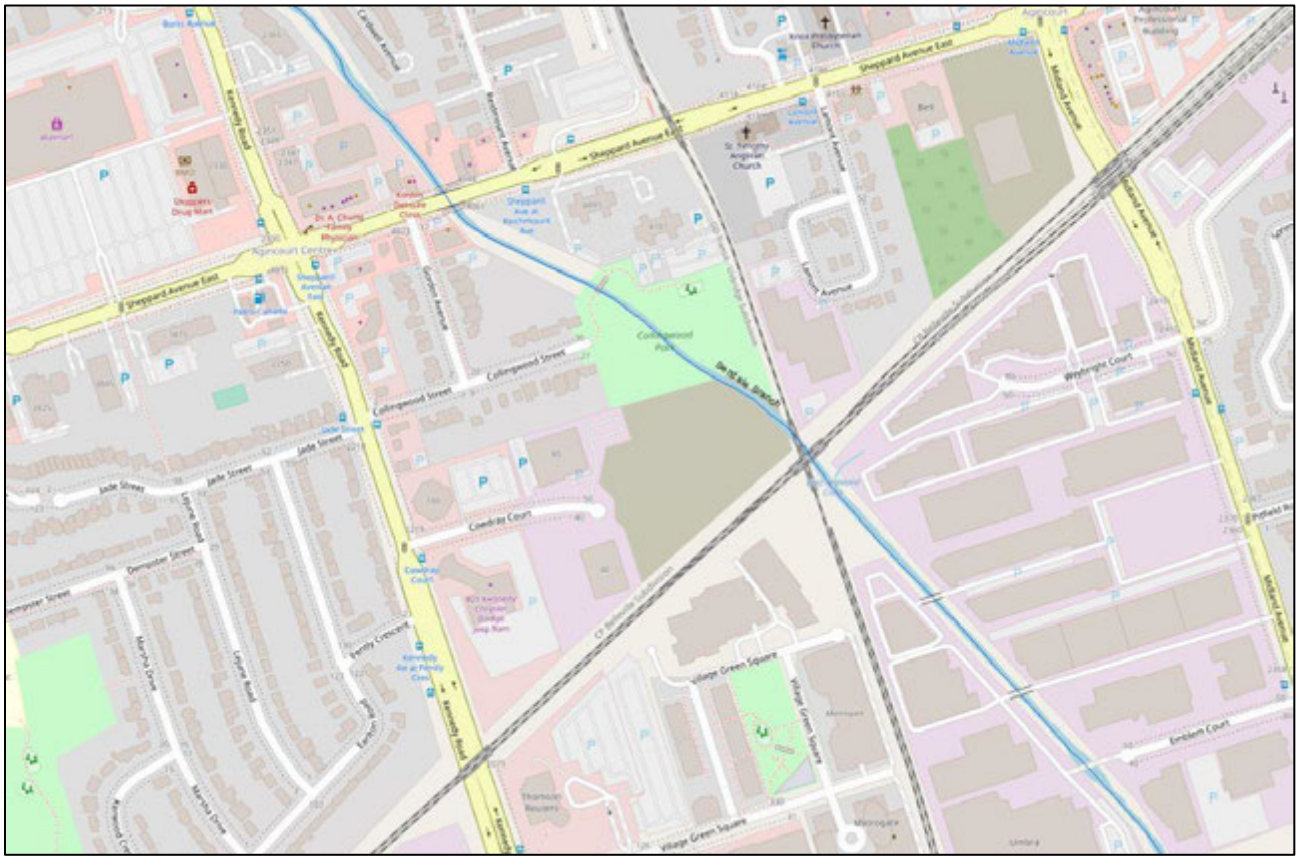
APPENDIX W

Future Floodplain Evaluation

City of Toronto

Floodplain Analysis for Southwest Agincourt Transportation Connection Study

March 29, 2023 FINAL



Floodplain Analysis for Southwest Agincourt Transportation Connection Study

City of Toronto

FINAL

Project No.: 19M-01888-00
Date: March 29, 2023

WSP
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March 29, 2023

City of Toronto
100 Queen St. W. Toronto, ON M5H 2N2

Dear Madam/Sir:

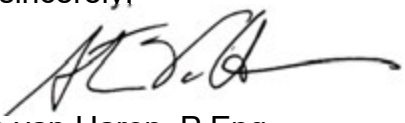
Subject: Floodplain Analysis for Southwest Agincourt Transportation Connection Study

We are pleased to submit an electronic copy of the Floodplain Study report to support the study of Southwest Agincourt Transportation Connection, City of Toronto.

The report examines the hydraulic conditions of the West Highland Creek and provides an analysis of flood impacts under both current and proposed conditions, and provides the findings of the study.

We trust the submission of this documents meets your requirements. Should you have any comments we look forward to your response.

Yours sincerely,



Steven van Haren, P.Eng.,
Manager, Land Development / Water Resources

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Revision History

FINAL

March 29, 2023	Floodplain Study	
Prepared by	Reviewed by	Approved by
Xiaoxu (Iris) Qu, P.Eng., Senior Project Engineer, Water Resources	Steven van Haren, P.Eng. Manager, Land Development/Water Resources	Steven van Haren, P.Eng. Manager, Land Development/Water Resources

Signatures

Prepared by

Xiaoxu (Iris) Qu, P.Eng., — March 29, 2023 (Date)

Steven van Haren, P.Eng.
Manager, Land Development/Water Resources — March 29, 2023 (Date)

[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.

Contributors

Client

City of Toronto

WSP

Senior Project Engineer, Water Resources	Xiaoxu (Iris) Qu, P.Eng.
Water Resources Modeller	Jenny Chui, M.Sc.
Manager, Water Resources	Steven van Haren, P.Eng.

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1 INTRODUCTION

1.1 General

The City of Toronto has retained WSP to undertake the Southwest Agincourt Transportation Connections Study (herein referred to as the SW Agincourt EA) following the Municipal Class Environmental Assessment (MCEA) process for Schedule 'C'. The purpose of this study is to consider the findings from the 2014 Feasibility Study, as well as the changes in the Focus Area and the latest City policies to identify improvements to enhance connectivity for all modes of transportation between Village Green Square (south of the CP Railway corridor), Cowdray Court, Collingwood Street and Sheppard Avenue East (in the vicinity of Reidmount Avenue and the Agincourt GO Station). A map of the study's Focus Area is shown in **Exhibit 1**.

Exhibit 1: Southwest Agincourt Transportation Connections Study Study Area

In the SW Agincourt EA study, four complete street alternatives that will serve all modes of transportation (e.g. pedestrians, cyclists, transit and motorists) have been developed through the Focus Area, as shown in **Exhibit 2**. Option C-1 was recommended as the preferred in the SW Agincourt EA study.

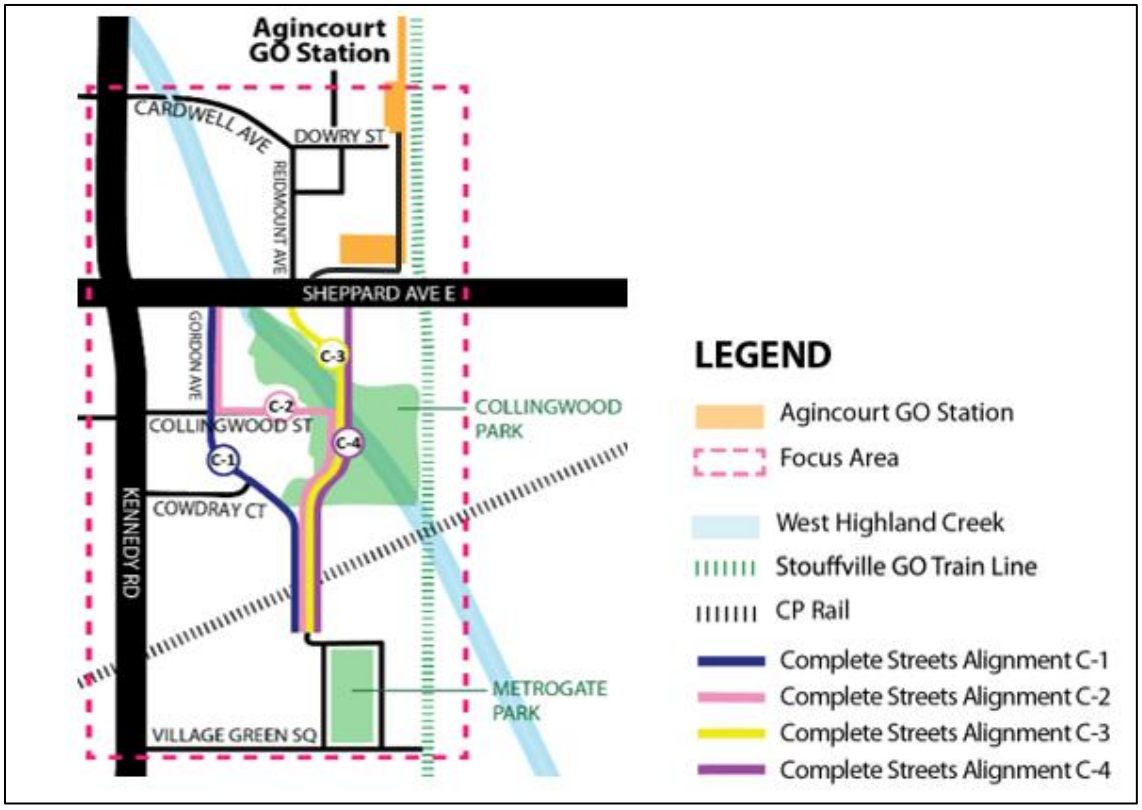


Exhibit 2: Map of Potential New Complete Streets

Two new muti-use trail alternatives have been considered in this study to serve key destinations and origins in the Focus Area: Agincourt GO Station, Collingwood Park, Kennedy/Sheppard, school and local transit, as shown in **Exhibit 3.** Option D-1 was recommended as the preferred in the SW Agincourt EA study.

