

Appendix N
Project Presentations

wood.

**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

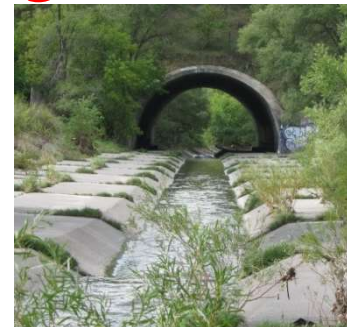
woodplc.com





FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

**October 7, 2019 Phase 2A Assessment
Milestone Meeting #2**



Agenda

1. Introductions (Wood)
2. Background Review/ Data Gaps (Wood)
3. Background Review Report – TRCA Comments (Wood)
4. Utilities and Infrastructure Plan (Wood)
5. Geotechnical Investigation Update (Wood)
6. Transportation and Traffic Assessment (Wood)
7. Phase 2A Assessment Discussion (Wood/DHI)
8. Next Steps (Wood)
9. Project Schedule (Wood)
10. Other Business (All)



1. Introductions

1. Introductions (Wood)

- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff
- DHI - Hydraulics



2. Background Review/ Data Gaps

2. Background Review/ Data Gaps (Wood)

- Municipal Infrastructure mapping needs to extend westerly to Scarlett Road. Currently the mapping ends just east of Jane Street.
- Not all infrastructure has elevation data.



3. Background Review Report – TRCA Comments (Wood)

3. Background Review Report – TRCA Comments

Summary of Comments and Input

- Update text to reflect widened 1D, coupled 2D model
- Additional details and further verification of aquatic and terrestrial habitat
- Verification of future work requirements
- Verification of BH depths at berm locations.



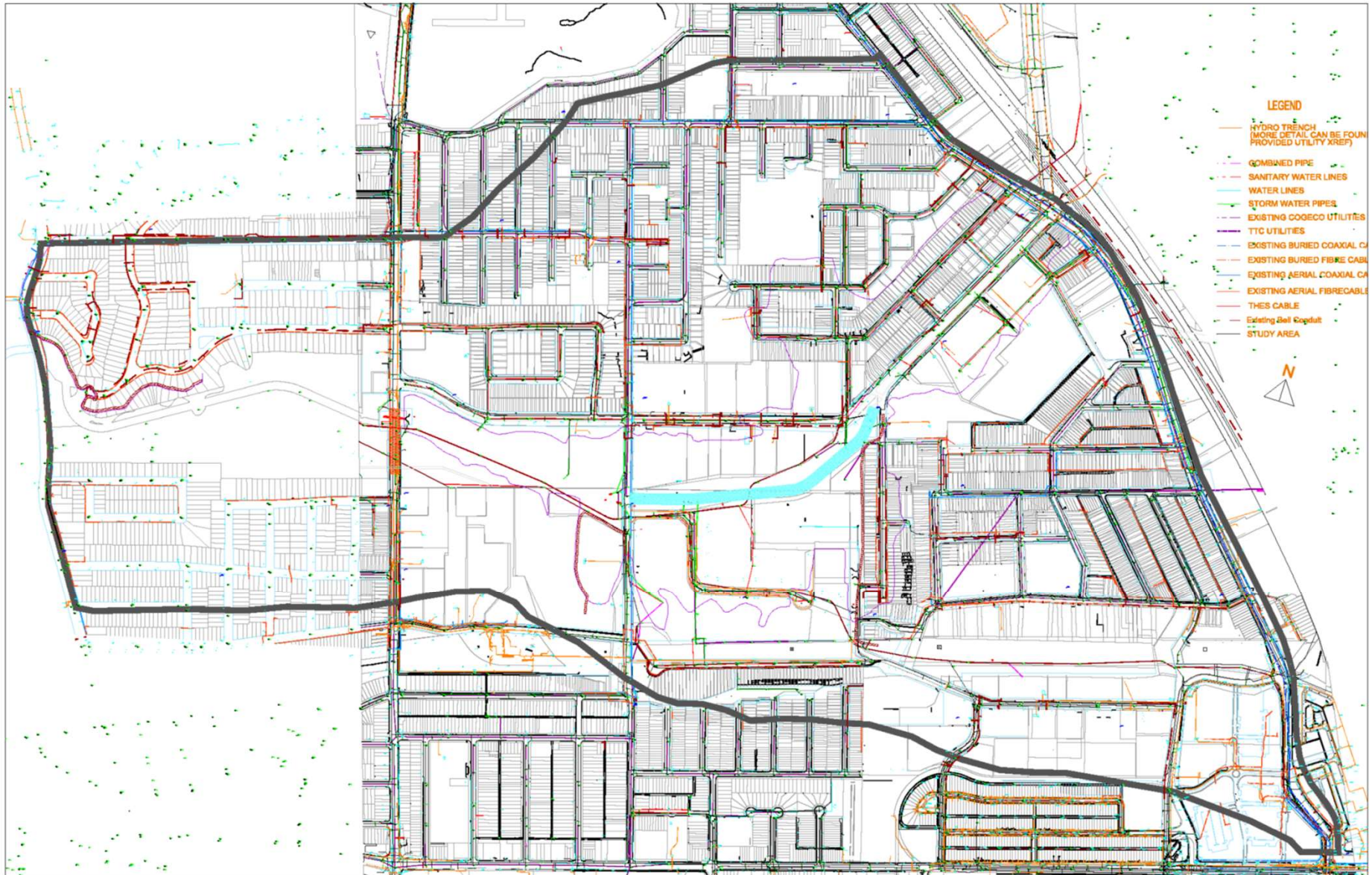
4. Utilities and Infrastructure Plan (Wood)

4. Utilities and Infrastructure Plan (Wood)

Company	Contact Name	Address/Phone	E-Mail	Submission Type	Info Requested (yyyy-mm-dd)	Mark-up Received (yyyy-mm-dd)	Facility within study area	Mark-Up format
Bell Canada Mark-up Only	Ken Elliott ken.elliott@bell.ca	100 Borough Drive, Floor F5 Toronto, ON, M1P 4W2 416-296-6975	bell.moc@telecon.ca	Electronic .PDF, .DGN or .DWG or 2 paper hard copies Attn: Sharmila Kumar sharmila.kumar@telecon.ca Telecon Design 7777 Weston Rd., Vaughan, Ontario L4L 0G9	2019-08-16	2019-09-24	Yes	Email, Letter, AutoCAD dwg, MicroStation DGN.
Bell Canada PUCC Approval	Ken Elliott ken.elliott@bell.ca	100 Borough Drive, Floor F5 Toronto, ON, M1P 4W2 416-296-6975	bell.moc@telecon.ca	Electronic .DGN or .DWG only (No PDFs) or 2 paper hard copies Attn: Sharmila Kumar sharmila.kumar@telecon.ca Telecon Design 7777 Weston Rd., Vaughan, Ontario L4L 0G9	2019-08-16	2019-09-24	Yes	Email, Letter, AutoCAD dwg, MicroStation DGN.
Cogeco Data Services	Mark Houston	413 Horner Avenue, Toronto, ON, M8W 4W3; 416-847-0869	utility.circulations@cogecodata.com	Electronic PDF	2019-08-16	2019-08-16	Yes	Email
Enbridge Gas Distribution	Arnel Mangalino	416-758-7949	Mark-Ups@enbridge.com	Electronic	2019-08-16	2019-08-21	Yes	Letter (EGD File # 23221559), PDF
Rogers Communications	Farhoodeh Foomany Third Party Markup Coordinator	289-657-8198 855 York Mills Rd Don Mills, On M3B 1Z1	GTA.Markups@rci.rogers.com	Electronic	2019-08-16	2019-08-30	Yes	Email, Letter, AutoCAD dwg
Toronto Hydro (including Street Lighting)		500 Commissioners Street, 3rd floor, Toronto, ON, M4M 3N7;	utility.circulations@torontohydro.com	Electronic (.DGN or.DWG)	2019-08-16	2019-08-21	Yes	PDF, Letter (Ref # THU2019-01965CN), DGN File
TTC	Kimna Seto TPUCC Administrator	1138 Bathurst Street, Toronto, ON, M5R 3H2	tpucc@ttc.ca	Electronic	2019-08-16	2019-08-16 (Acknowledgment)	Yes	Email, Letter, PDF

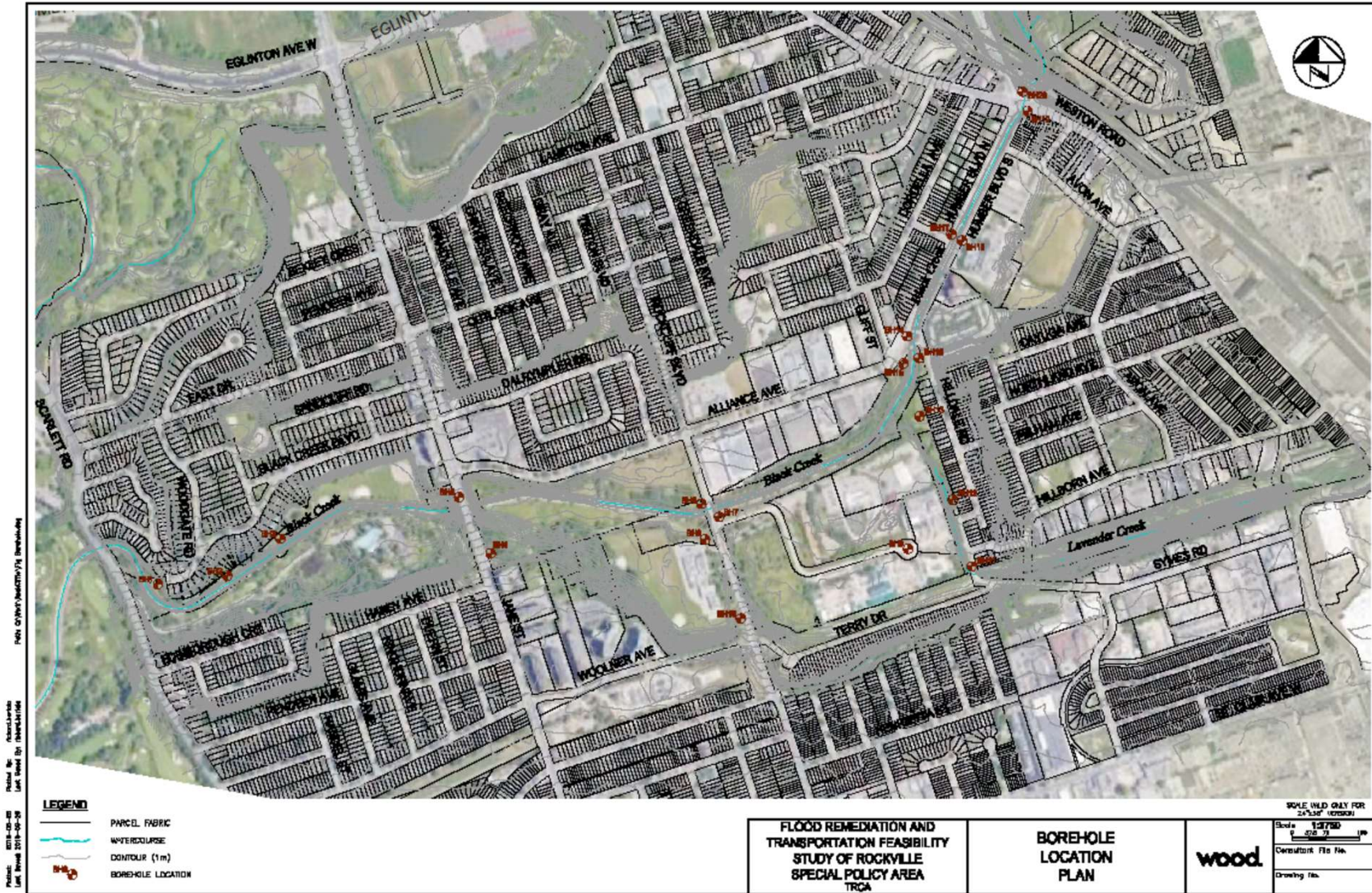


4. Utilities and Infrastructure Plan (Wood)



5. Geotechnical Investigation Update (Wood)

5. Geotechnical Investigation Update (Wood)



6. Geotechnical Investigation Update (Wood)

- Borehole testing to be completed on October 8, 2019
- Borehole rough logs near completion
- Lab testing to be completed mid October
- Borehole results will available to assess structural alternatives by end of this week.
- Geotechnical assessment requires flood protection berming details, to assess berms.



6. Transportation and Traffic Assessment (Wood)

6. Transportation and Traffic Assessment (Wood)

- Meeting on September 19, 2019 to discuss Transportation and Traffic Assessment Methodology
- Wood requested to provide a workplan for Turning Movement Count (TMC) data collection
- Wood conducting TMC data collection this week (October 8 & 10, 2019)
- City providing Traffic data and signal timing
- Wood to prepare Synchro model for existing conditions and 2031 future horizon year – level of service, queues and volume capacity ratios
- Existing condition model to be submitted for City review before end of October
- Alternative modelling to be conducted



7. Phase 2A Assessment Discussion (Wood/DHI)

7. Phase 2A Assessment Discussion (Wood/DHI)

Summary of Alternatives

- Alternatives Scenarios:
 - Scenario 1: Jane St. Crossing Upgrade and Valley Shaping
 - Scenario 2: Flood Protection Berms (Black Creek Drive, Rockcliffe Middle School and Hilldale Blvd)
 - Scenario 4: Channel widening (Rockcliffe Blvd. to Alliance Ave.)
- Modelling approach decided to use Combined Scenario 4 with 4 alternatives for Jane Street with flood protection berms and channel widening.
 - Alternative 1: 200 m span
 - Alternative 2: 100 year level of service – drop channel invert
 - Alternative 3: 350 year level of service
 - Alternative 4: Relief culverts



7. Phase 2A Assessment Discussion (Wood/DHI)

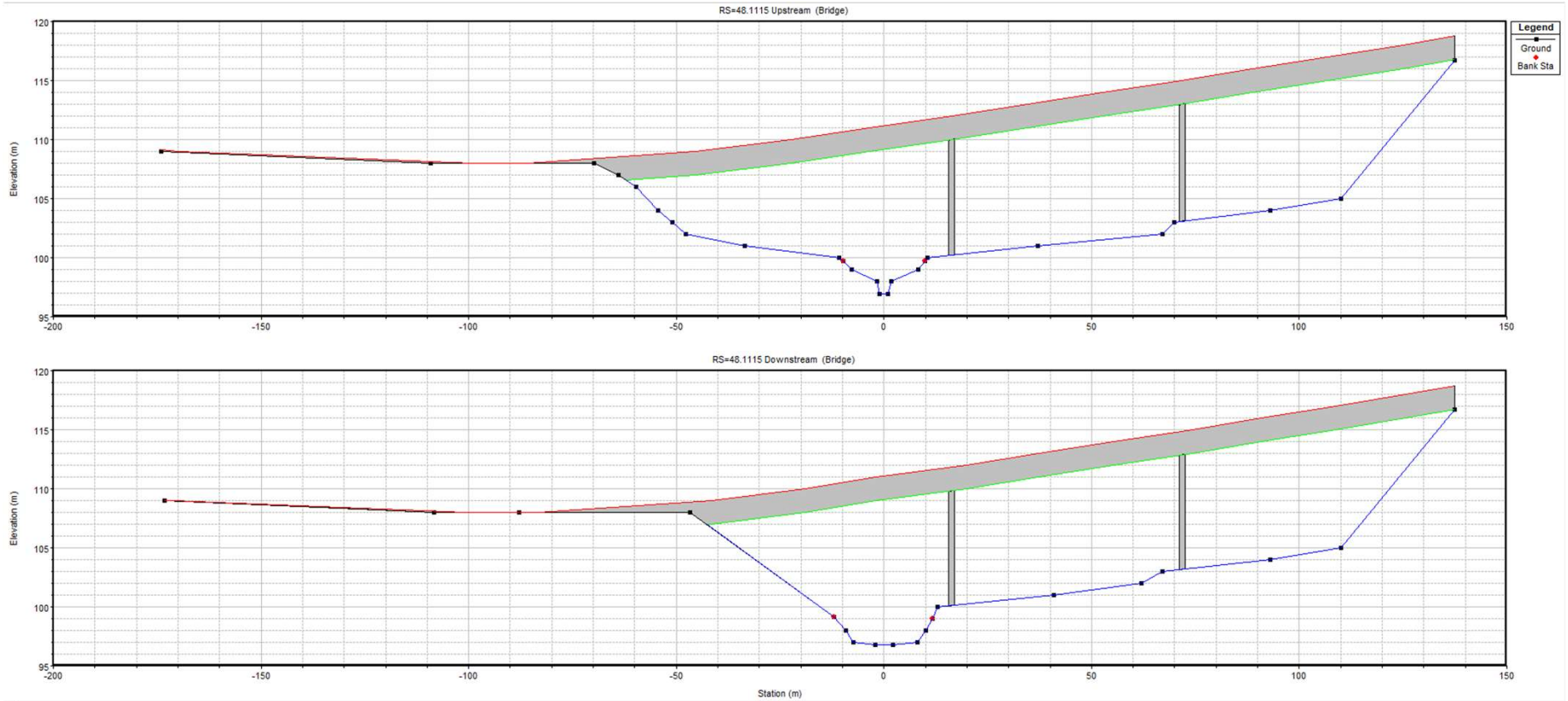
Phase 2A Alternatives Assessment Considerations

- Hydraulic Performance (depths, elevations, velocities)
- Flood Risk (depth, velocity, number of buildings, properties)
- Structural Feasibility
- Municipal Infrastructure and Utilities
- Future Class EA requirements
- Input from Traffic and Transportation, Geotechnical, Cultural Heritage in Phase 3



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 1: Jane Street 200m Span Bridge



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 1: Jane Street 200m Span Bridge

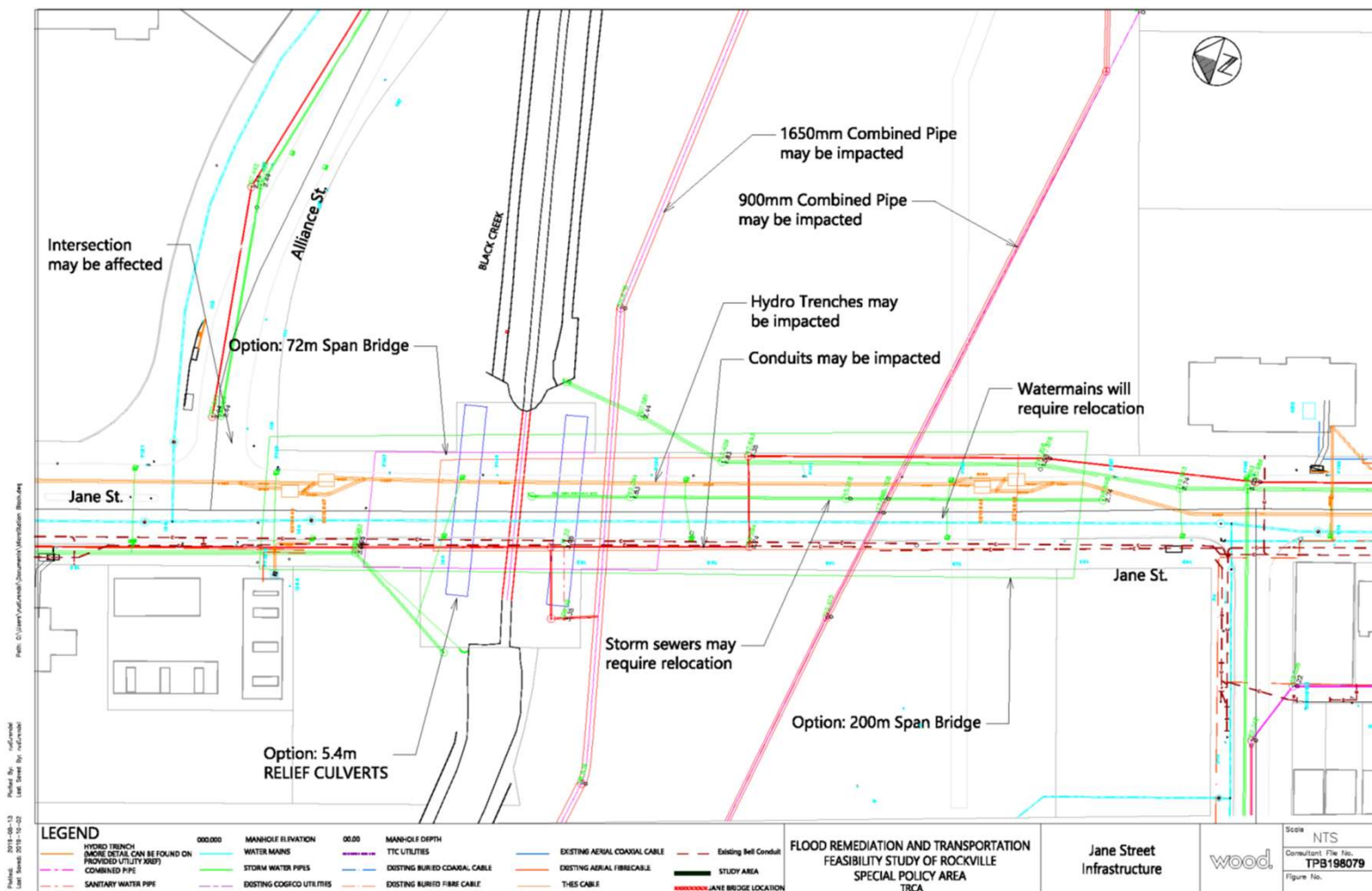
- Structural Feasibility:
 - The 200 m long structure can be constructed as a 3-span structure with spans of 60-80-60 utilizing haunched steel I-girders. It can also be constructed as a 4-span structure with spans of 45-55-55-45 meters and prismatic steel I-girders.
- Municipal Infrastructure and Utilities:
 - Storm sewers to be reconfigured to outlet near toe of valley wall
 - Watermain would have to be strung to the bridge
 - Combined sewers are below valley floor
 - Sanitary sewers to be lowered outside of valley
 - Utilities either strung to bridge or on poles
 - Alliance Avenue intersection may require adjustment



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 1: Jane Street 200m Span Bridge

- Municipal Infrastructure and Utilities:



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 1: Jane Street 200m Span Bridge

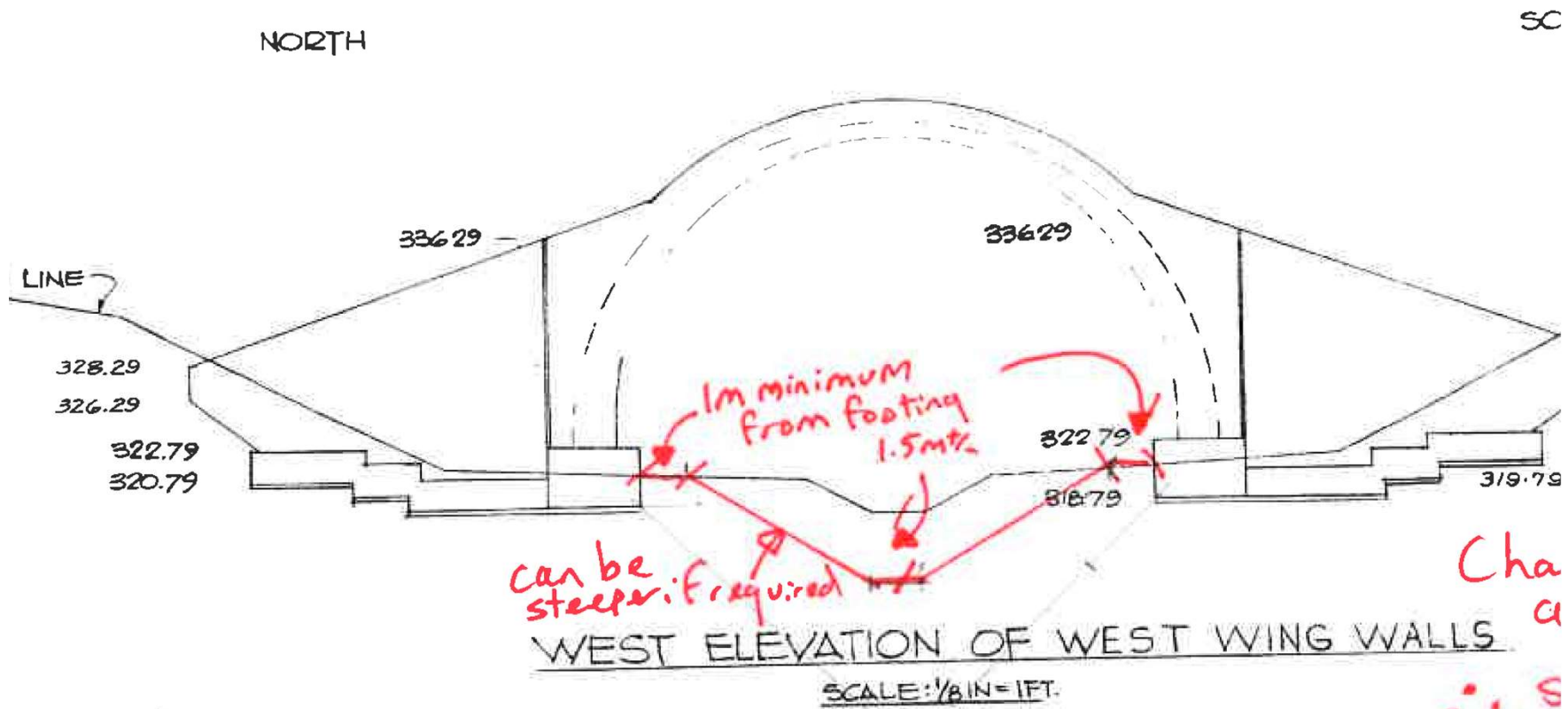
- Future Class EA requirements:

Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Widening of Bridge	<p>Schedule B (<2.4M) / Schedule C (>2.4M)</p> <p>25. Reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity or at the same location. (Capacity refers to either hydraulic or road capacity but does not include alterations to include or remove facilities for cycling, pedestrians or to support utilities.)</p>	Riverine Flooding	MCEA or COEA



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 2: Lower Channel Invert



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 2: Lower Channel Invert

- Structural Feasibility:
 - The concrete channel would be removed and reconstructed within culvert footings. The edge of channel needs to be 1m minimum distance from the footings. Channel side slopes can be 1:1 slope or steeper.
- Municipal Infrastructure and Utilities:
 - No issues with municipal infrastructure and utilities



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 2: Lower Channel Invert

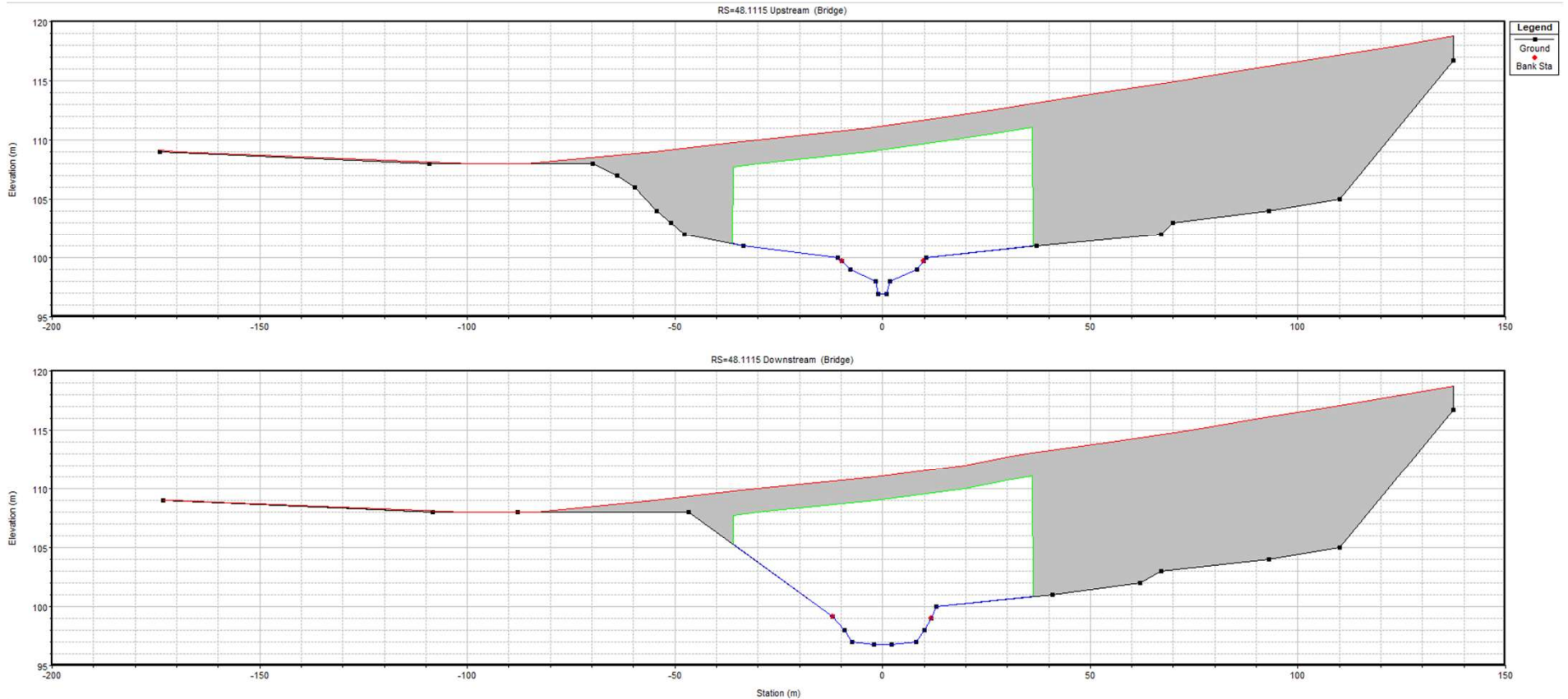
- Future Class EA requirements

Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Altering an existing Bridge (Lowering the invert)	Schedule B (<2.4M) / Schedule C (>2.4M) <i>30. Reconstruction or alteration of a structure or the grading adjacent to it when the structure is over 40 years old, which after appropriate evaluation is found to have cultural heritage value.</i>	Riverine Flooding	MCEA or COEA



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 3: 350 Year Level of Service: 72 m Span



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 3: 350 Year Level of Service: 72 m Span

- Structural Feasibility:
 - The concrete channel would be removed and reconstructed within culvert footings. The edge of channel needs to be 1m minimum distance from the footings. Channel side slopes can be 1:1 slope or steeper.
- Municipal Infrastructure and Utilities:
 - Storm sewers to be reconfigured to abutments
 - Watermain would have to be strung to the bridge
 - Combined sewers are below valley floor
 - Sanitary sewers to be lowered outside of valley
 - Utilities either strung to bridge or on poles



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 3: 350 Year Level of Service: 72 m Span

