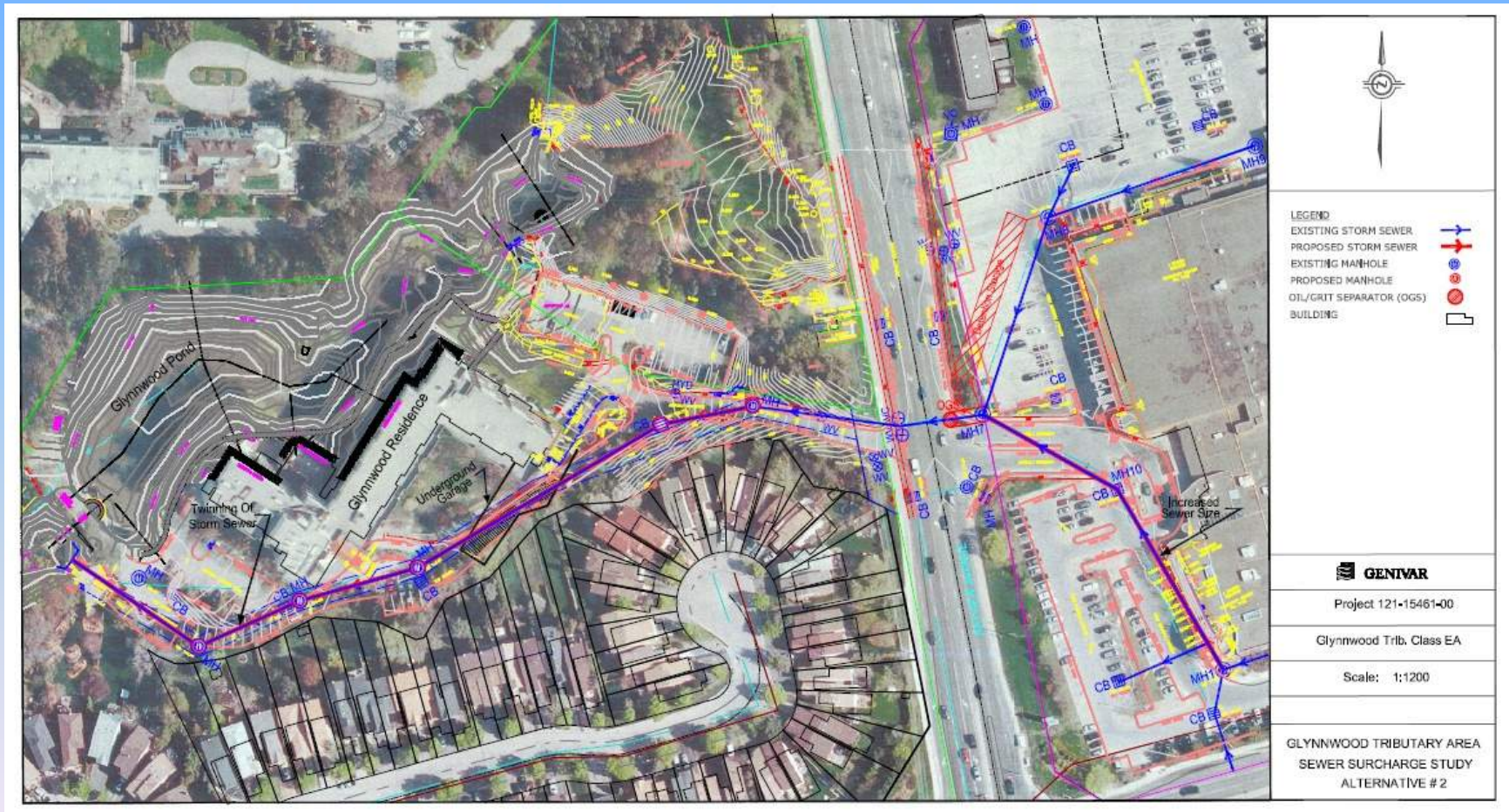
Three stormwater runoff quality control options were considered due to site constraints:

  - Do Nothing.
  - Oil/Grit Separator to be located within the Thornhill Square.
  - Diversion of low flows to Glynnwood Pond and re-configuring Glynnwood Pond outlet for stormwater quality control.

MARKHAM

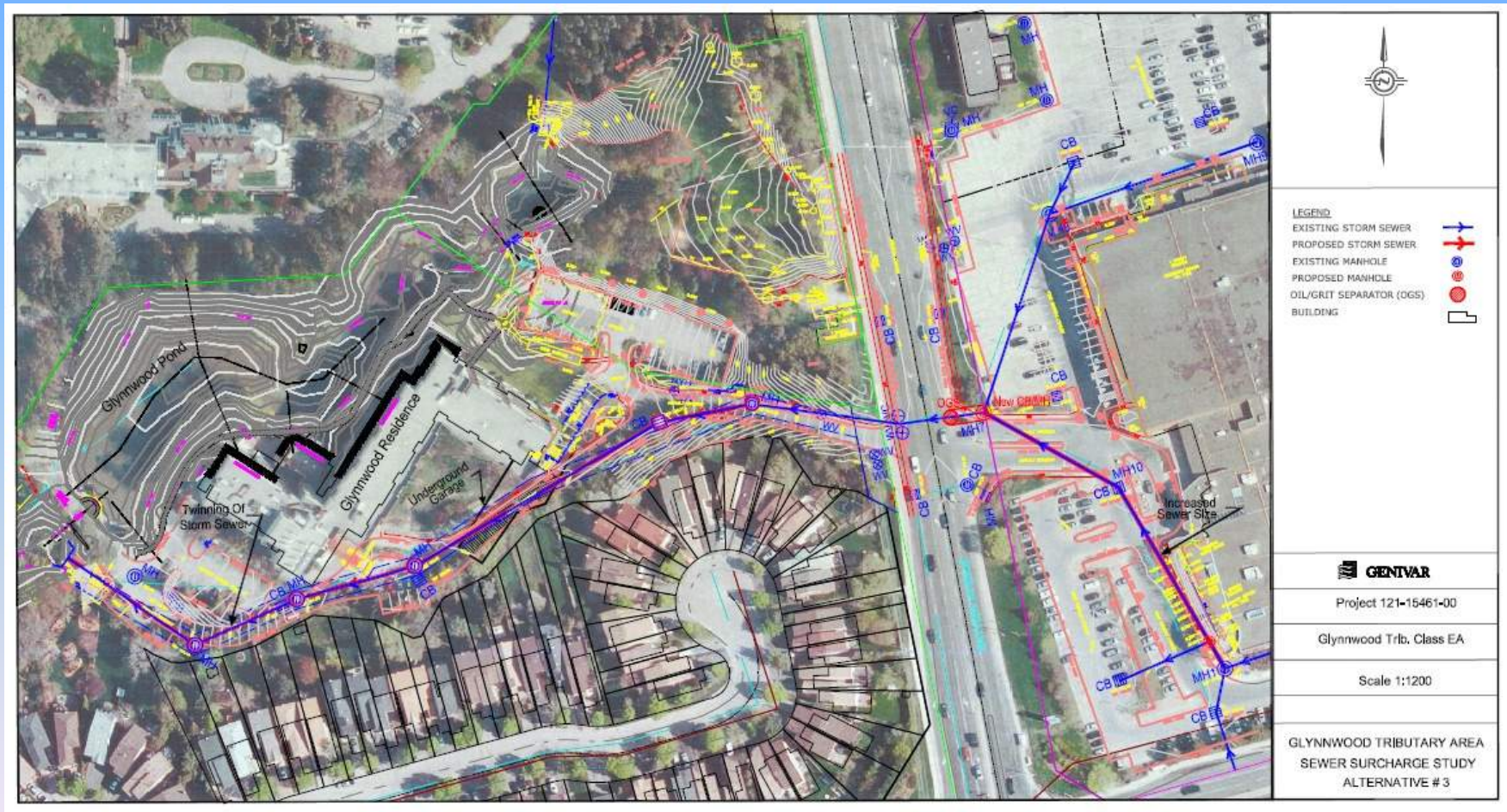
Alternative 2

1. Install underground storage tank in Parking Lot between MH 8 and MH7;
2. Install Oil/Grit Separator at outlet from Thornhill Square (MH7);
3. Increase size of storm sewer from MH1 to MH7 in Thornhill Square , adjacent to Community Centre;
4. Twin storm sewer through easement in Glynnwood Retirement Residence Access Road.



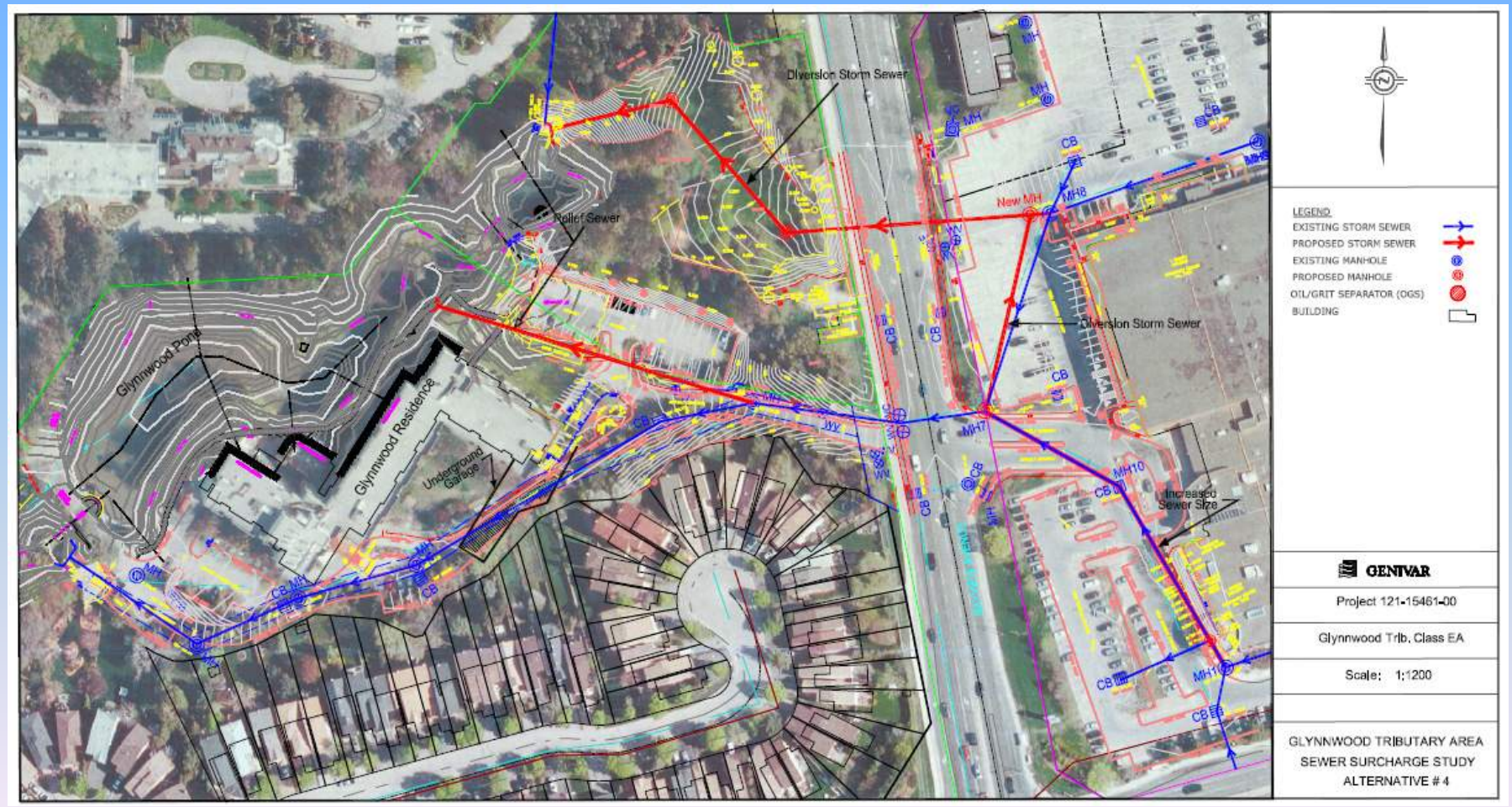
Alternative 3

1. Install Oil/Grit Separator at outlet from Thornhill Square (MH7);
2. Increase size of storm sewer from MH1 to MH7 in Thornhill Square , adjacent to Community Centre;
3. Twin storm sewer through easement in Glynnwood Retirement Residence Access Road.



Alternative 4 (Recommended)

1. New sewer to divert low flows from MH7 to New MH downstream of MH8;
2. Construct diversion sewer across Bayview Avenue to existing inlet to Glynnwood Upper Pond
3. Increase size of storm sewer from MH1 to MH7 in Thornhill Square, adjacent to Community Centre;
4. Construct bypass sewer through easement in Glynnwood Retirement Residence upper parking lot to main Glynnwood Pond.



Evaluation of Alternatives

The following criteria is being used in evaluating each of the alternatives and identifying the recommended solutions:

Natural Environment

- Potential impact on terrestrial systems (vegetation, trees, wildlife)
- Potential impact on aquatic systems, aquatic life and vegetation
- Potential impacts on soils, groundwater and surface water

Social and Cultural Environment

- Potential to impact the community (i.e., community disruption - visibility, noise, traffic impacts, etc.)
- Potential to impact land use compatibility (parks/open spaces, recreational uses)
- Potential to impact archaeological and/or heritage sites
- Property Impacts

Technical

- Effectiveness of control measure in eliminating basement flooding and /or improving the quality of the stormwater runoff
- Feasibility of control measure (available space, accessibility, construction requirements)
- Flooding impacts on upstream, downstream and surrounding areas

Economic

- Capital cost
- Operating/maintenance cost

MARKHAM

Next Steps

- After tonight's meeting, we will gather your comments, review the feedback and finalize the recommended solution;
- Council Approval;
- The Project File will be prepared and made available for 30-Day public Review in December 2012;
- Upon approval of funding, the City will implement the recommended solutions after the completion of the Environmental Assessment
- For more information on this study, or to provide your comments or to be added to the study mailing list, please contact:

- Eugene Chen, P.Eng.,
Senior Capital Works Engineer

Anthony Roman Centre

101 Town Centre Boulevard

Markham ON L3R 9W3

Phone: 905-477-7000

Fax: 905-415-7504

MARKHAM

GENIVAR

APPENDIX

E

MINUTES OF MEETING WITH TRCA ON JANUARY 17, 2020

MEETING RECORD

Date of Meeting	January 16, 2:00pm – 3:00pm	**File No.**	121-15461-00
Location	TRCA Head Office, Duffins Room	**Date of Record**	January 17, 2020
Meeting Title	Glynwood EA – TRCA Consultation Meeting to Discuss New Alignment Options Alternative No. 20	**Written by**	Sarah Piasetzki
		Checked by	

Present

		Absent/Other Distributions:	
Nehal Azmy (NA)	City of Markham	Steve Byberg (SB)	WSP
Steve van Haren (SVH)	WSP		
Sarah Piasetzki (SP)	WSP		
Harsha Gammanpila (HG)	TRCA		
Ali Shirazi (AS)	TRCA		
Don Ford (DF)	TRCA		
Bruna Peloso (BP)	TRCA		
Matthew Kuyntjes (MK)	TRCA		

ITEM NO.	DISCUSSION	ACTION	DUE DATE
INTRO			
20-1	Introduction were made.	INFO	
20-2	Recap of past meeting.	INFO	
20-3	Update to new alignment (channel option) presented. This is the same alignment as last meeting, but a channel instead of a deep pipe.	INFO	
20-4	Discussion about retaining wall: - Small retaining walls (~1.2 m or less) do not require geotechnical study at the EA level. - 3:1 slope behind retaining wall (or shallower) does not require a geotechnical study at the EA level. - Note these are rules of thumb and it is a balance of both wall size and slope behind the wall. Therefore, a geotechnical study may still be required at the EA stage if the TRCA initial review requires it. - No retaining wall may be possible as well with or without use of proprietary products. - City of Markham will be responsible for the maintenance of the retaining wall, if required. - Easement should include the entire influence zone of the wall. - Minimizing the height of the retaining wall is preferred. - Minimizing the width of the access road is preferred; access through the neighbouring site may be possible. Outcome of discussion:	WSP	

	- A geotechnical study is likely required due to the proximity of the channel to the proposed building on the adjacent existing parking lot. The scope of the study can be determined after the retaining wall concept is further defined. Monitoring wells (or similar) for groundwater data should be included in the scope of the geotechnical study. - If no retaining wall is proposed and the slope is not altered, a geotechnical and/or hydrogeological investigation is not required at the EA phase. Action items: - WSP to further refine retaining wall concept (if required) after discussion with neighbouring property owner and City of Markham.		
20-5	Discussion about groundwater: - Concrete channel may have uplift concerns; alternatives can be explored to prevent this (e.g. porous treatments such as turf reinforcement mats or rip rap). - If there is no uplift concern, a hydrogeological study is not required at the EA level to address this issue. - During detailed design, erosion mitigation and energy dissipation are required. - Vegetation is preferred where feasible. - Check dams may also be required during detailed design. - The roughness of the channel may change with alternatives; modelling would need to be updated to reflect this. Outcome of discussion: - A hydrogeological study is likely required due to uplift concerns on the concrete channel. If these concerns are removed through alternative channel properties, a hydrogeological study may not be required. Action items: - WSP to further refine channel concept after discussion with neighbouring property owner and City of Markham.	WSP	
20-6	Discussion about interaction with neighbouring property:	City of	

	- The adjacent landowner is proposing to replace the existing parking lot adjacent to the channel/retaining wall with a building. - Has the adjacent landowner been consulted about the channel/retaining wall? What are their thoughts? - Are they aware of the proximity of the channel/retaining wall to their proposed building? The constraints that may cause on their site (specifically the building footprint)? - What buffer from the slope has been provided to them by regulatory agencies? Will that buffer be affect by work on the channel? - Will they allow access to the channel and/or pond through their site? Can there be a formal access agreement? - What is the status of the site plan? The project timeline? - What type of flooding issues are currently being experienced? What are the causes of those issues? - Their current parking issue (groundwater or poor construction?) - What type of shoring will be used in their project? Can it be left in place as a barrier if the channel/retaining wall require it? Action items: - City of Markham to meet with adjacent landowner to get answers to these questions. Other action items from this meeting will be addressed after this meeting.	Markham	
20-7	Pond Discussion: - The original purpose of the pond is unknown. It is unclear if it is engineered or not and what it is trying to achieve. An engineered control structure is visible. - Work was completed on the pond in the past decade. This work was designed by Stantec. - The City of Markham can consider modification of the pond and/or outlet structure if necessary. Action items: - The City of Markham shall request information on the pond from Stantec if it is not on file.	City of Markham/ WSP	

	- WSP shall discuss the pond in the EA based on the information provided by Stantec. - If the provided information is inconclusive, an additional meeting with the TRCA to discuss a course of action shall be requested.		
20-8	Overall preferences of the TRCA: - A channel is preferred over the deep pipe option. - Minimizing the access on/beside the channel is preferred. - Construction of the channel before new building construction is preferred. - Discussion of all items in this meeting should be provided in the EA document.	INFO	
20-9	Another meeting with the TRCA shall be requested if required. If not, the EA documentation shall be prepared for submission.	INFO	
Meeting adjourned at 3:00 P.M.			

APPENDIX

F

SUPPORTING DOCUMENTS RELATED TO THE DEVELOPMENT OF REVISED PREFERRED ALTERNATIVE (JANUARY 2021)

LIST OF SUPPORTING DOCUMENTS RELATED TO THE DEVELOPMENT OF REVISED PREFERRED ALTERNATIVE

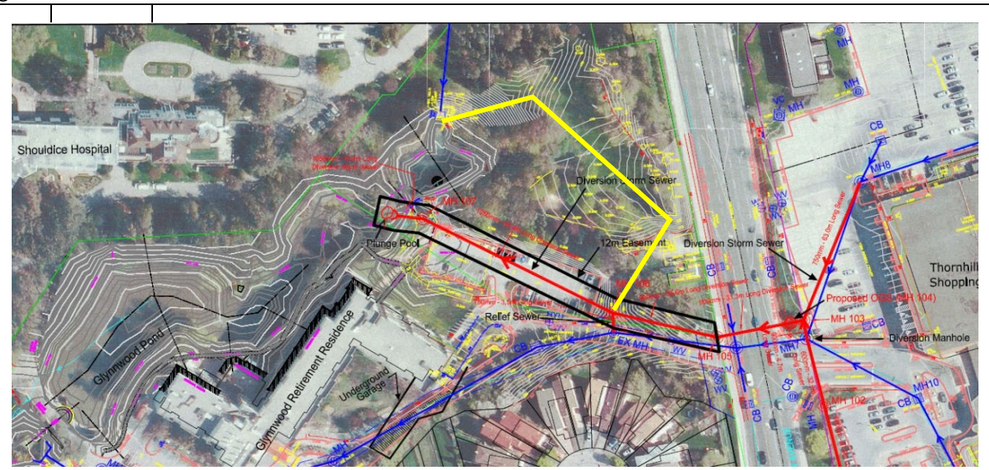
In Reverse Chronological Order (New to Old)

Date	Type	Subject
2022.02.14	Comments and Reponses	Comments Matrix Table
2022.01.18	Meeting Notes	Meeting re. 47303 TRCA comments to Glynnwood Tributary Restoration EA (Meeting Date: January 18, 2022)
2021.05.28	Meeting Notes	Meeting with Revera to Discuss the Status of EA Study (Meeting Date: May 28, 2021)
2020.12.18	Technical Memorandum (WSP to Markham)	Glynnwood EA – Revision of Modeling based on the STM - Additional Analysis Scenario– No 100-year Major System Overland Flow to Glynnwood Site
2020.08.27	Technical Memorandum (WSP to Markham)	Glynnwood EA – Additional Analysis Scenario #2 – No 100-year Major System Overland Flow to Glynnwood Site
2020.07.20	Technical Memorandum (WSP to Markham)	Glynnwood EA – Additional Analysis Scenario #1 – No 100-year Major System Overland Flow from TSSC site to Bayview Ave
2020.05.11	Technical Memorandum (WSP to Markham)	Glynnwood EA – Confirmation of InfoWorks Model Simulation
2020.02.20	Technical Memorandum (WSP to Markham)	Glynnwood EA - Additional Alternative – Proposed Bypass Sewer at South of Existing Sewer along Glynnwood Driveway (Feb 2020)
2020.01.17		Conceptual Design – Open Channel Option Cross Section

Scoped EIS, September 29, 2020
Glynwood EA Report, September 7, 2021
Geotechnical Investigation, September 10, 2021
Arborist Report, September 17, 2021

TRCA Comments (November 25, 2021)

ITEM	TRCA COMMENTS (November 25, 2021)	PROPONENT/CONSULTANT RESPONSE (February 14, 2022)
	Re: Draft Environmental Study Report (ESR) **Glynnwood Tributary Area Sewer Surcharge & Glynnwood Pond Restoration** **Implementation of Various Flood Remediation Class Environmental Assessment – Schedule B** **Don Watershed; City of Markham; Regional Municipality of York** Toronto and Region Conservation Authority (TRCA) staff received the draft Environmental Study Report (ESR) dated September 17th, 2021. **PROJECT OVERVIEW** Staff understands that that this study is undertaken to investigate solutions to flooding issues in the vicinity of Thornhill Community Centre on Bayview Avenue between John Street and Green Lane. The study also encompasses the existing Glynnwood Pond, located near the northwest corner of John Street and Bayview Avenue, which acts as a local drainage destination for storm runoff. The key purpose of this study includes, alleviate flooding to the Thornhill Community Centre (TCC) and the Glynnwood Retirement Residence by providing a level of service to 1 in 100-year storm event; and to provide enhanced level water quality control for the stormwater runoff from the TCC. **PROJECT REVIEW** While staff has no objection in principle to the preferred alternative, the following concerns must be addressed in the final EA document. Additional detailed comments are provided in Appendix A. These comments and responses should be included as an appendix in the final EA report. **RESUBMISSION REQUIREMENTS** Please ensure TRCA receives a digital copy of the Notice of Study Completion and digital copy of the final ESR. The final EA document should be accompanied by a covering letter which uses the numbering scheme provided in this letter and identifies how these comments have been addressed. Digital materials must be submitted in PDF format.	

1.	The Arborist Report shows that the proposed alternative #6 would require the removal of a total of 56 trees (35%), out of 162 surveyed in the significant woodland located to the north of the existing parking lot. This is considered highly impactful to the terrestrial system. However, the Comparative Criteria Scoring shown on page 41 of the EA assigns a rank of 4 (very good) to the potential impacts to the terrestrial system for alternative #6, which does not seem to be appropriate. A score of 1 (below average: high risk of adverse impacts to terrestrial systems) seems to better capture the impactful nature of the proposed alternative. At this time, the EA Report does not demonstrate consideration to the terrestrial system impacts in the selection of the preferred alternative. Please note that the Living City Policies indicates that the natural features protection hierarchy should be applied in all developments: avoidance, minimization of impacts, and then mitigation/restoration. Due to the proposed impacts to the terrestrial system, TRCA Ecology staff requests that other alternatives, or a combination of alternatives, are considered as the preferred alternative instead of alternative 6 (Fig 6-1) as is. The proposed alternative 6 (Fig 6-1) presents the most significant environmental impact. Furthermore, site topography might present significant challenges in constructing an open channel in the proposed location. The impacts to the terrestrial features might be significantly reduced and the challenges associated with site topography might be addressed if, , alternative # 6 (as shown on Fig 4-6) was proposed; or if Figure 6-1 was modified to configure the open channel along the grassed area north of the woodlot (as shown on Figs 4-1, 4-2 and 4-3) – i.e. the proposed MH 106 would connect to a system going to the north and not west (see yellow line below). TRCA staff is available for an on-site meeting to discuss the proposed alternatives to assess feasibility of the various options and discuss alternative design considerations. 	Relevant ecological related Sections of the Final EA Report (e.g., Sec. 3.3.3, etc.) will be revised to include the findings from the EIS study (dated September 29, 2020), which was prepared based on the final preferred alternative. Details of the Final Preferred Alternative will be included in the EA report. It will be identified as Pre-Screening Alternative #7 and Final Alternative #5. Table 5-2 (Comparative Criteria Scoring Table) will be updated to incorporate the Final Preferred Alternative. Note that a forest restoration plan in consultation with the TRCA and City will be prepared during the detail design stage.
2.	Additional comments to the Comparative Criteria Scoring: a. The score for the Terrestrial System for the Do Nothing alternative should be updated to a score of 5 considering there will be no impacts to the Terrestrial System. b. Please clarify what was taken into consideration for the Aquatic System scoring. It is not clear why Alternatives #2 and #3 scored 5 for aquatic system. c. Please clarify why has alternative #4 scored 5 for Performance – water quality. What water quality enhancement measures have been incorporated into this alternative? And why does it score higher than Alternatives # 2 and #3, both of which have a proposed oil/grit separator?	Please refer to #1, details of the Final Preferred Alternative will be included in the EA report. It will be identified as Pre-Screening Alternative #7 and Final Alternative #5. Table 5-2 (Comparative Criteria Scoring Table) will be updated to incorporate the Final Preferred Alternative.

3.	Should impacts to the natural system be unavoidable, compensation will be required. TRCA understands that the City of Markham has its own Tree Removal by-law. However, due to the nature of the features potentially impacted, TRCA would like to work together with the City of Markham to maximize the proposed compensation, applying a best-efforts approach, based on TRCA's Guideline for Determining Ecosystem Compensation, available at: https://s3-ca-central- 1.amazonaws.com/trcaca/app/uploads/2018/10/17163148/TRCA-Guideline-for-Determining-Ecosystem-Compensation-June-2018.pdf Compensation outcomes should strive to fully replace the same level of lost ecosystem structure and function in proximity to where the loss occurs, and where possible, achieve an overall gain. It is recommended that any tree compensation requirements associated with City By-Laws be directed towards a suitable location where a forest restoration plan can be implemented. TRCA staff is available to work with the City of Markham staff to find an area where planting could occur to satisfy the requirements from both agencies.	Please refer to #1, a forest restoration plan in consultation with the TRCA and City will be prepared during the detail design stage.
4.	The proposed alternatives show the stormwater channel outlet straight into the pond, into a plunge pool. Please explore the use of green infrastructures alternatives to transition the stormwater discharge to the pond in a less impactful way, such as the incorporation of an end-of-pipe wetland.	Detailed channel design including the outlet configuration will be completed during the detailed design stage.
5.	Please provide details on the potential ecological impacts related to the required maintenance of the proposed infrastructure, and how they will be mitigated. Please detail if any maintenance access infrastructure will be required, including temporary or permanent access roads to outlet structures.	Discuss potential access route and construction laydown areas for future maintenance during detailed design stage.
6.	There is limited hydrogeologic information provided, groundwater monitoring (one event). At the detailed design stage please provide additional groundwater information.	Another round of groundwater level measurement was taken on December 14, 2021. The results were included in the final report (dated Jan 2022).
7.	Page 29 of 174 notes a sediment forebay permanent pool elevation of 162.5masl, however this appears to be beyond the Stage-Storage Curve of the forebay shown on Page 28 of 174. Please extend the Stage-Storage Curve to capture the permanent pool.	Stage-Storage Curve will be updated in the Final EA Report.
8.	Page 7 of 174 notes a key purpose of the study is to "Provide Enhanced Level water quality control for the stormwater runoff from the TCC / Thornhill Plaza." However, TRCA staff note that the intent appears to be to provide a net benefit in quality control as "… these measures will not necessarily achieve an 80% (enhanced) reduction in TSS loadings, nor will it achieve all the objectives of the City, MOECC and TRCA with respect to stormwater quality" (Page 9 of 174). If the study intends to demonstrate a formal 80% TSS reduction is being achieved for the contributing drainage areas to the Glynnwood Pond, please provide supporting information for these areas and imperviousness (i.e. Page 29 of 174 notes an existing contributing area to Glynnwood Pond of 44.9ha at 35% imperviousness and Page 32 of 174 notes a proposed additional area of 26.4ha at 62.5% imperviousness.)	The Final EA Report will be revised to discuss the potential water quality control opportunities based on the preferred alternative. Please note that detailed SWM design including measures to achieve required water quality control targets will be included during the detailed design stage.
9.	Page 10 of 174 notes upgrading of the Glynnwood Pond and the report notes modification to the outlet weir to reduce the permanent pool in the main pond and provide 24-hour drawdown, however inadequate supporting information is provided with respect to proposed changes to the pond. If upgrades to the pond and/or its outlet are proposed as part of this EA, please provide supporting discussion, drawings, calculations as to what is proposed and how it pertains to all relevant aspects of SWM (e.g. drawdown time, volumes, how it affects peak flows, etc.).	Please see Item #8, detailed SWM design including measures to achieve required water quality control targets will be included during the detailed design stage.
10.	Based on the discussion provided, it appears the proposed design diverts more flow/volume towards Glynnwood Pond and away from immediately downstream of Glynnwood Pond. Page 45 of 174 (Table 6-2) notes the 100-year volume to the pond will increase from 30,500m^3 to 34,900m^3 in the proposed condition. Please provide supporting calculations showing the pond won't overtop during the 100-year event. 160.45masl is noted to be the existing permanent pool / outlet elevation of the main pond – please also provide drawings/details showing the overflow/spill elevation/configuration of the main pond. Please provide discharge information for the pond existing/proposed pond outlet.	Relevant Sections of the Final EA report related to the surface water drainage and Glynnwood Pond will be revised to include the pond details. Table 6-2 will be revised to include the relevant elevations of the pond. Stantec DWGs will also be referenced in the Final EA report.
11.	During detailed design, please provide details, calculations, etc. of the proposed plunge pool at the downstream end of the proposed channel. TRCA staff defer review of the proposed channel's hydraulics/capacity to the City of Markham.	Will be addressed during the Detailed Design

12.	The geotechnical report by WSP (dated September 10, 2021) was draft only without signature and stamp. Please ensure that the geotechnical report for EA is re-submitted as engineer stamped.	Addressed. A final report (dated Jan 2022) is completed.
13.	At the detailed design stage, the grading plan and sections needs to be provided including those for the area of channel and retaining wall showing all necessary information including existing grade vs proposed grade. It also needs to show the extent of temporary excavations for the construction of channel and retaining wall as well as installation of pipes and infrastructures. All necessary measures to protect the surrounding areas during construction and after need to be provided.	Will be addressed during the Detailed Design
14.	The retaining wall and regarding the slope needs to be designed and all detailed engineering drawings and specifications for the retaining walls to be provided as engineer stamped as per the design. Additionally, the global stability of the retaining wall and grading will need to be verified by geotechnical engineer in support of the detailed design to confirm that a global stability is met with a minimum factor of safety of 1.50.	Will be addressed during the Detailed Design
15.	The concrete channel works needs to be designed and all engineering details including cross-sections to be stamped by a qualified engineer at the detailed design stage.	Will be addressed during the Detailed Design
16.	The protection against the toe erosion and scouring will need to be developed at the detailed design, where applicable. All those details are needed to be provided as per the detailed design.	Will be addressed during the Detailed Design
17	Drawings indicates that a new 8-story building is proposed adjacent to the channel. Please confirm if the impacts to the proposed building (ie development limits) were considered and discussed/coordinated with the relevant parties.	As part of the EA process, meetings and consultation with the property owners were undertaken to coordinate the preferred storm sewer/channel alternative and proposed development within both properties at 7700 & 7750 Bayview Avenue.
18	TRCA confirmed that the Authority will not define a regulation limit along the proposed channel, which could have the effect of introducing setbacks impacting the development limits of the 7750 Bayview property.	TRCA staff to confirm

MEETING NOTES

JOB TITLE	Glynnwood Storm Sewers EA Study		
PROJECT NUMBER	121-15461-00	**DATE**	January 18, 2022 (March 21, 2022 Rev.)
TIME	12:30 PM	**VENUE**	Virtual Meeting
SUBJECT	Meeting re 47303 TRCA comments to Glynnwood Tributary Restoration EA		
CLIENT	City of Markham		

ATTENDEES			
Name	**Company**	**Phone**	**Email**
Nehal Azmy (NA)	City of Markham		nazmy@markham.ca
Patrick Wong	City of Markham		PatrickWong@markham.ca
Albert Zhuge (AZ)	WSP		Albert.Zhuge@wsp.com
Sharon Chen (SC)	WSP		Sharon.Chen@wsp.com
John Ho (JH)	WSP		John.Ho@wsp.com
Carlene Perkin (CP)	WSP		Carlene.Perkin@wsp.com
Harsha Gammanpila (HG)	TRCA		Harsha.Gammanpila@trca.ca
Matthew Kuyntjes (MK)	TRCA		Matthew.Kuyntjes@trca.ca
Harsimrat Pruthi (HP)	TRCA		Harsimrat.Pruthi@trca.ca
Ali Shirazi (AS)	TRCA		Ali.Shirazi@trca.ca
Bruna Peloso (BP)	TRCA		Bruna.Peloso@trca.ca
Suzanne Bevan (SB)	TRCA		Suzanne.Bevan@trca.ca
Don Ford (DF)	TRCA		Don.Ford@trca.ca

ADDITIONAL DISTRIBUTION			
Name	**Company**	**Phone**	**Email**
Steve van Haren (SvH)	WSP		Steve.vanHaren@wsp.com

MATTERS ARISING		**ACTION**
1.0	**Introduction**	
1.1	NA provided with the background information of the Glynnwood Storm Sewers EA Study	
2.0	**Clarification of Final Preferred Alternative (Figure 6.2 of EA Report)**	

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

2.1	WSP clarifies that Figure 6.2 of the EA Report (Dated September 7, 2021) represents the final preferred alternative for the subject study.	
2.2	WSP confirms that the Scoped EIS (dated September 29, 2020) was prepared based on the final preferred alternative (Figure 6.2 of the EA Report, September 7, 2021).	Scope EIS (dated September 29, 2020) to be provided to TRCA for review.
3.0	**TRCA Comments (dated November 25, 2021) and WSP Responses**	
3.1	Comment #1 — TRCA requests that Ecology related sections of the EA report need to be revised to reflect the Final Preferred Alterative.	WSP to revise the Final EA Report.
3.2	Comment #2 — TRCA requests that the Final Preferred Alternative needs to be included in Comparative Criteria Scoring (Table 5-2). — TRCA agrees the Evaluation Criteria (Table 5-1) remain unchanged.	WSP to revise the Final EA Report. The Final Preferred Alternative will be identified as Pre-Screening Alternative #7 and Final Alternative #5, and discussed in the Final EA Report. Table 5-2 (Comparative Criteria Scoring Table) will be updated to incorporate Final Preferred Alternative.
3.3	Comment #3 — A forest restoration plan in consultation with the TRCA and City will be prepared during the detail design stage.	
3.4	Comments #6 and #12 — WSP confirms that another round of groundwater level measurement has been taken on December 14, 2021. The results will be included in the final geotechnical report (dated Jan 2022). — WSP confirms that the Final Geotechnical Report will be stamped.	— Final Geotechnical Report (dated Jan 2022) to be submitted with the final EA report. — City will coordinate with its planning and development team regarding the developments on the tableland within the neighboring property, where the retaining wall is proposed for this project, to ensure that those developments on the tableland of the neighboring site above the retaining wall will have adequate setback with respect to the retaining wall, so that any potential failure or deficiencies of the retaining wall in the future, will not impact or endanger the developments on the tableland above the retaining wall in the neighboring site.
3.5	Comments #7, #8, #9 and #10 — TRCA (MK) and WSP had a meeting on January 27, 2022 to discuss the questions/comments provided by MK (TRCA) related to the hydraulic modelling and the Glynnwood Pond. — Comment #8: TRCA highlighted that a key purpose noted for the study is to provide Enhanced Level water quality control, however elsewhere the study notes that the measures proposed will not necessarily achieve enhanced level control, and so clarity on the intent and level of control was requested in the EA. In Jan 27 2022 discussion, it was confirmed that there is no increase in imperviousness as part of this project and it was understood that the intent is to provide a net benefit in control (i.e. not necessarily Enhanced) to the greatest extent feasible. I had asked that this be made clear in the EA so any future development will target an Enhanced level of control on-site.	WSP to revise the Final EA Report.

	— Comment #9: TRCA highlighted that upgrading of the pond and modifications to the outlet structure are proposed without adequate supporting information. In Jan 27 2022 discussion, TRCA specified locations in the report where “other work” and possible changes to the outfall were included. It was confirmed that “other work” may be a remnant from past iterations of the report and that there are no proposed changes to the outfall as part of this project – just a future possibility. It was requested this work be indicated as such (i.e. potential future and not proposed) and that it be clearly defined in the recommendations what exactly is being proposed as part of this EA (i.e. that "other work" either be removed or expanded upon with detail). — Comment #10: In Jan 27 2022 discussion, WSP staff clarified for TRCA staff that the major system flows are expected to drain to the Glynwood Pond, from both the north and south catchments, in the existing condition and that this has been effectively captured in the associated modelling. WSP staff clarified that the increase in the 100 year volume conveyed to the pond (between existing and proposed conditions) is a result of how the major system is conveyed (i.e. existing = overland/surface elevation, proposed = sewer overflow / underground elevation), but that the major / minor split either conveyed to the pond or bypassing the pond will be generally maintained in the proposed condition. TRCA staff look forward to reviewing the revisions and additional information noted in the response matrix related to the characteristics of and impacts to the pond and drainage.	
3.6	Comments #5, #11, #13-#16 — These comments will be addressed during the detailed design stage.	
3.7	Comment #17 — As part of the EA process, meetings and consultation with the property owners were undertaken to coordinate the preferred storm sewer/channel alternative and proposed development within both properties at 7700 & 7750 Bayview Avenue.	
4.0	**Next Step**	
4.1	WSP to follow up meeting with MK (TRCA) to address the questions related to the modelling and pond design.	TRCA (MK) and WSP had a meeting on January 27, 2022.
4.2	Prepare minutes of TRCA meeting for City review	WSP will prepare and submit draft meeting minute for review
4.3	Revise the responses to the TRCA comments and provide it for City review before sending to TRCA	WSP will revise the comments/response matrix and submit for review
4.4	Revise the EA report as per comments received from TRCA and City comments sent on May 11, 2021.	WSP will revise the EA report to address all comments received. The report will be completed by Feb 25, 2022.
4.5	Prepare draft notice of study completion.	

These minutes are considered to be accurate recording of all items discussed. Written notice of discrepancies, errors or omission must be given within seven (7) days, otherwise the minutes will be accepted as written.

MEETING NOTES

JOB TITLE	Glynnwood Storm Sewers EA Study		
PROJECT NUMBER	121-15461-00	**DATE**	28 May 2021
TIME	1:30 PM	**VENUE**	Zoom Virtual Meeting
SUBJECT	Meeting with Revera to Discuss the Status of EA Study		
CLIENT	City of Markham		

ATTENDEES			
Name	**Company**	**Phone**	**Email**
Kris Wemyss (KW)	Revera Living		Kris.Wemyss@reveraliving.com
Michael Theriault (MT)	Revera Living		Michael.Theriault@reveraliving.com
Dave Rogowsky (DR)	Revera Living		Dave.Rogowsky@reveraliving.com
Andrew Higgs (AH)	Revera Living		Andrew.Higgs@reveraliving.com
Denise Galan (DG)	Revera Living		Denise.Galan@reveraliving.com
Alain Cachola (AC)	City of Markham		ACachola@markham.ca
Nehal Azmy (NA)	City of Markham		nazmy@markham.ca
Kayam Ramsewak (KR)	MTE Consulting		KRAMSEWAK@mte85.com
Albert Zhuge (AZ)	WSP		Albert.Zhuge@wsp.com

ADDITIONAL DISTRIBUTION			
Name	**Company**	**Phone**	**Email**
Steve van Haren (SvH)	WSP		Steve.vanHaren@wsp.com

MATTERS ARISING		**ACTION**
1.0	**INTRODUCTION**	
2.0	**PREFERRED ALTERNATIVE**	
2.1	NA provided with the background information of the Glynnwood Storm Sewers EA Study — Preferred alignment with proposed open channel. — Survey was completed to collect existing sewer information. — Constructability check (e.g., sewer clearance) was completed. — EA study focused on the feasibility and preliminary design.	

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

	— Coordination meetings with Shouldice and TRCA were completed. — June 7, 2021: City's staff memo to City Council. — Existing sewer (blue line) would be remained.	
2.2	AZ described the purpose of the EA study: the design of a storm relief system to mitigate the upstream flooding issues. AZ further confirmed that there would be no impact to the downstream pond, and the water level of the pond remains unchanged.	
2.3	Timeline: — EA Completion: 2021 Summer — Detailed Design: Starting at the end of 2021 — Construction of the proposed channel: TBD — Construction of the proposed building at the parking lot: TBD	
2.4	NA confirmed the proposed channel would be located within the Shouldice's property.	
2.5	AC indicated that as part of the detailed design stage, access to the Revera's property would be evaluated, and alternative and emergency accesses would be provided during the construction. AC further confirmed that the detailed design would be coordinated with Revera and Shouldice.	
2.6	AC indicated that the detailed design will evaluate all components of the proposed system including the design of the proposed channel. AC clarified that the preferred option was revised to accommodate the Glynnwood retirement building expansion at the parking lot proposed by Revera. AC further indicated that we are currently at EA stage, and during the detailed design stage, all detailed technical aspects will be evaluated.	
2.7	NA indicated that the proposed sanitary system at the Glynnwood driveway needs to be coordinated with the City.	Revera would coordinate with the City for the proposed sanitary system at the Glynnwood driveway.
3.0	**PERMISSION TO ENTRE / GEOTECHNICAL STUDY**	
3.1	NA requested the permission to entre the Glynnwood parking lot for borehole installation. Revera concerned the loss of parking spaces due to the installation of the boreholes.	NA would confirm with Geotechnical Engineer (WSP) and respond to Revera regarding the installation of the boreholes at the Glynnwood parking area.
3.2	City would review and possibly expend the scope of the geotechnical study to include the required work to support the detailed design.	City would provide with updates.
3.3	DG confirmed she would be the main contact of Revera.	
4.0	**PROPOSED CHANNEL LOCATION**	
4.1	AC indicated the proposed channel would be located within Shouldice property at the north lot line of the Glynnwood property due to the restriction of the vegetated slope.	
4.2	AC further confirmed that the detailed design of the proposed channel would evaluate all components, including the construction, tieback, etc. The original alternative was to have deep underground pipes which will require higher retaining walls, additional disruption to the vegetated slopes, constructability issues and higher costs.	

MEETING NOTES

4.3	AC requested the Revera's building design to be coordinated with the City.	Revera would coordinate with the City for the proposed building design.

These minutes are considered to be accurate recording of all items discussed. Written notice of discrepancies, errors or omission must be given within seven (7) days, otherwise the minutes will be accepted as written.

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Alain Cachola (City of Markham), Steve Van Haren (WSP), James Zhou (WSP), Sharon Chan (WSP), John Ho (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Revision of Modeling based on the STM - Additional Analysis Scenario– No 100-year Major System Overland Flow to Glynnwood Site**

DATE: **January 11, 2021**

Further to our Technical Memo dated December 18, 2020 (attached), as per your request, we have revised the alignment of the proposed sewer at the Glynnwood property driveway.

Constructability of the proposed system was also evaluated based on the vertical and horizontal clearances between the elements. The detailed results are illustrated in **Figure X4.R3**. All supporting documents are attached for reference.

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- PROPOSED MANHOLE
- OIL/GRIT SEPARATOR (OGS)

0 10 20 30 40 50m

CLIENT	CITY OF MARKHAM
TITLE	GLYNWOOD TRIBUTARY CLASS EA PREFERRED ALTERNATIVE Upgrade Option – Scenario 2 (No Overland Flow to Glynnwood Site). Rev 3

wsp

Checked A.Z.Z.	Drawn AutoCAD/B.K.B./A.Z.Z.
Date JANUARY 2021	Proj. No. 121-15461-00
Scale AS SHOWN	Figure No. X4.R3 — Gr.No. 00

FIGURE X4.R3.dwg - Glynwood Tributary Class EA -Preferred Alternative #2 (February 2020) C:\Users\ZhugeA\Documents\2020\121-15461-00 Glynnwood\-- AZ WORK\2021.01.07 City Final Model and Constructability\CAD\ Jan 11, 2021 - 1:40pm

Glynnwood Scenario 1 under the 100-yr Design Storm Event Simulation Results

Proposed overland channel with proposed sewers moved south of existing 900 mm across Bayview Ave. Proposed sewers were upgraded to ensure that no overland flow crosses Bayview Avenue from east to west in the 100-year storm event. Updated with the survey data and as-built information, the existing 900 mm sewer across Bayview Ave. is sufficient to convey flows and eliminates the need for a diversion sewer across Bayview Ave. This determination is made based on the assumption that the survey and as-built data are accurate.

However, there is an inconsistency between the upstream invert for the 900 mm pipe across Bayview Ave. between the as-built and the sewer survey. The surveyed US invert for the 900 mm pipe across Bayview Ave. is 165.528 m. This is less than the US invert from the 167M-2 as-built, which is 165.69 m. The DS invert from the as-built is 165.56 m. No survey data is available for the DS invert. Using the surveyed US invert results in an negative slope in the sewer, which does not make sense. Moreover, the as-built was deemed to be more accurate because it also contained the 1800 mm watermain data and correct sewer sizes.

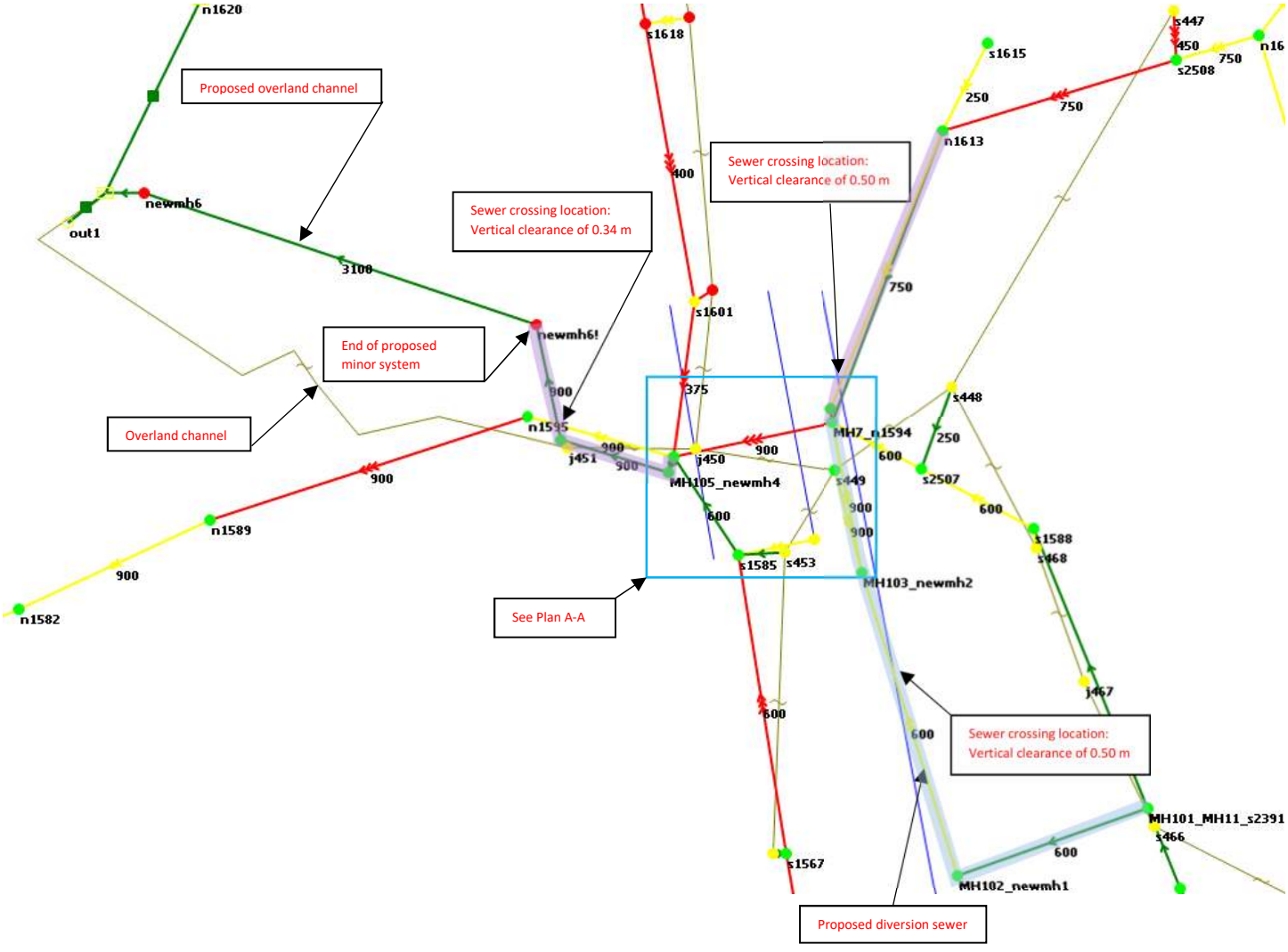
	US Invert Elevation (m)	DS Invert Elevation (m)	Pipe Slope
Survey Data	165.528	N/A, use as-built elevation	-0.09%
As-Built 167M-2	165.69	165.56	0.37%

In the 100-year storm event, depth of HGL is greater than 1.8 m at all except two minor system locations. HGL depth is less than 1.8 m at s1601 and s1618.

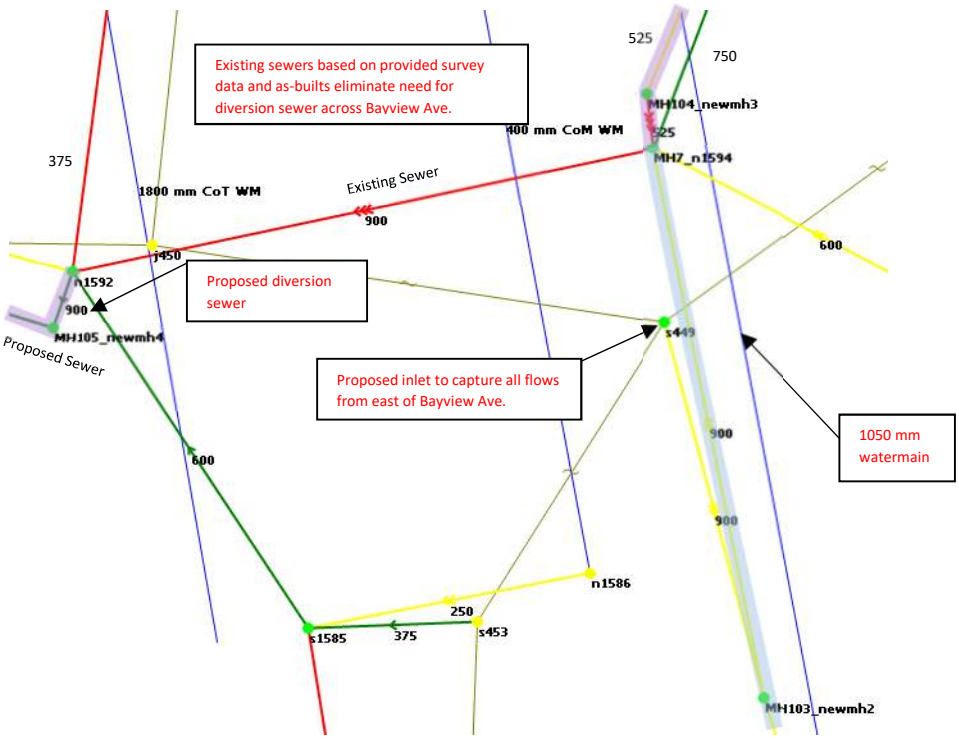
Legend:

Downsized proposed storm sewer system Proposed diversion sewers

Overall Plan

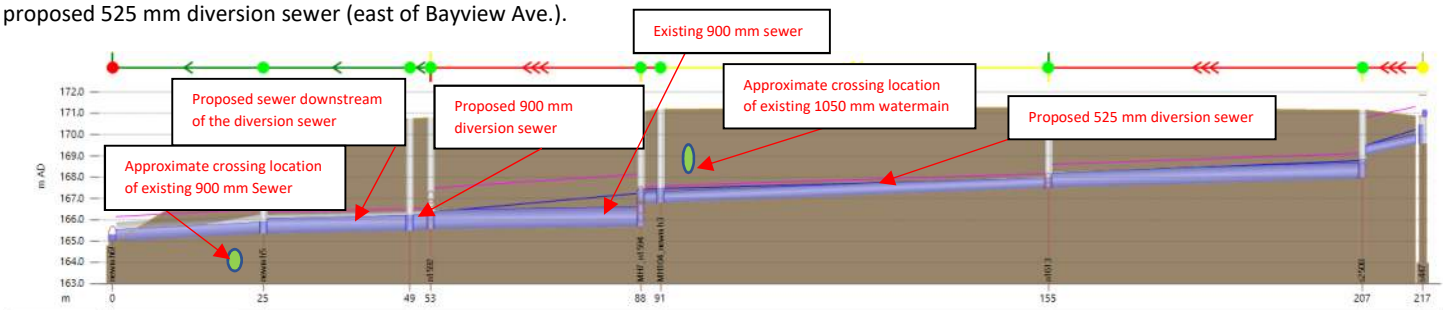


Plan A-A



Proposed sewers profile with 100-yr design storm event simulation results - from s447 to overland system at newmh6! – Alignment 1 (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

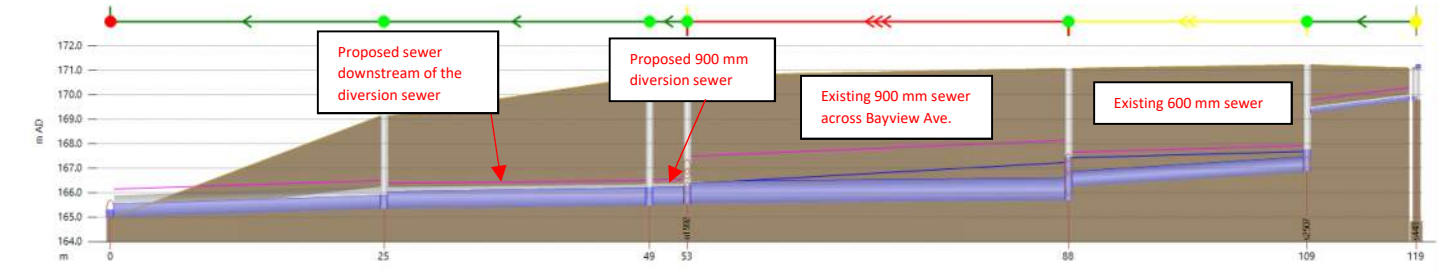
The vertical distance (including pipe size and thickness) is estimated to be **<u>0.34 m</u>** at the crossing location where the proposed 900 mm sewer is above the existing 900 mm sewer, and **<u>0.50 m</u>** at the crossing location where the existing 1050 mm City of Markham watermain is above the proposed 525 mm diversion sewer (east of Bayview Ave.).