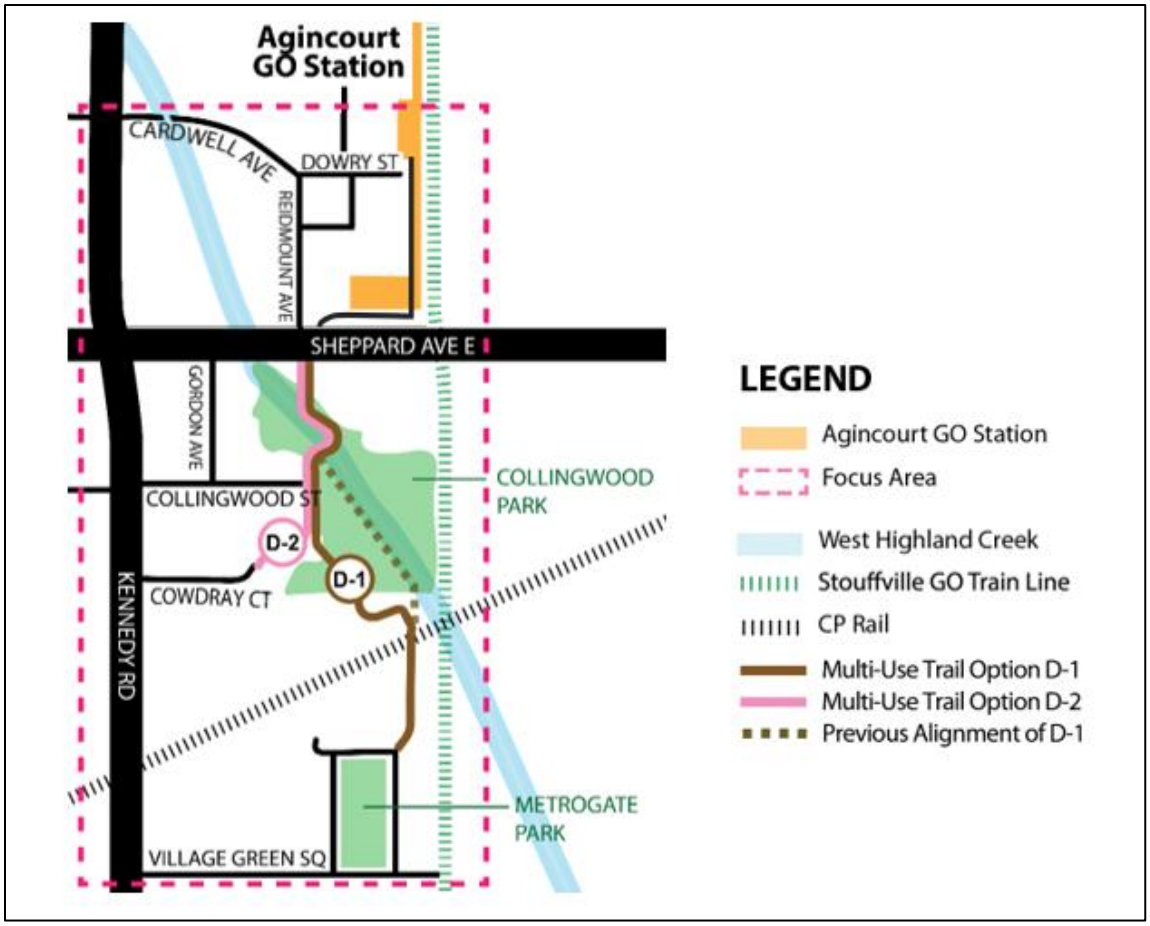


Exhibit 3: Map of Potential New Trail Connections

The preferred alternatives Complete Street Alignment C-1 and Multi-Use Trail Option D-1 were used for the proposed conditions in this floodplain analysis.

As shown in **Exhibit 1**, the West Highland Creek flows through the Focus Area from the north to the south. The West Highland Creek is a tributary of the Highland Creek, which is regulated by the Toronto and Region Conservation Authority (TRCA). Since the Focus Area is located within the watershed of the Highland Creek, a floodplain analysis was performed as part of the SW Agincourt EA Study to evaluate the potential hydraulic impacts of the proposed developments.

This report examines the current and proposed conditions, discusses the methodology of the hydraulic analysis, summarizes the results of computational simulations, and presents the findings for the Focus Area.

1.2 Scope of Floodplain Analysis

The scope of the floodplain analysis is described as follows:

- Overview the Technical Memo “Agincourt HEC-RAS Model Update” dated September 29, 2020 (herein referred to as *2020 Technical Memo*).
- Simulate the current and proposed conditions under the Regional event; examine the potential hydraulic impacts.
- Prepare a report to document the methodology of the analysis and summarize the results.

2 OVERVIEW: *2020 TECHNICAL MEMO*

On September 29, 2020, WSP prepared a technical memo entitled “Agincourt HEC-RAS Model Update” to document the HEC-RAS model updates. Below is the summary of the memo:

- WSP reviewed the latest Highland Creek HEC-RAS 1D model provided by the TRCA in April 2020. In the model, a creek named “Bendale Branch Reach 3” runs through the Focus Area. Four watercourse crossings were coded in this creek within the Focus Area. Among these crossings, the complex “Railway double crossing” was coded using two separate structures: the Metrolinx GO Stouffville Railway crossing and CP Railway crossing.
- WSP described the conversion of the TRCA HEC-RAS 1D model to a 1D/2D coupled model in the Focus Area by WSP to evaluate the spill paths and flooding conditions, especially at the Railway double crossing. In the WSP 1D/2D coupled model, the Railway double crossing was combined to be one structure configuration including two extended Metrolinx GO Stouffville Railway culverts, the railway top edge as an non-parallel weir and the existing CP bridge piers above.
- WSP presented the comparison of the modelled Regional water levels and floodlines between the TRCA 1D and WSP 1D/2D coupled model.

The *2020 Technical Memo* is provided in **Appendix A**.

3 CURRENT CONDITIONS

3.1 Site Location

As stated above, WSP converted the TRCA 1D HEC-RAS model to a 1D/2D coupled model in the Focus Area. **Figure 1** shows the site location, 1D/2D coupled model and the alignments of the proposed road and trail. The details of the coupled model are documented in the *2020 Technical Memo*.

3.2 Land Cover Map

The land cover map was generated to define the Manning's roughness in the 2D flow areas. Manning's n values of 0.025 and 0.05 were used for the impervious and pervious areas, respectively. **Figure 2** illustrates the land cover map under the current conditions.

3.3 Model Boundaries

Exhibit 4 shows the TRCA peak flows presented in the *2020 Technical Memo Table 2.*

Table 2 TRCA Peak Flows at Railway Double Crossings

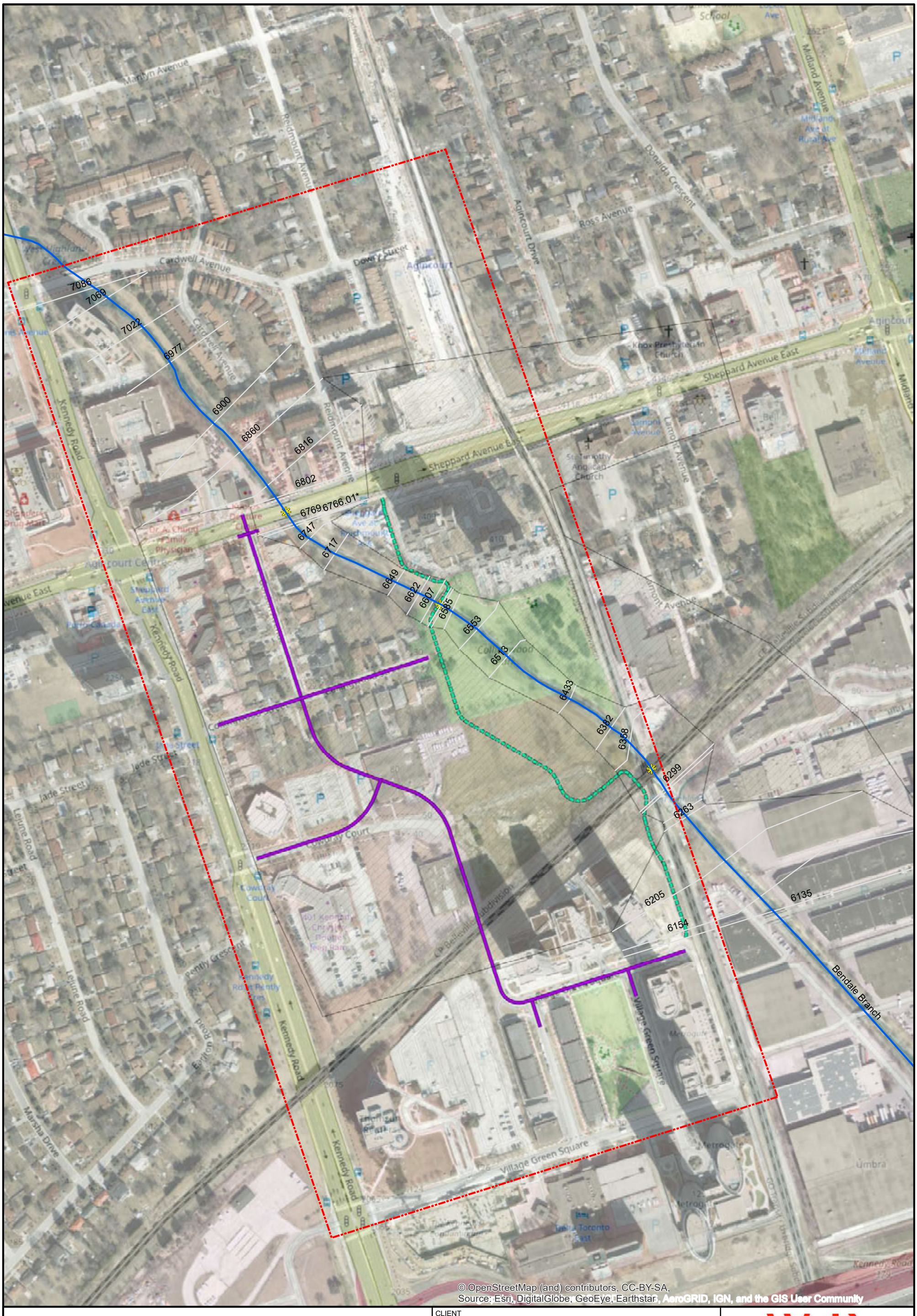
River	Reach	RS	Flow (m3/s)								Note
			2 yr	5 yr	10 yr	25 yr	50 yr	100 yr	350 yr	Regional	
Bendale Branch	Reach 3	7086	27.32	44.41	55.62	68.68	77.94	87.43	186.83	158.668	
		6769	31.27	51.34	64.12	78.48	87.53	97.27	203.53	185.907	
		6598	31.17	51.16	64.06	77.97	86.65	95.77	203.8	187.719	U/S of Railway Double Crossings
		6299	31.25	51.28	64.09	77.33	85.04	93.53	203.88	189.629	D/S of Railway Doule Crossings