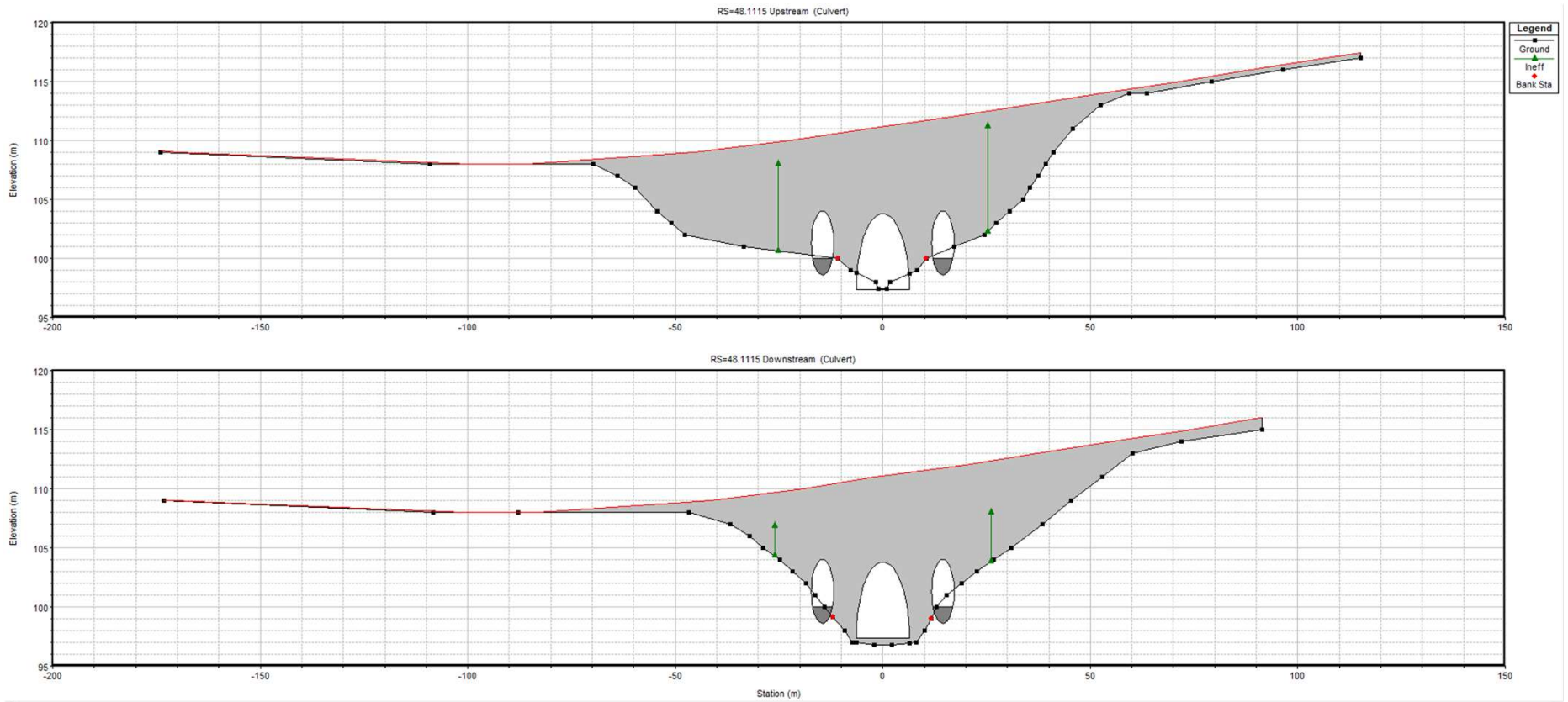
- Future Class EA requirements

Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Widening of Bridge	<p>Schedule B (<2.4M) / Schedule C (>2.4M)</p> <p>25. Reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity or at the same location. (Capacity refers to either hydraulic or road capacity but does not include alterations to include or remove facilities for cycling, pedestrians or to support utilities.)</p>	Riverine Flooding	MCEA or COEA



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 4: Relief Culverts



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 4: Relief Culverts - 5.4m Diameter

- Structural Feasibility:
 - The concrete channel would be removed and reconstructed within culvert footings. The edge of channel needs to be 1m minimum distance from the footings. Channel side slopes can be 1:1 slope or steeper.
- Municipal Infrastructure and Utilities:
 - Storm sewers to be reconfigured to relief culverts
 - Watermain above culverts
 - Combined sewers are below valley floor
 - Sanitary sewers above the culverts
 - Utilities either above culverts or on poles



7. Phase 2A Assessment Discussion (Wood/DHI)

Alternative 4: Relief Culverts

- Future Class EA requirements

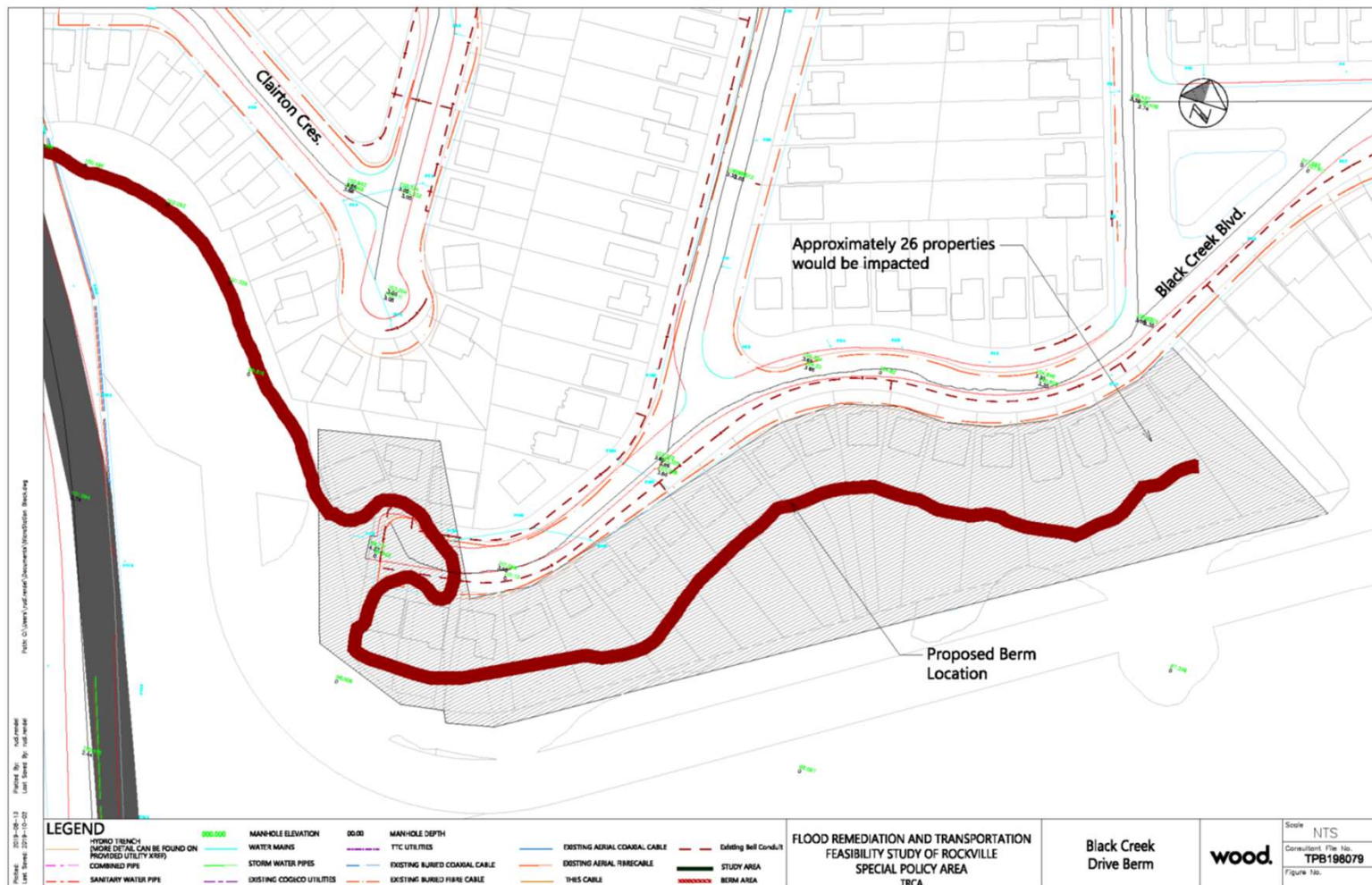
Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Altering an existing Bridge (Inclusion of relief culverts)	Schedule A (No cost limit) - 31. Reconstruction or alteration of a structure or the grading adjacent to it when the structure is over 40 years old which after appropriate evaluation is found not to have cultural heritage value.	Riverine Flooding	MCEA or COEA



7. Phase 2A Assessment Discussion (Wood/DHI)

Flood Protection Berms: Black Creek Trail, Rockcliffe Middle School, Hilldale Road/ Symes Road

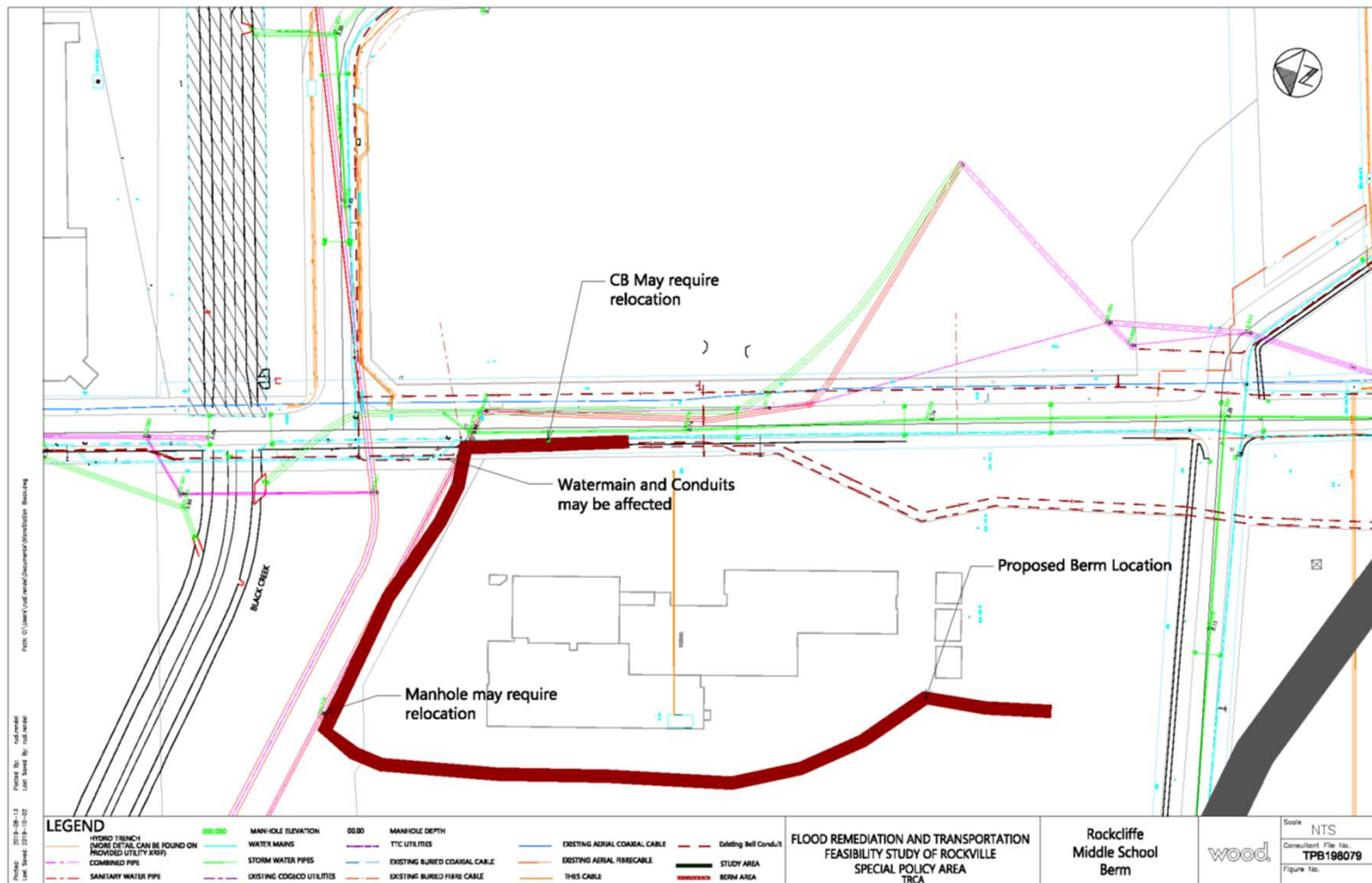
- Municipal Infrastructure and Utilities: **Black Creek Trail**



7. Phase 2A Assessment Discussion (Wood/DHI)

Flood Protection Berms: Black Creek Trail, Rockcliffe Middle School, Hilldale Road/ Symes Road

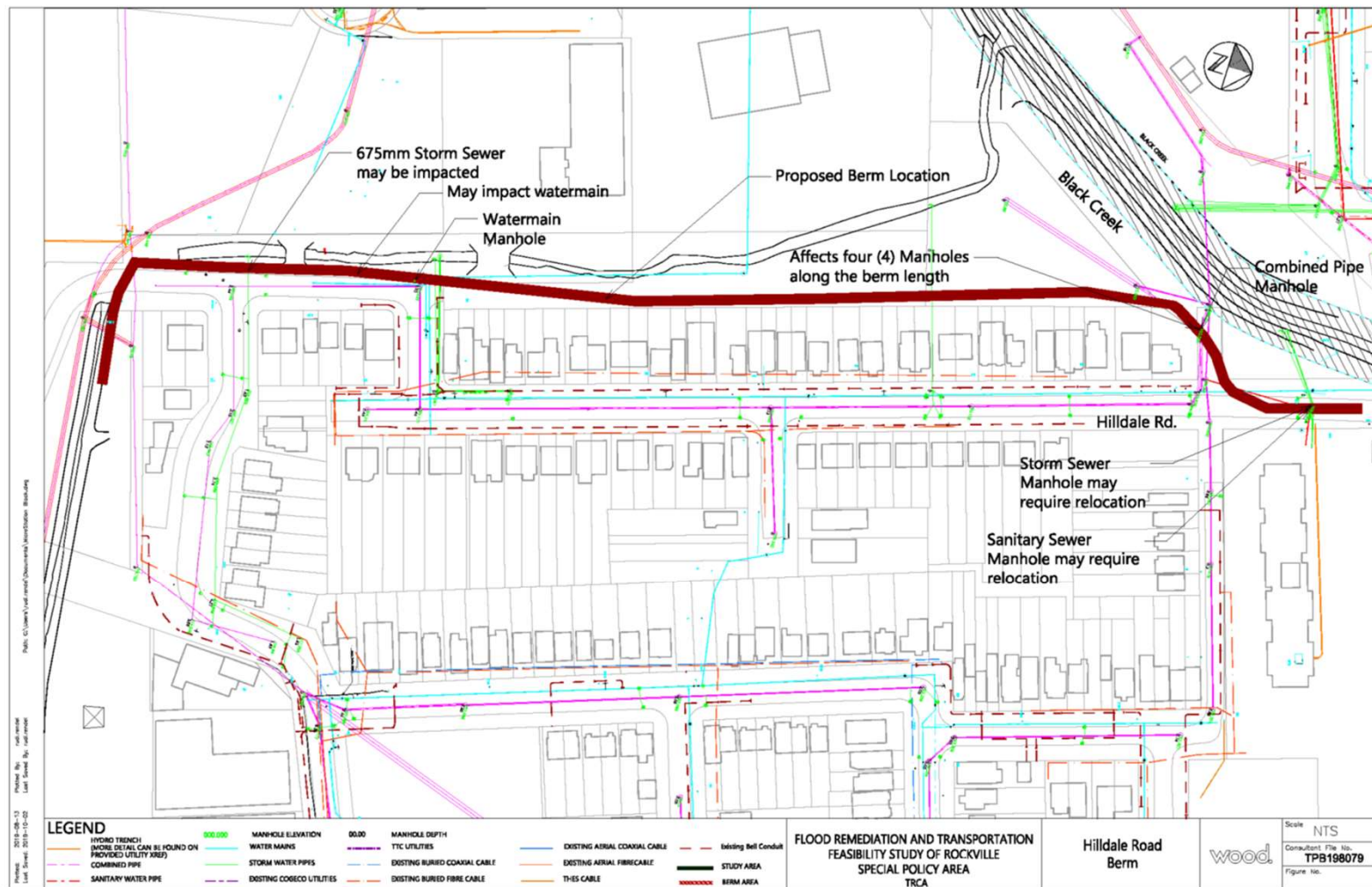
- Municipal Infrastructure and Utilities: **Rockcliffe Middle School**



7. Phase 2A Assessment Discussion (Wood/DHI)

Flood Protection Berms: Black Creek Trail, Rockcliffe Middle School, Hilldale Road/ Symes Road

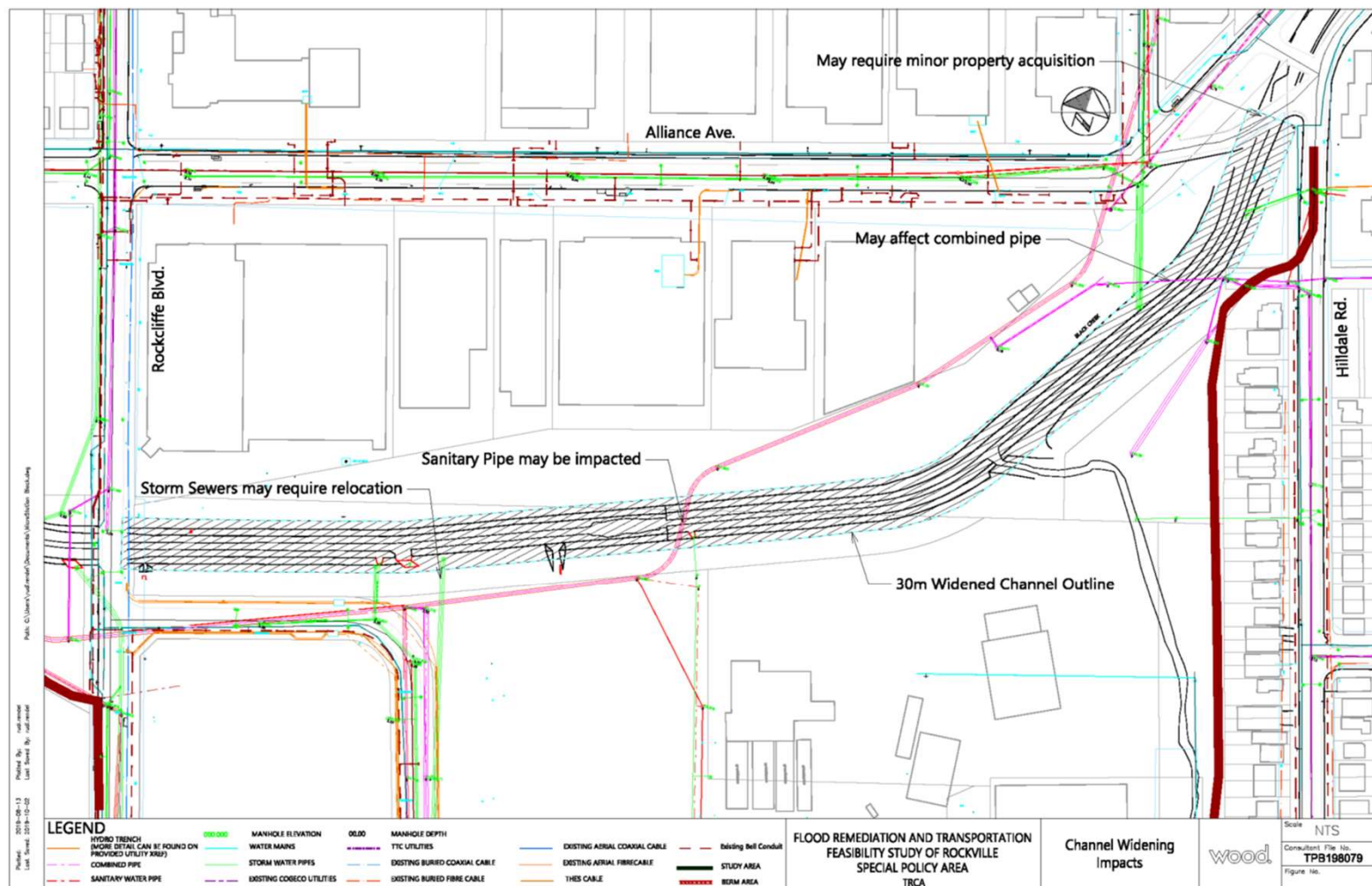
- Municipal Infrastructure and Utilities: **Hilldale Road/ Symes Road**



7. Phase 2A Assessment Discussion (Wood/DHI)

Channel Widening: Rockcliffe Blvd. to Alliance Avenue

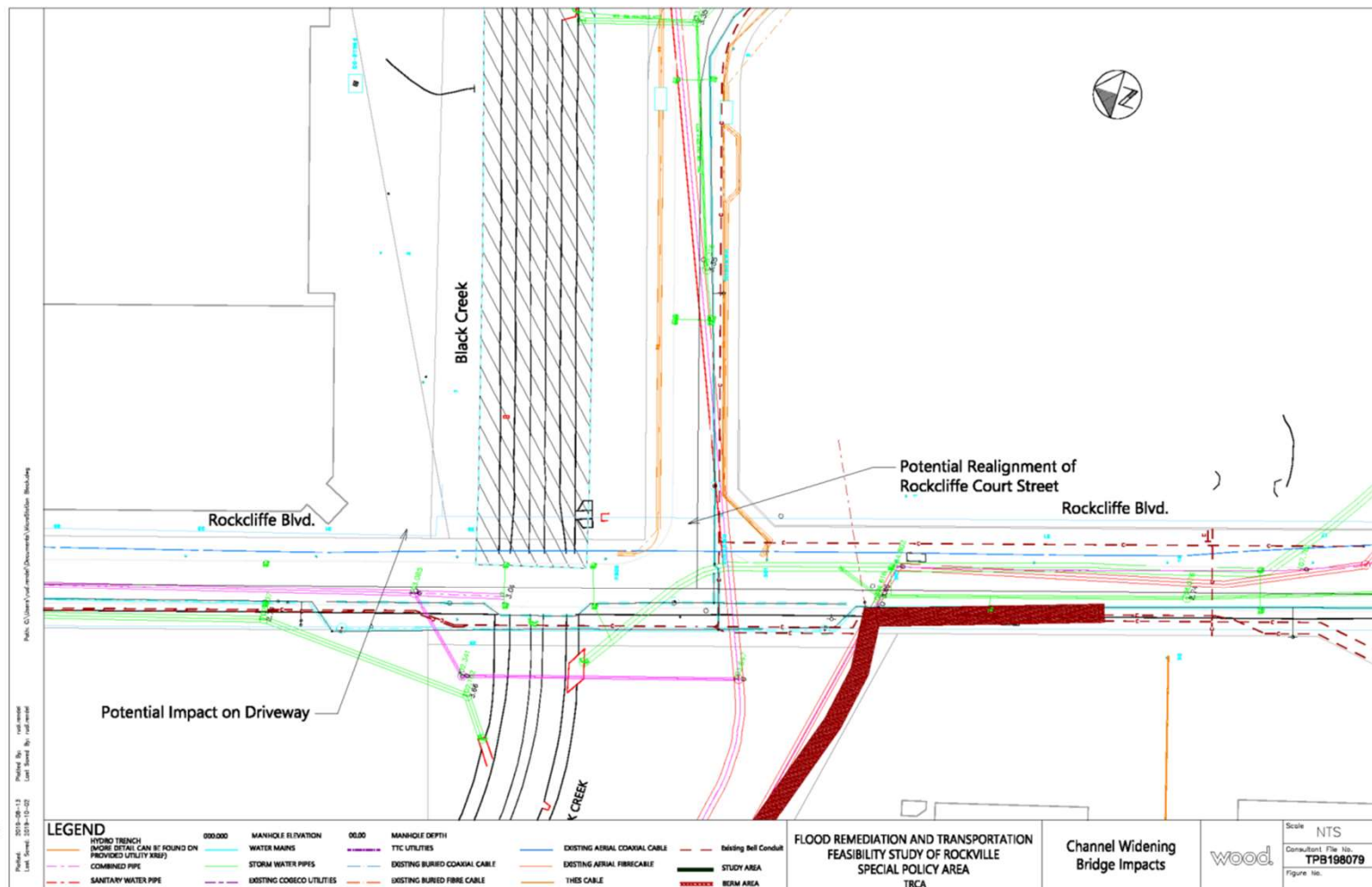
- Municipal Infrastructure and Utilities



7. Phase 2A Assessment Discussion (Wood/DHI)

Channel Widening: Rockcliffe Blvd. to Alliance Avenue (Rockcliffe Blvd. Bridge Widening)

- Municipal Infrastructure and Utilities



7. Phase 2A Assessment Discussion (Wood/DHI)

Flood Protection Berms: Black Creek Trail, Rockcliffe Middle School, Hilldale Road/ Symes Road

- Future Class EA requirements

Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Flood protection berms for Rockcliffe Middle School, Hilldale Road, and Black Creek Drive	Schedule B – 15. Construct berms along a watercourse for purposes of flood control in areas subject to damage by flooding.	Riverine Flooding	MCEA or COEA



7. Phase 2A Assessment Discussion (Wood/DHI)

Channel Widening: Rockcliffe Blvd to Alliance Avenue

- Future Class EA requirements

Alternative Description	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEAA or COEA
Creek naturalization and channel widening between Rockcliffe Blvd. and Alliance Avenue	Schedule B – 17. Works undertaken in a watercourse for the purposes of flood control or erosion control, which may include: - relocation, realignment or channelization of watercourse	Riverine Flooding	MCEA or COEA



8. Next Steps (Wood)

8. Next Steps (Wood)

1. Complete Progress Report 2: Class EA Alternatives Assessment
2. Complete Geotechnical Field Program, and finalize BH logs
3. Commence TMC data collection and prepare Traffic Synchro model
4. Commence Phase 2B – Assessment of Lavender Creek and Hilldale Road Area



9. Project Schedule (Wood)

9. Project Schedule (Wood)

- [INSERT LINK](#)



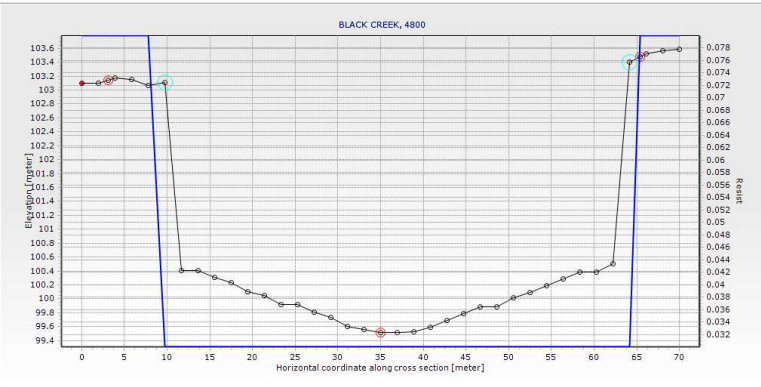
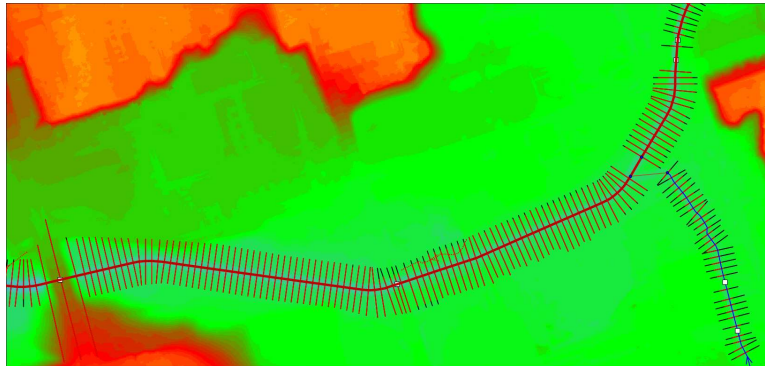
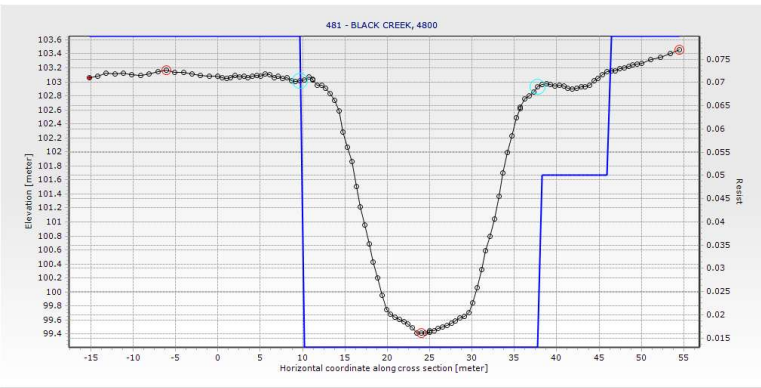
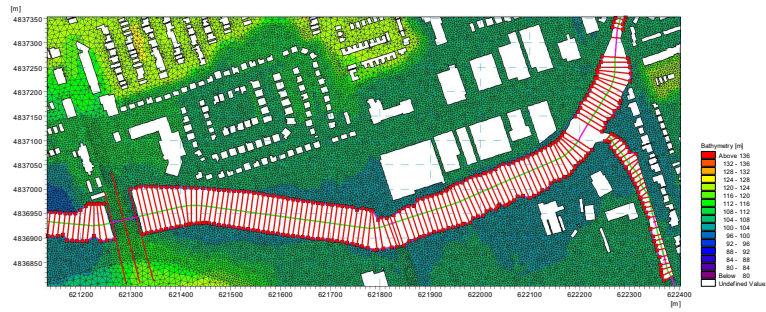
10. Other Business (All)

Discussion

Rockcliffe Model Update

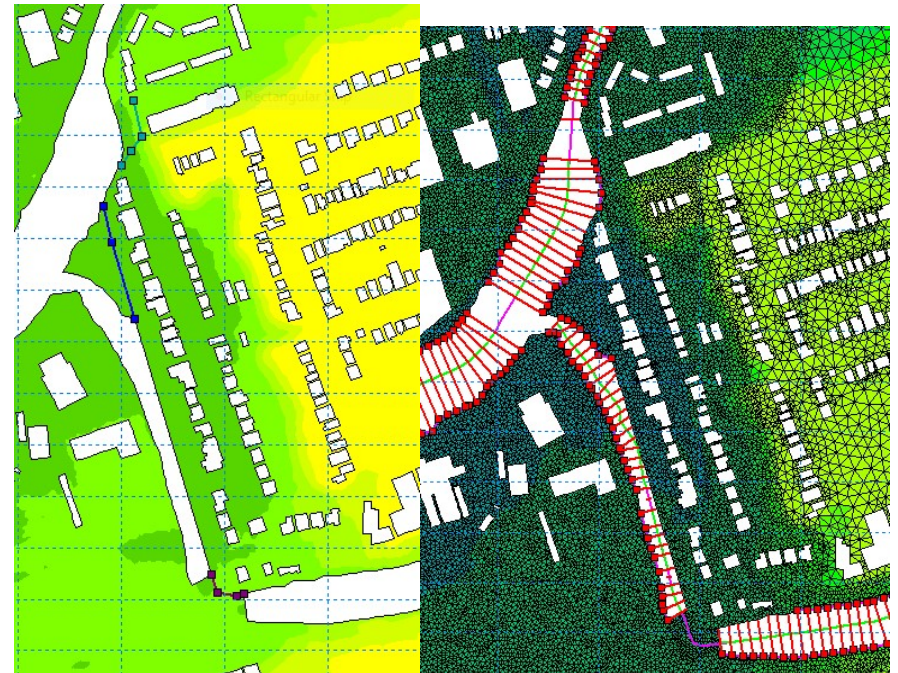
- Alternatives
 - Channel widening
 - Berms
 - Jane St Bridge
- Results comparison – 1D
- Results comparison – 2D

Channel Widened from Alliance Ave to Rockcliffe Blvd



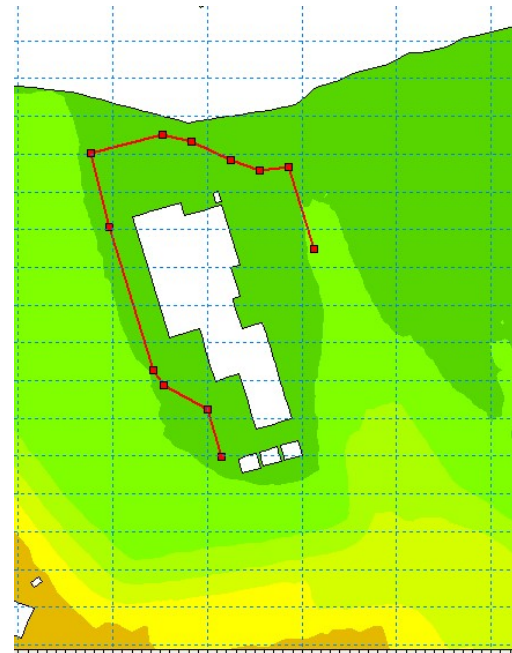
Hilddale Rd Berm

- Lateral links removed at 1D-2D boundary
- Berm extended at the upstream end on Lavender Creek
- Dikes added in 2D domain