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	-	n1613.1	s2508.1	s447.2
US node ID	newmh5	MH105_newmh4	-	MH7_n1594	-	n1613	s2508	s447
ds node	newmh6!	newmh5	-	n1592	90	MH104_newmh3	n1613	s2508
System type	storm	storm	-	storm	-	storm	storm	storm
Asset ID				minor			minor	lead
length (m)	25.0	24.2	3.5	34.9	3.3	64.3	52.0	10.0
Shape ID	CIRC	CIRC	-	CIRC	-	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	525	525	750	450
height (mm)	900	900	900	900	525	525	750	450
us inv (m AD)	165.350	165.470	-	165.690	-	167.512	167.928	169.557
ds inv (m AD)	165.000	165.350	-	165.560	-	166.800	167.512	169.057
grad (m/m)	0.01397	0.00495	-	0.00373	-	0.01108	0.00800	0.05000
surc	0.58	0.80	-	2.00	-	1.00	2.00	2.00
r.pfc (l/s)	2140	1274	-	1106	335	453	996	638
DS flow (l/s)	1350.60	1351.39	-	2826.46	-	401.16	1187.59	775.43
DS velocity (m/s)	3.500	2.584	-	4.687	-	1.996	2.879	5.143

Node	newmh6!	newmh5	-	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
Node ID	newmh6!	newmh5	-	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
System type	storm	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.175	171.267	171.139	-
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.471	167.944	168.835	-
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.704	-3.323	-2.304	-
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	-
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.703610	3.322588	2.304176	-

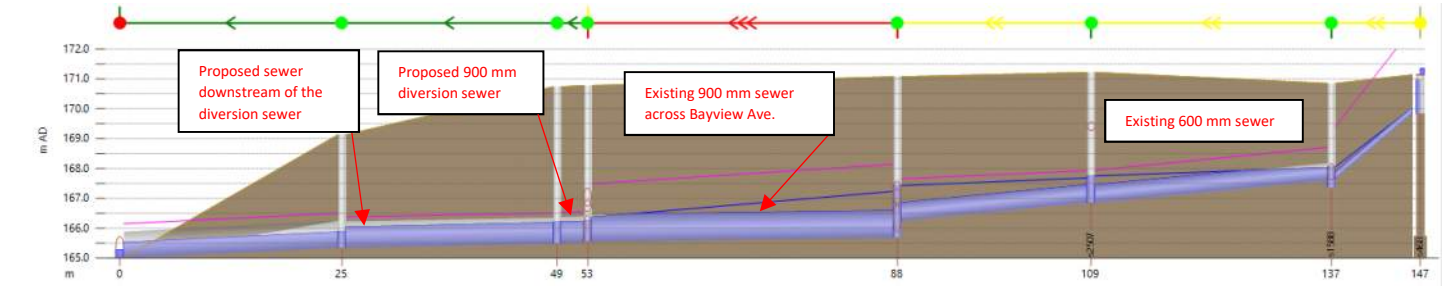
Proposed Sewers Profile with 100-yr design storm event simulation results from s448 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	s2507.1	s448.2
US node ID	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
ds node	newmh6l	newmh5	-	n1592	MH7_n1594	s2507
System type	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	lead
length (m)	25.0	24.2	3.5	34.9	21.8	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	600	250
height (mm)	900	900	900	900	600	250
us inv (m AD)	165.350	165.470	-	165.690	166.856	169.787
ds inv (m AD)	165.000	165.350	-	165.560	166.258	169.287
grad (m/m)	0.01397	0.00495	-	0.00373	0.02743	0.05000
surc	0.58	0.80	0.79	2.00	1.00	0.53
r.pfc (l/s)	2140	1274	1375	1106	1017	133
DS flow (l/s)	1350.60	1351.39	-	2826.46	736.15	70.20
DS velocity (m/s)	3.500	2.584	2.508	4.687	3.559	2.676

Node	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
Node ID	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
System type	storm	storm	storm	storm	storm	storm	overland
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.220	171.087
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.744	169.922
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.476	0.141
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	70.23
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.475783	1.164988

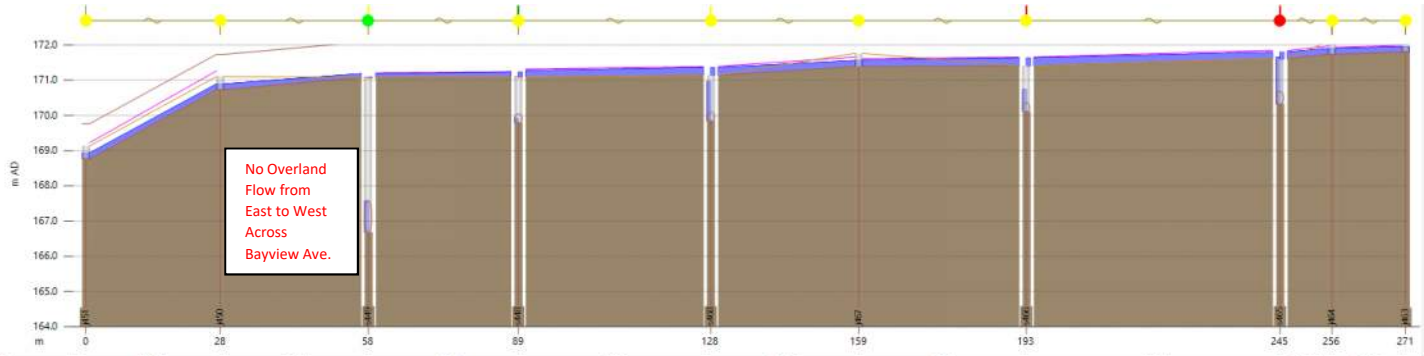
Proposed Sewers Profile with 100-yr design storm event simulation results from s468 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	s2507.1	s1588.1	s468.2
US node ID	newmh5	MH105_newmh4	-	MH7_n1594	s2507	s1588	s468
ds node	newmh6l	newmh5	-	n1592	MH7_n1594	s2507	s1588
System type	storm	storm	-	storm	storm	storm	storm
Asset ID				minor	minor	minor	lead
length (m)	25.0	24.2	3.5	34.9	21.8	27.1	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	600	600	250
height (mm)	900	900	900	900	600	600	250
us inv (m AD)	165.350	165.470	-	165.690	166.856	167.600	169.837
ds inv (m AD)	165.000	165.350	-	165.560	166.258	166.856	167.650
grad (m/m)	0.01397	0.00495	-	0.00373	0.02743	0.02745	0.21870
surc	0.58	0.80	0.79	2.00	1.00	1.00	1.00
r.pfc (l/s)	2140	1274	1375	1106	1017	1018	278
DS flow (l/s)	1350.60	1351.39	-	2826.46	736.15	701.90	276.35
DS velocity (m/s)	3.500	2.584	2.508	4.687	3.559	3.431	5.146

Node	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s1588	s468
Node ID	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s1588	s468
System type	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.220	170.850	-
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.744	168.048	-
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.476	-2.802	0.216
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	444.78	-
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.475783	2.802362	-

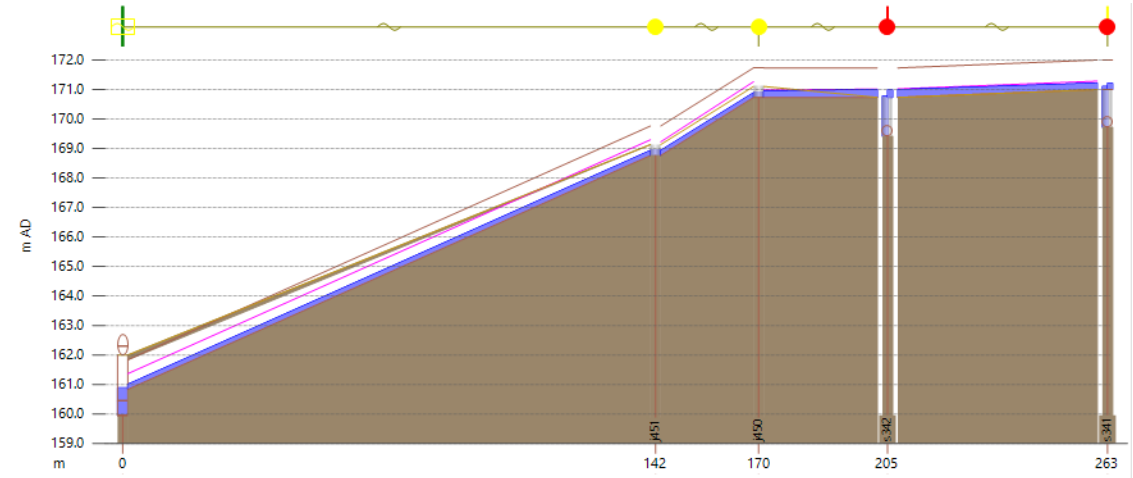
Existing overland system profile with 100-yr design storm event simulation results from Parking Lot east of Bayview Ave. to SWM Pond



Link	j450.1	s449.1	s448.1	s468.1	j467.1	s466.1	s465.1	j464.1	j463.1
US node ID	j450	s449	s448	s468	j467	s466	s465	j464	j463
Link suffix	1	1	1	1	1	1	1	1	1
ds node	j451	j450	s449	s448	s468	j467	s466	s465	j464
System type	overland	overland	overland	overland	overland	overland	overland	overland	overland
Length (m)	27.6	30.4	30.7	39.5	30.4	34.4	52.0	10.7	15.1
grad (m/m)	0.07147	0.01141	0.00029	0.00127	0.00833	0.00038	0.00390	0.01181	0.00438
surc	0.17	0.16	0.14	0.22	0.22	0.23	0.23	0.19	0.16
US flow (l/s)	2033.76	-0.04	507.20	1028.58	1214.73	966.52	1131.64	1228.19	1107.13
DS flow (l/s)	2033.22	-14.37	504.32	1015.64	1198.26	946.87	1072.43	1223.00	1096.13

Node	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
Node ID	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
System type	overland	overland	overland	overland	overland	overland	overland	overland	overland	-
ground (m AD)	169.131	171.101	171.078	171.087	171.137	171.760	171.403	171.606	172.102	-
level (m AD)	168.929	170.888	167.571	169.922	170.960	171.554	170.734	171.653	171.896	-
flood dep (m)	0.168	0.157	0.001	0.141	0.216	0.164	0.225	0.187	0.164	0.149
inflow (l/s)	262.37	187.61	568.95	70.23	174.93	374.71	169.75	182.71	12.34	99.03
expr:Freeboard	0.201526	0.213228	3.506558	1.164988	0.177359	0.205694	0.668915	-0.046908	0.206172	-

Existing overland system profile with 100-yr design storm event simulation results from Bayview Avenue North to SWM Pond



Link	j451.1	j450.1	s342.1	s341.1
US node ID	j451	j450	s342	s341
Link suffix	1	1	1	1
ds node	pond1	j451	j450	s342
System type	overland	overland	overland	overland
Length (m)	142.5	27.6	34.5	58.8
grad (m/m)	0.05562	0.07147	-0.00003	0.00456
surc	0.17	0.17	0.26	0.26
US flow (l/s)	2265.82	2033.76	1930.12	2480.46
DS flow (l/s)	2262.53	2033.22	1904.28	2359.73

Node	pond1	j451	j450	s342	s341
Node ID	pond1	j451	j450	s342	s341
System type	storm	overland	overland	overland	overland
ground (m AD)	162.000	169.131	171.101	170.730	170.998
level (m AD)	160.885	168.929	170.888	170.779	171.108
flood dep (m)	-1.115	0.168	0.157	0.260	0.215
inflow (l/s)	0.00	262.37	187.61	347.21	167.04
expr:Freeboard	1.115219	0.201526	0.213228	-0.049388	-0.110307

Glynnwood Scenario 2 under the 100-yr Design Storm Event Simulation Results

In Scenario 1, proposed overland channel with proposed sewers moved south of existing 900 mm across Bayview Ave. Proposed sewers were upgraded to ensure that no overland flow crosses Bayview Avenue from east to west in the 100-year storm event.

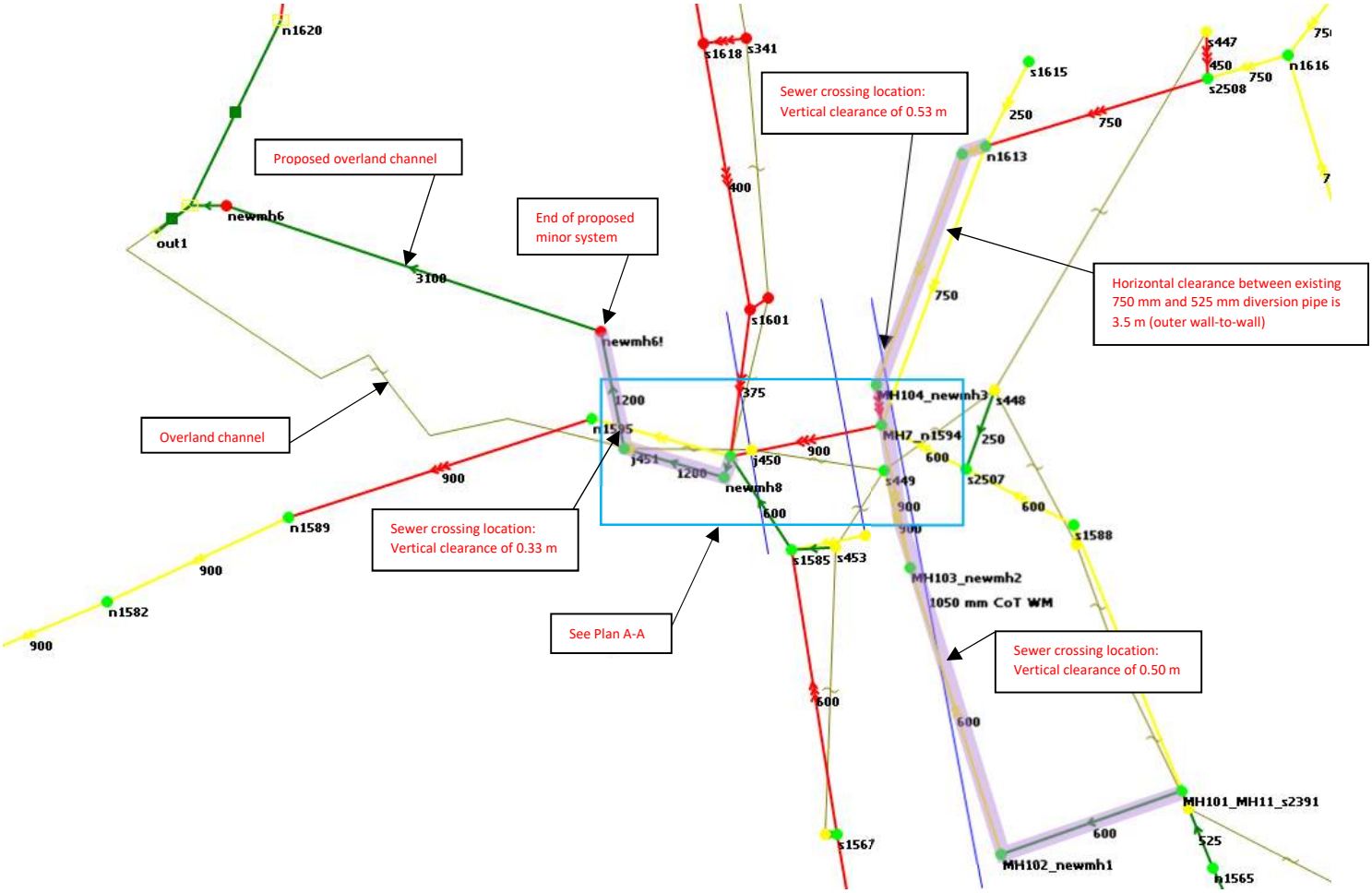
In Scenario 2, in addition to the flows captured in Scenario 1, overland flows from north to south on Bayview Avenue were also captured by a proposed inlet located on the driveway of the Glynnwood property. The proposed sewers west of Bayview Avenue were moved north of the existing 900 mm sewer and upgraded to capture all north to south overland flow in the 100-year storm event. Updated with the survey data and as-built information, the existing 900 mm sewer across Bayview Ave. is sufficient to convey flows and eliminates the need for a diversion sewer across Bayview Ave. This determination is made based on the assumption that the survey and as-built data are accurate. However, there are inconsistencies between the upstream invert for that pipe between the as-built and the sewer survey. The as-built invert was used because it also contained the 1800 mm watermain data and correct sewer sizes.

In the 100-year storm event, depth of HGL is greater than 1.8 m at all except 2 minor system locations. HGL depth is less than 1.8 m at s1601 and s1618.

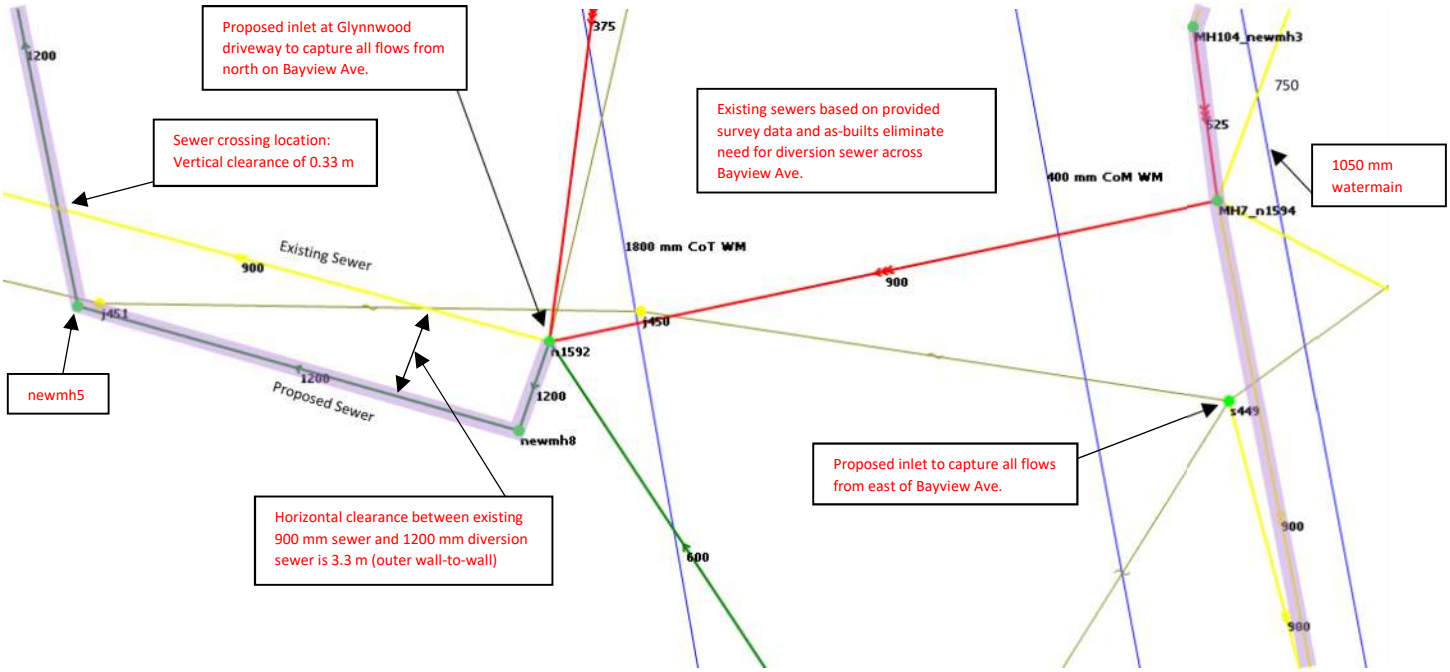
Legend:

Proposed storm sewer system

Overall Plan

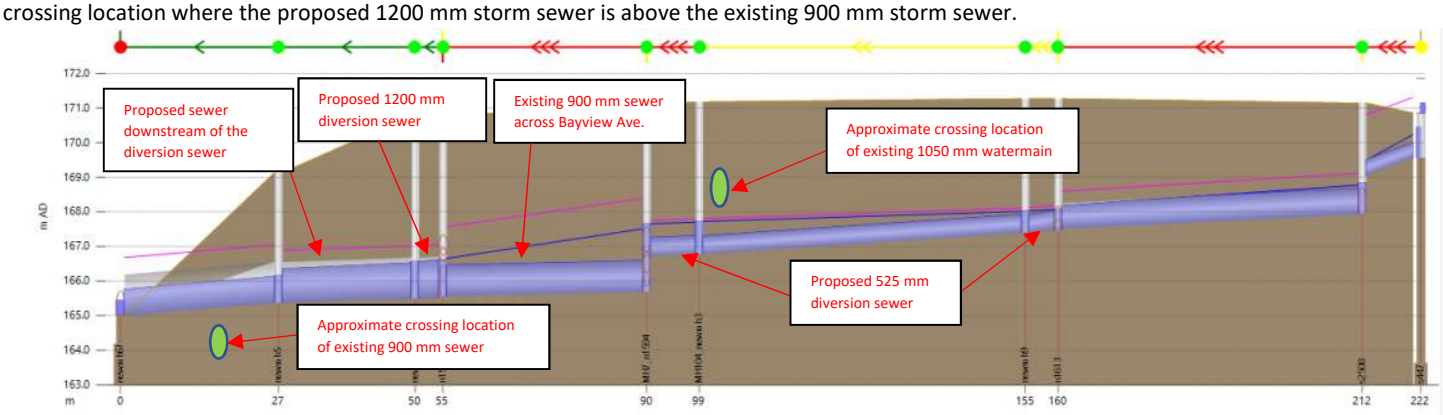


Plan A-A



Proposed sewers profile with 100-yr design storm event simulation results - from s447 to overland system at newmh6! – Alignment 1 (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

The vertical distance (including pipe size and thickness) is estimated to be **<u>0.53 m</u>** at the crossing location where the existing 1050 mm City of Markham watermain is above the proposed 525 mm diversion sewer (east of Bayview Ave.). The vertical distance is estimated to be **<u>0.33 m</u>** at the crossing location where the proposed 1200 mm storm sewer is above the existing 900 mm storm sewer.

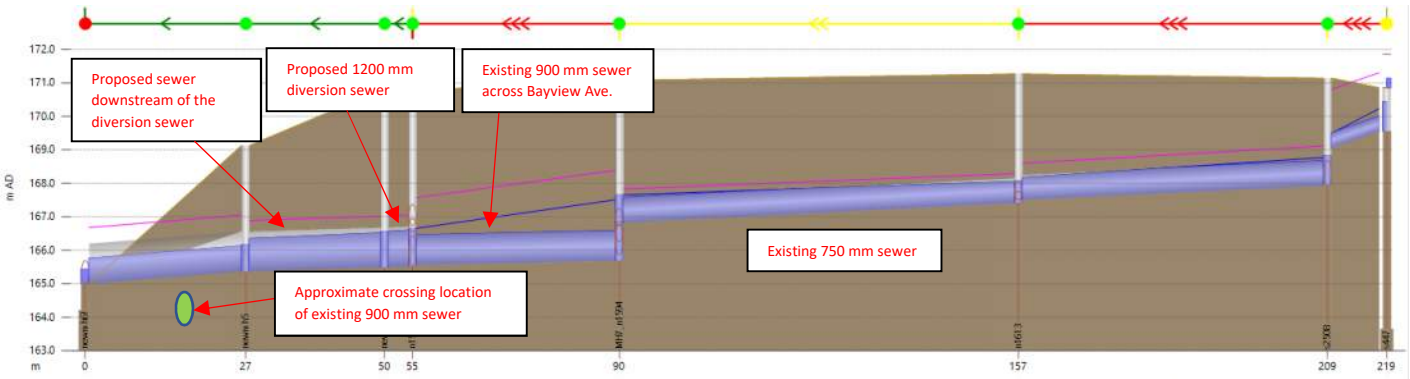


Link	newmh5.1	newmh8.1	-	MH7_n1594.1	-	newmh9.1	-	s2508.1	s447.2
US node ID	newmh5	newmh8	-	MH7_n1594	-	newmh9	-	s2508	s447
ds node	newmh6!	newmh5	-	n1592	-	MH104_newmh3	-	n1613	s2508
System type	storm	storm	-	storm	storm	storm	storm	storm	storm
Asset ID				minor				minor	lead
length (m)	27.0	23.4	4.7	34.9	9.0	55.7	5.6	52.0	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	525	525	525	750	450
height (mm)	1200	1200	1200	900	525	525	525	750	450
us inv (m AD)	165.370	165.490	-	165.690	166.780	167.400	-	167.928	169.557
ds inv (m AD)	165.000	165.370	-	165.560	166.730	166.780	-	167.512	169.057
grad (m/m)	0.01369	0.00513	-	0.00373	0.00557	0.01112	-	0.00800	0.05000
surc	0.64	0.86	0.90	2.00	2.00	1.00	1.00	2.00	2.00
r.pfc (l/s)	4562	2793	3108	1106	321	454	606	996	638
DS flow (l/s)	3218.57	3218.63	-	2815.04	422.77	414.65	-	1187.40	775.35
DS velocity (m/s)	4.240	3.240	-	4.255	2.229	1.972	2.200	2.879	5.143

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	MH104_newmh3	newmh9	n1613	s2508	-
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	MH104_newmh3	newmh9	n1613	s2508	-
System type	storm	storm	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.778	170.778	171.074	171.175	171.267	171.267	171.139	-
level (m AD)	165.435	166.163	166.563	166.641	167.654	167.719	168.030	168.075	168.835	-
flood dep (m)	0.435	-2.968	-4.215	-4.137	-3.420	-3.456	-3.237	-3.192	-2.304	-
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	0.00	0.00	0.00	-
exprFreeboard	-0.435364	2.967807	4.214523	4.137299	3.420161	3.455502	3.237459	3.192034	2.304482	-

Proposed sewers profile with 100-yr design storm event simulation results - from s447 to overland system at newmh6! – Alignment 2 (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

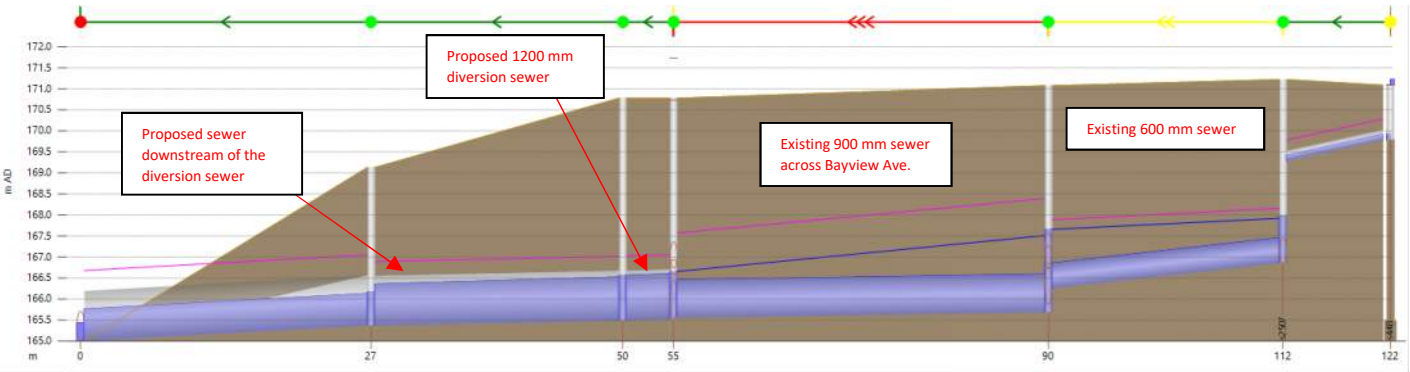
The vertical distance (including pipe size and thickness) is estimated to be **0.53 m** at the crossing location where the existing 1050 mm City of Markham watermain is above the proposed 525 mm diversion sewer (east of Bayview Ave.). The vertical distance is estimated to be **0.33 m** at the crossing location where the proposed 1200 mm storm sewer is above the existing 900 mm storm sewer.



Link	newmh5.1	newmh8.1	-	MH7_n1594.1	n1613.3	s2508.1	s447.2
US node ID	newmh5	newmh8	-	MH7_n1594	n1613	s2508	s447
ds node	newmh6!	newmh5	-	n1592	MH7_n1594	n1613	s2508
System type	storm	storm	-	storm	storm	storm	storm
Asset ID				minor		minor	lead
length (m)	27.0	23.4	4.7	34.9	67.2	52.0	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	750	750	450
height (mm)	1200	1200	1200	900	750	750	450
us inv (m AD)	165.370	165.490	-	165.690	167.417	167.928	169.557
ds inv (m AD)	165.000	165.370	-	165.560	166.828	167.512	169.057
grad (m/m)	0.01369	0.00513	-	0.00373	0.00877	0.00800	0.05000
surc	0.64	0.86	0.90	2.00	1.00	2.00	2.00
r.pfc (l/s)	4562	2793	3108	1106	1043	996	638
DS flow (l/s)	3218.57	3218.63	-	2815.04	908.09	1187.40	775.35
DS velocity (m/s)	4.240	3.240	-	4.255	2.619	2.879	5.143

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	n1613	s2508	-
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	n1613	s2508	-
System type	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.778	170.778	171.074	171.267	171.139	-
level (m AD)	165.435	166.163	166.563	166.641	167.654	168.075	168.835	-
flood dep (m)	0.435	-2.968	-4.215	-4.137	-3.420	-3.192	-2.304	-
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	0.00	-
exprFreeboard	-0.435364	2.967807	4.214523	4.137299	3.420161	3.192034	2.304482	-

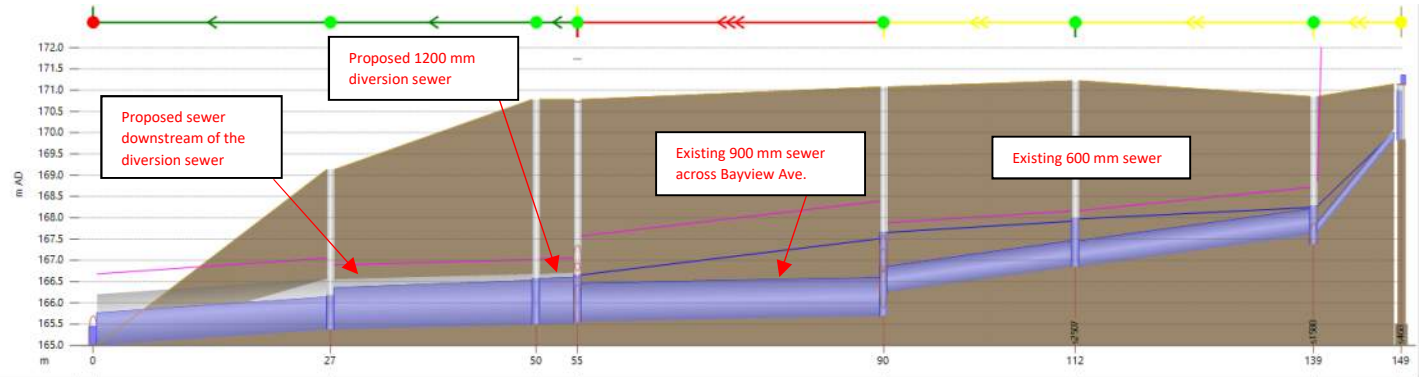
Proposed Sewers Profile with 100-yr design storm event simulation results from s448 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	newmh8.1	n1592.1	MH7_n1594.1	s2507.1	s448.2
US node ID	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
ds node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507
System type	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	lead
length (m)	27.0	23.4	4.7	34.9	21.8	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	600	250
height (mm)	1200	1200	1200	900	600	250
us inv (m AD)	165.370	165.490	165.520	165.690	166.856	169.787
ds inv (m AD)	165.000	165.370	165.490	165.560	166.258	169.287
grad (m/m)	0.01369	0.00513	0.00635	0.00373	0.02743	0.05000
surc	0.64	0.86	0.90	2.00	1.00	0.53
r.pfc (l/s)	4562	2793	3108	1106	1017	133
DS flow (l/s)	3218.57	3218.63	3219.64	2815.04	750.51	70.14
DS velocity (m/s)	4.240	3.240	3.009	4.255	3.558	2.676

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
System type	storm	storm	storm	storm	storm	storm	overland
ground (m AD)	165.000	169.131	170.778	170.778	171.074	171.220	171.087
level (m AD)	165.435	166.163	166.563	166.641	167.654	167.970	169.922
flood dep (m)	0.435	-2.968	-4.215	-4.137	-3.420	-3.250	0.141
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	70.16
exprFreeboard	-0.435364	2.967807	4.214523	4.137299	3.420161	3.249510	-

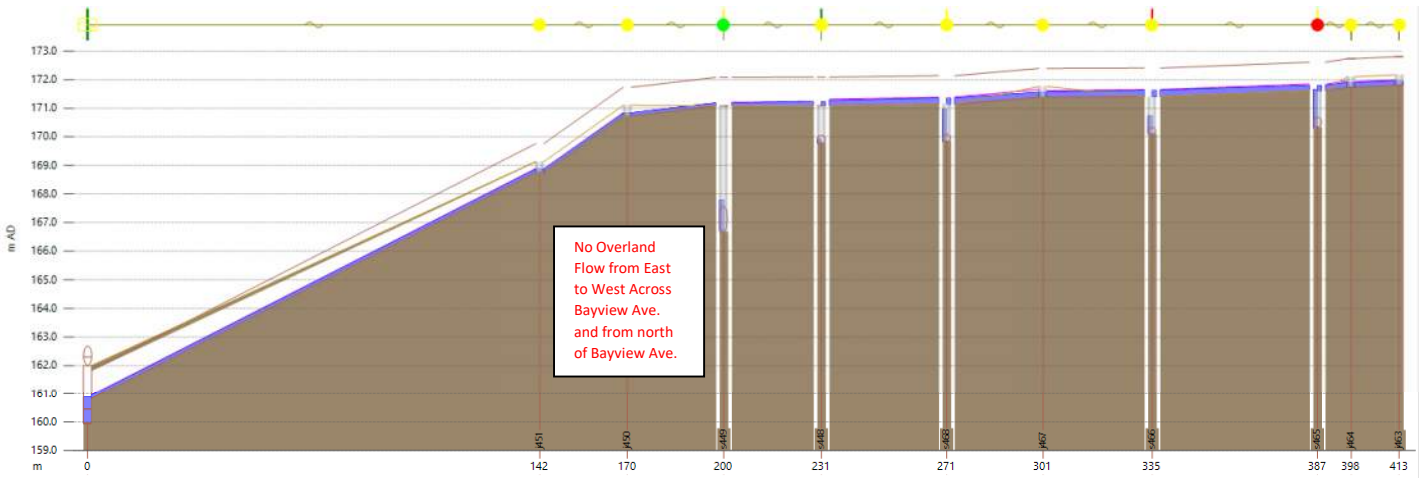
Proposed Sewers Profile with 100-yr design storm event simulation results from s468 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	newmh8.1	n1592.1	MH7_n1594.1	s2507.1	s1588.1	s468.2
US node ID	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
ds node	newmh6!	newmh5	-	n1592	MH7_n1594	s2507	s1588
System type	storm	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	minor	lead
length (m)	27.0	23.4	4.7	34.9	21.8	27.1	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	600	600	250
height (mm)	1200	1200	1200	900	600	600	250
us inv (m AD)	165.370	165.490	165.520	165.690	166.856	167.600	169.837
ds inv (m AD)	165.000	165.370	165.490	165.560	166.258	166.856	167.650
grad (m/m)	0.01369	0.00513	0.00635	0.00373	0.02743	0.02745	0.21870
surc	0.64	0.86	0.90	2.00	1.00	1.00	1.00
r.pfc (l/s)	4562	2793	3108	1106	1017	1018	278
DS flow (l/s)	3218.57	3218.63	3219.64	2815.04	750.51	714.70	201.06
DS velocity (m/s)	4.240	3.240	3.009	4.255	3.558	3.435	3.718

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
System type	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.778	170.778	171.074	171.220	170.850	-
level (m AD)	165.435	166.163	166.563	166.641	167.654	167.970	168.269	-
flood dep (m)	0.435	-2.968	-4.215	-4.137	-3.420	-3.250	-2.581	0.216
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	444.78	174.76
expr:Freeboard	-0.435364	2.967807	4.214523	4.137299	3.420161	3.249510	2.580560	-

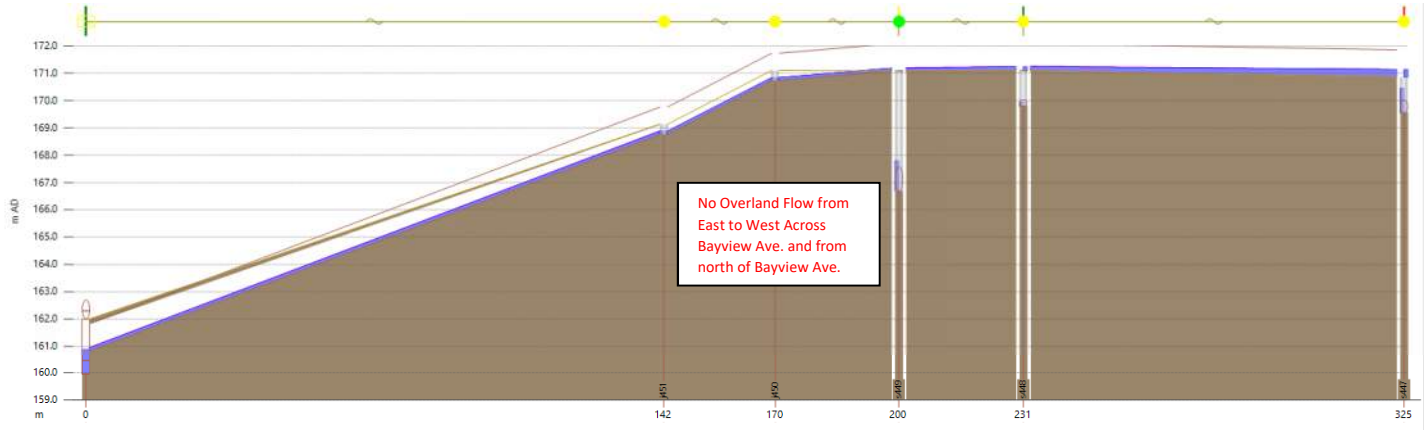
Existing overland system profile with 100-yr design storm event simulation results from Parking Lot east of Bayview Ave. to SWM Pond



Link	j451.1	j450.1	s449.1	s448.1	s468.1	j467.1	s466.1	s465.1	j464.1	j463.1
US node ID	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
Link suffix	1	1	1	1	1	1	1	1	1	1
ds node	pond1	j451	j450	s449	s448	s468	j467	s466	s465	j464
System type	overland	overland	overland	overland	overland	overland	overland	overland	-	overland
Length (m)	142.5	27.6	30.4	30.7	39.5	30.4	34.4	52.0	10.7	15.1
grad (m/m)	0.05562	0.07147	0.01141	0.00029	0.00127	0.00833	0.00038	0.00390	-	0.00438
surc	0.11	0.11	0.10	0.14	0.22	0.22	0.23	0.23	0.19	0.16
US flow (l/s)	261.94	-0.00	-0.00	506.34	1026.47	1212.76	965.72	1131.03	-	1107.22
DS flow (l/s)	253.96	-1.38	-0.00	503.47	1013.86	1195.69	943.86	1071.26	-	1096.16

Node	pond1	j451	j450	s449	s448	s468	j467	s466	s465	j464	-
Node ID	pond1	j451	j450	s449	s448	s468	j467	s466	s465	j464	-
System type	storm	overland	overland	overland	overland	overland	overland	overland	overland	-	-
ground (m AD)	162.000	169.131	171.101	171.078	171.087	171.137	171.760	171.403	171.606	-	-
level (m AD)	160.879	168.871	170.831	167.795	169.922	170.964	171.554	170.733	171.653	-	-
flood dep (m)	-1.121	0.110	0.100	0.001	0.141	0.216	0.164	0.225	0.187	0.164	-
inflow (l/s)	0.00	262.37	0.00	568.07	70.16	174.76	374.71	169.65	177.83	12.34	-
expr:Freeboard	1.121185	0.259998	0.270006	3.282941	1.165125	0.173087	0.205892	0.669525	-0.046863	-	-

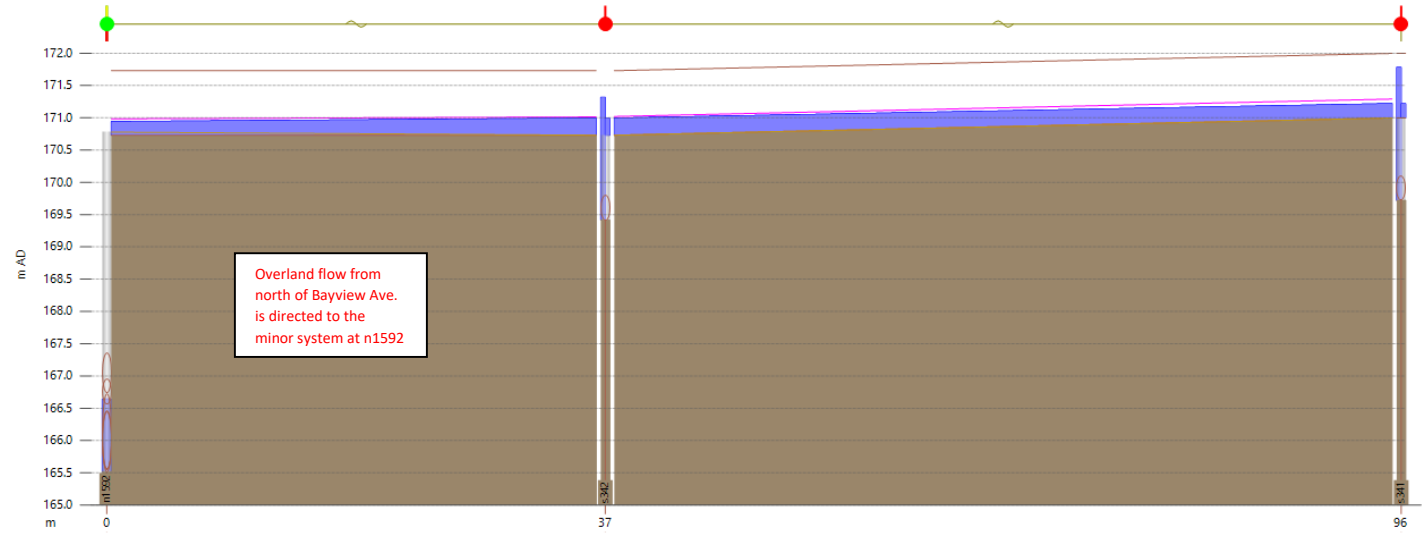
Existing overland system profile with 100-yr design storm event simulation results from s447 to SWM Pond



Link	j451.1		j450.1	s449.1	s448.1	s447.1
US node ID	j451		j450	s449	s448	s447
Link suffix	1		1	1	1	1
ds node	pond1		j451	j450	s449	s448
System type	overland		overland	overland	overland	overland
Length (m)	142.5		27.6	30.4	30.7	93.9
grad (m/m)	0.05562		0.07147	0.01141	0.00029	-0.00245
surc	0.11		0.11	0.10	0.14	0.28
US flow (l/s)	261.94		-0.00	-0.00	506.34	-389.33
DS flow (l/s)	253.96		-1.38	-0.00	503.47	-471.00

Node	pond1	j451	j450	s449	s448	s447
Node ID	pond1	j451	j450	s449	s448	s447
System type	storm	overland	overland	overland	overland	overland
ground (m AD)	162.000	169.131	171.101	171.078	171.087	170.857
level (m AD)	160.879	168.871	170.831	167.795	169.922	170.445
flood dep (m)	-1.121	0.110	0.100	0.001	0.141	0.278
inflow (l/s)	0.00	262.37	0.00	568.07	70.16	775.39
expr:Freeboard	1.121185	0.259998	0.270006	3.282941	1.165125	0.412008

Existing overland system profile with 100-yr design storm event simulation results from s341 to n1592



Link	s342.1		s341.1
US node ID	s342		s341
Link suffix	1		1
ds node	n1592		s342
System type	overland		overland
Length (m)	36.8		58.8
grad (m/m)	-0.00003		0.00456
surc	0.26		0.26
US flow (l/s)	1998.54		2700.94
DS flow (l/s)	1932.55		2478.18

Node	n1592	s342	s341
Node ID	n1592	s342	s341
System type	storm	overland	overland
ground (m AD)	170.778	170.730	170.998
level (m AD)	166.641	171.318	171.782
flood dep (m)	-4.137	0.264	0.221
inflow (l/s)	188.05	401.28	239.36
expr:Freeboard	4.137299	-0.588359	-0.784089

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Alain Cachola (City of Markham), Steve Van Haren (WSP), James Zhou (WSP), Sharon Chan (WSP), John Ho (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Revision of Modeling based on the STM - Additional Analysis Scenario– No 100-year Major System Overland Flow to Glynnwood Site**

DATE: **December 18, 2020**

We have completed the revision of the InfoWorks model based on the results of STM survey recently completed by the City. The vertical clearance between the existing STM and the proposed pipes were also evaluated and confirmed.

Detailed results and findings are included in the attachment. The following provides a summary.

1 Regarding the STM survey completed by the City, there is an inconsistency of the upstream inverts for the existing 900 mm pipe across Bayview Ave. The surveyed US invert of such pipe is 165.528 m, while the surveyed DS invert is unknown. The 167M-2 as-built drawing has both US and DS inverts for this pipe. By applying the as-built DS invert with the surveyed US invert, it results in an negative slope in the sewer, which does not make sense. Moreover, the as-built was deemed to be more accurate because it also contained the 1800 mm watermain data and correct sewer sizes. Therefore, the inverts of the existing 900 pipe across Bayview Ave were based on the as-built 167M-2 drawing.

Sources	US Invert Elevation (m)	DS Invert Elevation (m)	Pipe Slope
Survey Data	165.528	N/A. Use as-built elevation	-0.09%
As-Built 167M-2	165.69	165.56	0.37%

2 By using the data colleceted based on the recent City's STM survey, the updated Infoworks model confirms that the new STM relief pipe across the Bayview Avenue (as previously proposed) will not be necessary. The proposed system upgrades required on both TSSC site (east of Bayview) and Glynnwood site (west of Bayview) will be sufficient to convey flows (up to 100-year event) and solve the flooding issues at the TSSC site. An illustration of the

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

revised proposed system is shown in **Figure X4.R2**. Detailed proposed sewer profiles are included in the attachement.

3 The vertical clearance between the existing STM and the proposed pipes were evaluated at two locations east of Bayview Ave. It is confirmed the vertical clearance of 0.5 m will be achieved. The 0.5 m is the minimum clearance as stated in City of Markham's Subdivision Requirements. Detailed locations of the clearance check are are included in the attachement.

4 The proposed OGS unit will be relocated to the west of Bayview Ave., as shown in **Figure X4.R2**.

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Alain Cachola (City of Markham), Steve Van Haren (WSP), James Zhou (WSP), Sharon Chan (WSP), John Ho (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Revision of Modeling based on the STM - Additional Analysis Scenario– No 100-year Major System Overland Flow to Glynnwood Site**

DATE: **December 18, 2020**

We have completed the revision of the InfoWorks model based on the results of STM survey recently completed by the City. The vertical clearance between the existing STM and the proposed pipes were also evaluated and confirmed.

Detailed results and findings are included in the attachment. The following provides a summary.

1 Regarding the STM survey completed by the City, there is an inconsistency of the upstream inverts for the existing 900 mm pipe across Bayview Ave. The surveyed US invert of such pipe is 165.528 m, while the surveyed DS invert is unknown. The 167M-2 as-built drawing has both US and DS inverts for this pipe. By applying the as-built DS invert with the surveyed US invert, it results in an negative slope in the sewer, which does not make sense. Moreover, the as-built was deemed to be more accurate because it also contained the 1800 mm watermain data and correct sewer sizes. Therefore, the inverts of the existing 900 pipe across Bayview Ave were based on the as-built 167M-2 drawing.

Sources	US Invert Elevation (m)	DS Invert Elevation (m)	Pipe Slope
Survey Data	165.528	N/A. Use as-built elevation	-0.09%
As-Built 167M-2	165.69	165.56	0.37%

2 By using the data colleceted based on the recent City's STM survey, the updated Infoworks model confirms that the new STM relief pipe across the Bayview Avenue (as previously proposed) will not be necessary. The proposed system upgrades required on both TSSC site (east of Bayview) and Glynnwood site (west of Bayview) will be sufficient to convey flows (up to 100-year event) and solve the flooding issues at the TSSC site. An illustration of the

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

revised proposed system is shown in **Figure X4.R2**. Detailed proposed sewer profiles are included in the attachement.

3 The vertical clearance between the existing STM and the proposed pipes were evaluated at two locations east of Bayview Ave. It is confirmed the vertical clearance of 0.5 m will be achieved. The 0.5 m is the minimum clearance as stated in City of Markham's Subdivision Requirements. Detailed locations of the clearance check are are included in the attachement.

4 The proposed OGS unit will be relocated to the west of Bayview Ave., as shown in **Figure X4.R2**.

For Discussion Only

Proposed OGS Unit

Proposed Sewer Upgrade (525 mm)

Overland Flow Direction. Minor surface re-grading may be required (TBD).

Proposed Sewer Upgrade (1200 mm) - Sc2

Proposed Sewer Upgrade (1200 mm) - Sc2

Proposed Inlet Upgrade to Capture All Overland Flow (Sc-2)

Proposed Sewer Upgrade (900 mm)

Proposed Inlet Upgrade to Capture All Overland Flow (Sc-1)

Proposed Sewer Upgrade (600 mm)

PROPOSED 78m RETAINING WALL

PROPOSED 81m CHANNEL

PLUNGE POOL

HEADWALL

1050mm-3.0m

MH107

1050mm-34.1m

750mm-8.2m LONG SEWER

EX MH

MH106

28.7m LONG BYPASS SEWER

RELIEF SEWER

900mm-34.1m LONG BYPASS SEWER

DIVERSION STORM SEWER

750mm-63.0m LONG SEWER

PROPOSED OGS (MH104)

MH103

MH7

EX MH 1

750mm-15.9m LONG SEWER

DIVERSION MANHOLE

MH10

MH102

600mm-67.9m LONG FLOOD RELIEF SEWER

FLOOD RELIEF SEWER

MH11

MH101

600mm-41.2m LONG FLOOD RELIEF SEWER

UNDERGROUND GARAGE

GLYNNWOOD POND

GLYNNWOOD RETIREMENT RESIDENCE

PROPOSED 8-STOREY RETIREMENT RESIDENCE

BAYVIEW AVENUE

LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- PROPOSED MANHOLE
- OIL/GRIT SEPARATOR (OGS)

0 10 20 30 40 50m

CLIENT: CITY OF MARKHAM

TITLE: GLYNNWOOD TRIBUTARY CLASS EA

PREFERRED ALTERNATIVE #2 (FEBRUARY 2020)

Upgrade Option - Scenario 2 (No Overland Flow to Glynnwood Site). Rev 2

wsp

Checked A.Z.Z.	Drawn AutoCAD/B.K.B.
Date DEC 2020	Proj. No. 121-15461-00
Scale AS SHOWN	Figure No. X4.R2 / Gr.No. 00

FIGURE X2.dwg - Glynwood Tributary Class EA -Preferred Alternative #2 (February 2020) X:\DIV\38\2012\121-15461-00 Glynnwood\CAD\FIGURES\ Feb 27, 2020 - 4:51am

Glynnwood Scenario 1 under the 100-yr Design Storm Event Simulation Results

Proposed overland channel with proposed sewers moved south of existing 900 mm across Bayview Ave. Proposed sewers were upgraded to ensure that no overland flow crosses Bayview Avenue from east to west in the 100-year storm event. Updated with the survey data and as-built information, the existing 900 mm sewer across Bayview Ave. is sufficient to convey flows and eliminates the need for a diversion sewer across Bayview Ave. This determination is made based on the assumption that the survey and as-built data are accurate.

However, there is an inconsistency between the upstream invert for the 900 mm pipe across Bayview Ave. between the as-built and the sewer survey. The surveyed US invert for the 900 mm pipe across Bayview Ave. is 165.528 m. This is less than the US invert from the 167M-2 as-built, which is 165.69 m. The DS invert from the as-built is 165.56 m. No survey data is available for the DS invert. Using the surveyed US invert results in an negative slope in the sewer, which does not make sense. Moreover, the as-built was deemed to be more accurate because it also contained the 1800 mm watermain data and correct sewer sizes.

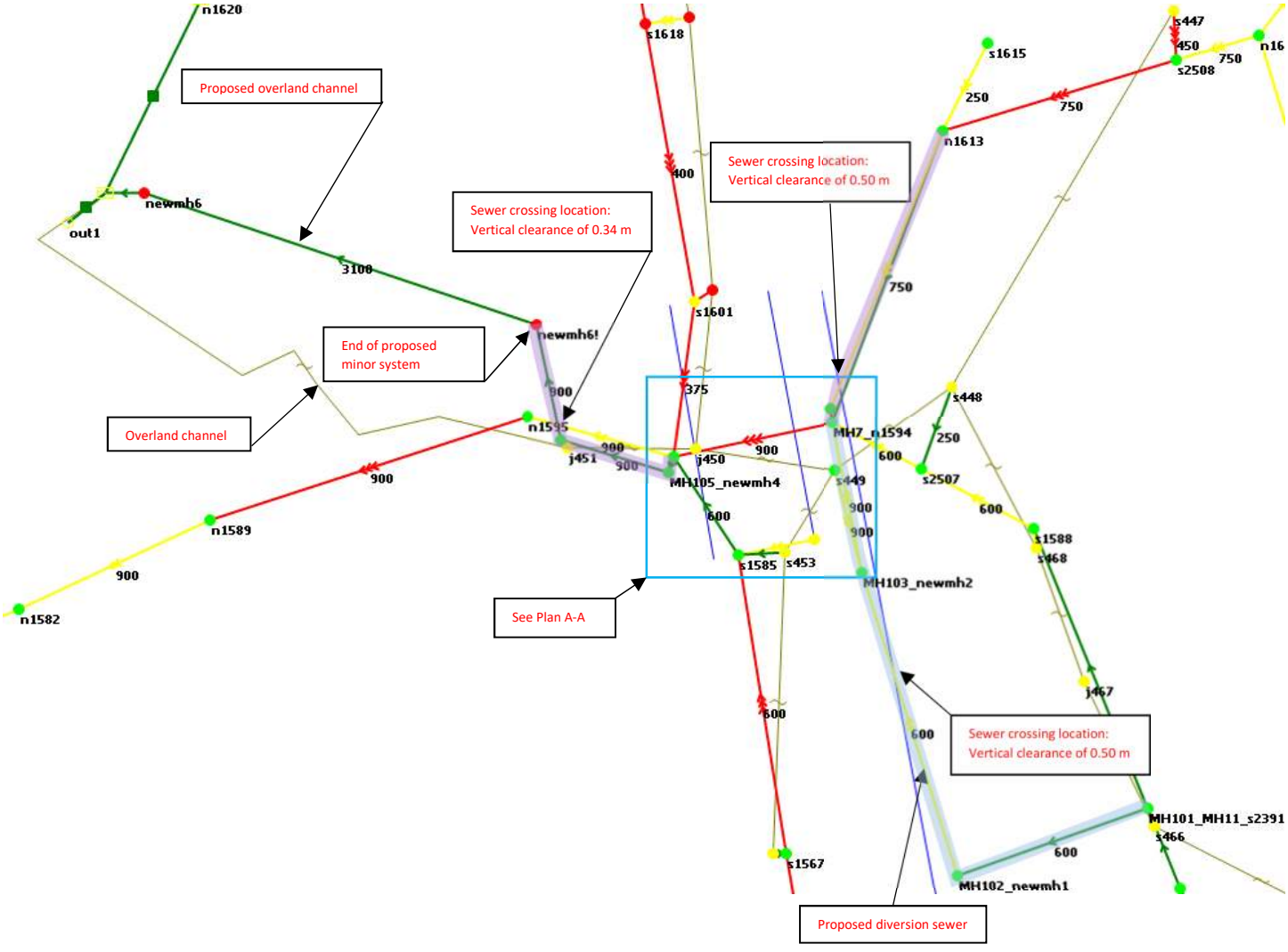
	US Invert Elevation (m)	DS Invert Elevation (m)	Pipe Slope
Survey Data	165.528	N/A, use as-built elevation	-0.09%
As-Built 167M-2	165.69	165.56	0.37%

In the 100-year storm event, depth of HGL is greater than 1.8 m at all except two minor system locations. HGL depth is less than 1.8 m at s1601 and s1618.

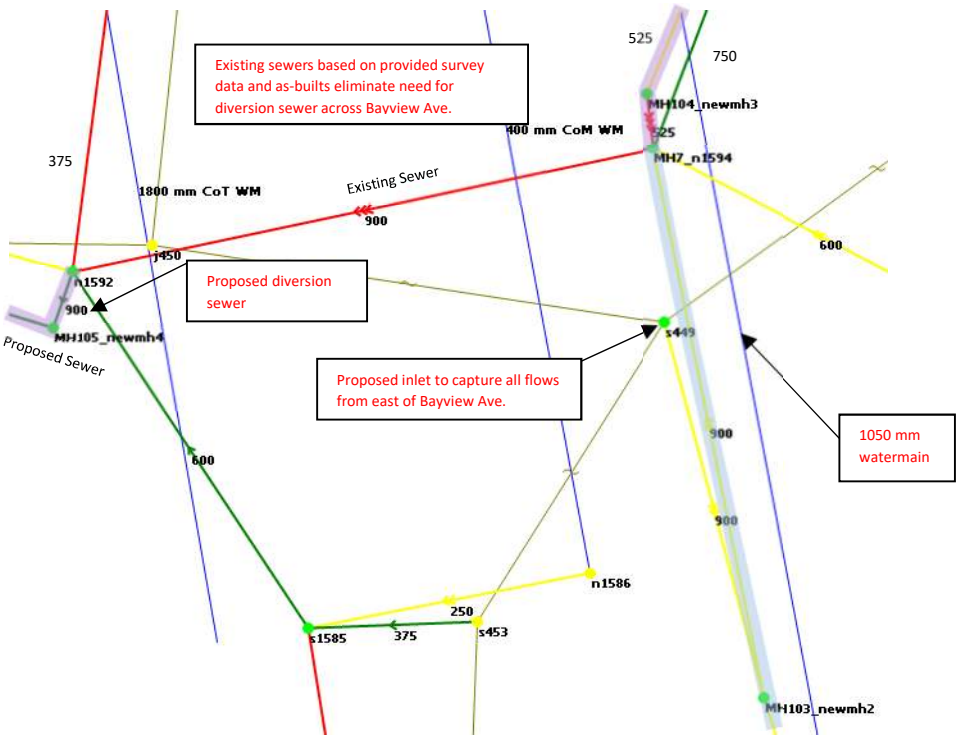
Legend:

Downsized proposed storm sewer system Proposed diversion sewers

Overall Plan

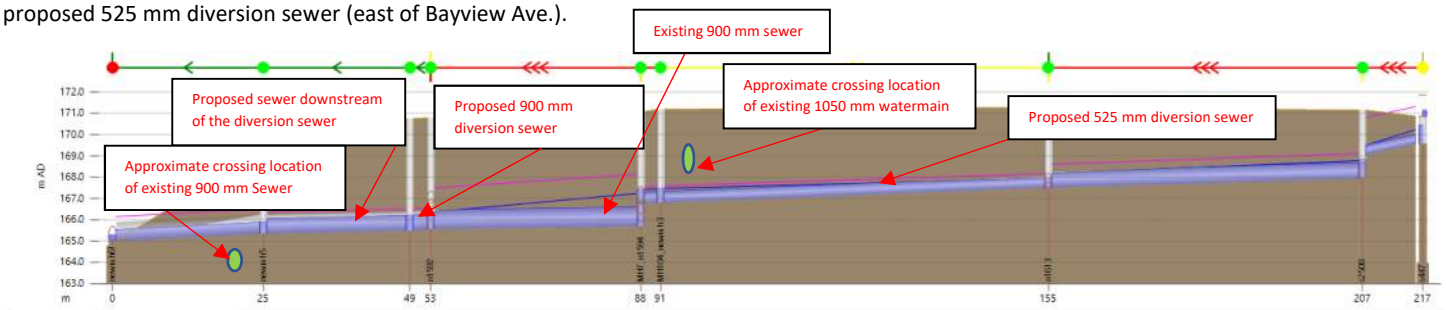


Plan A-A



Proposed sewers profile with 100-yr design storm event simulation results - from s447 to overland system at newmh6! – Alignment 1 (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

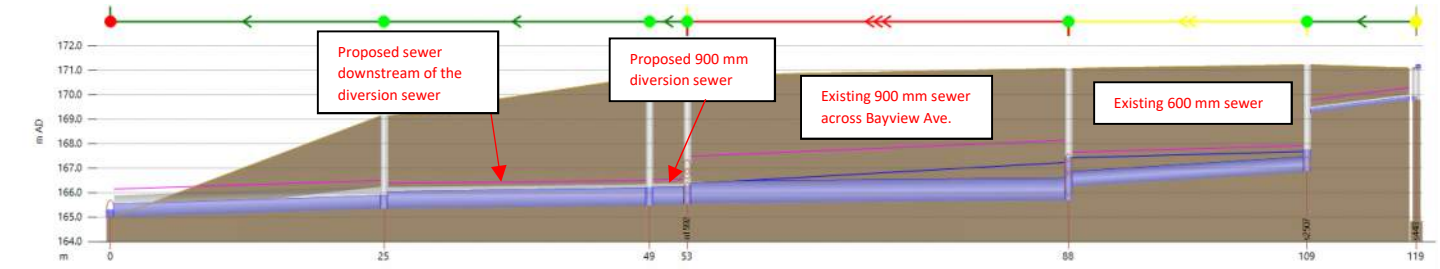
The vertical distance (including pipe size and thickness) is estimated to be **<u>0.34 m</u>** at the crossing location where the proposed 900 mm sewer is above the existing 900 mm sewer, and **<u>0.50 m</u>** at the crossing location where the existing 1050 mm City of Markham watermain is above the proposed 525 mm diversion sewer (east of Bayview Ave.).