Exhibit 4: TRCA Peak Flows

A quasi-steady hydrograph with a peak flow rate of 158.668 m^3/s (Regional event) was entered at RS 7086. Lateral inflows were entered in other three locations to match the TRCA peak flows. The Rating curve generated from the TRCA 1D model was used as the downstream boundary at RS 6135.

3.4 Simulation Results

The Regional flood event was simulated and the Regional floodlines were produced from the model results, as shown in **Figure 3**. The TRCA existing Regional floodlines are also shown in **Figure 3** for the comparison.



Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1

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CITY OF TORONTO

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FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Site Location

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Date: March 2023	Proj. No.: 19M-01888-00
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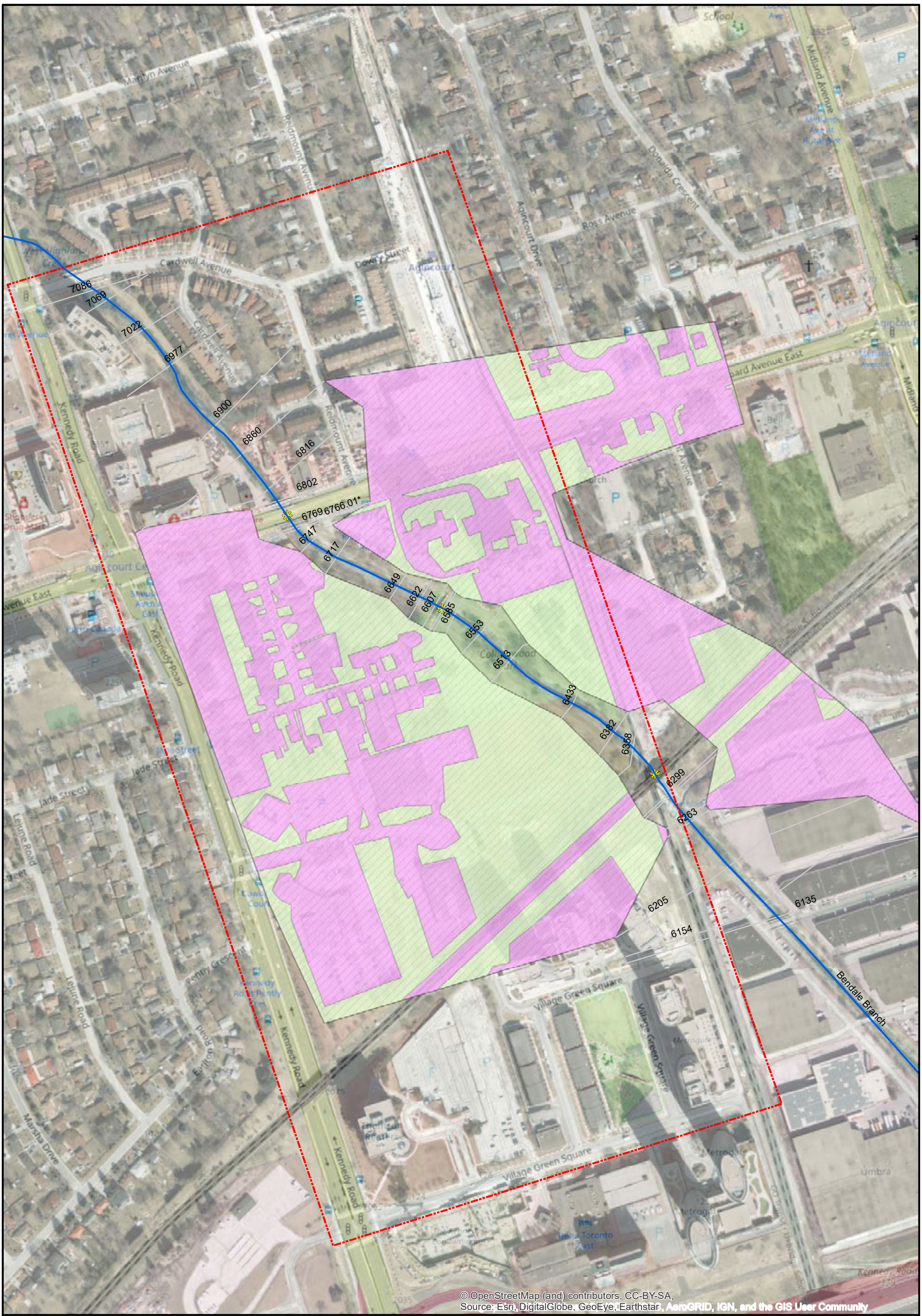

Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas

Manning's n_Current Conditions

- Urban Uses Impervious 0.025
- Urban Uses Pervious 0.05

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FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Land Cover Map for 2D Areas - Current Conditions

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I.Q	J.C
Date: March 2023	Proj. No.: 19M-01888-00
Scale: 1:3,500	Figure No.: **2**

Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- TRCA Regional Floodlines (1D, April 2020)
- WSP Regional Floodlines_Current Conditions (1D/2D Model)

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FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

TRCA and WSP Regional Floodlines - Current Conditions

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Scale: 1:3,500	Figure No.: **3**

4 PROPOSED CONDITIONS

4.1 Proposed Site Plan

As stated above, the preferred alternatives Complete Street Alignment C-1 and Multi-Use Trail Option D-1 were used for the proposed conditions in this floodplain analysis. The proposed site plan is provided in **Appendix B**.

The proposed surface was created and applied in the model simulation.