Rockcliffe Middle School Berm

- Dikes added in 2D domain



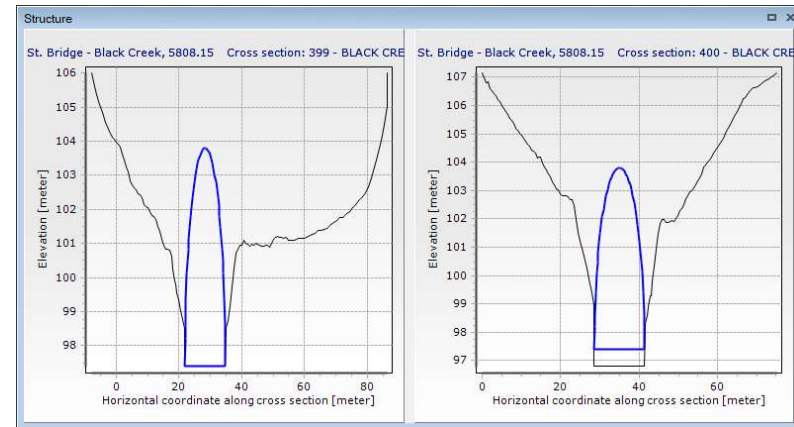
Black Creek Blvd Berm

- Lateral links removed at 1D-2D boundary
- Dikes added in 2D domain



Jane St. Culvert (Existing)

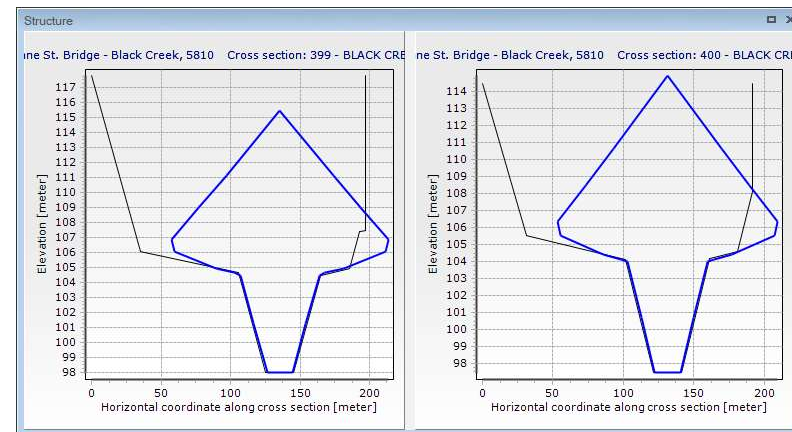
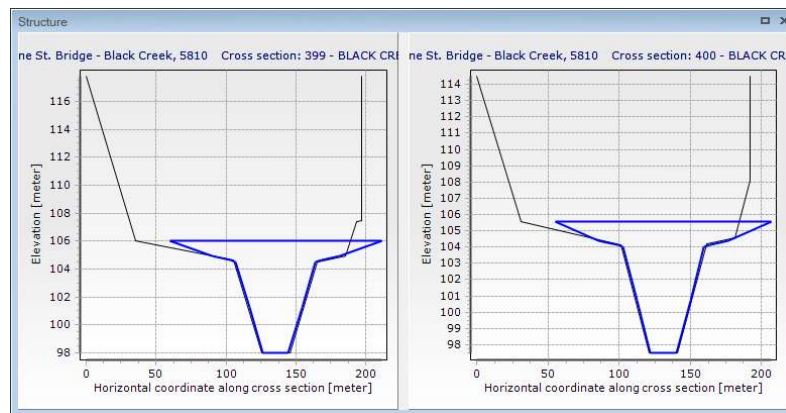
Upstream invert:	<input type="text" value="97.4"/>
Downstream invert:	<input type="text" value="97.4"/>
Length:	<input type="text" value="20"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



Jane St. Culvert (Alt 1)

- Bridge expanded to 200 m
- Depth-width curve implemented in model only cover up to 106 m (regional event reached 104 m)

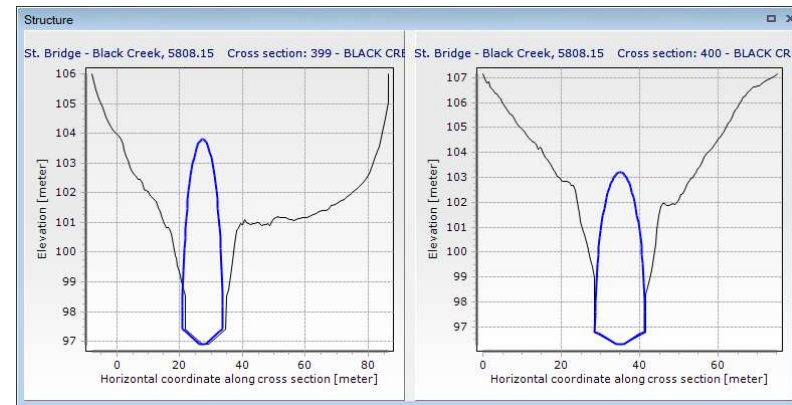
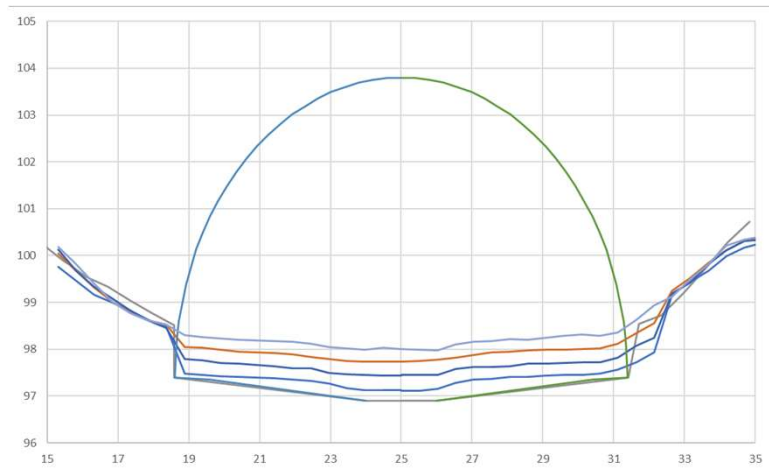
Upstream invert:	<input type="text" value="98"/>
Downstream invert:	<input type="text" value="97.5"/>
Length:	<input type="text" value="20"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



Jane St. Culvert (Alt 2)

- Bridge bottom lowered
- Blended into upstream cross-sections

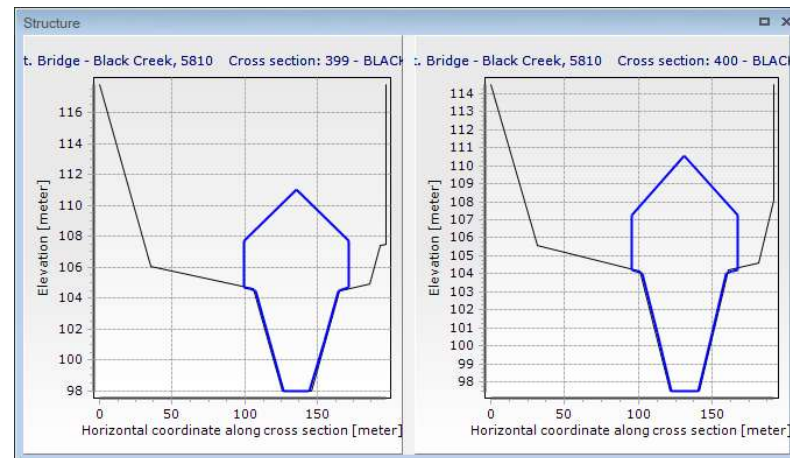
Upstream invert:	<input type="text" value="96.9"/>
Downstream invert:	<input type="text" value="96.3"/>
Length:	<input type="text" value="20"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



Jane St. Culvert (Alt 3)

- Bridge expanded to 72 m

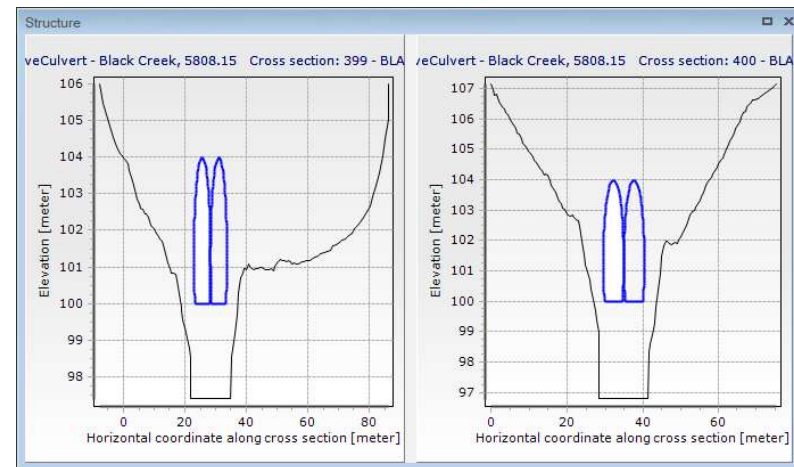
Upstream invert:	<input type="text" value="98"/>
Downstream invert:	<input type="text" value="97.5"/>
Length:	<input type="text" value="20"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



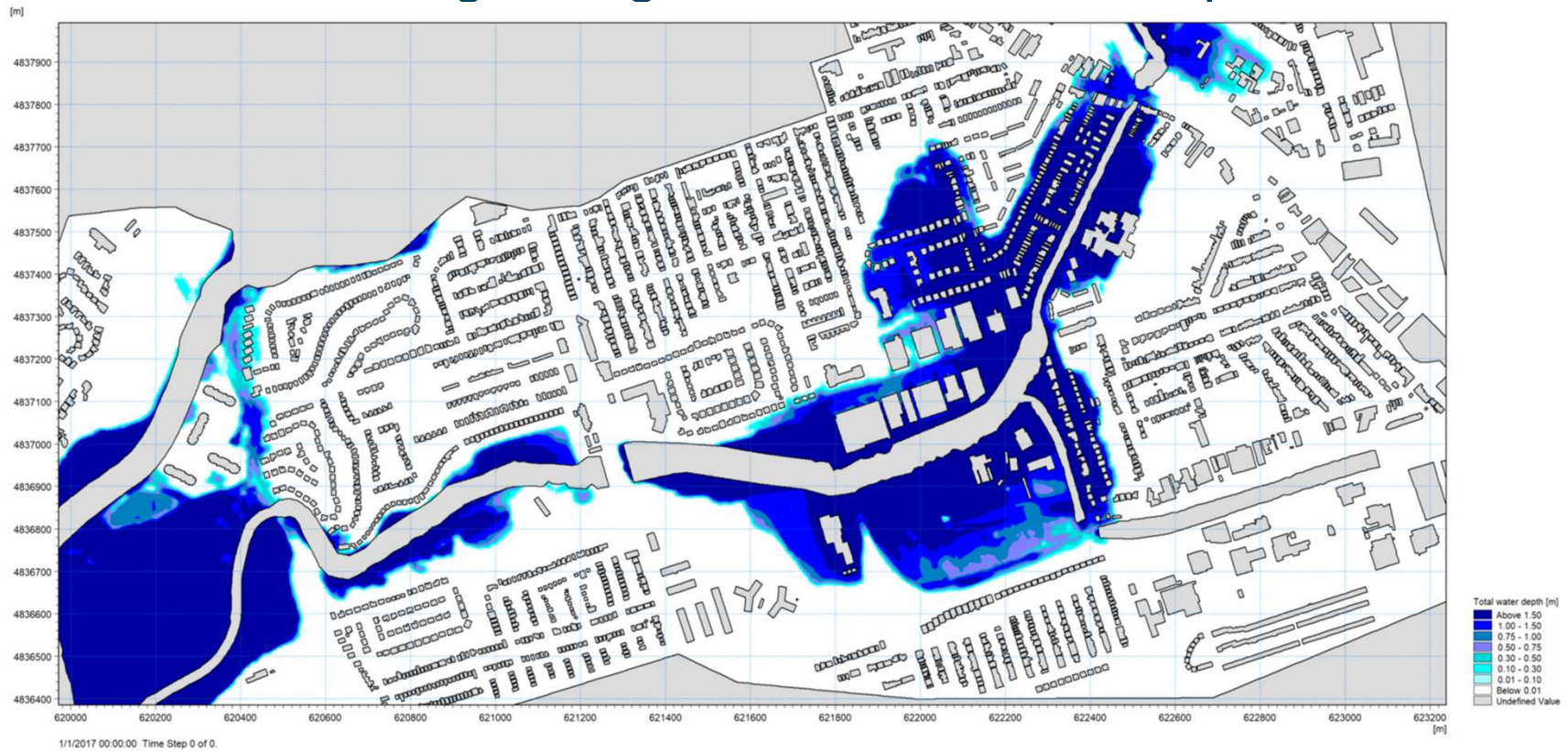
Jane St. Culvert (Alt 4)

- Added two culverts

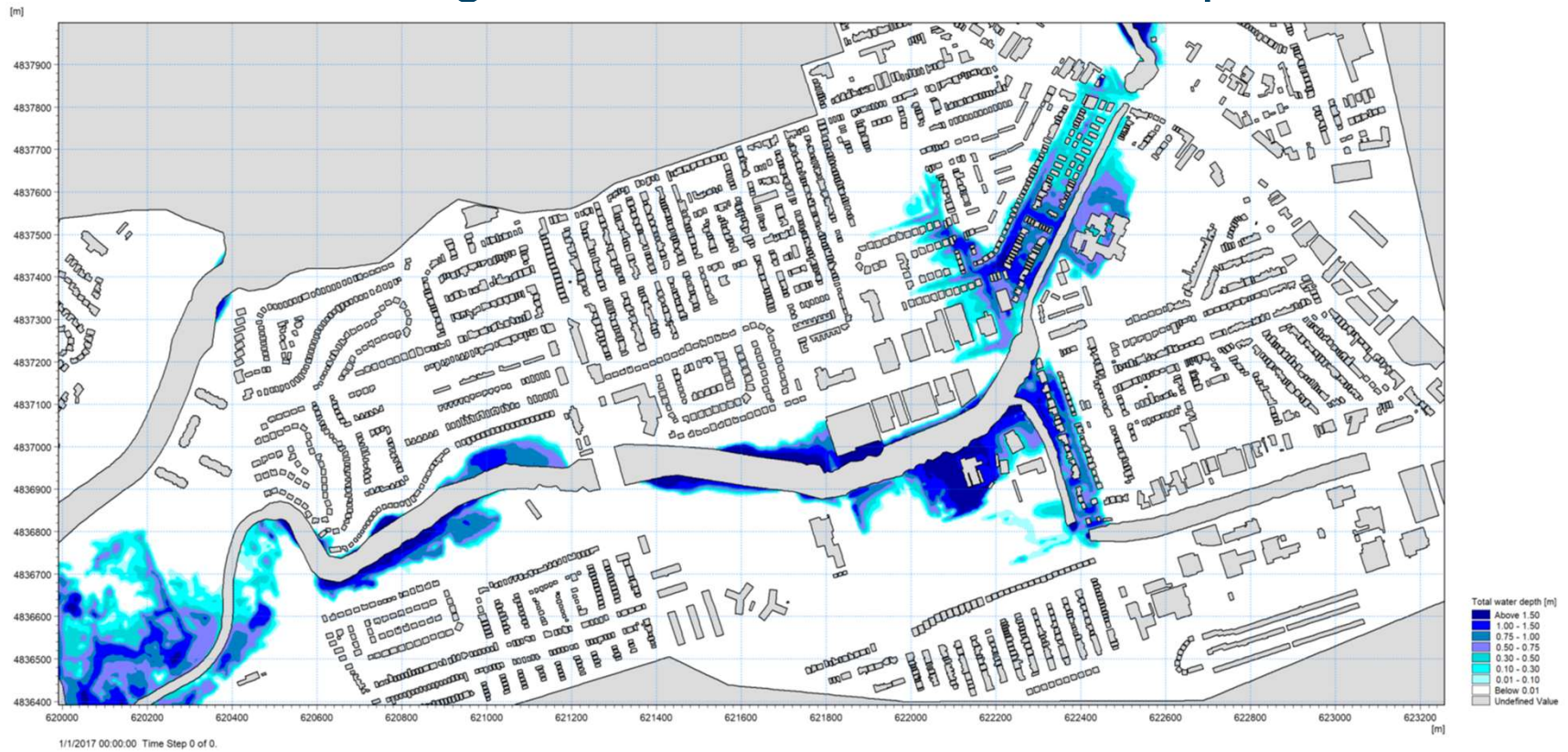
Upstream invert:	<input type="text" value="100"/>
Downstream invert:	<input type="text" value="100"/>
Length:	<input type="text" value="20"/>
No. of culverts:	<input type="text" value="2"/>
Section type:	<input type="text" value="Closed"/>



Results – Existing – Regional Event - Max Depth



Results – Existing – 350 Year Event - Max Depth



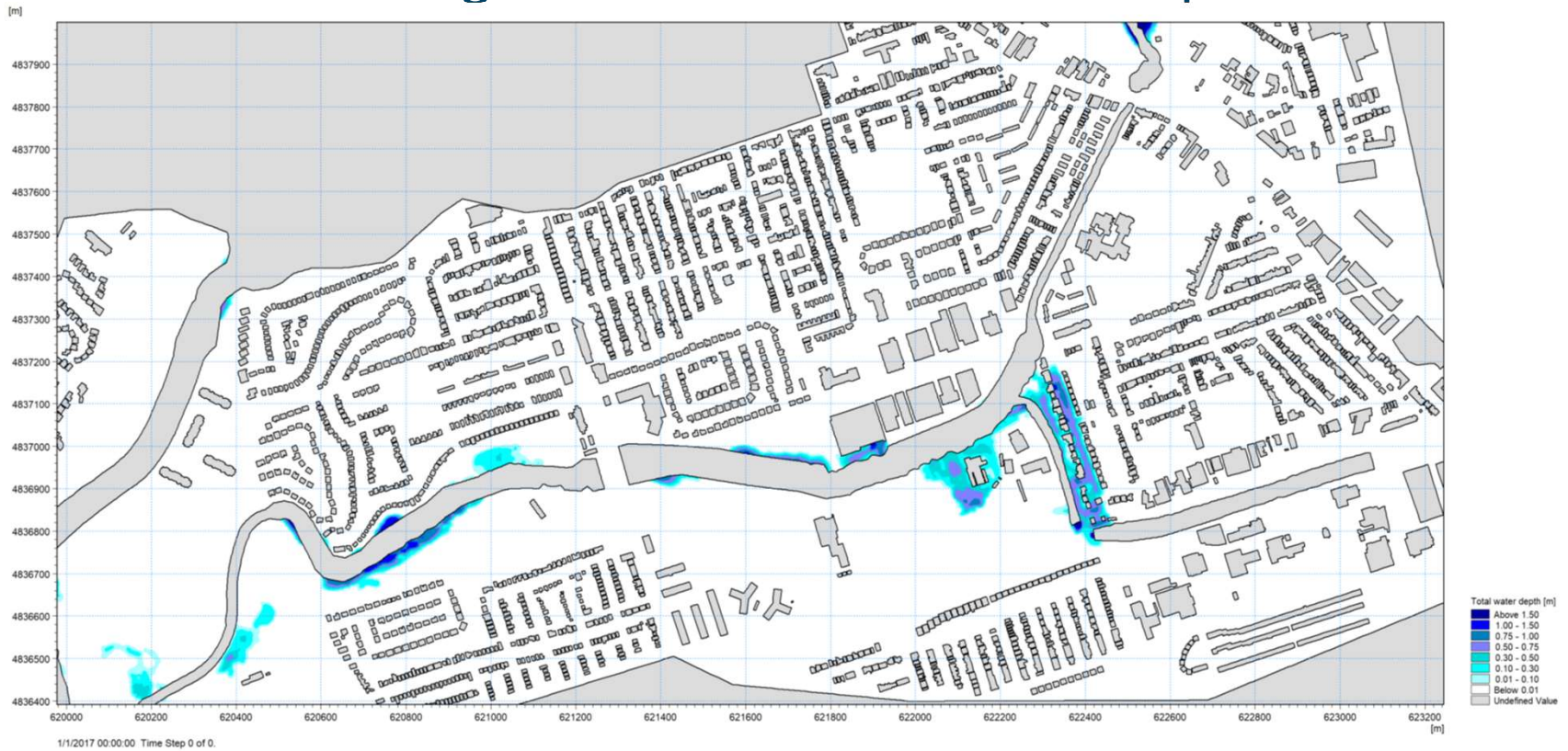
Results – Existing – 100 Year Event - Max Depth



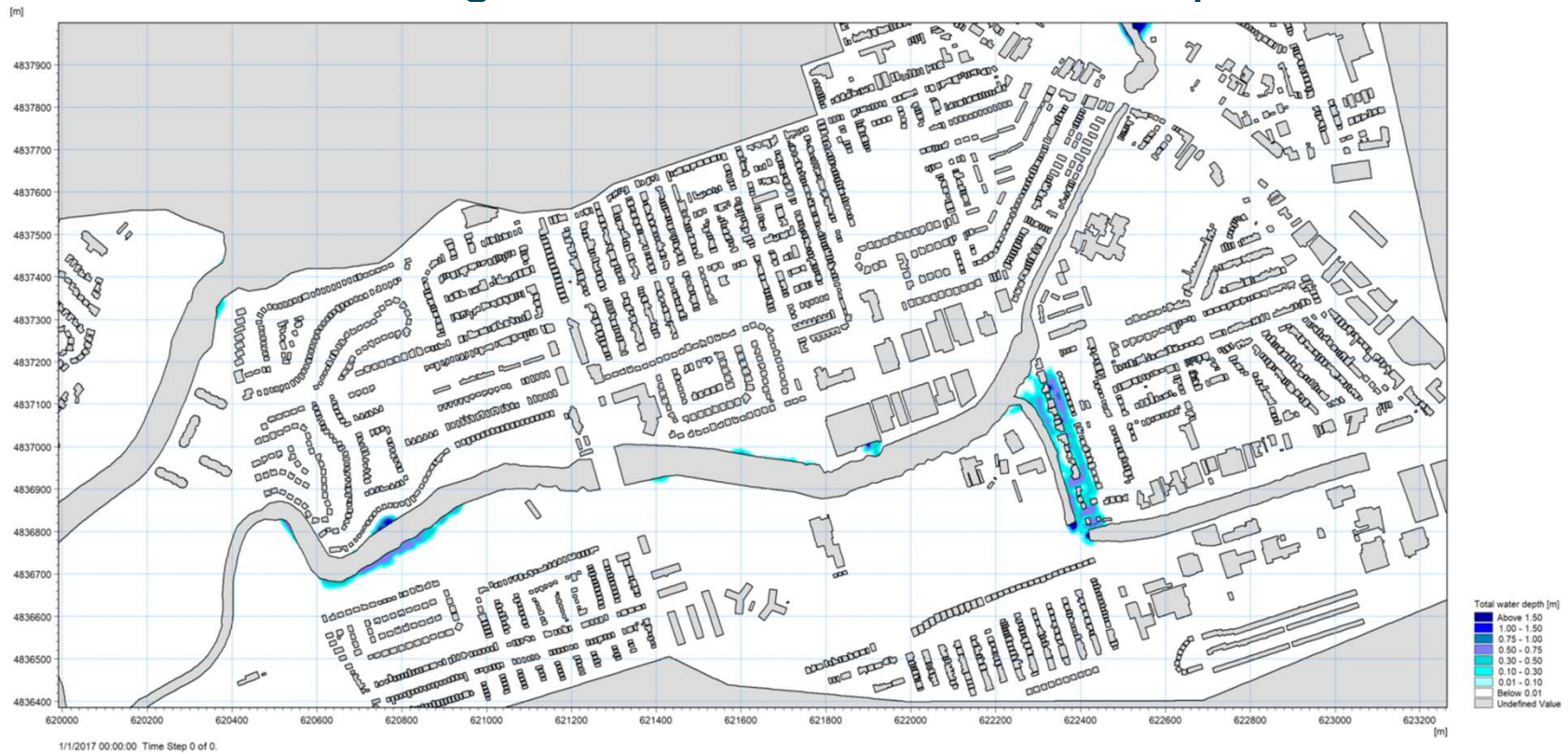
Results – Existing – 50 Year Event - Max Depth



Results – Existing – 25 Year Event - Max Depth



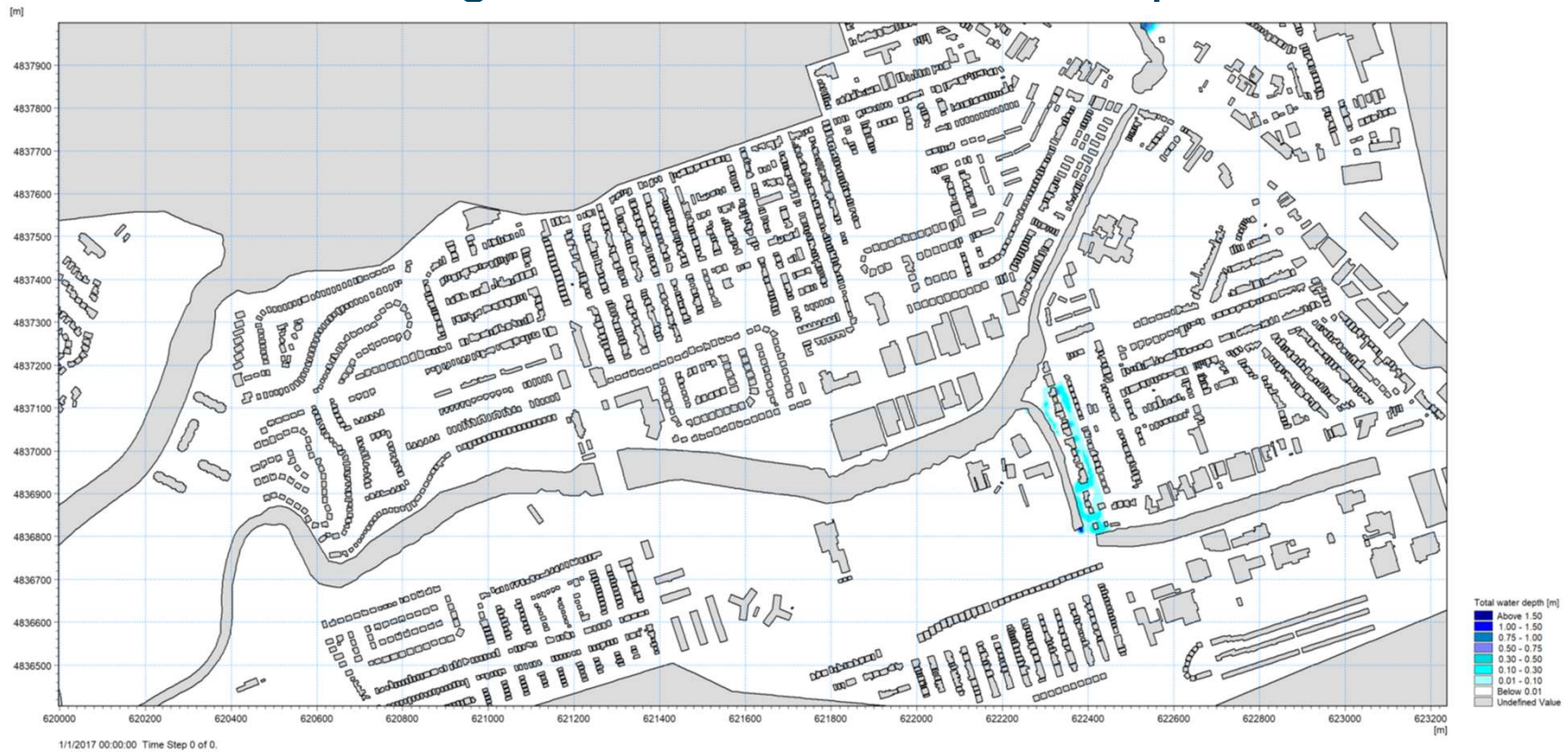
Results – Existing – 10 Year Event - Max Depth



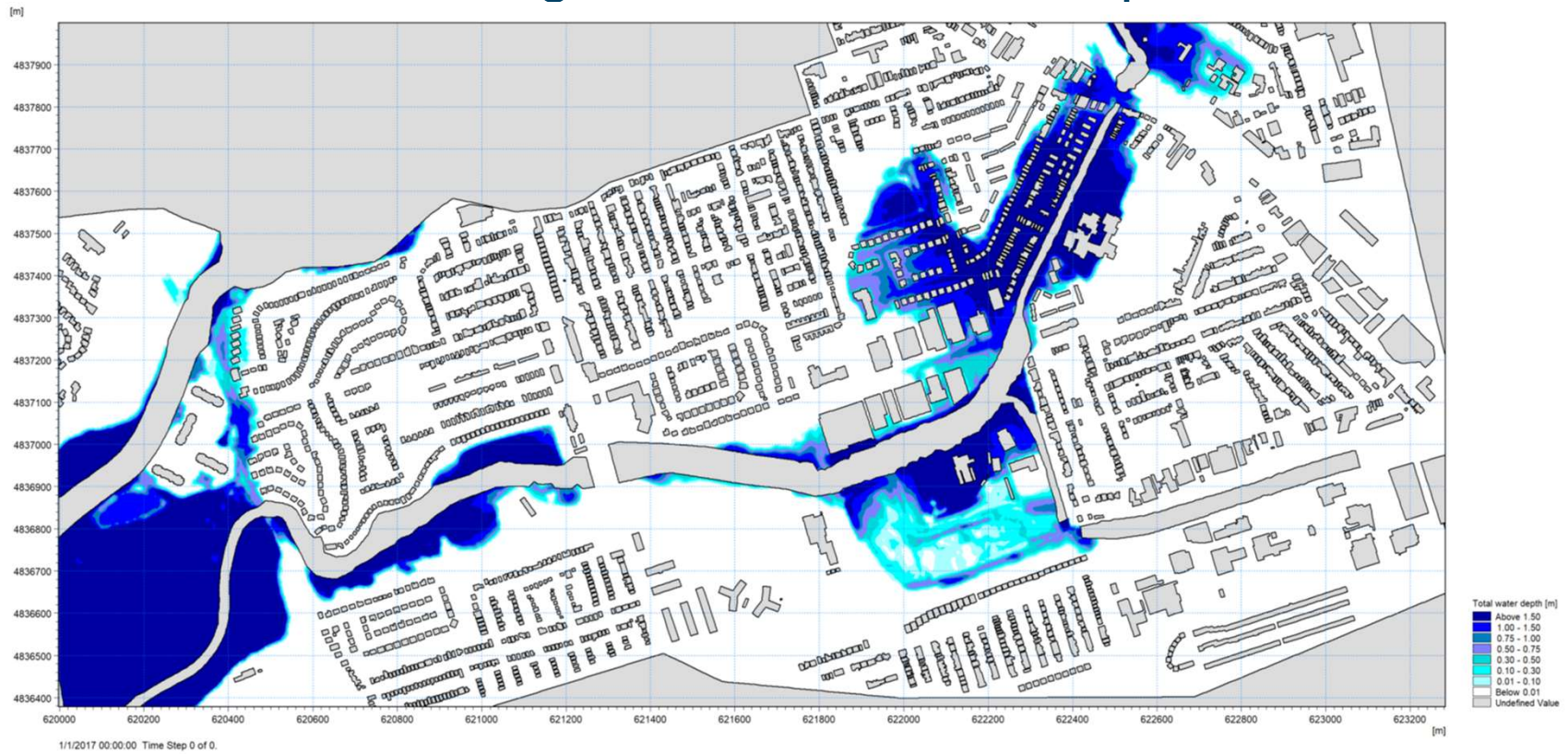
Results – Existing – 5 Year Event - Max Depth