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	-	n1613.1	s2508.1	s447.2
US node ID	newmh5	MH105_newmh4	-	MH7_n1594	-	n1613	s2508	s447
ds node	newmh6!	newmh5	-	n1592	90	MH104_newmh3	n1613	s2508
System type	storm	storm	-	storm	-	storm	storm	storm
Asset ID				minor			minor	lead
length (m)	25.0	24.2	3.5	34.9	3.3	64.3	52.0	10.0
Shape ID	CIRC	CIRC	-	CIRC	-	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	525	525	750	450
height (mm)	900	900	900	900	525	525	750	450
us inv (m AD)	165.350	165.470	-	165.690	-	167.512	167.928	169.557
ds inv (m AD)	165.000	165.350	-	165.560	-	166.800	167.512	169.057
grad (m/m)	0.01397	0.00495	-	0.00373	-	0.01108	0.00800	0.05000
surc	0.58	0.80	-	2.00	-	1.00	2.00	2.00
r.pfc (l/s)	2140	1274	-	1106	335	453	996	638
DS flow (l/s)	1350.60	1351.39	-	2826.46	-	401.16	1187.59	775.43
DS velocity (m/s)	3.500	2.584	-	4.687	-	1.996	2.879	5.143

Node	newmh6!	newmh5	-	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
Node ID	newmh6!	newmh5	-	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
System type	storm	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.175	171.267	171.139	-
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.471	167.944	168.835	-
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.704	-3.323	-2.304	-
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	-
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.703610	3.322588	2.304176	-

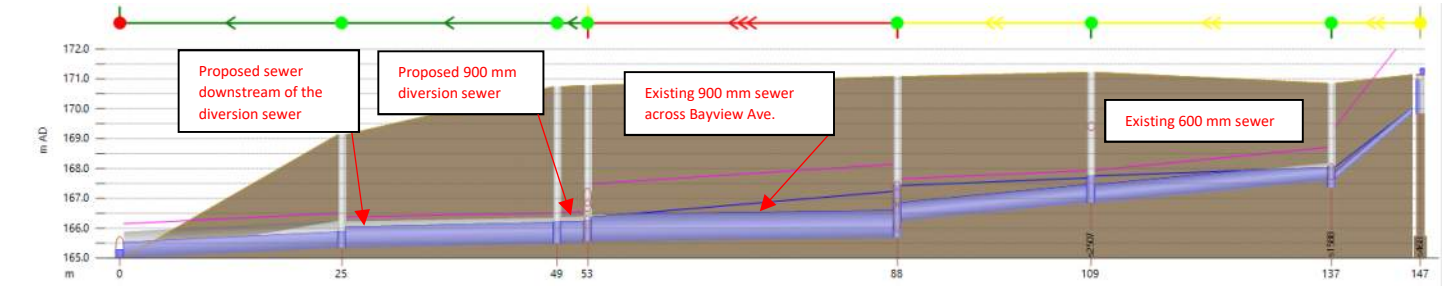
Proposed Sewers Profile with 100-yr design storm event simulation results from s448 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	s2507.1	s448.2
US node ID	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
ds node	newmh6l	newmh5	-	n1592	MH7_n1594	s2507
System type	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	lead
length (m)	25.0	24.2	3.5	34.9	21.8	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	600	250
height (mm)	900	900	900	900	600	250
us inv (m AD)	165.350	165.470	-	165.690	166.856	169.787
ds inv (m AD)	165.000	165.350	-	165.560	166.258	169.287
grad (m/m)	0.01397	0.00495	-	0.00373	0.02743	0.05000
surc	0.58	0.80	0.79	2.00	1.00	0.53
r.pfc (l/s)	2140	1274	1375	1106	1017	133
DS flow (l/s)	1350.60	1351.39	-	2826.46	736.15	70.20
DS velocity (m/s)	3.500	2.584	2.508	4.687	3.559	2.676

Node	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
Node ID	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s448
System type	storm	storm	storm	storm	storm	storm	overland
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.220	171.087
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.744	169.922
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.476	0.141
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	70.23
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.475783	1.164988

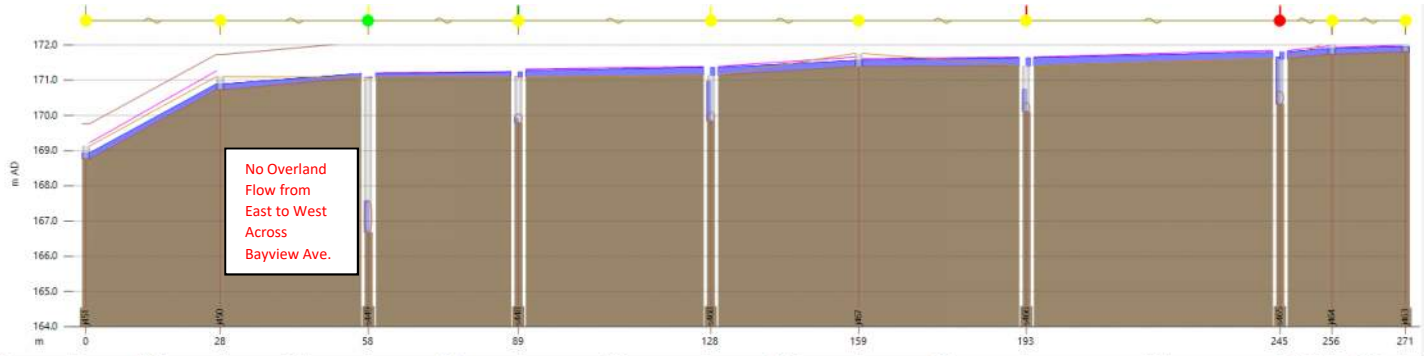
Proposed Sewers Profile with 100-yr design storm event simulation results from s468 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)



Link	newmh5.1	MH105_newmh4.1	-	MH7_n1594.1	s2507.1	s1588.1	s468.2
US node ID	newmh5	MH105_newmh4	-	MH7_n1594	s2507	s1588	s468
ds node	newmh6l	newmh5	-	n1592	MH7_n1594	s2507	s1588
System type	storm	storm	-	storm	storm	storm	storm
Asset ID				minor	minor	minor	lead
length (m)	25.0	24.2	3.5	34.9	21.8	27.1	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	900	900	900	900	600	600	250
height (mm)	900	900	900	900	600	600	250
us inv (m AD)	165.350	165.470	-	165.690	166.856	167.600	169.837
ds inv (m AD)	165.000	165.350	-	165.560	166.258	166.856	167.650
grad (m/m)	0.01397	0.00495	-	0.00373	0.02743	0.02745	0.21870
surc	0.58	0.80	0.79	2.00	1.00	1.00	1.00
r.pfc (l/s)	2140	1274	1375	1106	1017	1018	278
DS flow (l/s)	1350.60	1351.39	-	2826.46	736.15	701.90	276.35
DS velocity (m/s)	3.500	2.584	2.508	4.687	3.559	3.431	5.146

Node	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s1588	s468
Node ID	newmh6l	newmh5	MH105_newmh4	n1592	MH7_n1594	s2507	s1588	s468
System type	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	169.131	170.736	170.778	171.074	171.220	170.850	-
level (m AD)	165.281	165.888	166.209	166.252	167.423	167.744	168.048	-
flood dep (m)	0.281	-3.243	-4.527	-4.526	-3.651	-3.476	-2.802	0.216
inflow (l/s)	0.00	0.00	0.00	0.44	0.00	0.00	444.78	-
exprFreeboard	-0.281479	3.242603	4.526817	4.525879	3.651087	3.475783	2.802362	-

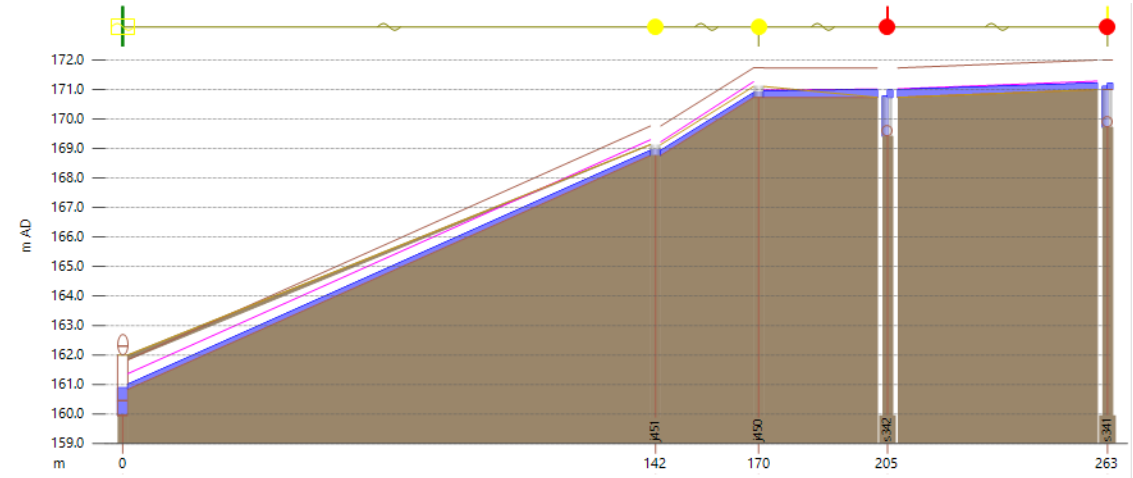
Existing overland system profile with 100-yr design storm event simulation results from Parking Lot east of Bayview Ave. to SWM Pond



Link	j450.1	s449.1	s448.1	s468.1	j467.1	s466.1	s465.1	j464.1	j463.1
US node ID	j450	s449	s448	s468	j467	s466	s465	j464	j463
Link suffix	1	1	1	1	1	1	1	1	1
ds node	j451	j450	s449	s448	s468	j467	s466	s465	j464
System type	overland	overland	overland	overland	overland	overland	overland	overland	overland
Length (m)	27.6	30.4	30.7	39.5	30.4	34.4	52.0	10.7	15.1
grad (m/m)	0.07147	0.01141	0.00029	0.00127	0.00833	0.00038	0.00390	0.01181	0.00438
surc	0.17	0.16	0.14	0.22	0.22	0.23	0.23	0.19	0.16
US flow (l/s)	2033.76	-0.04	507.20	1028.58	1214.73	966.52	1131.64	1228.19	1107.13
DS flow (l/s)	2033.22	-14.37	504.32	1015.64	1198.26	946.87	1072.43	1223.00	1096.13

Node	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
Node ID	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
System type	overland	overland	overland	overland	overland	overland	overland	overland	overland	-
ground (m AD)	169.131	171.101	171.078	171.087	171.137	171.760	171.403	171.606	172.102	-
level (m AD)	168.929	170.888	167.571	169.922	170.960	171.554	170.734	171.653	171.896	-
flood dep (m)	0.168	0.157	0.001	0.141	0.216	0.164	0.225	0.187	0.164	0.149
inflow (l/s)	262.37	187.61	568.95	70.23	174.93	374.71	169.75	182.71	12.34	99.03
expr:Freeboard	0.201526	0.213228	3.506558	1.164988	0.177359	0.205694	0.668915	-0.046908	0.206172	-

Existing overland system profile with 100-yr design storm event simulation results from Bayview Avenue North to SWM Pond



Link	j451.1	j450.1	s342.1	s341.1
US node ID	j451	j450	s342	s341
Link suffix	1	1	1	1
ds node	pond1	j451	j450	s342
System type	overland	overland	overland	overland
Length (m)	142.5	27.6	34.5	58.8
grad (m/m)	0.05562	0.07147	-0.00003	0.00456
surc	0.17	0.17	0.26	0.26
US flow (l/s)	2265.82	2033.76	1930.12	2480.46
DS flow (l/s)	2262.53	2033.22	1904.28	2359.73

Node	pond1	j451	j450	s342	s341
Node ID	pond1	j451	j450	s342	s341
System type	storm	overland	overland	overland	overland
ground (m AD)	162.000	169.131	171.101	170.730	170.998
level (m AD)	160.885	168.929	170.888	170.779	171.108
flood dep (m)	-1.115	0.168	0.157	0.260	0.215
inflow (l/s)	0.00	262.37	187.61	347.21	167.04
expr:Freeboard	1.115219	0.201526	0.213228	-0.049388	-0.110307

Glynnwood Scenario 2 under the 100-yr Design Storm Event Simulation Results

In Scenario 1, proposed overland channel with proposed sewers moved south of existing 900 mm across Bayview Ave. Proposed sewers were upgraded to ensure that no overland flow crosses Bayview Avenue from east to west in the 100-year storm event.

In Scenario 2, in addition to the flows captured in Scenario 1, overland flows from north to south on Bayview Avenue were also captured by a proposed inlet located on the driveway of the Glynnwood property. The proposed sewers west of Bayview Avenue were moved north of the existing 900 mm sewer and upgraded to capture all north to south overland flow in the 100-year storm event. Updated with the survey data and as-built information, the existing 900 mm sewer across Bayview Ave. is sufficient to convey flows and eliminates the need for a diversion sewer across Bayview Ave. This determination is made based on the assumption that the survey and as-built data are accurate. However, there are inconsistencies between the upstream invert for that pipe between the as-built and the sewer survey. The as-built invert was used because it also provided the watermain elevations.

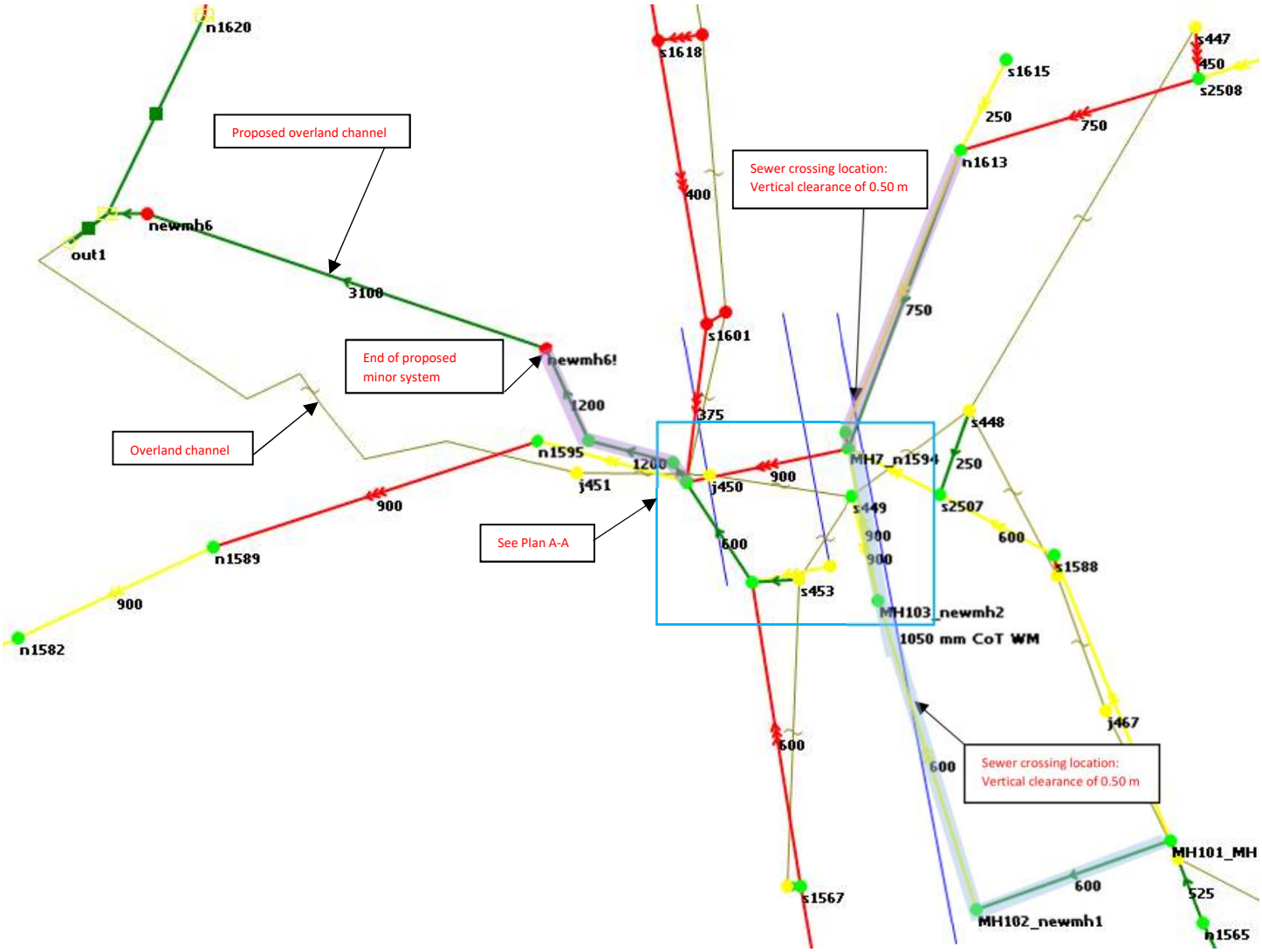
In the 100-year storm event, depth of HGL is greater than 1.8 m at all except 2 minor system locations. HGL depth is less than 1.8 m at s1601 and s1618.

Legend:

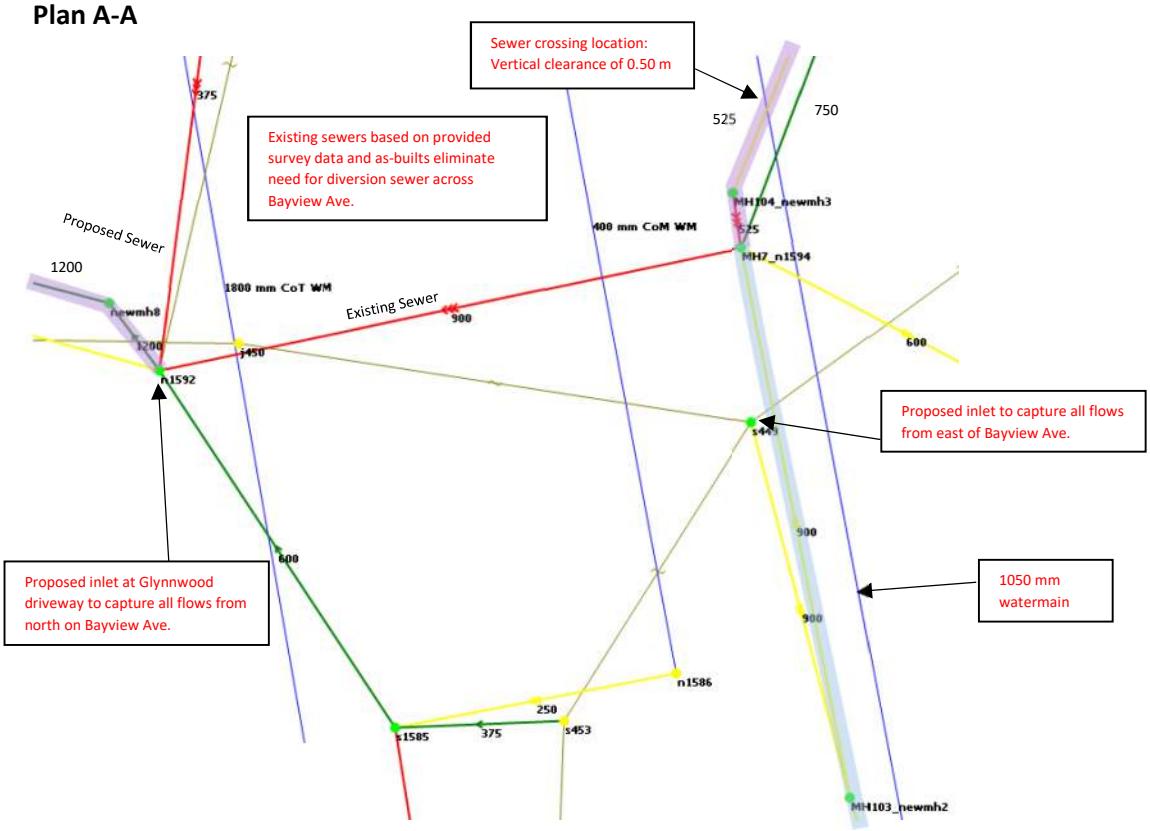
Downsized proposed storm sewer system

Proposed diversion sewers

Overall Plan

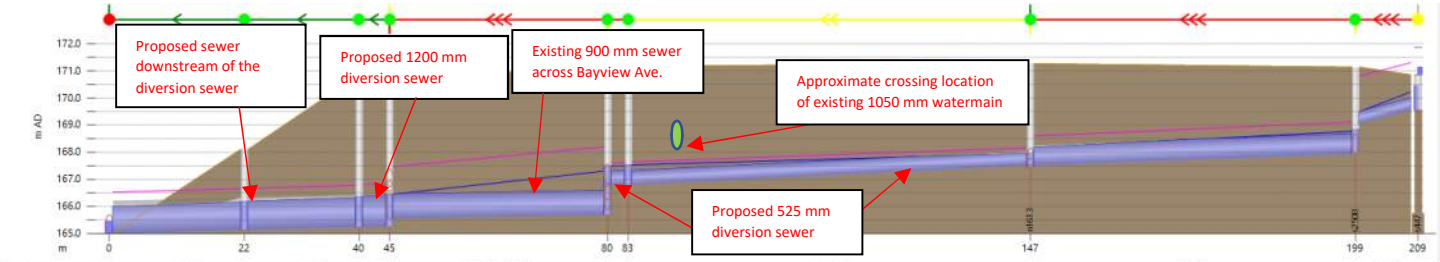


Plan A-A



Proposed sewers profile with 100-yr design storm event simulation results - from s447 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

The vertical distance (including pipe size and thickness) is estimated to be **<u>0.50 m</u>** at the crossing location where the existing 1050 mm City of Markham watermain is above the proposed 525 mm diversion sewer (east of Bayview Ave.).

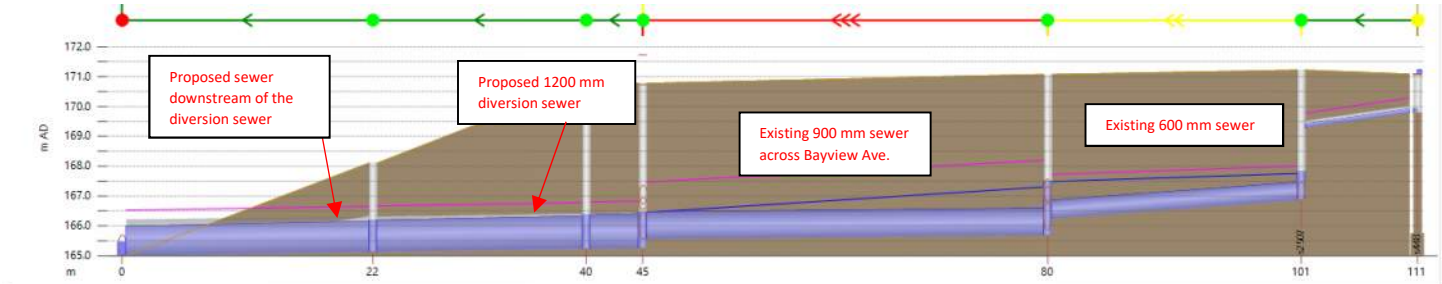


Link	newmh5.1	newmh8.1	-	MH7_n1594.1	-	n1613.1	s2508.1	s447.2
US node ID	newmh5	newmh8	-	MH7_n1594	-	n1613	s2508	s447
ds node	newmh6!	newmh5	-	n1592	-	MH104_newmh3	n1613	s2508
System type	storm	storm	storm	storm	-	storm	storm	storm
Asset ID				minor			minor	lead
length (m)	21.6	18.4	4.9	34.9	3.3	64.3	52.0	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	-	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	525	525	750	450
height (mm)	1200	1200	1200	900	525	525	750	450
us inv (m AD)	165.130	165.230	-	165.690	-	167.512	167.928	169.557
ds inv (m AD)	165.000	165.130	-	165.560	-	166.800	167.512	169.057
grad (m/m)	0.00602	0.00545	-	0.00373	-	0.01108	0.00800	0.05000
surc	0.85	0.91	0.95	2.00	-	1.00	2.00	2.00
r.pfc (l/s)	3025	2877	3063	1106	335	453	996	638
DS flow (l/s)	3236.81	3236.96	-	2826.10	-	401.90	1187.27	775.01
DS velocity (m/s)	3.251	3.064	2.923	4.646	-	1.995	2.879	5.140

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	MH104_newmh3	n1613	s2508	-
System type	storm	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	168.102	170.778	170.778	171.074	171.175	171.267	171.139	-
level (m AD)	165.437	166.185	166.362	166.442	167.483	167.531	167.960	168.834	-
flood dep (m)	0.437	-1.917	-4.416	-4.336	-3.591	-3.644	-3.307	-2.305	-
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	0.00	0.00	-
exprFreeboard	-0.436646	1.916682	4.415970	4.335693	3.590953	3.644299	3.306642	2.304665	-

Proposed Sewers Profile with 100-yr design storm event simulation results from s448 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

Since the proposed sewers west of Bayview Avenue are north of the existing 900 mm sewer, the vertical sewer crossing was eliminated.

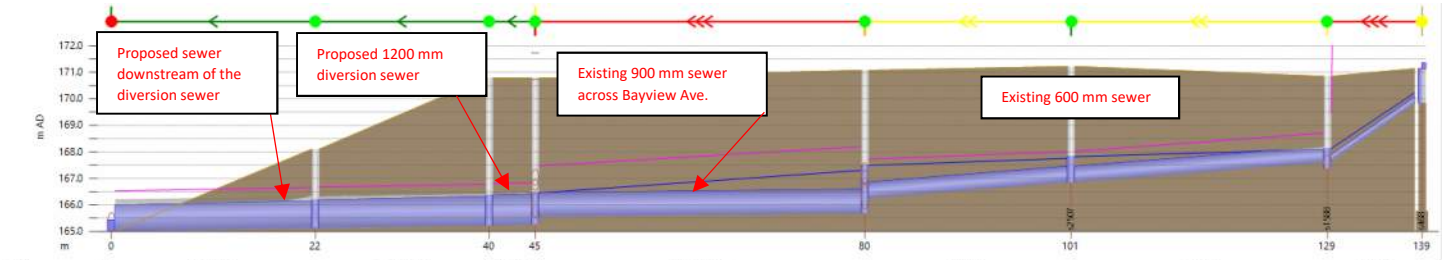


Link	newmh5.1	newmh8.1	n1592.1	MH7_n1594.1	s2507.1	s448.2
US node ID	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
ds node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507
System type	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	lead
length (m)	21.6	18.4	4.9	34.9	21.8	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	600	250
height (mm)	1200	1200	1200	900	600	250
us inv (m AD)	165.130	165.230	165.260	165.690	166.856	169.787
ds inv (m AD)	165.000	165.130	165.230	165.560	166.258	169.287
grad (m/m)	0.00602	0.00545	0.00617	0.00373	0.02743	0.05000
surc	0.85	0.91	0.95	2.00	1.00	0.53
r.pfc (l/s)	3025	2877	3063	1106	1017	133
DS flow (l/s)	3236.81	3236.96	3238.07	2826.10	746.37	70.01
DS velocity (m/s)	3.251	3.064	2.923	4.646	3.558	2.676

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s448
System type	storm	storm	storm	storm	storm	storm	overland
ground (m AD)	165.000	168.102	170.778	170.778	171.074	171.220	171.087
level (m AD)	165.437	166.185	166.362	166.442	167.483	167.816	169.922
flood dep (m)	0.437	-1.917	-4.416	-4.336	-3.591	-3.404	0.141
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	70.05
exprFreeboard	-0.436646	1.916682	4.415970	4.335693	3.590953	3.404418	1.165369

Proposed Sewers Profile with 100-yr design storm event simulation results from s468 to overland system at newmh6! (Depth of HGL is greater than 1.8 m at all minor system locations. No pipes surcharge in the 5-year design storm event)

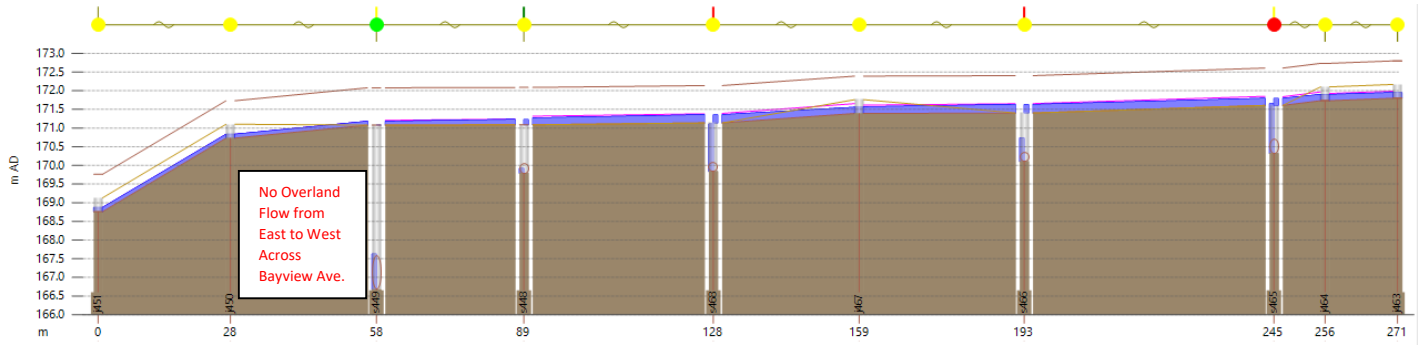
Since the proposed sewers west of Bayview Avenue are north of the existing 900 mm sewer, the vertical sewer crossing was eliminated.



Link	newmh5.1	newmh8.1	n1592.1	MH7_n1594.1	s2507.1	s1588.1	s468.2
US node ID	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
ds node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588
System type	storm	storm	storm	storm	storm	storm	storm
Asset ID				minor	minor	minor	lead
length (m)	21.6	18.4	4.9	34.9	21.8	27.1	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	1200	1200	1200	900	600	600	250
height (mm)	1200	1200	1200	900	600	600	250
us inv (m AD)	165.130	165.230	165.260	165.690	166.856	167.600	169.837
ds inv (m AD)	165.000	165.130	165.230	165.560	166.258	166.856	167.650
grad (m/m)	0.00602	0.00545	0.00617	0.00373	0.02743	0.02745	0.21870
surc	0.85	0.91	0.95	2.00	1.00	1.00	2.00
r.pfc (l/s)	3025	2877	3063	1106	1017	1018	278
DS flow (l/s)	3236.81	3236.96	3238.07	2826.10	746.37	714.33	280.92
DS velocity (m/s)	3.251	3.064	2.923	4.646	3.558	3.435	5.264

Node	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
Node ID	newmh6!	newmh5	newmh8	n1592	MH7_n1594	s2507	s1588	s468
System type	storm	storm	storm	storm	storm	storm	storm	-
ground (m AD)	165.000	168.102	170.778	170.778	171.074	171.220	170.850	171.137
level (m AD)	165.437	166.185	166.362	166.442	167.483	167.816	168.113	171.106
flood dep (m)	0.437	-1.917	-4.416	-4.336	-3.591	-3.404	-2.737	0.216
inflow (l/s)	0.00	0.00	0.00	188.05	0.00	0.00	444.78	174.45
exprFreeboard	-0.436646	1.916682	4.415970	4.335693	3.590953	3.404418	2.736810	-

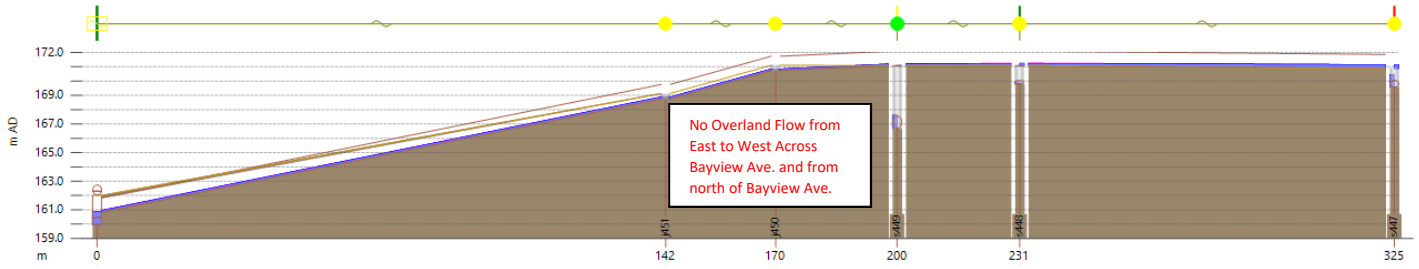
Existing overland system profile with 100-yr design storm event simulation results from Parking Lot east of Bayview Ave. to SWM Pond



Link	j450.1	s449.1	s448.1	s468.1	j467.1	s466.1	s465.1	j464.1	j463.1
US node ID	j450	s449	s448	s468	j467	s466	s465	j464	j463
Link suffix	1	1	1	1	1	1	1	1	1
ds node	j451	j450	s449	s448	s468	j467	s466	s465	j464
System type	overland	overland	overland	overland	overland	overland	overland	-	overland
Length (m)	27.6	30.4	30.7	39.5	30.4	34.4	52.0	10.7	15.1
grad (m/m)	0.07147	0.01141	0.00029	0.00127	0.00833	0.00038	0.00390	0.01181	0.00438
surc	0.11	0.10	0.14	0.22	0.22	0.23	0.23	0.19	0.16
US flow (l/s)	-0.00	-0.00	504.77	1025.40	1211.34	964.36	1131.08	1228.10	1107.26
DS flow (l/s)	-1.38	-0.00	502.16	1010.88	1194.39	942.49	1068.23	1221.97	1096.20

Node	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
Node ID	j451	j450	s449	s448	s468	j467	s466	s465	j464	j463
System type	overland	overland	overland	overland	overland	overland	overland	overland	overland	-
ground (m AD)	169.131	171.101	171.078	171.087	171.137	171.760	171.403	171.606	172.102	-
level (m AD)	168.871	170.831	167.625	169.922	171.106	171.554	170.733	171.653	171.896	-
flood dep (m)	0.110	0.100	0.001	0.141	0.216	0.164	0.225	0.187	0.164	-
inflow (l/s)	262.37	0.00	566.76	70.05	174.45	374.71	169.57	177.80	12.34	-
expr:Freeboard	0.259998	0.270006	3.452847	1.165369	0.031287	0.205969	0.670227	-0.046802	-	-

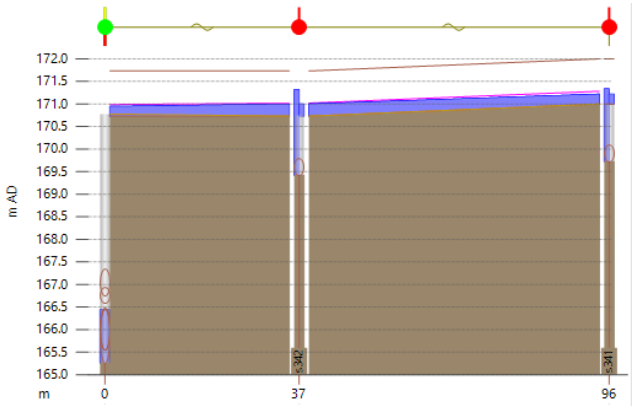
Existing overland system profile with 100-yr design storm event simulation results from s447 to SWM Pond



Link	j451.1	j450.1	s449.1	s448.1	s447.1
US node ID	j451	j450	s449	s448	s447
Link suffix	1	1	1	1	1
ds node	pond1	j451	j450	s449	s448
System type	overland	overland	overland	overland	overland
Length (m)	142.5	27.6	30.4	30.7	93.9
grad (m/m)	0.05562	0.07147	0.01141	0.00029	-0.00245
surc	0.11	0.11	0.10	0.14	0.28
US flow (l/s)	261.94	-0.00	-0.00	504.77	-390.81
DS flow (l/s)	253.96	-1.38	-0.00	502.16	-469.67

Node	pond1	j451	j450	s449	s448	s447
Node ID	pond1	j451	j450	s449	s448	s447
System type	storm	overland	overland	overland	overland	overland
ground (m AD)	162.000	169.131	171.101	171.078	171.087	170.857
level (m AD)	160.886	168.871	170.831	167.625	169.922	170.444
flood dep (m)	-1.114	0.110	0.100	0.001	0.141	0.278
inflow (l/s)	0.00	262.37	0.00	566.76	70.05	775.02
expr:Freeboard	1.113571	0.259998	0.270006	3.452847	1.165369	0.412649

Existing overland system profile with 100-yr design storm event simulation results from s341 to n1592



Link	s342.1	s341.1
US node ID	s342	s341
Link suffix	1	1
ds node	n1592	s342
System type	overland	overland
Length (m)	36.8	58.8
grad (m/m)	-0.00003	0.00456
surc	0.27	0.27
US flow (l/s)	1992.92	2500.17
DS flow (l/s)	1961.33	2372.69

Node	n1592	s342	s341
Node ID	n1592	s342	s341
System type	storm	overland	overland
ground (m AD)	170.778	170.730	170.998
level (m AD)	166.442	171.318	171.336
flood dep (m)	-4.336	0.266	0.216
inflow (l/s)	188.05	352.86	232.45
expr:Freeboard	4.335693	-0.588359	-0.337907

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Alain Cachola (City of Markham), Steve Van Haren (WSP), James Zhou (WSP), Sharon Chan (WSP), John Ho (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Additional Analysis Scenario #2 – No 100-year Major System Overland Flow to Glynnwood Site**

DATE: **August 27, 2020**

We have completed the analysis to evaluate the required upgrades for **Scenario #2** to ensure all major system flows up to 100-year are captured at the Glynnwood driveway entrance.

Note that Scenario #2 is evaluated based on the results of Scenario #1, where the required upgrades was proposed so that there would be no 100-year overland flows from TSSC site to the Glynnwood property across Bayview Ave.

The following summarizes the required upgrades with their associated InfoWorks Modelling results.

1 Inlet Upgrades

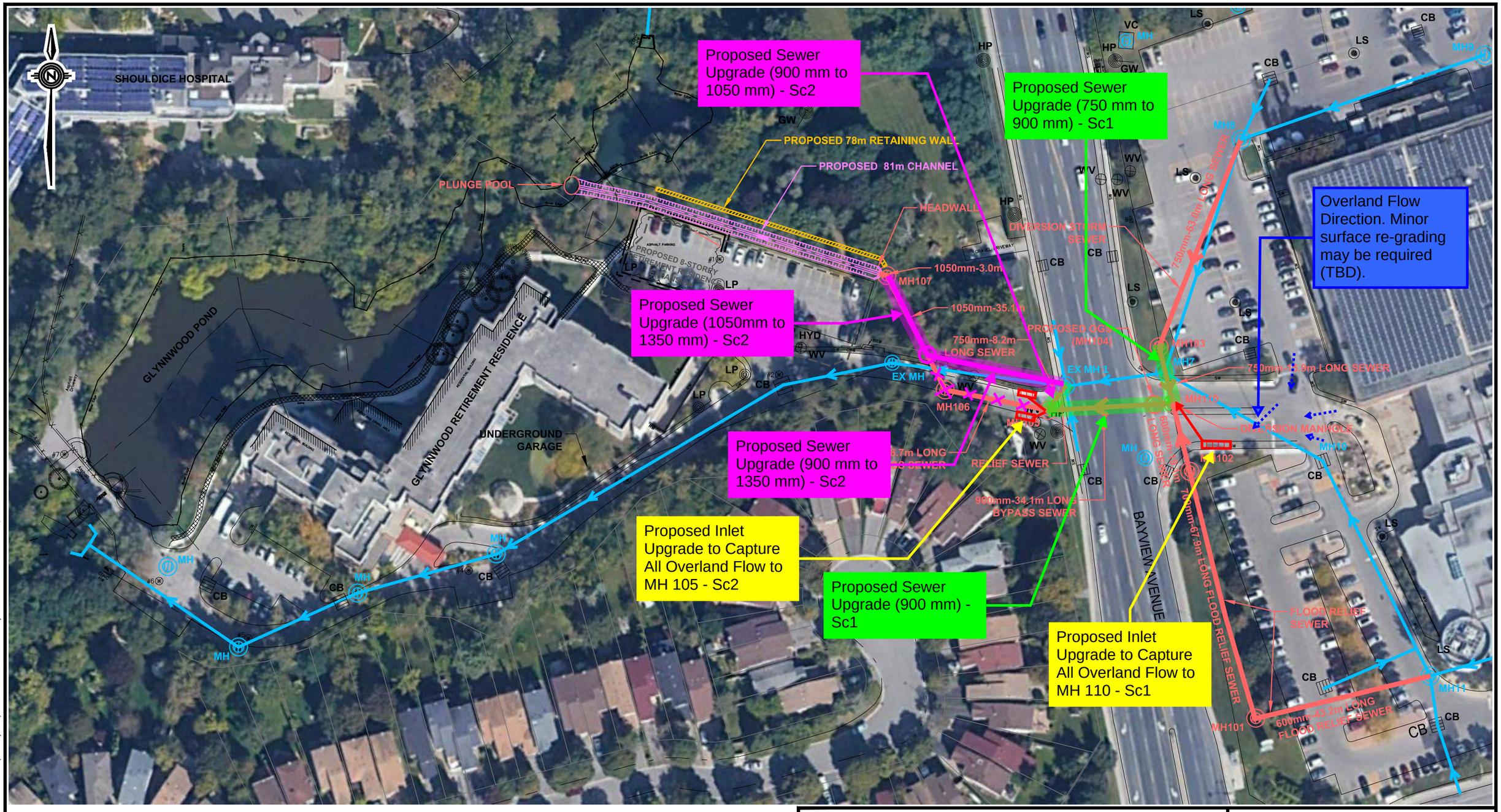
- At the Bayview Avenue driveway entrance to Glynnwood site, new inlet structures will be required. The improved structures will ensure that all overland flows at the location will be captured and drain to the underground storm sewer (e.g., Proposed MH 105).
- Similar to the proposed inlet upgrade at the TSSC site, multiple Catch Basins with curb open would be the preferred inlet type for the location. Based on the site conditions, CBs could be installed at both north and south side curbs at the entrance. The required number of CBs can be determined during the design stage.
- The locations are identified in the attached **Figure X4**.

2 Storm Sewer Upgrads

- The associated downstream underground storm sewer system requires upgrades to accommodate the increased flows from the surface up to 100-year storm event.
- Since the required size of the proposed sewer connecting MH106 to MH107 needs to be increased from 1050mm to 1350mm, the proposed pipe crossing may not have adequate clearance. Therefore, we propose to relocate the MH 106 upstream, so that pipe crossing would be eliminated.
- The required upgrades are highlighted in **Figure X4**.

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com



LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- PROPOSED MANHOLE
- OIL/GRIT SEPARATOR (OGS)

0 10 20 30 40 50m

CLIENT
CITY OF MARKHAM

TITLE
GLYNNWOOD TRIBUTARY CLASS EA

PREFERRED ALTERNATIVE #2 (FEBRUARY 2020)

Upgrade Option - Scenario 2 (No Overland Flow to Glynnwood Site)

wsp

Checked A.Z.Z.	Drawn AutoCAD/B.K.B.
Date AUG 2020	Proj. No. 121-15461-00
Scale AS SHOWN	Figure No. X4 / Gr.No. 00

FIGURE X2.dwg - Glynwood Tributary Class EA -Preferred Alternative #2 (February 2020) X:\DIV\38\20121\21-15461-00 Glynnwood\CAD\FIGURES\ Feb 27, 2020 - 4:51am

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Alain Cachola (City of Markham), Steve Van Haren (WSP), James Zhou (WSP), Sharon Chan (WSP), John Ho (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Additional Analysis Scenario #1 – No 100-year Major System Overland Flow from TSSC site to Bayview Ave**

DATE: **July 20, 2020**

We have completed the analysis to evaluate the required upgrades for **Scenario #1** to ensure

- All major system flows up to 100-year are captured on the Thornhill Square Shopping Centre (TSSC) site, and
- There are no 100-year overland flows from TSSC site to the Glynnwood property across Bayview Ave.

The following summarizes the required upgrades with their associated InfoWorks Modelling results.

1 Inlet Upgrads

- At the Bayview Avenue driveway entrance to TSSC site, a new inlet structure will be required. The improved structures will ensure that all overland flows at the location will be captured and drain to the underground storm sewer (e.g., Proposed MH 11).
- Possible inlet structure options include multiple or combination of catch-basins, ditch inlet, curb (or road) cut inlet system, etc. The determination of the proposed inlets will be completed during the detailed design stage.
- The locations are identified in the attached **Figure X3**.

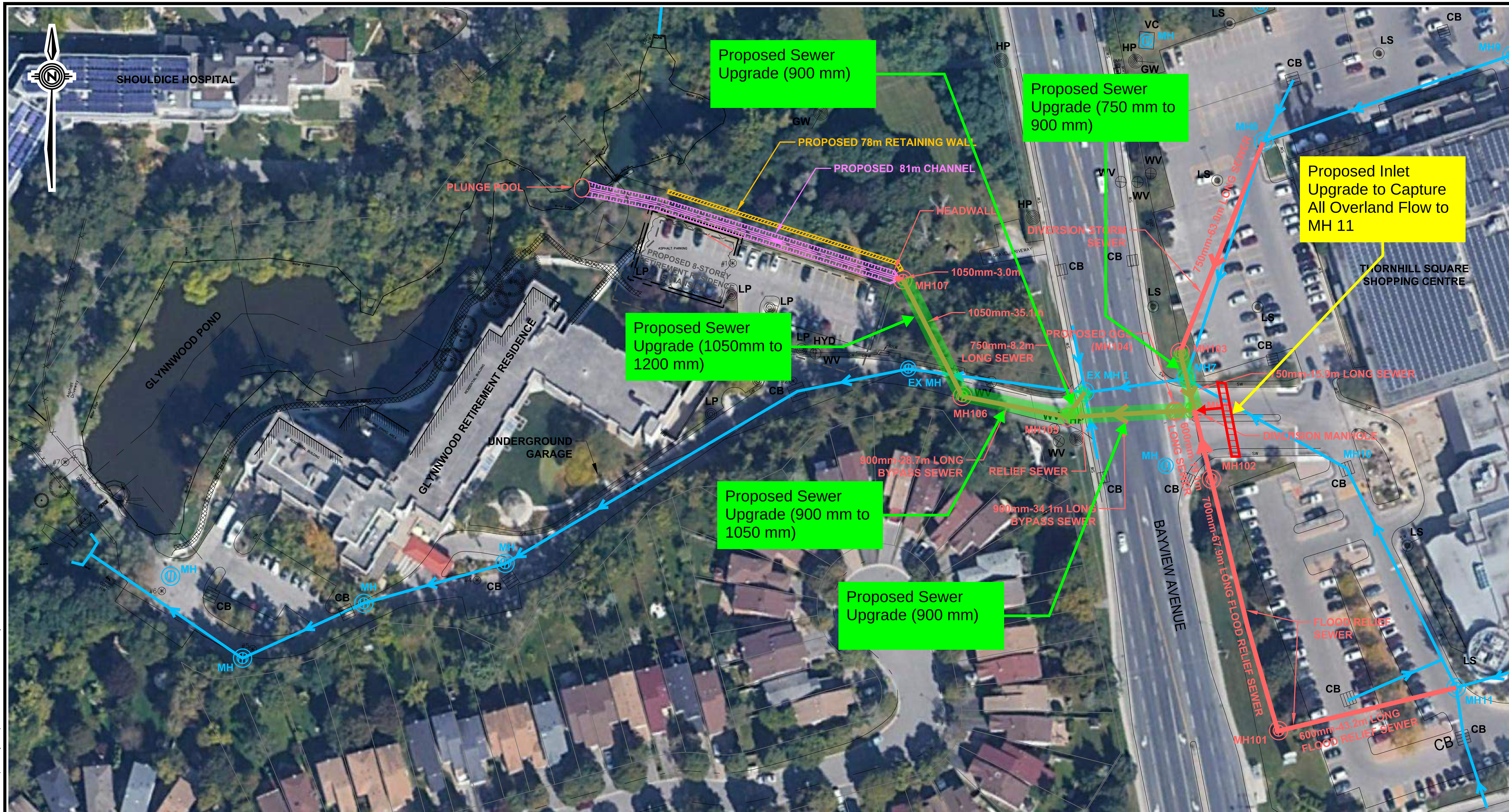
2 Storm Sewer Upgrads

- The associated underground storm sewer system also requires upgrades to accommodate the increased flows from the surface up to 100-year storm event. The required upgrades are highlighted in **Figure X3**.

Illustration 7 shows the major system profile from upstream (TSSC site) to its outfall at the proposed open channel via the Glennwood property (driveway). It confirms that with the proposed upgrades all major system flows up to 100-year would be captured on TCC site, and there would be no 100-year overland flows from TCC site to the Glynnwood property across Bayview Ave.

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com


SHOULDICE HOSPITAL
GLYNNWOOD POND
GLYNNWOOD RETIREMENT RESIDENCE
UNDERGROUND GARAGE
THORNHILL SQUARE SHOPPING CENTRE
BAYVIEW AVENUE
Proposed Sewer Upgrade (900 mm)
Proposed Sewer Upgrade (750 mm to 900 mm)
Proposed Inlet Upgrade to Capture All Overland Flow to MH 11
Proposed Sewer Upgrade (1050mm to 1200 mm)
Proposed Sewer Upgrade (900 mm to 1050 mm)
Proposed Sewer Upgrade (900 mm)
PROPOSED 78m RETAINING WALL
PROPOSED 81m CHANNEL
PLUNGE POOL
HEADWALL
MH107
1050mm-3.0m
1050mm-35.1m
750mm-8.2m LONG SEWER
PROPOSED OGS (MH104)
DIVERSION STORM SEWER
MH103
750mm-63.0m LONG SEWER
50mm-15.9m LONG SEWER
DIVERSION MANHOLE
MH106
MH105
EX MH
EX MH 1
900mm-28.7m LONG BYPASS SEWER
RELIEF SEWER
900mm-34.1m LONG BYPASS SEWER
600mm LONG SEWER
MH102
700mm-67.9m LONG FLOOD RELIEF SEWER
FLOOD RELIEF SEWER
MH101
600mm-43.2m LONG FLOOD RELIEF SEWER
MH7
MH8
MH9
MH10
MH11
MH
CB
LS
LP
HP
GW
WV
VC
HYD

LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- PROPOSED MANHOLE
- OIL/GRIT SEPARATOR (OGS)

0 10 20 30 40 50m

CLIENT

CITY OF MARKHAM

TITLE

GLYNWOOD TRIBUTARY CLASS EA

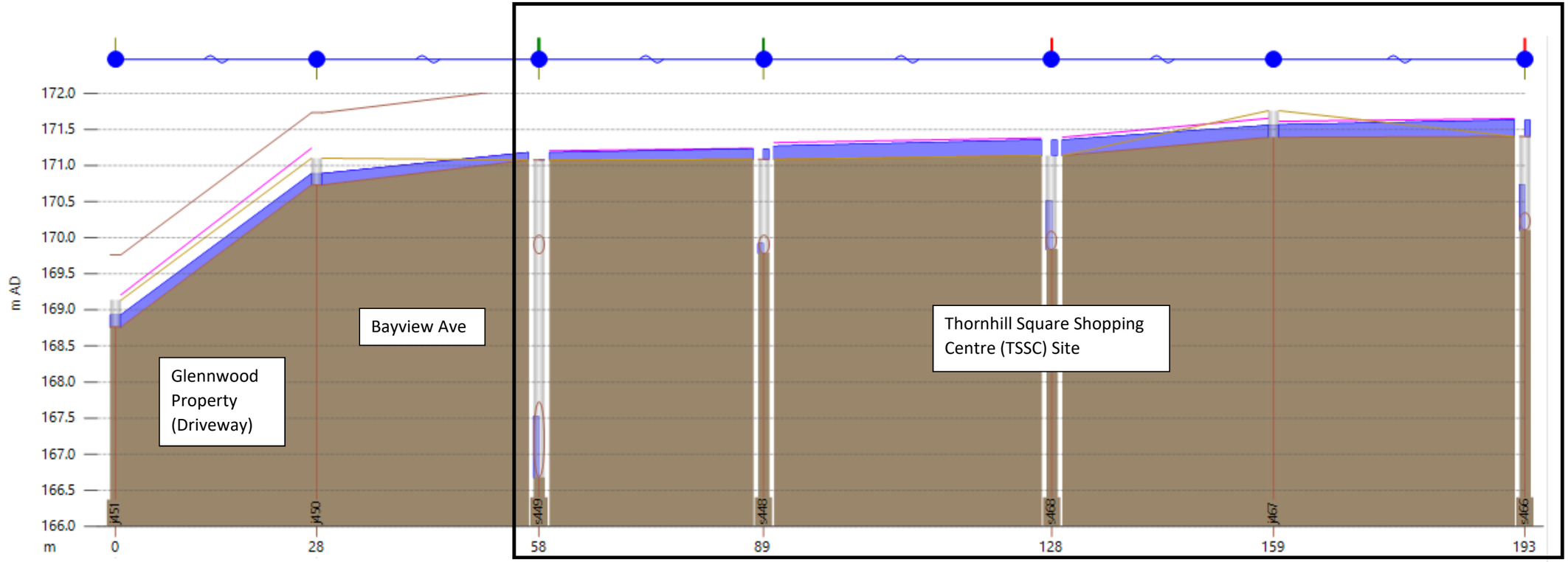
PREFERRED ALTERNATIVE #2 (FEBRUARY 2020)

Upgrade Option - Scenario 1 (No Overland Flow from TSSC to Bayview Ave)

wsp

Checked A.Z.Z.	Drawn AutoCAD/B.K.B.	
Date July 2020	Proj. No. 121-15461-00	
Scale AS SHOWN	Figure No. X3	Gr.No. 00

FIGURE X2.dwg - Glynwood Tributary Class EA -Preferred Alternative #2 (February 2020) X:\DIV38\2012\121-15461-00 Glynwood\CAD\FIGURES\ Feb 27, 2020 - 4:51am



Link	j450.1	s449.1	s448.1	s468.1	j467.1	s466.1
US node ID	j450	s449	s448	s468	j467	s466
Link suffix	1	1	1	1	1	1
ds node	j451	j450	s449	s448	s468	j467
System type	overland	overland	overland	overland	overland	overland
Length (m)	27.6	30.4	30.7	39.5	30.4	34.4
grad (m/m)	0.07147	0.01141	0.00029	0.00127	0.00833	0.00038
surc	0.17	0.15	0.14	0.22	0.22	0.23
US flow (m3/s)	1.93863	-0.00004	0.50387	1.02615	1.21213	0.96502
DS flow (m3/s)	1.93706	-0.01431	0.50066	1.01097	1.19515	0.94318

Node	j451	j450	s449	s448	s468	j467	s466
Node ID	j451	j450	s449	s448	s468	j467	s466
System type	overland	overland	overland	overland	overland	overland	overland
ground (m AD)	169.131	171.101	171.078	171.087	171.137	171.760	171.403
level (m AD)	168.927	170.886	167.523	169.921	170.514	171.554	170.733
flood dep (m)	0.166	0.155	0.001	0.141	0.216	0.164	0.225
inflow (m3/s)	0.26237	0.18761	0.56529	0.06990	0.17452	0.37471	0.16961
expr:Freeboard	0.203891	0.215410	3.554700	1.165751	0.622947	0.205923	0.669861

Overland Flow Depth < 0.3 m (Max. Ponding Depth)

No Overland flows across Bayview Ave.

Illustration 7. 100-Year Major System Profile

InfoWorks Modelling Results – Additional Analysis Scenario #1 – No 100-year Major System Overland Flow from TCC site to Bayview Ave

July 20, 2020

MEMO

TO: Nehal Azmy (City of Markham)

CC: Marija Ilic (City of Markham), Steve Van Haren (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA – Confirmation of InfoWorks Model Simulation**

DATE: **May 11, 2020**

As requested, we have completed the review of the current InfoWorks model developed for the subject study. Our findings are summarized as follows,

1) Catchment Area (see Attachment 1)

   It is confirmed that the developed InfoWorks model includes substantial drainage areas north of railway, which is consistent with the tributary areas as shown in Figure 1-1 of Glynnwood Tributary Area Sewer Surcharge and Glynnwood / Shouldice Pond Restoration report by Cole Engineering dated November 2011.

2) Minor System at John St

   It is confirmed that the storm sewer system at John St. drains to the existing sewer at TCC parking area and ultimately discharges to Glynnwood site. Please refer to Attachment 2 for details. This is consistent with the STM data provided by the City. Minor System at Commercial Plaza & Residential Developments

   It is further confirmed that the storm sewer system at Commercial Plaza and Residential Developments located to the east of TCC building drains to the existing sewer at TCC parking area and ultimately discharges to Glynnwood site. Please refer to Attachment 2. This is consistent with the STM data provided by the City.

3) Major System at the Vicinity of TCC site

   As shown in Attachment 3, all major system from the vicinity of TCC site, including John St., the commercial plaza and the residential developments, drains to TCC site and ultimately to the Glynnwood site.

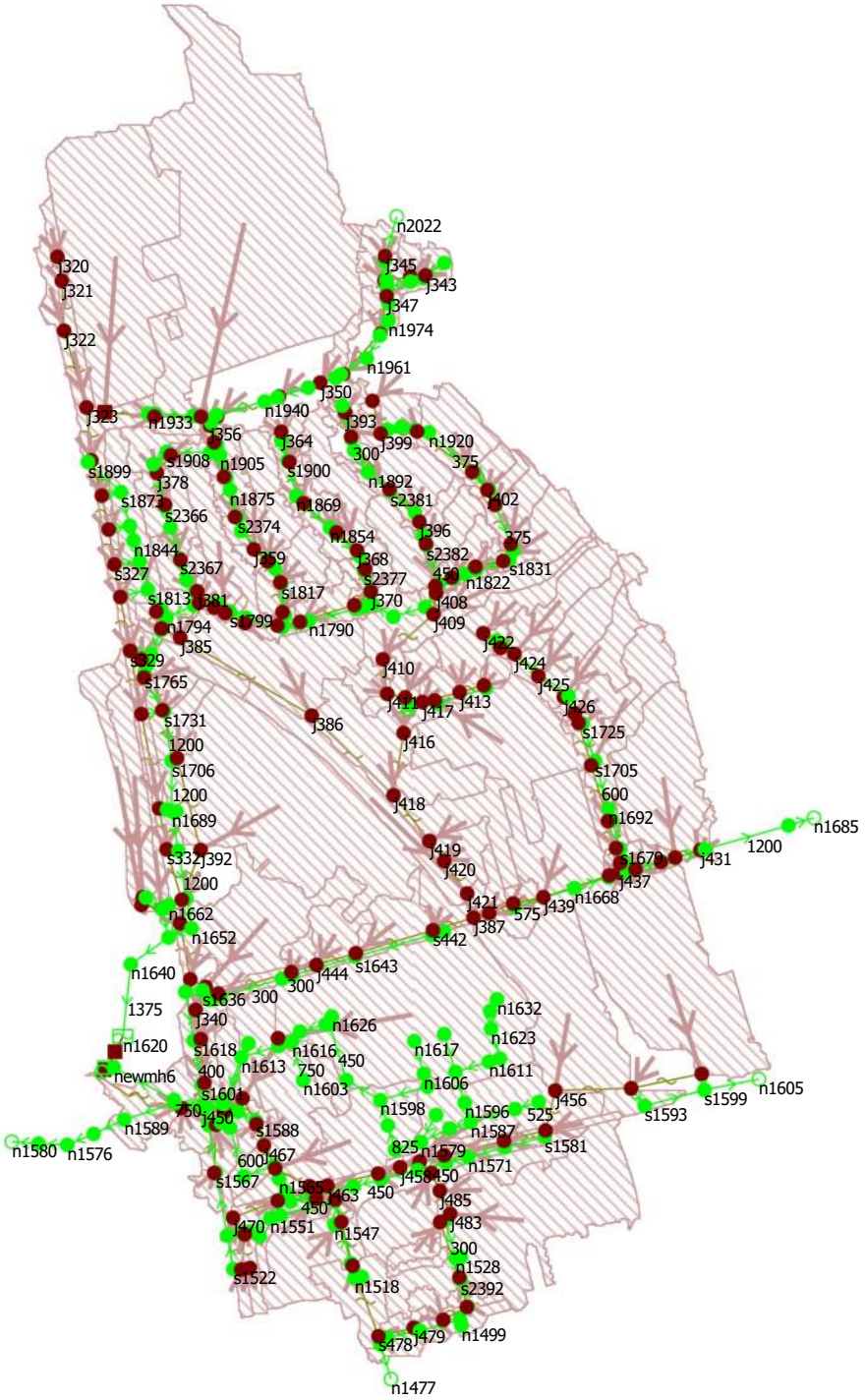
4) Max. Water Depth at South Entrance to TCC site from John St. during 100-Yr Event

   As shown in Attachments 3 and 4, the InfoWorks model confirms that the maximum 100-yr event water depth at the south entrance to TCC site from John St is 0.187 m (Node# s465); and the maximum 100-yr water depth at SW parking area of the TCC site is 0.225 m (Node# s466). Therefore, based on the latest proposed InfoWorks model, it is concluded that there will be no potential flooding issues (i.e., maximum water depths more than 0.30 m) at the South Entrance of the TCC site.