4.2 Land Cover Map

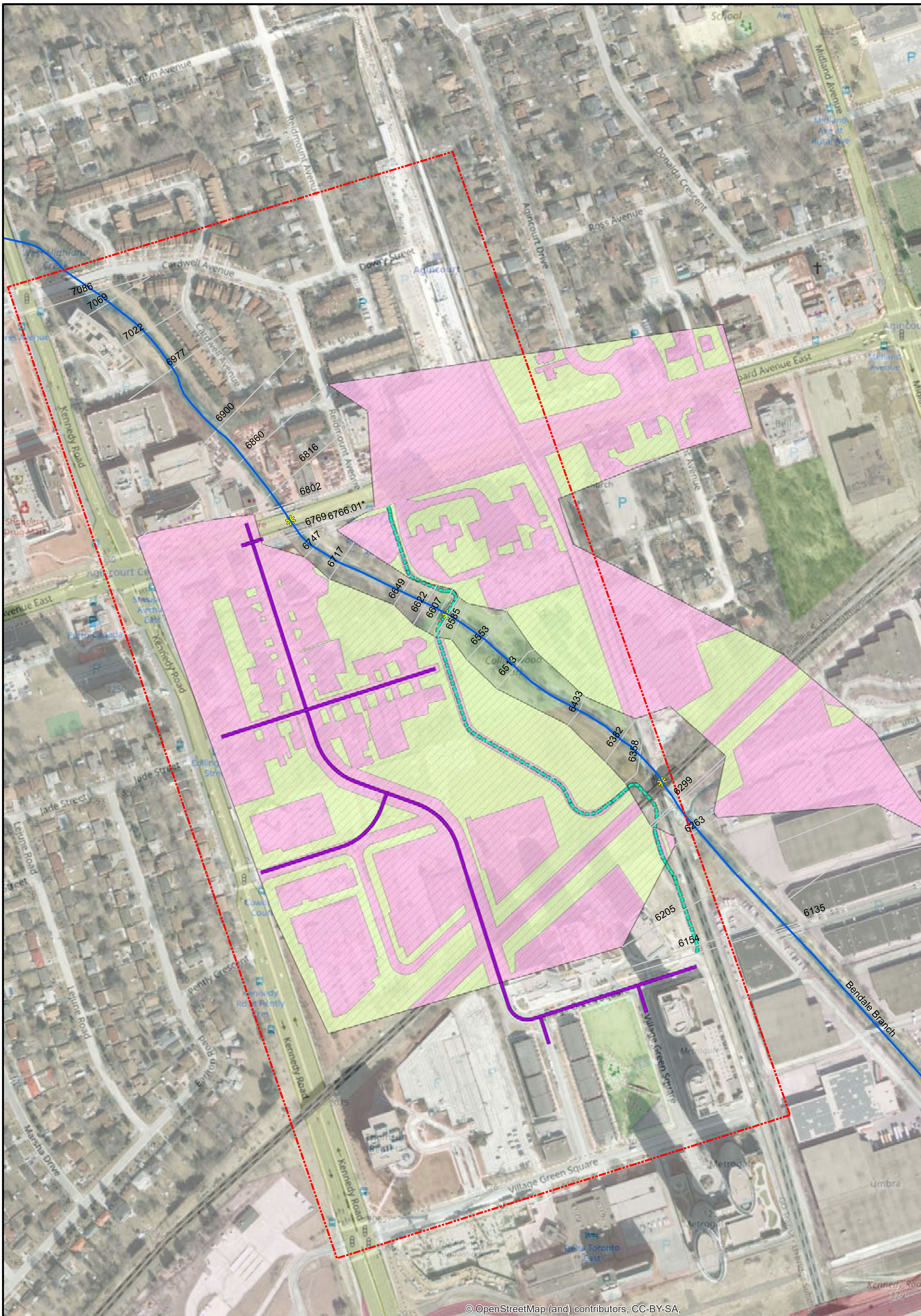
The land cover map for the 2D flow areas was revised for the proposed conditions. Manning's n values of 0.025 and 0.05 were used for the impervious and pervious areas, respectively. **Figure 4** illustrates the land cover map under the proposed conditions.

4.3 Model Boundaries

The flows and downstream boundaries remain unchanged for the proposed simulation.

4.4 Simulation Results

The Regional flood event was simulated and the Regional floodlines were produced, as shown in **Figure 5**. The outputs from the 1D portion for both current and proposed conditions are provided in **Appendix C**.



Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1

Manning's n_Proposed Conditions

- Urban Uses Impervious 0.025
- Urban Uses Pervious 0.05

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CITY OF TORONTO

TITLE

FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Land Cover Map for 2D Areas - Proposed Conditions

wsp

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Date	March 2023	Proj. No.	19M-01888-00
Scale	1:3,500	Figure No.	4

Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1
- WSP Regional Floodlines_Current Conditions (1D/2D Model)
- WSP Regional Floodlines_Proposed Conditions (1D/2D Model)

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FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

WSP Regional Floodlines - Current and Proposed Conditions

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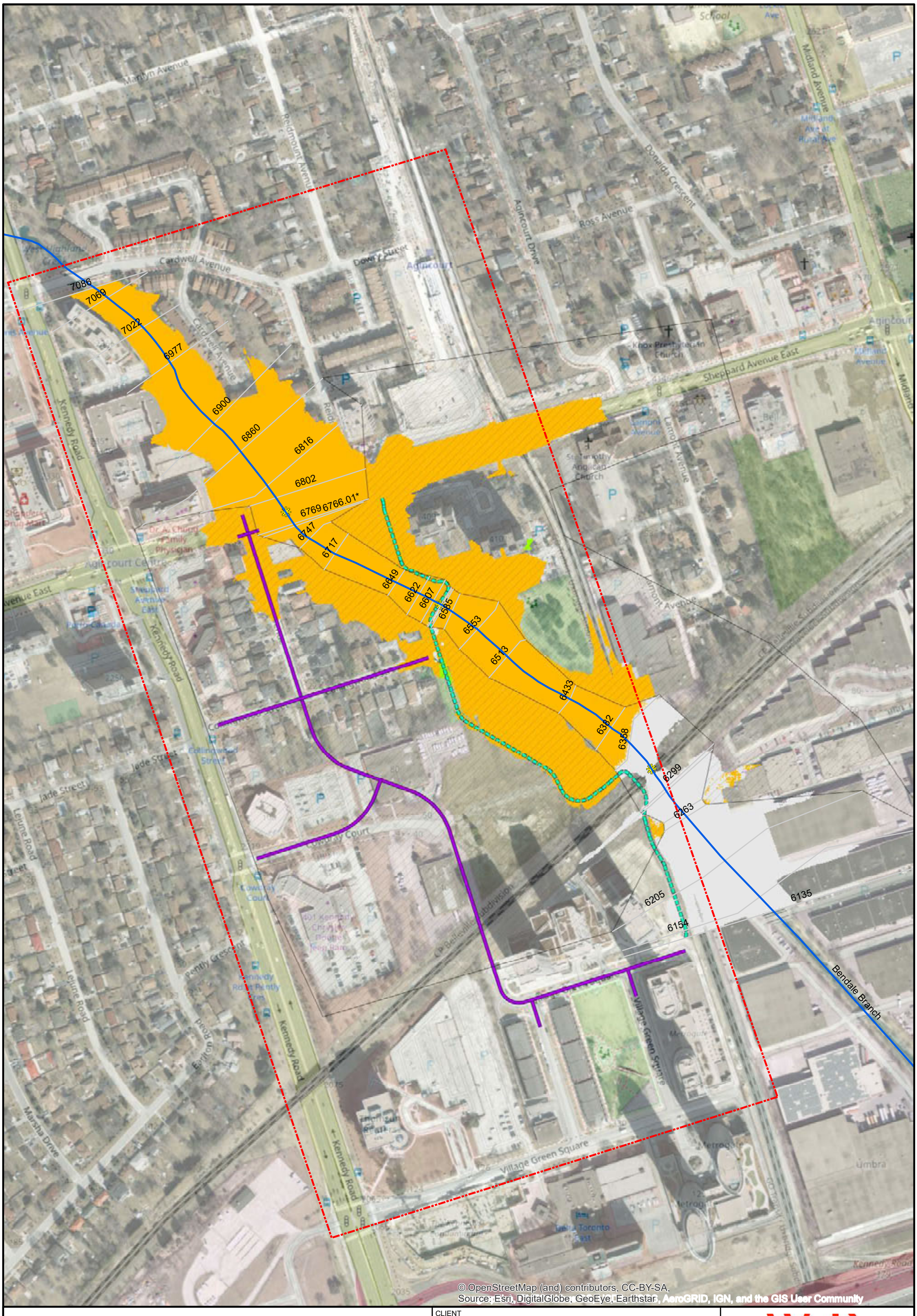
Date: March 2023	Proj. No.: 19M-01888-00
Scale: 1:3,500	Figure No.: **5**

4.5 Potential Hydraulic Impacts

The comparisons of the Regional water level, velocity and product of depth and velocity were made between the proposed and current conditions to examine the potential hydraulic impacts due to the site development, as illustrated in **Figure 6**, **Figure 7** and **Figure 8**. The results show the site development would have negligible hydraulic impacts to adjacent properties (normally 0- 0.05 m, 0-0.05 m/s and 0-0.05 m^2/s for water level, velocity and DxV in the majority of the Focus Area).



Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1

Regional Water Level Comparison
Proposed minus Existing (m)

- <0
- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- >0.15

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FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Regional Water Level Comparison Proposed minus Existing