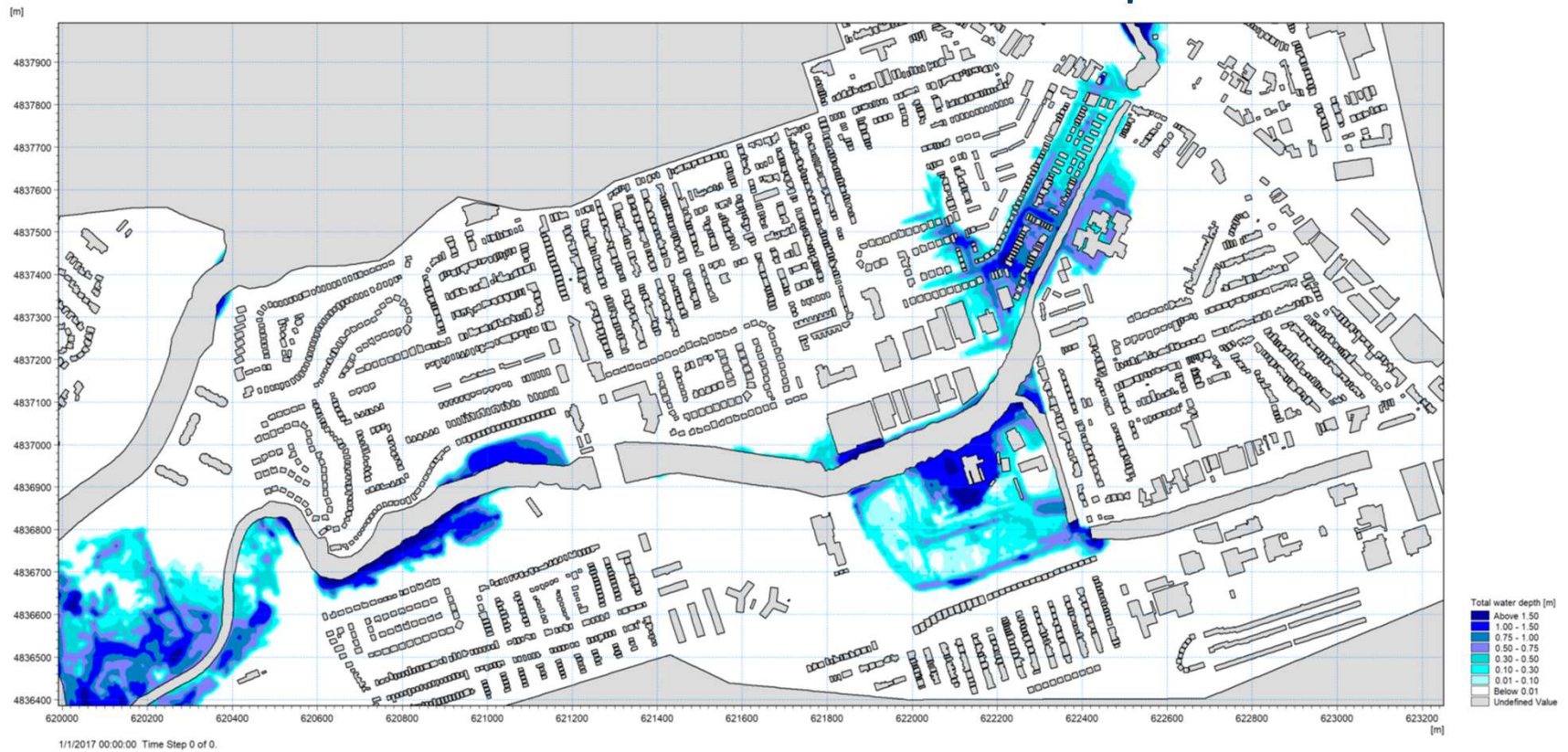
Results – Existing – 2 Year Event - Max Depth



Results – Alt 1 – Regional Event - Max Depth



Results – Alt 1 – 350 Year Event - Max Depth



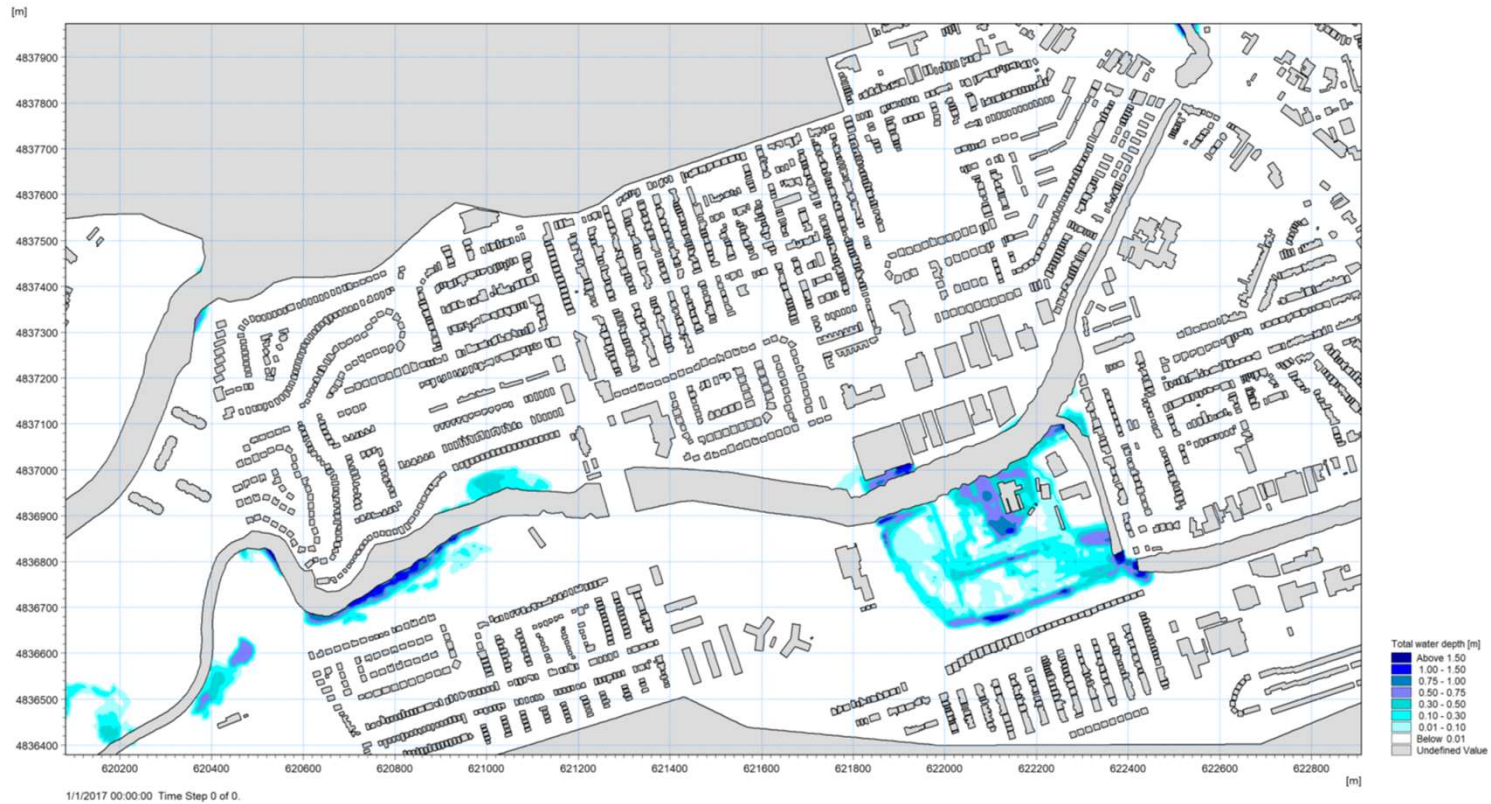
Results – Alt 1 – 100 Year Event - Max Depth



Results – Alt 1 – 50 Year Event - Max Depth



Results – Alt 1 – 25 Year Event - Max Depth



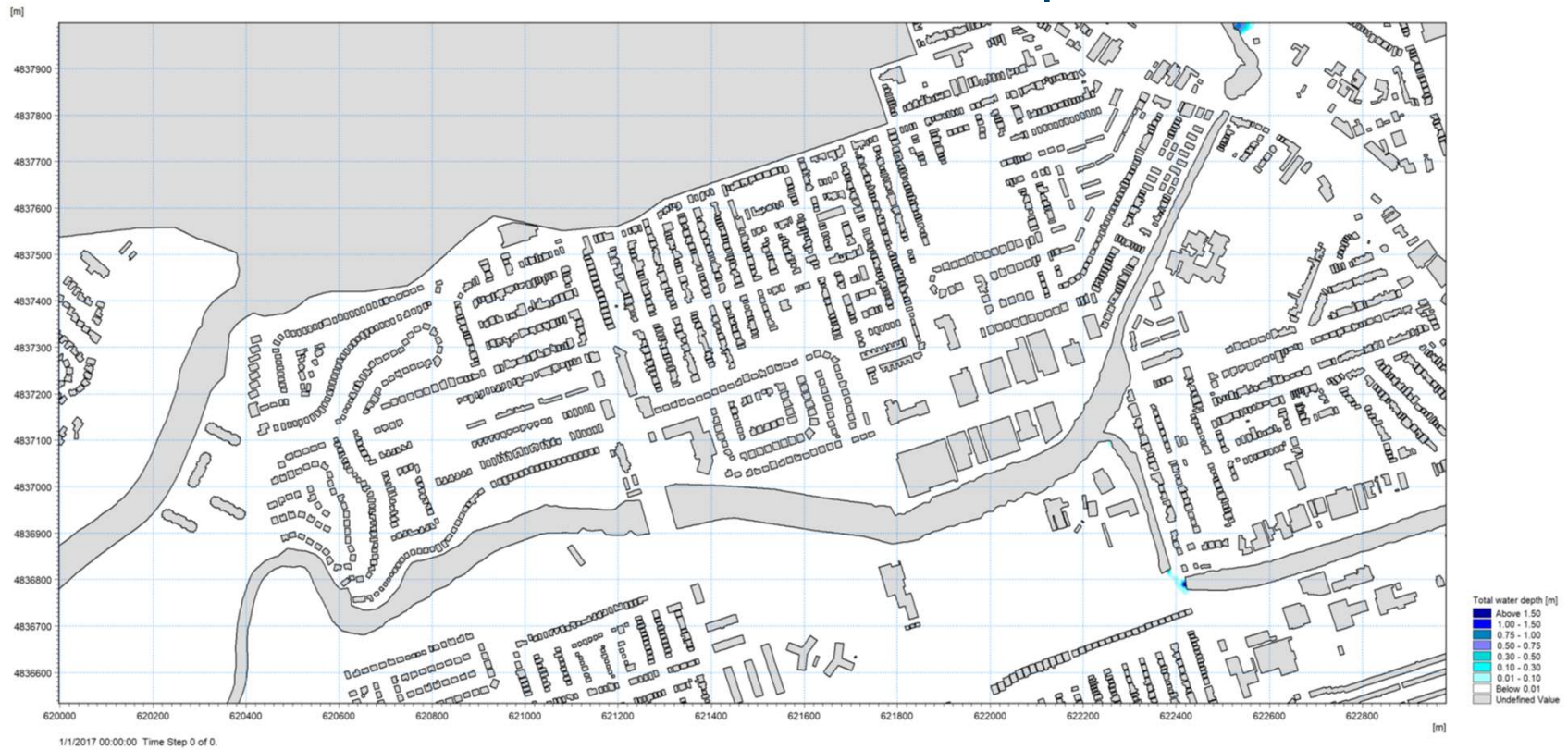
Results – Alt 1 – 10 Year Event - Max Depth



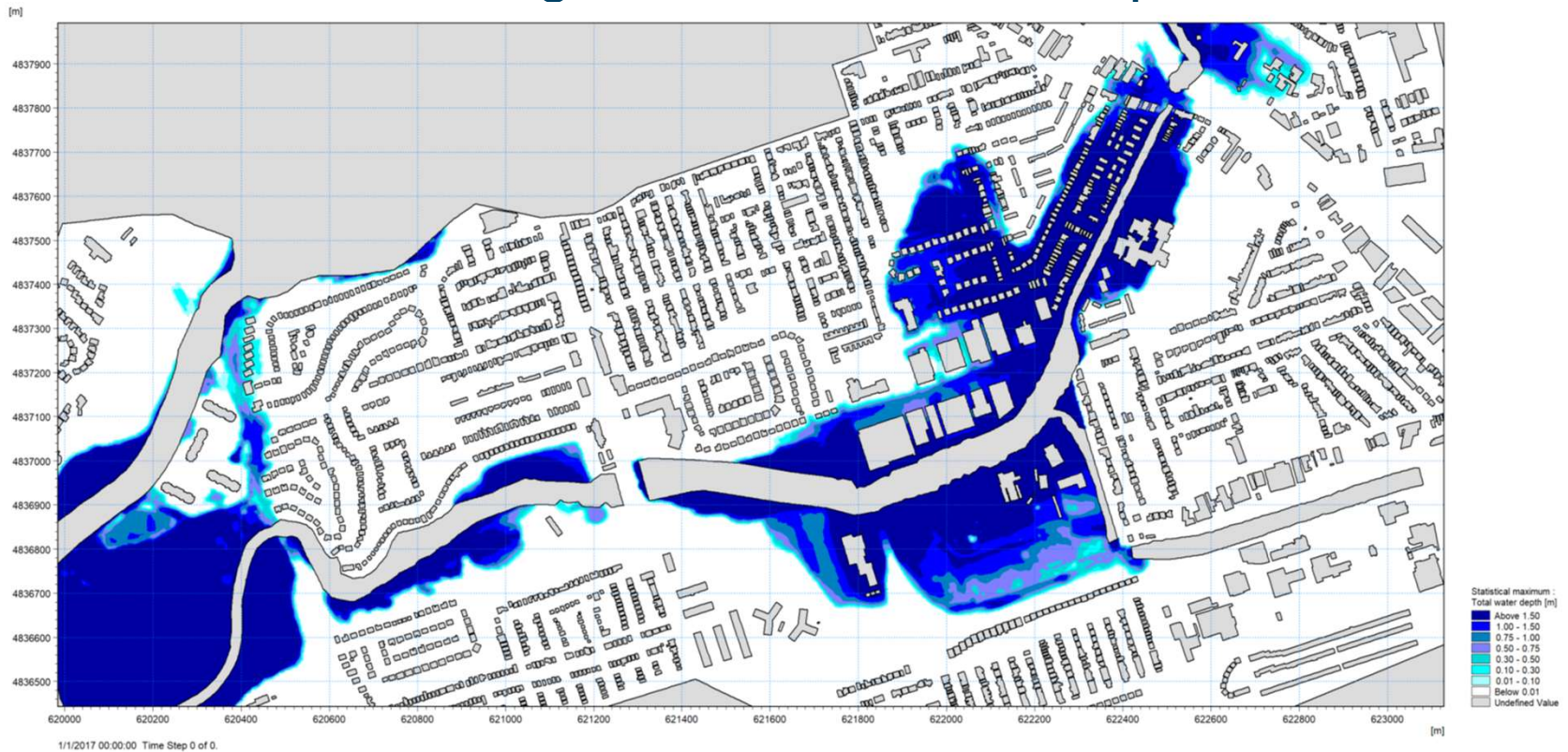
Results – Alt 1 – 5 Year Event - Max Depth



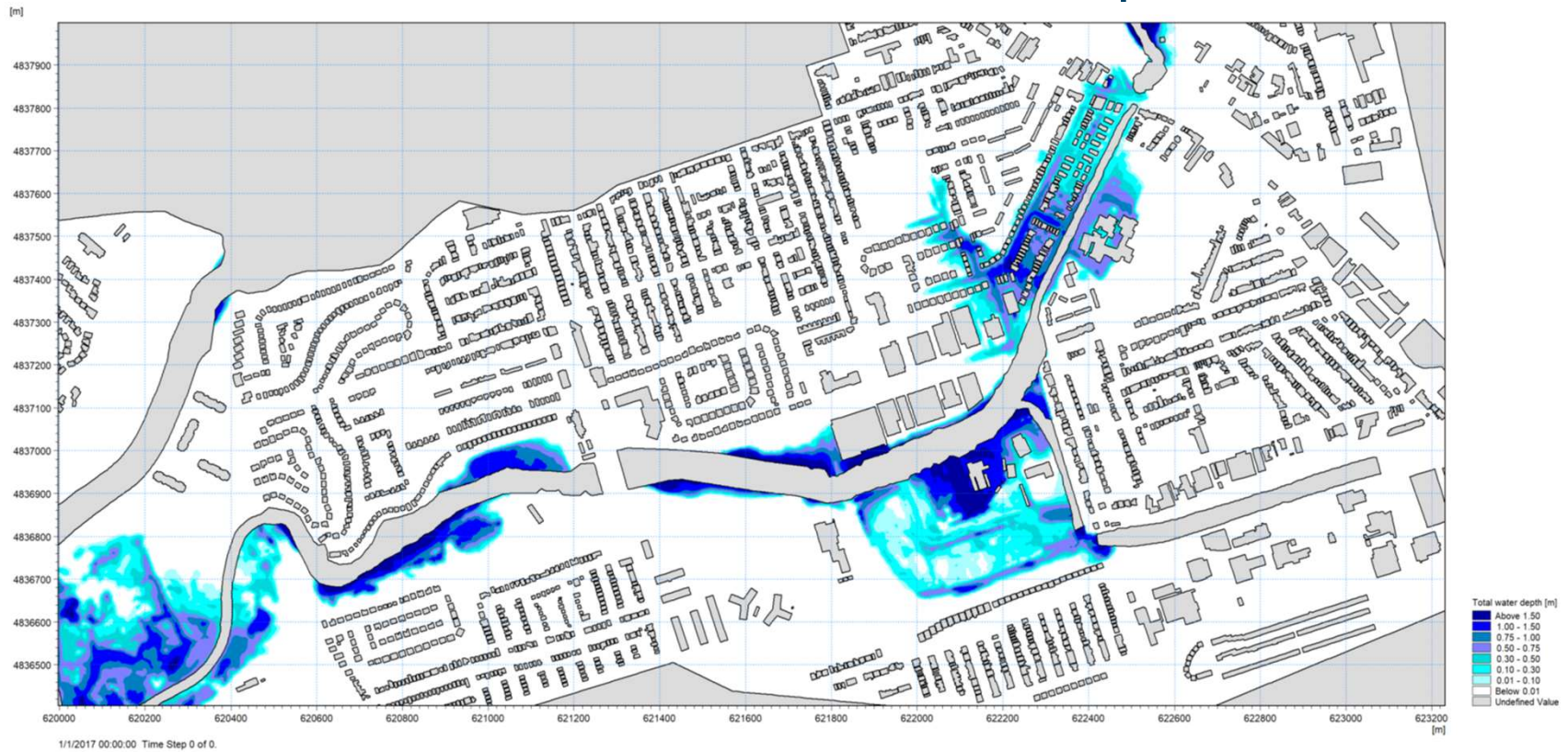
Results – Alt 1 – 2 Year Event - Max Depth



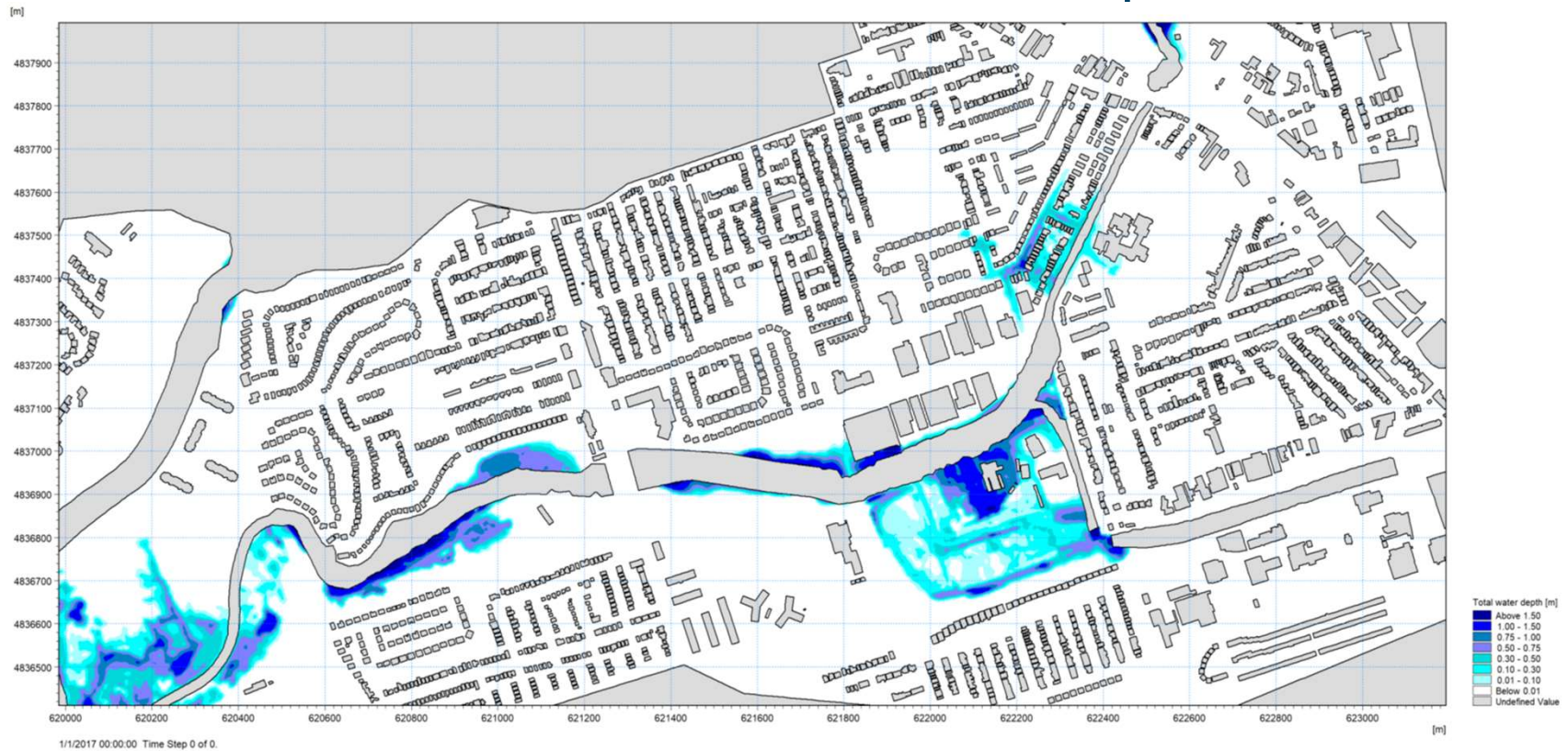
Results – Alt 2 – Regional Event - Max Depth



Results – Alt 2 – 350 Year Event - Max Depth



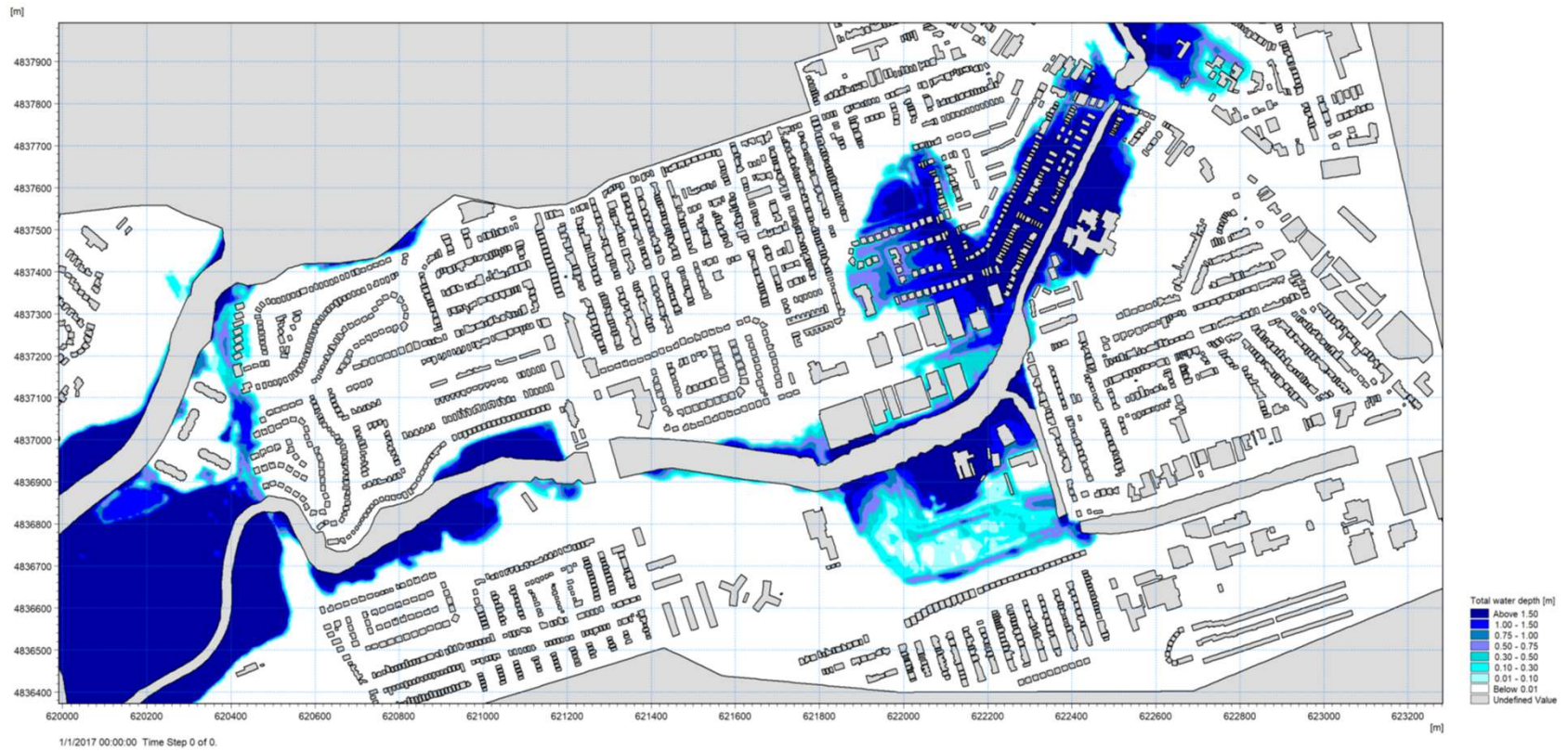
Results – Alt 2 – 100 Year Event - Max Depth



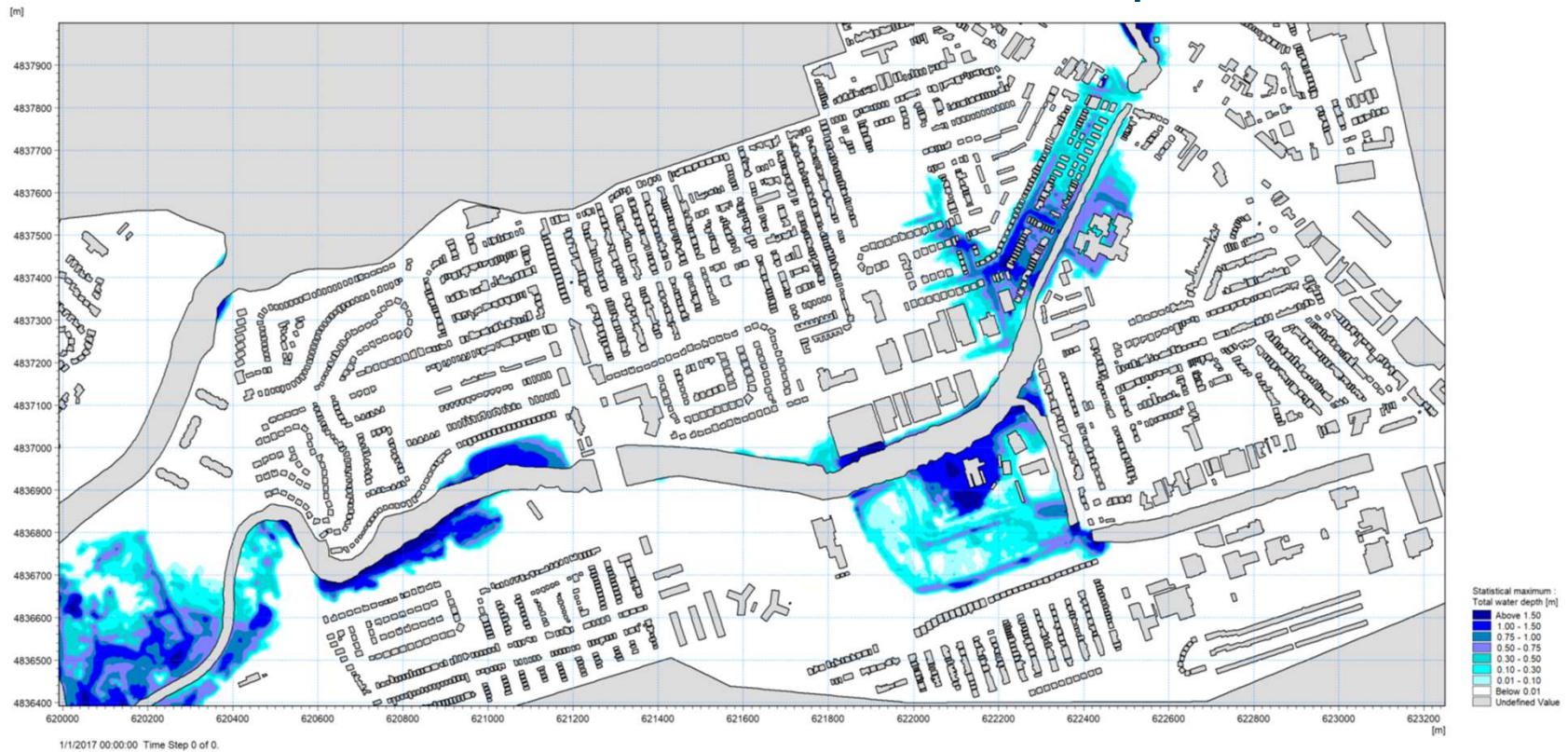
Results – Alt 2 – 50 Year Event - Max Depth



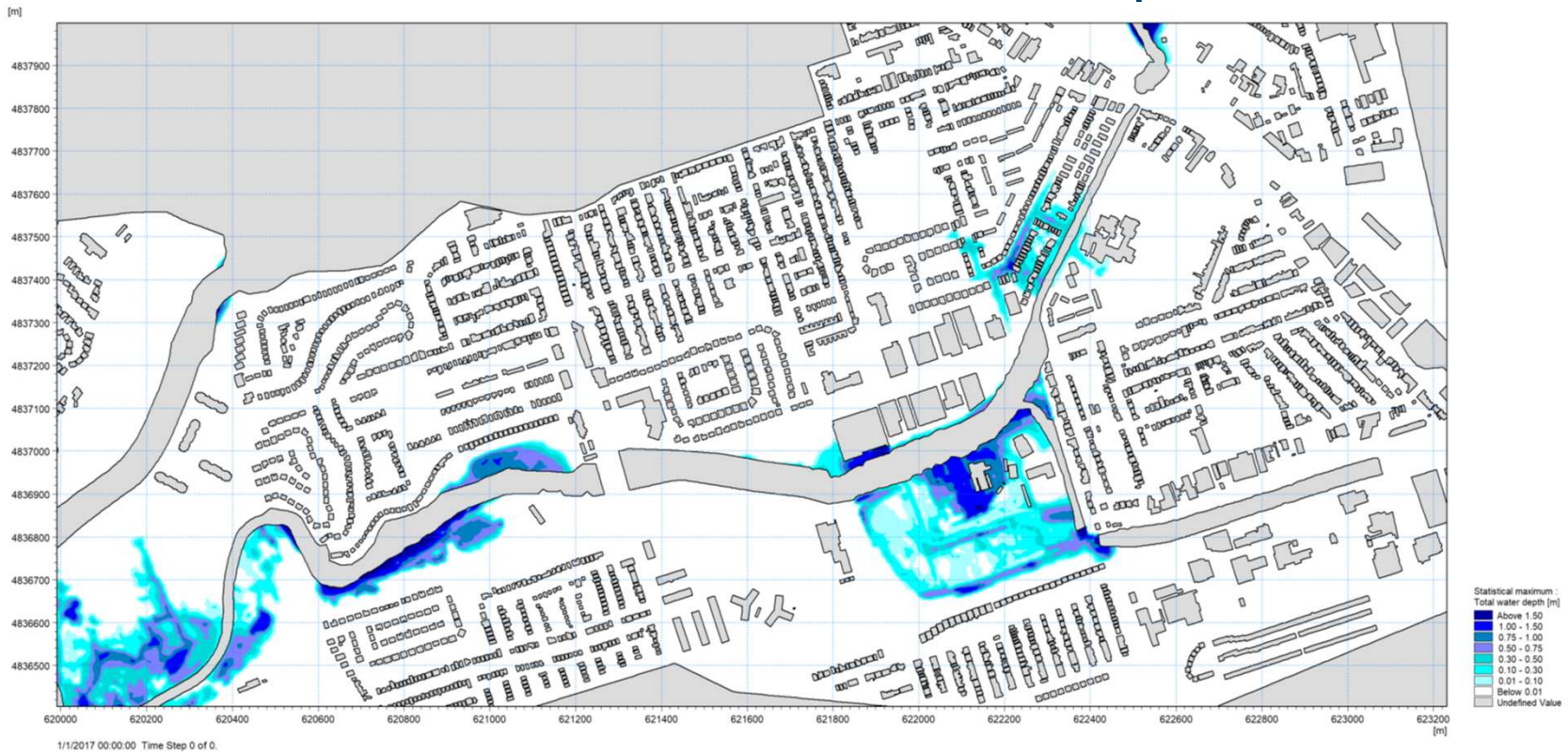
Results – Alt 3 – Regional Event - Max Depth