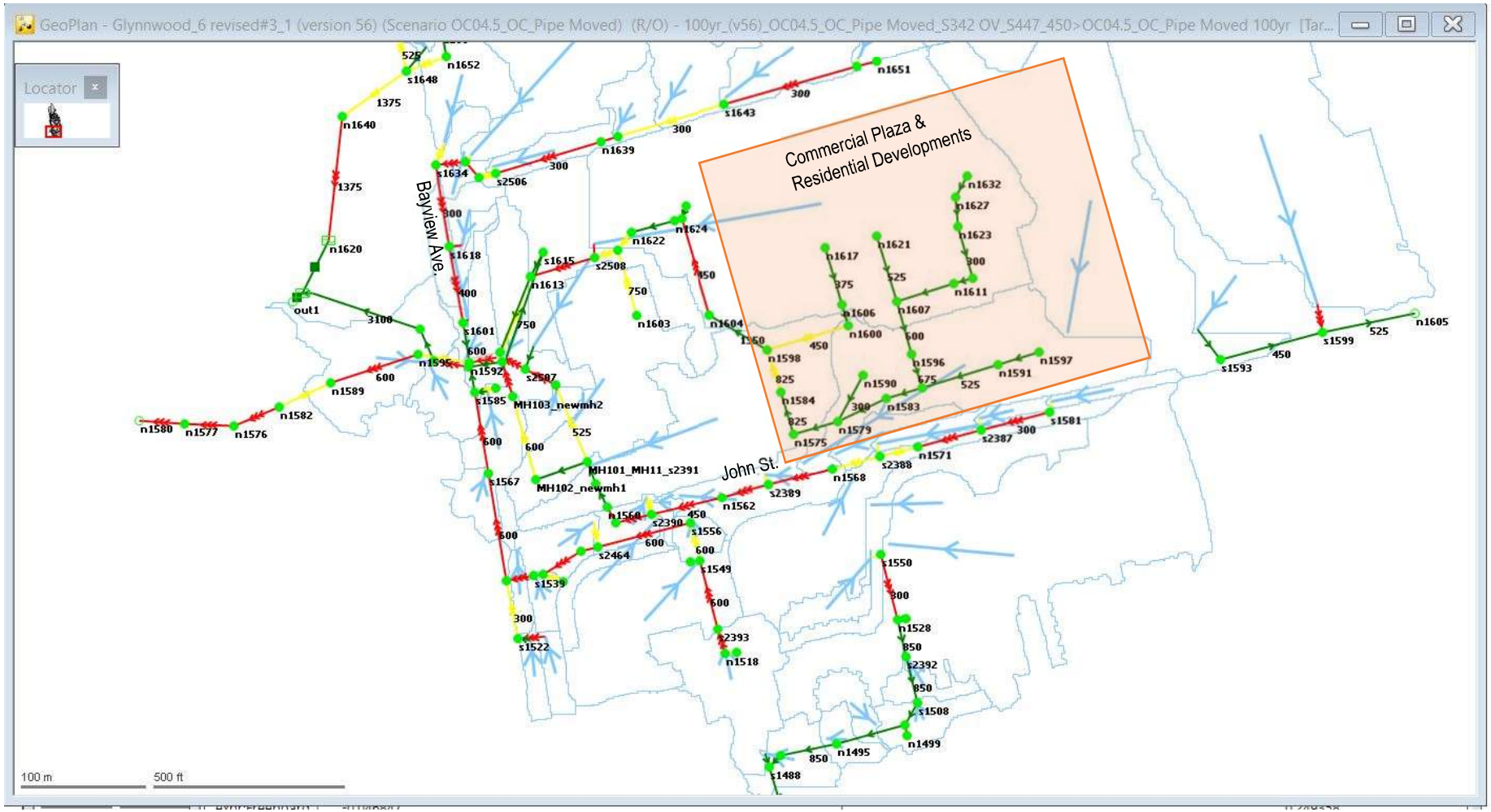
100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

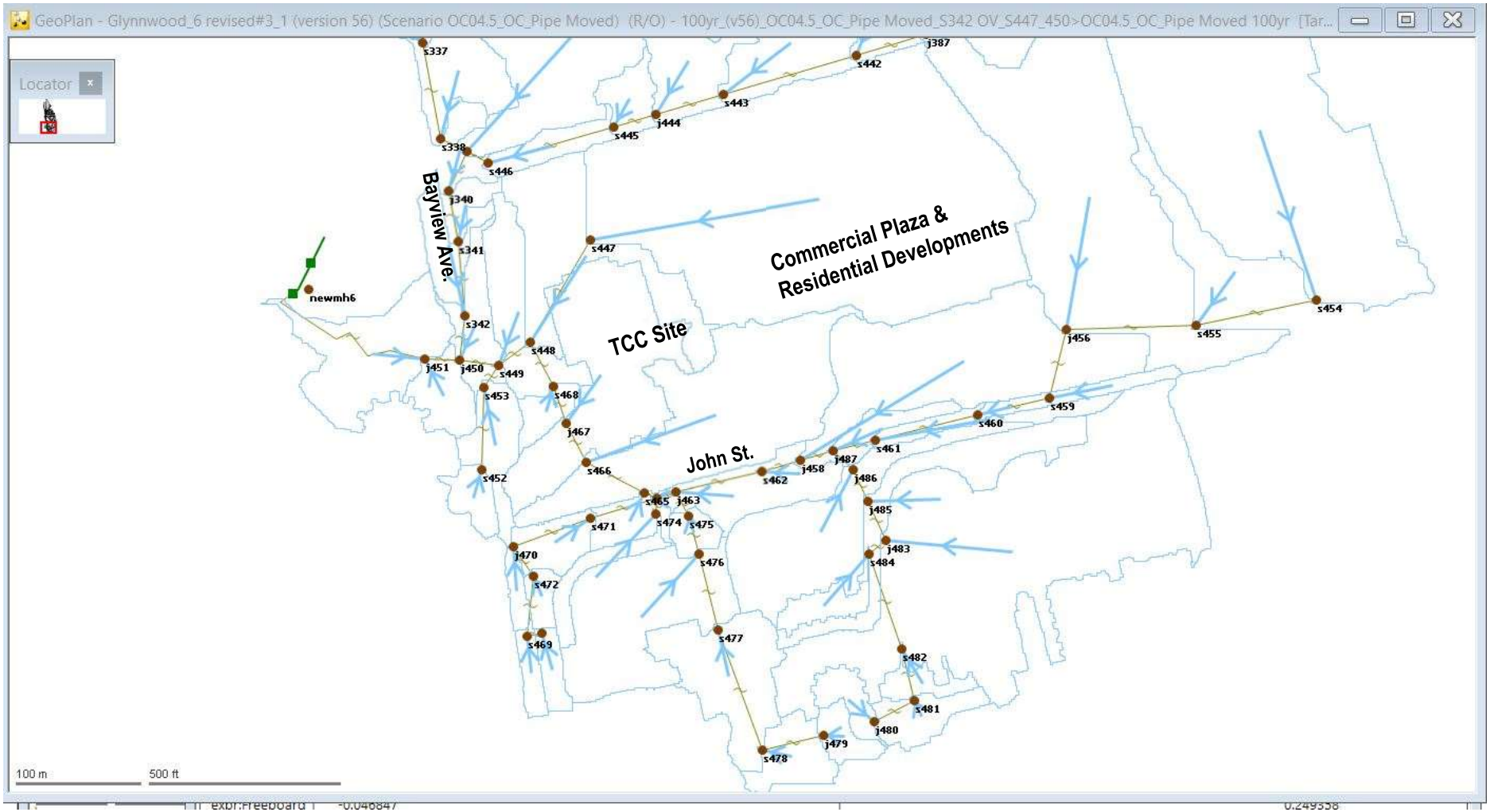
Attachment 1. InfoWorks Model Schematics (May 2020)



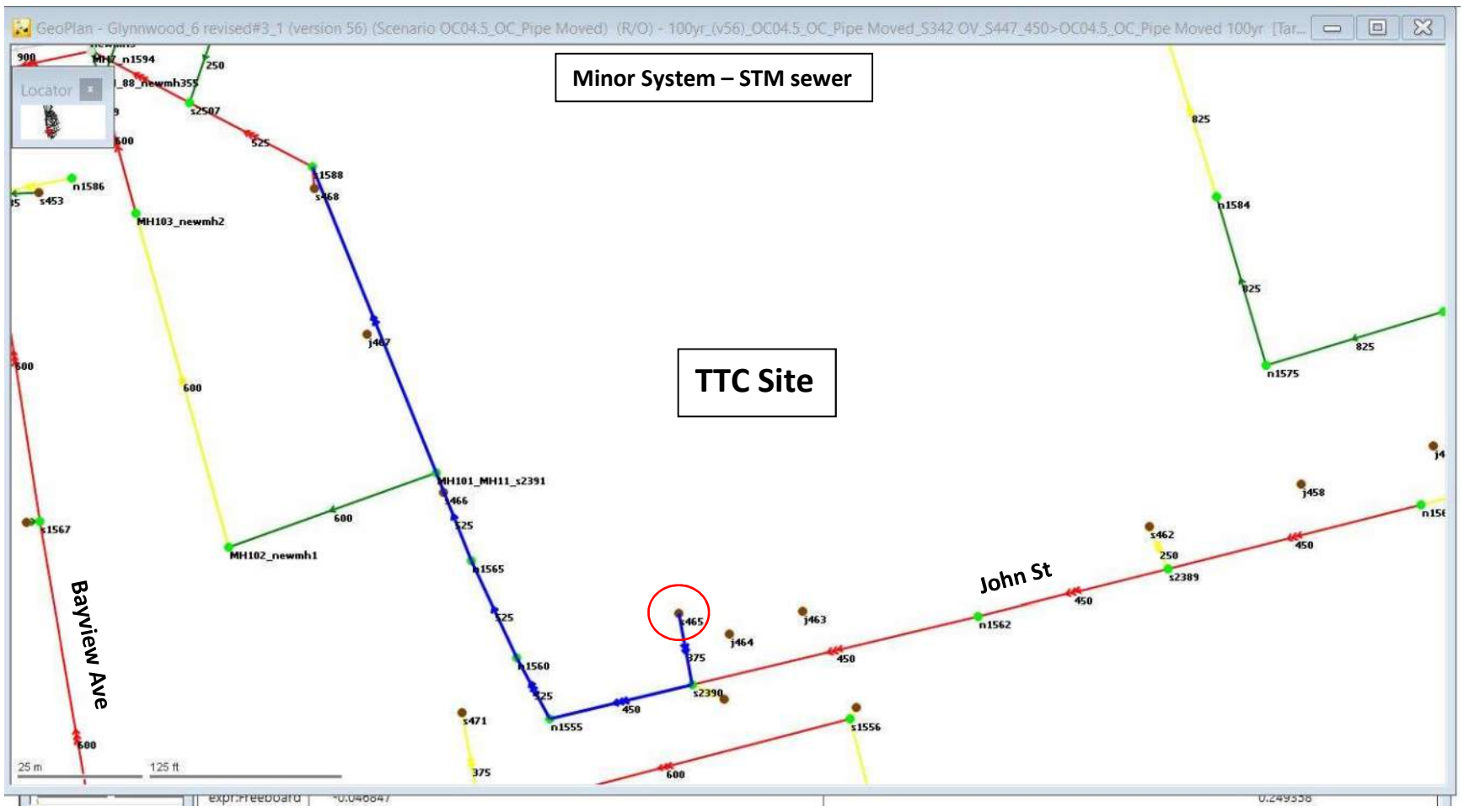
Attachment 2. InfoWorks - Minor System



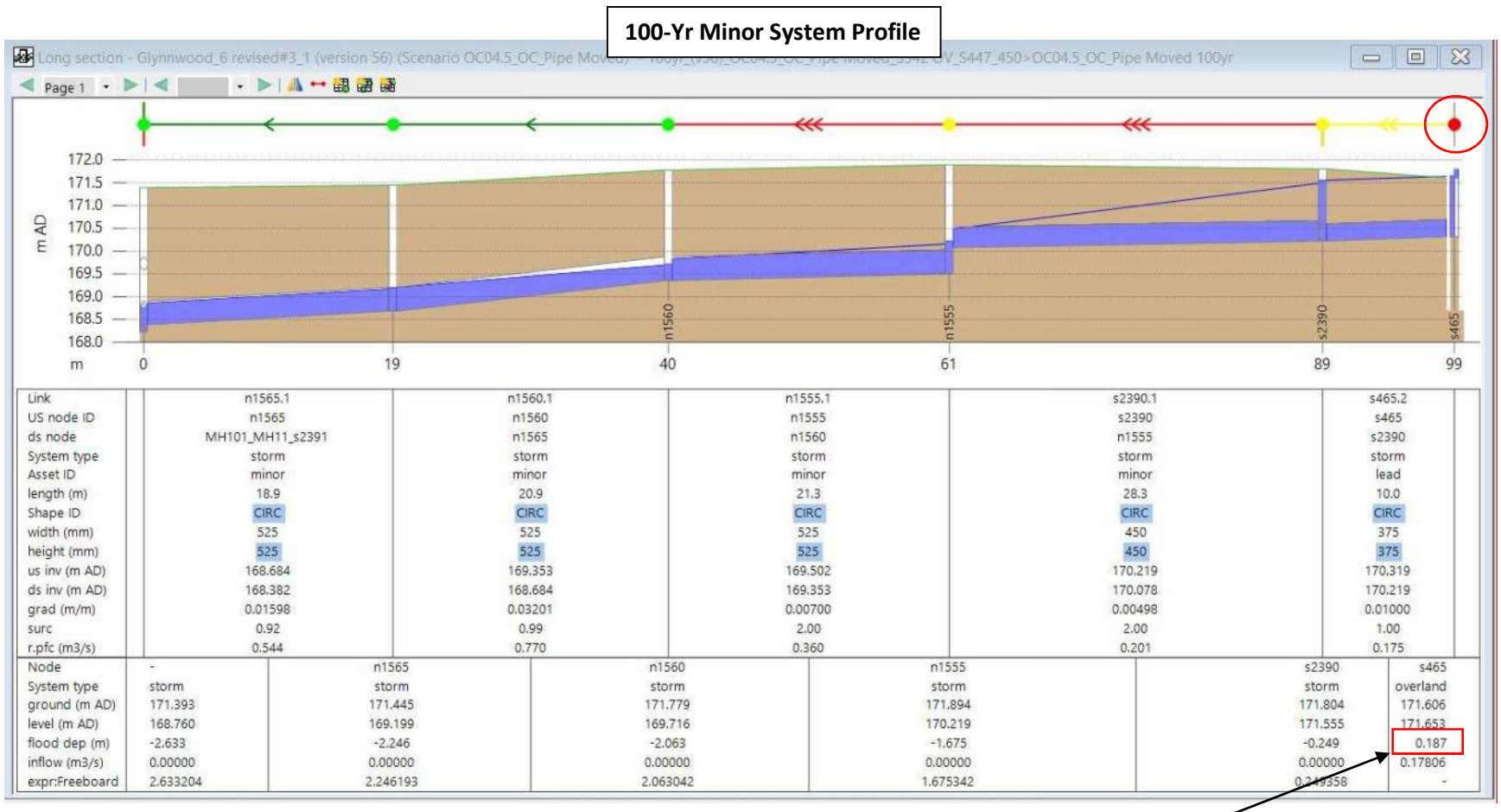
Attachment 3. InfoWorks - Major System



Attachment 4. Minor System Profile at South Entrance to TCC site from John St.



100-Yr Minor System Profile

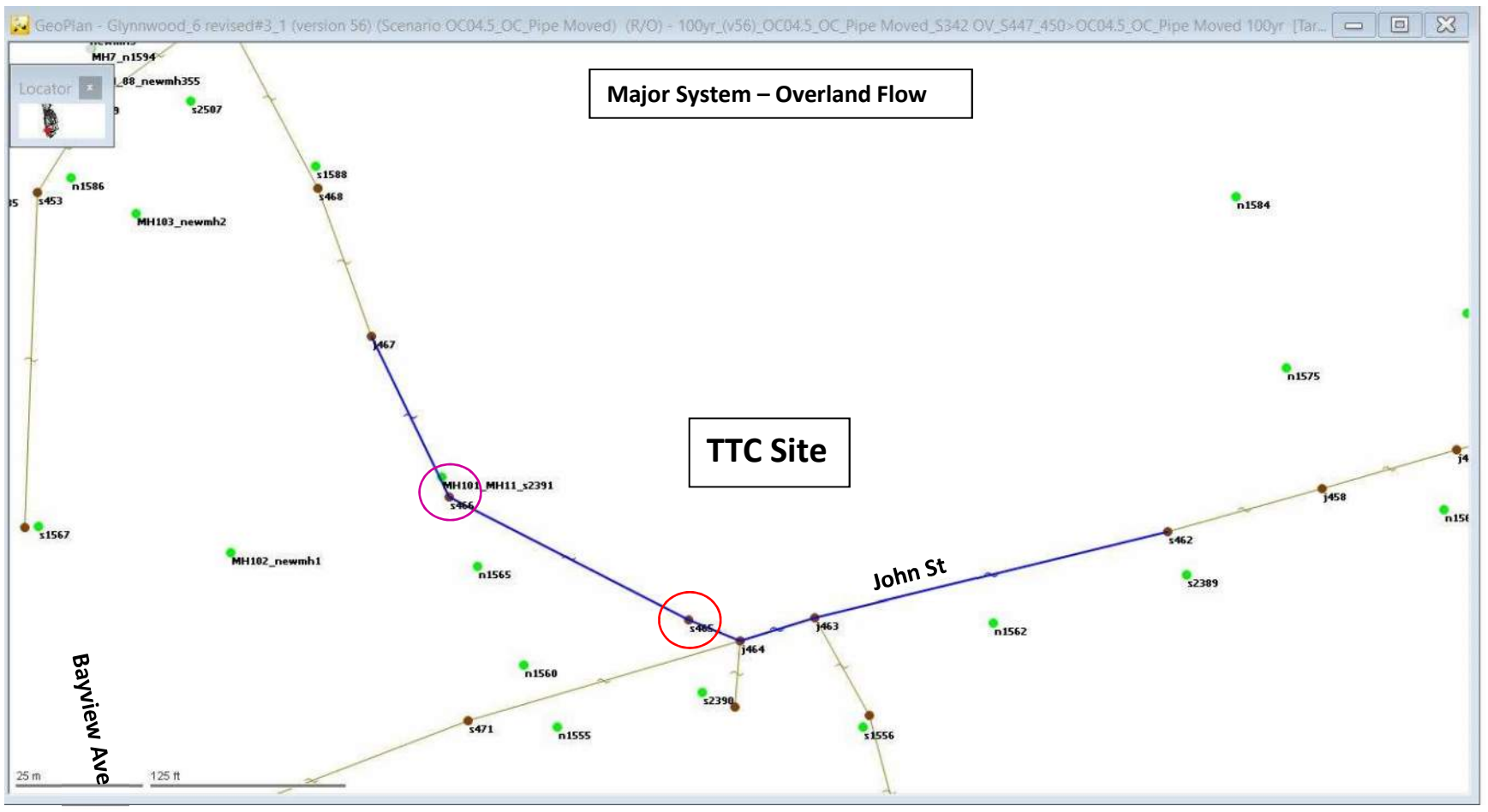


Link	n1565.1	n1560.1	n1555.1	s2390.1	s465.2
US node ID	n1565	n1560	n1555	s2390	s465
ds node	MH101_MH11_s2391	n1565	n1560	n1555	s2390
System type	storm	storm	storm	storm	storm
Asset ID	minor	minor	minor	minor	lead
length (m)	18.9	20.9	21.3	28.3	10.0
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	525	525	525	450	375
height (mm)	525	525	525	450	375
us inv (m AD)	168.684	169.353	169.502	170.219	170.319
ds inv (m AD)	168.382	168.684	169.353	170.078	170.219
grad (m/m)	0.01598	0.03201	0.00700	0.00498	0.01000
surc	0.92	0.99	2.00	2.00	1.00
r.pfc (m3/s)	0.544	0.770	0.360	0.201	0.175

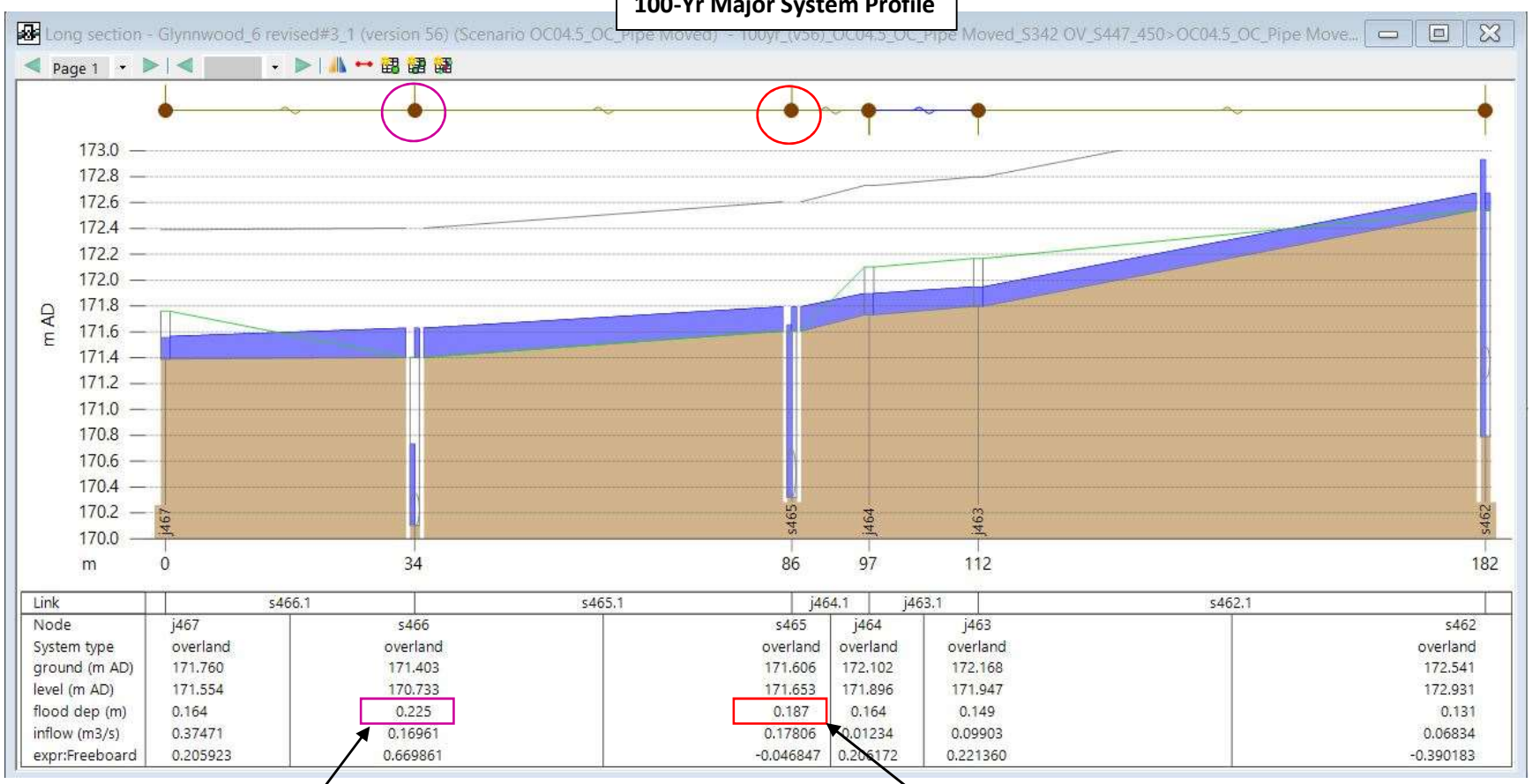
Node	-	n1565	n1560	n1555	s2390	s465
System type	storm	storm	storm	storm	storm	overland
ground (m AD)	171.393	171.445	171.779	171.894	171.804	171.606
level (m AD)	168.760	169.199	169.716	170.219	171.555	171.653
flood dep (m)	-2.633	-2.246	-2.063	-1.675	-0.249	0.187
inflow (m3/s)	0.00000	0.00000	0.00000	0.00000	0.00000	0.17806
expr:Freeboard	2.633204	2.246193	2.063042	1.675342	0.249358	-

100-Yr Water Depths at South Entrance to TCC site from John St

Attachment 5. Major System Profile at South Entrance to TCC site from John St.



100-Yr Major System Profile



Link		s466.1		s465.1		j464.1	j463.1		s462.1	
Node	j467		s466		s465	j464		j463		s462
System type	overland		overland		overland	overland		overland		overland
ground (m AD)	171.760		171.403		171.606	172.102		172.168		172.541
level (m AD)	171.554		170.733		171.653	171.896		171.947		172.931
flood dep (m)	0.164		0.225		0.187	0.164		0.149		0.131
inflow (m3/s)	0.37471		0.16961		0.17806	0.01234		0.09903		0.06834
expr:Freeboard	0.205923		0.669861		-0.046847	0.2[illegible]172		0.221360		-0.390183

100-Yr Water Depths at SW parking area of TCC site

100-Yr Water Depths at South Entrance to TCC site from John St

MEMO

TO: Nehal Azmy (City of Markham)

CC: Steve Van Haren (WSP), James Zhou (WSP)

FROM: Albert Zhuge (WSP)

SUBJECT: **Glynnwood EA - Additional Alternative – Proposed Bypass Sewer at South of Existing Sewer along Glynnwood Driveway (Feb 2020)**

DATE: **February 20, 2020**

Recently, a revised preferred alternative was prepared for the Glynwood Tributary Class EA study. As shown in **Figure X**, it includes a bypass sewer system and an open channel located at the grass area north of the Glynnwood parking lot and driveway areas. **Illustration 1** includes the results of the InfoWorks model which confirms that the proposed system will be able to provide adequate capacity to mitigate the flooding issues at subject area (including the existing Glynwood parking lot/driveway and Thornhill community centre parking lot).

As requested by the City, we have evaluated an additional alternative (based on the revised preferred plan) to relocate the proposed bypass sewer to south of the existing sewer along Glynnwood Driveway. To the best of our knowledge, such additional alternative was investigated to support a potential future development at Shouldice Hospital property.

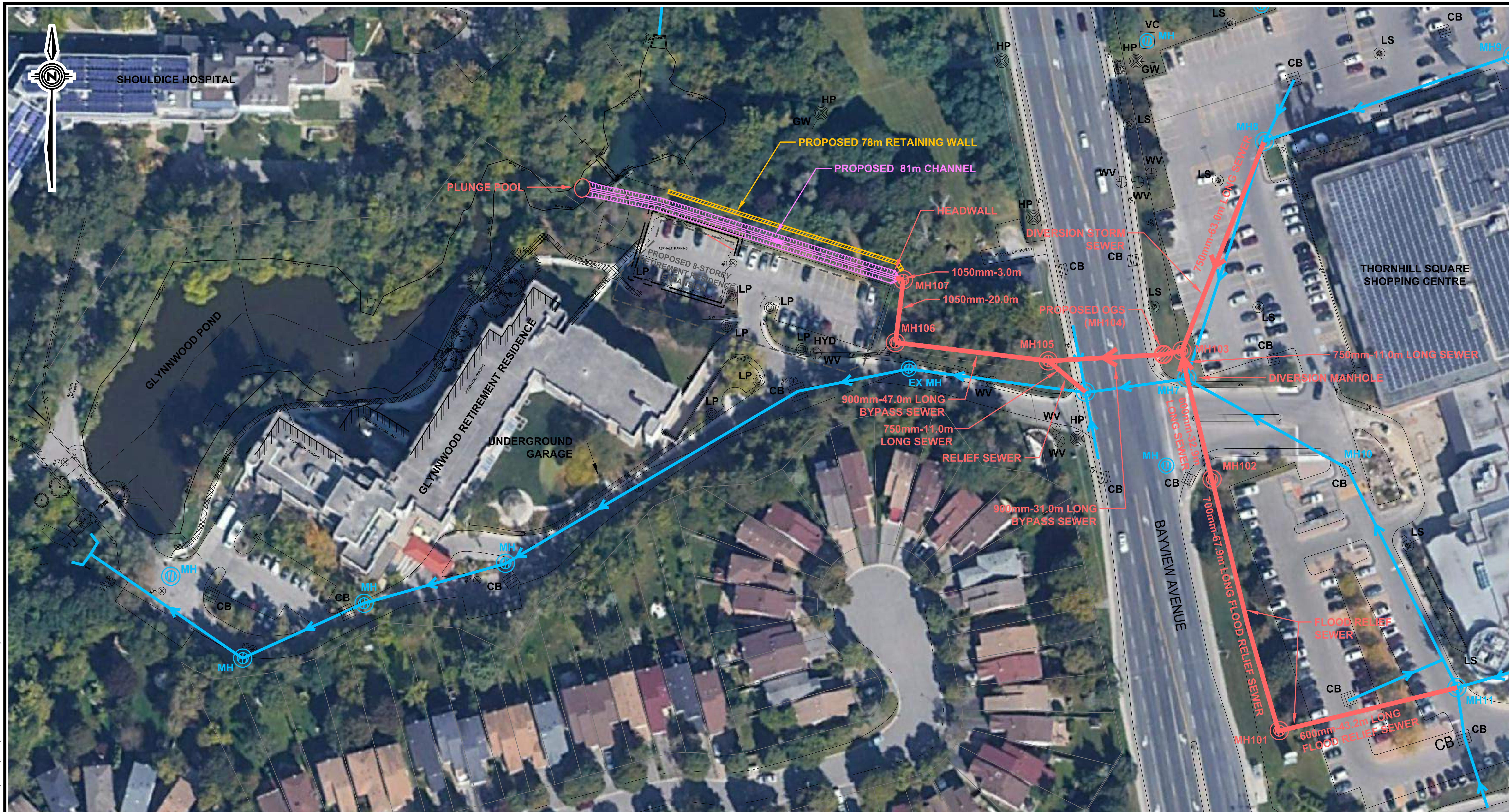
In order to relocate the proposed bypass sewer to the south of existing sewer and ultimately discharge to the receiving water course via the proposed open channel, a sewer crossing will be required. As shown in **Illustration 2**, such crossing will be located at approximately 10 meters upstream of the existing MH at Glynnwood driveway. The results of the InfoWorks model further confirms that the proposed system will be able to provide adequate capacity to mitigate the flooding issues currently at subject area.

As described previously, since the purpose of such additional alternative is to support a potential future development at Shouldice Hospital property, an option of the sewer network at the downstream of the sewer crossing is proposed. As shown in **Illustration 3**, with additional two MHs, the developable area may be maximized.

Albert Zhuge, M.A.Sc, P.Eng, PMP
Senior Project Manager, Water Resources

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com


SHOULDICE HOSPITAL
PROPOSED 78m RETAINING WALL
PROPOSED 81m CHANNEL
PLUNGE POOL
HEADWALL
DIVERSION STORM SEWER
1050mm-3.0m
MH107
1050mm-20.0m
MH106
PROPOSED OGS (MH104)
MH105
MH103
750mm-63.0m LONG SEWER
MH8
MH9
THORNHILL SQUARE SHOPPING CENTRE
750mm-11.0m LONG SEWER
DIVERSION MANHOLE
EX MH
900mm-47.0m LONG BYPASS SEWER
750mm-11.0m LONG SEWER
RELIEF SEWER
MH7
MH102
MH10
900mm-31.0m LONG BYPASS SEWER
BAYVIEW AVENUE
700mm-67.9m LONG FLOOD RELIEF SEWER
FLOOD RELIEF SEWER
MH101
600mm-43.2m LONG FLOOD RELIEF SEWER
MH11
GLYNNWOOD POND
GLYNNWOOD RETIREMENT RESIDENCE
UNDERGROUND GARAGE
PROPOSED 8-STOREY RETIREMENT RESIDENCE
MH
CB
LP
HP
LS
WV
GW
VC
HYD

LEGEND

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE
- PROPOSED MANHOLE
- OIL/GRIT SEPARATOR (OGS)

0 10 20 30 40 50m

CLIENT	CITY OF MARKHAM
TITLE	GLYNWOOD TRIBUTARY CLASS EA PREFERRED ALTERNATIVE (FEBRUARY 2020)

wsp

Checked A.Z.Z.	Drawn AutoCAD/B.K.B.		
Date FEBRUARY 2020	Proj. No. 121-15461-00		
Scale AS SHOWN	Figure No. X	Gr.No. 00	

FIGURE X.dwg - Glynwood Tributary Class EA -Preferred Alternative (February 2020) X:\DIV38\2012\121-15461-00 Glynnwood\CAD\FIGURES\ Feb 19, 2020 - 6:25am

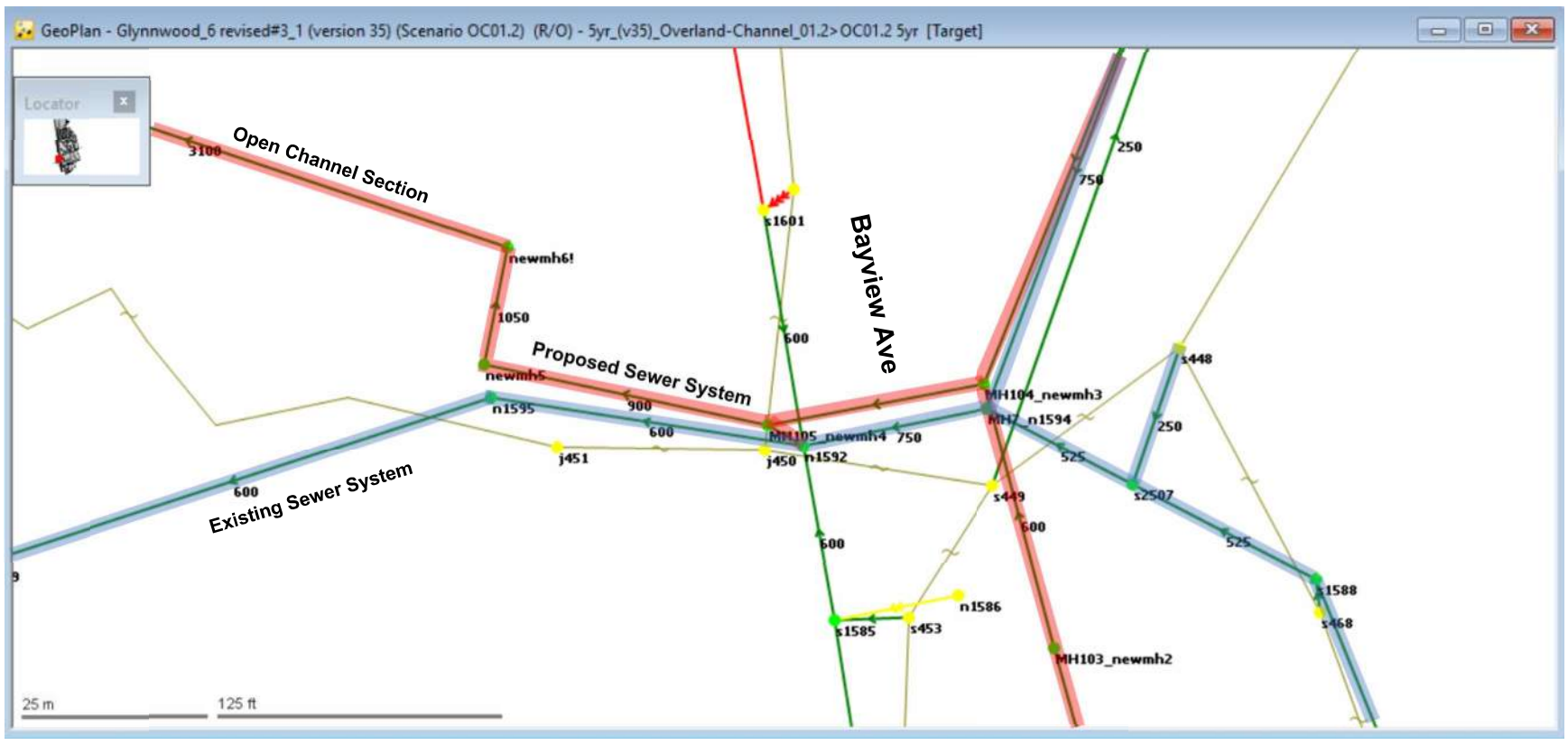
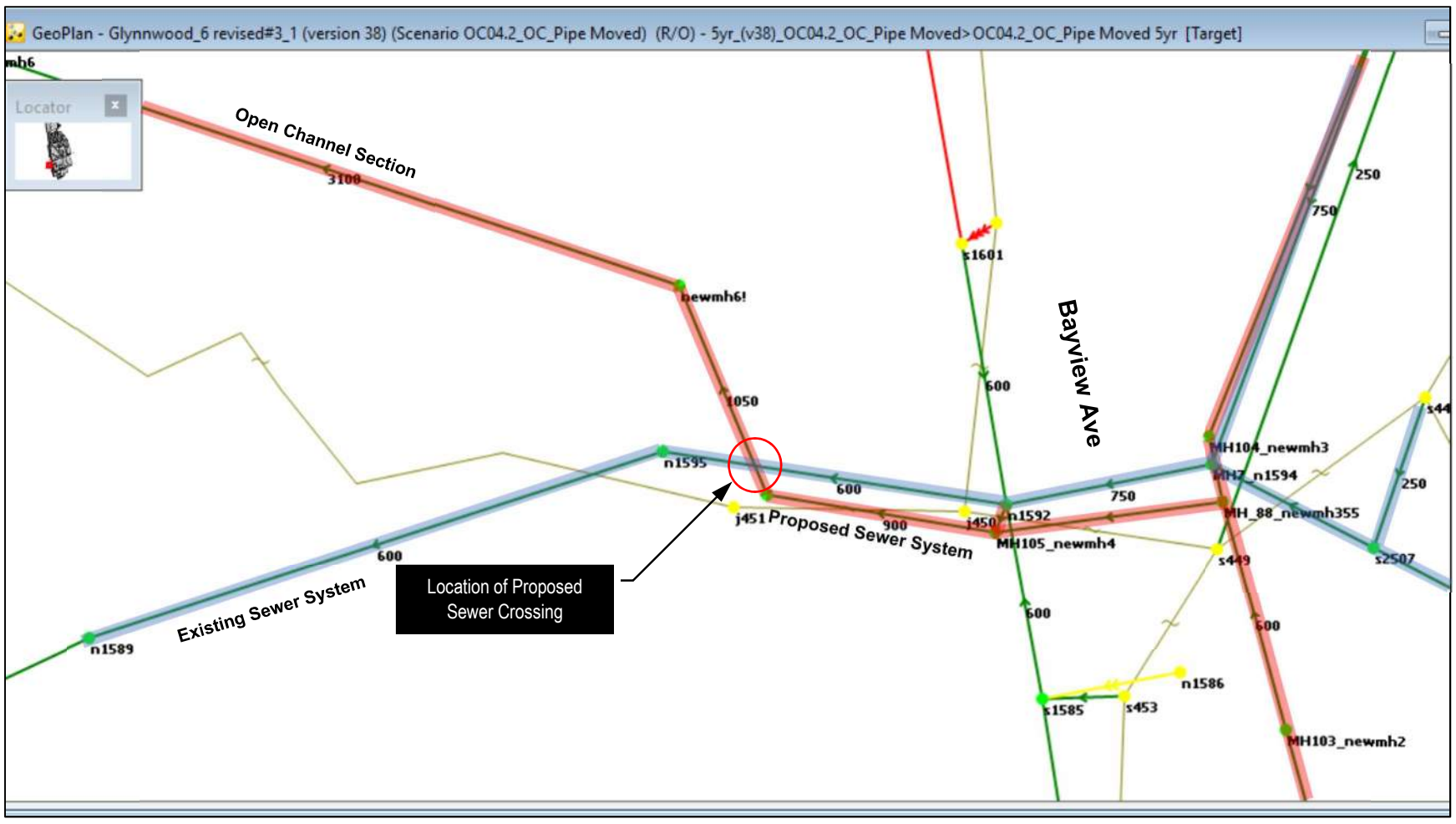


Illustration 1. InfoWorks Modelling Results - Preferred Alternative – Bypass Sewer and Open Channel (Feb 2020)



Link	-	newmh6!.1	newmh5.1	-	-	-	MH102_newmh1.1	MH101_MH11_s2391.2
US node ID	-	newmh6!	newmh5	MH105_newmh4	-	MH103_newmh2	MH102_newmh1	MH101_MH11_s2391
ds node	-	newmh6	newmh6!	newmh5	MH105_newmh4	-	MH103_newmh2	MH102_newmh1
System type	-	overland	storm	storm	storm	storm	storm	storm
Asset ID								
length (m)	8.2		27.0	27.6	27.3	28.3	67.9	43.2
Shape ID	-		CIRC	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	-	3100	1050	900	900	600	600	600
height (mm)	700	700	1050	900	900	600	600	600
us inv (m AD)	-	161.834	162.145	162.463	163.582	167.090	167.790	168.232
ds inv (m AD)	-	160.810	161.834	162.145	162.456	166.908	167.090	167.790
grad (m/m)	-	0.01150	0.01154	0.01154	0.04119	0.00644	0.01031	0.01024
surc	0.40	0.53	0.58	0.78	0.83	0.61	0.62	0.55
r.pfc (m3/s)	-	6.503	2.934	1.945	3.675	0.493	0.624	0.621

Approximate Crossing Location of 600 mm Existing Sewer

Node	newmh6		newmh6!	newmh5	-	-	MH103_newmh2		MH102_newmh1	-
System type	overland		storm	storm	storm	storm	storm		storm	storm
ground (m AD)	166.102		166.102	168.102	170.736	171.175	171.218		171.393	171.393
level (m AD)	161.088		162.208	162.761	163.204	163.856	167.462		168.117	168.560
inflow (m3/s)	0.00000		0.00000	0.00000	0.00000	0.00000	0.00000		0.00000	0.00000
expr:Freeboard	5.013911		3.894114	5.340800	7.531807	7.318661	3.755521		3.275767	2.832743

Link	n1592.3	MH7_n1594.1	s2507.1	s1588.1	MH101_MH11_s2391.1
US node ID	n1592	MH7_n1594	s2507	s1588	MH101_MH11_s2391
ds node	n1595	n1592	MH7_n1594	s2507	s1588
System type	storm	storm	storm	storm	storm
Asset ID	minor	minor	minor	minor	minor
length (m)	41.5	30.0	21.8	27.1	64.6
Shape ID	CIRC	CIRC	CIRC	CIRC	CIRC
width (mm)	600	750	525	525	525
height (mm)	600	750	525	525	525
us inv (m AD)	166.638	166.908	167.104	167.348	168.382
ds inv (m AD)	163.111	166.638	166.908	167.104	167.348
grad (m/m)	0.08499	0.00900	0.00899	0.00900	0.01601
surc	0.66	0.53	0.76	0.79	0.78
r.pfc (m3/s)	1.790	1.056	0.408	0.408	0.544

Node	n1595	n1592	MH7_n1594	s2507	s1588	MH101_MH11_s2391
System type	storm	storm	storm	storm	storm	storm
ground (m AD)	168.102	170.736	171.175	171.220	171.218	171.393
level (m AD)	163.508	166.896	167.305	167.519	167.759	168.560
inflow (m3/s)	0.00000	0.00025	0.00000	0.00000	0.24757	0.00000
expr:Freeboard	4.594233	3.839882	3.870160	3.701461	3.458662	2.832743

Illustration 2. InfoWorks Modelling Results - Additional Alternative – Proposed Bypass Sewer at South of Existing Sewer along Glynnwood Driveway (Feb 2020)

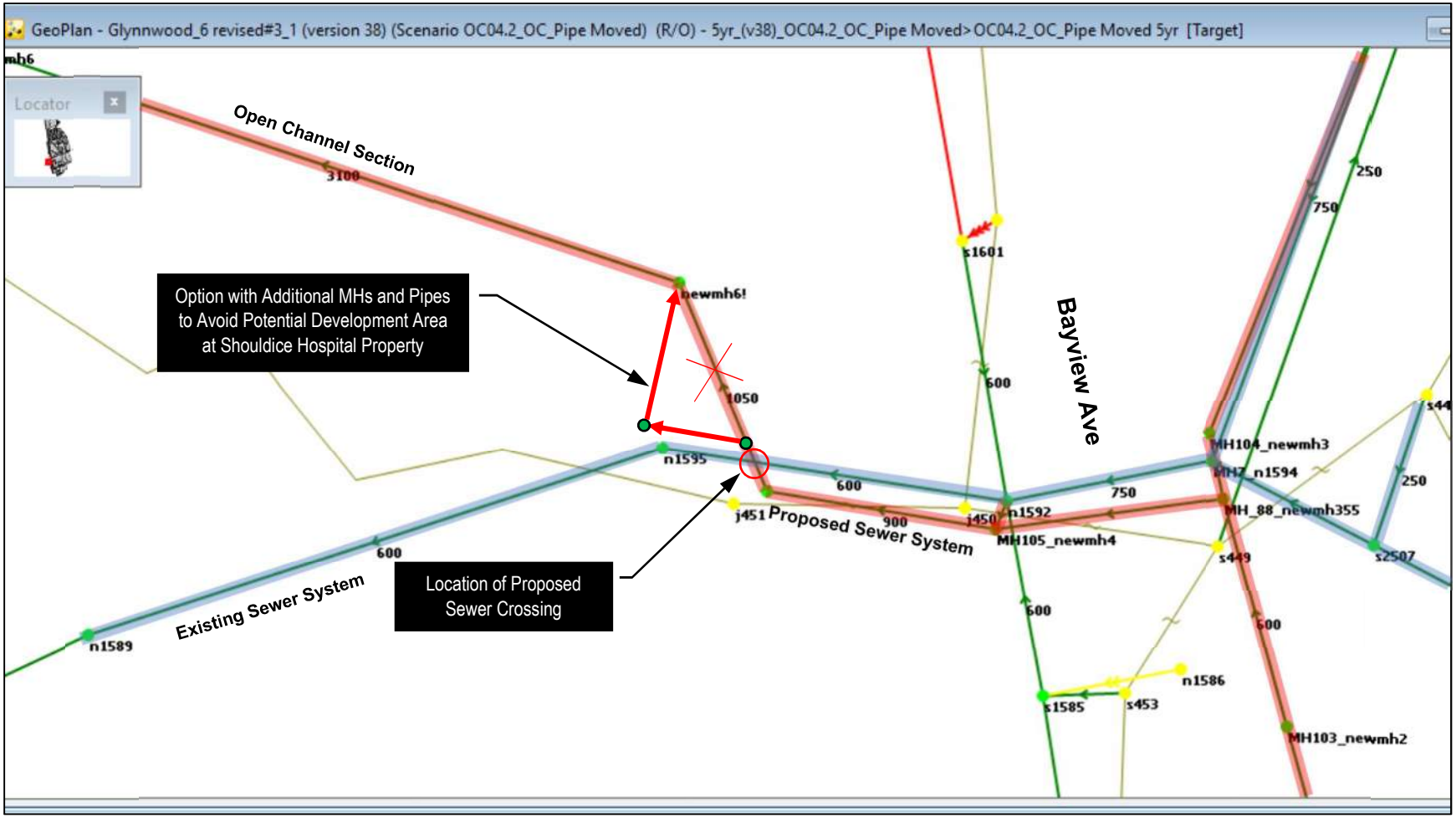


Illustration 3. Additional Alternative - Option to Avoid Potential Development Area at Shouldice Hospital Property

PROJECT :

PROJECT NUMBER :

SUBJECT :

Sheet no. of

Date

By

DISTRIBUTION :

Glynnwood Concrete channel Sizing

APPENDIX

G

REVISED PREFERRED ALTERNATIVE – CAPITAL COST TABLE

PROJECT: Glynnwood EA Glynnwood EA
DONE BY:
CHK'D BY:
SUBJECT: Cost Estimate for Water Quality Treatment Alternative (Recommended Alternative, Jan 2021)
PROJ. NO.: 121-15461-00
DATE: September 1, 2021

CAPITAL COST ESTIMATE

SPEC DIV No	DESCRIPTION OF ITEM	QTY	UNIT	UNIT COST (2013 $)	MATERIAL UNIT COST (2020 $)	MATERIAL INSTALLATION UNIT COST (2021 $)	TOTAL COST ($)	% OF MAT'L (%)	or UNIT COST ($)	TOTAL COST ($)	TOTAL MAT'L & INSTALL. ($)	SUB TOTAL COST ($)
Division 1 - General Requirements												
	Mobilization/demobilization see general items	1	LS			10,000	10,000			0	10,000	
	100% performance bond and insurance		LS				0			0	0	
	Engineer's field office as specified		LS				0			0	0	
	Permits, inspections, traffic signs, provision and maintenance of temporary site services and all other items not included under items A1 to A4 , inclusive	1	LS		10,000	10,000	10,000	25		2,500	12,500	
	Geotechnical and material testing	1			30,000	30,000			0	30,000		
	Hydrovac for underground service where required	1	LS		15,000	15,000			0	15,000		
	Traffic control and signage as required and Paid Duty Police Officer to direct traffic	1	LS		15,000	15,000			0	20,000		
	Coordinate Field Locate	1	LS		10,000	10,000			0	10,000		
	Construction Layout	1	LS		30,000	30,000			0	30,000		
			LS				0			0	0	
			LS				0			0	0	
OTHER COSTS (As Percentage of Sub-Total)										*Sub-Total:*	22,500	
			%								0	
			%								0	
TASK TOTAL COST										*Total:*	22,500	$22,500
Division 2 - Site Work						*Incl. Installation*						
	Construct the following storm sewers including all necessary excavation, bedding, backfill, compaction as directed by the Consultant.											
	Open cut - total cost for new sewer 525 mm diameter (EX. MH "N1613"-MH3)	8	m			350	2,625	0		0	2,625	
	Open cut - total cost for new sewer 525 mm diameter (MH3-MH7_N1594)	69	m			350	24,213	0		0	24,213	
	Open cut - total cost for new sewer 600 mm diameter (MH S2391-MH1)	49	m	712	818	400	19,600	0		0	19,600	
	Open cut - total cost for new sewer 600 mm diameter (MH1-MH2)	70	m	712	818	400	28,000	0		0	28,000	
	Open cut - total cost for new sewer 900 mm diameter (MH2-MH7_N1594)	28	m	968	1,112	800	22,080	0		0	22,080	
	Open cut - total cost for new sewer 1200 mm diameter (MHXX-MH8)	4	m	968	1,112	1,150	4,025	0		0	4,025	
	Open cut - total cost for new sewer 1200 mm diameter (MH8-OGS)	9	m	968	1,112	1,150	10,638	0		0	10,638	
	Open cut - total cost for new sewer 1200 mm diameter (OGS- MH5)	28	m	968	1,112	1,150	32,200	0		0	32,200	
	Open cut - total cost for new sewer 1200 mm diameter (MH5-MH6)	35	m	968	1,112	1,150	40,365	0		0	40,365	
	Open cut - total cost for new sewer 1200 mm diameter (MH6-CHANNEL)	3	m	968	1,112	1,150	3,450	0		0	3,450	
	Construct the following storm manholes including frames and covers, steps, benching, backfill, compaction, external drop structures, safety platforms and bulkheads in accordance with the drawings and specifications and as directed by the Consultant.											
	New 1200 mm maintenance holes MH3 & MH4	2	ea.	5,000	5,743	7,800	15,600	0		0	15,600	
	New 1500 mm maintenance holes MH1	1	ea.	5,000	5,743	10,500	10,500	0		0	10,500	
	New 1800 mm maintenance holes MH2,	1	ea.	6,500	7,466	13,000	13,000	0		0	13,000	
	New 2400 mm maintenance holes (Depth upto4.9m) MHXX, MH5, MH6 & MH8	4	ea.		15,000	21,000	84,000	0		0	84,000	
	New 3000 mm maintenance holes (Depth upto 5.5m) MH7_N1594	1	ea.			54,000	54,000	0		0	54,000	
	Oil/Grit Separator	1	ea.	60,000	68,921	85,000	85,000	0		0	85,000	
	New 100-year storm Inlet Structure (approximately 1.2m by 2m)	4	ea.	70,000	77,286	25,000	100,000	0		0	100,000	
	Headwall	1	ea.	25,000	28,717	27,000	27,000	0		0	27,000	
	Constuct-total cost for retaining wall along the proposed channel	78	m	25,000	1,500	1,500	116,250	0		0	116,250	
	Construct- total cost for trapezoidal sectional-3.5m wide rip-rap based lining channel (HW-POND)	81	m	25,000	310	356	28,836	0		0	28,836	
	Plunge Pool, Upgraded Channel & Landscaping	1	ea.	60,000	68,921	79,300	79,300	0		0	79,300	
	Removal/disposal of curb on east and west side of Bayview		m		50	80	0	0		0	0	
	Supply and install curb on east and west side of Bayview		m		110	120	0	0		0	0	
	Supply & install temporrary silt control devices	350	m	15	17	20	6,927	0		0	6,927	
	Construction Fence	1,254	m	20	23	26	33,099	0		0	33,099	
	CB protection	6	LS	10,000	11,487	13,210	79,259	0		0	79,259	
	Grass and sod restoration	300	m^2	8	9	10	2,972	0		0	2,972	
	Replanting	1	LS	5,000	5,743	6,600	6,600	0		0	6,600	
	Miscellaneous items	1	LS	10,000	11,487	13,210	13,210	0		0	13,210	
	Trailer	1	LS	20,000	22,974	25,000	25,000			0	25,000	
	Clearing and grubbing and removal/disposal of existing trees, shrubs, vegetation, abandoned surface utilities and other debris as indicated in the contract drawings	1	LS	10,000	11,487	13,200	13,200	25		3,300	16,500	
	Contractor's staging area	1	LS	5,000	5,743	6,600	6,600	25		1,650	8,250	
	Connect to existing MH	4	ea.		0	5,000	20,000			0	$20,000	
	CCTV Camera Inspection of Sewers	627	m			8.5	5,331			0		
	Restoration Including Sub base and Asphalt	1	m			815	815			0		
	Temprorary Access road	1	m			450	450			0		
	Asphalt and Sub base removal		m2			20				0		
OTHER COSTS (As Percentage of Sub-Total)										*Sub-Total:*	1,025,694	
			%								0	
			%								0	
TASK TOTAL COST										*Total:*	1,025,694	$1,025,694
											SUB-TOTAL:	$1,048,194
GENERAL ITEMS (As Percentage of Sub-Total Above)												
Mobilization and demobilization		3.0	%								31,446	
Bonds		1.0	%								10,482	
Insurance		1.0	%								10,482	
General contractor's overhead and profit		10.0	%								104,819	
Other:			%								0	
										General Items Total:	157,229	$157,229
											SUB-TOTAL:	$1,205,424
ENGINEERING AND CONTINGENCY (As Percentage of Sub-Total Above)												
Engineering (design and construction services)-Not Included		15.0	%								180,814	
Additional unit prices			%								0	
Construction lump sum contingency allowance		10.0	%								120,542	
Other:			%								0	
		25	%							*Engineering and Contingency Total:*	301,356	$301,356
											SUB-TOTAL:	$1,506,779
TAXES AND OTHER ITEMS (As Percentage of Sub-Total Above)												
Provincial sales tax			%								0	
Federal goods and services tax			%								0	
Other taxes, patent fees, import duties and foreign exchange			%								0	
Other:			%								0	
										Taxes Total:	0	$0
											GRAND TOTAL:	**$1,507,000**

NOTES

No	REVISION	DATE
0	Update to 2019 Dollars (assumed 2% inflation per year since 2013)	01/14 2019
1	Update to 2020 Dollars (assumed 2% inflation per year since 2013)	01/14 2020
2	Update based on February 2020 Plan with Assumed Major Flow Inlet at Glynnwood Entrance	06/15 2020
3	Update based on April 2021 Plan with Assumed Major Flow Inlet at Glynnwood Entrance	05/3 2021

SUMMARY	SUMMARY	
DIV 1	DIV 1 GENERAL REQUIREMENTS	$22,500
DIV 2	DIV 2 SITE WORK	$1,025,694
GENERAL IT	GENERAL ITEMS	$157,229
ENGINEERIN	ENGINEERING AND CONTINGENCY	$301,356
TAXES AND	TAXES AND OTHER ITEMS	$0
TOTAL	**TOTAL**	**$1,507,000**

APPENDIX

H SUPPORTING TECHNICAL DOCUMENTS

CITY OF MARKHAM

SCOPED ENVIRONMENTAL IMPACT STUDY

GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

OCTOBER 02, 2020

SCOPED ENVIRONMENTAL IMPACT STUDY

GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

CITY OF MARKHAM

PROJECT NO.: 121-15461-00
DATE: OCTOBER 02, 2020

WSP
UNIT 2
126 DON HILLOCK DRIVE
AURORA, ON, CANADA L4G 0G9

T: +1 905 750-3080
F: +1 905 727-0463
WSP.COM

October 02, 2020

City of Markham
101 Town Centre Boulevard
Markham, ON L3R 9W3

Attention: Nehal Azmy, P.Eng.

Dear Ms. Azmy,

Subject: Scoped Environmental Impact Study

A Scoped Environmental Impact Study (EIS) has been prepared in support of the Glynnwood Tributary Area Environmental Assessment, which involves the construction of a storm sewer for flood remediation. The study area includes lands described with the municipal addresses of 7700 and 7750 Bayview Avenue, Markham, Ontario. Please find the document attached for your review.

The study was developed to address survey requirements outlined by the Toronto and Region Conservation Authority (TRCA) to identify potential impacts associated with site preparation and construction of the proposed storm sewer on Natural Heritage Features and Areas identified in the vicinity of the site.

Thank you for the opportunity to complete this assessment. Please contact the undersigned if you have any questions.

Yours truly,

Erin Fitzpatrick, M.Sc.
Ecologist, Environment

CP/jf

WSP ref.: 121-15461-00

UNIT 2
126 DON HILLOCK DRIVE
AURORA, ON, CANADA L4G 0G9

T: +1 905 750-3080
F: +1 905 727-0463
wsp.com

SIGNATURES

PREPARED BY

DRAFT

October 2, 2020
Date

Carlene Perkin H.B.Sc
Ecologist - ISA Certified Arborist

APPROVED[1] BY *(must be reviewed for technical accuracy prior to approval)*

DRAFT

October 2, 2020
Date

Erin Fitzpatrick, M.Sc.
Ecologist

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by the City of Markham to complete a Scoped Environmental Impact Study (EIS) in support of the Glynnwood Tributary Area Environmental Assessment, which involves the construction of a storm sewer for flood remediation. The area surveyed within the lands described with the municipal addresses of 7700 and 7750 Bayview Avenue, Markham, Ontario is shown on **Figure 1** and is herein referred to as the 'study area'.

The Toronto and Region Conservation Authority (TRCA) requested that a Scoped EIS be completed to assess the potential impacts to flora and terrestrial natural heritage features associated with site preparation and construction of the proposed storm sewer. A woodland occurs within the study area and vegetation removal, including tree removal is expected to occur within this feature. The EIS focuses on impacts to plant species and vegetation communities within the study area. Specifically, the TRCA indicated that the EIS should be scoped to include the following:

A single season survey, to be conducted between late spring and early fall. The survey was to include:

- An inventory of flora within the study area;
- Ecological Land Classification (ELC) community descriptions, including species occurring within each layer (i.e., canopy, understory, and groundcover);
- Basal area and relative cover (based on results of prism sweeps) for each vegetation community;
- Incidental wildlife and analysis of potential wildlife habitat (including vernal pools, springs/seeps, cavity trees, etc.); and,
- Ministry of Environment, Conservation and Parks (MECP) consultation regarding a screening for Species at Risk (SAR).

The scoped EIS also includes identification and consideration for natural heritage features (NHFs) and areas within 120 m of the study area as defined by applicable municipal, regional, and provincial policies.

2 ENVIRONMENTAL POLICY CONTEXT

2.1 PROVINICAL POLICY STATEMENT

The Provincial Policy Statement (PPS) (Ontario Ministry of Municipal Affairs and Housing (OMMAH), 2020) is a planning document that provides a framework for, and governs development within, the Province of Ontario. In order to preserve various ecological resources deemed significant in the Province, development lands must be assessed for the presence of natural heritage features prior to construction. These natural heritage features (listed below) are both defined and afforded protections under the PPS. Linkages between natural heritage features, surface water and groundwater features are also recognized and afforded similar protections under the policy. Section 2.1.2 of the PPS also requires that the diversity and connectivity of natural heritage features and the long-term ecological function of natural heritage systems be maintained, restored or improved where possible. Further to this, natural heritage systems within Ecoregions 6E and 7E are to be identified as per Section 2.1.3.

Under the PPS (OMMAH, 2020), development or site alteration is prohibited within significant wetlands in Ecoregions 5E, 6E and 7E and in significant coastal wetlands, but may be allowed adjacent to these features provided the adjacent lands have been evaluated and it has been demonstrated that there will be no negative impacts to these features or their ecological functions. Development may be permitted in or adjacent to significant wetlands north of Ecoregions 5E, 6E and 7E, significant woodlands and significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River), significant wildlife habitat, and significant areas of natural and scientific interest (ANSI), provided there will be no negative impacts to these features or their ecological function due to the proposed undertaking. In addition, development and site alteration is not permitted in fish habitat unless in accordance with provincial and federal legislation.

Natural heritage features as defined by the PPS (OMMAH, 2020) include:

A) *Fish Habitat;*
B) *Habitats of Endangered and Threatened Species;*
C) *Significant Areas of Natural and Scientific Interest (ANSI);*
D) *Significant Wetlands;*
E) *Significant Coastal Wetlands;*
F) Other *Coastal Wetlands* in Ecoregions 5E, 6E and 7E;
G) *Significant Wildlife Habitat;*
H) *Significant Woodlands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River); and,
I) *Significant Valleylands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River).

A review of information resources (**Section 3**) indicates there are no wetlands, ANSIs or known occurrences of Species at Risk (SAR) on, or adjacent to, the study area.

The Ontario Ministry of Natural Resources and Forestry's (MNRF) Natural Heritage Areas Mapping shows Woodland mapped within the study area. This woodland is contiguous with a larger woodland associated with Pomona Creek, a tributary to the Don River East Branch, that runs north to south approximately 300 m west of the study area. While the larger woodland is part of the valley system and provides important functions as a linkage corridor, it is likely too small (< 50 ha) and lacking in significant ecological functions to be considered significant under the policies of the PPS. The woodland and its significance at the regional and local scale is discussed in the following sections.

2.2 CONSERVATION AUTHORITIES ACT

The *Conservation Authorities Act* gives individual conservation authorities the power to regulate development and activities in or adjacent to river or stream valleys, Great Lakes and large inland lakes and shorelines, watercourses, hazardous lands and wetlands. Regulations made under the Conservation Authorities Act specify the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations managed by individual Conservation Authorities. These regulations apply to lands within river or stream valleys, flood plains, wetlands, watercourses, lakes, hazardous lands or lands within 120 metres (m) of a Provincially Significant Wetland or wetlands greater than 2 hectares, or lands within 30 m of non-provincially significant wetlands. Development or site alteration within these regulated areas may be permitted provided development is conducted in accordance with existing policies.

The site is located within the jurisdiction of the TRCA and a permit under Ontario Regulation 166/06 may be required for work within the western half of the study area, as it is identified as regulated area (TRCA, 2020). Pomona Creek, a tributary of the Don River East Branch is located approximately 300 m west of the study area and is considered a permanent stream; a feature that merits protection as part of the Natural System (valley corridor) under the TRCA Living City Policies (LCP) (TRCA, 2014). The Glynnwood Pond occurs among the western half of the study area. This pond was created in the 1930's by damming a tributary to Pomona Creek. Storm sewers constructed for the upstream drainage area were directed into the pond at various outfalls. TRCA regulation mapping documents the pond and downstream channel extending into Pomona Creek to the west as a regulated area.

2.3 YORK REGION OFFICIAL PLAN

The study area is located in a designated Urban Area as indicated on Map 2 – Regional Greenland's System (December 2018). The policies set out in Section 2.1 of the York Region Official Plan (YROP - Office Consolidation: April 2019) protect key natural heritage features and key hydrologic features and the adjacent lands necessary to link these features within the Greenland System. Under the policy set out in Section 2.1.9, site development and site alteration is prohibited within the Regional Greenlands System and development and site

alteration applications within 120 m of the System shall be accompanied by an EIS. However, stormwater management systems/facilities may be permitted subject to meeting the requirements set out in the PPS.

Portions of the study area and adjacent lands are mapped as Woodlands on Map 5 (December 2018) in the YROP. Additionally, York Region's Land Information interactive map (York Region, 2020), identifies a small stand of trees within the study area, in addition to the woodland occurring west of the study area and within the Pomona creek corridor as *Ecologically Significant Forest*. Aerial imagery and mapping prepared using spatial data obtained from the MNRF's Land Information Ontario (LIO) database (**Figures 1 and 2**) indicate that the woodland is larger than what has been mapped by the Region and extends westward. The woodland within the study area is contiguous with the woodland associated with the Pomona Creek valley corridor. Through background review and during the site investigation, it was determined that the canopy coverage is continuous with the woodland adjacent to the study area and no significant gaps (> 20 m) were identified. However, the woodland within the area proposed for impact is considered to be of low botanical quality and provides limited ecological function given the sparse and/or manicured understory, presence of introduced species, and existing level of disturbance.

Under Section 2.2.45 of the YROP a review of the woodland and its ecological components on and adjacent to the study area is required to determine significance. Section 2.2.45 of the YROP states a significant woodland is to be verified on a site-by-site basis and shall include those woodlands meeting one of the following criteria:

Is 0.5 hectares or larger and:

i. directly supports globally or provincially rare plants, animals or communities as assigned by the Natural Heritage Information Centre; or,

ii. directly supports threatened or endangered species, with the exception of specimens deemed not requiring protection by the Province (e.g. as is sometimes the case with Butternut); or,

iii. is within 30 metres of a provincially significant wetland or wetland as identified on Map 4, waterbody, permanent stream or intermittent stream.

(YROP, Office Consolidation: April 2019)

Under criteria (iii) the woodland on and adjacent to the study area is considered significant due to its size (> 0.5 ha) and proximity to a permanent stream (Pomona Creek, a tributary of the Don River East Branch). Significance of other natural heritage features in the YROP follows guidelines set out in the PPS, where applicable. There were no other natural heritage features identified within the YROP mapping of the study area, or confirmed through the site investigation, that would be considered significant under the YROP policies.

According to the policies set out within the YROP, development and/or site alteration is not permitted in key natural heritage features (including woodlands) and key hydrologic features unless it is demonstrated through a natural heritage evaluation, hydrological evaluation, or EIS that the development or site alteration will not result in a negative impact on the natural feature or its ecological functions.

2.4 CITY OF MARKHAM OFFICIAL PLAN

The study area is in a designated Mixed Use Mid Rise and Greenway Area as indicated on the Land Use Map – Map 3, City of Markham Official Plan (CMOP), 2014. The purpose of Markham's Greenway System, discussed in Section 3.1 of the CMOP is to, "maintain and enhance, as a permanent landscape, an interconnected system of natural open space, certain agricultural lands and enhancement areas and linkages that will preserve areas of significant ecological value and certain protected agricultural lands while providing, where appropriate, opportunities to improve biodiversity and connectivity of natural features and ecological function". The City's Greenway System is comprised of the Natural Heritage Network (i.e., natural heritage and hydrologic features and their vegetation protection zones, and hazardous lands and sites), the Oak Ridges Moraine Conservation Plan Area, Greenbelt Plan Area, and certain naturalized stormwater management facilities, such as the Glynnwood storm water management pond within the study area. Markham's Greenway System also forms part of York Region's Greenlands System. As the proposed works include the construction of a storm sewer for flood remediation it is expected they will be subject to Policy 8.6.1.2, which permits watershed management, conservation, and flood and erosion control projects carried out by a public authority on lands designated as Greenway.

The Natural Heritage Network within the vicinity of the study lands is comprised of a permanent/intermittent stream, woodlands, valleylands, and other Greenway Systems Lands including naturalized stormwater management facilities, as described below.

The Greenway System is mapped on mapped on Map 5 – Natural Heritage Features and Landform (2014). Mapped woodlands are similar to those shown in the YROP mapping. Greenway System Lands including certain naturalized stormwater management facilities are associated with the Glynnwood Pond and downstream tributary to the Pomona Creek. As per Policy 3.1.2.16 of the CMOP, the woodland on and adjacent to the study area must be reviewed to determine significance. Section 11.2 of the CMOP defines significant woodlands and outlines the criteria to determine significance; these criteria are consistent with those described in the YROP (previous section). Based on these criteria, the woodland within the study area is considered *significant* under the CMOP (2014).