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Date: March 2023	Proj. No.: 19M-01888-00
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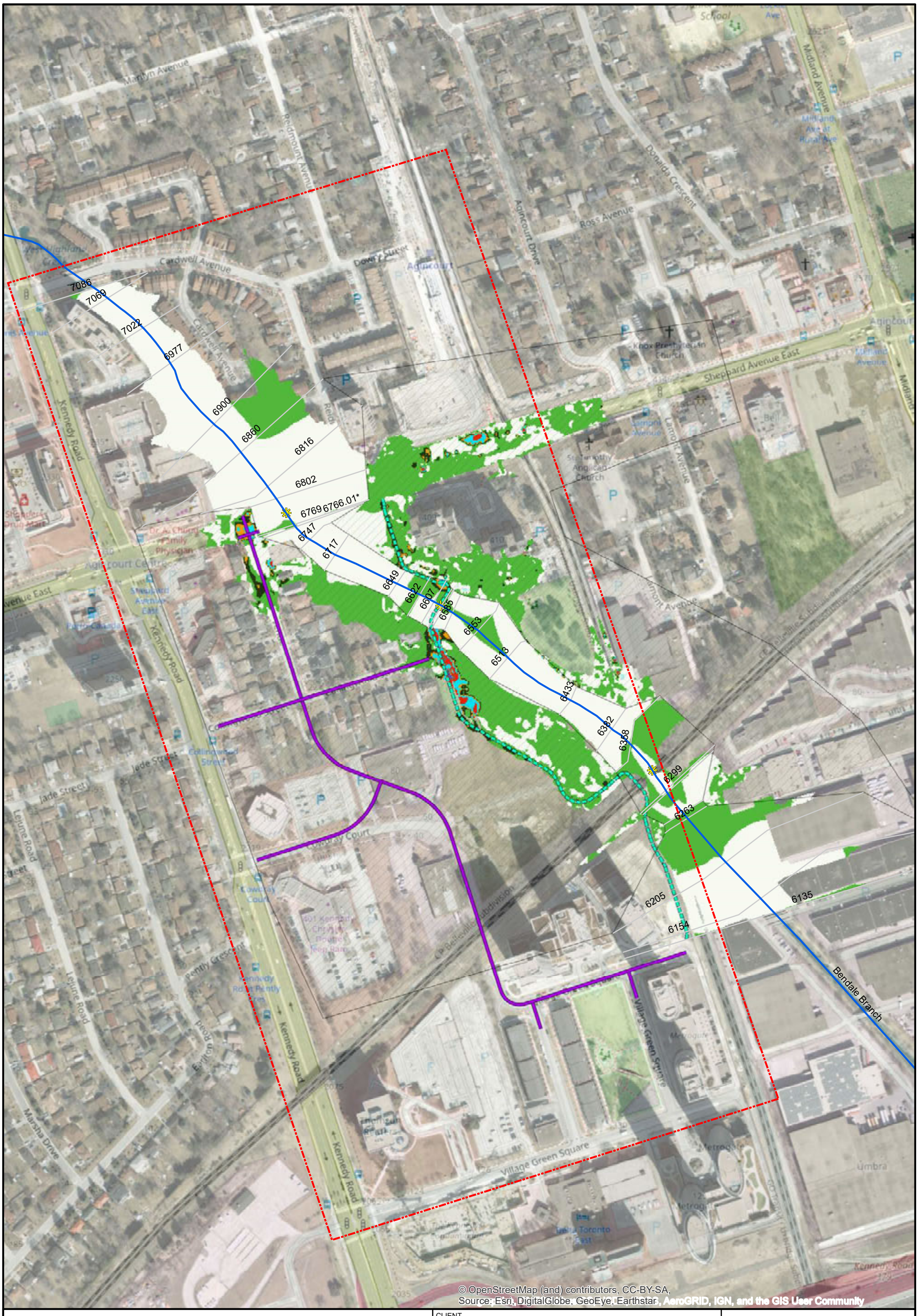

Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1

Regional Velocity Comparison

Proposed minus Existing (m/s)

- -1 - -0.5
- -0.5 - 0
- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- 0.15 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- 1 - 2
- >2

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CITY OF TORONTO

TITLE

FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Regional Velocity Comparison Proposed minus Existing

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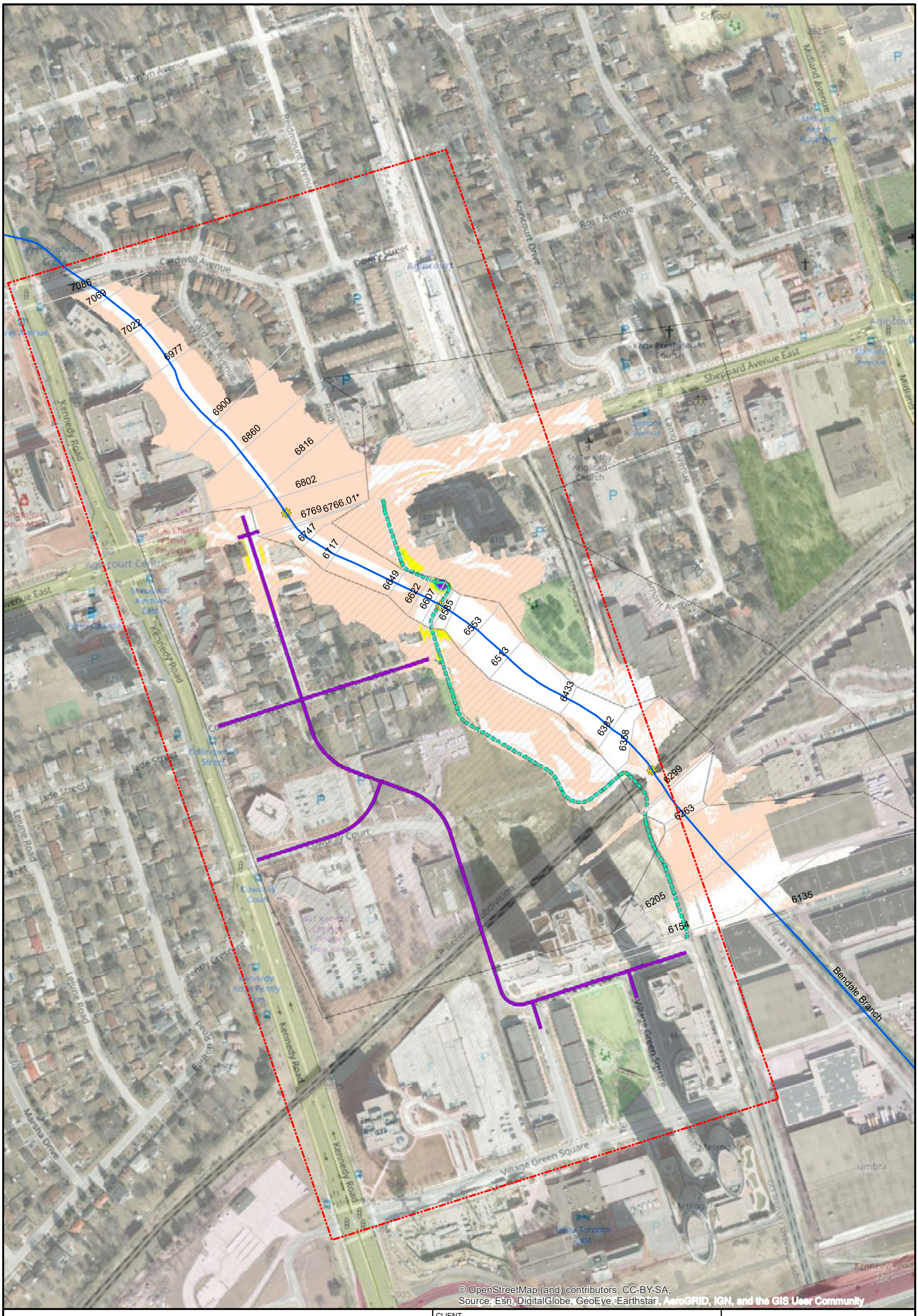

Legend

- Focus Area
- Bendale Branch
- Cross Sections
- Watercourse Crossing
- 2D Areas
- Proposed Complete Road Alignment C-1
- Proposed Multi-Use Trail Alignment D-1

Regional DepthxVelocity Comparison
Proposed minus Existing (m2/s)

- <0
- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4

CLIENT
CITY OF TORONTO

TITLE
FLOODPLAIN ANALYSIS FOR SOUTHWEST AGINCOURT TRANSPORTATION CONNECTION

Regional Depth x Velocity Comparison Proposed minus Existing

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I.Q	J.C
Date: March 2023	Proj. No.: 19M-01888-00
Scale: 1:3,500	Figure No.: **8**

5 CONCLUSION

A floodplain analysis was performed in support of the SW Agincourt EA study for the City of Toronto.

WSP converted the TRCA Highland Creek 1D HEC-RAS model to a 1D/2D coupled model in the Focus Area and simulated the revised model for the current conditions under the Regional flood event. The Regional floodlines for the current conditions were generated based on the model results.

Subsequently, the preferred Complete Road Alignment C-1 and Multi-Use Trail D-1 were used for the proposed conditions. The model was then revised to reflect the proposed conditions and simulated under the Regional Storm event. The Regional floodlines for the proposed conditions were produced based on the model results.

A comparison of Regional water levels, velocities and the product of depth and velocity was made between the proposed and current conditions. The results show the proposed conditions would generally have negligible impacts on the adjacent properties.

APPENDIX

A

Technical Memo « Agincourt HEC-RAS Model Update » (September 29, 2020)

Technical Memorandum

To: Steven van Haren, P.Eng. **Date:** September 29, 2020

From: Xiaoxu (Iris) Qu, P.Eng. **Project No:** 19M-16008-001

Subject: **Agincourt HEC-RAS Model Update**

1 Introduction

This technical memorandum documents the comparison of the Regional water levels modelled by the latest Highland Creek HEC-RAS 1D model obtained from the Toronto and Region Conservation Authority (TRCA) in April 2020 and WSP's HEC-RAS 1D/2D coupled model for the proposed conditions between upstream of Sheppard Avenue and downstream of the Railway double crossings.

2 Latest Highland Creek HEC-RAS 1D Model (TRCA)

The updated Highland Creek HEC-RAS 1D model was provided by the TRCA in April 2020.

Four structures were coded in Bendale Branch Reach 3 between Sheppard Avenue to Railway double crossings. The chainages and opening dimensions are presented in **Table 1**. As shown in **Table 1**, the Railway double crossings were coded using two separate structures: Metrolinx GO Stouffville Railway crossing and CP Railway crossing. **Figure 1** shows the geometries of the Railway double crossing structures.