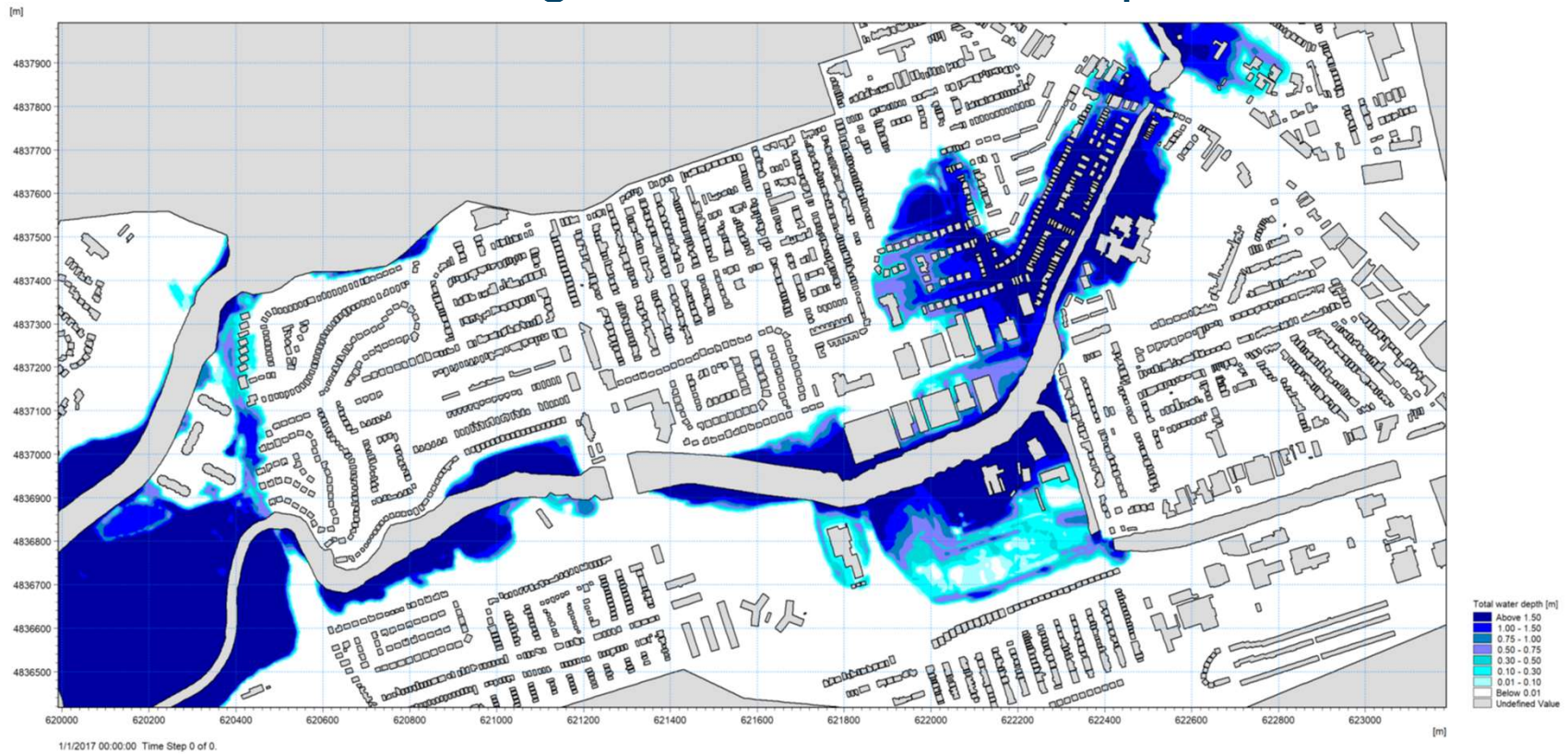
Results – Alt 3 – 350 Year Event - Max Depth



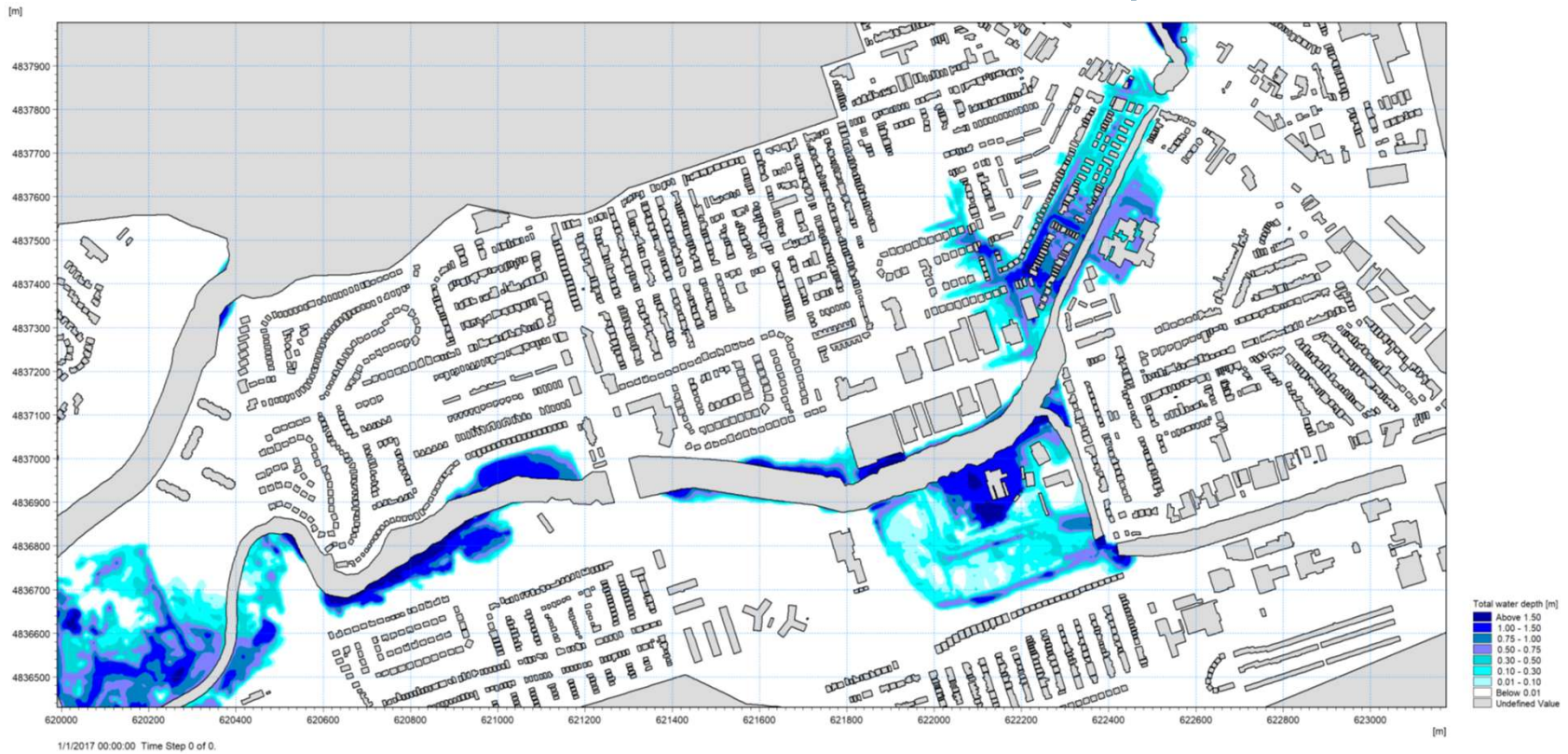
Results – Alt 3 – 100 Year Event - Max Depth



Results – Alt 4 – Regional Event - Max Depth



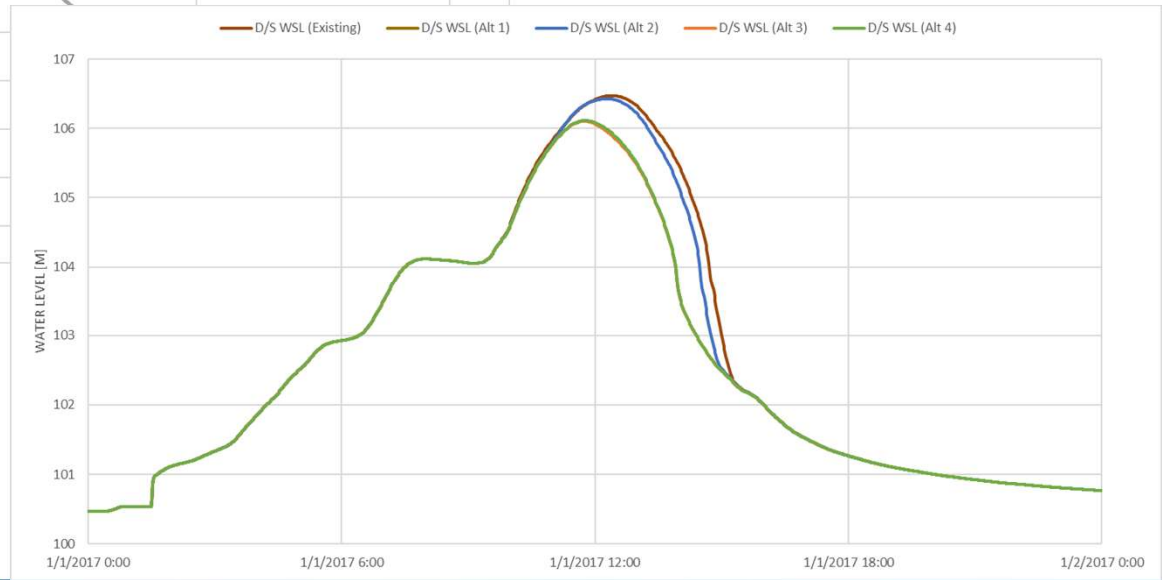
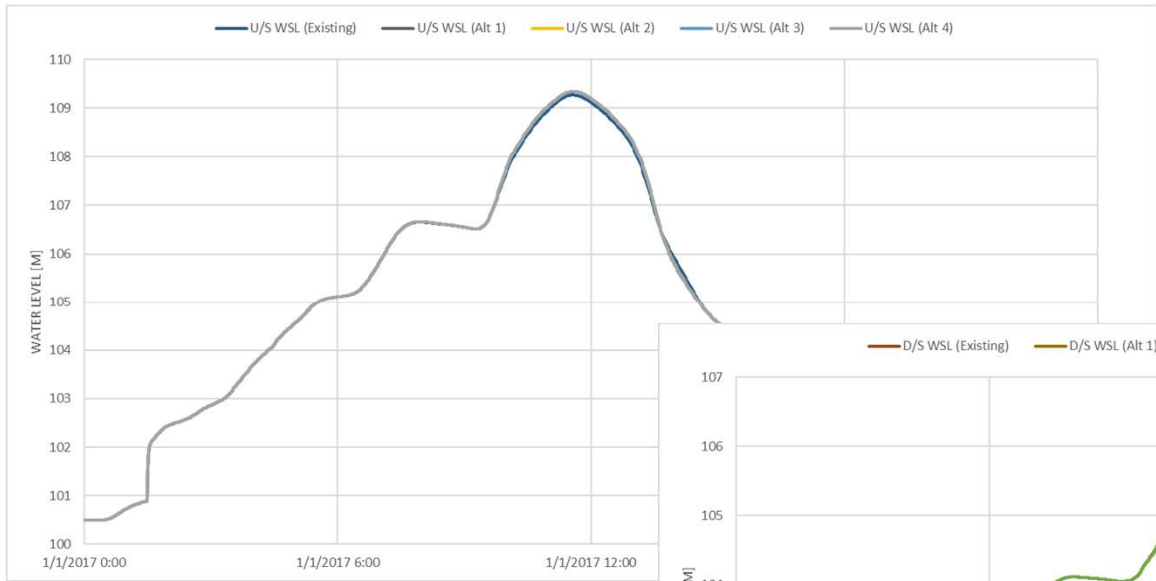
Results – Alt 4 – 350 Year Event - Max Depth



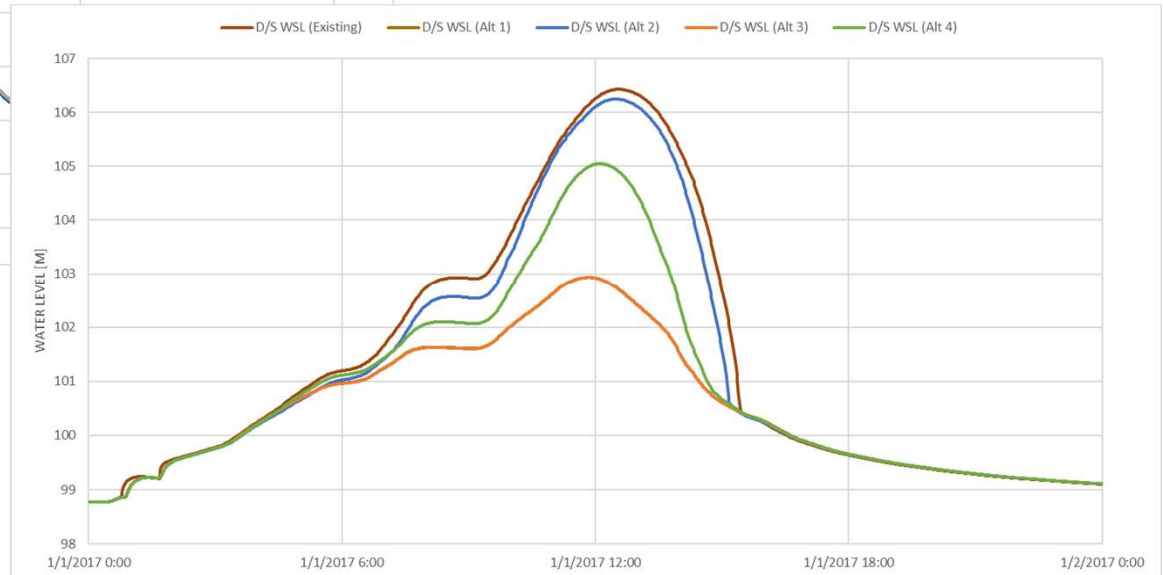
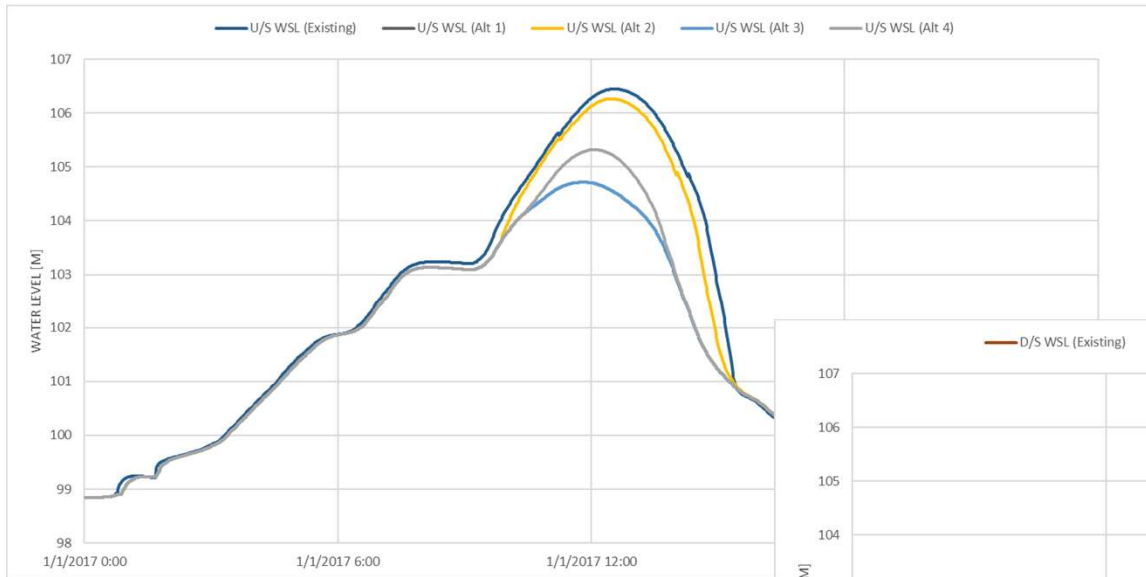
Results – Alt 4 – 100 Year Event - Max Depth



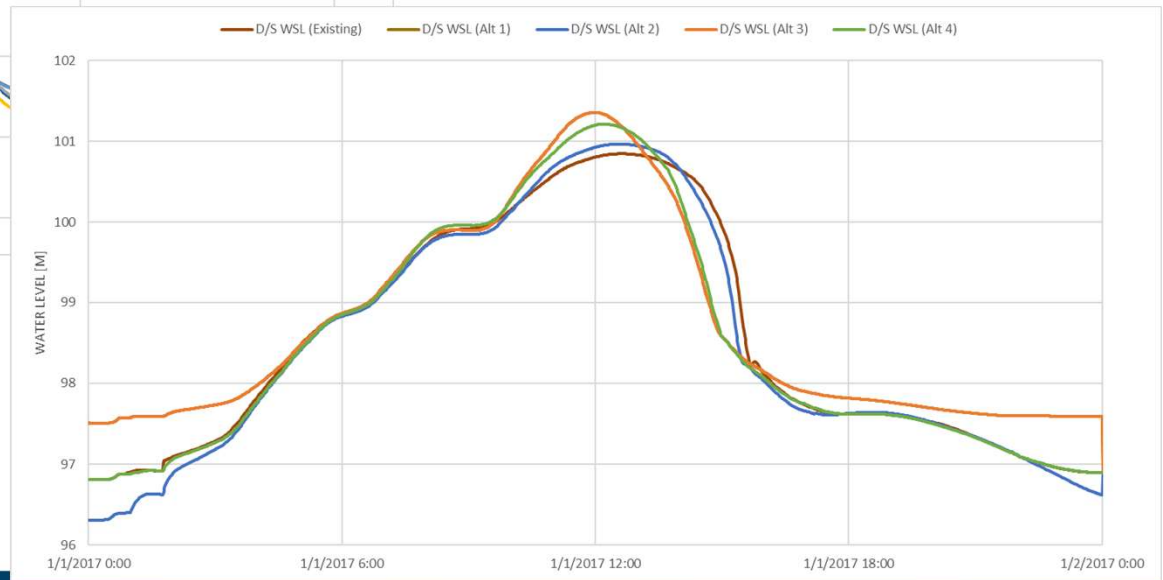
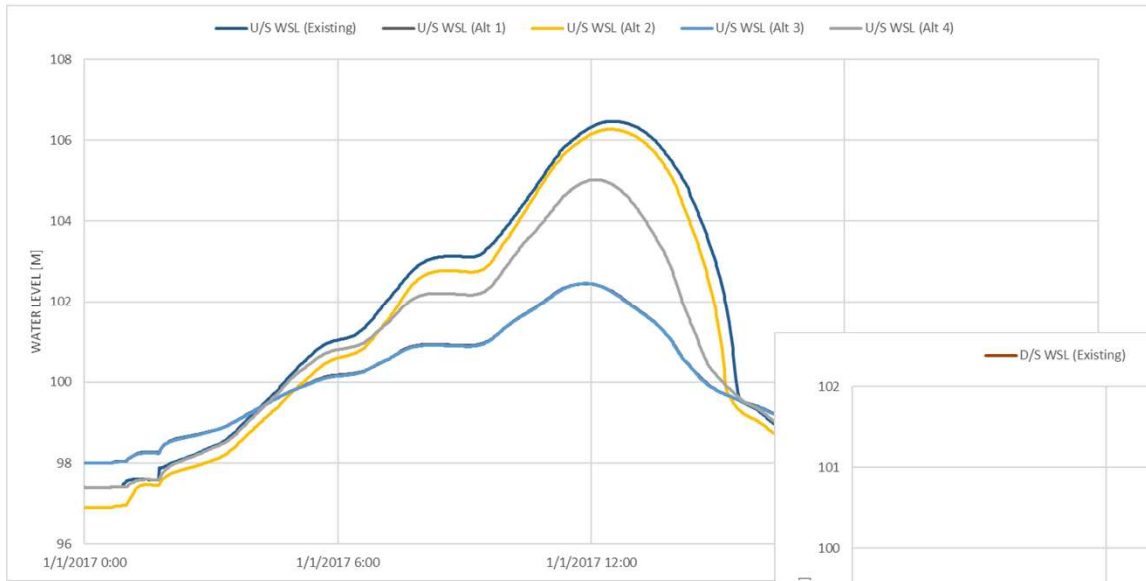
Results comparison – regional event Weston Rd



Results comparison – regional event Rockcliffe Blvd



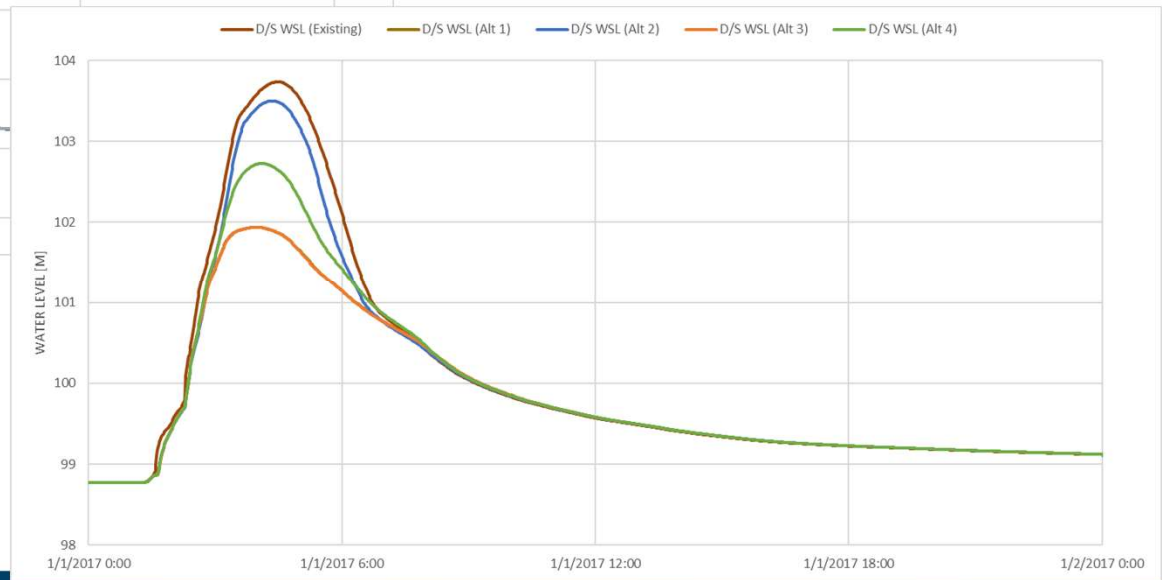
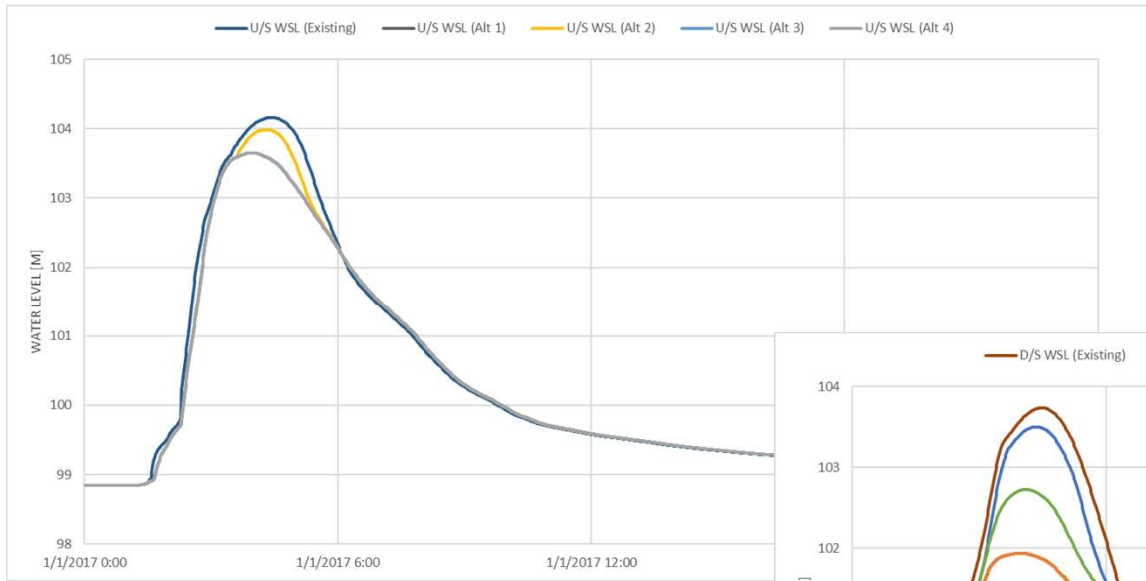
Results comparison – regional event Jane St



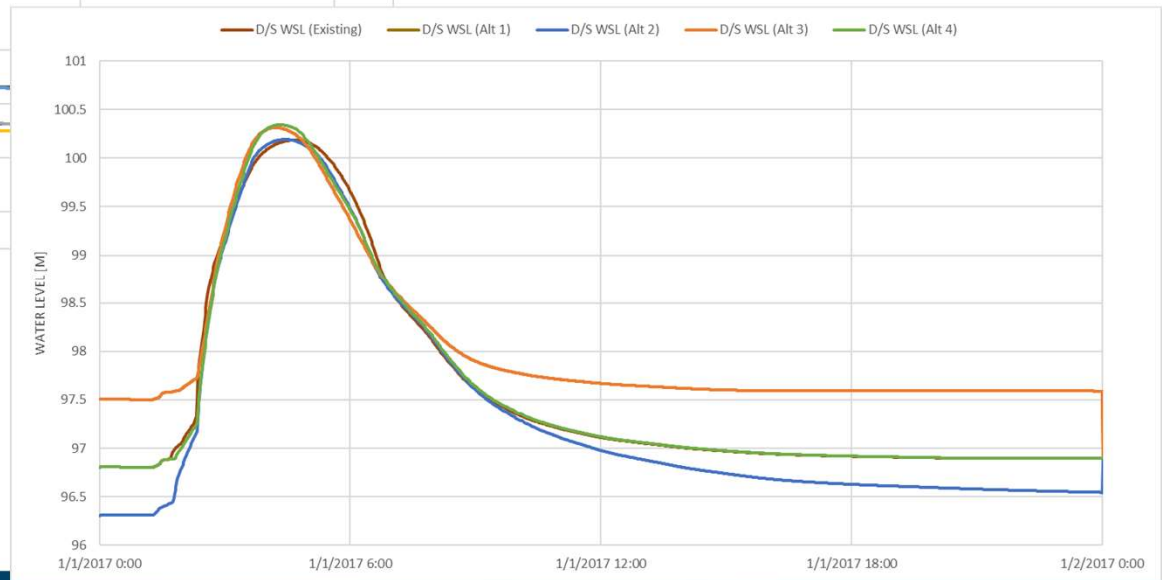
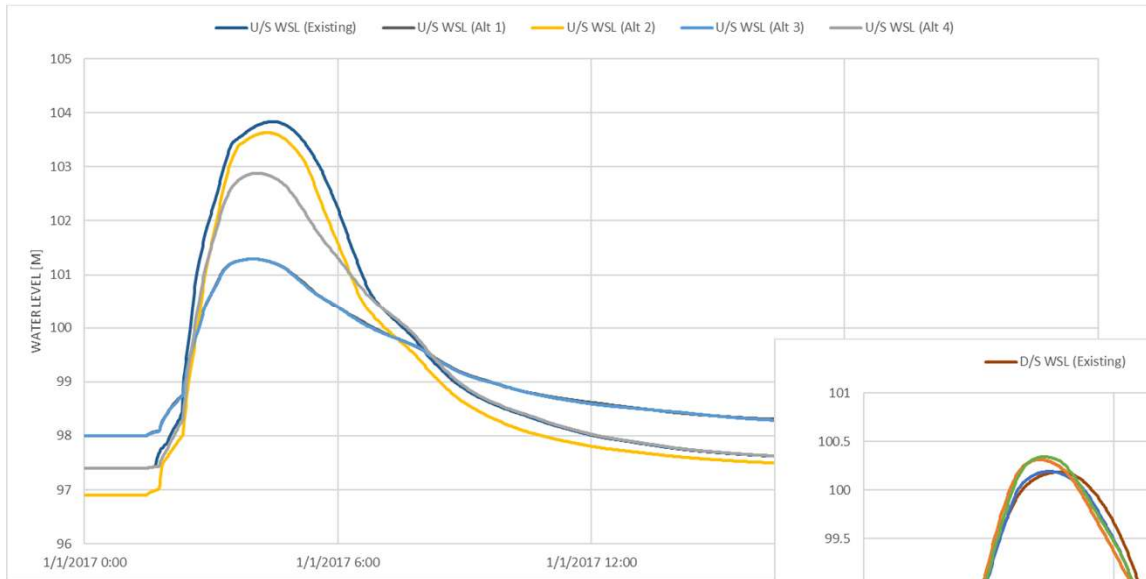
Results Comparison – Regional Event, Max Depth



Results comparison – 350-year event Rockcliffe Blvd



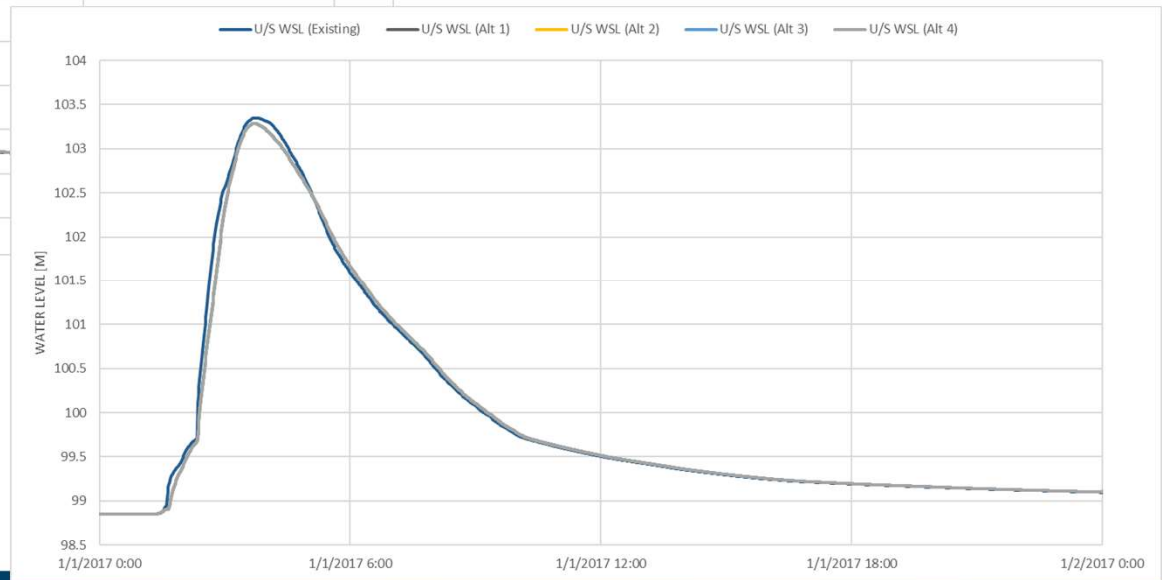
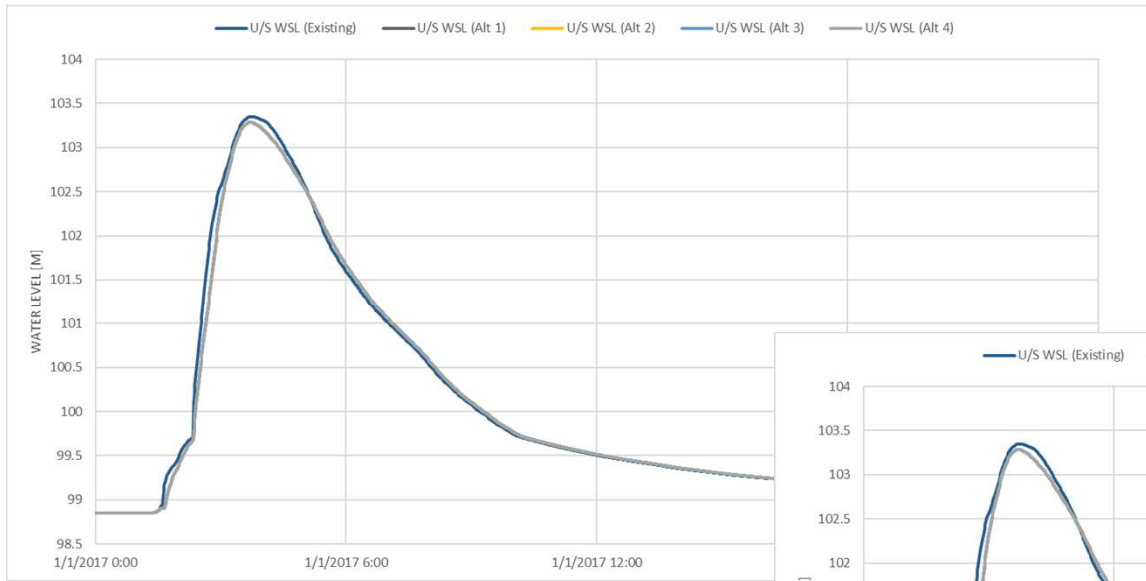
Results comparison – 350-year event Jane St