Valleylands, including potentially *significant valleylands*, and permanent and intermittent streams are mapped on Map 6 – Hydrologic Features of the CMOP (2014). Pomona Creek and its tributary, downstream of the Glynnwood Pond, are shown on Map 6 as permanent or intermittent streams. As discussed in Section 3.1.2.12 of the CMOP, valleylands are important for protection from flooding and erosion and provide habitat and natural linkage corridors for fish and wildlife species. Significant valleylands, if identified, are to be protected in accordance with the PPS. As per Policy 3.1.2.9 of the CMOP, the placement of infrastructure within the Natural Heritage Network may be permitted, provided measures are taken to minimize impacts. The valleyland associated with the Pomona Creek corridor extends easterly across the southern portion of the study area encompassing the tributary to Pomona Creek and the Glynnwood Pond. Due to the *Significant* designation of the woodland area that occurs within this valleyland, it is anticipated the valleyland feature, based on it's degree of naturalness in accordance with the Natural Heritage Reference Manual (MNR, 2005) would also be designated as *Significant*.

The Significant Woodland within the study area overlaps with the valleyland and is considered the greater constraint within the study area. Negative impacts to the valleyland and wider Natural Heritage Network are not anticipated provided the mitigation measures detailed in **Section 11** are followed.

3 INFORMATION RESOURCES

A list of information resources consulted over the course of this study and report preparation are provided below. References for publications used in this report are provided in the Literature Cited section (**Section 14**).

- Aerial Photographs and Satellite Images (2020);
- Atlas of the Breeding Birds of Ontario (Bird Studies Canada, 2005);
- City of Markham Official Plan (2014);
- *Conservation Authorities Act*, Ontario Regulation 166/06 Toronto Region Conservation Authority (2013);
- Ecological Land Classification (Lee et al., 1998);
- *Endangered Species Act*, 2007 (Government of Ontario, 2007);
- iNaturalist Canada (iNaturalist.ca, 2020);
- Natural Heritage Information Centre (NHIC) Mapping and Databases (OMNRF, 2020);
- Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (MNRF, 2010);
- Provincial Policy Statement (OMMAH, 2020);
- Significant Wildlife Habitat: Technical Guide (OMNR, 2000);
- Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (MNRF, 2020);
- Species at Risk in Canada (SARA) List (Government of Canada, 2020);
- Species at Risk in Ontario (SARO) List (Government of Ontario, 2020); and,
- York Region Official Plan (2010) - Office Consolidation: April 2019.

4 AGENCY CONSULTATION

On April 1, 2019, the administration of the *Endangered Species Act*, 2007 (ESA; Government of Ontario (Ontario, 2007) was transferred to the Ministry of Environment, Conservation and Parks (MECP). It is understood that project files relating to (SAR) were transferred from the Ontario Ministry of Natural Resources and Forestry (MNRF) to the MECP and all subsequent consultation regarding permits and approvals is to occur with the MECP.

WSP contacted the Aurora District Ministry of Natural Resources and Forestry (MNRF), Ministry of the Environment Conservation and Park (MECP) and the TRCA to obtain relevant information pertaining to natural heritage features, SAR, Species of Conservation Concern (SCC), and aquatic habitat and fish communities within the study area. A copy of email correspondence from the Aurora MECP staff outlining additional species for consideration in the vicinity of the study area is provided in **Appendix A**. The original request for information was sent out August 11, 2020 and a response was received from Jeff J. Andersen, Management Biologist at the Aurora MECP office on August 13, 2020. Mr. Andersen suggested that habitat for SAR bats be considered during the site investigations. A record of this correspondence is found in **Appendix A**. Rsponses from the MNRF and TRCA had not been received at time of publication.

5 BACKGROUND REVIEW

5.1 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN SCREENING

Prior to conducting the field investigation, a screening of SCC including provincially and federally listed SAR, provincially tracked species (those species tracked as S1, S2, or S3 in Ontario), and regionally significant species was conducted to determine the habitat potential of these species within the study area. To help refine and inform search efforts, this screening was used as a tool to develop a list of species and habitats that should be considered during the field investigation. Species and their habitat listed as Endangered (END) or Threatened (THR) on the Species at Risk in Ontario (SARO) List are protected under the ESA. All other SCC are not afforded provincial protection under the ESA; however, their protection is encouraged, where possible, to ensure the preservation of Ontario's biodiversity.

A species list was compiled based on a review of the information resources (refer to **Section 3**). A total of 26 species were screened for their habitat potential within the study area (**Table 5-1**). **Appendix D** outlines preferred habitat, habitat potential in and within 120 m of the study area, and the likelihood that SAR and/or SAR habitat will be impacted by the proposed works. . The results of the SAR screening are provided in **Section 8.5**.

Table 5-1 Species Screened for Habitat Potential within the Study Area

SPECIES	SRANK[1]	COSEWIC[2]	SARO[3]
AVIFAUNA			
Acadian Flycatcher *(Empidonax virescens)*	S2S3B,SZN	END	END
Bank Swallow *(Riparia riparia)*	S4B	THR	THR
Barn Swallow *(Hirundo rustica)*	S4B	THR	THR
Black Tern *(Chlidonias niger)*	S3B	NAR	SC
Bobolink *(Dolichonyx oryzivorus)*	S4B	THR	THR
Canada Warbler *(Cardellina canadensis)*	S4B	THR	SC

SPECIES	SRANK[1]	COSEWIC[2]	SARO[3]
AVIFAUNA			
Cerulean Warbler *(Setophaga cerulea)*	S3B	END	THR
Chimney Swift *(Chaetura pelagica)*	S4B, S4N	THR	THR
Common Nighthawk (*Chordeiles minor*)	S4B	THR	SC
Eastern Meadowlark *(Sturnella magna)*	S4B	THR	THR
Eastern Wood-pewee (*Contopus virens*)	SB5, SZN	SC	SC
Golden-winged Warbler *(Vermivora chrysoptera)*	S4B	THR	SC
Grasshopper Sparrow *(Ammodramus savannarum)*	S4B,SZN	SC	SC
Hooded Warbler *(Setophaga citrina)*	S3B	NAR	NAR
Least Bittern *(Ixobrychus exilis)*	S4B	THR	THR
Loggerhead Shrike *(Lanius ludovicianus)*	S2B,SZN	END	END
Olive-sided Flycatcher *(Contopus cooperi)*	S4B	THR	SC
Red-headed Woodpecker *(Melanerpes erythrocephalus)*	S4B	THR	SC
Red-shouldered Hawk *(Buteo lineatus)*	S4B	NAR	NAR
Short-eared Owl *(Asio flammeus)*	S2N,S4B	SC	SC
Whip-poor-will *(Caprimulgus vociferus)*	S4B	THR	THR
Wood Thrush (*Hylocichla mustelina*)	SB5, SZN	THR	SC
MAMMALS			
Eastern Small-footed Myotis (*Myotis leibii*)	S2 S3	NA	END
Little Brown Myotis (*Myotis lucifuga*)	S4	END	END
Northern Myotis (*Myotis septentrionalis*)	S3	END	END
Tri-colored Bat (*Perimyotis subflavus*)	S3?	END	END

SRank[1] = Sub-national Rank (Ontario) - B – Breeding Sites, N – Not Applicable (not at risk), ? – Uncertain (more data required), 1 - Critically Imperiled, 2 - Imperiled, 3 - Vulnerable, 4 - Apparently Secure, 5 - Secure.
COSEWIC[2] - Committee on the Status of Endangered Wildlife in Canada and SARO[3] - Species at Risk in Ontario: END – Endangered, THR – Threatened, SC – Special concern.

6 FIELD INVESTIGATION

One site visit was completed on July 31, 2020 to confirm the presence of NHFs and determine general characteristics of the study area. Prior to the field investigations, satellite images of the property, land use and topographical maps were reviewed to identify the presence of NHFs, available wildlife habitat and the potential for SAR and SCC. The site visit details are provided in **Table 6-1**.

Table 6-1 Site Visit Details

DATE	WEATHER CONDITIONS
July 31, 2020	Sunny, ±-27°C, gentle breeze, no trace of precipitation

7 SITE DESCRIPTION

The study area is located west of Bayview Avenue and north of John Street, within the City of Markham, and includes portions of municipal addresses 7700 and 7750 Bayview Avenue, Thornhill, Ontario. The wider area is heavily developed with a variety of urban land uses. A woodland occupies the western portion of the study area and is connected to the larger woodlands associated with the Pomona Creek corridor approximately 300 m west. As part of a larger woodland, the woodland within the study area is considered significant based on the definitions for significance in the YROP (2019) and CMOP (2014). Untreed areas of the property were maintained as mowed lawn at the time of the site investigation, and areas within the woodland understory were also manicured. Evidence of disturbance within the area included pedestrian trails, dumping and non-native species. A full description of the flora within the study area is provided in **Section 8.1** of this report.

The Glynnwood Pond, located within the western portion of the study area, was created in the 1930's by damming a tributary to Pomona Creek. As the area became more urbanized, storm sewers constructed to capture upstream drainage area were directed into the pond at various outfalls. As a maintained storm water management facility, the pond is not considered fish habitat; and as a result an aquatic assessment was not conducted as part of this study. The pond is lined with stone along the embankments, and drains in a southwesterly direction eventually discharging into the tributary of Pomona Creek. The pond banks are vegetated with species associated with wet habitats, such as Willows (*Salix* sp.) American Water-horehound (*Lycopus americanus*), Common Reed (*Phragmites australis*), Reed Canarygrass (*Phalaris arundinacea var. arundinacea*), Spotted Lady's-thumb (*Persicaria maculosa*), Broad-leaved Cattail (*Typha latifolia*), Coltsfoot (*Tussilago farfara*), and Common Buttercup (*Ranunculus acris*).

8 BIOPHYSICAL INVENTORY / FIELD OBSERVATIONS

The following sections detail the methodology and results of the field investigation, with particular reference to the specific objectives of the Scoped EIS as required by the TRCA.

8.1 FLORAL INVENTORY

An inventory of the flora in the study area was completed during the July 31, 2020 site investigation. A total of 64 vascular plant taxa were observed within the study area. Of these, 59 where identified to species. Of the identified species, 31 (53%) were native and 28 (47%) were non-native. Refer to the vascular plant list provided in **Appendix B**.

There were no naturally occurring species with a high Coefficient of Conservatism (8 to 10) identified in the study area. A Coefficient of Conservatism (CC) is defined by how closely associated a species is to a specific (typically natural) habitat. A high CC means that the species in question is more closely tied to a specific habitat, while species with a low CC can adapt to multiple habitats, including altered or disturbed habitats.

There were 13 species in the study area with a Coefficient of Wetness (CW) of -3 to -5, which are typically tied to wetlands or slow-moving water. These species are primarily associated with the banks of the stormwater management pond in the study area.

8.2 VEGETATION COMMUNITY MAPPING

Vegetation communities were approximated using satellite imagery then field-checked to confirm the vegetation type, where possible. Vegetation units have been described using the ELC System for Southern Ontario: First Approximation and Its Application (Lee et al., 1998), or by ELC for Southern Ontario: 2nd Approximation (Lee et al. 2008), as required. ELC information gathered included vegetation community type, species associations, abundances and condition / level of disturbance.

The study area is surrounded by urban land use (e.g. residential mid-rises, commercial property, parking lots, railway and arterial roads). Vegetation community types were observed to be highly impacted by historic anthropogenic activities and the introduction of exotic/invasive species. This has led to the establishment of a cultural woodland and manicured green spaces within and surrounding the study area. Planted landscape vegetation with species typical of cities was observed surrounding the residential buildings and within public spaces. Landscape plant species observed are typically used due to their tolerance to air pollution, salt and drought. The vegetation type comprising the treed area within the study area and surrounding the banks of the stormwater management pond is considered to have relatively higher ecological value; however, this area was also observed to consist largely of exotic / introduced species. ELC vegetation types are identified in **Figure 3** and described in the text that follows.

CUW1 – Mineral Cultural Woodland Ecosite

This vegetation type was observed in treed habitats of the study area. The majority of trees were observed to be young (< 25 cm diameter at breast height [DBH]) and are likely the result of successional growth following a historic excavation/disturbance of this area. The canopy consisted of a mix of Canada Poplar (*Populus x canadensis*) and Freeman's Maple (*Acer x freemanii*) with occasional Scots Pine (*Pinus sylvestris*). Rare occurrences of Silver Maple (*Acer saccharinum*) and Elm Species (*Ulmus sp.*) were also noted. Within the sub-canopy, species mostly consisted of planted Blue Spruce (*Picea pungens*), Norway Maple (*Acer platanoides*), Norway Spruce (*Picea abies*), White Spruce (*Picea glauca*) with occasional Freeman's Maple and invasive Common Buckthorn (*Rhamnus cathartica*). Closer to the stormwater management pond and watercourse and associated habitat, the sub-canopy included rare amounts of Golden Weeping Willow (*Salix x sepulcralis*), White Willow (*Salix alba*), Red Maple (*Acer rubrum*) and Trembling Aspen (*Populus tremuloides*). The understory of the CUW1 consisted of an abundance of invasive Common Buckthorn (*Rhamnus cathartica*) and Garlic Mustard (*Alliaria petiolata*), as well as occasional Norway Maple, Black Raspberry (*Rubus occidentalis*), Eastern White Cedar (*Thuja occidentalis*), domestic apple (*Malus spp.*), invasive Honeysuckle Species (*Lonicera sp.*), Common Burdock (*Arctium minus*), Dame's Rocket (*Hesperis matronalis*), Canada Goldenrod (*Solidago canadensis var. canadensis*) and Panicled Aster (*Symphyotrichum lanceolatum*). The groundcover was limited and consisted of invasive Common Buckthorn seedlings, Garlic Mustard and occasionally Wild Carrot (*Daucus carota*), European Wood-sorrel (*Oxalis stricta*), Ground-ivy (*Glechoma hederacea*), Common Burdock, Wood Avens (*Geum urbanum*), Dame's Rocket, Woodland Strawberry (*Fragaria vesca*) and Heart-leaved Aster (*Symphyotrichum cordifolium*).

Landscape and Lawn

Surrounding the residential buildings, pathways, pedestrian trails and in public open areas, vegetation consisted of mowed lawn with planted trees that are being maintained / cared for and introduced species. Common planted trees consisted of Norway Maple, Freeman's Maple, Blue Spruce, White Spruce, Norway Spruce, Red Maple and Bur Oak (*Quercus macrocarpa*). In areas that could not be mowed easily (e.g. on steep slopes), Garlic Mustard and Common Buckthorn seedlings were found in abundance.

8.3 BASAL AREA METHODOLOGY AND RESULTS

In accordance with the TRCA's request, the EIS was scoped to include an assessment of basal area based on results of prism sweeps for each vegetation community. Appendix B of the TRCA's Guideline for Determining Ecosystem Compensation (June 2018) was used as a guideline to complete the assessment. Since the footprint of impact is small and the study area is within an urban landscape, the basal area can be used to establish restoration replacement

ratios. In general, a higher basal area correlates to older and higher functioning treed ecosystems. The TRCA guideline provides compensation ratios for basal areas ranging from 0 m^2/ha to over 50 m^2 /ha.

Basal area was determined using a BAF 2 metric prism. During the 2020 site visit, a WSP ecologist assessed basal area in the wooded area with the greatest potential for impact. A total of four (4) plots were established to provide suitable coverage (BA1, BA2, BA3 and BA4). Each plot was situated within ELC vegetation type CUW1. The locations of the plots are shown in **Figure 3**. The results of the tree basal area survey are provided in **Appendix D**. The average basal area for the CUW1 vegetation type was estimated to be 19 m^2/ha. Once the final footprint of impact is determined at detailed design, and the extent of tree removal is better understood, compensation requirements should be determined through consultation with the TRCA and the City.

8.4 INCIDENTAL WILDLIFE

Incidental wildlife observations were documented during the field investigation and are detailed in **Appendix B**. For species observed, the conservation status has been documented with reference to NHIC and to regional species lists where available.

Visual observations of wildlife at the study area included common mammals and birds found in urban areas. All wildlife observations occurred within or adjacent to the CUW1 vegetation type.

Mammal observations included an Eastern Gray Squirrel (*Sciurus carolinensis*), Eastern Cottontail (*Sylvilagus floridanus*) and Eastern Chipmunk (*Tamias striatus*).

A single amphibian species, Green Frog (*Lithobates clamitans*), was heard calling from the stormwater management pond.

Birds observed and / or heard included Mallard (*Anas platyrhynchos*), Canada Goose (*Branta canadensis*), Northern Cardinal (*Cardinalis cardinalis*), American Goldfinch (*Spinus tristis*), American Crow (*Corvus brachyrhynchos*), Blue Jay (*Cyanocitta cristata*), Belted Kingfisher (*Megaceryle alcyon*), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Black-capped Chickadee (*Poecile atricapillus*), Red-breasted Nuthatch (*Sitta canadensis*), American Robin (*Turdus migratorius*) and Mourning Dove (*Zenaida macroura*).

Belted Kingfisher, Hairy Woodpecker and Red-breasted Nuthatch have been assigned a rank of L4 by the TRCA, indicating that these species represent a concern due to their potential to decline within an urban matrix; however, they are thought to be able to withstand some disturbance. These species were observed in and / or adjacent to the CUW1 (refer to **Section 8.5.3**). Other wildlife species observed on or adjacent to the study area have ranks of L5 and are considered generally secure within the TRCA jurisdiction and are not of concern. The area proposed for development is within an urban matrix with a high level of existing disturbance; however, some species can be considered rare within the urban landscape. Potential impacts are not anticipated to significantly alter wildlife species habitat since the footprint of disturbance is small and indirect impacts related to construction will be temporary.

8.5 SAR / TRACKED SPECIES OBSERVED

No provincially or federally listed SAR were observed within the study area during the field investigation. The species discussed in the SAR screening (**Section 5.1**) and their preferred habitats were given special consideration during the site investigation. The SAR Screening Table in **Appendix C** outlines the species of note, their preferred habitat, field observation notes for the species, the presence of potential habitat on the study area, and the likelihood and magnitude of potential impacts to the species and / or their habitat.

The 26 species that were identified to be within the general area, listed in **Section 5.1**, were determined to have a low to moderate likelihood to be present on, or within 120 meters of the study area. Of these 26 species, 22 bird SAR species were reviewed for their potential to occur within or adjacent to the study area. As significant habitat (e.g., nesting habitat) was not observed on the study area, impacts to SAR birds are not anticipated. These species have moderate potential to occur in the area as a foraging visitant; however, the study area does not provide preferred nesting habitat. As such, these species are unlikely to be impacted by the proposed development.

The four (4) SAR bat species: Northern Myotis, Little Brown Myotis, Eastern Small-footed Myotis and Tri-colored Bat were determined to have moderate potential to occur on and / or adjacent to the study area. With appropriate mitigation in place, impacts to these bat species are expected to be minimal based on the nature of the proposed works and work limits within the study area. There were no threatened or endangered species observed during the site investigation.

In addition to potential bat roosting habitat, twelve (12) regionally rare species were observed in the study area. These features and species are described below.

8.5.1 SAR BAT HABITAT

Significant habitats for bat roosting and overwintering are unlikely to be present in, and surrounding, the study area. Due to the small size of the study area, it is thought to have low suitability for maternity roosting as few large trees with cavities/chimneys/ample loose bark were observed. The majority of trees observed during the field investigation were young (< 25 cm DBH with a few above 50 cm DBH), were in good health without characteristic habitat traits (e.g. cavities and loose bark), and / or were not of preferred trees species (e.g. native Maple [*Acer sp.*] and Oak [*Quercus sp.*]). Mature trees present consisted predominately of Canada Poplar, Freeman's Maple, Elm Species, or landscape planted Norway Maple, Blue Spruce, Norway Spruce and White Spruce. Dead trees within and adjacent to the study area may have some potential to be used as a rest site during the day and during foraging, but the study area is not considered significant habitat for bats.

Dead and / or dying Canada Poplars and mature dead coniferous species with loose bark were observed northeast of the parking lot and are adjacent to the area proposed for development. Impacts to these trees should be re-assessed during detailed design once the final footprint of disturbance has been determined. Should removal be necessary, to avoid potential impacts to resting bats, if present, trees should be removed outside of the bat active period. Timing windows for tree removal and vegetation clearing are recommended in **Section 11**.

8.5.2 REGIONALLY RARE AND UNCOMMON FLORA

Twelve (12) species were identified within the study area as uncommon or regionally rare in Ecoregion 7E, York Region, Greater Toronto Area (GTA), and / or by the TRCA (**Table 8-1**). Most of the species listed were planted, or have established themselves within the surrounding urban matrix. Due to the small footprint of disturbance, impacts to these regionally or locally uncommon or sensitive flora within the study area is anticipated to be minimal. Five (5) of these species will not be impacted as they were observed outside of the proposed work limit and impacts associated with the storm sewer and retaining wall installation are not anticipated. The remaining seven (7) species occur within or immediately adjacent to the anticipated development footprint. Recommendations to protect or replace these species are not considered necessary for this project. In order to minimize potential impacts to vegetation, general mitigation measures detailed in **Section 11** are recommended.

Table 8-1: Rare or Uncommon Flora Observed

SPECIES	ECODISTRICT 7E4 (GTA) (Oldham, 2017)	TRCA (2018)	YORK REGION (Varga et al., 2000)	GREATER TORONTO AREA (Varga et al., 2000)	ELC UNIT	COMMENT
Freeman's Maple (*Acer x freemanii*)	hyb	L4	XSR	X	CUW1	Common in this area Outside the development zone – no impacts expected
Red Maple (*Acer rubrum*)	C	L4	X	X	CUW1	Planted in this area Outside the development zone – no impacts expected
Sugar Maple (A*cer saccharum*)	C	L4	X	X	CUW1	Within the proposed development zone – potential for impact
Silver Maple (*Acer saccharinum*)	X	L4	X	X	CUW1	Within the proposed development zone – potential for impact
Virginia Stickseed (*Hackelia virginiana*)	U	L5	R5	X?	CUW1	Within the proposed development zone Other populations present within the study area – potential for impact
Black Walnut (*Juglans nigra*)	C	L5	R	X	CUW1	Common in this area Outside the development zone – no impacts expected
Tamarack (*Larix laricina*)	R	L3	X	X	CUW1	Within the proposed development zone – potential for impact
American Water-horehound (*Lycopus americanus*)	C	L4	X	X	Glynnwood SWM Pond	Common in this area Outside the development zone – no impacts expected
White Spruce (*Picea glauca*)	U	L3	X	X	CUW1	Within the proposed development zone – potential for impact

SPECIES	ECODISTRICT 7E4 (GTA) (Oldham, 2017)	TRCA (2018)	YORK REGION (Varga et al., 2000)	GREATER TORONTO AREA (Varga et al., 2000)	ELC UNIT	COMMENT
Eastern White Pine (*Pinus strobus*)	C	L4	X	X	CUW1	Within the proposed development zone – potential for impact
Eastern White Cedar (*Thuja occidentalis*)	C	L4	X	X	CUW1	Within the proposed development zone – potential for impact
Broad-leaved Cattail (*Typha latifolia*)	C	L4	X	X	Glynnwood SWM Pond	Common in this area Outside the development zone – no impacts expected

References:

Oldham, Michael J. 2017. List of the Vascular Plants of Ontario's Carolinian Zone (Ecoregion 7E). Carolinian Canada and Ontario Ministry of Natural Resources and Forestry. Peterborough, ON. 132 pp.

R: Rare.
U: Uncommon.
C: Common.
X: Present. Native but no status assigned because of lack of information, often due to confusion with similar species.
hyb: Hybrid.

TRCA. 2018. Annual Local Occurrence Score and Local Rank Update: Terrestrial Species and Vegetation Communities.

L3: Of concern regionally; generally secure in a natural matrix; able to withstand minor disturbance.
L4: Of concern in urban matrix; generally secure in rural matrix; able to withstand some disturbance.
L5: Not of concern; generally secure throughout the jurisdiction, including urban matrix; able to withstand high levels of disturbance.

Varga, S., et. al. 2000. The Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources, Aurora, ON. 103 pp.

U: Uncommon native species.
R: Rare native species.
R#: Number of stations for a rare native species.
X: Present.

8.5.3 REGIONALLY RARE WILDLIFE

Belted Kingfisher, Hairy Woodpecker and Red-breasted Nuthatch were observed and / or heard within or adjacent to the study area. These species are regionally tracked species by the TRCA and have been assigned a local rarity code of L4. Species with a code of L4 are of urban concern and although they occur throughout the region, the decline of the species could occur if urban impacts are not mitigated effectively. The proposed works will not result in significant changes to the existing landscape, or the availability of existing habitat for these species. Potential impacts to these species can be addressed through timing windows for vegetation removals and clearing (outlined in S**ection 11)**.

8.6 SIGNIFICANT WILDLIFE HABITAT

Wildlife habitat is referred to as significant if it is ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System (OMMAH, 2020). Guidelines and criteria for the identification of SWH are detailed in the Significant Wildlife Habitat: Technical Guide (OMNR, 2000) and the Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (OMNRF, 2015). SWH is broadly categorized as:

- Seasonal concentration areas (i.e., conifer forests for deer wintering);
- Rare vegetation communities or specialized habitats for wildlife;
- Habitats of SCC, excluding the habitats of Endangered or Threatened species; and,
- Animal movement corridors.

Detailed wildlife surveys were not completed for the study area. Assessments of the potential for SWH are based on a review of available information and observations from the single site visit. SWH on or adjacent to the study area was not identified in the York Region Official Plan (2019), the City of Markham Official Plan (2014), or other background sources reviewed in the preparation of this report.

Based on the assessment of SWH, it was determined that the study area is situated within an urban matrix, which already sustains a high level of disturbance related to existing development in a residential urban environment. Significant wildlife habitat is typically associated with natural features and areas. The Pomona Creek corridor may act as an important movement corridor for wildlife within the area, but it will not be affected by the proposed works. Results from the background review and site visit indicate that significant habitats for wildlife do not occur within the study area.

8.7 SIGNIFICANT NATURAL HERITAGE FEATURES AND AREAS

As noted in the policy review provided in **Section 2**, natural heritage and hydrologic features observed on, and adjacent to, the study area include:

— A significant woodland;
— A candidate significant valleyland; and,
— Pomona Creek, its tributary, and potential fish habitat downstream of the Glynnwood Pond.

These features were assessed for their significance and are described below.

8.7.1 WOODLANDS

Based on field observations the wooded area within the study area (CUW1) is part of a larger contiguous woodland associated with the Pomona Creek valley corridor (**Figure 1),** and as such meets YROP criteria to be considered a significant woodland (key natural heritage feature) (refer to **Section 2.3**). As the woodland abuts the parking lot of 7700 Bayview Avenue, a minimum vegetation protection zone cannot be provided in this area.

The portion of woodland within the study area, though contiguous with woodlands in the greater landscape, is comprised of planted species, exotic species, a limited understory, pedestrian trails and mowed lawn and is of low botanical quality and offers limited ecological functions. Impacts to the CUW1 may involve tree removal and / or injury based on the proposed development footprint; however, impacts are anticipated to be limited to the disturbed woodland edge and alterations to the overall function as a significant woodland are not expected.

8.7.2 VALLEYLANDS

A valleyland is mapped within the study area (CMOP, 2014). Criteria to determine significance of the valleyland considers surface water, groundwater, landform, geomorphic, species diversity and uniqueness features (MNR, 2005). A comprehensive evaluation to determine valleyland significance was not completed as part of this work; however, given the woodland within the valleyland feature is designated as significant, it is therefore expected that key characteristics of the woodland will also satisfy one of the valleyland evaluation criteria, resulting in a *significance* designation.

The significant woodland, tributary to Pomona Creek, and associated wildlife habitat comprise the greater valleyland feature. Landform characteristics of a valleyland were not distinct in the field due to the gradual slope of the study area and no well-defined stop-of-slope limit. It is therefore anticipated, that protection and enhancement of encompassing features of the significant valleyland (i.e. significant woodland, creek and wildlife) would also result in protection and enhancement of the significant valleyland's form and function.

8.7.3 HYDROLOGIC FEATURES / FISH HABITAT

Pomona Creek is a tributary of the Don River East Branch and is considered a permanent stream (key hydrologic feature), which is a protected area as part of the Regional Greenlands System, municipal Greenway System, and a Natural System (valley corridor) under the TRCA Living City Policies (2014). The mainstem of the creek is approximately 300 m west of the proposed area for impact and approximately 165 m away from the storm water management pond. Its tributary conveys drainage from the Glynnwood Pond to Pomona Creek. Direct impacts to Pomona Creek, its tributary, and potential fish habitat are not anticipated. Potential indirect impacts to downstream fish habitat can be addressed through standard erosion and sedimentation controls and best management practices for storm water management and outfall construction.

9 PROPOSED DEVELOPMENT

As previously stated, the Glynnwood Tributary Area Environmental Assessment involves the construction of a storm sewer for flood remediation.

This impact assessment focuses on the proposed construction of an open channel and associated retaining wall along the slope northeast of the existing parking lot at 7700 Bayview Avenue. The proposed storm water outfall is to be directed into the Glynnwood Pond, immediately downstream of the weir between the forebay and main body of the pond (**Figure 4**). A new building is proposed over the existing parking lot; therefore, the storm sewer cannot be installed beneath the existing hardscape.

Infrastructure components west of Bayview Avenue are expected to be constructed using open cuts; however, the full extent of disturbance will be determined at detailed design. The draft temporary and permanent easements

within the study area are shown on **Figure 4**. It is anticipated that much of the temporary easement will be disturbed to permit construction; the permanent easement will be secured to facilitate future maintenance activities.

10 IMPACT ASSESSMENT AND RECOMMENDATIONS

As part of an EIS, an impact assessment must be completed to determine the potential for negative impacts on significant natural features or their ecological functions on, or within 120 meters of, the proposed development. In addition, suggestions for mitigation, including preventative or remedial measures must also be provided. Environmental effects can be direct, where impacts are immediately incurred as a result of site preparation or construction, such as vegetation removal, the loss of habitat, or erosion. Alternatively, environmental effects that are not immediately detected or occur adjacent to the development may be considered indirect impacts. Long term effects on drainage, the introduction of invasive species, and increasing anthropogenic pressures from noise and light are just a few examples. The following outlines the results of a preliminary impact assessment based on the preferred alternative (**Figure 4**). Standard mitigation and best management practices outlined in **Section 11** will help to reduce potential impacts to wildlife and vegetation outside the work area. A more detailed assessment of impacts should be completed during detailed design once the construction methodology and footprint of disturbance have been finalized.

10.1 DIRECT IMPACTS

10.1.1 WOODLANDS / VEGETATION / VALLEYLAND

The staging areas and construction works are expected to be located within the existing parking lot, roadways and landscaped portions of the CUW1 vegetation community within the limits of the temporary easement (**Figure 4**).

The proposed construction will require limited tree removal and / or tree injury within the CUW1 community adjacent to the parking lot (**Figure 3**). These actions are not expected to result in significant negative impacts to the woodland or the wider Natural System of which it is a part (significant woodland and valley corridor of Pomona Creek) as the limits of proposed works are restricted to the woodland edge within a disturbed urban matrix of low botanical quality. It is expected that an Arborist Report and Tree Protection Plan will be completed under a separate cover to identify appropriate tree protection methodology and determine the extent of tree removal / injury as a result of the proposed works. Once the final footprint of disturbance is determined at detailed design, if tree impacts are assessed to be extensive, or may subject remaining trees to stress associated with being on the new edge, an edge management plan should be considered.

By minimizing vegetation removal to the extent possible, significant long-term impacts to the woodland are not expected, and impacts to identified regionally rare and uncommon species are expected to be minimal. General mitigation measures to reduce indirect impacts to the woodland and vegetation within the study area are provided in **Section 11**. These mitigation measures are expected to maintain the form and function of the valleyland within the study area as well.

10.1.1 WILDLIFE

Vegetation removal during the period when most birds in the area breed (April 1st to August 31st) has the potential to impact nests, eggs, and young if present. The nests and nesting activity of most bird species are protected under the *Migratory Bird Convention Act* (MBCA) (Government of Canada, 1994). SAR bats are protected under the ESA

and may be impacted by removal of roost trees (trees with cavities/chimneys/ample loose bark), if present and vegetation removal is completed during their active period (April 1st to September 30th). To avoid impacts to these species, timing windows for vegetation removals and clearing are provided in **Section 11**.

Wildlife may be harmed if they enter the work zone. However, this is unlikely as the limits of disturbance are relatively small and active construction will deter most animals away from the work zone. Light, noise, dust and vibrations associated with construction activities have the potential to cause short-term disturbance to wildlife and may cause certain wildlife to abandon or temporarily avoid the area. No SAR or sensitive wildlife species are expected to be impacted, including the regionally rare Belted Kingfisher, Hairy Woodpecker and Red-breasted Nuthatch.

10.2 INDIRECT IMPACTS

The following indirect impacts may be expected to occur as a result of the proposed development:

- Sedimentation and spills of contaminants/fuel have the potential to impact fish habitat and water quality within Pomona Creek and its tributary, if appropriate mitigation is not in place.
- Construction of the retaining wall and storm sewer may introduce potential sources of petroleum hydrocarbons, which are typically contained either in vehicles or in designated storage containers/areas on the construction site. The release of these substances will typically be the result of accidents or failures of storage systems. Leakage of fuels onto pervious surfaces could result in impairment of water quality.
- Dewatering activity can also increase the risk of deleterious substances, such as sediment, running into the creek if not properly filtered prior to the water being discharged.

Recommendations are provided in **Section 11** to limit these potential impacts.

11 MITIGATION DISCUSSION

The following sections outline recommendations to avoid, minimize and mitigate potential impacts to identified natural heritage and key hydrological features identified within the study area. The following recommendations are based on a preliminary review of the potential impacts that may occur as a result of the proposed works. Impacts should be reassessed during detailed design when the footprint of disturbance, construction plan, and final design have been established. Mitigation measures should be reviewed to ensure they are appropriate for the impacts assessed at that time.

11.1 WOODLANDS / VEGETATION / VALLEYLAND

To minimize impacts to the CUW1, and other vegetation within the study area, the following measures are recommended:

- Minimize vegetation clearing where possible (e.g. adjacent to woodlands, landscaped areas).
- An Arborist Report and Tree Protection Plan should be prepared to document tree removal/injury to individual trees adjacent to the work area. Tree protection fencing/ESC measures should be installed to protect trees to be retained. These measures will reduce the potential for physical damage to trees and their root systems. Supports and bracing used to secure the barriers should be installed along the tree driplines, or further away where possible, and in a way that minimizes root damage.
- Tree protection fencing/ESC measures should be installed before work in the study area begins and inspected regularly to ensure it is performing its intended function. If any section is found to be damaged or non-functional it should be replaced immediately.
- The installation, monitoring, maintenance and removal of temporary measures shall meet the requirements of the approval agencies (e.g. TRCA, the City).

- The following activities are prohibited beyond the tree protection fencing, storage or stockpiling of materials including fill, topsoil, construction equipment and debris; disposal of liquids; and operation of heavy machinery.
- Tree removal should conform to local, municipal, or regional by-laws, and should be performed by properly trained and accredited individuals.
- Stabilize and re-vegetate exposed surfaces as soon as possible upon completion of works.
- Within the laydown areas, actions should be taken to de-compact or scarify the soils prior to planting and seeding to enhance infiltration and provide a better medium for plant growth.
- A tree replacement ratio should be determined through consultation with the City and TRCA, and may rely on the recommendations set out in the Arborist Report (expected to be produced under a separate cover) and/or the basal area estimates obtained as a part of this study.

11.2 WILDLIFE

The following general recommendations are proposed to reduce impacts to local wildlife and natural heritage features within the study area:

- Wildlife incidentally encountered during construction shall not be knowingly harmed and shall be allowed to move away from the construction area on its own.
- In the event wildlife encountered during construction does not move from the construction zone, the contractor shall contact the MNRF Aurora District Office to move the animal to a safe area.
- If a SAR, or a suspected SAR, is encountered within or adjacent to the construction site, work is to be stopped immediately and the MECP SAR Branch contacted to determine next steps.
- To limit disturbance to the local birds, tree removal (and limbing) should be limited during their most vulnerable period, i.e. outside the breeding bird season (April 1st to August 31st), unless a survey by a qualified biologist confirms that there are no active nests within the tree to be removed.
- The Contractor shall not destroy the active nests (nests with eggs or young birds), or wound or kill birds, of species protected under the MBCA, 1994 and/or Regulations under that Act. When active nests are encountered the contractor shall contact a qualified biologist and/or the MNRF Aurora District for direction.
- Should the removal of snag trees be necessary, to avoid potential impacts to resting bats, if present, trees should be removed outside of the bat active period. Tree removals shall be limited to between October 1st and March 31st (bat hibernation period) to avoid direct harm to SAR bat individuals (including potential maternal and day-roosting bats). The potential for impacts to these trees is to be reassessed during detailed design.

11.3 GENERAL SITE MITIGATION

The following general recommendations are proposed to reduce construction-related impacts to the natural environment surrounding the study area:

- Cleaning, refuelling, and maintenance work on machinery should be completed offsite.
- Temporarily store, handle, and dispose of materials used or generated (e.g. organics, soils, woody debris, temporary stockpiles) during site preparation and construction in a manner that prevents their entry into naturalized areas. It is recommended that materials temporarily stored onsite are to be stockpiled on the existing parking lot, as far away from the tree driplines as possible, in an attempt to mitigate negative impacts. Only if the existing parking lot is not feasible, should the material be stockpiled on a manicured lawn area away from the dripline extent of all trees.
- Areas of exposed soil, especially newly graded areas that cannot be immediately stabilized with the final surface treatments should be appropriately treated to minimize erosion (e.g., straw mulch, erosion blanket, sod, or hydroseed). Restoration of disturbed areas within the woodland should occur with a native seed mix. Seeding should occur in early fall (October-November) or early spring up to May 30th. All seed to be installed in accordance with manufacturer's specifications and specific seeding rate/timing of application.

— Potential indirect impacts to downstream fish habitat can be addressed through standard erosion and sedimentation controls and best management practices for storm water management and outfall construction.

12 CONCLUSIONS AND RECOMENDATIONS

This Scoped EIS has been prepared in support of the Glynnwood Tributary Area Environmental Assessment, which involves the construction of a storm sewer for flood remediation. The study area includes lands described with the municipal addresses of 7700 and 7750 Bayview Avenue, Thornhill, Ontario. The following conclusions and recommendations are provided based on the results of a background review, field investigation and consultation with the regulating agencies:

- The study area is designated as Urban Area under the YROP (Map 2 – Regional Greenland's System) (December 2018) and Mixed Use Mid Rise and Greenway (Map 3 – Land Use Map) (CMOP, 2014). Regional and municipal official plans, identify natural heritage and hydrologic features, including woodlands, valleylands, and permanent/intermittent streams in or adjacent to the study area. These areas are considered part of the City of Markham's Natural Heritage Network and Greenway System.
- As per Policy 3.1.2.9 of the CMOP, infrastructure placement within the Natural Heritage Network may be permitted, provided mitigation measures are implemented. The significant woodland within the study area overlaps with the valleyland and is considered the greater constraint within the study area. No negative impacts to the valleyland and wider Natural Heritage Network are expected provided the mitigation measures detailed in **Section 11** of this report are implemented.
- Endangered, rare or threatened species were not identified during the site investigation; however, endangered bat species, including Little Brown Myotis, Eastern Small-footed Bat, Northern Myotis and Tri-colored Bat have moderate potential to be present in the study area, given the presence of a woodland with some dead or dying trees. The significant woodland within the wider landscape also provides moderate habitat potential for SAR bird species. Mitigation measures provided within **Section 11** of this report should be followed to avoid the potential for impacts to potential SAR and their habitat.
- The woodland within the study area is considered significant based on the policies of the YROP (2019) and CMOP (2014). The portion of woodland within the study area is comprised of planted species, exotic species, a limited understory, pedestrian trails and mowed lawn and is of low botanical quality and offers limited ecological functions.
- To construct the retaining wall and open channel, tree removal from within the significant woodland is anticipated (**Figure 4**). Impacts to the woodland should be determined during detailed design when the footprint of disturbance has been established. Efforts should be made to retain trees located within the vicinity of the proposed development where possible; however, as removals are expected to be limited to the woodland edge, significant alterations to the overall form and function of the significant woodland are not anticipated. It is expected that an Arborist Report and Tree Protection Plan will be completed by a certified arborist to determine the extent of tree removal / injury as a result of the proposed works.
- Compensation for tree removal should be determined during detailed design using replacement ratios established through consultation with the City and TRCA. Replacement ratios may utilize average basal area as established through this scoped EIS, or a straight tree replacement ratio as required by regional or municipal tree protection by-laws.
- To ensure that potential negative impacts to identified natural heritage features on and adjacent to the study area are minimized, mitigation measures outlined within this report should be followed.

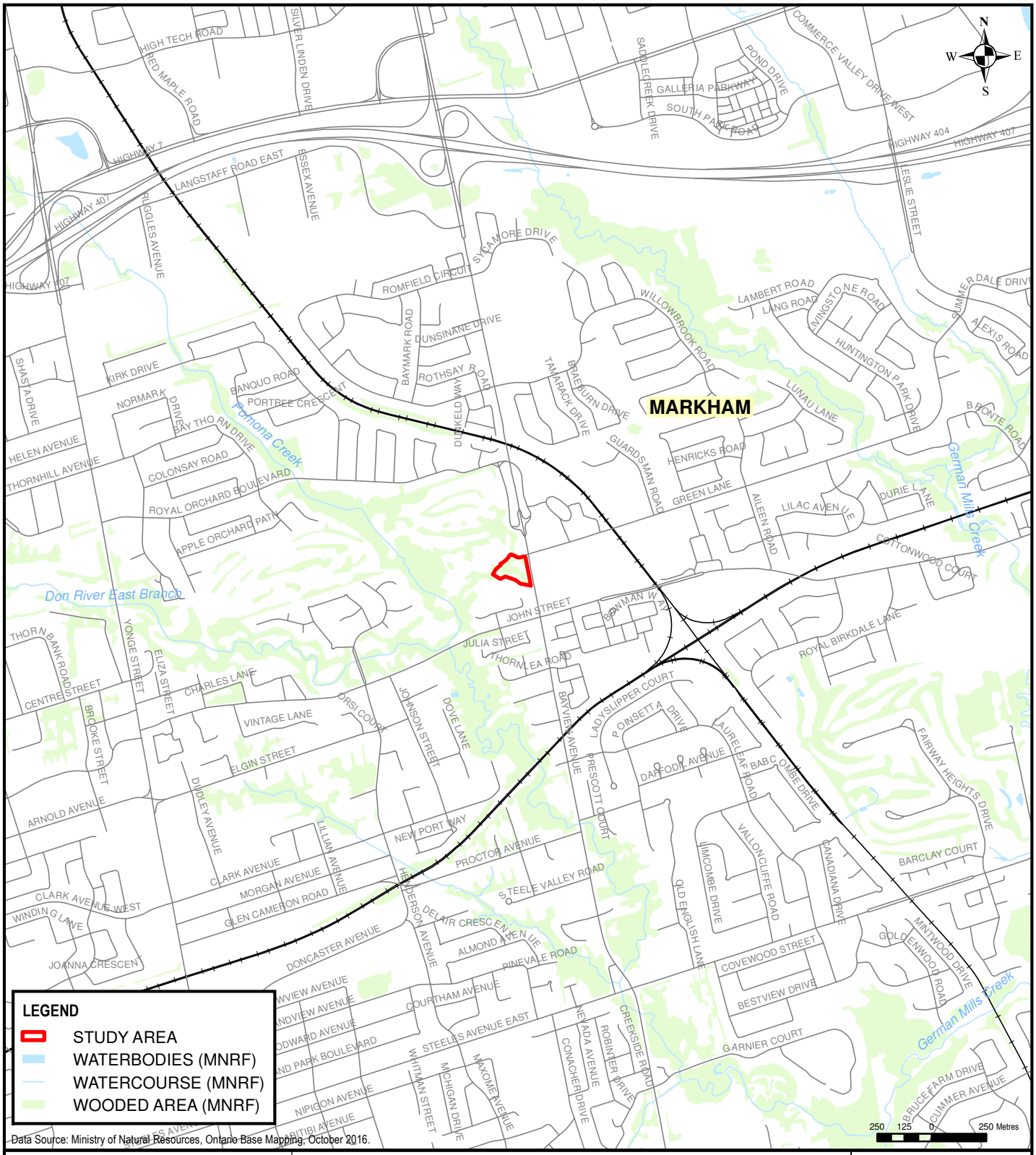
13 CLOSURE

This report has been prepared by WSP Canada Inc. The assessment represents the conditions within the study area only at the time of the assessment and is based on the information referenced and contained in the report. The conclusions presented herein respecting current conditions represent the best judgment of the assessors based on current environmental standards. WSP Canada Inc. attests that to the best of our knowledge, the information presented in this report is accurate. The information in this report should be evaluated, interpreted, and implemented only in the context of the assignment. The use of this report or any of its parts for other projects without written permission of the Client and WSP Canada Inc. is solely at the user's own risk. This report must be reviewed and approved by the relevant regulating agencies prior to being relied on for planning and/or construction purposes.

14 LITERATURE CITED

- Bird Studies Canada, Ontario Field Ornithologists, Environment Canada, Ontario Nature, and Ontario Ministry of Natural Resources. 2006. Atlas of the Breeding Birds of Ontario. Available Online: http://www.birdsontario.org/atlas/index.jsp.
- City of Markham. June 2014. City of Markham Official Plan.
- Government of Canada. 1994. Migratory Birds Convention Act. Available online: http://laws-lois.justice.gc.ca/eng/acts/M-7.01/
- Government of Canada. 2015. Species at Risk (SARA) Public Registry. http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1.
- Government of Ontario (Ontario). 2007. *Endangered Species Act*, 2007. Statutes of Ontario. Chapter 6.
- Government of Ontario (Ontario). 2020. Species at Risk in Ontario List. Available online: https://www.ontario.ca/environment-and-energy/species-risk-ontario-list
- Lee, H. T. 2008. Ecological Land Classification Evolution update. ELC Portal Website: http://www.conservation-ontario.on.ca/events_workshops/ELC_portal/index.html
- Ontario Ministry of Municipal Affairs and Housing. 2020. Provincial Policy Statement. Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2020. Natural Heritage Areas Mapping. Land Information Ontario. Queen's Printer for Ontario. http://www.giscoeapp.lrc.gov.on.ca/Mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US
- Ontario Ministry of Natural Resources. 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement. Second Edition. Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2000. Significant Wildlife Habitat: Technical Guide.
- Ontario Ministry of Natural Resources. 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. 39 pp.
- Ontario Ministry of Natural Resources. 2018. Species at Risk in Ontario (SARO) list. http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html.
- Regional Municipality of York. 2010. York Region Official Plan. 125 pp.
- Toronto and Region Conservation Authority. June 2018. Guideline for Determining Ecosystem Compensation.
- Toronto and Region Conservation Authority. 2014. The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority. Available at: http://www.trca.on.ca/dotAsset/200582.pdf
- Toronto and Region Conservation Authority. 2020. TRCA Regulation Mapping. Available online: https://trca.ca/planning-permits/regulated-area-search-v3/

FIGURES



Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

PROJECT:
SCOPED ENVIRONMENTAL IMPACT STUDY - GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

TITLE:
SITE LOCATION MAP

CLIENT:
CITY OF MARKHAM

SCALE:	1:25,000
DRAWN BY:	TP
CHECKED BY:	EF
PROJECT NO:	121-15461-00
DATE:	OCTOBER 2020
FIGURE NO:	1
REV.:	-

Document Path: D:\aProjects\121-15461-00\MXD\121-15461-00 Figure 1 Location Map.mxd

wsp

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- STUDY AREA
- WOODLAND (MNRF)
- TRCA REGULATION LIMIT

N
W E
S

20 10 0 20 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2019.
Imagery, York Region, 2019

CLIENT:

CITY OF MARKHAM

PROJECT:

SCOPED ENVIRONMENTAL IMPACT STUDY - GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

PROJECT NO:	DATE:
121-15461-00	OCTOBER 2020

DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: -

FIGURE NO:	SCALE:
2	1:1,500

TITLE:

NATURAL HERITAGE FEATURES

DISCIPLINE:

ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\121-15461-00\MXD\121-15461-00 Figure 2 NHF.mxd

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- STUDY AREA
- BASAL AREA SURVEY LOCATIONS
- ECOLOGICAL LAND CLASSIFICATION
  - UNIT 1: CUW1 - MINERAL CULTURAL WOODLAND
  - OW - OPEN WATER

N W E S

6 3 0 6 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2019.
Imagery, York Region, 2019

CLIENT:
CITY OF MARKHAM

PROJECT:
SCOPED ENVIRONMENTAL IMPACT STUDY - GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

PROJECT NO:	DATE:
121-15461-00	OCTOBER 2020

DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: -

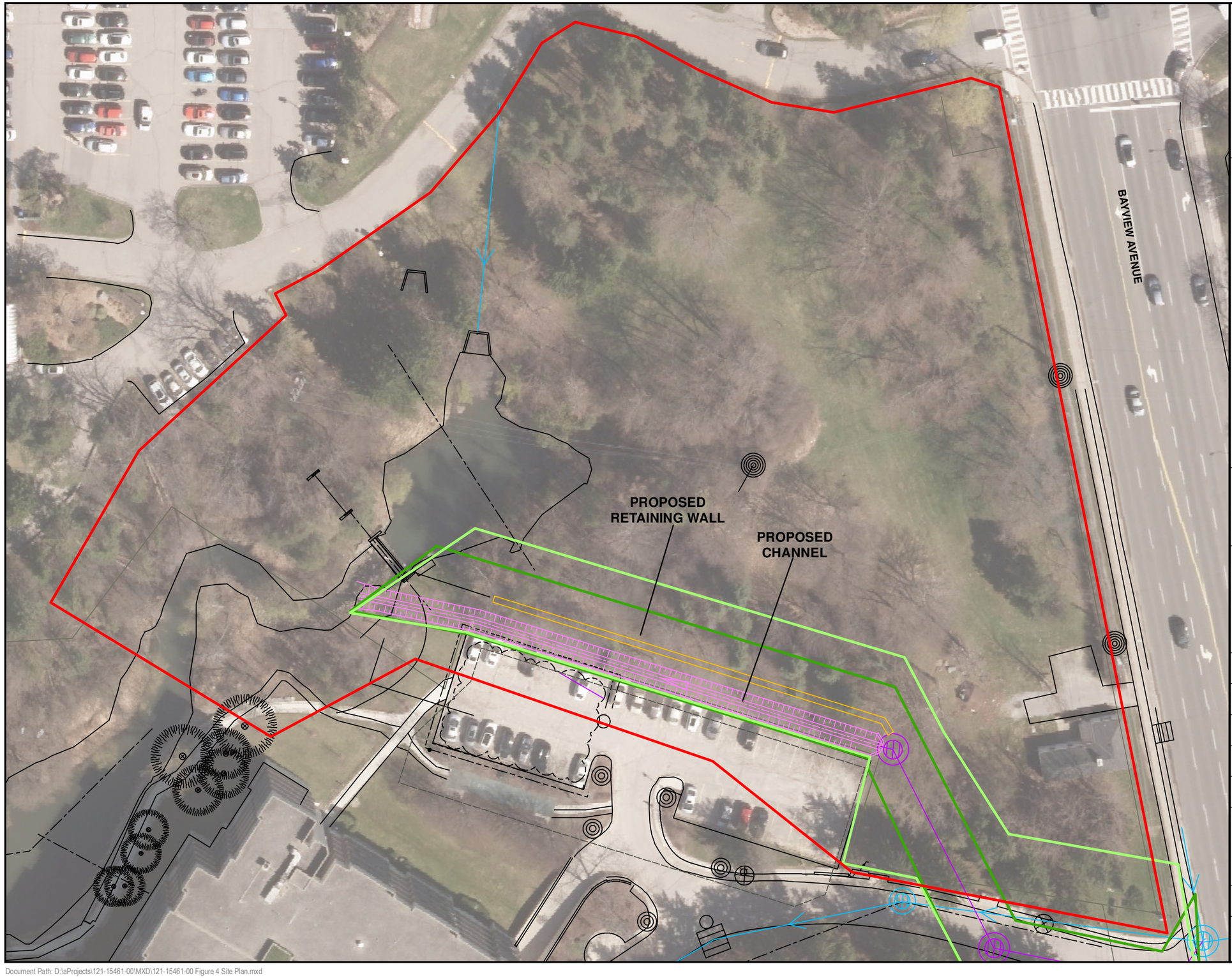
FIGURE NO:	SCALE:
3	1:700

TITLE:
ECOLOGICAL LAND CLASSIFICATION

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\121-15461-00\MXD\121-15461-00 Figure 3 ELC.mxd



wsp

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- STUDY AREA
- PERMANENT EASEMENT
- TEMPORARY EASEMENT
- EXISTING STORM SEWER
- PROPOSED STORM SEWER

N
W E
S

6 3 0 6 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2019.
Imagery, York Region, 2019

CLIENT:

CITY OF MARKHAM

PROJECT:

SCOPED ENVIRONMENTAL IMPACT STUDY - GLYNNWOOD TRIBUTARY AREA ENVIRONMENTAL ASSESSMENT

PROJECT NO:	DATE:
121-15461-00	OCTOBER 2020

DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: -

FIGURE NO:	SCALE:
4	1:600

TITLE:

SITE PLAN

DISCIPLINE:

ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\121-15461-00\MXD\121-15461-00 Figure 4 Site Plan.mxd

APPENDIX

A AGENCY CORRESPONDENCE

From: Species at Risk (MECP) <SAROntario@ontario.ca>
Sent: Thursday, August 13, 2020 8:44 AM
To: Perkin, Carlene
Subject: RE: Glynnwood EA - Request for Background Information
Attachments: DRAFT-Proponents Guide to Preliminary Screening-May 2019.pdf

Carlene;

MECP staff have nothing to add save Species at Risk Bats. I suggest following the attached guide for more information.

Kind Regards;

JJA

JEFF J. ANDERSEN

MANAGEMENT BIOLOGIST
PERMISSIONS AND COMPLIANCE SECTION, SPECIES AT RISK BRANCH
LAND AND WATER DIVISION
ONTARIO MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS

50 Bloomington Road, Aurora ON L4G 0L8 | jeff.andersen@ontario.ca | 289-221-1705

Ontario

From: Perkin, Carlene <carlene.perkin@wsp.com>
Sent: August 11, 2020 8:54 AM
To: Species at Risk (MECP) <SAROntario@ontario.ca>
Cc: Fitzpatrick, Erin <Erin.Fitzpatrick@wsp.com>
Subject: Glynnwood EA - Request for Background Information

To whom it may concern,

WSP Canada Inc. (WSP) has been retained by the City of Markham to undertake a Scoped Environmental Impact Study (EIS) in support of the Glynnwood Tributary Area Environmental Assessment, Thornhill, Ontario. The location of the study area is shown on the attached map.

As such, we are formally contacting you to request any available natural heritage information pertinent to the study area. We have also contacted the MNRF for potential SAR information; however, given the recent switch in ministry, and vast information regarding natural heritage resources, we are requesting information from both ministries.

We are currently aware of the following natural heritage information for the study area:

- A review of Natural Heritage Information Centre (NHIC) for two adjacent quadrats (17PJ2853 and 17PJ2852) did not reveal historical species records.

- A review of the Ontario Breeding Bird Atlas (OBBA) for squares #17PJ25 revealed records for the following SAR and provincially rare species within the study area vicinity:
    - Alder Flycatcher
    - Bank Swallow
    - Barn Swallow
    - Black Tern
    - Bobolink
    - Canada Warbler
    - Cerulean Warbler
    - Chimney Swift
    - Common Nighthawk
    - Eastern Meadowlark
    - Eastern Wood-Pewee
    - Golden-winged Warbler
    - Grasshopper Sparrow
    - Hooded Warbler
    - Least Bittern
    - Loggerhead Shrike
    - Olive-sided Flycatcher
    - Red-headed Woodpecker
    - Red-shouldered Hawk
    - Short-eared Owl
    - Whip-poor-will
    - Wood Thrush

Additional information we are seeking includes any of the following information that is not publicly available through the above sources:

- Species at Risk (SAR):
    - List of SAR to be considered for the study area
    - Locations, observation dates and any other relevant information about SAR – if possible, please provide the UTMs/accuracy codes
    - Locally rare species lists or records and/or rare vegetation communities known from the study area

If further information is required, please feel free to contact the undersigned. Thank you for your assistance, it is greatly appreciated.

Thank you,
Carlene

Carlene Perkin, B. Sc.
Terrestrial Ecologist – ISA Certified Arborist
Ecology and Environmental Impact Assessment

WSP Canada Group Limited
582 Lancaster Street West
Kitchener, Ontario
N2K 1M3 Canada

Skype +1 289-982-4220

carlene.perkin@wsp.com

Please consider the environment before printing...

-LAEmHhHzdJzBlTWfa4Hgs7pbKI

APPENDIX

B SPECIES LISTS

Appendix B: Vascular Plants Species List

COMMON NAME	SCIENTIFIC NAME	CC [1]	CW[1]	G_RANK[3]	N_RANK	S_RANK[4]	COSEWIC[5]	SARA[6]	SARO[7]	CITY OF TORONTO (Varga et al. 2000)[8]	ECODISTRICT 7E4 (GTA) (Oldham 2017)[8]	TRCA (2018)[8]	YORK REGION (Varga et al. 2000)[8]	GREATER TORONTO AREA (Varga et al. 2000)[8]	NATIVE STATUS[9]	AUTHOR	ORDER	FAMILY
Freeman's Maple	*Acer x freemanii*	6	-5	GNA	NNA	SNA				X	hyb	L4	XSR	X	N	E. Murr.	Sapindales	Sapindaceae
Manitoba Maple	*Acer negundo*	0	0	G5	N5	S5				X	IC	L+?	X	X	N	L.	Sapindales	Sapindaceae
Norway Maple	*Acer platanoides*		5	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Sapindales	Sapindaceae
Red Maple	*Acer rubrum*	4	0	G5	N5	S5				X	C	L4	X	X	N	L.	Sapindales	Sapindaceae
Sugar Maple	*Acer saccharum*	4	3	G5	N5	S5				X	C	L4	X	X	N	Marsh.	Sapindales	Sapindaceae
Silver Maple	*Acer saccharinum*	5	-3	G5	N5	S5				X	X	L4	X	X	N	L.	Sapindales	Sapindaceae
Garlic Mustard	*Alliaria petiolata*		0	GNR	NNA	SNA				X	IC	L+	X	X	I	(Bieb.) Cavar.a & Grande	Capparales	Brassicaceae
Common Burdock	*Arctium minus*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	Bernh.	Asterales	Asteraceae
Canada Thistle	*Cirsium arvense*		3	G5	NNA	SNA				X	IC	L+	X	X	I	(L.) Scop.	Asterales	Asteraceae
Bull Thistle	*Cirsium vulgare*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	(Savi) Ten.	Asterales	Asteraceae
Hawthorn sp.	*Crataegus sp.*															L.	Rosales	Rosaceae
Wild Carrot	*Daucus carota*		5	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Apiales	Apiaceae
Woodland Strawberry	*Fragaria vesca*	4	3	G5	N5	S5									N	L.	Rosales	Rosaceae
Green Ash	*Fraxinus pennsylvanica*	3	-3	G5	N5	S4				X	C	L5	X	X	N	Marsh.	Scrophulariales	Oleaceae
Wood Avens	*Geum urbanum*		5	G5	NNA	SNA				X	IX	L+	X	X	I	L.	Rosales	Rosaceae
Ground-ivy	*Glechoma hederacea*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Lamiales	Lamiaceae
Virginia Stickseed	*Hackelia virginiana*	5	3	G5	N5	S5				XU	U	L5	R5	X?	N	(L.) I.M. Johnston	Lamiales	Boraginaceae
Dame's Rocket	*Hesperis matronalis*		3	G4G5	NNA	SNA				X	IC	L+	X	X	I	L.	Capparales	Brassicaceae
Hawkweed sp.	*Hieracium sp.*															L.	Asterales	Asteraceae
Common St. John's-wort	*Hypericum perforatum*		5	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Theales	Hypericaceae
Black Walnut	*Juglans nigra*	5	3	G5	N4	S4?				X	C	L5	R	X	N	L.	Juglandales	Juglandaceae
Common Nipplewort	*Lapsana communis*		3	GNR	NNA	SNA				X	IU	L+	X	X	I	L.	Asterales	Asteraceae
Tamarack	*Larix laricina*	7	-3	G5	N5	S5				R3	R	L3	X	X	N	(Du Roi) K. Koch	Pinales	Pinaceae
Honeysuckle sp.	*Lonicera sp.*															L.	Dipsacales	Caprifoliaceae
Garden Bird's-foot Trefoil	*Lotus corniculatus*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Fabales	Fabaceae
American Water-horehound	*Lycopus americanus*	4	-5	G5	N5	S5				X	C	L4	X	X	N	Muhl. ex W. Bart.	Lamiales	Lamiaceae
Large False Solomon's-seal	*Maianthemum racemos*	4	3	G5	N5	S5				X	C	L5	X	X	N	(L.) Link	Liliales	Asparagaceae
Apple sp.	*Malus sp.*															Mill.	Rosales	Rosaceae
Dwarf Mallow	*Malva neglecta*		5	GNR	NNA	SNA				X	IR	L+	X	X	I	Wallr.	Malvales	Malvaceae
White Mulberry	*Morus alba*		0	GNR	NNA	SNA				X	IC	L+	XSR	X	I	L.	Urticales	Moraceae
European Wood-sorrel	*Oxalis stricta*		3	G5	N5	S5				X	C	L5	X	X	I	L.	Geraniales	Oxalidaceae
Virginia Creeper	*Parthenocissus quinqu*	6	3	G5	N4N5	S4?				R	R	L5	R	X	N	(L.) Planch. ex DC.	Rhamnales	Vitaceae
Thicket Creeper	*Parthenocissus vitacea*	4	3	G5	N5	S5				X	C	L5	X	X	N	(Knerr) A.S. Hitchc.	Rhamnales	Vitaceae
Spotted Lady's-thumb	*Persicaria maculosa*		-3	G3G5	NNA	SNA				X	IC	L+	X	X	I	Gray	Polygonales	Polygonaceae
Reed Canarygrass	*Phalaris arundinacea v*	0	-3	G5TNR	NNR	S5				X	C	L+?	X	X	N	L.	Cyperales	Poaceae
Common Reed	*Phragmites australis*	0	-3	G5	N5	S4?				X	IC	L+	X	X	N	(Cavan.) Trinius ex. Steudel	Cyperales	Poaceae
Norway Spruce	*Picea abies*		5	G5	NNA	SNA				X	IX	L+	X	X	I	(L.) Karst.	Pinales	Pinaceae
White Spruce	*Picea glauca*	6	3	G5	N5	S5				X+	U	L3	X	X	N	(Moench) Voss	Pinales	Pinaceae
Blue Spruce	*Picea pungens*		3	G5	NNA	SNA						L+			I	Engelm.	Pinales	Pinaceae
Eastern White Pine	*Pinus strobus*	4	3	G5	N5	S5				X	C	L4	X	X	N	L.	Pinales	Pinaceae
Scots Pine	*Pinus sylvestris*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Pinales	Pinaceae
Canada Poplar	*Populus x canadensis*		0	GNA	NNR	SNA				X	hyb	L+		X	I	Moench (pro sp.)	Salicales	Salicaceae
Trembling Aspen	*Populus tremuloides*	2	0	G5	N5	S5				X	C	L5	X	X	N	Michx.	Salicales	Salicaceae
Black Cherry	*Prunus serotina*	3	3	G5	N5	S5				X	C	L5	X	X	N	Ehrh.	Rosales	Rosaceae
Common Buttercup	*Ranunculus acris*		0	G5	NNA	SNA				X	IC	L+	X	X	I	L.	Ranunculales	Ranunculaceae
European Buckthorn	*Rhamnus cathartica*		0	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Rhamnales	Rhamnaceae
Staghorn Sumac	*Rhus typhina*	1	3	G5	N5	S5				X	C	L5	X	X	N	L.	Sapindales	Anacardiaceae
Eastern Prickly Gooseberry	*Ribes cynosbati*	4	3	G5	N5	S5				X	C	L5	X	X	N	L.	Rosales	Grossulariaceae
Black Locust	*Robinia pseudoacacia*		3	G5	NNA	SNA				X	IC	L+	X	X	I	L.	Fabales	Fabaceae
Black Raspberry	*Rubus occidentalis*	2	5	G5	N5	S5				X	C	L5	X	X	N	L.	Rosales	Rosaceae
White Willow	*Salix alba*		-3	G5	NNA	SNA				X	IC	L+	X	X	I	L.	Salicales	Salicaceae
Cottony Willow	*Salix eriocephala*	4	-3	G5	N5	S5				X	C	L5	X	X	N	Michx.	Salicales	Salicaceae
Golden Weeping Willow	*Salix x sepulcralis*		0	GNA	NNA	SNA				X	hyb	L+	X	X	I	Simonkai	Salicales	Salicaceae
Purple Crown-vetch	*Securigera varia*		5	GNR	NNA	SNA				X	IC	L+	X	X	I	(L.) Lassen	Fabales	Fabaceae
Canada Goldenrod	*Solidago canadensis va*	1	3	G5T5	N5	S5				X	C	L5	X	X	N	L.	Asterales	Asteraceae

Appendix B: Vascular Plants Species List

COMMON NAME	SCIENTIFIC NAME	CC [1]	CW[1]	G_RANK[3]	N_RANK	S_RANK[4]	COSEWIC[5]	SARA[6]	SARO[7]	CITY OF TORONTO (Varga et al. 2000)[8]	ECODISTRICT 7E4 (GTA) (Oldham 2017)[8]	TRCA (2018)[8]	YORK REGION (Varga et al. 2000)[8]	GREATER TORONTO AREA (Varga et al. 2000)[8]	NATIVE STATUS[9]	AUTHOR	ORDER	FAMILY
Heart-leaved Aster	*Symphyotrichum cordif*	5	5	G5	N5	S5				X	C	L5	X	X	N	(L.) Nesom	Asterales	Asteraceae
Panicled Aster	*Symphyotrichum lance*	3	-3	G5	N5	S5									N	(Willdenow) Nesom	Asterales	Asteraceae
Common Dandelion	*Taraxacum officinale*		3	G5	N5	SNA				X	IC	L+	X	X	I	G.H. Weber ex Wiggers	Asterales	Asteraceae
Eastern White Cedar	*Thuja occidentalis*	4	-3	G5	N5	S5				X	C	L4	X	X	N	L.	Pinales	Cupressaceae
Coltsfoot	*Tussilago farfara*		3	GNR	NNA	SNA				X	IC	L+	X	X	I	L.	Asterales	Asteraceae
Broad-leaved Cattail	*Typha latifolia*	1	-5	G5	N5	S5				X	C	L4	X	X	N	L.	Typhales	Typhaceae
Elm sp.	*Ulmus sp.*															L.	Urticales	Ulmaceae
Stinging Nettle	*Urtica dioica*	2	0	G5	N5	S5					IR				N	L.	Urticales	Urticaceae
Riverbank Grape	*Vitis riparia*	0	0	G5	N5	S5				X	C	L5	X	X	N	Michx.	Rhamnales	Vitaceae

PLANT LIST LEGEND

Scientific Name, Common Name and Family

Based on Vascan (Dec. 2017) and NHIC (Dec. 16 2018)

Vascan: http://data.canadensys.net/vascan/search

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

[1] Coefficient of Conservatism, Coefficient of Wetness, Weediness, and Physiology/Habit

Oldham, M. J., W. D. Bakowsky and D. A. Sutherland. 1995. Floristic Quality Assessment System for Southern Ontario. Natural Heritage Information Centre, Ministry of Natural Resources. Peterborough, Ontario.