Table 1 Structures Coded in Existing 1D Model

Location	HEC-RAS Chainage	Structure Type	Opening Dimensions
Sheppard Ave.	Bendale Branch, Reach 3, 6785.84	Bridge	10.2 m (W) x 3.1 m (H)
Collingwood Park Pedestrian Bridge	Bendale Branch, Reach 3, 6602.81	Bridge	21.7 m (W) x 3.4 m (H)
Metrolinx GO Stouffville Railway crossing	Bendale Branch, Reach 3, 6345	Culvert	2 – 6.12 m (W) x 3.44 m (H), 21.75 m long
Canadian Pacific (CP) Railway crossing	Bendale Branch, Reach 3, 6313	Bridge	45.6 m (W) x 10.3 m (H)

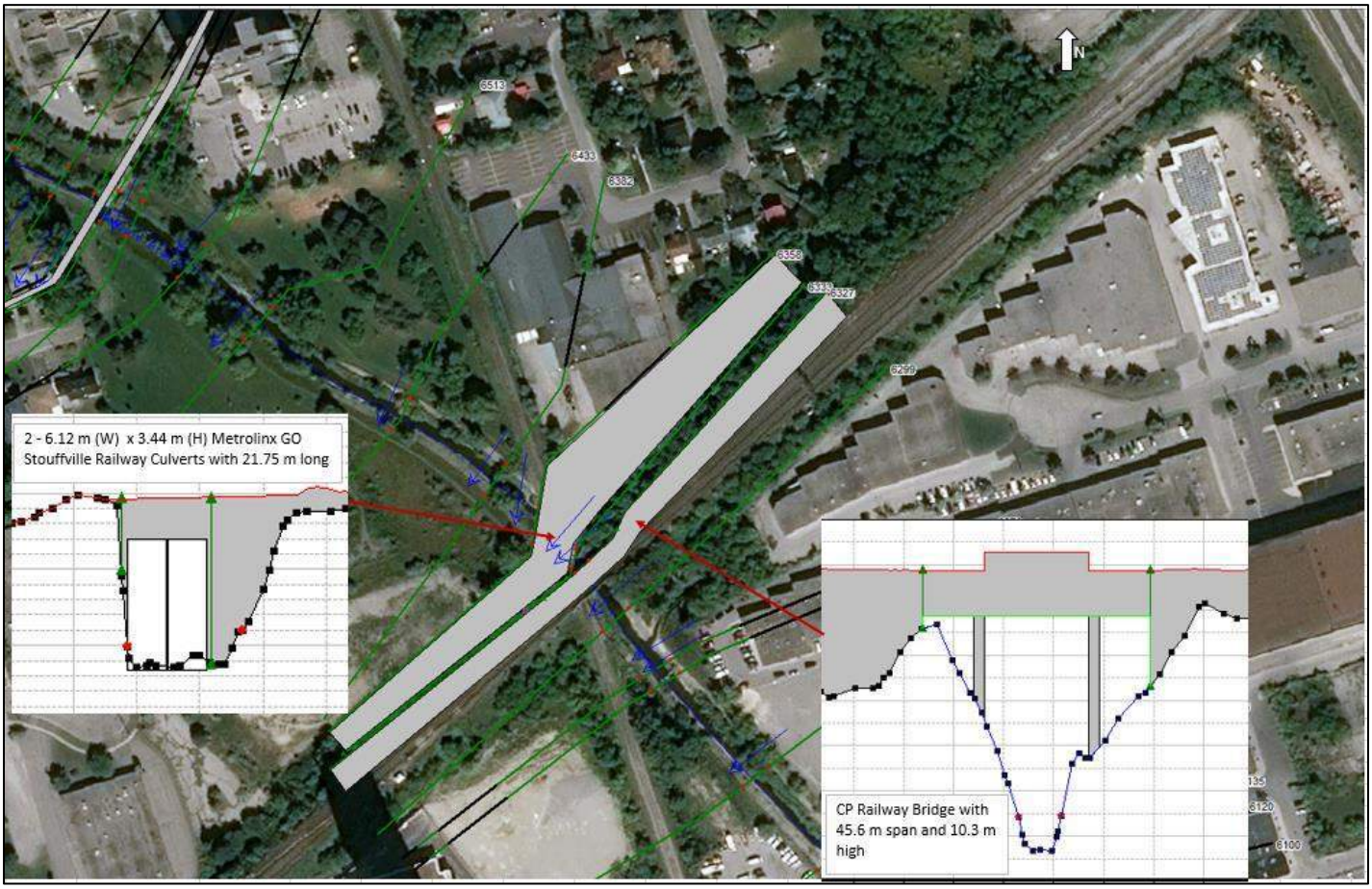


Figure 1 TRCA HEC-RAS 1D Model - Double Railway Crossings

2- to 350-yr and Regional peak flow rates extracted from the TRCA HEC-RAS model at both upstream and downstream of the Railway double crossings are presented in **Table 2**.

Table 2 TRCA Peak Flows at Railway Double Crossings

River	Reach	RS	Flow (m3/s)								Note
			2 yr	5 yr	10 yr	25 yr	50 yr	100 yr	350 yr	Regional	
Bendale Branch	Reach 3	7086	27.32	44.41	55.62	68.68	77.94	87.43	186.83	158.668	
		6769	31.27	51.34	64.12	78.48	87.53	97.27	203.53	185.907	
		6598	31.17	51.16	64.06	77.97	86.65	95.77	203.8	187.719	U/S of Railway Double Crossings
		6299	31.25	51.28	64.09	77.33	85.04	93.53	203.88	189.629	D/S of Railway Doule Crossings

Except the CP Railway bridge, other three structures would be overtopped during the Regional flood event. The modelled Regional water levels (this simulation was named “RUN 1”) are provided in **Table 3**.

3 HEC-RAS 1D/2D Coupled Model for Proposed Conditions (WSP)

Given the complex hydraulics at the Railway double crossings, WSP converted the TRCA’s HEC-RAS 1D model to a 1D/2D coupled model from upstream of Shepperd Avenue to downstream of Railway double crossings to allow for an appropriate level of detail in evaluating spill paths and flooding conditions.

To focus on the study area, the existing TRCA 1D model was extracted from Bendale Branch Reach 3 RS 7086 to RS 6135 to construct the 1D/2D model.

The construction drawings of Stouffville Rail Corridor Expansion 2nd Track (Contract No. IT-2015-CI-047) were obtained from AECOM. Since the Metrolinx GO Stouffville Rail is proposed to be expanded, the existing Metrolinx GO Stouffville Railway culverts are proposed to be extended to south approximately 15.9 m and 24.5 m. The extended portion will be under the existing CP Railway bridge. As such, the Railway double crossings were combined to be one structure configuration including two extended Metrolinx GO Stouffville Railway culverts and the existing CP bridge piers for the proposed conditions, as shown in **Figure 2**. Shepperd Avenue bridge and Collingwood Park Pedestrian bridge remain unchanged in the WSP’s model. These three structures were coded in 1D river channel, while the floodplains were modelled using two separate 2D domains from immediately upstream of Shepperd Avenue to downstream of Railway double crossings. The 2D areas were connected to the 1D channel using two lateral structures, as shown in **Figure 2.**

Qusi-steady hydrograph with a peak rate of 158.668 m^3/s (Regional event) was entered at RS 7086. Lateral inflows were entered in other three flow change locations. Rating curve generated from the existing TRCA 1D model was used as the downstream boundary at RS 6135.

The modelled Regional water levels (this simulation was named “RUN 2”) are provided in **Table 3**.