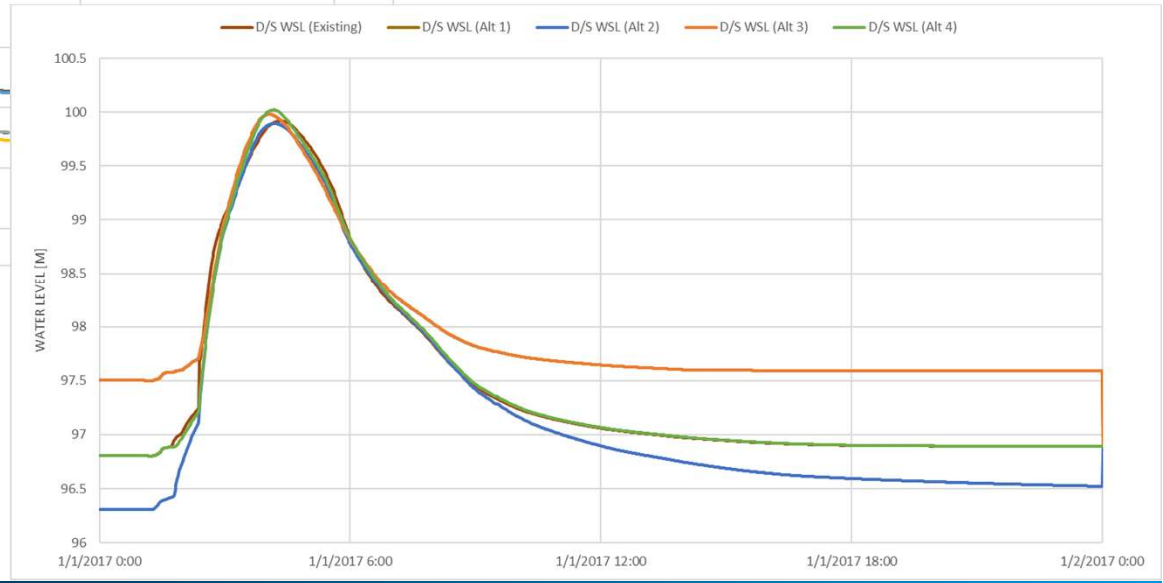
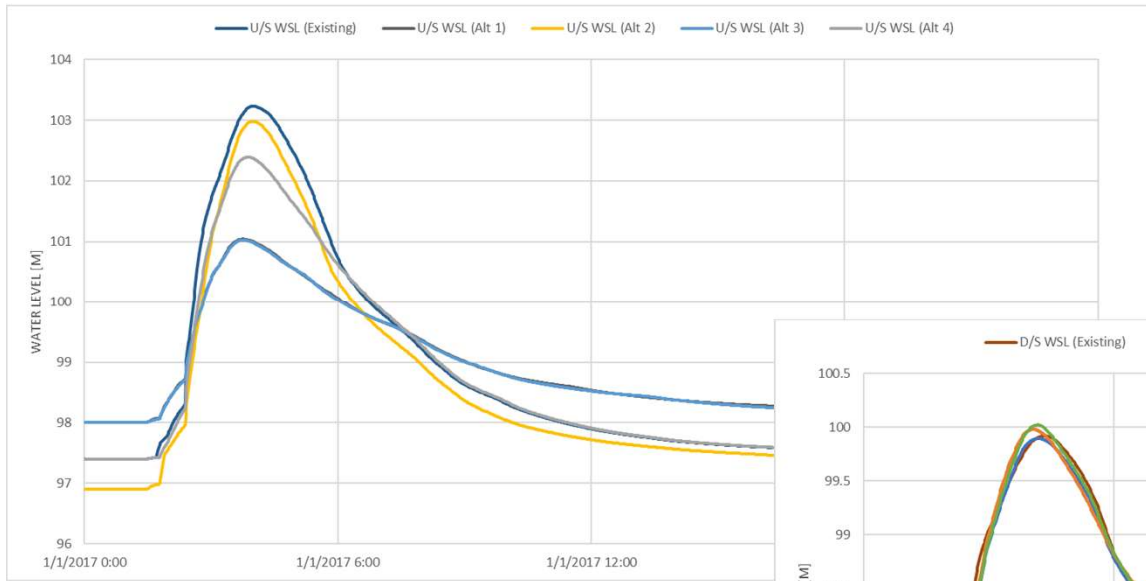
Results Comparison – 350-year Event, Max Depth



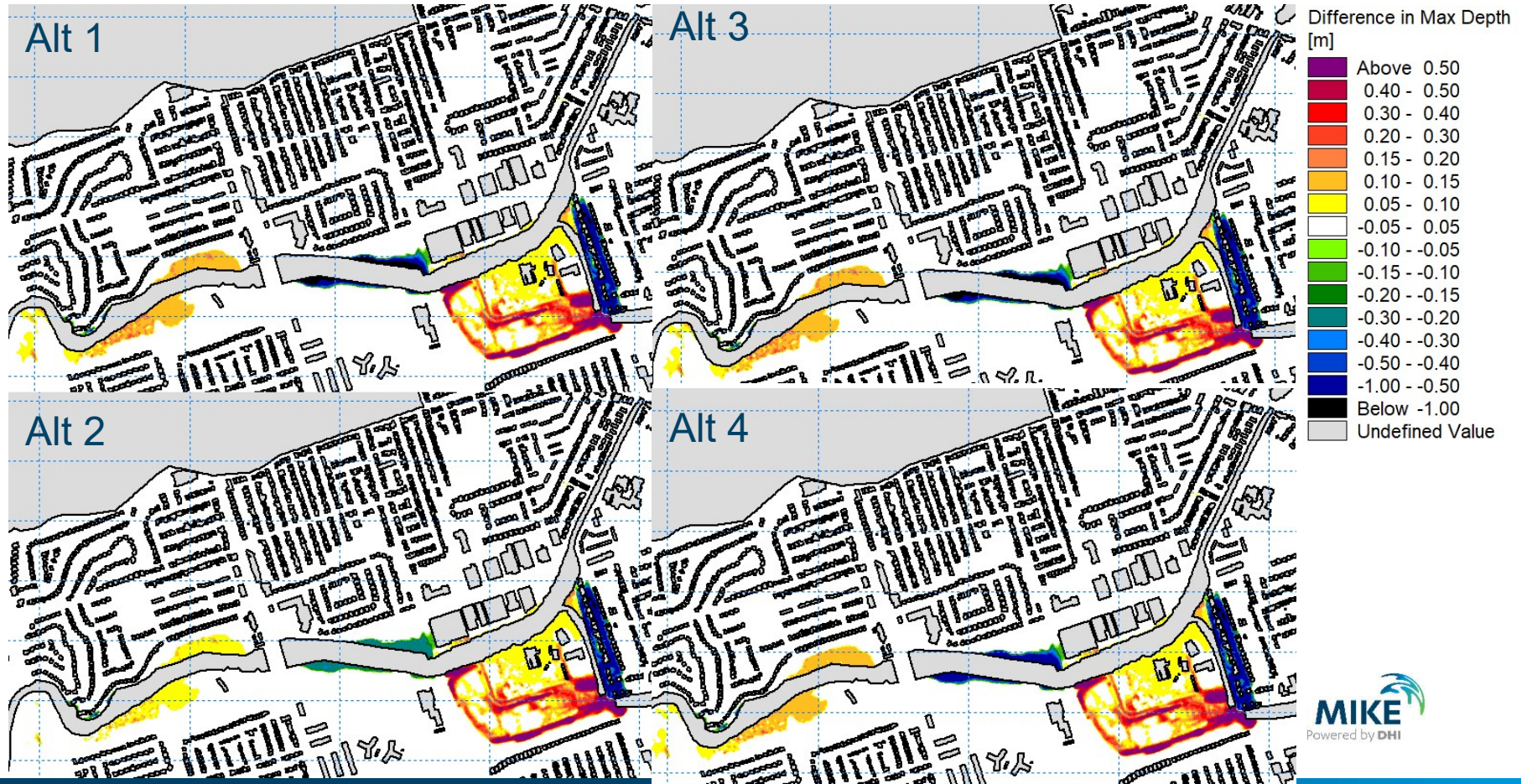
Results comparison – 100-year event Rockcliffe Blvd



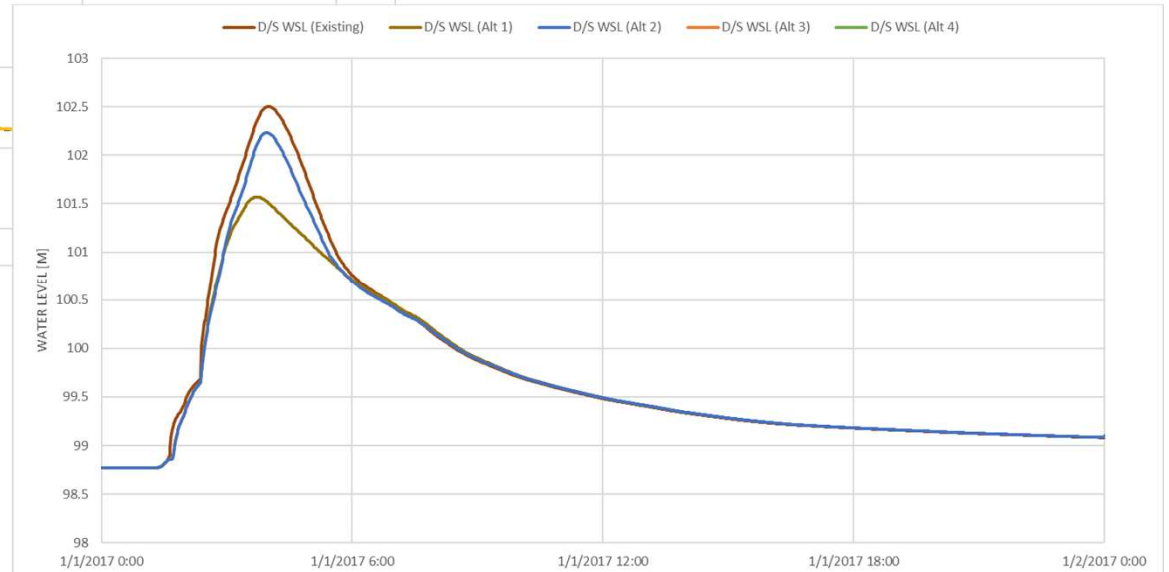
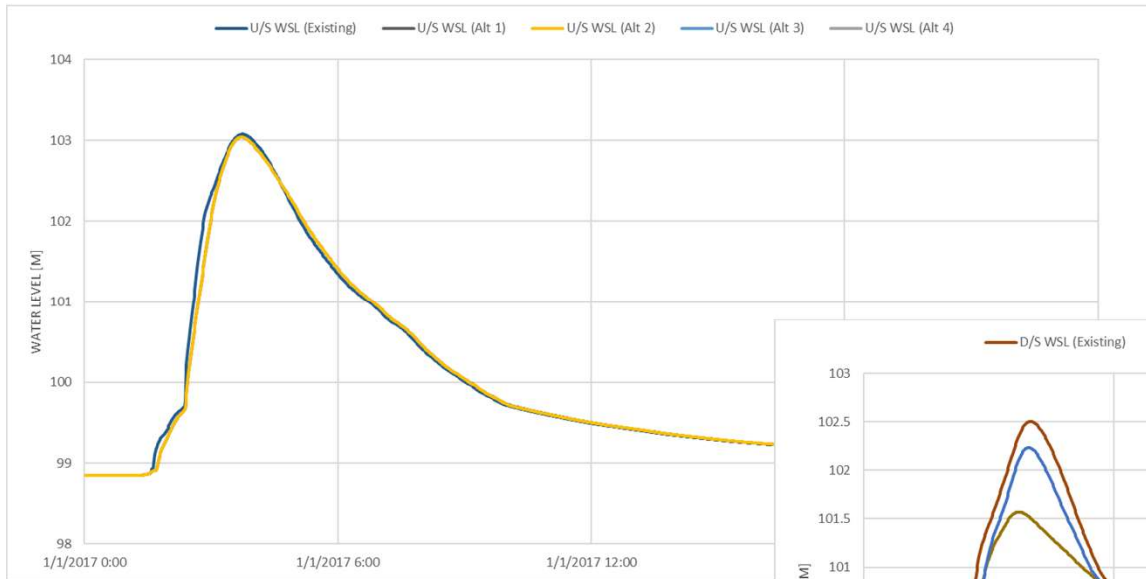
Results comparison – 100-year event Jane St



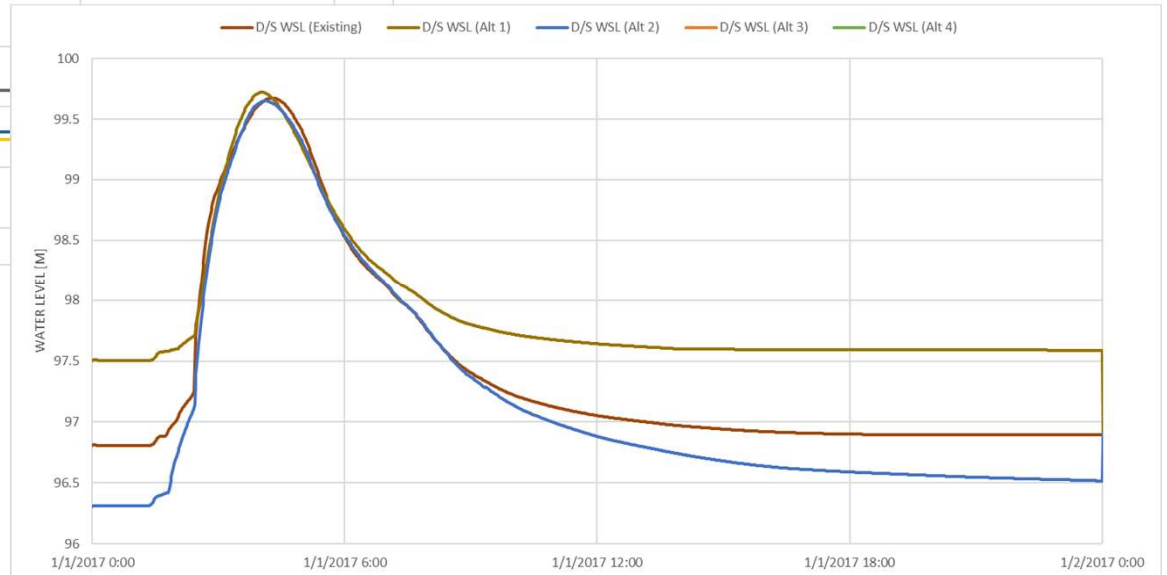
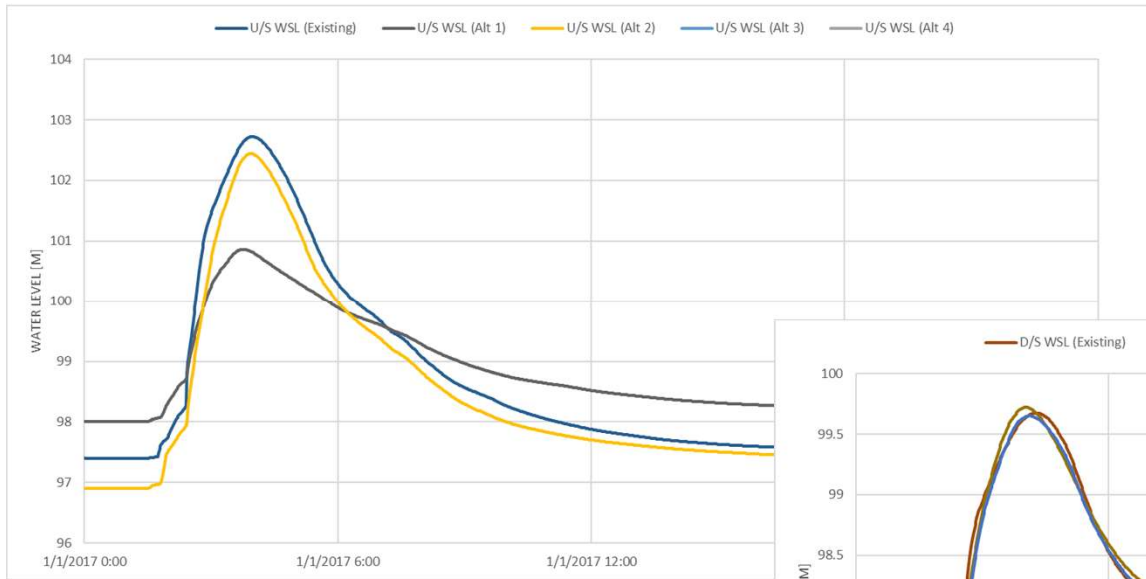
Results Comparison – 100-year Event, Max Depth



Results comparison – 50-year event Rockcliffe Blvd



Results comparison – 50-year event Jane St



Results Comparison – 50-year Event, Max Depth

Alt 1

Alt 2



wood.

**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

woodplc.com





wood.

FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

**November 21 2019 Jane St. LOS Assessment
Milestone Meeting #3**



Agenda

1. Introductions (Wood)
2. Review of October 7, 2019 Meeting Minutes (Wood)
3. Geotechnical Investigation Update (Wood)
4. Transportation and Traffic Assessment (Wood)
5. Phase 2A Assessment Results Discussion (Wood/DHI)
6. Jane Street Level of Service Assessment (Wood/DHI)
7. Phase 2B Lavender Creek Assessment Update (Wood/DHI)
8. Next Steps (Wood)
9. Project Schedule (Wood)
10. Other Business (All)



1. Introductions

1. Introductions (Wood)

- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff
- DHI - Hydraulics



2. Review of October 7, 2019 Meeting Minutes (Wood)

2. Review of October 7, 2019 Meeting Minutes

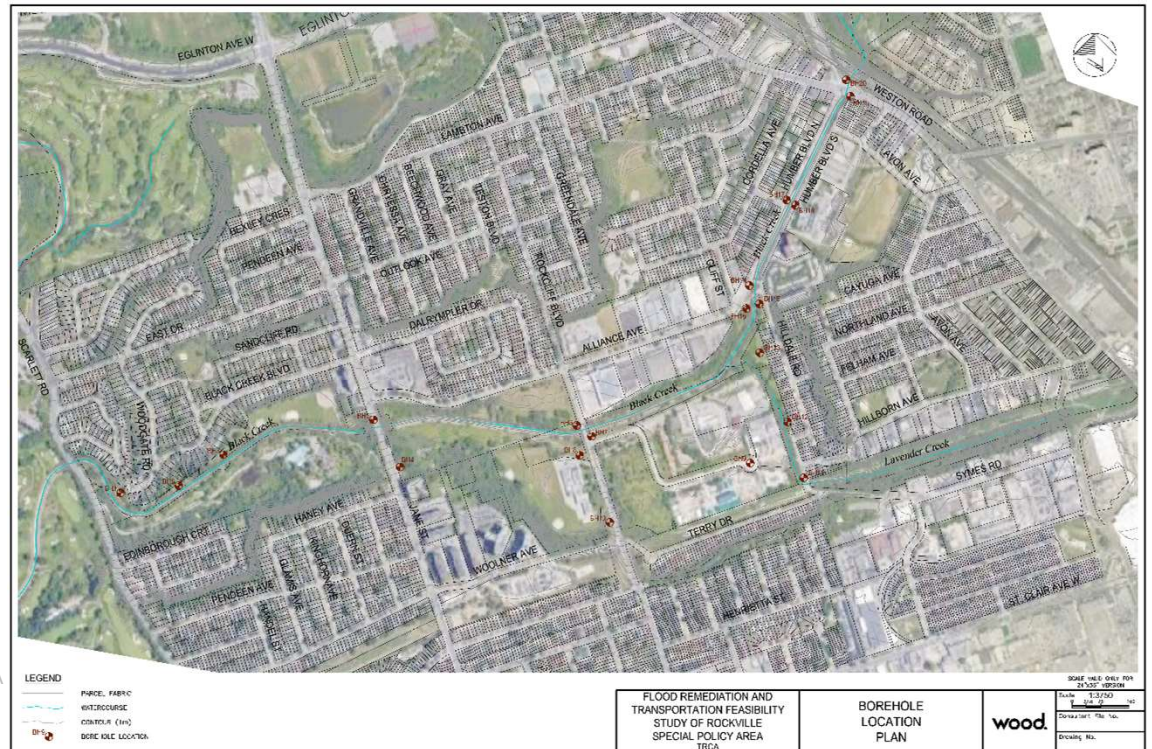
Open Minutes



3. Geotechnical Investigation Updates (Wood)

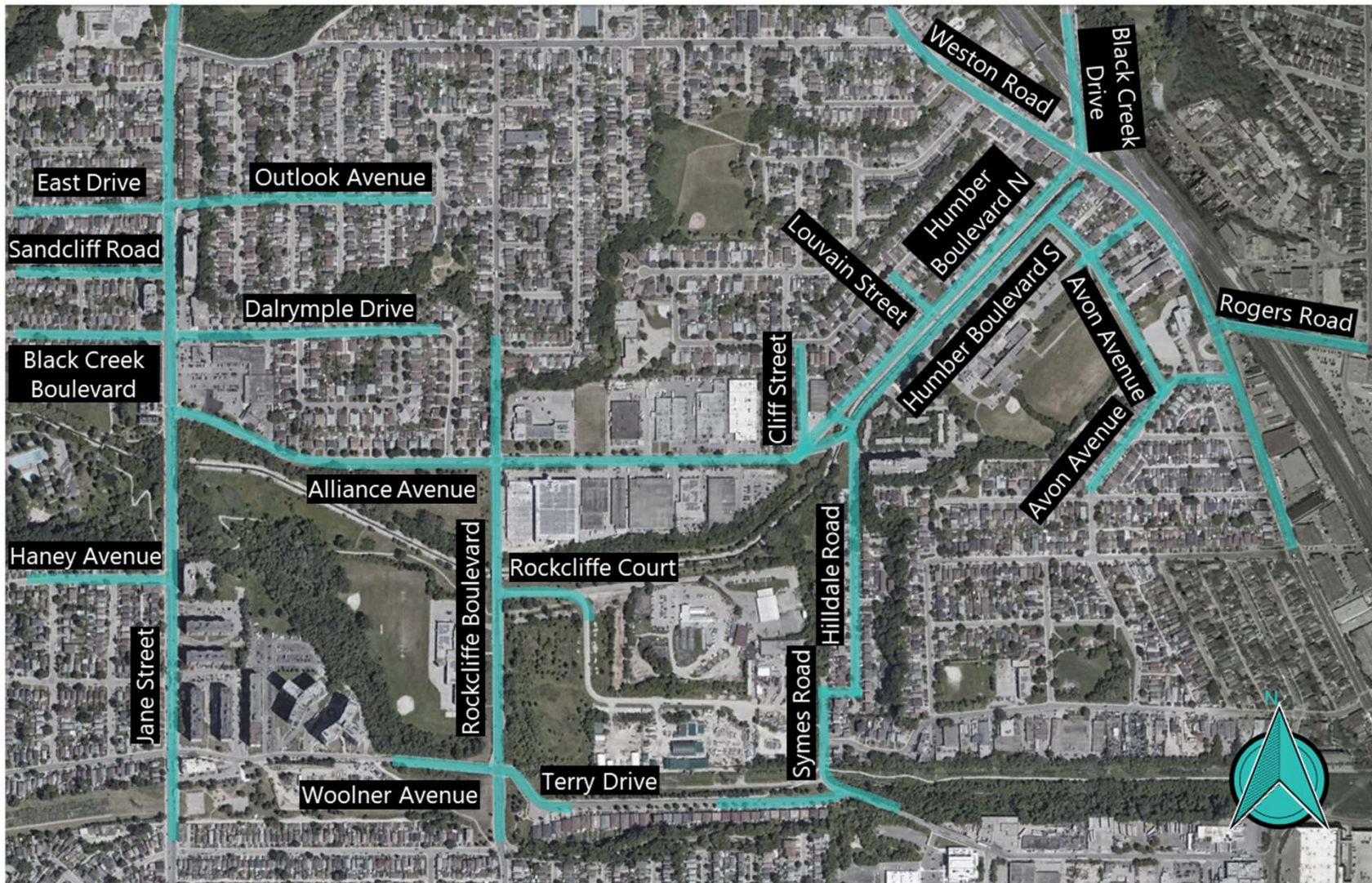
3. Geotechnical Investigation Update

- Boreholes completed
- Borehole logs – nearing completion (16/20), within next week
- Geotechnical Assessment Memo – start next week, to be prepared by December 13, 2019
- Barrels being emptied by Wood this week, for removal by contractor next week

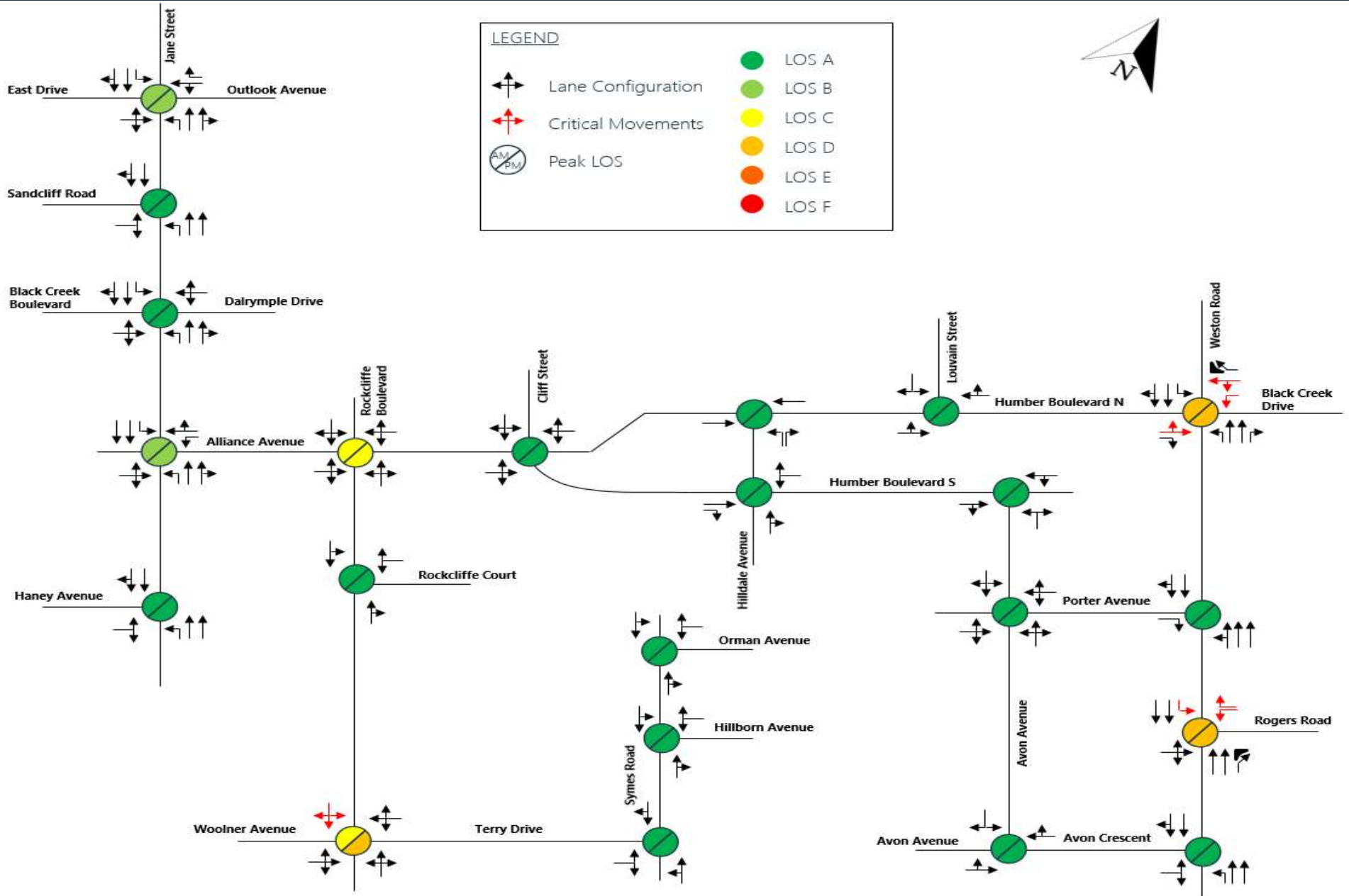


4. Transportation and Traffic Assessment (Wood)

4. Traffic and Transportation Assessment (Wood)



4. Traffic and Transportation Assessment (Wood)



5. Phase 2A Results Discussion (Wood)

5. Phase 2A Results Discussion (Wood)

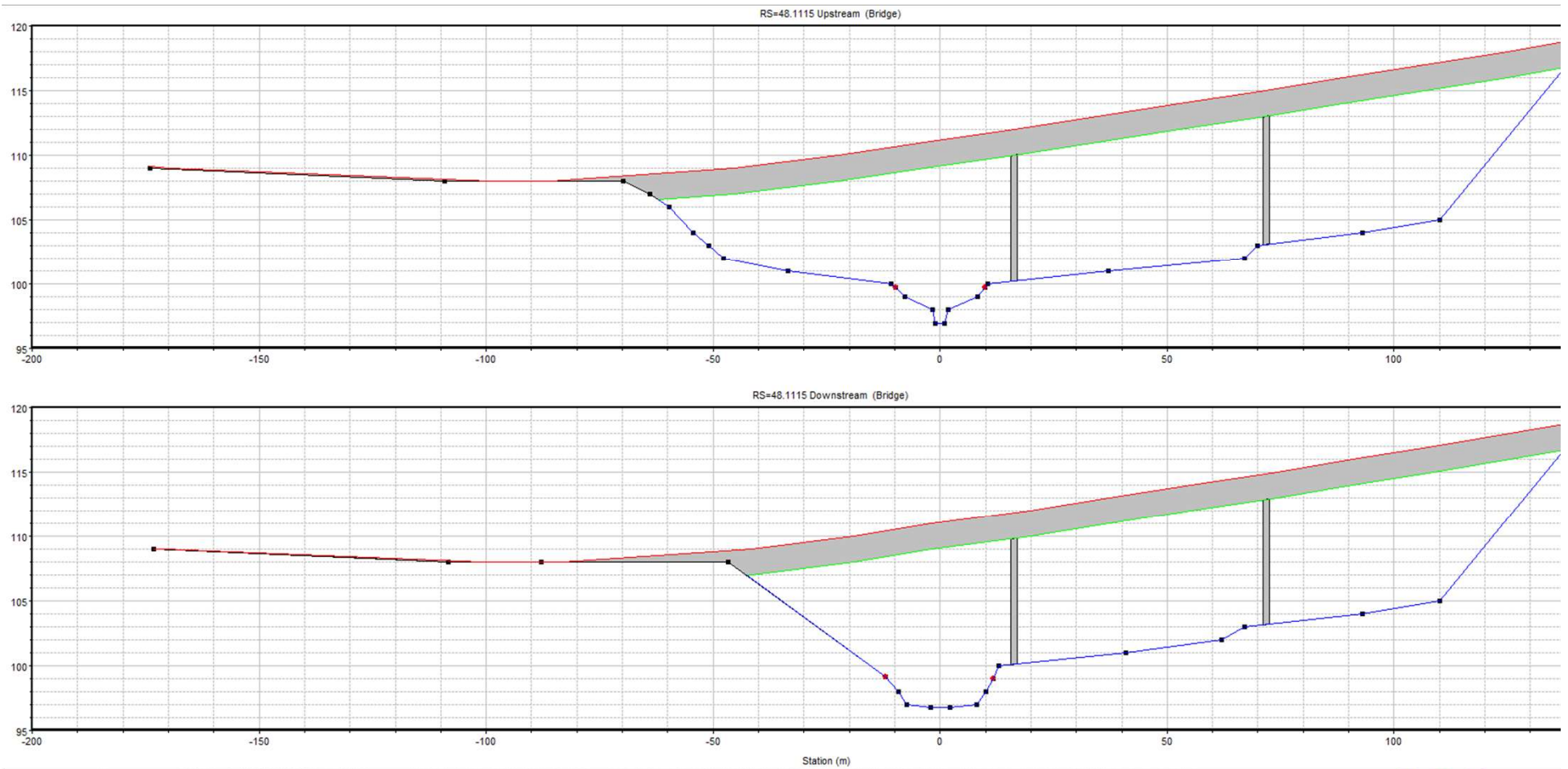
Flood Mitigation Alternative Scenarios

- Alternatives Scenarios:
 - **Scenario 1:** Jane St. Crossing Upgrade and Valley Shaping
 - **Scenario 2:** Flood Protection Berms (Black Creek Drive, Rockcliffe Middle School and Hilldale Blvd)
 - **Scenario 3:** Channel widening (Rockcliffe Blvd. to Alliance Ave.)
 - **Scenario 4:** Combined Scenario of Scenarios 1-3
- Decided to use Combined Scenario 4 with 4 alternatives for Jane Street with flood protection berms and channel widening.
 - **Alternative 1:** 200 m Span
 - **Alternative 2:** 100 year Level of Service – Drop Channel Invert
 - **Alternative 3:** 350 year Level of Service
 - **Alternative 4:** Relief Culverts