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

CC and CW values reflect updates by NHIC, current as of Dec. 16, 2018).

CC: Coefficient of Conservatism. Rank of 0 to 10 based on plants degree of fidelity to a range of synecological parameters: (0-3) Taxa found in a variety of plant communities; (4-6) Taxa typically associated with a specific plant community but tolerate moderate disturbance; (7-8) Taxa associated with a plant community in an advanced successional stage that has undergone minor disturbance; (9-10) Taxa with a high fidelity to a narrow range of synecological parameters.

CW: Coefficient of Wetness. Value between 5 and –5. A value of –5 is assigned to Obligate Wetland (OBL) and 5 to Obligate Upland (UPL), with intermediate values assigned to the remaining categories.

Weediness: Weediness Score, assigned to all non-native species and range from -1 (low impact of the species on natural areas) to -3 (high impact of the species on natural areas).

Habit: Physiology/Habit. The growth form of the species (e.g. forb, shrub, tree).

[2] OWES Wetland Plant List

Ontario Ministry of Natural Resources. 2013. Ontario Wetland Evaluation System Southern Manual. 3rd Edition, Version 3.3

Ontario Ministry of Natural Resources. 2013. Ontario Wetland Evaluation System Northern Manual. 1st Edition, Version 1.3

Species presence or absence on the Ontario Wetland Evaluation System (OWES) Wetland Plant List.

Codes are defined as follows:

X: Present on the list

[3] G-Rank (Global)

Global Status from Nature Serve (via NHIC, Dec. 16, 2018)

NS: http://explorer.natureserve.org/

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

Global ranks are assigned by a consensus of the network of Conservation Data Centres (CDCs), scientific experts, and the Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies, or variety.

Global (G) Conservation Status Ranks

G1:	Critically Imperiled - At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
G2:	Imperiled - at high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3:	Vulnerable - At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4:	Apparently Secure - At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5:	Secure - At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
G#G#:	Range Rank – A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4).
GX:	Presumed Extinct - Not located despite intensive searches and virtually no likelihood of rediscovery.
GH:	Possibly Extinct - Known from only historical occurrences but still some hope of rediscovery. Examples of evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species has been searched for unsuccessfully, but not thoroughly enough to presume that it is extinct or eliminated throughout its range.
GU:	Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR:	Unranked – Global rank not yet assessed.
GNA:	Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities. A global conservation status rank may be not applicable for several reasons, related to its relevance as a conservation target. For species, typically the species is a hybrid without conservation value, or of domestic origin. For ecosystems, the type is typically non-native (e.g, many ruderal vegetation types), agricultural (e.g. pasture, orchard) or developed (e.g. lawn, garden, golf course).
?:	Inexact Numeric Rank – Denotes inexact numeric rank; this should not be used with any of the Variant Global Conservation Status Ranks or GX or GH.
T#:	Infraspecific Taxon (trinomial) - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or

variety is more abundant than the species, for example, a G1T2 subrank should not occur. A vertebrate animal population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Q: Questionable taxonomy that may reduce conservation priority – Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level.

C: Captive or Cultivated Only – Taxon or ecosystem at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population or ecosystem restoration, not yet established. The "C" modifier is only used at a global level and not at a national or subnational level. Possible ranks are GXC or GHC. This is equivalent to "Extinct" in the Wild (EW) in IUCN's Red List terminology (IUCN 2001).

[4] S-Ranks (Provincial)

Provincial Status from the NHIC (Dec. 16, 2018)

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario.

S1: Critically Imperiled – At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S2: Imperiled – At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3: Vulnerable – At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

S4: Apparently Secure – At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

S5: Secure – At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

S#S#: Range Rank – A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

SX: Presumed Extirpated – Species or ecosystem is believed to be extirpated from the jurisdiction (province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. [equivalent to "Regionally Extinct" in IUCN Red List terminology]

SH: Possibly Extirpated (Historical) – Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some

	evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
SNR:	Unranked – subnational conservation status not yet assessed.
SU:	Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA:	Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities (e.g., long distance aerial and aquatic migrants, hybrids without conservation value, and non-native species.
?:	Inexact or Uncertain - Denotes inexact or uncertain numeric rank.
T#:	Infraspecific Taxon (trinomial) - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the subnational rank of a critically imperiled subspecies of an otherwise widespread and common species would be S5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species, for example, a S1T2 subrank should not occur. A vertebrate animal population may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

[5] COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

The federal review process is implemented by COSEWIC (Status as of Dec. 2018)
The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent advisory panel to the Minister of Environment and Climate Change Canada that meets twice a year to assess the status of wildlife species at risk of extinction.

https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html

EXT:	Extinct – A species that no longer exists.
EXP:	Extirpated – A species no longer existing in the wild in Canada, but occurring elsewhere.
END:	Endangered – A species facing imminent extirpation or extinction.
THR:	Threatened – A species likely to become endangered if limiting factors are not reversed.
SC:	Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
NAR:	Not At Risk – A species that has been evaluated and found to be not at risk of extinction given the current circumstances.
DD:	Data Deficient – Available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

[6] SARA (Species at Risk Act) Status and Schedule

Federal status from the Government of Canada's Species at Risk Public Registry (Status as of Dec. 2018)

http://www.registrelep-sararegistry.gc.ca/

The Act establishes Schedule 1, as the official list of species at risk in Canada. It classifies those species as being either Extirpated, Endangered, Threatened, or a Special Concern. Once listed, the measures to protect and recover a listed species are implemented. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

EXT:	Extinct – A species that no longer exists.
EXP:	Extirpated – A species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
END:	Endangered – A species that is facing imminent extirpation or extinction.
THR:	Threatened – A species likely to become endangered if limiting factors are not reversed.
SC:	Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

[7] SARO (Species At Risk in Ontario)

Provincial status from MNRF (Status as of Dec. 2018)

https://www.ontario.ca/environment-and-energy/species-risk-ontario-list

The provincial review process is implemented by the MNR's Committee on the Status of Species at Risk in Ontario (COSSARO). COSSARO is an independent advisory panel to the Ontario Ministry of Natural Resources and Forestry that assesses the status of species at risk of extinction.

EXP:	Extirpated – Lives somewhere in the world, and at one time lived in the wild in Ontario, but no longer lives in the wild in Ontario.
END:	Endangered – Lives in the wild in Ontario but is facing imminent extinction or extirpation.
THR:	Threatened – Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
SC:	Special Concern – Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.

[8]Ecodistrict 7E4 (comprising the City of Toronto, and southern portions of York, Peel, and Halton Regional Municipalities)

Oldham, Michael J. 2017. List of the Vascular Plants of Ontario's Carolinian Zone (Ecoregion 7E). Carolinian Canada and Ontario Ministry of Natural Resources and Forestry. Peterborough, ON. 132 pp.

Rankings are based on "previous lists, personal communications, and the author's knowledge of the Carolinian Zone flora."

Codes are defined as follows:

H: Historic. Native and no known records for at least 30 years.
R: Rare
U: Uncommon
C: Common
X: Present. Native but no status assigned because of lack of information, often due to confusion with similar species.
I: Introduced. A non-native (exotic) species that is established (or was formerly established) outside of cultivation.

[8]Toronto and Region Conservation Authority (TRCA).

Toronto and Region Conservation Authority (TRCA). 2018. Annual Local Occurrence Score and Local Rank Update: Terrestrial Species and Vegetation Communities.

L rank (Local Rank) – A rank assigned by TRCA to a species, vegetation community, or habitat patch which describes its rank and level of conservation concern in the TRCA Region. Species of concern, according to the TRCA methodology are any species with a local rank of L1 to L3, and some particularly sensitive species with a rank of L4. They are generally species which are disappearing in the landscape, primarily as a result of land use changes. For flora the ranks are defined as follows:

L1: Of concern regionally; almost certainly rare in TRCA jurisdiction; generally occur in high-quality natural areas, in natural matrix; unable to withstand disturbance.
L2: Of concern regionally; probably rare in TRCA jurisdiction; generally occur in high-quality natural areas, in natural matrix; unable to withstand disturbance.
L3: Of concern regionally; generally secure in natural matrix; able to withstand minor disturbance.
L4: Of concern in urban matrix; generally secure in rural matrix; able to withstand some disturbance.
L5: Not of concern; generally secure throughout jurisdiction, including urban matrix; able to withstand high levels of disturbance.
LX: Extirpated from the TRCA region with remote chance of rediscovery. Presumably highly sensitive. Not scored.
LH: Hybrid between two native species. Usually not scored unless highly stable and behaves like a species.
L+: Exotic. Not native to TRCA jurisdiction. Includes hybrids between a native species and an exotic. Not scored.
L+?: Origin uncertain or disputed (i.e., may or may not be native). Not scored.

[9]Native Status

Based on Vascan (Dec. 2017) and NHIC (Dec. 16, 2018)

Vascan: http://data.canadensys.net/vascan/search
NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

Appendix B: Incidental Wildlife Species List

COMMON NAME	SCIENTIFIC NAME	G_RANK[3]	S_RANK[4]	COSEWIC[5]	SARO[7]	FAMILY
Mallard	*Anas platyrhynchos*	G5	S5	-	-	Anatidae
Canada Goose	*Branta canadensis*	G5	S5	-	-	Anatidae
Northern Cardinal	*Cardinalis cardinalis*	G5	S5	-	-	Cardinalidae
American Goldfinch	*Carduelis tristis*	G5	S5B	-	-	Fringillidae
American Crow	*Corvus brachyrhynchos*	G5	S5B	-	-	Corvidae
Blue Jay	*Cyanocitta cristata*	G5	S5	-	-	Corvidae
Green Frog	*Lithobates clamitans*	G5	S5	-	-	Ranidae
Belted Kingfisher	*Megaceryle alcyon*	G5	S4B	-	-	Alcedinidae
Downy Woodpecker	*Picoides pubescens*	G5	S5	-	-	Picidae
Hairy Woodpecker	*Picoides villosus*	G5	S5	-	-	Picidae
Black-capped Chickadee	*Poecile atricapillus*	G5	S5	-	-	Paridae
Eastern Gray Squirrel	*Sciurus carolinensis*	G5	S5	-	-	Sciuridae
Red-breasted Nuthatch	*Sitta canadensis*	G5	S5	-	-	Sittidae
Eastern Cottontail	*Sylvilagus floridanus*	G5	S5	-	-	Leporidae
Eastern Chipmunk	*Tamias striatus*	G5	S5	-	-	Sciuridae
American Robin	*Turdus migratorius*	G5	S5B	-	-	Turdidae
Mourning Dove	*Zenaida macroura*	G5	S5	-	-	Columbidae

APPENDIX

C SAR AND SCC SCREENING TABLES

Species	ESA Status[1] and Regional Occurrence	ESA Protection[2]	Source of Record (Date)	Key Habitats Used by Species in Ontario	Reasonable Likelihood of Presence in Study Area	Surveys Undertaken	Results of Field Surveys	Likelihood and Magnitude of Impacts to Species or Habitat
Birds								
Acadian Flycatcher (Empidonax virescens)	END	Species and General Habitat Protection	OBBA	Generally requires large areas of mature, undisturbed forest; avoids the forest edge; often found in well wooded swamps and ravines (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Bank Swallow (Riparia riparia)	THR	Species and General Habitat Protection	OBBA	It nests in a wide variety of naturally and anthropogenically created vertical banks, which often erode and change over time including aggregate pits and the shores of large lakes and rivers (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Barn Swallow (Hirundo rustica)	THR	Species and General Habitat Protection	OBBA	prefers farmland; lake/river shorelines; wooded clearings; urban populated areas; rocky cliffs; and wetlands. They nest inside or outside buildings; under bridges and in road culverts; on rock faces and in caves etc. (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Black Tern (Chlidonias niger)	SC	N/A	OBBA	Generally prefer freshwater marshes and wetlands; nest either on floating material in a marsh or on the ground very close to water (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Bobolink (Dolichonyx oryzivorus)	THR	Species and General Habitat Protection	OBBA	Generally prefers open grasslands and hay fields. In migration and in winter uses freshwater marshes and grasslands (MNRF Guelph - Waterloo List, 2014)	**Moderate** - suitable breeding habitat was not identified on the study area, and the suitability of the study area during migration is limited due to the lack of open field habitat.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Canada Warbler (Cardellina canadensis)	SC	N/A	OBBA	Generally prefers wet coniferous, deciduous and mixed forest types, with a dense shrub layer. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Cerulean Warbler (Setophaga cerulea)	THR	Species and General Habitat Protection	OBBA	Generally found in mature deciduous forests with an open understory; also nests in older, second-growth deciduous forests (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Chimney Swift (Chaetura pelagica)	THR	Species and General Habitat Protection	OBBA	Historically found in deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer; now most are found in urban areas in large uncapped chimneys (MNRF Guelph - Waterloo List, 2014)	**Moderate** - suitable urban breeding habitat may be present in uncapped chimneys and / or the species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Common Nighthawk (Chordeiles minor)	SC	N/A	OBBA	Generally prefer open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests. Can also be found in urban areas (nest on flat roof-tops) (MNRF Guelph - Waterloo List, 2014)	**Moderate** - suitable urban breeding habitat may be present on flat roof-tops and / or the species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Eastern Meadowlark (Sturnella magna)	THR	Species and General Habitat Protection	OBBA	Generally prefers grassy pastures, meadows and hay fields. Nests are always on the ground and usually hidden in or under grass clumps (MNRF Guelph - Waterloo List, 2014)	**Moderate** - suitable breeding habitat was not identified on the study area, and the suitability of the study area during migration is limited due to the lack of open field habitat.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Eastern Wood-pewee (Contopus virens)	SC	N/A	OBBA	Associated with deciduous and mixed forests. Within mature and intermediate age stands it prefers areas with little understory vegetation as well as forest clearings and edges (MNRF Guelph - Waterloo List, 2014)	**Moderate** - wooded and forested areas on and adjacent to the study area provide potentially suitable habitat for this species.	SAR Habitat Assessment	No observations	**Minimal** - marginal potential habitat within the study area; however, the larger natural area surrounding Pomona Creek is more suitable to the species.
Golden-winged Warbler (Vermivora chrysoptera)	SC	N/A	OBBA	Generally prefer areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways, or recently logged areas (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.

Species	ESA Status[1] and Regional Occurrence	ESA Protection[2]	Source of Record (Date)	Key Habitats Used by Species in Ontario	Reasonable Likelihood of Presence in Study Area	Surveys Undertaken	Results of Field Surveys	Likelihood and Magnitude of Impacts to Species or Habitat
Grasshopper Sparrow (Ammodramus savannarum)	SC	N/A	OBBA	Medium to large grasslands with grasses of intermediate height in both native and tame grasslands including agricultural fields and cattle pastures (COSEWIC 2013b)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Hooded Warbler (Setophaga citrina)	NAR	N/A	OBBA	Generally found in the Carolinian Zone, in the interiors of large upland tracts of mature deciduous and mixed forest, and in ravines; can breed in low shrubbery such as raspberry canes (MNRF Guelph - Hamilton List, 2013)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Least Bittern (Ixobrychus exilis)	THR	Species and General Habitat Protection	OBBA	Generally located near pools of open water in relatively large marshes and swamps that are dominated by cattail and other robust emergent plants (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Loggerhead Shrike (Lanius ludovicianus)	END	Species and General Habitat Protection	OBBA	Generally prefer a combination of pasture or other grassland with scattered low trees and shrubs. They build their nests in small trees or shrubs (MNRF Guelph - Wellington List, 2015).	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Olive-sided Flycatcher (Contopus cooperi)	SC	N/A	OBBA	Generally prefers natural forest edges and openings adjacent to rivers or wetlands. Commonly nest in conifers such as White and Black Spruce, Jack Pine and Balsam Fir. (MNRF Guelph - Wellington List, 2015)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Red-headed Woodpecker (Melanerpes erythrocephalus)	SC	N/A	OBBA	Generally prefer open oak and beech forests, grasslands, forest edges, orchards, pastures, riparian forests, roadsides, urban parks, golf courses, cemeteries, as well as along beaver ponds and brooks (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Red-shouldered Hawk (Buteo lineatus)	NAR	N/A	OBBA	Prefers deciduous or mixed-woods forests containing shade-tolerant hardwood trees close to wetland areas. (SARA Species Profile Online 2015)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Short-eared Owl (Asio flammeus)	SC	N/A	OBBA	Generally prefers a wide variety of open habitats, including grasslands, peat bogs, marshes, sand-sage concentrations, old pastures and agricultural fields (MNRF Guelph - Waterloo List, 2014)	**Moderate** - while suitable breeding habitat was not identified on the study area, tthe species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Eastern Whip-poor-will (Caprimulgus vociferus)	THR	Species and General Habitat Protection	OBBA	Generally prefer semi-open deciduous forests or patchy forests with clearings; areas with little ground cover are also preferred; In winter they occupy primarily mixed woods near open areas (MNRF Guelph - Waterloo List, 2014)	**Moderate** - open, patchy forest with clearings was not identified on the study area, though the species may migrate through the study area.	SAR Habitat Assessment	No observations	**None** - no suitable breeding habitat within the study area.
Wood Thrush (Hylocichla mustelina)	SC	N/A	OBBA	Nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics, but may also nest in small forest fragments (MNRF Guelph - Waterloo List, 2014)	**Moderate** - wooded and forested areas on and adjacent to the study area provide potentially suitable habitat for this species.	SAR Habitat Assessment	No observations	**Minimal** - marginal potential habitat within the study area; however, the larger natural area surrounding Pomona Creek is more suitable to the species.
Mammals								
Small-footed Bat (Myotis leibii)	END	Species and General Habitat Protection	Thorold MNRF Regional List (2018)	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: primarily under loose rocks on exposed rock outcrops, crevices and cliffs, and occasionally in buildings, under bridges and highway overpasses and under tree bark (MNRF Guelph - Waterloo List, 2014)	**Moderate** - this species may be found in the general vicinity of the study area, and potentially suitable wooded and forested habitats are present.	SAR Habitat Assessment	No observations	**Minimal** - tree removal may impact potential day-roosting snag trees; however, similar forested habitat is found in the area and suitable significant maternity roost trees were not observed on the study area. Impacts can be minimized by limiting tree removals, where possible, and restricting removal of cavity trees (if identified at detailed design) outside of the bat hibernation period (between October 1st and March 31st).

Species	ESA Status[1] and Regional Occurrence	ESA Protection[2]	Source of Record (Date)	Key Habitats Used by Species in Ontario	Reasonable Likelihood of Presence in Study Area	Surveys Undertaken	Results of Field Surveys	Likelihood and Magnitude of Impacts to Species or Habitat
Little Brown Bat (Little Brown Myotis) (Myotis lucifugus)	END	Species and General Habitat Protection	Thorold MNRF Regional List (2018)	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh) (MNRF Guelph - Waterloo List, 2014)	**Moderate** - this species may be found in the general vicinity of the study area, and potentially suitable wooded and forested habitats are present.	SAR Habitat Assessment	No observations	**Minimal** - tree removal may impact potential day-roosting snag trees; however, similar forested habitat is found in the area and suitable significant maternity roost trees were not observed on the study area. Impacts can be minimized by limiting tree removals, where possible, and restricting removal of cavity trees (if identified at detailed design) outside of the bat hibernation period (between October 1st and March 31st).
Northern Long-eared Bat (Northern Myotis) (Myotis septentrionalis)	END	Species and General Habitat Protection	Thorold MNRF Regional List (2018)	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.)(MNRF Guelph - Waterloo List, 2014)	**Moderate** - this species may be found in the general vicinity of the study area, and potentially suitable wooded and forested habitats are present.	SAR Habitat Assessment	No observations	**Minimal** - tree removal may impact potential day-roosting snag trees; however, similar forested habitat is found in the area and suitable significant maternity roost trees were not observed on the study area. Impacts can be minimized by limiting tree removals, where possible, and restricting removal of cavity trees (if identified at detailed design) outside of the bat hibernation period (between October 1st and March 31st).
Tri-colored Bat (Perimyotis subflavus)	END	Species and General Habitat Protection	Thorold MNRF Regional List (2018)	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Manmade structures or tree cavities. Foraging over still water, rivers, or in forest gaps (COSEWIC 2013f)	**Moderate** - this species may be found in the general vicinity of the study area, and potentially suitable wooded and forested habitats are present.	SAR Habitat Assessment	No observations	**Minimal** - tree removal may impact potential day-roosting snag trees; however, similar forested habitat is found in the area and suitable significant maternity roost trees were not observed on the study area. Impacts can be minimized by limiting tree removals, where possible, and restricting removal of cavity trees (if identified at detailed design) outside of the bat hibernation period (between October 1st and March 31st).

APPENDIX

D BASAL AREA ASSESSMENT DATA

BASAL AREA PRISM SWEEP

Project: 121-15461-00 50 20		Surveyor: Carlene Perkin				Polygon/Community: CUW1	
		Tally					
Common Name	Scientific Name	BA1	BA2	BA3	BA4	Total	Rel. Avg
Common Buckthorn	*Rhamnus cathartica*	5				5	13.5
Scots Pine	*Pinus sylvestris*	1	1			2	5.4
Sugar Maple	*Acer saccharum*	1				1	2.7
American Larch	*Larix laricina*	1				1	2.7
Blue Spruce	*Picea pungens*		1	4		5	13.5
Norway Maple	*Acer platanoides*	1	3	4		8	21.6
Black Cherry	*Prunus serotina*		1			1	2.7
Canada Poplar	*Populus x canadensis*			1		1	2.7
Elm Species	*Ulmus sp.*			2		2	5.4
Norway Spruce	*Picea abies*				9	9	24.3
White Spruce	*Picea glauca*				2	2	5.4
Total		9	6	11	11	37	100.0
Basal Area		18	12	22	22	**Average BA:**	19
Dead		1	1	2	2		
Borderline*		3	1	1	4		
*every other borderline tree has been counted in the tally							

CITY OF MARKHAM

GEOTECHNICAL INVESTIGATION FOR PROPOSED CONCRETE CHANNEL AND RETAINING WALL, GLYNWOOD EA

7700 BAYVIEW AVENUE, MARKHAM, ONTARIO

JANUARY 12, 2022

GEOTECHNICAL INVESTIGATION FOR PROPOSED CONCRETE CHANNEL AND RETAINING WALL, GLYNWOOD EA

7700 BAYVIEW AVENUE, MARKHAM, ONTARIO

CITY OF MARKHAM

GEOTECHNICAL REPORT
FINAL

PROJECT NUMBER: 121-15461-00
DATE: JANUARY 12, 2022

WSP
UNITS 10 & 12
351 STEELCASE ROAD WEST
MARKHAM, ON, CANADA L3R 4H9

T: +1 905 475-0065
WSP.COM

January 12, 2022

CITY OF MARKHAM
101 Town Centre Boulevard
Markham, ON
L3R 9W3

Attention: Nehal Azmy, P.Eng., Senior Capital Works Engineer

Dear Madam:

Subject: Geotechnical Investigation for Proposed Concrete Channel and Retaining Wall, Glynwood EA, Markham, ON
Project No.: 121-15461-00

Please find the enclosed our report for the geotechnical investigation for the above-referenced site. We appreciate the opportunity to be of service to you, and trust that this report provides geotechnical engineering information to facilitate the planning and development of this project.

We look forward to providing you with continuing service during the detailed design and construction stage.

Please do not hesitate to contact our office should you wish to discuss any aspects of this project.

Yours sincerely,

Laifa Cao, P.Eng.
Principal Geotechnical Engineer

LC
Encl.

WSP ref.: 121-15461-00

UNITS 10 & 12
351 STEELCASE ROAD WEST
MARKHAM, ON, CANADA L3R 4H9

T: +1 905 475-0065
wsp.com

REVISION HISTORY

FIRST ISSUE

September 10, 2021	Draft	
Prepared by	**Reviewed by**	
Kether Huang, M.Eng. Geotechnical Intern	Laifa Cao, P.Eng. Principal Geotechnical Engineer	
SECOND ISSUE		
January 12, 2022	Final	
Prepared by	**Reviewed by**	
Kether Huang, M.Eng. Geotechnical Intern	Laifa Cao, P.Eng. Principal Geotechnical Engineer	
Prepared by	**Reviewed by**	**Approved By**

SIGNATURES

PREPARED BY

January 12, 2022

Kether Huang, M. Eng.
Geotechnical Intern

Date

REVIEWED BY

Laifa Cao, P. Eng.
Principal Geotechnical Engineer

Date

CONTRIBUTORS

CLIENT

Representative	Nehal Azmy

WSP

Field Technician	Tim Yu
Project Coordinator	Kether Huang
Technical Review	Laifa Cao

SUBCONSULTANTS

Driller	DBW Drilling Ltd.

TABLE OF CONTENTS

TABLES

FIGURE

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by City of Markham (the Client) to provide a geotechnical investigation for the proposed concrete retaining wall channel at 7700 Bayview Avenue, Markham, Ontario. It is noted that the detailed design for the concrete channel and retaining wall was not available when providing this report. However, a conceptual design plan was provided for the discussion purpose of this report.

The purpose of the geotechnical investigation was to obtain subsurface soil and groundwater information in the development area by means of two (2) boreholes. Based on our interpretation of the borehole data, this report presents the findings of the investigations and provides geotechnical engineering recommendations for the planning and design of the proposed concrete channel and retaining wall.

This report has been prepared based on the conceptual design and it is imperative upon the potential users that their designs should be analyzed against the information/recommendation provided in this report. This report is provided on the basis that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. For final design it may be necessary to carry out additional borings and reporting before recommendations for final detailed design can be made.

This report has been prepared for the Client and the Client's designers. Third party use of this report without WSP consent is prohibited.

2 PHYSIOGRAPHY AND GEOLOGY

The project area lies within the Peel Plain physiographic region as defined by Chapman and Putnam (1984). The main physiographic landform across the Site is bevelled till plains.

The project area is situated near the boundary of peel ponds (deep water deposits: silt, clay) and modern river deposits (sand, silt, minor gravel and organic material) areas as represented in Quaternary Geology: Toronto and Surrounding Area (Ministry of Natural Resources, Ontario Geological Survey, Preliminary Map P.2204).

3 FIELD AND LABORATORY WORK

The field work for this investigation was carried out by WSP on August 4, 2021, during which time two (2) boreholes were advanced to depths ranging approximately from 6.2 to 6.5 m below ground surface (mbgs), as shown on Borehole Location Plan, Figure 1. The boreholes were advanced using a truck mounted drilling machine provided by a drilling sub-contractor under the direction and supervision of WSP technical personnel. Soil samples were retrieved at regular intervals from the boreholes with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method (ASTM D 1586).

This SPT sampling method recovers samples from the soil strata, and the number of blows (SPT 'N'-values) required to drive the sampler 0.3 m depth into the undisturbed soil gives an indication of the compactness condition or consistency of the sampled soil material. It should be noted that the split spoon samplers used limit the particle size of the retrieved samples to less than 50 mm. As such any particles greater than that are not retrieved or represented within the laboratory particle size distributions analyses.

Following completion of drilling the soil samples were transported to WSP's laboratory where they were subject to further visual examination. Laboratory testing was completed on select soil samples including the following:

- Water content testing on all soil samples; and
- Grain size analysis of two (2) soil samples.

Water level observations were made during drilling in the open boreholes and upon completion of drilling operation. A 50-mm diameter monitoring well was installed in each borehole to permit further monitoring of the groundwater levels.

It should be noted that borehole elevations and coordinates were obtained from the topography map provided by the client and should be considered to be approximate. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

4 SITE AND SUBSURFACE CONDITIONS

The subject site is located at 7700 Bayview Avenue, Markham, Ontario. At the time of this investigation, the site is occupied as parking lots area. An existing slope is located immediately north of the parking lot.

The locations of the boreholes advanced on site are shown in the borehole location plan, Figure 1. Notes on soil samples description are presented in Appendix A. The subsurface conditions in the boreholes are presented on the individual borehole log (Refer to Appendix A). The subsurface conditions in the boreholes are summarized in the following sections.

4.1 SOIL CONDITIONS

In summary, underlying the pavement structure/granular fill, fill materials were encountered and extended to depths ranging from about 0.7 to 2.1 mbgs. The native soil encountered at the site mainly consisted of cohesionless sandy/silty soils.

4.1.1 EXISTING PAVEMENT STRUCTURE

Existing pavement/granular fill was encountered at ground surface in both boreholes. A layer of asphalt was encounter with thickness of about 80 mm. The granular fill was encountered below the asphalt with thicknesses ranging from about 180 to 220 mm.

4.1.2 FILL MATERIALS

Fill materials, consisting of silty clay or sand to sandy silt, were encountered in all boreholes and extended to depths ranging approximately from 0.7 to 2.1 mbgs. SPT 'N' values measured within the cohesive fill was 7 blows per 0.3 m penetration, indicating a firm consistency. SPT 'N' values measured within the cohesionless fill ranged from 15 to 28 blows per 0.3 m penetration, indicating a compact state of compactness. Water contents measured in samples of fill materials ranged from 5% to 18%.

4.1.3 COHESIONLESS SOILS

Cohesionless soils with highly variable proportions, ranging from silt and sandy silt to silty sand, were encountered below fill materials in both boreholes, which extended to the termination depths ranging approximately from 6.2 to 6.5 mbgs. SPT 'N values measured in theses deposits ranged from 23 to more than 100 blows per 0.3 m penetration, indicating a compact to very dense state of compactness. Water contents measured in these samples ranged from 10% to 19%.

Two (2) samples obtained from the cohesionless soils was selected for grain size analyses. The results of laboratory testing are presented in Appendix B as well as summarized in Table 4.1.

Table 4.1 Grain Size Distribution for Cohesionless Soils

BOREHOLE NO.	SAMPLE NO.	% GRAVEL	% SAND	% SILT	% CLAY
BH21-1	SS3	1	52	43	4
BH21-2	SS6	2	14	76	8

4.2 GROUNDWATER CONDITIONS

Both boreholes were instrumented with a 50-mm diameter monitoring well to permit further monitoring the groundwater levels. The details of the monitoring well installation are presented on the borehole logs in Appendix A. Groundwater levels observed in the monitoring wells are presented in Table 4.2.

Table 4.2 Groundwater Levels Measured in Monitoring Wells

BOREHOLE NO.	MEASURED DATE	DEPTH OF GROUNDWATER TABLE (m)	ELEVATION OF GROUNDWATER TABLE (mASL)	NOTES
BH21-1	August 24, 2021	1.0	163.3	50mm dia. monitoring well
	December 14, 2021	1.0	163.3	
BH21-2	August 24, 2021	1.3	164.5	
	December 14, 2021	1.2	164.6	

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

5 RECOMMENDATIONS

5.1 GENERAL

In this section of the report, the soil and groundwater conditions are interpreted as relevant to the design of the proposed development as described herein. Comments relating to construction are intended solely for the guidance of the design engineer to establish constructability. Construction methods described in this report must not be considered as being specifications or direct recommendations to the contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and conditions may vary significantly in-between and beyond the boreholes.

5.2 RETAINING WALL AND SLOPE

5.2.1 EXISTING SLOPE

It is understood that the proposed retaining wall will be constructed at the toe of the existing slope. A visual field review of the slope was carried out by the geotechnical engineer on August 4, 2021. Based on our site observations and the provided design drawing, the slope conditions at the site are described as follows:

- The Slope Stability Ratings for slope section between BH21-1 and BH21-2 are attached in Appendix D. A review of the Slope Stability Ratings shows that a rating value of 25 was obtained. According to the Guide (Technical Guide for River & Stream Systems: Erosion Hazard Limit, 2002), a slope with a rating ranging from 25 to 35, the potential for instability is considered 'slight';
- The existing slope between BH21-1 and BH21-2 having a height of about 5 m and an inclination of about 2.9H:1V (2.9 horizontal to 1 vertical) is situated at the north of the existing parkin lot;
- The top of slope and slope surface are generally covered by trees/vegetation/bushes while the bottom of slope is covered by asphalt pavement parking lot, as shown on Photographs 1 to 4 in Appendix C;
- Indications of surficial creep (e.g. curved tree trunks) and shallow slumping/sloughing of the near-surface slope materials were not observed along the slope face;
- Tension cracks and/or other indicators of deep seated movement of the slope were not observed at or beyond the crest of the slope;
- No water seepage was noted at the slope face within the study area at the time of field review.

5.2.2 RECOMMENDATIONS FOR RETAINING WALL

Based on the conceptual design drawing, retaining wall is proposed at the toe of the existing slope, along the north side of the parking lot. The heights, types, sizes and loading conditions of the proposed retaining walls are unknown at this time, the following geotechnical parameters and recommendations are provided in general for the wall designers and further reviews by experienced geotechnical engineer(s) are required once the wall designs are available.

- The existing slopes with about 2.9H:1V inclination may generally be considered stable for the purpose of preliminary design of the retaining wall and site grading. The global stability of the slope and retaining wall depends on the design of the wall, including the geometry of the wall and the reinforced earth section behind the wall. Once the size and type of retaining walls are finalized, the overall stability of the wall together with the slope must be analyzed by the geotechnical engineer.
- All foundations of the retaining walls should be founded on native soils. Based on the information obtained from BH21-1 and BH21-2, retaining wall foundations established on the undisturbed native soils at or below Elev. 163.5 m, a bearing capacity of 200 kPa at SLS (Serviceability Limit States) and 300 kPa at ULS (Ultimate Limit States) can be used for the design. Footings designed to the above bearing capacity at SLS are expected to settle less than 25 mm total and 19 mm differential;
- Should rigid concrete retaining walls be considered, wall design should be aware of that working pressure on retaining wall base is higher than the vertical load, due to the contribution of the lateral earth pressure. For a preliminary analysis of a gravity retaining wall, the working pressure can be assumed as 150% to 200% of the vertical load;
- Select well-draining granular fill, such as OPSS Granular B, Type I or as specified by the retaining wall designer, should be used as backfill immediately adjacent to the retaining wall. A geotextile/fabric should be placed between the retaining wall and backfill to mitigate the migration of fines. An effective internal friction angle of Ø = 32º may be used for compacted OPSS Granular B material. An effective internal friction angle of Ø = 35º may be used for compacted OPSS Granular A material;

- As a minimum requirement, the granular backfill should be placed in the wedge-shaped zone defined by a 60-degree line extending up and back from the base of the retaining wall footings, beginning from a point at least 1.2 m from the back of the retaining wall footings. Filtered longitudinal drains should be installed at the base of the granular fill to provide positive drainage of the granular backfill. All granular backfill should be placed in maximum 300 mm loose lifts and uniformly compacted to a minimum of 98 percent of standard Proctor Maximum Dry Density in a manner so as not to damage the retaining wall, or as specified by the retaining wall designer. Heavy compaction equipment should not be used within close proximity to the structure;
- Assuming that the retaining wall is permitted to yield sufficiently for "active" earth pressure conditions to occur, an "active" lateral earth pressure coefficient should be used in design. In this case, the appropriate geotechnical design parameters are as follows for a triangular lateral earth pressure distribution:

  Unit weight of granular backfill γ = 21 kN/m³

  Unit weight of water γ_w = 9.8 kN/m³

  "Active" lateral earth pressure coefficient Ka:

  0.3 for horizontal retained surface

  0.38 for 3H:1V retained surface

  0.45 for 2.5H:1V retained surface

  Coefficient of friction between precast concrete and engineered fill μ = 0.3

  Coefficient of friction between precast concrete and OPSS Granular A μ = 0.4

  Coefficient of friction between cast in place concrete and native soil μ= 0.3
- If the retaining wall is not designed to permit sufficient movement for "active" conditions to occur, an "at-rest" lateral earth pressure coefficient (K_o) of 0.47 for horizontal retained surface, 0.6 for 3H:1V retained surface and 0.7 for 2.5H:1V retained surface should be used in design. The value of K_o should also be used for structural design. It should be noted that the value of K_o assumes that retaining wall is backfilled with free-draining, compacted granular backfill;
- The foundation of the retaining wall should be provided with at least 1.4 m of cover (including the thickness of free drained Granular A fills) after final grading, in order to minimize the potential for damage due to frost action. Or, the frost cover could be less, provided minor movements caused by the frost are considered to be acceptable by the retaining wall design engineer;
- The external modes of failures such as overturning, sliding as well as internal stability and available bearing resistance should be analysed by the retaining wall design engineer;
- Prior to the placement of the wall foundation, all founding surfaces must be prepared and inspected by experienced geotechnical personnel;
- The recommendations in this report relate to geotechnical aspects of the project only. The design and construction of the wall is also subject to compliance with standards of the local municipality and other agencies' regulations

5.3 CONCRETE CHANNEL

5.3.1 FOUNDATIONS

Based on the borehole information, the proposed concrete channel can be founded in the competent, undisturbed native soil. The recommended geotechnical reactions at SLS, factored geotechnical resistances at ULS and the corresponding founding depths at each borehole location are summarized in Table 5.1.

Table 5.1 Bearing Soils and Founding Levels of Footings at Borehole Locations

BOREHOLE NO.	GEOTECHNICAL REACTION AT SLS (kPA)	GEOTECHNICAL RESISTANCE AT ULS (kPA)	MINIMUM DEPTH BELOW EXISTING GROUND SURFACE (m) / ELEVATIONS (mASL)
BH21-1	250	375	0.8* / 163.5
BH21-2	250	375	2.3 / 163.5

Note: * A minimum founding depth of 1.4 m below finished grade is required to provide frost cover.

Footing bearing in approved engineered fill may be designed using a geotechnical reaction of 150 kPa at SLS, and factored geotechnical resistance of 225 kPa at ULS. Consideration also can be given to use engineered Granular A fill or 2" Crusher Run limestone to achieve the bearing resistances of 200 kPa at SLS and 300 kPa at ULS.

Foundations designed to the specified bearing resistances at Serviceability Limit States (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.4 m of soil cover for frost protection or be otherwise protected by artificial insulation.

Where it is necessary to place footings at different levels, the footing at the higher level must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

5.3.2 UPLIFTING

Groundwater levels were measured at 163.3 mASL and 164.5 mASL on August 24, 2021, and 163.3 mASL and 164.6 mASL on December 14, 2021 at BH21-1 and BH21-2, respectively. Seasonally the groundwater level could rise above these levels.

Should the concrete channel be designed to be watertight, the structure should be designed to resist hydrostatic uplift pressure using the weight of the structure and any backfill on top of it. The design groundwater level should be taken at the ground surface. If the uplift at maximum water level is resisted only by the dead weight of the structure and backfill then a minimum factor of safety (FS) of 1.1 should be adequate. If other factors (e.g. side friction) are considered, then a higher FS should be used.

5.4 EXCAVATIONS AND GROUNDWATER CONTROL

Based on the conceptual design plan, it is expected that excavation for the proposed retaining wall and channel will continue to the depth up to 2.3 m below the existing grade. The excavation for the foundation will be carried generally through existing fill materials and cohesionless soils.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill can be classified as Type 3 Soil above the groundwater table and as Type 4 Soil below the groundwater table; the dense to very dense silty sand to sandy silt can be classified as Type 1 to 2 Soil above the groundwater table and as Type 3 Soil below the groundwater table.

The groundwater level at the site ranged from depths of 1.0 to 1.3 m below the existing grade, corresponding to Elev. 163.3 to 164.6 mASL. Considering the excavation extended into cohesionless silty sand soil below groundwater level, groundwater control measures using well points/eductors may be considered to dewater or depressurize the hydrostatic pressure in the sandy/silty soils below groundwater table. The groundwater level should be lowered to at least 1 m below the excavation base to maintain the stability of the base and side slopes of the excavations in these areas. Surface water should be directed away from the open excavations.

It is recommended to carry out a "public digging" (i.e. test pitting) during the tender stage, to allow prospective bidders to assess the subsurface conditions and determine the type of groundwater control required, consistent with their equipment capabilities and the actual groundwater conditions at that time. The locations of the test pits should be determined in consultation with the geotechnical engineer.

It should be recognized that groundwater and saturated soil levels may be influenced by the effects of precipitation as well as seasonal fluctuations. Groundwater control measures that extract more than 50,000 L/day of water are subject to Environmental Activity Sector Registry (EASR) or Permit to Take Water (PTTW), as regulated by The Ministry of the Environment, Conservation and Parks (MECP). Based on the investigation findings, we would not expect that a EASR or PTTW would be required for this project.

5.5 EARTH PRESSURES

The lateral earth pressures acting on concrete channel may be calculated from the following expression:

$P_h = K[\gamma (h - h_w) + (\gamma' h_w) + q] + h_w \gamma_w$

where, P_h = horizontal pressure on the concrete channel wall (kPa)

K = Earth pressure coefficient equal to 0.5 for vertical walls and horizontal backfill

γ = bulk unit weight of retained soil (kN/m^3), a value of 21 kN/m^3 may be assumed

γ' = submerged unit weight of soil ($\gamma - \gamma_w$) (kN/m^3), a value of 11.2 kN/m^3 may be assumed

γ_w = unit weight of water (9.81 kN/m^3)

h = depth below ground surface (m)

h_w = depth below the ground water level (m)

q = surcharge loading (kPa)

5.6 EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed structures can be classified as "Class D" for seismic site response.

6 LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Inc. at the time of preparation. Unless otherwise agreed in writing by WSP Canada Inc., it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

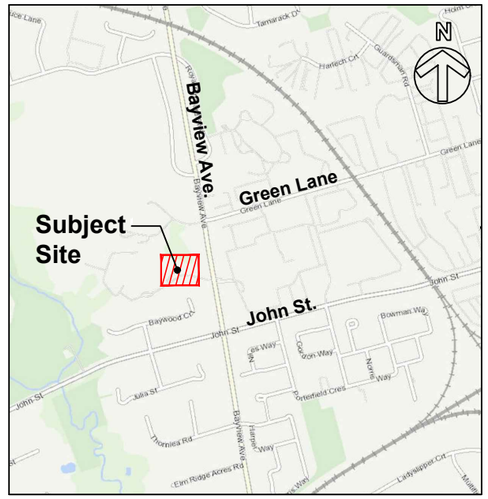
The conclusions and recommendations given in this report are based on the information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

FIGURES



Key Plan

N.T.S.

LEGEND:

MONITORING WELL (WSP 2021)

20 10 0 20 metres

BOREHOLE LOCATION PLAN

GEOTECHNICAL INVESTIGATION
for Proposed Retaining Wall and Channel,
Glynwood EA, Markham, ON

DATE: AUGUST 2021	SCALE: AS SHOWN
PROJECT: 121-15461-00	FILE NO.:

wsp

FIGURE
1

APPENDIX

A NOTES ON SAMPLE DESCRIPTION AND BOREHOLE LOGS

Enclosure 1-A: Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by WSP also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Enclosure 1-B: Explanation of Terms Used in the Record of Borehole

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

WH – Samples sinks under "weight of hammer"

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils (ASTM D2487-10)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm - 4.75 mm
Silt	0.002 mm - 0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
Γ	Unit weight

LOG OF BOREHOLE BH21-1

PROJECT: Geotechnical Investigation for Proposed Retaining Wall and Channel, Glynwood EA, Markham, ON
REF. NO.: 121-15461-00

CLIENT: City of Markham
Method: Soild Stem Auger
ENCL NO.: 2

PROJECT LOCATION: 7700 Bayview Ave. Thornhill, ON
Diameter: 110 mm

DATUM: UTM, NAD83 , ZONE17
Date: Aug/04/2021

BH LOCATION: N 4853146 E 628434

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION
164.3	Ground Surface					
164.2 / 0.0	**ASPHALT:** (80 mm)					
164.0 / 0.1	**GRANULAR BASE/SUBBASE:** (180 mm)					
0.3	**FILL:** sand, trace to some silt, trace clay, brown, wet, compact.	1	SS	24		164
163.6 / 0.7	**SILTY SAND TO SANDY SILT:** trace clay, trace gravel, brown to grey, moist to wet, compact to very dense. --- spoon wet	2	SS	23	W. L. 163.3 m Dec 14, 2021	163
	--- layers of sand	3	SS	83		
	--- grey	4	SS	55		162
	--- layers of clayey silt till	5	SS	100 / 250 mm		161
		6	SS	58		160
159.9 / 4.4	**SILT:** trace to some sand, moist, grey, very dense.	7	SS	50 / 75 mm		159
158.1		8	SS	50 / 125 mm		
6.2	**END OF BOREHOLE**					

Notes:
1). Borehole caved to a depth of 4.57 m below ground surface upon completion of drilling.
2). Water was at a depth of 0.9 m below ground surface upon completion of drilling.
3). A 50 mm dia. monitoring well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m bgs.)
August 24, 2021	1.00
December 14, 2021	0.97

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
1	52	43	4	

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-2

PROJECT: Geotechnical Investigation for Proposed Retaining Wall and Channel, Glynwood EA, Markham, ON
REF. NO.: 121-15461-00
CLIENT: City of Markham
Method: Hollow Stem Auger
ENCL NO.: 3
PROJECT LOCATION: 7700 Bayview Ave. Thornhill, ON
Diameter: 203 mm
DATUM: UTM, NAD83 , ZONE17
Date: Aug/04/2021
BH LOCATION: N 4853134 E 628476

ELEV	DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION
165.8		Ground Surface				
165.7	0.0	**ASPHALT:** (80 mm)				
165.5	0.1	**GRANULAR BASE/SUBBASE:** (220 mm)				
	0.3	**FILL:** sandy silt, trace to some clay, trace gravel, brown, moist, compact.	1	SS	15	
165.0	0.8	**FILL:** silty clay, trace sand, organic inclusions, brown to grey, moist, firm.	2	SS	7	165
164.4	1.4	**FILL:** sand, trace to some silt, trace clay, trace gravel, brown, wet, compact. --- spoon wet	3	SS	28	164
163.7	2.1	**SANDY SILT TO SILTY SAND:** trace clay, trace gravel, brown, moist to wet, very dense to dense.	4	SS	80	163
			5	SS	35	
161.7	4.1	**SILT:** some sand, trace clay, trace gravel, moist, grey, dense.	6	SS	43	162
160.2	5.6	**SILTY SAND:** trace clay, trace gravel, brown, moist to wet, very dense.	7	SS	100 / 250 mm	161
159.3	6.5	**END OF BOREHOLE**				160

Notes:
1). Water encountered at a depth of 1.5 m below ground surface during drilling.
2). A 50 mm dia. monitoring well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m bgs.)
August 24, 2021	1.32
December 14, 2021	1.21

GROUND WATER CONDITIONS: W. L. 164.6 m Dec 14, 2021 Aug 24, 2021

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
2	14	76	8

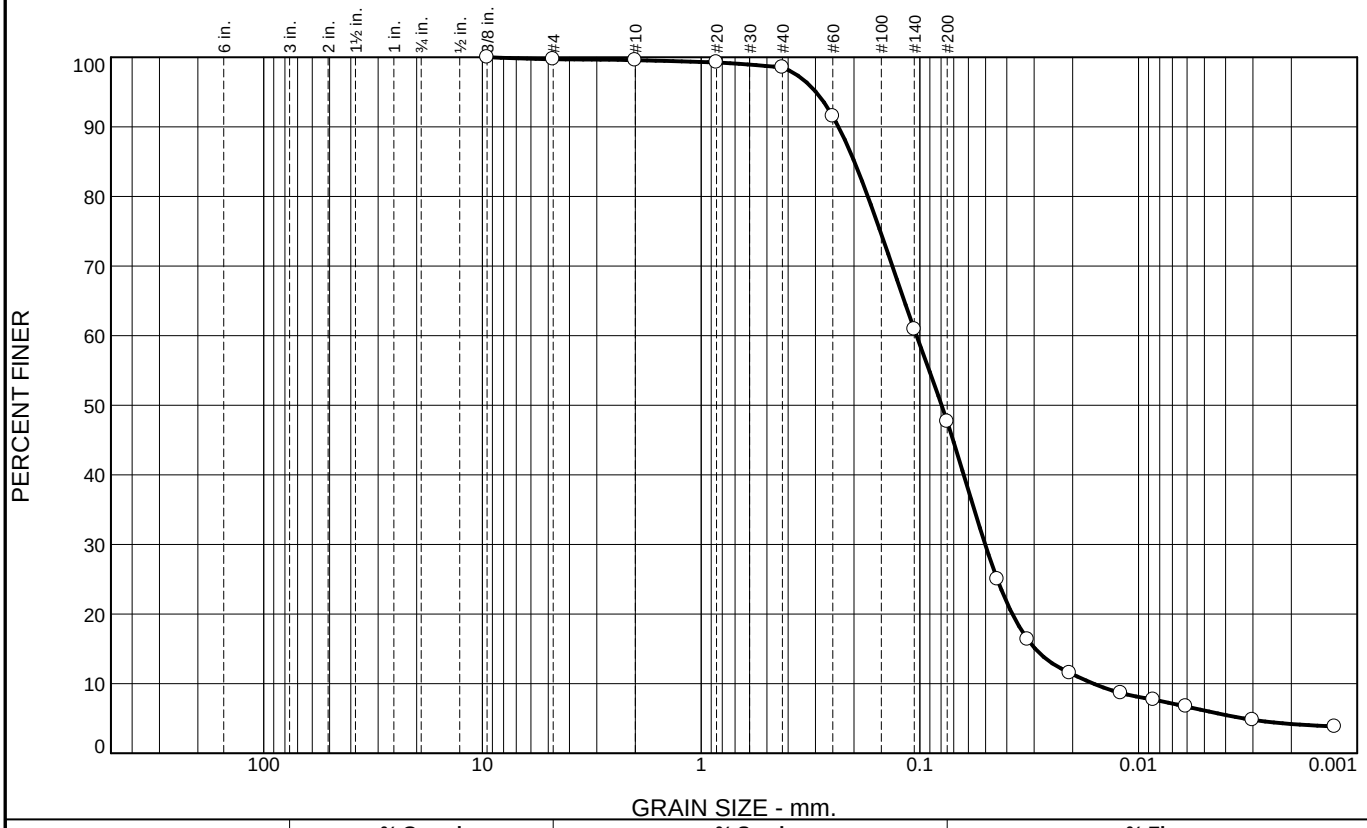
GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

APPENDIX

B RESULTS OF GRAIN SIZE ANALYSES

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.1	1.1	50.8	43.5	4.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.7		
2mm	99.6		
0.850mm	99.3		
0.425mm	98.5		
0.250mm	91.5		
0.106mm	60.9		
0.075mm	47.7		
0.0443 mm.	25.0		
0.0322 mm.	16.4		
0.0206 mm.	11.6		
0.0120 mm.	8.7		
0.0085 mm.	7.7		
0.0061 mm.	6.7		
0.0030 mm.	4.8		
0.0013 mm.	3.9		

* (no specification provided)

Soil Description

Sand and silt, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2354 D_{85}= 0.1993 D_{60}= 0.1035
D_{50}= 0.0794 D_{30}= 0.0503 D_{15}= 0.0296
D_{10}= 0.0160 C_u= 6.45 C_c= 1.52

Classification

USCS= AASHTO=

Remarks

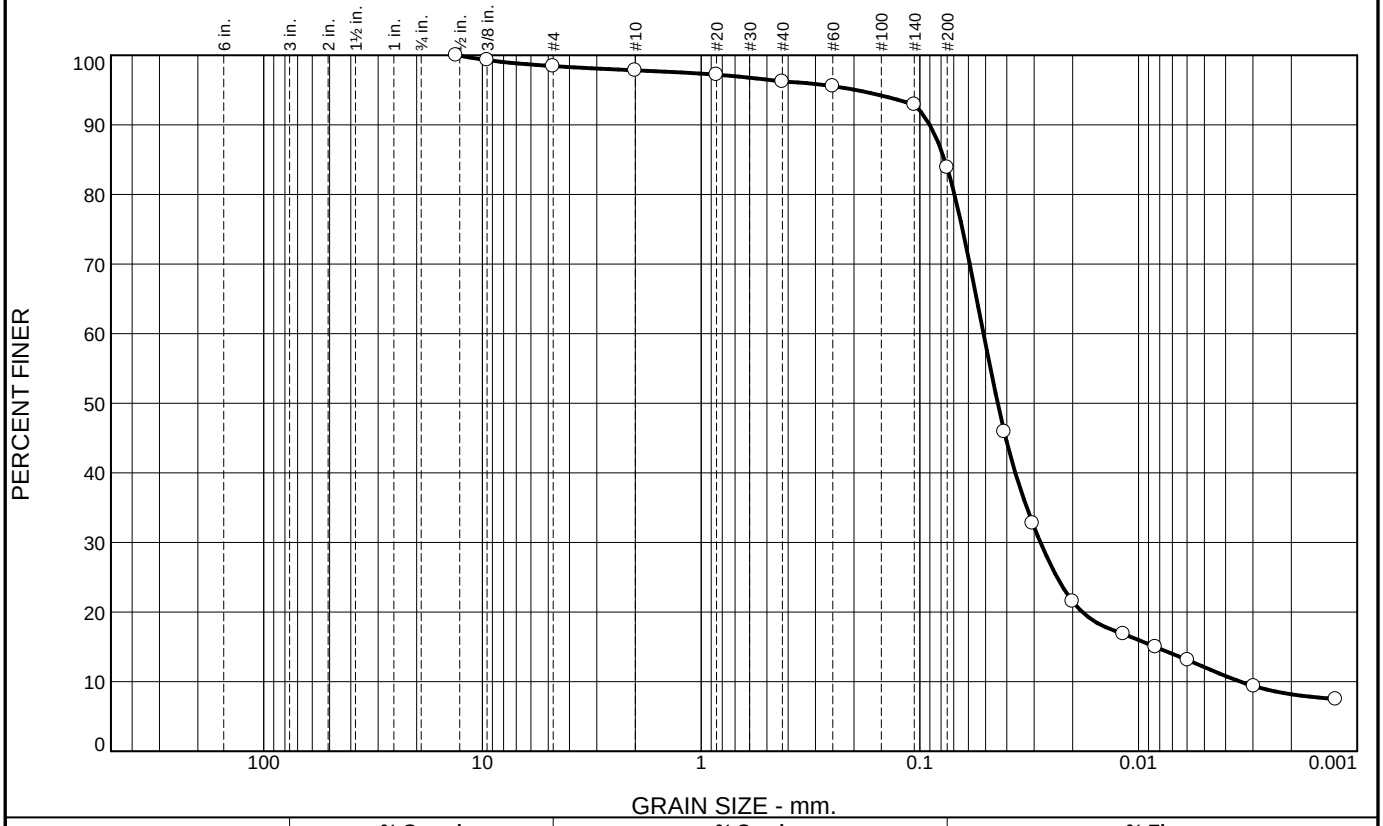
Sampled by Tim on August.4, 2021

Location: BH21-1 SS3
Sample Number: 21MM-652

Date: 10/08/21

Client: City of Markham
Project: 121-15461-00 - Glynwood Tributary Area EA, 7700 Bayview Ave., Markham, ON
Project No: 121-15461-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	0.6	1.6	12.3	75.7	8.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	99.3		
4.75mm	98.4		
2mm	97.8		
0.850mm	97.2		
0.425mm	96.2		
0.250mm	95.6		
0.106mm	92.9		
0.075mm	83.9		
0.0411 mm.	45.9		
0.0305 mm.	32.8		
0.0200 mm.	21.5		
0.0117 mm.	16.9		
0.0084 mm.	15.0		
0.0060 mm.	13.1		
0.0030 mm.	9.4		
0.0013 mm.	7.5		

* (no specification provided)

Soil Description

Silt, some sand, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0901 D_{85}= 0.0770 D_{60}= 0.0511
D_{50}= 0.0440 D_{30}= 0.0281 D_{15}= 0.0084
D_{10}= 0.0034 C_u= 14.96 C_c= 4.51

Classification

USCS= AASHTO=

Remarks

Sampled by Tim on August.4, 2021

Location: BH21-2 SS6
Sample Number: 21MM-653

Date: 10/08/21

Client: City of Markham
Project: 121-15461-00 - Glynwood Tributary Area EA, 7700 Bayview Ave., Markham, ON
Project No: 121-15461-00 **Figure**

APPENDIX

C PHOTOGRAPHS OF SITE SLOPE

Photograph 1 – View of the bottom of Slope, Existing Parking Lot (Looking East)

Photograph 2 – Vegetated/Treed Slope Surface (Standing at the Toe of Slope, Looking North)

Photograph 3 – View of Vegetated/Treed top of Slope

Photograph 4 – Vegetated/Treed Slope (Standing in the middle of Slope, Looking East)

APPENDIX

D SLOPE STABILITY RATING CHART

SLOPE STABILITY RATING CHART, GLYNWOOD
TRIBUTARY AREA EA, 7700 BAYVIEW ROAD, MARKHAM,
ONTARIO

Site Location:	**North of Parking Lot**	**File No.**	**121-15461-00**
Property Owner:	7500 and 7700 Bayview Ave., Markham	Inspection Date:	August 4, 2022
Inspected By:	D. Wang	Weather:	Sunny, 29 °C

	Inspection		**Rating Options**	**Assigned**
1. SLOPE INCLINATION				
	Degrees	**Horizontal: Vertical**		
a)	18 or less	3:1 or flatter	0	
b)	18 to 26	2:1 to more than 3:1	6	**6**
c)	more than 26	Steeper than 2:1	16	
2. SOIL STRATIGRAPHY				
a)	Shale, Limestone, Granite (Bedrock)		0	
b)	Sand, Gravel		6	
c)	Glacial Till		9	**9**
d)	Clay, Silt		12	
e)	Fill		16	
f)	Leda Clay		24	
3. SEEPAGE FROM SLOPE FACE				
a)	None or near bottom only		0	**0**
b)	Near mid-slope only		6	
c)	Near crest only or from several levels		12	
4. SLOPE HEIGHT				
a)	2 m or less		0	
b)	2.1 to 5 m		2	**4**
c)	5.1 to 10 m		4	
d)	more than 10 m		8	
5. VEGETATION COVER ON SLOPE FACE				
a)	Well vegetated, heavy shrubs or forested with mature trees		0	**4**
b)	Light Vegetation; Mostly grass, weeds, occasional trees, shrubs		4	
c)	No vegetation, bare		8	
6. TABLE LAND DRAINAGE				
a)	Table land flat, no apparent drainage over slope		0	**2**
b)	Minor drainage over slope, no active erosion		2	
c)	Drainage over slope, active erosion, gullies		4	
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE				
a)	15 m or more from slope toe		0	**0**
b)	Less than 15 m from slope toe		6	
8. PREVIOUS LANDSLIDE ACTIVITY				
a)	No		0	**0**
b)	Yes		6	
			RATING VALUES TOTAL	25

SLOPE INSTABILITY RATING		**INVESTIGATION REQUIREMENTS**
1. Low Potential	<24	Site inspection only, confirmation,
2. Slight Potential	25 - 35	Site inspection and surveying, preliminary study,
3. Moderate Potential	>35	Boreholes, piezometers, lab tests, surveying detailed report

Notes:

a) Choose only one rating value from each category; compare total rating value with above requirements

b) If there is a waterbody (stream, creek, river, pond, bay, lake) at the slope toe, the potential for toe erosion and undercutting should be evaluated in detail and protection provided if required.

c) For leda clay and rock slopes, additional evaluation must be carried out

Source: Table 4.2 Slope Stability Rating Chart (Technical Guide - River and Stream Systems - Erosion Hazard Limit - 2002, Ontario Ministry of Natural Resources)

CITY OF MARKHAM

ARBORIST REPORT

GLYNNWOOD TRIBUTARY AREA – MARKHAM, ONTARIO

SEPTEMBER 17, 2021

121-15461-00

ARBORIST REPORT

GLYNNWOOD TRIBUTARY AREA – MARKHAM, ONTARIO

CITY OF MARKHAM

PROJECT NO.: 121-15461-00
DATE: SEPTEMBER 17, 2021

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON
CANADA L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
WSP.COM

September 17, 2021

City of Markham
101 Town Centre Boulevard
Markham, ON L3R 9W3

Attention: Nehal Azmy, P.Eng.