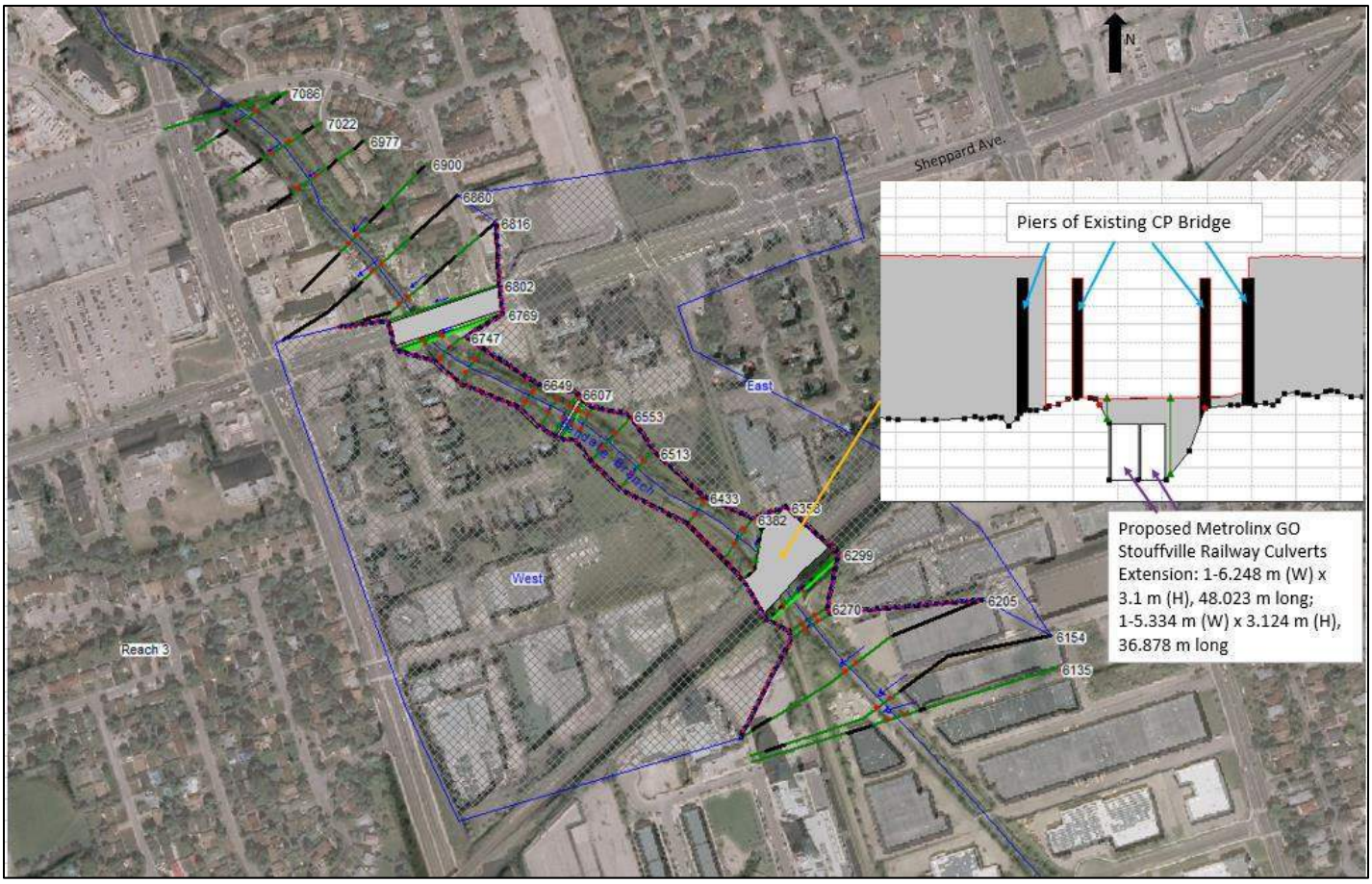


Figure 2 Revised Railway Double Crossings for Proposed Conditions (HEC-RAS 1D/2D Coupled Model)

Table 3 Comparison of Modelled Regional Water Levels

RUN 1				RUN 2				WL Difference (m) (RUN 2-RUN 1)
TRCA April Model (1D)				WSP Revised Proposed Metrolinx Crossing (1D/2D) (with Proposed Grade and buildings)				
				Lateral Weir Coefficient 0.2				
Reach	River Station	Q Total	Regional W.S. Elevation	Reach	River Station	Q Total (1D and 2D)	Regional W.S. Elevation	
		(m^3/s)	(m)			(m^3/s)	(m)	
Reach 3	7086	158.67	167.77	Reach 3	7086	158.67	167.34	-0.43
Reach 3	7069	158.67	167.8	Reach 3	7069	158.71	167.43	-0.37
Reach 3	7022	158.67	167.78	Reach 3	7022	158.8	167.41	-0.37
Reach 3	6977	158.67	167.77	Reach 3	6977	158.75	167.39	-0.38
Reach 3	6900	158.67	167.6	Reach 3	6900	158.42	167.24	-0.36
Reach 3	6860	158.67	167.67	Reach 3	6860	158.69	167.31	-0.36
Reach 3	6816	158.67	167.64	Reach 3	6816	158.5	167.29	-0.35
Reach 3	6802	158.67	167.71	Reach 3	6802	157.64	167.36	-0.35
Reach 3	6785.84	Bridge	Sheppard Ave. Bridge	Reach 3	6785.84	Bridge	Sheppard Ave. Bridge	-
Reach 3	6769	185.91	167.71	Reach 3	***6769*** [1]	***157.64*** [1]	***167.36***	***-0.35***
Reach 3	6747	185.91	167.67	Reach 3	6747	185.46	167.28	-0.39
Reach 3	6717	185.91	167.59	Reach 3	6717	185.92	167.24	-0.35
Reach 3	6649	185.91	167.53	Reach 3	6649	186.04	167.16	-0.37
Reach 3	6622	185.91	167.56	Reach 3	6622	186.04	167.23	-0.33
Reach 3	6607	185.91	167.59	Reach 3	6607	185.24	167.27	-0.32
Reach 3	6602.81	Bridge	Collingwood Park Pedestrian Bridge	Reach 3	6602.81	Bridge	Collingwood Park Pedestrian Bridge	-
Reach 3	6598	187.72	167.55	Reach 3	6598	185.47	166.90	-0.65
Reach 3	6585	187.72	167.48	Reach 3	6585	188.42	166.84	-0.64
Reach 3	6553	187.72	167.48	Reach 3	6553	188.04	166.84	-0.64
Reach 3	6513	187.72	167.44	Reach 3	6513	187.75	166.83	-0.61
Reach 3	6433	187.72	167.42	Reach 3	6433	187.81	166.75	-0.67
Reach 3	6382	187.72	167.47	Reach 3	6382	188.00	166.77	-0.70
Reach 3	6358	187.72	167.47	Reach 3	6358	188.00	166.88	-0.59
Reach 3	**6345**	**Culvert**	**Metrolinx Culvert**	Reach 3	6345	**Proposed Metrolinx Double Crossing**	-	-
Reach 3	6333	187.72	167.2	~~Reach 3~~	~~6333~~	-	-	-
Reach 3	6327	187.72	166.72	~~Reach 3~~	~~6327~~	-	-	-
Reach 3	**6313**	**Bridge**	**CNRailway Bridge**	**~~Reach 3~~**	**~~6313~~**	-	-	-
Reach 3	6299	189.63	165.86	Reach 3	6299	188.00	165.90	0.04
Reach 3	6270	189.63	165.87	Reach 3	6270	189.99	165.79	-0.08
Reach 3	6263	189.63	165.89	Reach 3	6263	189.85	165.83	-0.06
Reach 3	6205	189.63	165.9	Reach 3	6205	189.9	165.87	-0.03
Reach 3	6154	189.63	165.83	Reach 3	6154	189.88	165.83	0
Reach 3	6135	189.63	165.81	Reach 3	6135	189.88	165.81	0

Note 1: Flow change location. But because this is the bridge D/S cross section, 1D/2D coupled model doesn't allow to add a flow node at this cross section, so an additional cross section (RS 6766.01) was added 3 m downstream of RS 6769 for flow change.

4 Comparison of Modelled Regional Water Levels

As presented in **Table 3**, 0.32 m to 0.70 m water level reduction would occur between Sheppard Avenue and Railway double crossings comparing WSP 1D/2D coupled model for the proposed conditions (RUN 2) to the TRCA's 1D model provided in April (RUN 1).

The Regional floodlines for RUN 1 and RUN 2 are provided in **Figure 3.**

Xiaoxu (Iris) Qu, P.Eng.

Senior Project Engineer, Water Resources

Legend

- Watercourse
- Road
- Regional Floodline (TRCA 1D Model, April
- Regional Floodline (WSP Revised 1D/2D Model with Proposed Metrolinx Crossing)
- 2D Areas

CLIENT
TORONTO AND REGION CONSERVATION AUTHORITY

TITLE
AGINCOURT HEC RAS MODELS

REGIONAL FLOODLINE (TRCA 1D MODEL, APRIL 2020) (WSP Rebised 1D/2D Model with Proposed Metrolinx Crossing)

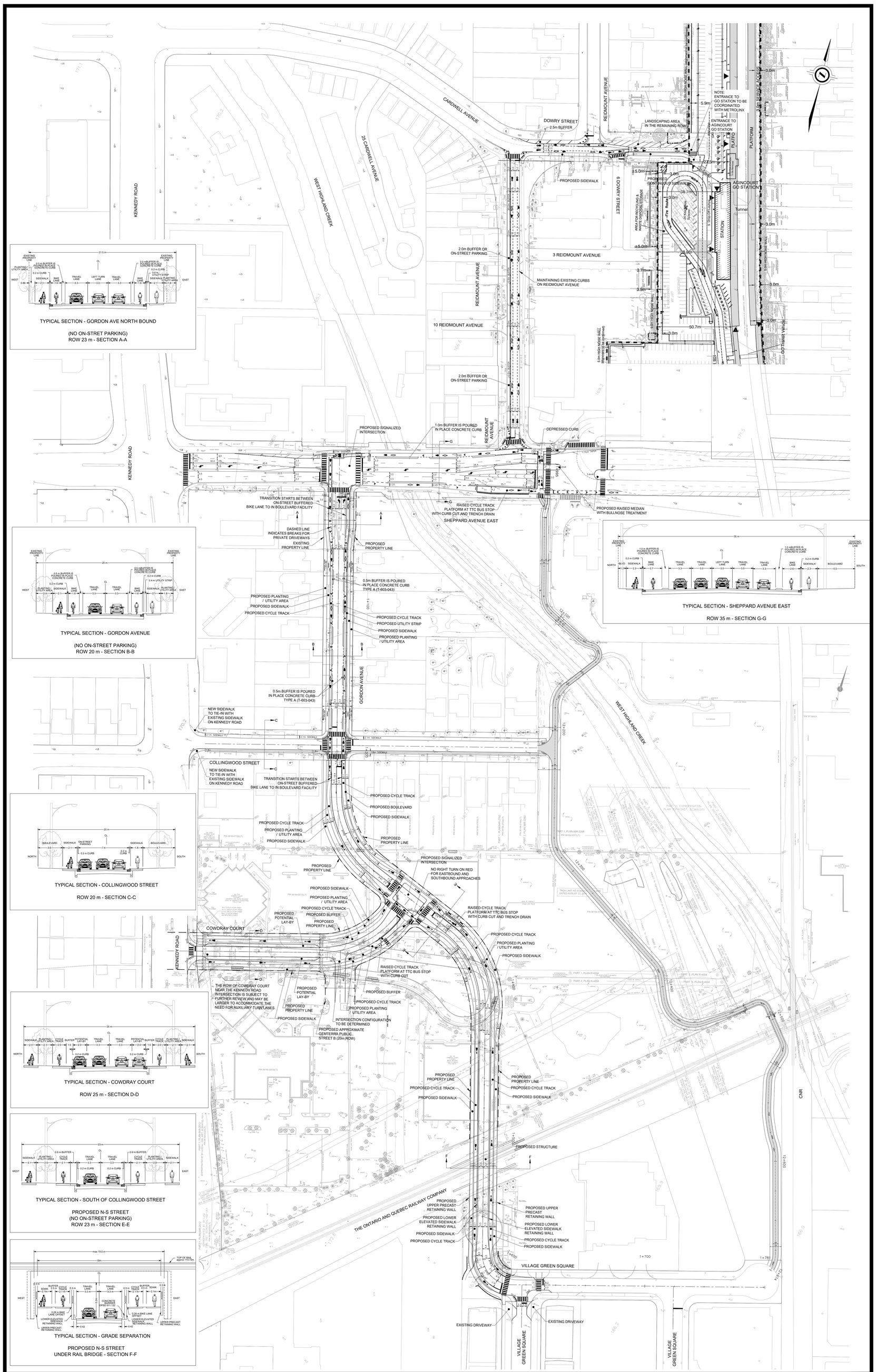
Checked: X.X	Drawn: X.X
Date: August 2020	Proj. No.: 19M-16008-001
Scale: 1:3,000	Figure No.: 3