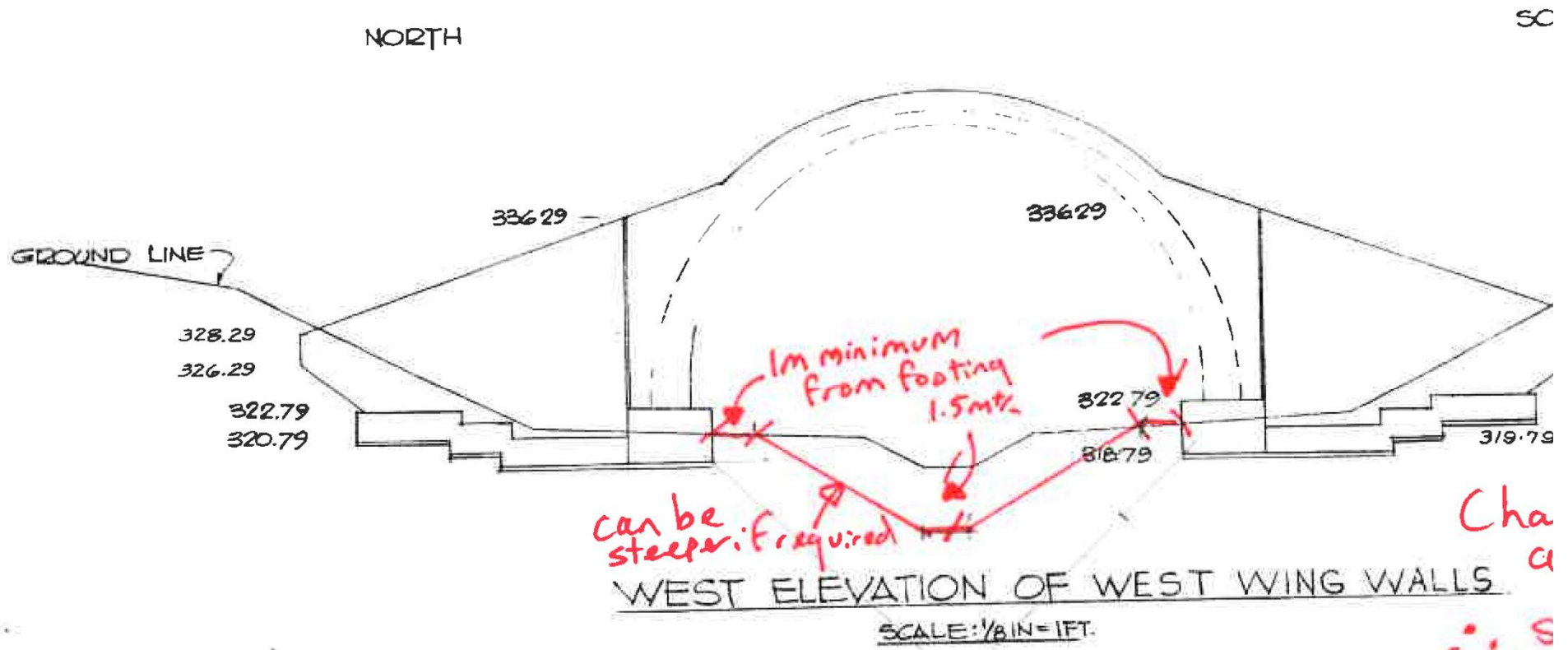
5. Phase 2A Results Discussion (Wood)

Alternative 1: 200 m Span



5. Phase 2A Results Discussion (Wood)

Alternative 2: 100 Year Level of Service – Drop Channel Invert

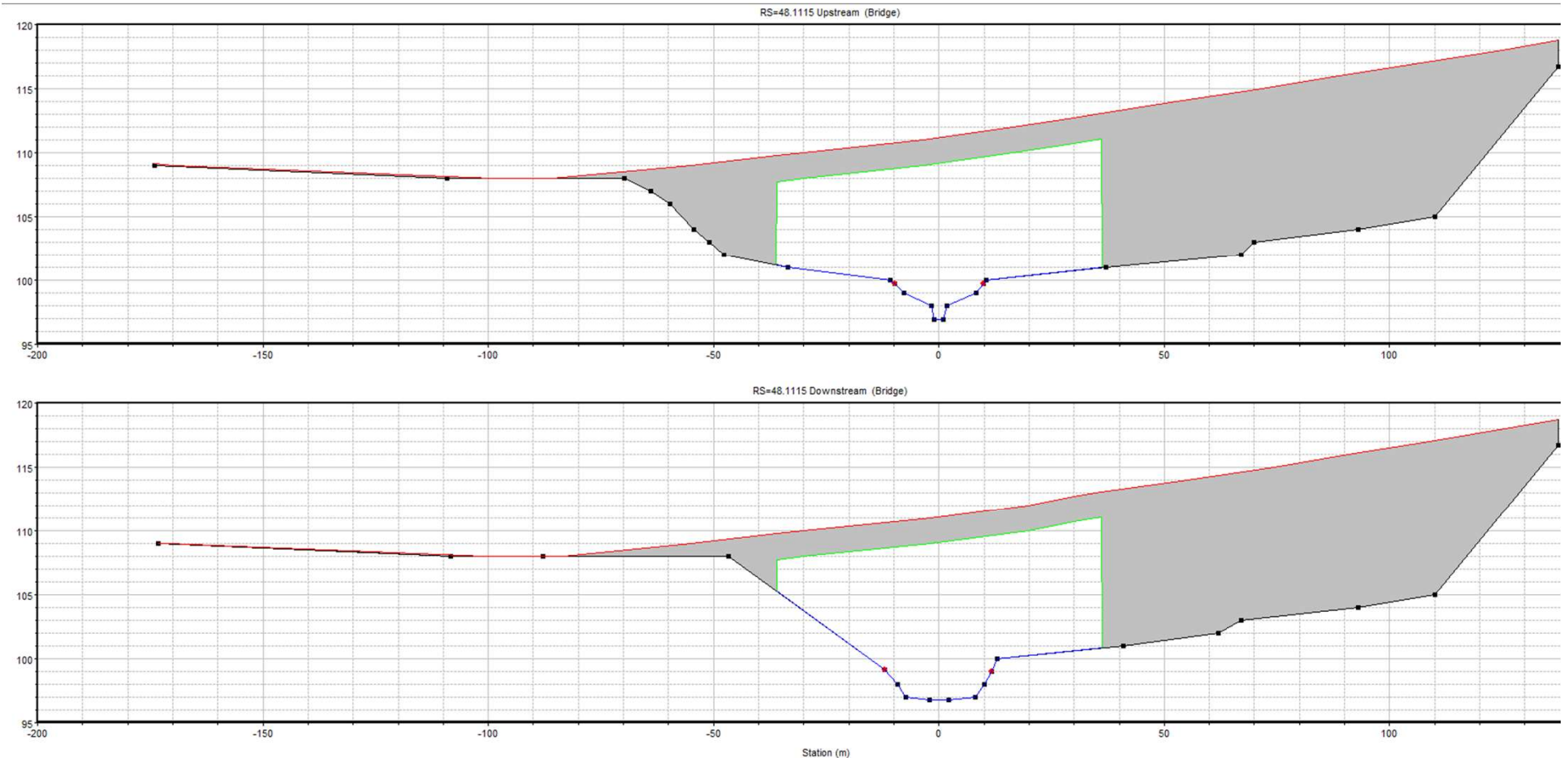


SC



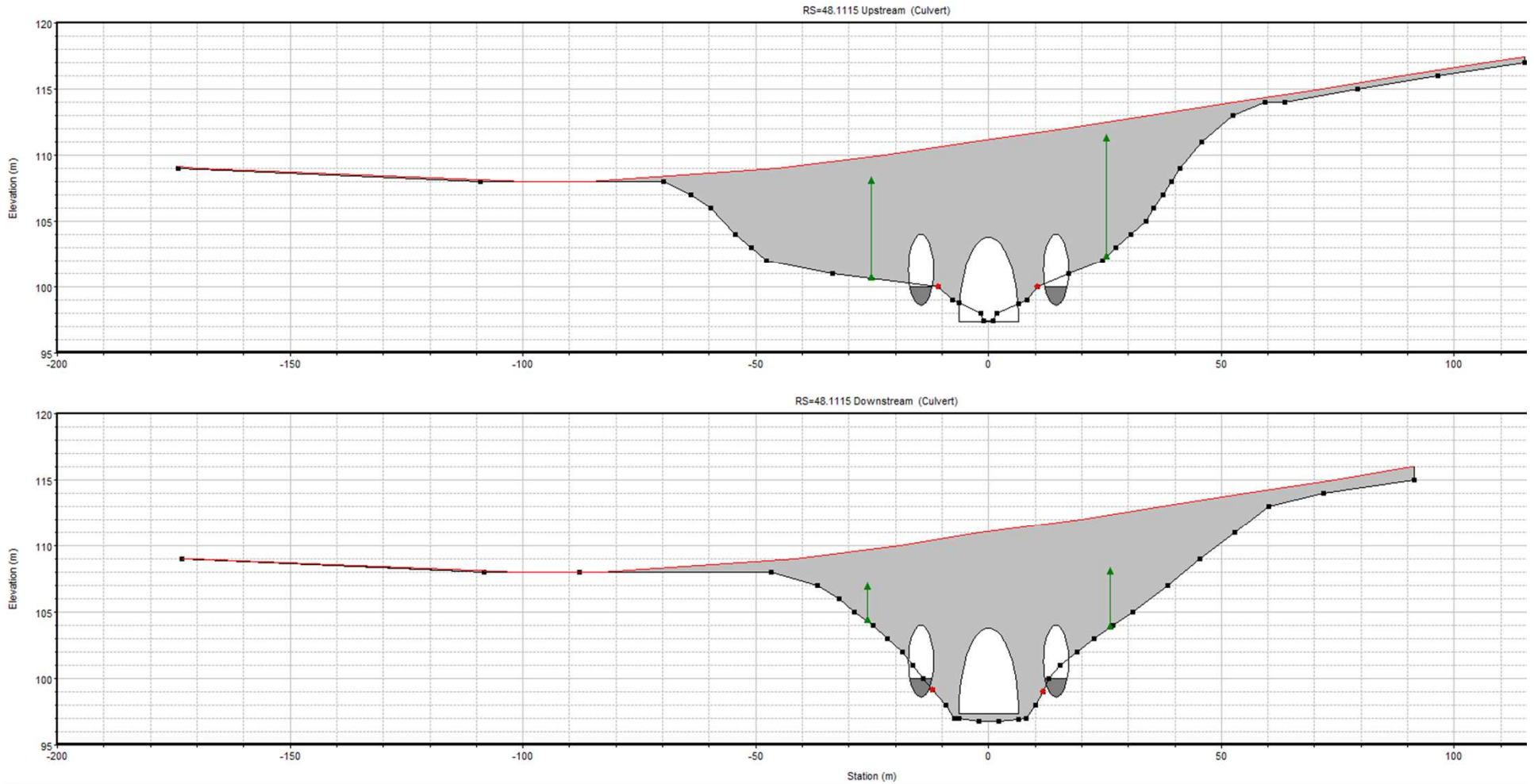
5. Phase 2A Results Discussion (Wood)

Alternative 3: 350 Year Level of Service (72 m Span Bridge) – Would Include a Pier



5. Phase 2A Results Discussion (Wood)

Alternative 4: Relief Culverts (5.4m Inner Diameter)



5. Phase 2A Results Discussion (Wood/DHI)



- Berms
- Existing Condition
- Buildings
- Alternative 1
- Railways
- Alternative 2
- Roads
- Alternative 3
- Contour
- Alternative 4

1:2000 (At Original document size of 11x17)
 Prepared by Yi Wang, approved by Patrick Delaney on 2019-10-16

Client/Project
 Rockcliffe SPA 2D Model and Floodplain Mapping Update
 Toronto Region Conservation Authority
 Figure No.

Title
**FLOOD EXTENTS COMPARISON,
 REGIONAL EVENT**



5. Phase 2A Results Discussion (Wood)

Summary of Buildings Impacted by Flooding and (Benefitting) for Each Alternative

	Reg.	350 Yr	100 Yr	50 Yr	25 Yr	10 Yr	5 Yr	2 Yr
Existing	366	215	113	57	47	33	26	15
Alternative 1 200 m Span Bridge	282 (84)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 2 Lowering Channel	301 (65)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 3 72 m Span Bridge	282 (84)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 4 Relief Culverts	290 (76)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)

*Values shown in parenthesis indicate numbers of properties or buildings benefiting from alternatives, in comparison with the existing scenario.



5. Phase 2A Results Discussion (Wood)

Summary of Findings

1. Flood elevations are reduced by the Alternatives in the order of:
 - Alternative 1: 200 m span bridge
 - Alternative 3: 72 m span bridge
 - Alternative 4: Relief 5.4m diameter culverts
 - Alternative 2: Lower channel invert
2. Upstream of Rockcliffe. Blvd. all alternatives results in same flood elevations up to the 100 year event, with the 350 year and Regional Storm event varying by 0.34m and 1.54 m respectively.
3. Upstream of Alliance Ave. all alternatives results in same flood elevations up to the 350 year event, with the Regional Storm event varying by 1.00m.
4. Black Creek Blvd. Berm for events > 50 year; 2.5 m depth for Reg. Storm
5. Rockcliffe Middle Sch. Berm for Alts. 2 and 4 and Reg. Storm
6. Hilldale Rd. Berm for all alternatives and events; 0.5m to >2 m for 2 year to Reg. Storm



5. Phase 2A Results Discussion (Wood)

Summary of Conceptual Cost Estimates

Jane Street Alternative	Cost (\$)
Alternative 1: 200 m Span Bridge	\$33,358,056
Alternative 2: Lowering Channel	\$5,437,200
Alternative 3: 72 m Span Bridge	\$14,115,744
Alternative 4: Relief Culverts	\$14,082,900



5. Phase 2A Results Discussion (Wood)

Summary of Class EA Process Requirements

1. Flood berms require MCEA Schedule 'B' or COEA equivalent
2. Channel widening requires MCEA Schedule 'B' or COEA equivalent
3. Lowering channel invert requires MCEA Schedule 'A' or COEA equivalent. (Dependent on no cultural heritage value classification)
4. Relief culverts and bridge alternatives require MCEA Schedule 'C' or COEA equivalent



6. Jane Street Level of Service Assessment (Wood/DHI)

6. Jane Street Level of Service Assessment

Introduction

- Following the Phase 2A Meeting, it was decided in consultation with TRCA that further hydraulic assessment of the Jane Street alternatives without the hydrologic and hydraulic influence of upstream structures (Rockcliffe Blvd., Alliance Ave., and Humber Blvd.) should be conducted to determine a preferred Jane Street alternative.



6. Jane Street Level of Service Assessment

Introduction



6. Jane Street Level of Service Assessment

Introduction



6. Jane Street Level of Service Assessment

Hydraulic Assessment

- Switch to DHI Slides



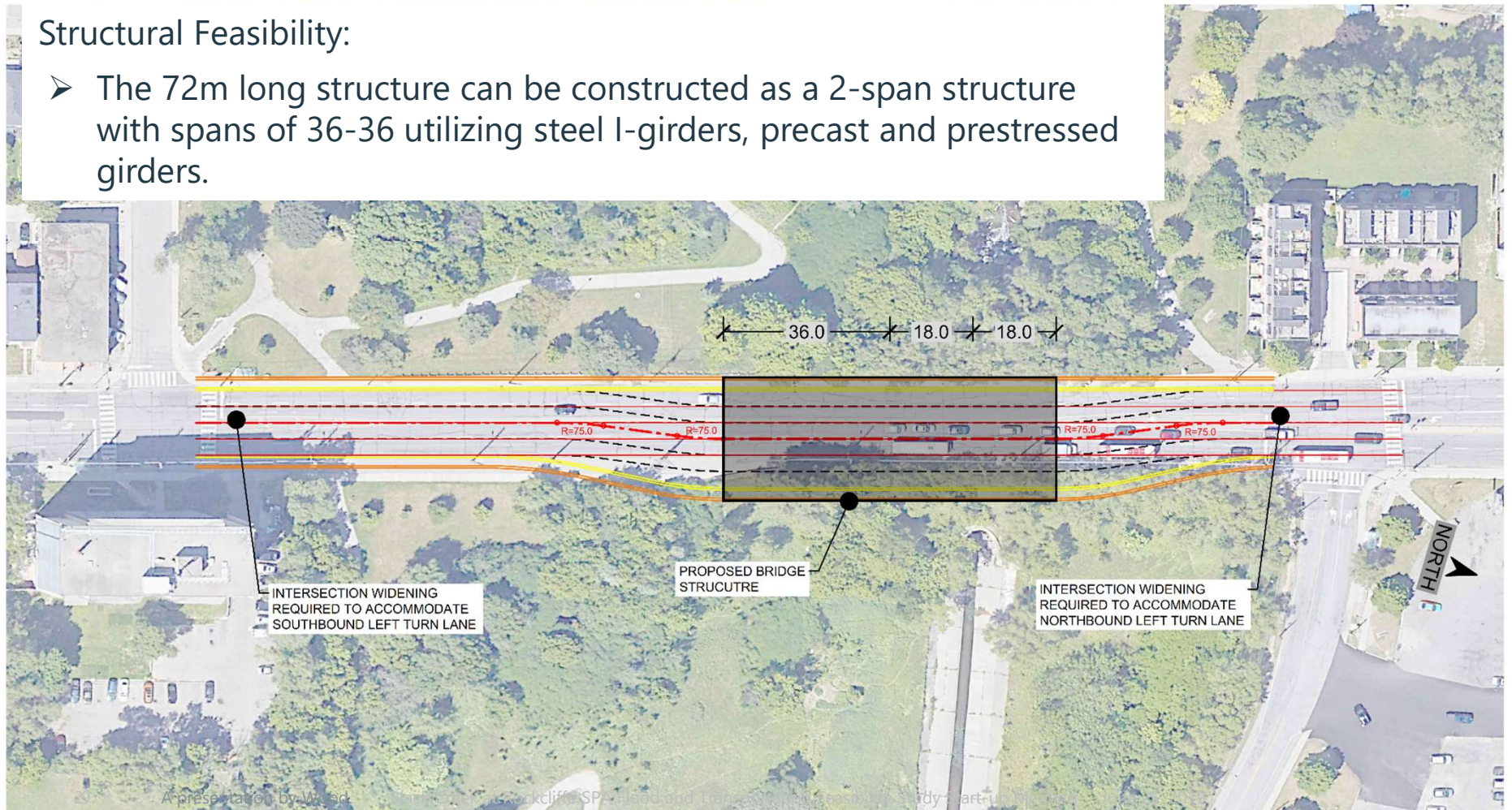
6. Jane Street Level of Service Assessment

Implementation Considerations: 6 Lane Bridge - 72 m Span

JANE STREET - OPTION - 72m BRIDGE

Structural Feasibility:

- The 72m long structure can be constructed as a 2-span structure with spans of 36-36 utilizing steel I-girders, precast and prestressed girders.



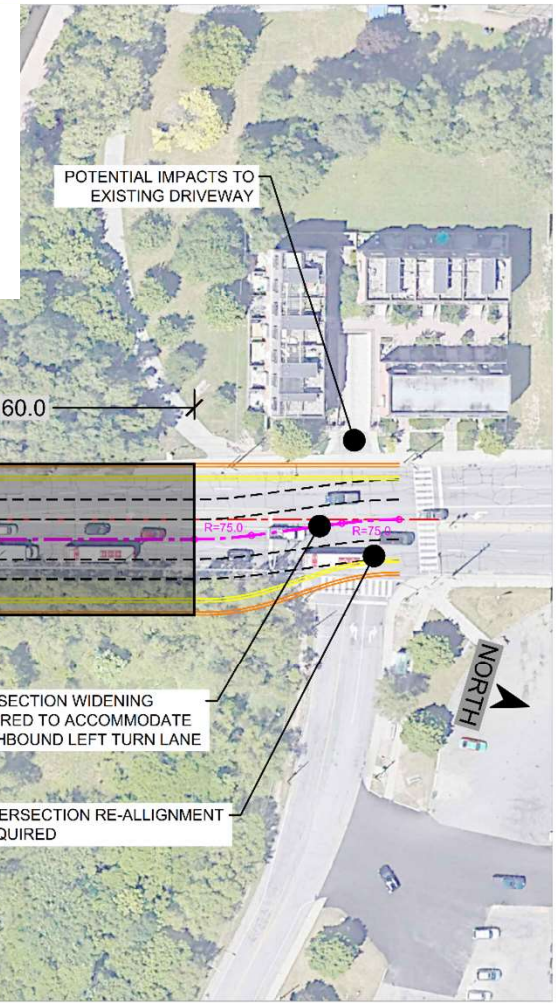
6. Jane Street Level of Service Assessment

Implementation Considerations: 6 Lane Bridge – 200 m Span

JANE STREET - OPTION - 200m BRIDGE

Structural Feasibility:

- The 200 m long structure can be constructed as a 3-span structure with spans of 60-80-60 utilizing haunched steel I-girders. It can also be constructed as a 4-span structure with spans of 45-55-55-45 meters and prismatic steel I-girders.



6. Jane Street Level of Service Assessment

Implementation Considerations: 4 Lane Bridge Staging

This bridge will be constructed in two stages (East side and West side). Note that only one lane in each direction and one sidewalk will always be active until completion.

- Drive sheet piles for roadway protection during night time/weekend (three lanes closed);
- Shift traffic onto two adjacent lanes (one lane for each direction);
- Excavate earth and strengthen roadway protection as required;
- Construct new bridge substructure on the East side;
- Shift traffic to new bridge superstructure on the East side (one lane for each direction);
- Excavate earth and strengthen roadway protection as required;
- Construct new bridge substructure on the West side; and
- Excavate earth and remove existing culvert if not removed earlier.



6. Jane Street Level of Service Assessment

Implementation Considerations: 6 Lane Bridge – 2 Stage Option

This bridge will be constructed in two stages (East side and West side). Note that with this option, the intent is always to maintain one lane of traffic in each direction and one sidewalk. **This option would be significantly cheaper than a three-stage option.**

- Drive piles for roadway protection during night time/weekend (three lanes closed);
- Close down two lanes and shift traffic to remaining two lanes;
- Excavate earth and remove existing culvert if required;
- Construct new bridge substructure on the East side;
- Shift northbound traffic to new East bridge segment;
- Excavate earth and remove existing culvert if required;
- Construct new bridge substructure along the West; and
- Excavate earth and remove existing culvert if not removed earlier.



6. Jane Street Level of Service Assessment

Implementation Considerations: 6 Lane Bridge – 3 Stage Option

This bridge will be constructed in 3 stages (east side, centre, and west side). Note that with this option, the intent is always to maintain 2 lanes of traffic in each direction and one sidewalk. **As such, the staging would be very comprehensive and could cost up to \$3,000,000 for the 72m bridge and 2-3 times that for the 200m bridge. (\$1,500,000 +/- assumed for 2 stage option)**

- Drive sheet piles for roadway protection during night/weekend (3 lanes closed);
- Install temporary shoring on the East side as required;
- Excavate earth to construct new bridge substructure on the East side if required;
- Construct new bridge substructure on the East side;
- Shift northbound traffic to new East bridge segment and maintain southbound traffic on 2 westernmost lanes;
- Excavate earth and remove existing culvert if required;
- Construct bridge substructure along the centre;



6. Jane Street Level of Service Assessment

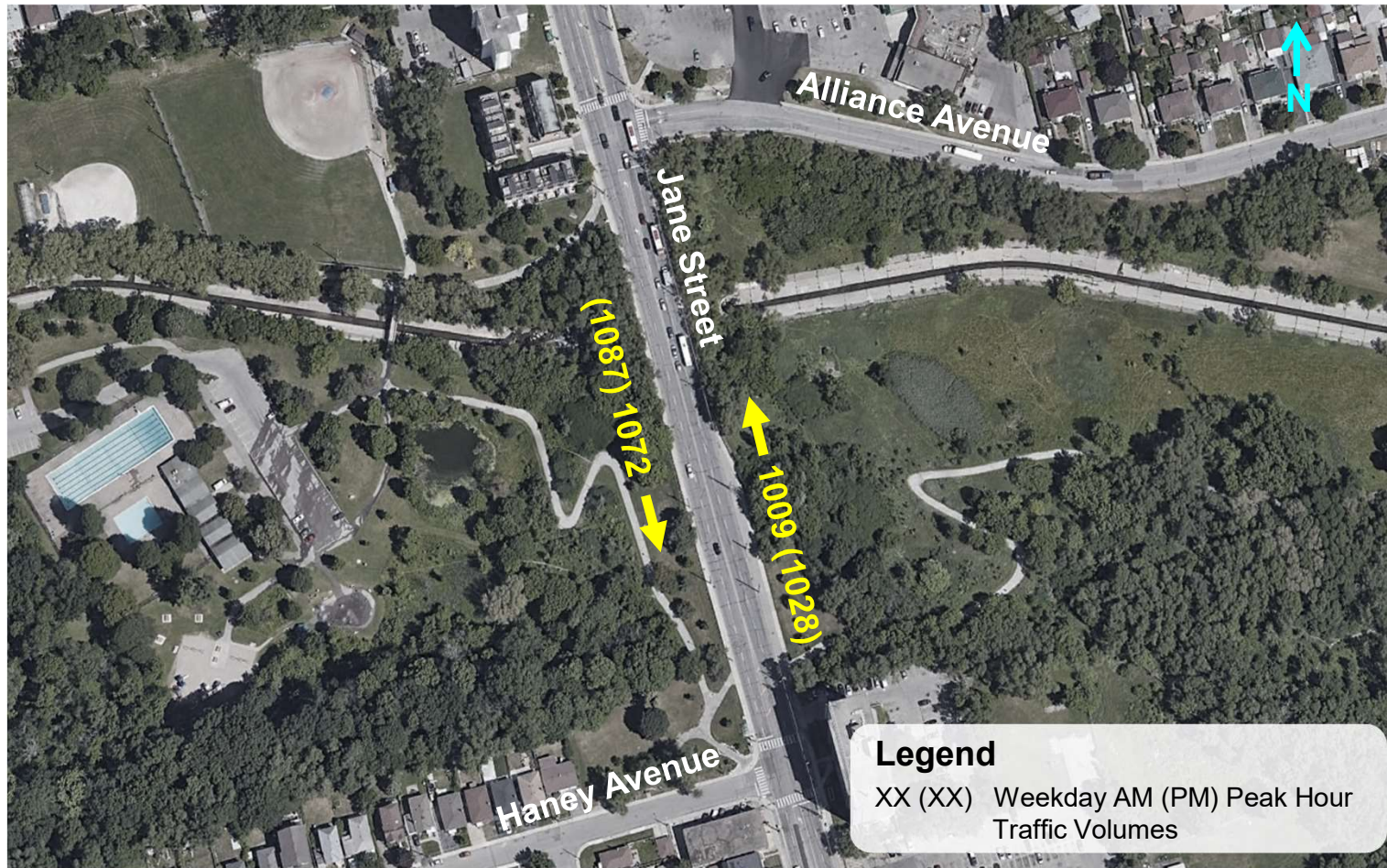
Implementation Considerations: 6 Lane Bridge – 3 Stage Option Continued

- Shift southbound traffic to new centre bridge segment and maintain northbound traffic on new East bridge segment;
- Excavate earth and remove existing culvert if required;
- Construct new bridge substructure along the West; and
- Excavate earth and remove existing culvert if not removed earlier.