Dear Ms. Azmy,

Subject: Arborist Report for Glynnwood Tributary Area, Markham, Ontario

WSP Canada Inc. (WSP) has been retained by the City of Markham to produce an Arborist Report and Tree Preservation Plan (TPP) for the construction of a storm sewer for flood remediation. The study area includes lands described with the municipal addresses of 7700, 7750 and 7755 Bayview Avenue, Thornhill, Ontario. These documents meet the specifications identified in the City of Markham Tree Preservation By-law 2008-96A (2017), the City's Tree Permit Requirements (2019), the City's Tree Inventory, Analysis, and Preservation Requirements (2009) and Region of York Street Tree and Forest Preservation Guidelines (2016).

If you have any questions or comments about this report, please contact the undersigned.

Yours sincerely,

WSP CANADA INC.

Carlene Perkin, H.B.Sc.
Terrestrial Ecologist – ISA Certified Arborist ON-2306A
Ecology and Environmental Impact Assessment

WSP ref.: 121-15461-00

100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON
CANADA L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft			
Date	September 17, 2021			
PREPARED BY	PERKIN, C.			
SIGNATURE				
Checked by	Peter McNamara			
Signature				
Authorised by				
Signature				
Project number				
Report number				
File reference				

SIGNATURES

PREPARED BY

Carlene Perkin, H.B.Sc.
Ecologist | ISA Certified Arborist ON-2306A

REVIEWED BY

Peter McNamara, B.A.
Senior Landscape Technologist | ISA Certified Arborist ON-1140A

This report was prepared by WSP Canada Inc. (WSP) for the account of the City of Markham, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

TABLE OF CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) has been retained by the City of Markham to produce an Arborist Report and Tree Management Plan (TMP) for removal of trees associated with the construction of a storm sewer for flood remediation within the lands described with the municipal addresses of 7700, 7750 and 7755 Bayview Avenue, within the City of Markham, York Region. The subject property is located northwest of the intersection of John Street and Bayview Avenue. The proposed works associated with this report are located within the City of Markham's property boundaries, and within the Bayview Avenue right-of-way (ROW). This report and TMP meet the specifications identified in the City of Markham's Tree Preservation By-law 2008-96A (2017), the City's Tree Permit Requirements (2019), the City's Tree Inventory, Analysis, and Preservation Requirements (2009) and the Region of York Street Tree and Forest Preservation Guidelines (2016).

The proposed development plan includes storm sewer pipeline construction. The woody vegetation within the area of proposed works is the subject of this report. An up-to-date general plan and plan of proposed subdivision have been provided in advance of this work.

This report presents a detailed inventory of trees within the subject lands and extending 6 m beyond the proposed development limits for trees within the City of Markham, and 10 m for trees within the York Region's road allowance. The inventory includes individual tree species, quantity, diameter at breast height (DBH), canopy dimensions, location and condition. Recommendations have been provided for tree protection, tree injury and removals based on the current extent of proposed work.

The results from the tree inventory were used to create a TMP, which identifies and details tree protection methodology. As part of this plan, the tree protection zone (TPZ) for each tree is identified by applying the accepted minimum distances for public and privately-owned trees. The following documents / guidelines were utilized to prepare this report and the TMP:

- City of Markham's Tree Preservation By-law 2008-96A (2017);
- Tree Assessment and Preservation Plan (TAPP) requirements from the City of Markham's Tree Permit Requirements (2019);
- The City's Tree Inventory, Analysis, and Preservation Requirements (2009); and,
- The York Region's Street Tree and Forest Preservation Guidelines (2016).

The City of Markham and York Region have standardized TPZ guidelines in their respective tree preservation guidelines. The TMP (TM-1 to TM-2) includes details on the appropriate use of the TPZ, tree protection fencing, and general notes on best management practices.

This Arborist Report identifies the trees required to be removed to install the proposed storm sewer infrastructure, those that will be retained and protected, and those for which injury may occur but may be preserved using appropriate treatment and preservation methods. For trees within the site, the 'potential for injury' is defined as the percentage of encroachment into the identified TPZ. Recommendations are provided for appropriate treatment of trees that will be preserved, but may suffer injury due to encroachment into their respective TPZs.

This report is to be read in conjunction with:

- Table 1: Tree Inventory and Preservation Charts;
- Appendix A: Tree Management Plan: Figures: TM-1 to TM-2; and,
- Appendix B: York Region's Tree Condition Rating Specifications.

2 EXISTING CONDITIONS

The study area is located west of Bayview Avenue and north of John Street, within the City of Markham, and includes portions of municipal addresses 7700, 7750 and 7755 Bayview Avenue. The wider area is heavily developed with a variety of urban land uses. A woodland occupies the western portion of the study area and is connected to the larger woodlands associated with the Pomona Creek corridor approximately 300 m west.

A majority of the vegetation found within the site area is young to mature. Trees inventoried within the proposed development area consist of urban tolerant, native and non-native cultivars that range in size from less than 10 cm in diameter to 73 cm DBH.

Species consist of:

- American Elm (*Ulmus americana*);
- Amur Maple (*Acer ginnala*);
- Apple (*Malus* sp.);
- Ash (*Fraxinus* sp.);
- Black Cherry (*Prunus serotina*);
- Black Pine (*Pinus nigra*);
- Blue Spruce (*Picea pungens*);
- Canada Poplar (*Populus x canadensis*);
- Chanticleer Pear (*Pyrus calleryana* "Chanticleer");
- Cherry (*Prunus* sp.);
- Eastern White Cedar (*Thuja occidentalis*);
- European Buckthorn (*Rhamnus cathartica*);
- Freeman's Maple (*Acer x freemanii*);
- Green Ash (*Fraxinus pennsylvanica*);
- Horse Chestnut (*Aesculus hippocastanum*);
- Little-leaf Linden (*Tilia cordata*);
- Manitoba Maple (*Acer negundo*);
- Norway Maple (*Acer platanoides*);
- Norway Spruce (*Picea abies*);
- Pear (*Pyrus* sp.);
- Pyramidal English Oak (*Quercus robur* "Fastigiata");
- Red Maple (*Acer rubrum*);
- Scots Pine (*Pinus sylvestris*);
- Serviceberry (*Amelanchier* sp.);
- Slippery Elm (*Ulmus rubra*);
- Sugar Maple (*Acer saccharum*);
- Swamp White Oak (*Quercus bicolor*);
- Tamarack (*Larix laricina*);
- Thornless Honey-locust (*Gleditsia triacanthos* var. *inermis*);

- Tulip Tree (*Liriodendron tulipifera*); and,
- White Spruce (*Picea glauca*).

Condition:

- Tree health ranges between good and poor, with a majority of trees in good condition. Some dead trees are present, including a recently planted Tulip Tree, mature Norway Spruce, Sugar Maple, Apple and a few dead Ash with evidence of Emerald Ash Borer (EAB) damage.
- Signs of decline and defects were observed on some live trees including:
  - Deadwood ranging between <10 to 95%;
  - Cut main stems;
  - Dead main stems;
  - Exposed roots with wounds;
  - Soil erosion at base;
  - Girdling roots;
  - Epicormic shoots;
  - Suckering stems at base;
  - Water sprouting;
  - Irregular trunk form;
  - Codominant stems with included bark;
  - Weak 'V' shaped branch unions;
  - Wounds with poor compartmentalization;
  - Wounds with decay;
  - Heavy trunk lean;
  - Fungal growth on trunk;
  - Evidence of insect infestation;
  - Galls on branches;
  - Frost cracks;
  - Peeling bark;
  - Dead branches;
  - Broken branches;
  - Vines growing into canopy
  - Suppressed growth due to shading from adjacent vegetation;
  - Canopy dieback; and,
  - Symptoms of decline in Ash trees observed due to the presence of EAB include:
    - D' shaped exit holes in bark;
    - Suckering at the base;
    - Water sprouting up trunk;
    - Woodpecker damage from woodpeckers eating the larvae; and/or,
    - Deadwood in crown.

3 TREE INVENTORY

The tree inventory was conducted on June 21, 2018 and a second site visit was carried out on August 4, 2021 to capture additional trees on properties 7700, 7750 and 7755 Bayview Avenue that have the potential to be impacted by site disturbance associated with the installation of a stormwater sewer pipeline. The following characteristics were collected for each tree inventoried:

- Individual tree number;
- Species;
- DBH;
- Approximate dripline radius;
- Location / By-law information; and,
- Notes on general tree health / condition.

Trees were identified in accordance with the City of Markham's Tree Preservation By-law 2008-96 (2017), the City's Tree Permit Requirements (2019), the City's Tree Inventory, Analysis, and Preservation Requirements (2009) and the York Region's Street Tree and Forest Preservation Guidelines (2016):

- All trees situated within the City of Markham's property boundaries and trees within the adjacent private properties within 6 m from potential impact;
- All trees within the York Region's road allowance for Bayview Avenue within 10 m of site disturbance;
- Individual trees have been identified using a pre-numbered aluminum tree tag affixed to the tree (i.e. #464 to 537, 818 to 913 and 1901 to 1994);
- Tree groupings have been identified using an alpha-numerical identification (i.e. #C01); and,
- GPS coordinates of individual trees were recorded at the location of each trunk.

A total of 162 trees were assessed for this report (Trees #464 to 537, 818 to 913 and 1901 to 1994 and four (4) trees within hedgerow C01).

4 DEFINITIONS

The following are the definitions of the assessment categories utilized in this Arborist Report, the City of Markham's Tree Preservation By-law 2008-96 (2017), the York Region's Street Tree and Forest Preservation Guidelines (2016) and the ISA Arborists' Certification Study Guide (2010):

Tree Number	This number refers to the tree identification number on the development plan.
Tree Grouping	A tree grouping is more than 1 tree located within close proximity of other trees with no separation between the canopies.
Species	The botanical and common names are provided for each tree.
DBH	This refers to diameter (in centimetres) at breast height (DBH) and is measured at 1.37 m above ground level for each tree. For multi-stemmed trees that fall under the City of Markham's Tree Permit Requirements, the DBH of the three (3) largest trunks are used to determine trunk diameter for multi-stemmed trees. For multi-stemmed trees that are protected under the York Region's guidelines, the DBH of the largest-DBH stem is used to determine compensation.
Canopy Spread	This represents the approximate extent of an individual tree's branch structure on two axes (in metres).
Tree Protection Zone	This refers to the preservation area of the tree to be protected with tree protection measures. No construction activities are to be undertaken within this zone.
Suppressed	Refers to trees that have their crowns completely overtopped by adjacent trees and received limited to very limited sunlight.
Codominant Stem	Stems equal in size and relative importance that make up the overall crown of the tree.
Union	Junction point where two or more stems meet. A 'U' shaped junction indicates a well-formed union. A 'V' shaped junction indicates a weakly formed union, whereas stems grow and increase in girth, weak bark called 'included bark' forms within the junction and stems start to push apart causing vertical cracks and loss of structure.
Compartmentalization	This is a naturally occurring process by which chemical and physical barriers are synthesized to prevent the spread of decay and disease in trees.

Irregular Tree Form	Refers to branches and stems that have formed irregularly often resulting in contorted growth, weak attachments, weakly formed unions and codominant stems. The irregular growth of scaffold (lateral) branches typically leads to damage to other scaffold branches.
Hazard Tree	Refers to a tree that is severely damaged to the extent that it is or poses an immediate safety threat to persons or property.
Dead, Dying or Diseased Tree	Refers to a tree with no living tissue, a tree where seventy (70) percent or more of its crown is dead or a tree infected by a lethal pathogen, as certified by a Qualified Tree Expert.
Injury	Means lasting damage to a tree which has or is likely to have the effect of inhibiting or terminating its growth, but does not include pruning or removing branches for maintenance purposes, provided that any such pruning or branch removal is limited to the removal, as appropriate, of not more than one-third of the live branches or limbs of a tree, and “injure” “injured”, “injuring” and similar words have the same meaning.
Adverse Impacts	As stated in the York Region’s Street Tree and Forest Preservation Guidelines, adverse impacts are defined as, “any activities which may result in short-, medium- or long-term decline in the health, structural condition, stability or other biological or physical characteristics of a tree to be protected.”
Root Zone	Refers to the subterranean area around the tree measured from the trunk to up to 2 to 3 m from the dripline.
Critical Root Zone	The minimum area of the root system necessary to maintain vitality or stability of the tree. Typically, this area extends to the drip line of the tree. The severing of one root can cause approximately 5-20% loss of the root system. A reduction of this area by greater than 30% can pose stability concerns for the tree.

Tree Assessment Criteria:

Trunk Integrity (T.I.)	This is an assessment of the trunk for any defects or weaknesses. It is measured on a scale of poor, fair, good.
Canopy Structure (C.S.)	This is an assessment of the scaffold branches, unions and the canopy of the tree. This is measured on a scale of good, fair and poor.

Canopy Vigour (C.V.)	This is an assessment of the health of the tree and assesses the amount of deadwood and live growth in the crown as compared to a 100% healthy tree. The size, colour and amount of foliage are also considered in this category. This is measured on a scale of good, fair and poor.
GOOD	Dead branches less than 10%; signs of good compartmentalization on any wounds, no structural defects.
FAIR	10-30% dead branches, size or occurrence of wounds present some concerns, minor structural defects.
POOR	More than 30% dead branches, weak compartmentalization, early leaf drop, presence of insects or disease, major structural defects.

5 POLICY CONTEXT

This section summarizes the various municipal, regional, provincial and federal planning policies and regulations related to the tree inventory and apply to the project. Thus, they provide the policy context for this Arborist Report. The City of Markham's TAPP requirements stated in the City's Tree Permit Requirements (2019) outlines specific guidelines in determining TPZs. York Region's Street Tree and Forest Preservation Guidelines (2016) were used in calculating TPZ areas for Region-owned trees that fall within the Regional road allowance.

5.1 CITY OF MARKHAM TREE PRESERVATION BY-LAW

The City of Markham's Tree Preservation By-law to Regulate or Prohibit the Injury or Destruction of Trees within the Town of Markham (By-law 2008-96, 2017) applies to any tree within the City that falls outside of the York Region's road allowance limits and has a DBH of 20 cm or greater. A permit is required prior to any tree injury or tree removal.

Applicability to Project:

- Applies to 109 trees beyond the Regional road allowance limit with a DBH of 20 cm or greater with the potential for tree injury or tree removal (Trees #P01 to P08, P11 to P18, 464 to 468, 471, 474 to 476, 478 to 493, 518, 520 to 525, 527 to 532, 537, 818 o 821, 822 to 825, 828 to 832, 833 to 835, 865 to 867, 869, 870, 877, 879, 881, 882, 884, 887, 895, 899, 901, 902, 904, 905, 907 to 910, 913, 1916 to 1918, 1920, 1922 to 1924, 1926 to 1929, 1985 and 1988 to 1994).

5.2 YORK REGION BY-LAWS

5.2.1 REGIONAL RIGHT-OF-WAY (REGION OF YORK)

The York Region Street Tree and Forest Preservation Guidelines (2016) applies to Region-owned street trees and natural vegetation within the road allowance. These Guidelines do not apply to site disturbance located beyond the Regional ROW, provided that Region-owned street trees and/or natural vegetation will not be injured by the proposed site disturbance affecting trees located on municipal (City of Markham), or private property.

These Guidelines apply where:

- Site disturbance is proposed in the Regional road allowance and any Region-owned street trees are situated within 10 m or less of the limit of potential site disturbance, and/or trees greater than 10 cm DBH are situated outside the Regional road allowance and within 10 m of the limit of potential site disturbance, and/or:
- Site disturbance is proposed outside of the Regional road allowance and Region-owned street trees are situated within 10 m of the limit of potential site disturbance, and/or;

- Site disturbance is proposed outside of the Regional ROW and Region-owned street trees are situated more than 10 m from the limit of potential site disturbance, but may be adversely impacted by the proposed site disturbance.

Applicability to Project:

- Applies to two (2) trees within the road allowance of Bayview Avenue within 10 m of the limit of potential site disturbance (Trees #900 and 901).

5.2.2 FOREST CONSERVATION BY-LAW (REGION OF YORK)

The Regional Municipality of York has a By-Law that prohibits or regulates the destruction or injuring of trees in the Regional Municipality of York (By-Law No. 2013-68).

'WOODLAND' means land at least 1 ha in area with at least:

- 1000 trees, of any size, per ha;
- 750 trees, measuring over 5 cm DBH, per ha;
- 500 trees, measuring over 12 cm DBH, per ha; and,
- 250 trees, measuring over 20 cm DBH, per ha.

'WOODLOT' means land at least 0.2 ha in area and no greater than 1 ha in area, with at least:

- 200 trees, of any size, per 0.2 ha;
- 150 trees, measuring over 5 cm DBH, per 0.2 ha;
- 100 trees, measuring over 12 cm DBH, per 0.2 ha; and,
- 50 trees, measuring over 20 cm DBH, per 0.2 ha.

Applicability to Project:

- Portions of the study area and adjacent lands are mapped as Woodlands on Map 5 (December 2018) in the York Region Official Plan (YROP - Office Consolidation: April 2019). Aerial imagery and woodland mapping prepared by the Ministry of Natural Resources and Forestry (MNRF, 2021) indicate that the woodland extends westward and is contiguous with the woodland associated with the Pomona Creek valley corridor. Through an Environmental Impact Study (EIS) prepared by WSP in 2020 and during the site investigations, it was determined that the canopy coverage is continuous with the woodland adjacent to the study area. As stated in the EIS, “the woodland within the area proposed for impact can be considered to be of low botanical quality and limited ecological function given the sparse understory, and in some cases manicured understory, presence of introduced species and existing level of disturbance” (WSP, 2020). Impacts associated with the stormwater sewer pipe installation are anticipated to be limited to the disturbed woodland edge; therefore, impacts to the overall function as a significant woodland are not anticipated.

5.3 TREE INJURY

5.3.1 CITY OF MARKHAM TREE INJURY POLICY

The City of Markham's Tree injury policy is defined as: The minimum tree protection zone not being protected. The City of Markham's TAPP requirements (2019) outlines specific TPZ guidelines for trees situated on municipal property outside of the Region's road allowance limits.

Applicability to Project:

- Applies to nine (9) inventoried trees located on municipal property with a DBH of 20 cm or greater (Trees #469, 480, 489, 528, 821, 879, 882, 886 and 1925).

5.3.2 YORK REGION TREE PRESERVATION GUIDELINES (2016)

According to the York Region's Tree Preservation Guidelines (2016), a TPZ area must be implemented if construction is proposed within the area and has the potential to encroach within tree protection limits and cause tree injury. Tree preservation within a TPZ is intended to limit and mitigate adverse impacts to trees associated with site disturbance.

- The York Region's Guidelines apply where site disturbance is proposed within the 49 m Regional ROW for:
  - All street trees that fall within 10 m or less of potential construction limits; and,
  - Trees greater than 10 cm DBH that are situated outside the ROW within 10 m of the limit of potential site disturbance.
- The York Region's Guidelines apply where site disturbance is proposed outside of the ROW for:
  - Street trees that are situated within 10 m of potential site disturbance; and,
  - Street trees that are situated more than 10 m from proposed construction limits, but have the potential for injury.

Applicability to Project:

- There are no trees situated within the regional ROW that are proposed to be injured or removed.

5.4 CANADA FOOD AND INSPECTION AGENCY

Canada Food and Inspection Agency (CFIA) Directive D-03-08: Phytosanitary Requirements to Prevent the Introduction into and Spread within Canada of the Emerald Ash Borer (*Agrilus planipennis*), (Fairmaire) applies to Ash Species (*Fraxinus* sp.) observed on properties that are located within the Emerald Ash Borer (EAB) Regulated Areas of Canada, prepared by the CFIA and dated February 2017. This area covers all of south and central Ontario and western Quebec. Ash trees that require removal are subject to this directive.

The CFIA restricts the movement of all Ash material including wood, bark, chips or bark chips from being transported outside of the Regulated Area. A Movement Certificate is required by the CFIA for any Ash material leaving the Regulated Area.

Ash are permitted to be chipped on site and/or removed or cut down and removed from site. Chipped Ash material that is to remain on site must be ground or chipped to a size of less than 2.5 cm in any two dimensions. All Ash material chipped or whole that is to be removed from site must be disposed of within the Regulated Areas of Canada. Please refer to the following link to access a map showing the Emerald Ash Borer Regulated Areas of Canada:

http://www.inspection.gc.ca/plants/plant-pests-invasive-species/insects/emerald-ash-borer/areas-regulated/eng/1347625322705/1367860339942

Applicability to Project:

- There is one (1) Green Ash tree (*Fraxinus pennsylvanica*) (Tree #907) on the 7700 Bayview Avenue property, which is in good to fair condition although there is evidence of EAB infestation.
- Nine (9) dead Ash trees with evidence of EAB infestation were identified within the 7700 Bayview Avenue property limits.

5.5 ENDANGERED SPECIES ACT, 2007

Species designated as Threatened or Endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO), otherwise known as Species at Risk in Ontario (SARO), and their habitats (i.e., areas essential for breeding, rearing, feeding, hibernation and migration) are automatically afforded legal protection under the Endangered Species Act, 2007 (ESA) (Government of Ontario 2007). The ESA (Subsection 9 (1)) states that:
"No person shall,

a) kill, harm, harass, capture or take a living member of a species that is listed on the SARO List as an extirpated, endangered or threatened species;

b) possess, transport, collect, buy, sell, lease, trade or offer to buy, sell, lease or trade;
   (i) a living or dead member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;
   (ii) any part of a living or dead member of a species referred to in subclause (i);
   (iii) anything derived from a living or dead member of a species referred to in subclause (i); or

c) sell, lease, trade or offer to sell, lease or trade anything that the person represents to be a thing described in subclause (b) (i), (ii) or (iii)".

Clause 10(1) (a) of the ESA states that:
"No person shall damage or destroy the habitat of a species that is listed on the SARO list as an endangered or threatened species".

In order to balance social and economic considerations with protection and recovery goals, the ESA also enables the Ministry of Natural Resources and Forestry (MNRF) to issue permits or enter into agreements with proponents in order to authorize activities that would otherwise be prohibited by subsections 9 (1) or 10 (1) of the ESA provided the legal requirements of the ESA are met.

Applicability to Project:

- No species at risk were observed within the limits of work.

6 DISCUSSION

This section is a discussion of the retention potential, preservation and/or impacts to trees within the study area. Potential impacts include:

- Site disturbance;
- Excavation:
- Microtunneling;
- Grading;
- Construction;
- Staging areas; and/or,
- Material storage.

Determinations made with respect to tree preservation and removal are based on the degree of impact that will occur within their TPZs. At the time this report was prepared, general site and proposed subdivision plans had been provided to the Arborist for coordination. Refer to the following section and Table 1. Table 1 details the species, quantity, condition, minimum TPZ and recommendation (i.e. remove, preserve, or retain) for each tree included in this report.

The proposed storm sewer pipeline installation is subject to the City of Markham's Tree Preservation By-law 2008-96A (2017), the City's Tree Permit Requirements (2019), the City's Tree Inventory, Analysis, and Preservation Requirements (2009) and the York Region's Street Tree and Forest Preservation Guidelines (2016).

Vegetation recommendations:

- Retain: are determined to be beyond the limits of potential impact and do not require protection measures.
- Preserve: are deemed to be minimally affected and will be protected through either general or specific mitigation measures.
- Remove: are within work limits and would not be able to withstand construction related activities or TPZ encroachment. This designation also may be applied to trees that are dead, in poor condition or trees that could pose future safety concerns and trees dying as a result of a disease or insect infestation.
- Transplanted: are deemed to be within the limit of work, in good condition and typically under 30 cm DBH. Transplanting of trees is dependent on available space on site.

6.1 ASSUMPTIONS

6.1.1 TREE REMOVAL

- Tree removal is based on the degree of excavation / disturbance within the TPZ considering tree species, size, condition and the number of critical roots that would be impacted that are vital to sustaining overall tree health and stability.

- This amount of impact above is likely to cause a significant and irreversible decline in health of the tree.

6.1.2 TREE PRESERVATION

- Preservation of trees is considered where an encroachment, excavation or disturbance into the TPZ is expected to be minor or nil and that tree health and stability will not be adversely impacted with the implementation of protection measures.
- Mitigation measures will reduce potential impacts to the tree therefore allowing for the tree to be preserved.

6.1.3 TREE INJURY

- Tree injury is based on percent of encroachment into TPZs within the development area.

6.1.4 TREE PROTECTION ZONE ENCROACHMENT

- Reductions necessary for construction.

6.2 CITY OF MARKHAM TREE PRESERVATION BY-LAW

This By-law applies to all trees situated on the subject property that fall outside of the York Region's road allowance limits with a DBH of 20 cm or greater.

6.2.1 TREE REMOVAL

Impacts to trees will occur during the installation of new watermain and storm and sanitary sewer pipelines.

- Thirty-five (35) trees greater than or equal to 20 cm in diameter (Trees #P17, 464 to 468, 471, 479, 483, 484, 488, 524, 525, 529 to 532, 537, 819, 869, 870, 877, 881, 887, 913, 1924, 1926, 1985, 1986, 1988 to 1992 and 1994) will not survive construction and are recommended for removal.

Fifteen (15) trees are considered to be dead. The removal of these trees is also recommended to minimize safety concerns. These trees are exempt from compensation.

6.2.2 TREE PRESERVATION

Preservation is limited to trees beyond 6 m from the limits of proposed sewer pipe construction with no encroachment into the tree protection zone can be retained. These trees will not require tree protection hoarding.

Trees where construction limits are less than 6 m away from tree protection zones are not proposed to be adversely impacted by construction, but will require tree protection hoarding. The table below details trees by category (retain or preserve):

Tree Preservation

Category	Tree ID's	TPZ
Retain	P07, P08, P11 to P15, 474, 475, 481, 482, 485, 486, 491 to 493, 518, 521, 522, 822, 828 to 831, 834, 895, 899, 904, 905, 907 to 909, 1929	N/A
Preserve	P03, P04, 818, 823, 824, 832, 476, 478, 490, 527, 866, 867, 1920, 1922, 1923	1.8m
	P01, P02, P06, P16, P18, 487, 520, 820, 865, 884, 1918, 1927, 1928, 1993	2.4m
	P05, 480, 523, 902, 1916	3.0m
	910	4.2m

Hoarding to be installed along these limits, as shown on plan TM-1. TPZ barrier to consist of:

- Continuous and solid plywood on 1.22 m (4') height wood frames on a 38 x 89 mm (2" x 4") wood frame for all trees within the woodland installed at the minimum TPZ. Hoarding to be secured to the ground and installed with screws.
- In circumstances where sightline is a safety issue, the TPZ shall be orange safety fencing mounted on a wood frame similar to above.

Trees within 6 m of the proposed impacts should be protected using a TPZ barrier as described above, as well as general protection measures outlined in this report and in TM-2.

6.2.3 TREE PROTECTION ZONE REDUCTION (TPZ – TREE INJURY)

Where tree protection zones will require a reduction due to work that will occur within development limits, trees will be considered to be 'Injured'.

The location of the limit of work for the proposed storm sewer pipeline installation will encroach into the TPZs of nine (9) trees (Trees #469, 480, 489, 528, 821, 879, 882, 886 and 1925). Given the location of these trees to the proposed limits of work, there is potential for root damage from microtunneling and/or compaction from construction traffic. Any roots and branches encountered are to be pruned in accordance with the recommendations in Section 7. Refer to the following tree injury details:

- Reduction of the TPZ to the limit of work (to be refined at detailed design); and,
- Injury to roots and tree health will be mitigated through the application of air spade excavation.

6.3 YORK REGION RIGHT-OF-WAY

The York Region's Street Tree and Forest Preservation Guidelines (2016) apply when construction work is proposed within and adjacent to the Region's ROW and trees located within the Regional road allowance have the potential to be adversely impacted.

6.3.1 TREE PRESERVATION

Preservation is limited to trees beyond the limits of proposed sewer pipeline construction. There are two (2) trees (Trees #900 and 901) that are within 6 m of proposed construction limits. Although construction impacts will not encroach into the TPZ, these trees will require tree protection hoarding at the TPZ limit. The table below details trees by category (preserve) and TPZ area.

Tree Preservation

Category	Tree ID's	TPZ
Preserve	900	2.4m
	901	2.8m

Hoarding to be installed along these limits, as shown on plan TM-1. TPZ barrier to consist of:

- Continuous and solid plywood on 1.2 m (4') height wood frames with the width of individual frame sections shall not exceed 2.4 m on a 38 x 89 mm (2" x 4") wood frame for all trees installed at the minimum TPZ. Hoarding to be secured to the ground using a wooden stake installed at a minimum of 125 mm into the ground and installed with wood screws. A minimum of one support leg shall be installed per 2.4 m (8') of linear TPZ barrier distance, or per frame section. Corner bracing may be installed between adjacent faces of the TPZ barrier to provide additional stability.
- Orange construction safety fencing shall be securely and tightly stapled to the outside of the TPZ barrier frame to construct the framed construction fencing TPZ barrier type. Other fencing materials (e.g., chicken wire, green snow fence, etc.) shall not be used.
- Plywood or oriented strand board (OSB) sheathing with a minimum thickness of 3/8" shall be affixed using wood screws to the outside of the TPZ barrier frame to construct the solid hoarding TPZ barrier type. Nails, staples or other fasteners shall not be used.

These 2 trees should be protected using a TPZ barrier as described above, as well as general protection measures outlined in this report and in TM-2.

7 MITIGATION MEASURES

- The area of disturbance associated with the proposed storm sewer pipeline construction is within the minimum TPZs of 56 of the inventoried trees (including 34 trees greater than or equal to 20 cm in diameter: Trees #P17, 464 to 468, 471, 479, 483, 484, 488, 524, 525, 529 to 532, 537, 819, 869, 870, 877, 881, 887, 913, 1924, 1926, 1985, 1986, 1988 to 1992 and 1994) shown on Figure TM-1 and Table 1, and are therefore recommended for removal.
- A total of 53 trees (P07, P08, P11 to P15, 474, 475, 481, 482, 485, 486, 491 to 493, 518, 521, 522, 822, 828 to 831, 834, 895, 899, 904, 905, 907 to 909, 1929) included in this inventory will not require protection measures since they are beyond the minimum limit from potential site disturbance (6 m for City trees and 10 m for Regional street trees).
- There are 35 trees (Trees #P03, P04, 818, 823, 824, 832, 476, 478, 490, 527, 866, 867, 1920, 1922, 1923, P01, P02, P06, P16, P18, 487, 520, 820, 865, 884, 1918, 1927, 1928, 1993, P05, 480, 523, 902, 1916 and 910) that are City trees 6 m within proposed construction activities and two (2) Regional street trees within 10 m of removal areas (Trees #900 and 901) that can be preserved and should therefore be protected to prevent the storage of materials and construction traffic within the dripline. These trees can be preserved with the establishment of a TPZ barrier as well as using general preservation measures described in this report and in TM-2.
- There are nine (9) trees (Trees #469, 480, 489, 528, 821, 879, 882, 886 and 1925) where TPZ encroachments will occur due to site disturbance; therefore, these trees will be considered to be 'Injured' and will require more specific preservation measures described in this report and in TM-2.
- There are 15 dead trees that are recommended to be removed and are exempt from compensation.

7.1 PRESERVATION AND PROTECTION RECOMMENDATIONS

The survival rates for trees, which are in proximity to construction, are dependent on the resultant changes to a variety of environmental and anthropogenic factors. These construction activities bring about changes to a variety of environmental features such as the existing microclimate that includes winds, air temperature, soil moisture, amount of available sunlight, soil quality, and the level of the water table. Increased human activities may also damage the structure and/or physiological activities of the trees. The full effects of the damage may not appear until several years after its occurrence. Thus, it is essential that both vegetative clearing and preservation methods follow the guidelines below. The guidelines are organized into those requirements set out by the following agencies:

- Tree Assessment and Preservation Plan (TAPP) requirements from the City of Markham's Tree Permit Requirements (2019);
- The City's Tree Inventory, Analysis, and Preservation Requirements (2009);
- The York Region's Street Tree and Forest Preservation Guidelines (2016);
- Applicable provincial regulations; and,
- Additional recommendations that are in keeping with good horticultural and construction practices.

7.2 CITY OF MARKHAM TREE PRESERVATION REQUIREMENTS AND PROVINCIAL REGULATIONS

7.2.1 CITY OF MARKHAM TREE PRESERVATION SPECIFICATIONS

- Prior to the commencement of construction, tree protection barriers shall be installed in accordance with the City of Markham's Tree Preservation Requirements, and in accordance with the approved TPP and Arborist Report.
- All existing trees which are to remain shall be fully protected with fencing erected around the entire perimeter of the TPZ.
- Areas within the protective fencing shall remain undisturbed and shall not be used for the storage of building materials or equipment.
- This work shall be completed, to the satisfaction of the Commissioner of Development Services, prior to the issuance of Building Permits for the site development. The developer or his/her agent shall take every precaution necessary to prevent damage to trees or shrubs to be retained.
- No rigging cables shall be wrapped around or installed in trees; and surplus soil, equipment, debris or materials shall not be placed over root systems of the trees within the protective fencing. No contaminants will be dumped or flushed where feeder roots of trees exist.
- Where limbs or portions of trees are removed to accommodate construction work, they will be carefully removed by an ISA certified Arborist.
- Where root systems of protected trees are exposed directly adjacent to or damaged by construction work, they shall be trimmed neatly by a qualified arborist and the area back filled with appropriate material to prevent desiccation.
- If grades around trees to be preserved are likely to change, the developer shall be required to take such precaution as dry welling and root feeding to the satisfaction of the Commissioner of Development Services.
- Trees to be preserved that have died or have been damaged beyond repair, shall be subject to suitable compensation as determined by the City of Markham and review of the Tree Inventory and Analysis.
- An ISA Certified Arborist shall be on site for any work which impacts any tree or Tree Protection Zone.
- The following activities are prohibited within a TPZ:
  - demolition, construction, replacement or alteration of permanent or temporary buildings, structures or pathways of any kind;
  - installation of large stones or boulders;
  - altering grade by adding or removing soil or fill, excavating, trenching, topsoil or fill scraping, compacting soil or fill, dumping or disturbance of any kind;
  - storage of construction materials, equipment, wood, branches, leaves, soil or fill, construction waste or debris of any sort;
  - application, discharge or disposal of any substance or chemical that may adversely affect the health of a tree;
  - causing or allowing water or discharge, to flow over slopes or through natural areas;
  - access, parking or movement of vehicles, equipment or pedestrians;
  - cutting, breaking, tearing, crushing, exposing or stripping tree's roots, trunk and branches;
  - nailing or stapling into a tree, including attachment of fences, electrical wires or signs;

- stringing of cables or installing lights on trees;
- soil remediation, removal of contaminated fill; and,
- excavating for directional or micro-tunnelling and boring entering shafts.

- Every precaution must be taken to prevent damage to trees and root systems from damage, compaction and contamination resulting from the construction to the satisfaction of the City of Markham. The Contractor must report immediately to the City any accidental/unforeseen damage to trees such as broken limbs and damage to roots so that the damage can be assessed and mitigated as deemed appropriate.

7.2.2 MIGRATORY BIRD PROTECTION

- Nesting migratory birds are protected under the Migratory Birds Conservation Act, MBCA (1994) and Regulations.
- No work is permitted to proceed that would result in the destruction of nests or eggs, or the wounding or killing of bird species protected under the MBCA and / or Regulations under that Act. It is the responsibility of the proponent and/or contractor to ensure compliance with the MBCA. Guidance for assessing potential risk of MBCA contravention and other relevant information is found on Environment Canada's website:

  http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=1B16EAFB-1

- In general, it is recommended that activities which could result in an MBCA contravention be conducted outside of the area-specific "Regional Nesting Period" (i.e. outside of April 1 to August 31). See nesting period and calendars here:

  http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1

- If works are proposed within the Regional Nesting Period, the proponent must demonstrate due diligence, including an evaluation of risk (per Environment Canada guidelines at the referenced web links) and appropriate avoidance / mitigation measures. This is a site-specific analysis based on habitat, species recorded / expected and potential risk due to activities.

7.3 CONSTRUCTION IMPLEMENTATION

- Prior to construction, a site meeting shall be held with the Contractor and Contract Administrator to review the clearing limits and confirm the installation location for the temporary tree protection fence.
- Tree protection barriers shall be clearly staked in the field and approved by the City of Markham prior to construction to ensure correct positioning of fencing and avoid unnecessary disturbance.
- In accordance to the City of Markham Tree Preservation and Protection Requirements, the TPZ Barrier:
  - Shall be shown on the Grading and Servicing Plan and used in the TAPP.
  - Shall be installed prior to any demolition, excavation or construction activity on the site. The purpose of the barrier is to define the TPZ, which is to be protected from any activity throughout the project.
  - Shall completely enclose all trees to be preserved, or up to property lines where applicable.
  - Shall be located at minimum TPZ requirements.
  - Shall be continuous and solid plywood on 1.2 m (4') height wood frames with the width of individual frame sections shall not exceed 2.4 m on a 38 x 89 mm (2" x 4") wood frame for all trees installed at the minimum TPZ.
  - Orange construction safety fencing shall be securely and tightly stapled to the outside of the TPZ barrier frame to construct the framed construction fencing TPZ barrier type.

- Plywood or oriented strand board (OSB) sheathing with a minimum thickness of 3/8” shall be affixed using wood screws to the outside of the TPZ barrier frame to construct the solid hoarding TPZ barrier type. Nails, staples or other fasteners shall not be used.
- Signage shall be installed on all sides of the TPZ barrier.
- Shall remain in place throughout the entire project, and cannot be altered, moved or removed in any way without the written authorization of York Region or its designate.
- No grade change, storage or temporary storage of any materials or equipment, washing of equipment, nor the dumping of any debris is permitted within this area.
- To avoid root zone impacts on trees to be retained, excavated material shall not be stored against the tree protection barrier.
- Inspection of the tree protection fencing, including photographic records and deficiency notes, shall be undertaken by a qualified tree professional and submitted to the Region once-weekly or on a schedule approved by the Region or its designate. Any deficiencies shall be noted in writing and any TPZ barriers found shall be repaired, modified or replaced as necessary within 48 hours.
- All removals should be felled into the work area to ensure that damage does not occur to the trees within the tree preservation zone. Upon completion of the tree removals, all felled trees are to be removed from the site, and all brush chipped. All brush, roots and wood debris should be shredded into pieces that are smaller than 25 mm in size to ensure that any insect pests that could be present within the wood are destroyed.

7.4 BRANCH PRUNING PRACTICES

- All limbs damaged or broken during the course of construction should be pruned cleanly, utilizing by-pass secateurs in accordance with approved horticultural practices. Should there be a potential risk of transfer of disease from infected to non-infected trees; tools must be disinfected after pruning each tree by dipping in methyl hydrate. This practice is particularly important during periods of tree stress and when pruning many members of the same genera, within which a disease could be spread quickly (i.e., Verticillium Wilt on Maples or Fireblight on genera of the Rosaceae family).
- All pruning cuts should be made to a growing point such as a bud, twig or branch, cut just outside the branch collar (the swollen area at the base of the branch that sometimes has a bark ridge), and perpendicular to the branch being pruned rather than as close to the trunk as possible. This minimizes the site of the wound. No stubs should be left. Poor cut location, poor cut angle and torn cuts are not acceptable.
- Extensive pruning is best completed before plants break dormancy. Pruning should be limited to the removal of no more than one third (1/3) of the total bud and leaf bearing branches. Pruning should include the careful removal of:
  1. Deadwood;
  2. Branches that are weak, damaged, diseased and those which will interfere with construction activity;
  3. Secondary leaders of conifers;
  4. Trunk and root suckers;
  5. Trunk waterspouts; and,
  6. Tight ‘V’-shaped or weak crotches (included unions).
- Any branches that overhang the work area and require pruning are to be pruned using good arboricultural practices utilizing by-pass secateurs in accordance with approved horticultural practices and/or American National Standard (ANSI) A300 (Part 1) – 2008 Pruning.
- The Contractor must report immediately any damage to trees such as broken limbs, damage to roots, or wounds to the main trunk or stem systems so that the damage can be assessed immediately.
- Any proposed pruning must be approved by the Region or its designate prior to undertaking of pruning.

7.5 ROOT COMPACTION

Root zone compaction protection must be installed wherever traffic, access, storage or other at-grade TPZ encroachment is planned, anticipated or likely within minimum required TPZs or other areas to be protected. Any TPZ encroachment must be permitted in writing by York Region or its designate.

Depending upon the intensity of encroachment, Light, Moderate or Heavy root zone compaction protection may be required.

7.6 ROOT-EXPLORATORY EXCAVATION

Root-exploratory excavation may be required to visually determine the extent of existing tree roots within an area of proposed excavation without damaging the roots where potential adverse impacts upon tree roots within TPZs may be difficult to accurately determine. Prior written approval of the Region is required before any root-exploratory excavation may be undertaken.

Root-exploratory excavation shall be undertaken utilizing pneumatic soil excavation (e.g., AirSpade or similar) or hydro-vac excavation. Excavation equipment shall be set to a sufficiently low pressure to avoid damage to root bark. Exposed roots shall be examined by a qualified tree professional and/or the Region. If significant structural roots (roots greater than 6 cm [2.5”]) in diameter or an abundance of fine roots are encountered, the proposed excavation may need to be relocated as recommended by the qualified tree professional and approved by the Region or its designate, or alternative excavation measures (e.g., tunneling) may need to be implemented. The excavated trench must be backfilled using native soil immediately following root-exploratory excavation if proposed excavation is to be relocated.

7.7 ROOT-SENSITIVE EXCAVATION AND ROOT PRUNING

If excavation is required within a TPZ and it is determined that the extent of root loss associated with the proposed excavation is not likely to result in significant tree decline, mortality or loss of rooting stability, root-sensitive excavation and root pruning shall be undertaken prior to conventional excavation.

The purpose of root-sensitive excavation and root pruning is to enable tree roots to be cleanly severed and to prevent root damage in the un-excavated area through tearing, fracturing or breakage caused by conventional excavation equipment.

7.8 STEM PROTECTION

In areas where TPZ encroachment is approved in writing by the Region or its designate and where impacts may occur upon the main stem or scaffold branches of a tree to be preserved, stem protection shall be installed.

Stem protection shall be constructed in the following manner:

1. Entire main stem shall be tightly triple-wrapped in burlap to a minimum height of 2.4 m (8').
2. Entire main stem shall be clad with 2x4s to a minimum height of 2.4 m (8'), secured with wire.
3. Alternative materials, such as plywood on a 2×4 frame, may be approved by the Region or its designate.
4. Stem protection greater than the minimum 2.4 m (8') height may be required by the Region or its designate.
5. Similar protection of significant scaffold limbs may be required by the Region. If required, such protection shall only be installed by a qualified tree professional.

8 ASH TREE REMOVAL

EAB-killed trees are likely to become a ‘Hazard’ and are more susceptible to wind throw. Ash infested with EAB that are in poor condition or dead located within the limit of work, or within 5 m of the limit of work / hoarding limit are recommended to be removed to remove potential hazards and provide space for restoration planting.

One (1) live Green Ash tree (Tree #907) identified within the property limits displayed signs and symptoms of EAB damage (insect exit holes, water sprouting). Although damage caused by the EAB was observed, this tree is in good to fair condition and is situated beyond 5 m of the limits of construction. Therefore, the removal of this tree is not required.

Nine (9) dead Ash trees were identified on the 7700 Bayview Avenue property. EAB damage was evidenced by the presence of exit holes and peeling bark. Since these trees are considered to be ‘dead, permits are not required for their removal.

9 TREE REMOVALS / INJURY / COMPENSATION

In accordance with the City of Markham's Tree Inventory, Analysis and Preservation Requirements stated in the Trees for Tomorrow: Streetscape Manual (2009), and the York Region's Street Tree and Forest Preservation Guidelines (2016), approval must be given prior to any tree removal. For all developments within the City of Markham, zero net loss of trees or canopy is permitted. Compensation is required for the removal of trees on the Regional road allowance in order to preserve canopy cover and to realize no net loss of trees. Preservation of existing trees and soil is generally preferred over replacement.

9.1 CITY OF MARKHAM

As a result of the impacts associated with the proposed development plan:

- There will be 35 City / private property trees greater than 20 cm in diameter that are recommended to be removed and 6 City / private property trees greater than 20 cm DBH that are proposed to be injured due to encroachments into their TPZs.
- There are 15 dead Ash trees with evidence of EAB exit holes.
- Species of Ash that are not undergoing treatment for EAB infestation are not considered for compensation; therefore, these trees are not eligible for compensation. Refer to the chart below that details tree removal/injury assessments made in Section 6.2 and 6.3.

Injury and Removal Compensation Chart

Applicable By-law	Trees to be Removed	Trees that will be Injured	Compensation Ratio (Injury & Removal)	Ash Trees (Exempt from Compensation / Permits)	Replacement Trees Required
City of Markham Tree Preservation By-law	29 (DBH 20 – 39 cm)	5 (DBH 20 – 39 cm)	DBH 20 - 39 cm: 2:1	0	34 x 2 = 68
	6 (DBH ≥40 cm)	1 (DBH ≥40 cm)	DBH ≥40 cm: Each tree shall have an individual valuation submitted.	0	7 x 2 = 14 *An individual valuation must be submitted.
Total Compensation					**82 Trees* (minimum)**

The total number of replacement trees for trees that will be removed and/or are injured due to the proposed storm sewer pipeline installation equals a minimum of **82** trees*. However, seven (7) of these trees proposed for removal / injury maintain a DBH of ≥40 cm and will therefore need to be evaluated on an individual basis by the City. Replacement trees are recommended to be planted where possible. If space is not available for replacement planting then a suitable alternate location will be agreed upon by the City, or cash in lieu could be considered (submitted 1 month after building completion). Approved

replacement or enhancement planting to be reviewed and accepted by the City of Markham. Tree replacements must occur within five (5) years of removal.

9.2 YORK REGION RIGHT-OF-WAY

The replacement cost for a given street tree is based on the Region's cost for planting a tree and maintaining it in good condition and under warranty for 3 years. The size of replacement tree plantings is 50 mm (5 cm) caliper; compensation value is currently set at $846.84/tree (2021).

Certain tree species are exempt from compensation Guidelines. Exempt trees include: Tree-of-Heaven (*Ailanthus altissima*), European/Black Alder (*Alnus glutinosa*), Russian Olive (*Elaeagnus angustifolia*), any tree of the genus Ash (*Fraxinus* sp.) not under an EAB treatment program, and any tree of the genus Buckthorn (*Rhamnus* sp.).

According to the proposed construction plan, Trees #900 and 901 are Regional street trees within 10 m of proposed development that can be preserved with general preservation methods. These trees require specific preservation measures in addition to general preservation measures to protect their TPZs from construction activities. Refer to the chart below that details tree protection recommendations made in Section 6.4.

The number of replacement trees is calculated as follows (e.g. A tree that is 38 cm DBH):

=[(DBH of tree to be removed/Replacement Tree Caliper Size) *Condition Rating]
=[(38 cm/5 cm)*Good Condition Rating 100%]
=7.6*1
=7.6
=8 replacement trees

Refer to Appendix B for condition rating specifications and their respective percentages.

Compensation value is calculated as follows (using the same example from above):

=(Number of replacement trees) * Replacement Cost
=8 replacement trees*$846.84/tree
=$6,774.72

York Region - Injury and Removal Compensation Chart

Tree to be Removed	Species	DBH of the Largest Stem (cm)	Condition Rating	Condition Rating Percentage (%)	**Number of Compensation Trees (Rounded)**	**Compensation Value ($)**
None	-	-	-	-	-	-
Totals					**-**	**-**

Compensation may be provided in the form of replacement plantings or through payment of equivalent compensation value. Since there are no trees proposed to be removed within the Region's ROW limits, no compensation is required to be provided to the York Region.

10 CONCLUSION

The vegetation found ranges from young to mature and characterized by a mixture of planted native and non-native urban tolerant deciduous and coniferous species.

A total of 162 trees (Trees #464 to 537, 818 to 913 and 1901 to 1994 and four (4) trees within hedgerow C01) are located within the area of proposed works and were assessed for this report. Given the implementation of the mitigation measures enclosed in this report, significant impacts to 56 of these trees will result in their removal. **Thirty-five (35)** of these trees are greater than or equal to 20 cm in diameter (Trees #P17, 464 to 468, 471, 479, 483, 484, 488, 524, 525, 529 to 532, 537, 819, 869, 870, 877, 881, 887, 913, 1924, 1926, 1985, 1986, 1988 to 1992 and 1994) and are therefore the City of Markham's Tree Preservation By-law requires permitting prior to their **removal**.

The removal of **14 dead trees** is recommended to minimize future safety hazards and requirements for tree compensation will not apply.

Fifty-three (53) trees to be retained (P07, P08, P11 to P15, 474, 475, 481, 482, 485, 486, 491 to 493, 518, 521, 522, 822, 828 to 831, 834, 895, 899, 904, 905, 907 to 909, 1929) will not require general, nor specific protection measures since they are beyond the minimum limit from potential site disturbance (6 m for City trees and 10 m for Regional street trees).

In total, **35 trees** (Trees #P03, P04, 818, 823, 824, 832, 476, 478, 490, 527, 866, 867, 1920, 1922, 1923, P01, P02, P06, P16, P18, 487, 520, 820, 865, 884, 1918, 1927, 1928, 1993, P05, 480, 523, 902, 1916 and 910) that are City trees 6 m within proposed construction activities and two (2) Regional street trees within 10 m of removal areas (Trees #900 and 901) that can be **preserved** and should therefore be protected using the establishment of a TPZ barrier as well as using general preservation methods.

There are **six (6) trees** (Trees #489, 528, 821, 835, 879 and 882) that fall under the City's tree protection requirements where TPZ encroachments will occur due to site disturbance; therefore, these trees will be considered to be '**Injured**' and will require more specific preservation measures. Care should be taken to protect trees to be retained with tree protection fencing as detailed on the attached plan (Figure TM-1).

Given the implementation of the mitigation measures enclosed in this report, including protection of trees beyond the limit of disturbance, significant impacts to trees to be preserved are not anticipated. Vegetation has been recommended to be retained and preserved beyond the construction limits. Proposed mitigation measures will minimize the detrimental effects from construction activities and will help to ensure that the good tree health will continue. Tree protection fencing shall be erected prior to the start of construction and demolition and maintained for the duration of the work. Priority should be given to protecting vegetation that will not be impacted by grading and construction as this vegetation along property lines provides a visual barrier, shade, noise and wind buffer between properties.

11 LIMITATIONS OF ASSESSMENT

It is our policy to attach the following clause regarding limitations. We do this to ensure that the client is aware of what is technically and professionally realistic in retaining trees.

The assessment of the trees presented in this report has been made using accepted arboricultural techniques. These include a visual examination of all the above ground parts of the tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of attack by insects, discoloured foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the trees and the surrounding site, and the proximity of property and people. Except where specifically noted, the trees were not cored, probed or climbed and there was no detailed inspection of the root crowns involving excavations.

Notwithstanding the recommendations and conclusions made in this report, it must be recognized that trees are living organisms, and their health and vigour constantly change over time. They are not immune to changes in site conditions or seasonal variations in the weather conditions.

While reasonable efforts have been made to ensure that the subject trees are healthy, no guarantees are offered, or implied, that these trees or any of their parts will remain standing. It is both professionally and practically impossible to predict with absolute certainty the behaviour of any single tree or its component parts under all circumstances. Inevitably, a standing tree will always pose some level of risk. Most trees have the potential for failure under adverse weather conditions, and the risk can only be eliminated if the tree is removed.

Although every effort has been made to ensure that this assessment is reasonably accurate, the trees should be re-assessed periodically. The assessment presented in this report is valid at the time of inspection.

WSP CANADA INC.

Carlene Perkin, B.Sc.
Arborist, ISA Certified Arborist ON-2306A
Ecology and EIA Department

12 LITERATURE CITED

- City of Markham. June, 2009. Trees for Tomorrow: Streetscape Manual. Appendix G: Tree Inventory, Analysis, and Preservation Requirements. 3 pp.
- City of Markham. July, 2019. Tree Permit Requirements. 5 pp.
- City of Markham. May, 2017. Tree Preservation By-law 2008-96. 14 pp.
- City of Markham. December 5, 2017. Tree Permit Requirements. 5 pp.
- Lily, Sharon. J. 2010. Arborists' Certification Study Guide. International Society of Arboriculture.
- WSP. September, 2020. Scoped Environmental Impact Study.
- York Region. 2018. Forest Conservation Bylaw. Bill No. 70. Bylaw No. 2013-68. 7 pp.
- York Region. December, 2016. York Region Street Tree and Forest Preservation Guidelines. 81 pp.