Document Path: \\thfiler1\ENGCAD$\DIV3\2016\19M-16008-001 Agincourt\GIS\PIC_Figure3_TRCAApril1D_WSP1D2D_27Aug2020.mxd

APPENDIX

B

Proposed Site Plan



TORONTO

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AGINCOURT EA

FROM VILLAGE GREEN SQUARE TO DOWRY STREET

DESIGN	G.B.	DRAWN	G.B.	CHECKED	P.Y.	CONTRACT No.
SCALE	N.T.S.			DRAWING NUMBER		SHEET PLAN
DATE						

APPENDIX

C

Model Outputs from HEC-RAS 1D Portion

HEC-RAS River: Bendale Branch Reach: Reach 3 Profile: Max WS

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	7086	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.67	162.72	167.39		167.60	0.000872	2.05	92.06	41.95	0.32
Reach 3	7086	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.67	162.72	167.41		167.61	0.000858	2.04	92.81	42.14	0.31
Reach 3	7069	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.67	162.40	167.47		167.57	0.000337	1.40	133.62	43.32	0.21
Reach 3	7069	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.67	162.40	167.49		167.58	0.000333	1.40	134.32	43.43	0.21
Reach 3	7022	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.66	162.44	167.45		167.55	0.000397	1.45	125.74	39.52	0.22
Reach 3	7022	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.67	162.44	167.47		167.57	0.000391	1.45	126.40	39.58	0.22
Reach 3	6977	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.66	162.42	167.43		167.54	0.000401	1.48	131.06	46.74	0.23
Reach 3	6977	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.67	162.42	167.45		167.55	0.000395	1.47	131.86	46.75	0.23
Reach 3	6900	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.66	162.18	167.29		167.57	0.000158	2.47	101.15	63.24	0.36
Reach 3	6900	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.66	162.18	167.31		167.59	0.000155	2.46	102.03	63.46	0.36
Reach 3	6860	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.66	162.21	167.37		167.53	0.000091	2.01	136.24	69.80	0.29
Reach 3	6860	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.66	162.21	167.38		167.54	0.000089	1.99	137.56	69.80	0.28
Reach 3	6816	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	158.66	162.12	167.34		167.54	0.000105	2.18	124.42	85.05	0.31
Reach 3	6816	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	158.66	162.12	167.36		167.55	0.000103	2.17	126.06	85.49	0.31
Reach 3	6815			Lat Struct									
Reach 3	6814			Lat Struct									
Reach 3	6802	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	157.51	162.10	167.41	164.84	167.49	0.000057	1.48	217.69	123.07	0.21
Reach 3	6802	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	157.40	162.10	167.43	164.84	167.50	0.000056	1.47	219.94	123.07	0.21
Reach 3	6785.84			Bridge									
Reach 3	6769	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	157.51	162.07	167.41		167.46	0.000029	1.16	239.50	117.98	0.17
Reach 3	6769	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	157.39	162.07	167.43		167.48	0.000029	1.15	241.63	117.98	0.17
Reach 3	6766.01*	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	156.76	162.06	167.42		167.45	0.000082	0.90	229.48	107.65	0.13
Reach 3	6766.01*	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	156.65	162.06	167.44		167.47	0.000080	0.89	231.39	107.65	0.13
Reach 3	6747	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	182.51	161.98	167.32		167.45	0.000486	1.78	122.02	41.84	0.26
Reach 3	6747	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	182.34	161.98	167.33		167.47	0.000476	1.77	122.83	41.84	0.26
Reach 3	6717	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	179.39	161.92	167.27		167.46	0.000097	2.06	122.98	44.00	0.30
Reach 3	6717	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	179.13	161.92	167.29		167.48	0.000095	2.04	123.86	44.00	0.30
Reach 3	6649	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	180.72	161.80	167.19		167.49	0.000144	2.61	110.90	30.75	0.37
Reach 3	6649	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	180.35	161.80	167.21		167.51	0.000141	2.59	111.56	30.75	0.37
Reach 3	6622	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	180.71	161.75	167.26		167.44	0.000140	1.99	142.24	45.36	0.29
Reach 3	6622	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	180.42	161.75	167.28		167.46	0.000140	1.99	140.50	45.36	0.29
Reach 3	6607	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	177.03	161.73	167.29	164.74	167.43	0.000488	1.83	142.40	49.83	0.26
Reach 3	6607	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	176.64	161.73	167.32	164.74	167.44	0.000457	1.78	142.39	49.83	0.25
Reach 3	6602.81			Bridge									
Reach 3	6598	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	177.03	161.72	166.85		167.06	0.000828	2.13	109.19	45.88	0.33
Reach 3	6598	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	176.64	161.72	166.85		167.06	0.000840	2.15	107.65	45.88	0.33
Reach 3	6595.02*	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	177.43	161.72	166.85		167.05	0.000752	2.11	110.49	44.33	0.32
Reach 3	6595.02*	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	176.94	161.72	166.86		167.05	0.000747	2.10	110.56	44.33	0.32
Reach 3	6585	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	180.88	161.73	166.80		167.05	0.000192	2.26	110.40	39.10	0.35
Reach 3	6585	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	180.31	161.73	166.81		167.05	0.000190	2.25	110.48	39.10	0.34
Reach 3	6553	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	183.95	161.80	166.82		167.03	0.000169	2.06	126.58	63.00	0.32
Reach 3	6553	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	183.49	161.80	166.82		167.03	0.000168	2.05	126.67	63.00	0.32
Reach 3	6513	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	184.43	161.63	166.83		167.02	0.000189	2.01	132.07	54.12	0.30
Reach 3	6513	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	184.20	161.63	166.83		167.02	0.000188	2.01	132.12	54.12	0.30
Reach 3	6433	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	188.52	161.56	166.75		167.01	0.000135	2.35	101.16	33.30	0.35
Reach 3	6433	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	188.47	161.56	166.75		167.01	0.000135	2.35	101.16	33.30	0.35
Reach 3	6382	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.42	161.42	166.78		167.00	0.000109	2.19	122.51	49.07	0.32
Reach 3	6382	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.38	161.42	166.78		167.00	0.000109	2.19	122.51	49.07	0.32
Reach 3	6358	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	187.81	161.35	166.88		166.95	0.000078	1.30	216.67	83.82	0.19
Reach 3	6358	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	187.81	161.35	166.88		166.95	0.000078	1.30	216.67	83.82	0.19
Reach 3	6345			Culvert									
Reach 3	6299	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	187.81	161.35	165.90		166.00	0.000102	1.52	166.71	81.14	0.24
Reach 3	6299	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	187.81	161.35	165.90		166.00	0.000102	1.52	166.71	81.14	0.24
Reach 3	6295.97*	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	187.74	161.35	165.90		166.01	0.000233	1.56	173.38	86.43	0.25
Reach 3	6295.97*	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	187.75	161.35	165.90		166.01	0.000233	1.56	173.38	86.43	0.25
Reach 3	6270	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.54	161.30	165.78		166.05	0.000164	2.44	109.49	46.00	0.39
Reach 3	6270	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.54	161.30	165.78		166.05	0.000164	2.44	109.49	46.00	0.39
Reach 3	6263	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.80	160.85	165.82		166.03	0.000119	2.23	124.35	49.70	0.33
Reach 3	6263	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.80	160.85	165.82		166.03	0.000119	2.23	124.35	49.70	0.33
Reach 3	6205	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.72	160.89	165.87		166.01	0.000096	2.02	182.89	111.61	0.30
Reach 3	6205	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.72	160.89	165.87		166.01	0.000096	2.02	182.89	111.61	0.30
Reach 3	6154	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.72	160.79	165.83		166.03	0.000119	2.14	152.58	99.81	0.33
Reach 3	6154	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.72	160.79	165.83		166.03	0.000119	2.14	152.58	99.81	0.33

HEC-RAS River: Bendale Branch Reach: Reach 3 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6135	Max WS	Highland_ProAgincourt2D_Reg_Current_NEW4	189.72	160.74	165.81	163.70	166.02	0.000116	2.13	149.54	139.28	0.33
Reach 3	6135	Max WS	ProAgincourt2D_Reg_ProRdTr_v6	189.72	160.74	165.81	163.70	166.02	0.000116	2.13	149.54	139.28	0.33