Table 1: Tree Preservation Charts

Project: Glynnwood Tributary Area EA | **Field Work Completed By:** Carlene Perkin | **Date of Fieldwork:** 8/4/2021 | **Weather:** 28C, sunny, low wind

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Recommendation Legend:
Trees to be Retained | TPZ Reduction / Encroachment | Dead / Hazard Trees
Trees to be Preserved | Tree to be Removed | Trees to be Transplanted

Tree #	*Botanical Name*	Common Name	Qty	DBH (cm)	Effecive DBH	Tree Condition			Dripline Radius (m)	Tree Location / By-law	Tree Protection Zone	York Region Condition Rating	York Region % for Compensation	Recommendation	Comments / Health
						TI	CS	CV							
Glynnwood Tributary Area EA - Understory species (trees / shrubs <5 to <10cm DBH consisted of: Common Buckthorn, Manitoba Maple, Green Ash, Yew species, Eastern White Cedar. Incidental wildlife observations included: American Goldfinch, Blue Jay, House Sparrow, Brown-headed Cowbird, American Robin, Red-breasted Nuthatch.															
865	*Acer platanoides*	*Norway Maple*	1	36	36	F	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Wound at base with compartmentalization
866	*Gleditsia triacanthos*	*Honey-locust*	1	24	24	G	G	G	4.5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
867	*Acer platanoides*	*Norway Maple*	1	23	23	G	G	G	4.5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Wound on trunk with poor compartmentalization
P01	*Acer platanoides*	*Norway Maple*	1	32	32	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Some dieback, dry leaves
P02	*Quercus robur "Fastigiata"*	*Pyramidal English Oak*	1	34	34	G	G	G	3	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Litter at base, waste accumulated at base and in branches of all oaks in row
P03	*Quercus robur "Fastigiata"*	*Pyramidal English Oak*	1	25	25	G	F	F	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve	Dead at top, 25% dieback
P04	*Quercus robur "Fastigiata"*	*Pyramidal English Oak*	1	28	28	G	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
P05	*Quercus robur "Fastigiata"*	*Pyramidal English Oak*	1	50	50	G	G	G	3	7755 Bayview Avenue - City of Markham	3	Good	100%	Preserve	
P06	*Gleditsia triacanthos*	*Honey-locust*	1	31	31	G	G	G	4.5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
P07	*Gleditsia triacanthos*	*Honey-locust*	1	43	43	G	G	G	6	7755 Bayview Avenue - City of Markham	3	Good	100%	Retain	
P08	*Amelanchier sp.*	*Serviceberry sp.*	1	10,13,15,15	27	G	G	F	4.5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Branch with peeling bark, dead at top, 5% dieback
P09	*Prunus sp.*	*Cherry sp.*	1	9	9	F	G	G	1	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Retain	Peeling bark, water sprouting
P10	*Pyrus calleryana "Chanticleer"*	*Chanticleer Pear*	1	12	12	G	F	F	1.5	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Retain	Branch dieback, 30% dieback
P11	*Gleditsia triacanthos*	*Honey-locust*	1	26	26	G	G	G	5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Frost crack with compartmentalization
Dead	*Liriodendron tulipifera*	*Tulip Tree*	-	8	8	-	-	-	-	7755 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead, epicormic shoot
P12	*Gleditsia triacanthos*	*Honey-locust*	1	31	31	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
P13	*Tilia cordata*	*Little-leaf Linden*	1	20	20	G	G	G	4	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
P14	*Gleditsia triacanthos*	*Honey-locust*	1	31	31	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
P15	*Tilia cordata*	*Little-leaf Linden*	1	28	28	G	G	G	6	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
P16	*Gleditsia triacanthos*	*Honey-locust*	1	31	31	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
P17	*Tilia cordata*	*Little-leaf Linden*	1	25	25	G	G	G	4	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	
P18	*Gleditsia triacanthos*	*Honey-locust*	1	32	32	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
868	*Pyrus sp.*	*Pear sp.*	1	15	15	P	P	P	2	7755 Bayview Avenue - City of Markham	1.8	Declining	40%	Preserve	Evidence of insect holes, dead branches with shriveled leaves, 75% dieback
869	*Acer platanoides*	*Norway Maple*	1	30	30	P	P	P	5	7755 Bayview Avenue - City of Markham	2.4	Declining	40%	Remove	Trunk wounds, dead branches with peeling bark , 70% dieback
870	*Picea glauca*	*White Spruce*	1	22	22	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Pruned lower branches, lean
871	*Acer ginnala*	*Amur Maple*	1	12	12	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
872	*Acer ginnala*	*Amur Maple*	1	7,11	13	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
873	*Acer ginnala*	*Amur Maple*	1	12	12	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
874	*Acer ginnala*	*Amur Maple*	1	8	8	F	G	G	3	7755 Bayview Avenue - City of Markham	1.2	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
875	*Acer ginnala*	*Amur Maple*	1	10	10	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
876	*Acer ginnala*	*Amur Maple*	1	8,11	14	P	P	P	3	7755 Bayview Avenue - City of Markham	1.8	Declining	40%	Remove	Cut stems at base, lean, peeling bark, dead stem, dead branches
877	*Acer platanoides*	*Norway Maple*	1	55	55	G	G	G	6	7755 Bayview Avenue - City of Markham	3.6	Good	100%	Remove	Frost crack with compartmentalization, exposed roots, dead House Sparrow at base
878	*Picea glauca*	*White Spruce*	1	15	15	P	P	P	3	7755 Bayview Avenue - City of Markham	1.8	Death Imminent	20%	Remove	Dead branches, dead at top, 95% dieback
879	*Acer platanoides*	*Norway Maple*	1	29	29	P	G	G	5	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve / Encroachment	Trunk wounds at base with poor compartmentalization, exposed girdling

Table 1: Tree Preservation Charts

Project: Glynnwood Tributary Area EA | **Field Work Completed By:** Carlene Perkin | **Date of Fieldwork:** 8/4/2021 | **Weather:** 28C, sunny, low wind

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Recommendation Legend:
Trees to be Retained | TPZ Reduction / Encroachment | Dead / Hazard Trees
Trees to be Preserved | Tree to be Removed | Trees to be Transplanted

Tree #	*Botanical Name*	Common Name	Qty	DBH (cm)	Effecive DBH	Tree Condition			Dripline Radius (m)	Tree Location / By-law	Tree Protection Zone	York Region Condition Rating	York Region % for Compensation	Recommendation	Comments / Health
						TI	CS	CV							
880	*Aesculus hippocastanum*	*Horse Chestnut*	1	8	8	G	G	G	0.5	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Remove	Burlap wrapped around trunk
881	*Picea glauca*	*White Spruce*	1	31	31	G	G	G	4.5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	
882	*Acer platanoides*	*Norway Maple*	1	40	40	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve / Encroachment	
883	*Picea glauca*	*White Spruce*	1	18	18	G	F	G	3.5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	Shaded by 882, lean
884	*Acer platanoides*	*Norway Maple*	1	35	35	G	G	G	5	7755 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Girdling root, frost crack with compartmentalization, Crimson King
885	*Picea glauca*	*White Spruce*	1	18	18	G	G	G	4	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	10% dieback at top
886	*Liriodendron tulipifera*	*Tulip Tree*	1	4	4	G	G	G	0.5	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Preserve / Encroachment	Small trunk wound
887	*Acer ginnala*	*Amur Maple*	1	10,13,15,16	27	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
888	*Acer ginnala*	*Amur Maple*	1	3,7	8	F	G	G	3	7755 Bayview Avenue - City of Markham	1.2	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
889	*Acer ginnala*	*Amur Maple*	1	3	3	P	P	P	3	7755 Bayview Avenue - City of Markham	1.2	Death Imminent	20%	Remove	Cut stems at base, lean, peeling bark, 95% dieback
890	*Acer ginnala*	*Amur Maple*	1	9	9	F	G	G	3	7755 Bayview Avenue - City of Markham	1.2	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
891	*Acer ginnala*	*Amur Maple*	1	4,4,4,9	11	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
892	*Acer ginnala*	*Amur Maple*	1	8	8	F	G	G	3	7755 Bayview Avenue - City of Markham	1.2	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
893	*Acer ginnala*	*Amur Maple*	1	12	12	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
894	*Acer ginnala*	*Amur Maple*	1	12,13	18	F	G	G	3	7755 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Cut stems at base, lean, peeling bark
C01	*Thuja occidentalis*	*Eastern White Cedar*	4	<10	<10	G	G	G	1	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Retain	Hedge
895	*Acer platanoides*	*Norway Maple*	1	42	42	G	G	G	6	7755 Bayview Avenue - City of Markham	3	Good	100%	Retain	
896	*Quercus bicolor*	*Swamp White Oak*	1	11	11	G	G	G	1.5	7755 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
897	*Quercus bicolor*	*Swamp White Oak*	1	9	9	G	G	G	1.5	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Retain	
898	*Quercus bicolor*	*Swamp White Oak*	1	8	8	G	G	G	1.5	7755 Bayview Avenue - City of Markham	1.2	Good	100%	Retain	
899	*Pinus nigra*	*Black Pine*	1	46	46	G	G	G	5	7755 Bayview Avenue - City of Markham	3	Good	100%	Retain	
900	*Picea glauca*	*White Spruce*	1	7	7	G	G	G	2	York Region Road Allowance	2.4	Good	100%	Preserve	Common Buckthorn adjacent to fence
901	*Picea abies*	*Norway Spruce*	1	28	28	G	G	G	3	York Region Road Allowance	2.8	Good	100%	Preserve	
1916	*Picea abies*	*Norway Spruce*	1	50	50	F	G	G	4	7700 Bayview Avenue - City of Markham	3	Good	100%	Preserve	Codominant stems with included bark
1917	*Picea abies*	*Norway Spruce*	-	30	30	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
1918	*Picea abies*	*Norway Spruce*	1	36	36	G	G	G	4	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
Dead	*Fraxinus sp.*	*Ash sp.*	-	40	40	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
1920	*Picea abies*	*Norway Spruce*	1	26	26	G	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
1922	*Picea abies*	*Norway Spruce*	1	20	20	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
902	*Picea abies*	*Norway Spruce*	1	44	44	G	G	G	5	7700 Bayview Avenue - City of Markham	3	Good	100%	Preserve	
1924	*Picea abies*	*Norway Spruce*	1	38	38	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	
1923	*Picea abies*	*Norway Spruce*	1	20	20	G	G	G	2.5	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Shaded out
1925	*Picea abies*	*Norway Spruce*	1	17	17	G	G	G	2.5	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve / Encroachment	Shaded out
1926	*Picea abies*	*Norway Spruce*	1	30	30	G	F	P	4	7700 Bayview Avenue - City of Markham	2.4	Declining	40%	Remove	Dead at top, 55% dieback
1927	*Picea abies*	*Norway Spruce*	1	34	34	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	

Table 1: Tree Preservation Charts

Project: Glynnwood Tributary Area EA | **Field Work Completed By:** Carlene Perkin | **Date of Fieldwork:** 8/4/2021 | **Weather:** 28C, sunny, low wind

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Recommendation Legend:
Trees to be Retained | TPZ Reduction / Encroachment | Dead / Hazard Trees
Trees to be Preserved | Tree to be Removed | Trees to be Transplanted

Tree #	*Botanical Name*	Common Name	Qty	DBH (cm)	Effecive DBH	Tree Condition			Dripline Radius (m)	Tree Location / By-law	Tree Protection Zone	York Region Condition Rating	York Region % for Compensation	Recommendation	Comments / Health
						TI	CS	CV							
1928	*Picea abies*	*Norway Spruce*	1	30	30	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
1929	*Picea abies*	*Norway Spruce*	1	34	34	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
818	*Picea abies*	*Norway Spruce*	1	22	22	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
903	*Picea abies*	*Norway Spruce*	1	17	17	G	G	G	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
904	*Ulmus rubra*	*Slippery Elm*	1	4,6,9,10,11,15	24	G	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
905	*Pinus sylvestris*	*Scots Pine*	1	32	32	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
906	*Acer negundo*	*Manitoba Maple*	1	8	8	G	G	G	2	7700 Bayview Avenue - City of Markham	1.2	Good	100%	Retain	Lean
907	*Fraxinus pennsylvanica*	*Green Ash*	1	20	20	F	F	G	4	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Retain	EAB evidence, water sprouting
908	*Acer x freemanii*	*Freeman's Maple*	1	28,33	43	G	G	G	10	7700 Bayview Avenue - City of Markham	3	Good	100%	Retain	Water sprouting, leaf nest in canopy, very healthy
909	*Acer x freemanii*	*Freeman's Maple*	1	22,39	45	G	G	G	10	7700 Bayview Avenue - City of Markham	3	Good	100%	Retain	Water sprouting, very healthy
910	*Acer x freemanii*	*Freeman's Maple*	1	33,40,40	65	G	G	G	10	7700 Bayview Avenue - City of Markham	4.2	Good	100%	Preserve	Very healthy
819	*Picea abies*	*Norway Spruce*	1	24	24	G	P	P	2	7700 Bayview Avenue - City of Markham	1.8	Declining	40%	Remove	75% dieback
820	*Picea abies*	*Norway Spruce*	1	32	32	G	G	G	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
Dead	*Picea abies*	*Norway Spruce*	-	14	14	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
911	*Picea abies*	*Norway Spruce*	1	19	19	G	G	G	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
821	*Picea abies*	*Norway Spruce*	1	30	30	G	G	G	3.5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve / Encroachment	
912	*Picea glauca*	*White Spruce*	1	10	10	G	G	G	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	
913	*Picea glauca*	*White Spruce*	1	5,6	30	F	G	G	2	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	
823	*Picea abies*	*Norway Spruce*	1	28	28	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
822	*Picea abies*	*Norway Spruce*	1	30	30	G	G	G	4	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
824	*Picea abies*	*Norway Spruce*	1	28	28	G	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
835	*Picea abies*	*Norway Spruce*	1	31	31	G	G	G	4	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	
834	*Picea abies*	*Norway Spruce*	1	31	31	G	G	G	4	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
833	*Picea abies*	*Norway Spruce*	-	27	27	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
825	*Picea abies*	*Norway Spruce*	-	20	20	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
828	*Picea abies*	*Norway Spruce*	1	33	33	G	G	G	4	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
829	*Picea abies*	*Norway Spruce*	1	30	30	G	G	G	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
830	*Picea abies*	*Norway Spruce*	1	22	22	G	G	G	3.5	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
Dead	*Picea abies*	*Norway Spruce*	-	17	17	-	-	-	-	7700 Bayview Avenue - City of Markham	-	Dead	0%	Remove - Condition	Dead
832	*Picea abies*	*Norway Spruce*	1	25	25	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
831	*Picea abies*	*Norway Spruce*	1	27	27	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Exposed roots from erosion on top of slope
1992	*Picea abies*	*Norway Spruce*	1	30	30	G	G	P	4	7700 Bayview Avenue - City of Markham	2.4	Potential Trouble	60%	Remove	Pruned, dieback at top 5m down
1993	*Picea abies*	*Norway Spruce*	1	39	39	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Pruned
1994	*Picea abies*	*Norway Spruce*	1	45	45	G	G	G	7	7700 Bayview Avenue - City of Markham	3	Good	100%	Remove	Pruned, exposed roots
464	*Picea abies*	*Norway Spruce*	1	21	21	G	G	G	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	Pruned, exposed roots

Table 1: Tree Preservation Charts

Project: Glynnwood Tributary Area EA | **Field Work Completed By:** Carlene Perkin | **Date of Fieldwork:** 8/4/2021 | **Weather:** 28C, sunny, low wind

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Recommendation Legend:
Trees to be Retained | TPZ Reduction / Encroachment | Dead / Hazard Trees
Trees to be Preserved | Tree to be Removed | Trees to be Transplanted

Tree #	*Botanical Name*	Common Name	Qty	DBH (cm)	Effecive DBH	Tree Condition			Dripline Radius (m)	Tree Location / By-law	Tree Protection Zone	York Region Condition Rating	York Region % for Compensation	Recommendation	Comments / Health
						TI	CS	CV							
Dead	*Fraxinus sp.*	Ash sp.	8 Dead	15 to 30	30	-	-	-	-	7700 Bayview Avenue - City of Markham	2.4	Dead	0%	Remove - Condition	Dead
465	*Populus x canadensis*	Canada Poplar	1	26	26	G	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	In dense Buckthorn, dieback
466	*Populus x canadensis*	Canada Poplar	1	32	32	G	G	F	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	In dense Buckthorn, dieback, exposed roots
467	*Populus x canadensis*	Canada Poplar	1	25	25	F	G	F	2	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	In dense Buckthorn, dieback, heavy lean
1991	*Populus x canadensis*	Canada Poplar	1	20	20	G	F	F	2	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	In dense Buckthorn
1990	*Acer platanoides*	Norway Maple	1	34, 5	34	F	G	G	7	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Lean, exposed roots, girdling roots
468	*Ulmus americana*	American Elm	1	42, 27	50	F	G	G	8	7700 Bayview Avenue - City of Markham	3	Good	100%	Remove	"Y" at 1m, lean, exposed roots, girdling roots
469	*Ulmus americana*	American Elm	1	16	16	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve / Encroachment	Growing adjacent to 470
470	*Ulmus americana*	American Elm	1	11	11	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Lean at top
471	*Ulmus americana*	American Elm	1	60, 7, 14, 14, 24, 28	73	F	G	G	12	7700 Bayview Avenue - City of Markham	4.8	Good	100%	Remove	Multi-stem, "Y" at 2m, exposed roots
Dead	*Populus x canadensis*	Canada Poplar	-	62	62	-	-	-	-	7700 Bayview Avenue - City of Markham	4.2	Dead	0%	Remove - Condition	Dead
472	*Populus x canadensis*	Canada Poplar	1	17	17	G	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Buckthorn at base, dieback
473	*Populus x canadensis*	Canada Poplar	1	19	19	F	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Buckthorn at base, lean
474	*Populus x canadensis*	Canada Poplar	1	47	47	P	P	P	5	7700 Bayview Avenue - City of Markham	3	Declining	40%	Retain	Buckthorn at base, oozing sap with inset, peeling bark, heavy dieback
475	*Picea pungens*	Blue Spruce	1	23	23	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
476	*Picea pungens*	Blue Spruce	1	26	26	F	F	F	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve	Bend in trunk, pruned, dieback,
477	*Picea pungens*	Blue Spruce	1	18	18	G	F	F	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve	Pruned, dieback
478	*Acer platanoides*	Norway Maple	1	27	27	G	G	G	6	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Exposed roots
479	*Picea pungens*	Blue Spruce	1	33	33	F	F	F	5	7700 Bayview Avenue - City of Markham	2.4	Satisfactory	80%	Remove	Dieback, galls on branches
480	*Acer mariana*	Norway Maple	1	41	41	P	G	G	6	7700 Bayview Avenue - City of Markham	3	Satisfactory	80%	Preserve / Encroachment	"Y" at 1m, exposed roots, decay inside frost crack
481	*Acer mariana*	Norway Maple	1	38	38	P	G	G	6	7700 Bayview Avenue - City of Markham	2.4	Satisfactory	80%	Retain	"Y" at 1m, exposed roots, girdling roots,
482	*Picea pungens*	Blue Spruce	1	34	34	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
1989	*Populus x canadensis*	Canada Poplar	1	16, 19, 32	41	F	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Multi-stem, exposed roots
1988	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	7	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	"Y" at 2m, exposed roots, wounded roots
483	*Picea pungens*	Blue Spruce	1	24	24	F	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Dieback
484	*Picea pungens*	Blue Spruce	1	36	36	F	G	F	4	7700 Bayview Avenue - City of Markham	2.4	Satisfactory	80%	Remove	Dieback, galls on branches
485	*Acer platanoides*	Norway Maple	1	31	31	F	G	G	6	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	Exposed roots, girdling roots
486	*Acer platanoides*	Norway Maple	1	31	31	F	G	G	6	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	Exposed roots, girdling roots
487	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	7	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Exposed roots, "Y" at 2m
488	*Acer platanoides*	Norway Maple	1	23	23	G	G	G	5	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	
489	*Picea pungens*	Blue Spruce	1	28	28	F	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve / Encroachment	Galls, dieback
490	*Picea pungens*	Blue Spruce	1	21	21	G	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Dieback
491	*Picea pungens*	Blue Spruce	1	32	32	G	G	G	5	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Retain	
492	*Acer platanoides*	Norway Maple	1	21	21	G	F	G	5	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Broken branches
493	*Picea pungens*	Blue Spruce	1	22	22	G	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	

Table 1: Tree Preservation Charts

Project: Glynnwood Tributary Area EA | **Field Work Completed By:** Carlene Perkin | **Date of Fieldwork:** 8/4/2021 | **Weather:** 28C, sunny, low wind

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Recommendation Legend:
Trees to be Retained | TPZ Reduction / Encroachment | Dead / Hazard Trees
Trees to be Preserved | Tree to be Removed | Trees to be Transplanted

Tree #	*Botanical Name*	Common Name	Qty	DBH (cm)	Effecive DBH	Tree Condition			Dripline Radius (m)	Tree Location / By-law	Tree Protection Zone	York Region Condition Rating	York Region % for Compensation	Recommendation	Comments / Health
						TI	CS	CV							
494	*Rhamnus cathartica*	European Buckthorn	1	10, 8, 7	15	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Multi-stem, flagged
495	*Rhamnus cathartica*	European Buckthorn	1	13, 11, 8	19	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Multi-stem, epicormic shoots
496	*Rhamnus cathartica*	European Buckthorn	1	10	10	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
516	*Rhamnus cathartica*	European Buckthorn	1	10	10	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	
517	*Rhamnus cathartica*	European Buckthorn	1	10	10	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Epicormic shoots
518	*Picea pungens*	Blue Spruce	1	25	25	G	G	F	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Dieback
519	*Picea pungens*	Blue Spruce	1	17	17	G	G	F	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Dieback
520	*Acer platanoides*	Norway Maple	1	30	30	F	G	G	6	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Preserve	Exposed roots, girdling roots, flagged
1986	*Acer platanoides*	Norway Maple	1	30	30	F	G	G	6	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Exposed roots, girdling roots
521	*Rhamnus cathartica*	European Buckthorn	1	22, 11, 8	26	F	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Epicormic shoots, squirrel nest
522	*Rhamnus cathartica*	European Buckthorn	1	25	25	F	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Retain	Epicormic shoots
523	*Prunus serotina*	Black Cherry	1	43	43	G	G	G	8	7700 Bayview Avenue - City of Markham	3	Good	100%	Preserve	
1985	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	Lean, sucker stem
524	*Picea pungens*	Blue Spruce	1	28	28	F	F	F	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	Co-dominant stems, dieback
525	*Acer platanoides*	Norway Maple	1	28, 30, 29	50	F	G	G	7	7700 Bayview Avenue - City of Markham	3	Good	100%	Remove	Exposed roots, multi-stem, flagged
526	*Prunus serotina*	Black Cherry	1	15	15	P	G	G	3	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Preserve	Exposed roots, epicormic shoots, lean
527	*Pinus sylvestris*	Scots Pine	1	27	27	G	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	
528	*Pinus sylvestris*	Scots Pine	1	29	29	G	G	G	4	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve / Encroachment	
Dead	*Acer saccharum*	Sugar Maple	-	15	15	-	-	-	-	7700 Bayview Avenue - City of Markham	1.8	Dead	0%	Remove - Condition	Dead
Dead	*Malus sp.*	Apple sp.	2 Dead	30 to 50	50	-	-	-	-	7700 Bayview Avenue - City of Markham	3	Dead	0%	Remove - Condition	Dead
529	*Acer platanoides*	Norway Maple	1	20, 18	27	P	F	G	4	7700 Bayview Avenue - City of Markham	1.8	Satisfactory	80%	Remove	"Y" at 0.5m, vines in canopy, co-dominant stem
530	*Larix laricina*	Tamarack	1	31	31	G	G	G	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Erosion on bank side of trunk
531	*Larix laricina*	Tamarack	1	38	38	G	G	G	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Erosion on bank side of trunk
532	*Larix laricina*	Tamarack	1	34	34	G	G	G	3	7700 Bayview Avenue - City of Markham	2.4	Good	100%	Remove	Erosion on bank side of trunk
533	*Thuja occidentalis*	Eastern White Cedar	1	12	12	F	P	F	0.5	7700 Bayview Avenue - City of Markham	1.8	Declining	40%	Preserve	Dead main stem, decay
534	*Thuja occidentalis*	Eastern White Cedar	1	18	18	G	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Erosion on bank side of trunk
535	*Rhamnus cathartica*	European Buckthorn	1	11, 7, 8, 6	16	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Preserve	Epicormic shoots
536	*Rhamnus cathartica*	European Buckthorn	1	12	12	F	G	G	1	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	
537	*Rhamnus cathartica*	European Buckthorn	1	8,8,10,8,8,7,8,7,8,5	25	G	G	G	2	7700 Bayview Avenue - City of Markham	1.8	Good	100%	Remove	Multi-stem
1901	*Acer rubrum*	*Red Maple*	1	6	6	G	G	F	1.5	7700 Bayview Avenue - City of Markham	1.2	Good	100%	Remove	Staked, wounds on trunk, flagged
1903	*Acer rubrum*	*Red Maple*	1	8	8	G	G	G	2	7700 Bayview Avenue - City of Markham	1.2	Good	100%	Remove	Staked, wounds on trunk, flagged

APPENDIX

A DRAWINGS

KEY MAP

LEGEND

EXISTING SURVEYED TREES TO REMAIN & BE PROTECTED

EXISTING SURVEYED TREES PROPOSED FOR REMOVAL

EXISTING SURVEYED TREES TO REMAIN & BE PROTECTED, TREE PROTECTION ZONE ENCROACHMENT / INJURY

EXISTING SURVEYED TREE GROUPING

EXISTING SURVEYED TREE GROUPING PROPOSED FOR REMOVAL

SUPPLY & INSTALL TREE PROTECTION FENCING AS PER 1/TM-2

PROPOSED SEWER

PROPERTY LINE

NO	DATE	REVISION/ISSUED	BY	APPD
1	09-10-2021	EA SUBMISSION	JB	BV

wsp

Landscape Architecture
582 Lancaster Street West
Kitchener, ON N2K 1M3
t. 519-743-8777
www.wsp.com

CLIENT:
CITY OF MARKHAM
MARKHAM, ON

PROJECT TITLE:
GLYNWOOD RETIREMENT RESIDENCE
TREE MANAGMENT PLAN

SITE ADDRESS:
7700 BAYVIEW AVE
THORNHILL, ON L3T 5W1

DRAWING TITLE:
TREE MANAGEMENT PLAN

STAMP | STAMP

DESIGNED JB	DRAWN JB	CHECKED BV
SCALE 1:500	DATE AUGUST 2021	
PROJECT NUMBER 121-15461-00-20	DWG. NUMBER TM-1	

YYYY/MM/DD 9/16/2021 10:09 AM
R:\Jobs\2018\121-15461-00-20 Glynwood Retirement Residence Tree Management Plans\Drawings\Glynwood Retirement Home_TMP - MH.dwg

TREE PRESERVATION NOTES AND GUIDELINES

ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ):

- TREE PRESERVATION MEASURES, INCLUDING THE ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ) SHALL APPLY TO THE VEGETATION IDENTIFIED TO BE RETAINED AND PROTECTED. THE TREE PROTECTION ZONE SHALL CONSIST OF TREE PROTECTION FENCING AS PER CITY OF MARKHAM STANDARDS, PLACED AT MINIMUM OF 1M FROM THE DRIPLINE OF VEGETATION TO BE PRESERVED. REFER TO DETAILS ON THIS SHEET.
- NO GRADE CHANGES SHALL OCCUR WITHIN TREE PROTECTION ZONE. IN THE EVENT THAT GRADE CHANGES OCCUR EITHER AS A CUT OR FILL SITUATION, THE CONSULTING ARBORIST MUST BE NOTIFIED SO THAT PRECAUTIONS TO PRESERVE THE TREE CAN BE DETERMINED PRIOR TO THE PLACEMENT OF FILL OR EXCAVATION ACTIVITIES.
- EVERY PRECAUTION MUST BE TAKEN TO PREVENT DAMAGE TO TREES AND ROOT SYSTEMS FROM DAMAGE, COMPACTION AND CONTAMINATION RESULTING FROM THE CONSTRUCTION TO THE SATISFACTION OF THE CONSULTING ARBORIST.
- TREES THAT REQUIRE PRUNING TO PERMIT CONSTRUCTION ACTIVITIES WILL BE DONE SO IN ACCORDANCE WITH GOOD ARBORICULTURAL PRACTICES. IN THE EVENT THAT IT IS NECESSARY TO REMOVE ADDITIONAL LIMBS OR PORTIONS OF TREES, AFTER CONSTRUCTION HAS COMMENCED, TO ACCOMMODATE CONSTRUCTION, THE CONSULTING ARBORIST IS TO BE INFORMED AND UNDER THEIR DIRECTION THE REMOVAL IS TO BE EXECUTED CAREFULLY AND IN FULL ACCORDANCE WITH ARBORICULTURAL TECHNIQUES, BY A CERTIFIED ARBORIST.
- ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED.

TREE PROTECTION ZONE:

APPLIES TO TREES LOCATED THE LIMIT OF GRADING OR NOTED OTHERWISE. THESE TREES ARE TO BE PRESERVED AND WILL HAVE SILT / TREE PROTECTION FENCING INSTALLED AT ALONG THE LIMIT OF GRADING / LIMIT OF WORK TO ESTABLISH THE TREE PROTECTION ZONE. ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED. WITHIN A TREE PROTECTION ZONE THERE IS TO BE:

- NO CONSTRUCTION
- NO ALTERING OF GRADE BY ADDING FILL, EXCAVATING, TRENCHING, SCRAPING, DUMPING OR DISTURBANCE OF ANY KIND.
- NO STORAGE OF CONSTRUCTION MATERIALS, EQUIPMENT, SOIL, CONSTRUCTION WASTE OR DEBRIS WITHIN THE DRIP LINE
- NO MOVEMENT OF VEHICLES, EQUIPMENT
- NO PARKING OF VEHICLES OR MACHINERY
- NO DIGGING, BORING
- NO RIGGING CABLES SHALL BE WRAPPED AROUND OR INSTALLED IN TREES
- NO CONTAMINANTS WILL BE PLACED OVER ROOT SYSTEM
- NO CONTAMINANTS WILL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST

WORK WITHIN A TREE PROTECTION ZONE:

IF WORK MUST BE CONDUCTED WITHIN A TREE PROTECTION ZONE THE CONTRACTOR SHOULD MINIMIZE SOIL COMPACTION AND MECHANICAL ROOT DAMAGE BY UTILIZING ONE OF THE FOLLOWING FOUR METHODS;

1. APPLYING 150-300mm OF MULCH TO AREA. UPON COMPLETION REMOVE EXCESS MULCH LEAVING A 100mm DEPTH LAYER OF MULCH.
2. LAYING 20mm THICK PLYWOOD OR 100X100mm WOOD BEAMS OVER A 100+MM THICK LAYER OF WOOD CHIP MULCH. UPON COMPLETION REMOVE PLYWOOD AND LEAVE MULCH LAYER IN PLACE.
3. APPLYING 100-150mm DEPTH OF GRAVEL OVER A TAUT, STAKED GEOTEXTILE FABRIC. UPON COMPLETION REMOVE GRAVEL AND GEOTEXTILE.
4. PLACING COMMERCIAL LOGGING OR ROAD MATS ON TOP OF A MULCH LAYER. UPON COMPLETION REMOVE MATS. STONE, GEOTEXTILE, AND MULCH EXCEEDING 100mm THICK WILL BE REMOVED FROM THE TREE PRESERVATION AREA ONCE THE THREAT OF SOIL OR ROOT DAMAGE HAS PASSED.

TREE PRESERVATION AND PROTECTION RECOMMENDATIONS:

THE SURVIVAL RATES FOR TREES, WHICH ARE IN PROXIMITY TO CONSTRUCTION SITES ARE DEPENDENT ON THE RESULTANT CHANGES TO A VARIETY OF ENVIRONMENTAL AND ANTHROPOGENIC FACTORS. THESE CONSTRUCTION ACTIVITIES BRING ABOUT CHANGES TO A VARIETY OF ENVIRONMENTAL FEATURES INCLUDING THE EXISTING MICROCLIMATE INCLUDING WINDS, TEMPERATURE, SOIL MOISTURE, AMOUNT OF AVAILABLE SUNLIGHT, SOIL QUALITY, AND THE LEVEL OF THE WATER TABLE. INCREASED HUMAN ACTIVITIES MAY ALSO DAMAGE THE STRUCTURE AND / OR PHYSIOLOGICAL ACTIVITIES OF THE TREES. THE FULL EFFECTS OF THE DAMAGE MAY NOT APPEAR UNTIL SEVERAL YEARS AFTER ITS OCCURRENCE. THUS, IT IS ESSENTIAL THAT BOTH VEGETATIVE CLEARING AND PRESERVATION METHODS FOLLOW THE GUIDELINES BELOW AND THOSE GENERALLY ACCEPTED AS KEEPING WITH GOOD HORTICULTURAL AND CONSTRUCTION PRACTICES. THE GUIDELINES ARE SUBJECT TO ADJUSTMENTS DEEMED REASONABLE AND APPROPRIATE CONSIDERING THE PROXIMITY AND NUMBER OF TREES INVOLVED AND THE SITE-SPECIFIC SERVICING REQUIREMENT.

GENERAL RECOMMENDATIONS:

- ALL TREES WITHIN THE TREE PRESERVATION ZONE MUST BE LEFT STANDING. THE TREE REMOVALS MUST BE COORDINATED TO BE COMPLETED OUTSIDE OF THE BIRD NESTING SEASON, **APRIL 1 TO AUGUST 31**.
- ALL REMOVALS MUST BE FELLED INTO THE WORK AREA TO ENSURE THAT DAMAGE DOES NOT OCCUR TO THE TREES WITHIN THE TREE PRESERVATION ZONE.
- UPON COMPLETING OF THE TREE REMOVALS, ALL FELLED TREES ARE TO BE CHIPPED. THIS WORK MUST BE COMPLETED OUTSIDE OF THE BIRD NESTING SEASON, **MAY 1 TO JULY 31.**
- TREE PROTECTION FENCING / SILT FENCE MUST BE INSTALLED AS PER THE CITY OF MARKHAM STANDARD SILT FENCE DETAIL AND AS SHOWN ON THE APPROVED MUNICIPAL ENGINEERING PLAN. UPON INSTALLATION OF THE FENCING, THE CONTRACTOR WILL CONTACT THE CONSULTING ARBORIST TO REVIEW AN APPROVE THE FENCING AND ITS LOCATION PRIOR TO COMMENCEMENT OF ANY GRADING WORK.
- AREAS WITHIN THE TREE PRESERVATION ZONE ARE NOT TO BE USED FOR ANY TYPE OF STORAGE (E.G. STORAGE OF DEBRIS, CONSTRUCTION MATERIAL, SURPLUS SOILS, AND CONSTRUCTION EQUIPMENT). NO TRENCHING OR TUNNELLING FOR UNDERGROUND SERVICES SHALL BE LOCATED WITHIN THE TREE PROTECTION ZONE OR DRIPLINE OF TREES DESIGNATED FOR PRESERVATION WITHIN OR ADJACENT TO THE CONSTRUCTION ZONE.

ROOT PRUNING:

AT THE COMMENCEMENT OF CONSTRUCTION PRUNE ROOTS CLEANLY USING ACCEPTABLE ARBORICULTURAL PRACTICES AND IMMEDIATELY BACKFILL WITH APPROPRIATE MATERIAL. ROOTS OVER 2.5cm DIAMETER THAT ARE TO BE CUT SHOULD BE PRUNED RATHER THAN LEFT TORN OR CRUSHED. THE FOLLOWING ARE GENERAL METHODS OF ROOT PRUNING:

1. SOIL EXCAVATION USING SUPERSONIC AIR TOOLS, PRESSURIZED WATER OR HAND TOOLS, FOLLOWED BY SELECTIVE ROOT CUTTING
2. CUTTING THROUGH THE SOIL ALONG A PREDETERMINED LINE ON THE SURFACE USING TOOL SPECIFICALLY DESIGNED TO CUT ROOTS
3. MECHANICALLY EXCAVATING (e.g. BACKHOE) THE SOIL AND PRUNING WHAT IS LEFT OF THE EXPOSED ROOTS.
4. CUTS TO BE MADE WITH HAND PRUNING SHEARS, BY-PASS BLADE, PRUNING SAW. DO NOT USE ANVIL TYPE PRUNERS.

PRUNING PRACTICES:

- ALL LIMBS DAMAGED OR BROKEN DURING THE COURSE OF CONSTRUCTION SHOULD BE PRUNED CLEANLY, UTILIZING BY-PASS SECATEURS IN ACCORDANCE WITH APPROVED HORTICULTURAL PRACTICES. SHOULD THERE BE A POTENTIAL RISK OF TRANSFER OF DISEASE FROM INFECTED TO NON-INFECTED TREES; TOOLS MUST BE DISINFECTED AFTER PRUNING EACH TREE BY DIPPING IN METHYL HYDRATE. THIS PRACTICE IS PARTICULARLY IMPORTANT DURING PERIODS OF TREE STRESS AND WHEN PRUNING MANY MEMBERS OF THE SAME GENERA, WITHIN WHICH A DISEASE COULD BE SPREAD QUICKLY (I.E., VERTICILLIUM WILT ON MAPLES OR FIRE BLIGHT ON GENERA OF THE ROSACEA FAMILY).
- DURING EXCAVATION OPERATIONS IN WHICH THE ROOT AREA IS AFFECTED, THE CONTRACTOR IS TO PRUNE ALL EXPOSED ROOTS CLEANLY. PRUNED ROOT ENDS ARE TO BE NEATLY AND SQUARELY TRIMMED AND THE AREA IS TO BE BACKFILLED WITH CLEAN NATIVE FILL AS SOON AS POSSIBLE TO PREVENT DESICCATION AND PROMOTE ROOT GROWTH. THE EXPOSED ROOTS SHOULD NOT BE ALLOWED TO DRY OUT, AND THE CONTRACTOR SHALL DISCUSS WATERING OF THE ROOTS WITH THE CONSULTING ARBORIST SO THAT THE ROOTS SHALL MAINTAIN OPTIMUM SOIL MOISTURE DURING CONSTRUCTION AND BACKFILLING OPERATIONS, YET SO NOT TO INTERFERE WITH CONSTRUCTION OPERATIONS. BACKFILLING MUST BE WITH CLEAN UNCONTAMINATED TOPSOIL FROM AN APPROVED SOURCE. TEXTURE MUST BE COARSER THAN EXISTING SOILS, AND TO COME INTO CLEAN CONTACT WITH EXISTING SOILS (REMOVE AIR POCKETS, SOD, ETC.)
- ALL PRUNING CUTS SHOULD BE MADE TO A GROWING POINT SUCH AS A BUD, TWIG OR BRANCH, CUT JUST OUTSIDE THE BRANCH COLLAR (THE SWOLLEN AREA AT THE BASE OF THE BRANCH THAT SOMETIMES HAS A BARK RIDGE), AND PERPENDICULAR TO THE BRANCH BEING PRUNED RATHER THAN AS CLOSE TO THE TRUNK AS POSSIBLE. THIS MINIMIZES THE SITE OF THE WOUND. NO STUBS SHOULD BE LEFT. POOR CUT LOCATION, POOR CUT ANGLE AND TORN CUTS ARE NOT ACCEPTABLE.
- TREE ROOTS SHOULD NOT BE EXCAVATED WITHIN THE CRITICAL STRUCTURAL ROOTING AREA. THIS IS THE MINIMUM AREA OF THE ROOT SYSTEM NECESSARY TO MAINTAIN VITALITY OR STABILITY OF THE TREE. TYPICALLY THIS AREA EXTENDS TO THE DRIPLINE OF THE TREE. THE SEVERING OF ONE ROOT CAN CAUSE APPROXIMATELY 5-20% LOSS OF THE ROOT SYSTEM. A REDUCTION OF THIS AREA BY GREATER THAN 30% CAN POSE STABILITY CONCERNS FOR THE TREE.
- A SLOW RELEASE FERTILIZER EG: BONE MEAL OR APPROVED EQUAL TO BE APPLIED TO TREES WHERE ROOT PRUNING OR ROOT DAMAGE HAS OCCURRED. APPLY PER MANUFACTURER'S RECOMMENDATIONS
- EXTENSIVE PRUNING IS BEST COMPLETED BEFORE PLANTS BREAK DORMANCY. PRUNING SHOULD BE LIMITED TO THE REMOVAL OF NO MORE THAN ONE THIRD (1/3) OF THE TOTAL BUD AND LEAF BEARING BRANCHES. PRUNING SHOULD INCLUDE THE CAREFUL REMOVAL OF:
  - DEADWOOD,
  - BRANCHES THAT ARE WEAK, DAMAGED, DISEASED AND THOSE WHICH WILL INTERFERE WITH CONSTRUCTION ACTIVITY,
  - SECONDARY LEADERS OF CONIFERS,
  - TRUNK AND ROOT SUCKERS,
  - TRUNK WATERSPOUTS, AND
  - TIGHT V-SHAPED OR WEAK CROTCHES (INCLUDED UNIONS).

THE CONTRACTOR MUST IMMEDIATELY REPORT ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY.

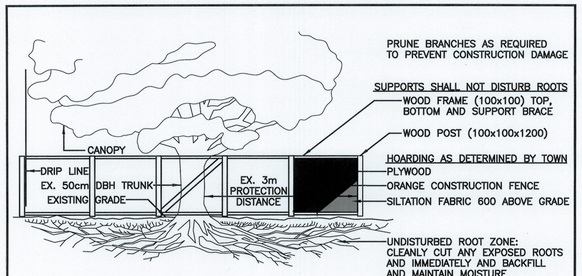
THE TREE PROTECTION FENCING WILL BE MAINTAINED UNTIL ALL CONSTRUCTION IS COMPLETED, SOILS ARE STABILIZED AND ALL OF THE EQUIPMENT HAS BEEN REMOVED FROM THE SITE.

TREE INJURY:

TYPICALLY TREE ROOTS EXTEND 1.5 TO 3 TIMES BEYOND THE DRIPLINE OF THE TREE AND ARE WITHIN THE TOP 150mm OF THE SOIL. TYPES OF DAMAGE FROM CONSTRUCTION INCLUDE:

- PHYSICAL INJURY
- SOIL COMPACTION
- SEVERING OF ROOTS
- SMOTHERING OF ROOTS
- SPLIT OR BROKEN BRANCHES
- EXCESSIVE PRUNING

SOIL COMPACTION REDUCES PORE SPACE, OXYGEN AVAILABLE TO ROOTS INCREASES CARBON DIOXIDE ACCUMULATION, RESTRICTS ROOT GROWTH AND THE ABILITY TO ABSORB WATER AND NUTRIENTS, AS WELL AS IMPAIRS DRAINAGE.
SMOTHERING OF ROOTS: 90% OF FINE ABSORBING ROOTS ARE WITHIN THE UPPER 150-300mm OF THE SOIL. SMOTHERING WITH THE ADDITION OF SOIL CAN KILL THE ROOTS AND STRESS THE TREE.
PHYSICAL INJURY, SPLIT OR BROKEN BRANCHES HINDER THE TREES ABILITY TO COMPARTMENTALIZE (CLOSE) WOUNDS PROPERLY.



MINIMUM TREE PROTECTION DISTANCE FROM TRUNK:

< 10cm DBH	1.2m
10–29cm DBH	1.8m
30–40cm DBH	2.4m
41–50cm DBH	3.0m
51–60cm DBH	3.6m
61–70cm DBH	4.2m
71–80cm DBH	4.8m
81–90cm DBH	5.4m
91–100cm DBH	6.0m
> 100cm DBH	6cm/1cmø

(DIAMETER AT BREAST HEIGHT) DBH = TRUNK DIAMETER AT 1.4m HEIGHT

40cmx60cm SIGN MOUNTED ON ALL SIDES OF BARRIER

MARKHAM

TREE PROTECTION ZONE

NO WORK IS PERMITTED WITHIN THE TREE PROTECTION ZONE INCLUDING GRADING, CONSTRUCTION ACCESS AND MATERIAL STORAGE.

BREACH OF TREE PROTECTION ZONE IS SUBJECT TO A FINE OF $_____

CONTACT TOWN OF MARKHAM FOR MORE INFORMATION: 905-477-5530

TREE PROTECTION NOTES:

1. ALL TREE PROTECTION BARRIERS SHALL BE IN PLACE AND APPROVED BY THE TOWN PRIOR TO CONSTRUCTION ACCESS.
2. ALL SUPPORTS AND STAKES SHALL BE OUTSIDE THE TREE PROTECTION ZONE AND SHALL MINIMIZE ROOT DAMAGE.
3. TREE PROTECTION BARRIERS SHALL REMAIN IN PLACE AND IN GOOD CONDITION UNTIL ALL CONSTRUCTION IS COMPLETE AND APPROVED BY THE TOWN.
4. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS, SHALL BE DONE BY A QUALIFIED TREE WORKER CERTIFIED WITH THE INTERNATIONAL SOCIETY OF ARBORICULTRE APPROVED BY THE TOWN.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN

MARKHAM ENGINEERING DEPARTMENT	DRAWING NAME: TREE PRESERVATION DETAILS	SCALE: NTS REV: 0 DATE: SEPTEMBER 2010	APPROVED BY: DIRECTOR OF ENGINEERING DWG. NO. MP12

1 / TM-2 TREE PROTECTION ZONE

Scale: NTS

KEY MAP

NO	DATE	REVISION/ISSUED	BY	APPD
1	09-10-2021	EA SUBMISSION	JB	BV

wsp
Landscape Architecture
582 Lancaster Street West
Kitchener, ON N2K 1M3
t. 519-743-8777
www.wsp.com

CLIENT:
CITY OF MARKHAM
MARKHAM, ON

PROJECT TITLE:
GLYNWOOD RETIREMENT RESIDENCE
TREE MANAGMENT PLAN

SITE ADDRESS:
7700 BAYVIEW AVE
THORNHILL, ON L3T 5W1

DRAWING TITLE:
TREE PROTECTION NOTES & DETAILS

STAMP | STAMP

DESIGNED	DRAWN	CHECKED
JB	JB	BV

SCALE 1:xxx | DATE AUGUST 2021

PROJECT NUMBER 121-15461-00-20 | DWG. NUMBER TM-2

APPENDIX

B CONDITION RATING SPECIFICATIONS

Table 2. Tree condition rating specifications.

Condition Rating	Percentage (for compensation)	Criteria
Good	100%	Growth occurs mostly as extensions from the terminal bud with little epicormics branching. Shoot growth usually exceeds 10 cm. Full, symmetrical crown, no sign of active decay, chronic or acute insect attack, large open wounds, tissue necrosis, dieback or chlorotic foliage, not leaning, falling or about to be uprooted.
Satisfactory	80%	Growth occurs mostly as extensions from the terminal bud. Epicormic branching may be heavy providing that the growth is healthy and abundant. May have a partially leaved or disfigured crown (>74%crown density), combined with a few dead branches or limbs, or small open wounds and small trunk tissue necrosis. *Tree* health will likely not decline further in the next 5 years.
Potential trouble	60%	Growth occurs mostly as epicormic branching or basal sprouts. Usually no growth from terminal buds. New growth may be thin with small buds showing lack of vigour. May improve or decline in health over the next 5 years. May have a partially leaved or disfigured crown (50-74% crown density). These *trees* usually have a combination of problems which may include poor form or lean, chronic or acute insect attack, small trunk tissue necrosis, small stem scars, twig dieback, dead branches, exposed roots or rootball, and/or animals burrowing in to rooting area. Infection may be present in its early stages.
Declining	40%	Declining in health. Crowns have significant twig dieback and dead branches. Usually describes *trees* having large trunk tissue necrosis, large stem scars. Foliage discolouration is often associated with this condition as is moderate to heavy top dieback and epicormic branching (<50% crown density). Chronic fungal infection or insect infestation may be present. These *trees* may require major corrective pruning, or replacement.
Death imminent	20%	Symptoms as in Declining but more acute. Will likely die within 5 years. Will require replacement or removal.
Dead	0%	No leaves, brittle twigs, dry buds.

KEY MAP

LEGEND

- EXISTING SURVEYED TREES TO REMAIN & BE PROTECTED
- EXISTING SURVEYED TREES PROPOSED FOR REMOVAL
- EXISTING SURVEYED TREES TO REMAIN & BE PROTECTED, TREE PROTECTION ZONE ENCROACHMENT / INJURY
- EXISTING SURVEYED TREE GROUPING
- EXISTING SURVEYED TREE GROUPING PROPOSED FOR REMOVAL
- SUPPLY & INSTALL TREE PROTECTION FENCING AS PER 1/TM-2
- PROPOSED SEWER
- PROPERTY LINE

NO	DATE	REVISION/ISSUED	BY	APPD
1	09-10-2021	EA SUBMISSION	JB	BV

wsp
Landscape Architecture
582 Lancaster Street West
Kitchener, ON N2K 1M3
t. 519-743-8777
www.wsp.com

CLIENT:
CITY OF MARKHAM
MARKHAM, ON

PROJECT TITLE:
GLYNWOOD RETIREMENT RESIDENCE
TREE MANAGMENT PLAN

SITE ADDRESS:
7700 BAYVIEW AVE
THORNHILL, ON L3T 5W1

DRAWING TITLE:
TREE MANAGEMENT PLAN

STAMP

STAMP

DESIGNED	JB	DRAWN	JB	CHECKED	BV
SCALE	1:500	DATE	AUGUST 2021		
PROJECT NUMBER	121-15461-00-20	DWG. NUMBER	TM-1		

YY/MM/DD 09/16/2021 10:09 AM
R:\Jobs\2018\121-15461-00-20 Glynwood Retirement Residence Tree Management Plans\Drawings\Glynwood Retirement Home_TMP - MH.dwg

TREE PRESERVATION NOTES AND GUIDELINES

ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ):

- TREE PRESERVATION MEASURES, INCLUDING THE ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ) SHALL APPLY TO THE VEGETATION IDENTIFIED TO BE RETAINED AND PROTECTED. THE TREE PROTECTION ZONE SHALL CONSIST OF TREE PROTECTION FENCING AS PER CITY OF MARKHAM STANDARDS, PLACED AT MINIMUM OF 1M FROM THE DRIPLINE OF VEGETATION TO BE PRESERVED. REFER TO DETAILS ON THIS SHEET.
- NO GRADE CHANGES SHALL OCCUR WITHIN TREE PROTECTION ZONE. IN THE EVENT THAT GRADE CHANGES OCCUR EITHER AS A CUT OR FILL SITUATION, THE CONSULTING ARBORIST MUST BE NOTIFIED SO THAT PRECAUTIONS TO PRESERVE THE TREE CAN BE DETERMINED PRIOR TO THE PLACEMENT OF FILL OR EXCAVATION ACTIVITIES.
- EVERY PRECAUTION MUST BE TAKEN TO PREVENT DAMAGE TO TREES AND ROOT SYSTEMS FROM DAMAGE, COMPACTION AND CONTAMINATION RESULTING FROM THE CONSTRUCTION TO THE SATISFACTION OF THE CONSULTING ARBORIST.
- TREES THAT REQUIRE PRUNING TO PERMIT CONSTRUCTION ACTIVITIES WILL BE DONE SO IN ACCORDANCE WITH GOOD ARBORICULTURAL PRACTICES. IN THE EVENT THAT IT IS NECESSARY TO REMOVE ADDITIONAL LIMBS OR PORTIONS OF TREES, AFTER CONSTRUCTION HAS COMMENCED, TO ACCOMMODATE CONSTRUCTION, THE CONSULTING ARBORIST IS TO BE INFORMED AND UNDER THEIR DIRECTION THE REMOVAL IS TO BE EXECUTED CAREFULLY AND IN FULL ACCORDANCE WITH ARBORICULTURAL TECHNIQUES, BY A CERTIFIED ARBORIST.
- ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED.

TREE PROTECTION ZONE:

APPLIES TO TREES LOCATED THE LIMIT OF GRADING OR NOTED OTHERWISE. THESE TREES ARE TO BE PRESERVED AND WILL HAVE SILT / TREE PROTECTION FENCING INSTALLED AT ALONG THE LIMIT OF GRADING / LIMIT OF WORK TO ESTABLISH THE TREE PROTECTION ZONE. ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED. WITHIN A TREE PROTECTION ZONE THERE IS TO BE:

- NO CONSTRUCTION
- NO ALTERING OF GRADE BY ADDING FILL, EXCAVATING, TRENCHING, SCRAPING, DUMPING OR DISTURBANCE OF ANY KIND.
- NO STORAGE OF CONSTRUCTION MATERIALS, EQUIPMENT, SOIL, CONSTRUCTION WASTE OR DEBRIS WITHIN THE DRIP LINE
- NO MOVEMENT OF VEHICLES, EQUIPMENT
- NO PARKING OF VEHICLES OR MACHINERY
- NO DIGGING, BORING
- NO RIGGING CABLES SHALL BE WRAPPED AROUND OR INSTALLED IN TREES
- NO CONTAMINANTS WILL BE PLACED OVER ROOT SYSTEM
- NO CONTAMINANTS WILL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST

WORK WITHIN A TREE PROTECTION ZONE:

IF WORK MUST BE CONDUCTED WITHIN A TREE PROTECTION ZONE THE CONTRACTOR SHOULD MINIMIZE SOIL COMPACTION AND MECHANICAL ROOT DAMAGE BY UTILIZING ONE OF THE FOLLOWING FOUR METHODS;

1. APPLYING 150-300mm OF MULCH TO AREA. UPON COMPLETION REMOVE EXCESS MULCH LEAVING A 100mm DEPTH LAYER OF MULCH.
2. LAYING 20mm THICK PLYWOOD OR 100X100mm WOOD BEAMS OVER A 100+MM THICK LAYER OF WOOD CHIP MULCH. UPON COMPLETION REMOVE PLYWOOD AND LEAVE MULCH LAYER IN PLACE.
3. APPLYING 100-150mm DEPTH OF GRAVEL OVER A TAUT, STAKED GEOTEXTILE FABRIC. UPON COMPLETION REMOVE GRAVEL AND GEOTEXTILE.
4. PLACING COMMERCIAL LOGGING OR ROAD MATS ON TOP OF A MULCH LAYER. UPON COMPLETION REMOVE MATS. STONE, GEOTEXTILE, AND MULCH EXCEEDING 100mm THICK WILL BE REMOVED FROM THE TREE PRESERVATION AREA ONCE THE THREAT OF SOIL OR ROOT DAMAGE HAS PASSED.

TREE PRESERVATION AND PROTECTION RECOMMENDATIONS:

THE SURVIVAL RATES FOR TREES, WHICH ARE IN PROXIMITY TO CONSTRUCTION SITES ARE DEPENDENT ON THE RESULTANT CHANGES TO A VARIETY OF ENVIRONMENTAL AND ANTHROPOGENIC FACTORS. THESE CONSTRUCTION ACTIVITIES BRING ABOUT CHANGES TO A VARIETY OF ENVIRONMENTAL FEATURES INCLUDING THE EXISTING MICROCLIMATE INCLUDING WINDS, TEMPERATURE, SOIL MOISTURE, AMOUNT OF AVAILABLE SUNLIGHT, SOIL QUALITY, AND THE LEVEL OF THE WATER TABLE. INCREASED HUMAN ACTIVITIES MAY ALSO DAMAGE THE STRUCTURE AND / OR PHYSIOLOGICAL ACTIVITIES OF THE TREES. THE FULL EFFECTS OF THE DAMAGE MAY NOT APPEAR UNTIL SEVERAL YEARS AFTER ITS OCCURRENCE. THUS, IT IS ESSENTIAL THAT BOTH VEGETATIVE CLEARING AND PRESERVATION METHODS FOLLOW THE GUIDELINES BELOW AND THOSE GENERALLY ACCEPTED AS KEEPING WITH GOOD HORTICULTURAL AND CONSTRUCTION PRACTICES. THE GUIDELINES ARE SUBJECT TO ADJUSTMENTS DEEMED REASONABLE AND APPROPRIATE CONSIDERING THE PROXIMITY AND NUMBER OF TREES INVOLVED AND THE SITE-SPECIFIC SERVICING REQUIREMENT.

GENERAL RECOMMENDATIONS:

- ALL TREES WITHIN THE TREE PRESERVATION ZONE MUST BE LEFT STANDING. THE TREE REMOVALS MUST BE COORDINATED TO BE COMPLETED OUTSIDE OF THE BIRD NESTING SEASON, **APRIL 1 TO AUGUST 31**.
- ALL REMOVALS MUST BE FELLED INTO THE WORK AREA TO ENSURE THAT DAMAGE DOES NOT OCCUR TO THE TREES WITHIN THE TREE PRESERVATION ZONE.
- UPON COMPLETING OF THE TREE REMOVALS, ALL FELLED TREES ARE TO BE CHIPPED. THIS WORK MUST BE COMPLETED OUTSIDE OF THE BIRD NESTING SEASON, **MAY 1 TO JULY 31.**
- TREE PROTECTION FENCING / SILT FENCE MUST BE INSTALLED AS PER THE CITY OF MARKHAM STANDARD SILT FENCE DETAIL AND AS SHOWN ON THE APPROVED MUNICIPAL ENGINEERING PLAN. UPON INSTALLATION OF THE FENCING, THE CONTRACTOR WILL CONTACT THE CONSULTING ARBORIST TO REVIEW AN APPROVE THE FENCING AND ITS LOCATION PRIOR TO COMMENCEMENT OF ANY GRADING WORK.
- AREAS WITHIN THE TREE PRESERVATION ZONE ARE NOT TO BE USED FOR ANY TYPE OF STORAGE (E.G. STORAGE OF DEBRIS, CONSTRUCTION MATERIAL, SURPLUS SOILS, AND CONSTRUCTION EQUIPMENT). NO TRENCHING OR TUNNELLING FOR UNDERGROUND SERVICES SHALL BE LOCATED WITHIN THE TREE PROTECTION ZONE OR DRIPLINE OF TREES DESIGNATED FOR PRESERVATION WITHIN OR ADJACENT TO THE CONSTRUCTION ZONE.

ROOT PRUNING:

AT THE COMMENCEMENT OF CONSTRUCTION PRUNE ROOTS CLEANLY USING ACCEPTABLE ARBORICULTURAL PRACTICES AND IMMEDIATELY BACKFILL WITH APPROPRIATE MATERIAL. ROOTS OVER 2.5cm DIAMETER THAT ARE TO BE CUT SHOULD BE PRUNED RATHER THAN LEFT TORN OR CRUSHED. THE FOLLOWING ARE GENERAL METHODS OF ROOT PRUNING:

1. SOIL EXCAVATION USING SUPERSONIC AIR TOOLS, PRESSURIZED WATER OR HAND TOOLS, FOLLOWED BY SELECTIVE ROOT CUTTING
2. CUTTING THROUGH THE SOIL ALONG A PREDETERMINED LINE ON THE SURFACE USING TOOL SPECIFICALLY DESIGNED TO CUT ROOTS
3. MECHANICALLY EXCAVATING (e.g. BACKHOE) THE SOIL AND PRUNING WHAT IS LEFT OF THE EXPOSED ROOTS.
4. CUTS TO BE MADE WITH HAND PRUNING SHEARS, BY-PASS BLADE, PRUNING SAW. DO NOT USE ANVIL TYPE PRUNERS.

PRUNING PRACTICES:

- ALL LIMBS DAMAGED OR BROKEN DURING THE COURSE OF CONSTRUCTION SHOULD BE PRUNED CLEANLY, UTILIZING BY-PASS SECATEURS IN ACCORDANCE WITH APPROVED HORTICULTURAL PRACTICES. SHOULD THERE BE A POTENTIAL RISK OF TRANSFER OF DISEASE FROM INFECTED TO NON-INFECTED TREES; TOOLS MUST BE DISINFECTED AFTER PRUNING EACH TREE BY DIPPING IN METHYL HYDRATE. THIS PRACTICE IS PARTICULARLY IMPORTANT DURING PERIODS OF TREE STRESS AND WHEN PRUNING MANY MEMBERS OF THE SAME GENERA, WITHIN WHICH A DISEASE COULD BE SPREAD QUICKLY (I.E., VERTICILLIUM WILT ON MAPLES OR FIRE BLIGHT ON GENERA OF THE ROSACEA FAMILY).
- DURING EXCAVATION OPERATIONS IN WHICH THE ROOT AREA IS AFFECTED, THE CONTRACTOR IS TO PRUNE ALL EXPOSED ROOTS CLEANLY. PRUNED ROOT ENDS ARE TO BE NEATLY AND SQUARELY TRIMMED AND THE AREA IS TO BE BACKFILLED WITH CLEAN NATIVE FILL AS SOON AS POSSIBLE TO PREVENT DESICCATION AND PROMOTE ROOT GROWTH. THE EXPOSED ROOTS SHOULD NOT BE ALLOWED TO DRY OUT, AND THE CONTRACTOR SHALL DISCUSS WATERING OF THE ROOTS WITH THE CONSULTING ARBORIST SO THAT THE ROOTS SHALL MAINTAIN OPTIMUM SOIL MOISTURE DURING CONSTRUCTION AND BACKFILLING OPERATIONS, YET SO NOT TO INTERFERE WITH CONSTRUCTION OPERATIONS. BACKFILLING MUST BE WITH CLEAN UNCONTAMINATED TOPSOIL FROM AN APPROVED SOURCE. TEXTURE MUST BE COARSER THAN EXISTING SOILS, AND TO COME INTO CLEAN CONTACT WITH EXISTING SOILS (REMOVE AIR POCKETS, SOD, ETC.)
- ALL PRUNING CUTS SHOULD BE MADE TO A GROWING POINT SUCH AS A BUD, TWIG OR BRANCH, CUT JUST OUTSIDE THE BRANCH COLLAR (THE SWOLLEN AREA AT THE BASE OF THE BRANCH THAT SOMETIMES HAS A BARK RIDGE), AND PERPENDICULAR TO THE BRANCH BEING PRUNED RATHER THAN AS CLOSE TO THE TRUNK AS POSSIBLE. THIS MINIMIZES THE SITE OF THE WOUND. NO STUBS SHOULD BE LEFT. POOR CUT LOCATION, POOR CUT ANGLE AND TORN CUTS ARE NOT ACCEPTABLE.
- TREE ROOTS SHOULD NOT BE EXCAVATED WITHIN THE CRITICAL STRUCTURAL ROOTING AREA. THIS IS THE MINIMUM AREA OF THE ROOT SYSTEM NECESSARY TO MAINTAIN VITALITY OR STABILITY OF THE TREE. TYPICALLY THIS AREA EXTENDS TO THE DRIPLINE OF THE TREE. THE SEVERING OF ONE ROOT CAN CAUSE APPROXIMATELY 5-20% LOSS OF THE ROOT SYSTEM. A REDUCTION OF THIS AREA BY GREATER THAN 30% CAN POSE STABILITY CONCERNS FOR THE TREE.
- A SLOW RELEASE FERTILIZER EG: BONE MEAL OR APPROVED EQUAL TO BE APPLIED TO TREES WHERE ROOT PRUNING OR ROOT DAMAGE HAS OCCURRED. APPLY PER MANUFACTURER'S RECOMMENDATIONS
- EXTENSIVE PRUNING IS BEST COMPLETED BEFORE PLANTS BREAK DORMANCY. PRUNING SHOULD BE LIMITED TO THE REMOVAL OF NO MORE THAN ONE THIRD (1/3) OF THE TOTAL BUD AND LEAF BEARING BRANCHES. PRUNING SHOULD INCLUDE THE CAREFUL REMOVAL OF:
  - DEADWOOD,
  - BRANCHES THAT ARE WEAK, DAMAGED, DISEASED AND THOSE WHICH WILL INTERFERE WITH CONSTRUCTION ACTIVITY,
  - SECONDARY LEADERS OF CONIFERS,
  - TRUNK AND ROOT SUCKERS,
  - TRUNK WATERSPOUTS, AND
  - TIGHT V-SHAPED OR WEAK CROTCHES (INCLUDED UNIONS).

THE CONTRACTOR MUST IMMEDIATELY REPORT ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY.

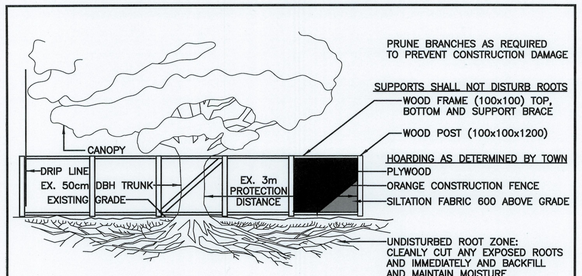
THE TREE PROTECTION FENCING WILL BE MAINTAINED UNTIL ALL CONSTRUCTION IS COMPLETED, SOILS ARE STABILIZED AND ALL OF THE EQUIPMENT HAS BEEN REMOVED FROM THE SITE.

TREE INJURY:

TYPICALLY TREE ROOTS EXTEND 1.5 TO 3 TIMES BEYOND THE DRIPLINE OF THE TREE AND ARE WITHIN THE TOP 150mm OF THE SOIL. TYPES OF DAMAGE FROM CONSTRUCTION INCLUDE:

- PHYSICAL INJURY
- SOIL COMPACTION
- SEVERING OF ROOTS
- SMOTHERING OF ROOTS
- SPLIT OR BROKEN BRANCHES
- EXCESSIVE PRUNING

SOIL COMPACTION REDUCES PORE SPACE, OXYGEN AVAILABLE TO ROOTS INCREASES CARBON DIOXIDE ACCUMULATION, RESTRICTS ROOT GROWTH AND THE ABILITY TO ABSORB WATER AND NUTRIENTS, AS WELL AS IMPAIRS DRAINAGE.
SMOTHERING OF ROOTS: 90% OF FINE ABSORBING ROOTS ARE WITHIN THE UPPER 150-300mm OF THE SOIL. SMOTHERING WITH THE ADDITION OF SOIL CAN KILL THE ROOTS AND STRESS THE TREE.
PHYSICAL INJURY, SPLIT OR BROKEN BRANCHES HINDER THE TREES ABILITY TO COMPARTMENTALIZE (CLOSE) WOUNDS PROPERLY.



MINIMUM TREE PROTECTION DISTANCE FROM TRUNK:

< 10cm DBH	1.2m
10–29cm DBH	1.8m
30–40cm DBH	2.4m
41–50cm DBH	3.0m
51–60cm DBH	3.6m
61–70cm DBH	4.2m
71–80cm DBH	4.8m
81–90cm DBH	5.4m
91–100cm DBH	6.0m
> 100cm DBH	6cm/1cmø

(DIAMETER AT BREAST HEIGHT) DBH = TRUNK DIAMETER AT 1.4m HEIGHT

40cmx60cm SIGN MOUNTED ON ALL SIDES OF BARRIER

MARKHAM

TREE PROTECTION ZONE

NO WORK IS PERMITTED WITHIN THE TREE PROTECTION ZONE INCLUDING GRADING, CONSTRUCTION ACCESS AND MATERIAL STORAGE.

BREACH OF TREE PROTECTION ZONE IS SUBJECT TO A FINE OF $_____

CONTACT TOWN OF MARKHAM FOR MORE INFORMATION: 905-477-5530

TREE PROTECTION NOTES:

1. ALL TREE PROTECTION BARRIERS SHALL BE IN PLACE AND APPROVED BY THE TOWN PRIOR TO CONSTRUCTION ACCESS.
2. ALL SUPPORTS AND STAKES SHALL BE OUTSIDE THE TREE PROTECTION ZONE AND SHALL MINIMIZE ROOT DAMAGE.
3. TREE PROTECTION BARRIERS SHALL REMAIN IN PLACE AND IN GOOD CONDITION UNTIL ALL CONSTRUCTION IS COMPLETE AND APPROVED BY THE TOWN.
4. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS, SHALL BE DONE BY A QUALIFIED TREE WORKER CERTIFIED WITH THE INTERNATIONAL SOCIETY OF ARBORICULTRE APPROVED BY THE TOWN.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN

MARKHAM ENGINEERING DEPARTMENT	DRAWING NAME: TREE PRESERVATION DETAILS	SCALE: NTS REV: 0 DATE: SEPTEMBER 2010	APPROVED BY: DIRECTOR OF ENGINEERING DWG. NO. MP12

1 / TM-2 TREE PROTECTION ZONE

Scale: NTS

KEY MAP

NO	DATE	REVISION/ISSUED	BY	APPD
1	09-10-2021	EA SUBMISSION	JB	BV

wsp
Landscape Architecture
582 Lancaster Street West
Kitchener, ON N2K 1M3
t. 519-743-8777
www.wsp.com

CLIENT:
CITY OF MARKHAM
MARKHAM, ON

PROJECT TITLE:
GLYNWOOD RETIREMENT RESIDENCE
TREE MANAGMENT PLAN

SITE ADDRESS:
7700 BAYVIEW AVE
THORNHILL, ON L3T 5W1

DRAWING TITLE:
TREE PROTECTION NOTES & DETAILS

STAMP | STAMP

DESIGNED	DRAWN	CHECKED
JB	JB	BV

SCALE 1:xxx | DATE AUGUST 2021

PROJECT NUMBER 121-15461-00-20 | DWG. NUMBER TM-2