6. Jane Street Level of Service Assessment

Implementation Considerations: Staging Traffic Considerations



6. Jane Street Level of Service Assessment

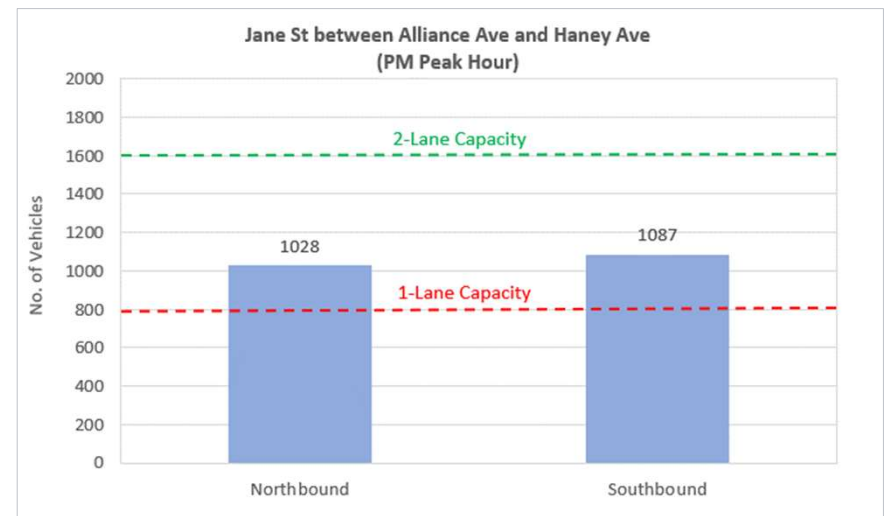
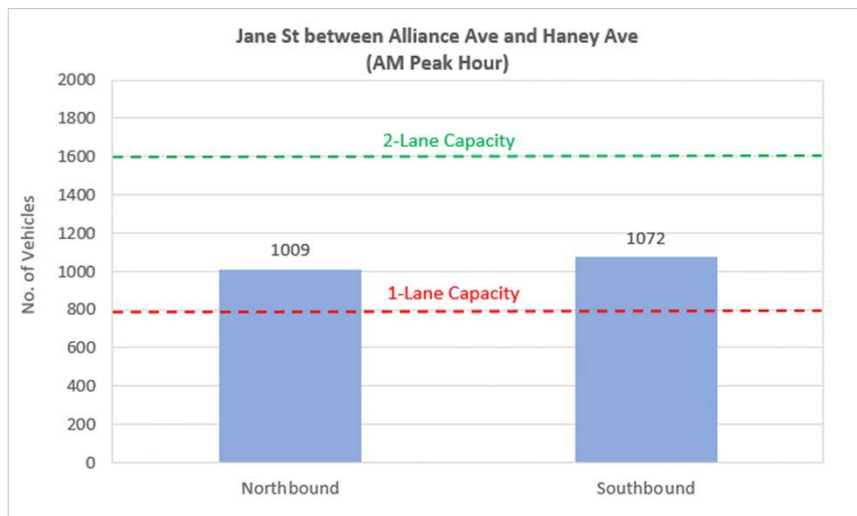
Implementation Considerations: Staging Traffic Considerations

Proposed Alternatives	Construction Method / Staging Options	Impact to Traffic?
Four-lane Bridge	<ul style="list-style-type: none"> - Construct bridge in two stages - Close 1 lane per direction during construction 	Yes
Six-lane Bridge	<ul style="list-style-type: none"> - Construct bridge in three stages - Maintain existing two lanes per direction during construction 	No
	<ul style="list-style-type: none"> - Construct bridge in two stages - Close 1 lane per direction during construction 	Yes
Supplemental culverts on either side of the existing culverts	<ul style="list-style-type: none"> - Tunneling - Nightly lane closure for soil injection 	No
Lowering channel invert in culvert	<ul style="list-style-type: none"> - Completed through culvert 	No



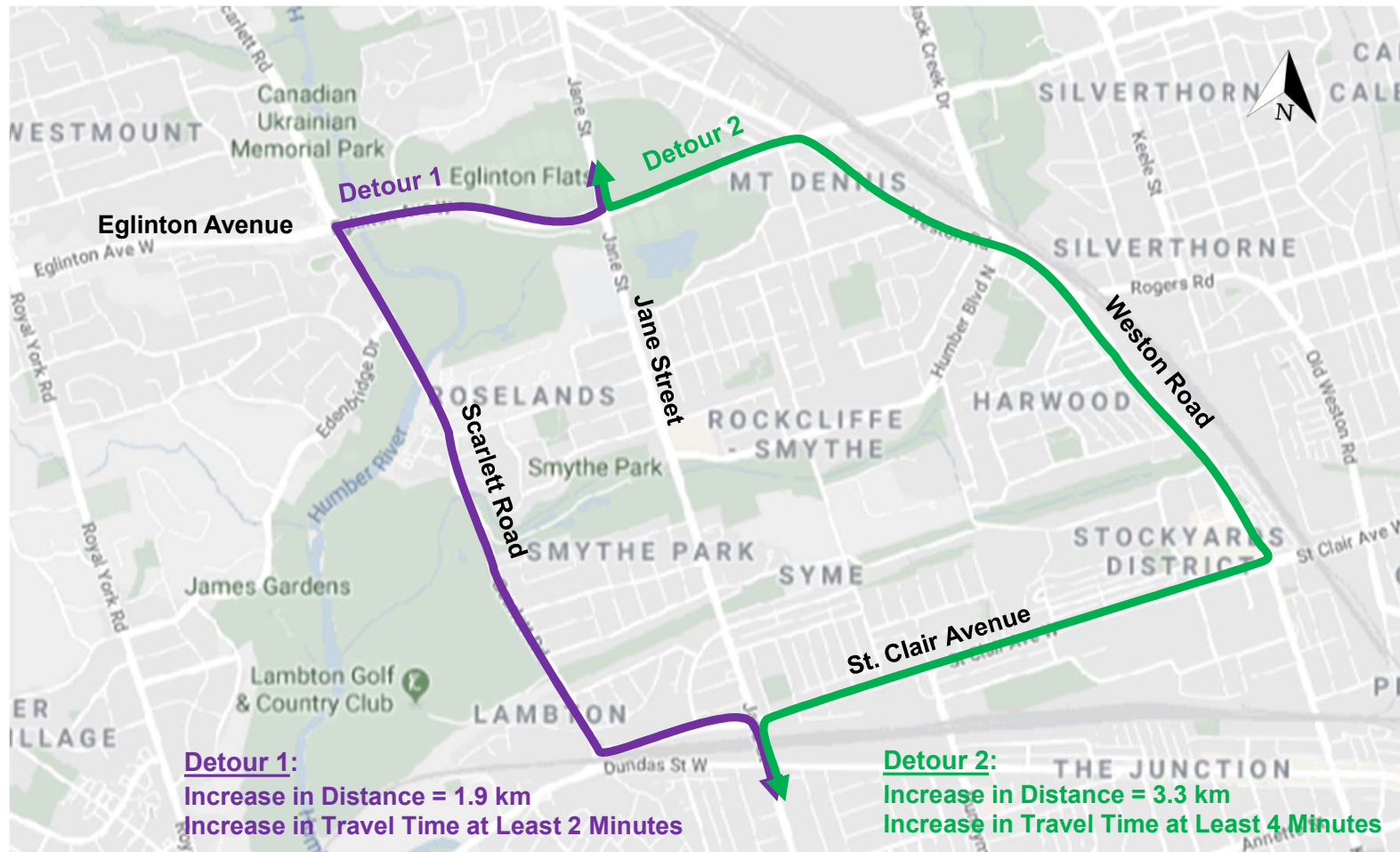
6. Jane Street Level of Service Assessment

Implementation Considerations: Staging Traffic Considerations



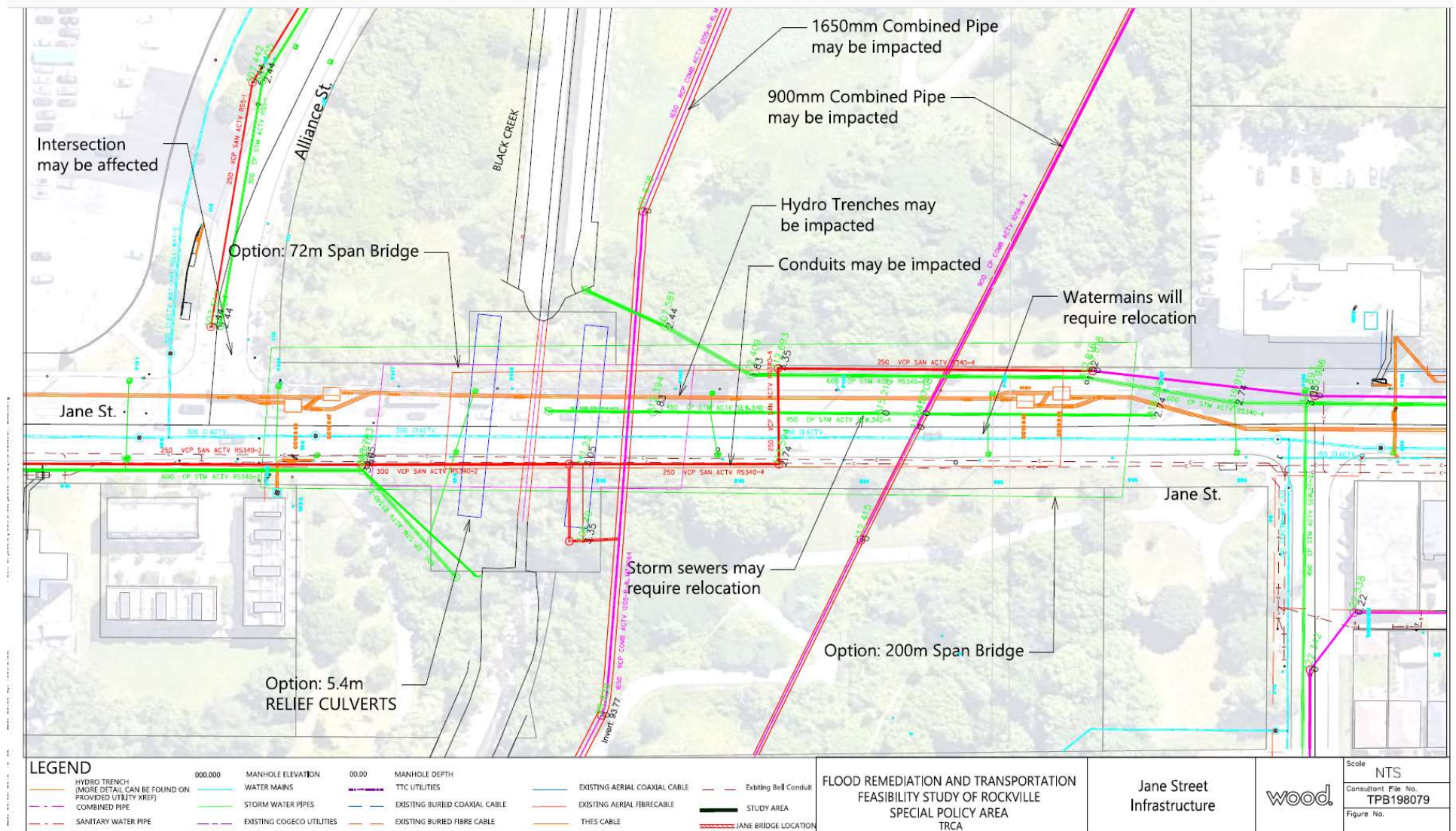
6. Jane Street Level of Service Assessment

Implementation Considerations: Staging Traffic Considerations



6. Jane Street Level of Service Assessment

Implementation Considerations: Infrastructure



6. Jane Street Level of Service Assessment

Implementation Considerations: Infrastructure

Municipal Infrastructure and Utilities:

- Storm sewers to be reconfigured to abutments
- Watermain would have to be strung to the bridge
- Combined sewers are below valley floor
- Sanitary sewers to be lowered outside of valley (to be below valley floor)
- Utilities either strung to bridge or on poles



7. Phase 2B Lavender Creek Assessment Update (Wood/DHI)

7. Phase 2B Lavender Creek Assessment Update

Summary of Alternative Scenarios

- Six (6) Scenarios to be assessed as per the Work Plan
- **Scenario 1:** Lavender Creek Flow Conveyance Improvements:
 - Jane Street – preferred alternative
 - Rockcliffe Road upgraded to 52 m+/- (need to confirm span). Channel widening upstream of Rockcliffe Blvd to Alliance Avenue as per Phase 2A
 - Symes Road Crossing Upgrade to 12 m span by 2 m+ rise
 - Eliminate upstream private crossing – it is not being used
 - Downstream private crossing to 15 m span by 3.25 m rise
 - Widen channel from Symes Road to Black Creek: 15m wide concrete rectangular channel – rise would vary depending on adjacent grades



7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations

- **Scenario 2:** As per Scenario 1 but with Symes Road crossing eliminated – we would have to assess transportation for this.
- **Scenario 3:** As per Scenario 2 but with the 2nd private crossing eliminated
- **Scenario 4:** Realign Lavender Creek
 - Jane Street – preferred alternative
 - Rockcliffe Road upgraded to 52 m+/- (need to confirm span). Channel widening upstream of Rockcliffe Blvd to Alliance Avenue as per Phase 2A
 - Realign Lavender Creek downstream of Symes Road to Black Creek – through properties north and east of Rockcliffe Court
- **Scenario 5:** As per Scenario 4 but with the Symes Road crossing eliminated
- **Scenario 6:** One of Scenarios 1-5 selected with flood protection berm/ wall in place



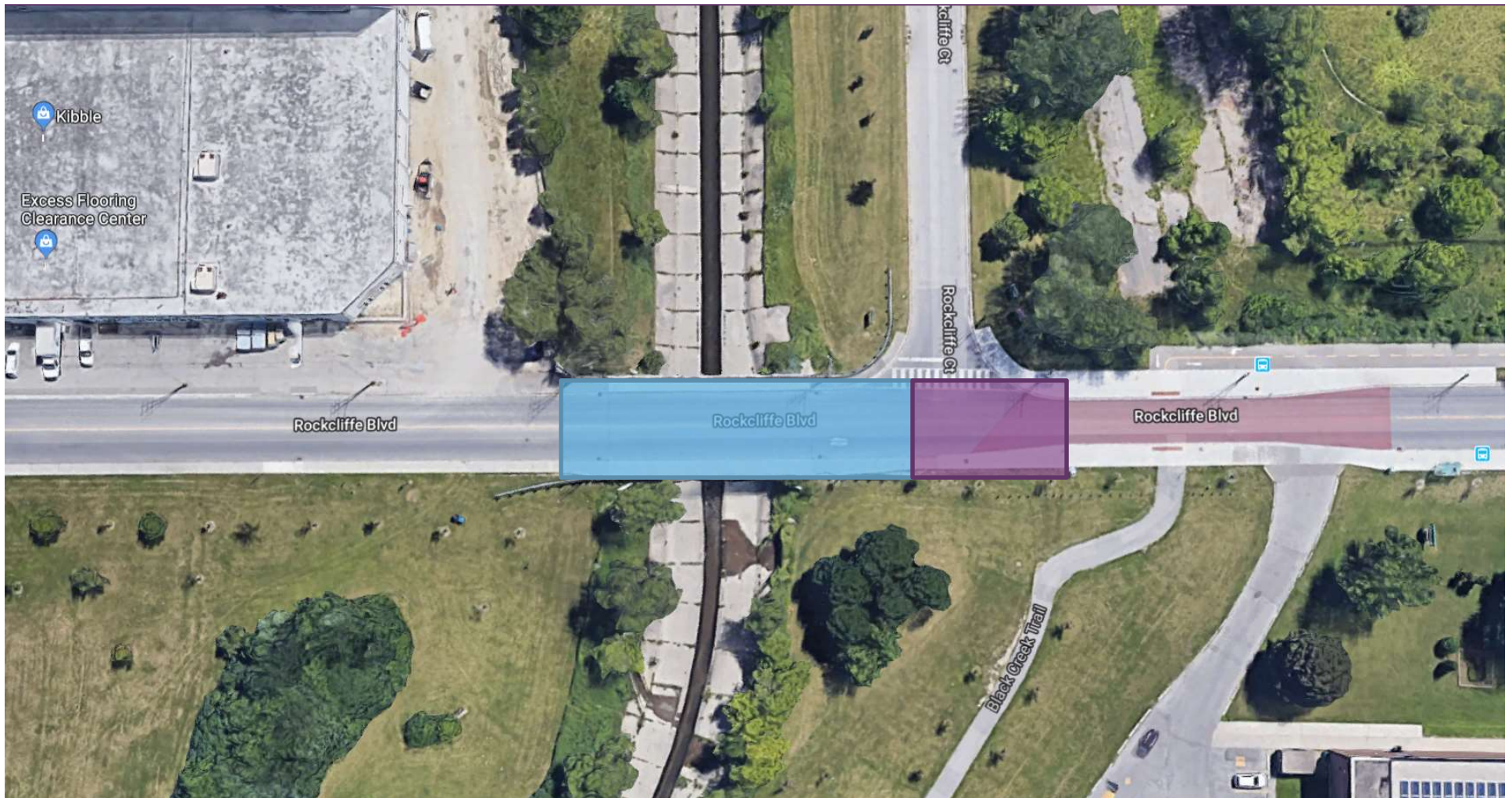
7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Rockcliffe Blvd Crossing



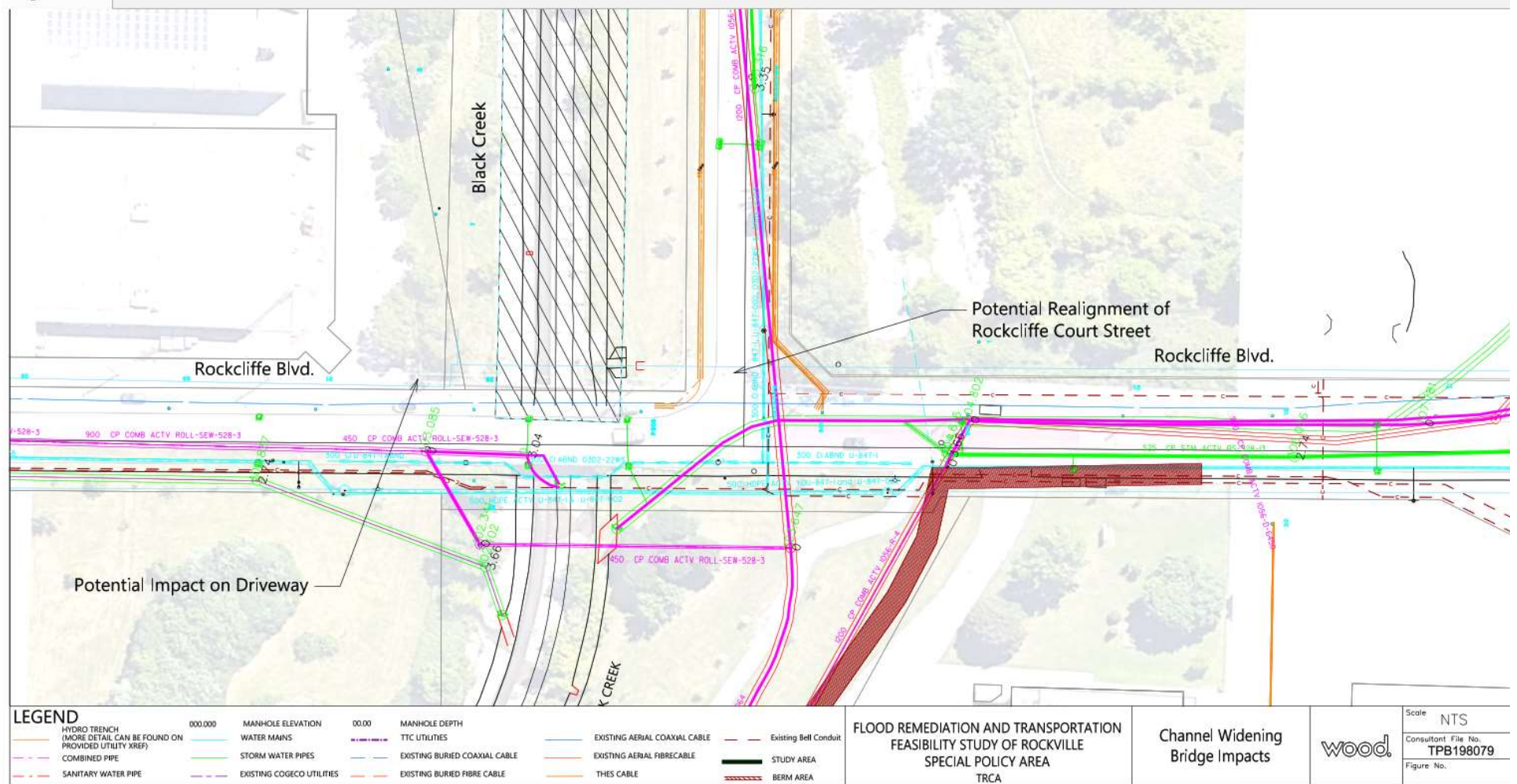
7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Rockcliffe Blvd Crossing



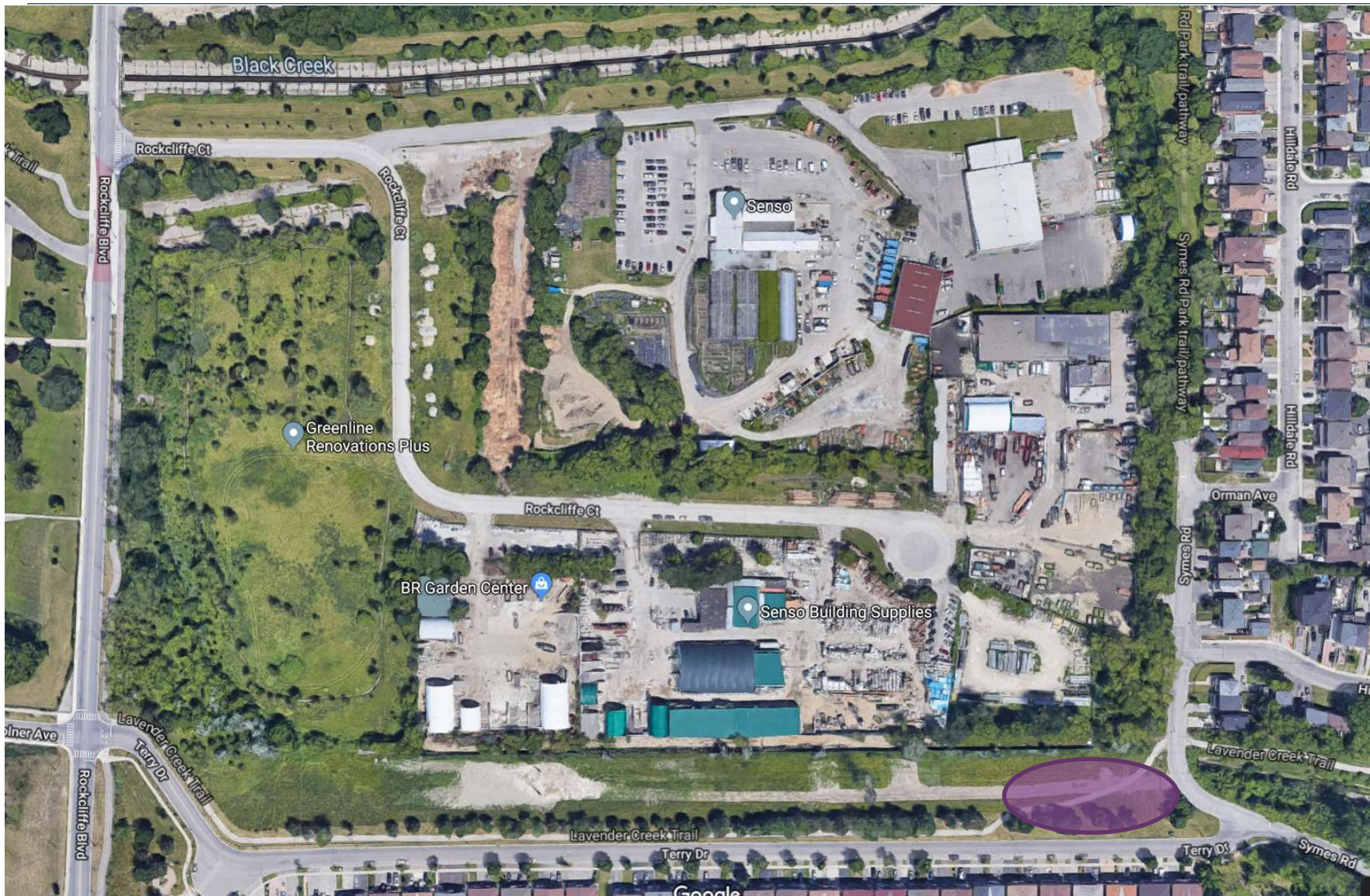
7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Rockcliffe Blvd Crossing



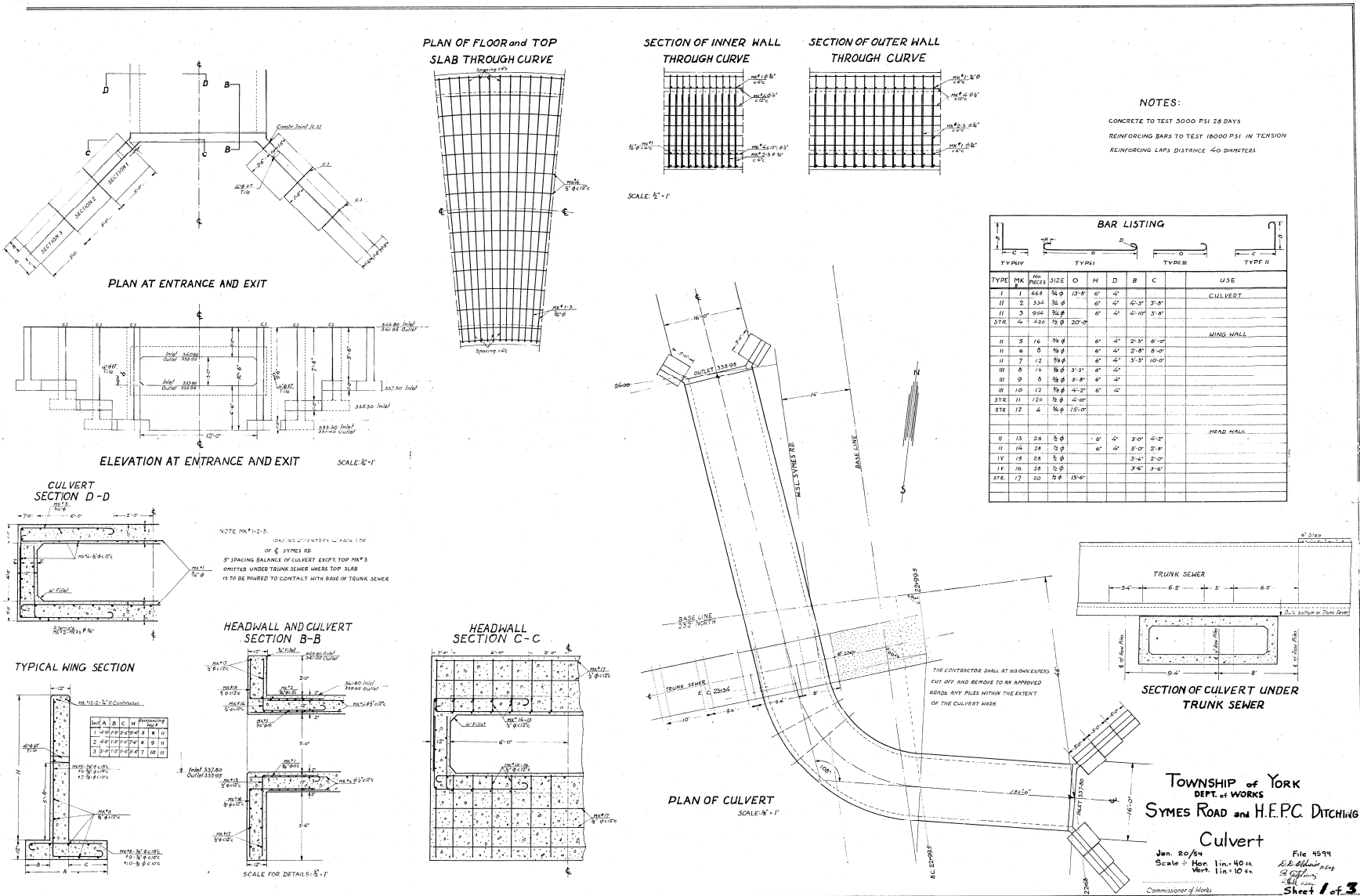
7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Realign Lavender Creek (Route?)



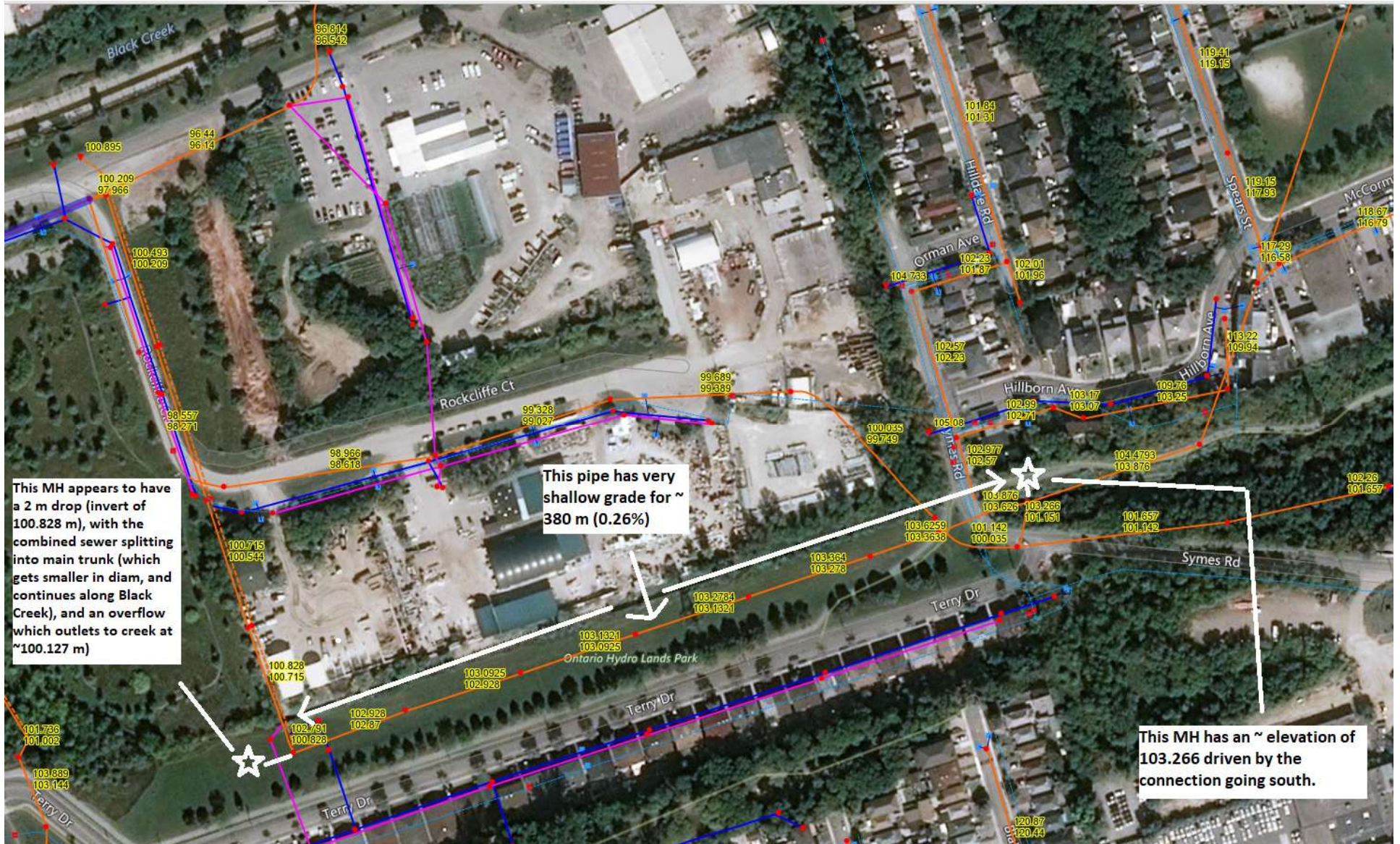
7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Symes Road Crossing



7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Symes Road Crossing



7. Phase 2B Lavender Creek Assessment Update

Phase 2A Alternatives Assessment Considerations – Symes Road Crossing

- Culvert Crossing 3.6 m by 0.9 m
- Culvert crossing inv. 102.96 m, bottom conc. 102.83 m
- Road at 106.1 m +/-
- Combined trunk sewer 2.6 m by 2.3 m sits on culvert, inv. 103.88 m +/- at 0.26 % slope;
- 1200 mm sanitary crosses under trunk sewer at invert 100.04 m
- Need combined sewer invert upstream of Symes Road at 97.00 m +/-
- Need a drop of the combined trunk sewer by 6.88 m + (assuming same size pipe)
- Connection to 1650 mm combined at 95.89 m at bend at Rockcliffe Court
- 680 m pipe lowered and partial relocation; average slope 0.16%
- Can reconfigure pipe size to improve slope. Need to consider overflow



8. Next Steps (Wood)

8. Next Steps (Wood)

1. Select Preferred Jane Street Alternative
2. Commence Phase 2B – Assessment of Lavender Creek and Hilldale Road Area (need City input on Symes Road closure)
3. Finalize Phase 2A Report



9. Project Schedule (Wood)

9. Project Schedule (Wood)

- Open Schedule



10. Other Business (All)

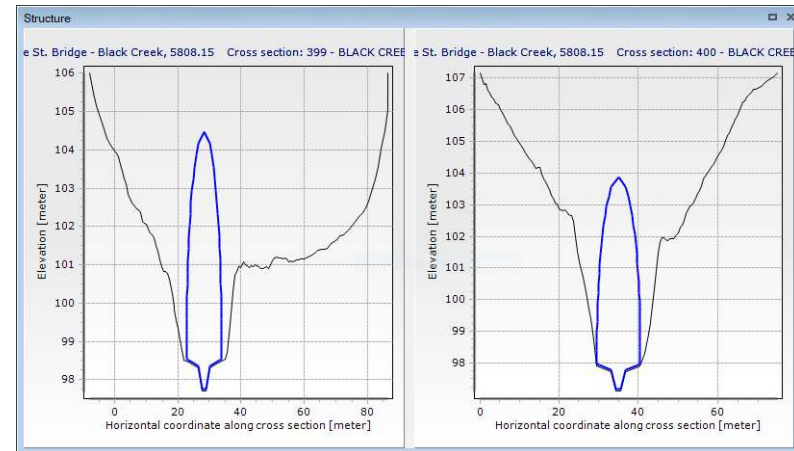
Discussion

Rockcliffe Model Update

- Update to existing model
 - Channel widening, Berms
 - Removed structures at Humber Blvd, Alliance Ave, and Rockcliffe Blvd
- Alternatives:
 - Alt 1: 200 m span new bridge
 - Alt 2: lower the culvert bottom
 - Alt 3: 72 m span new bridge
 - Alt 4: additional relief culverts

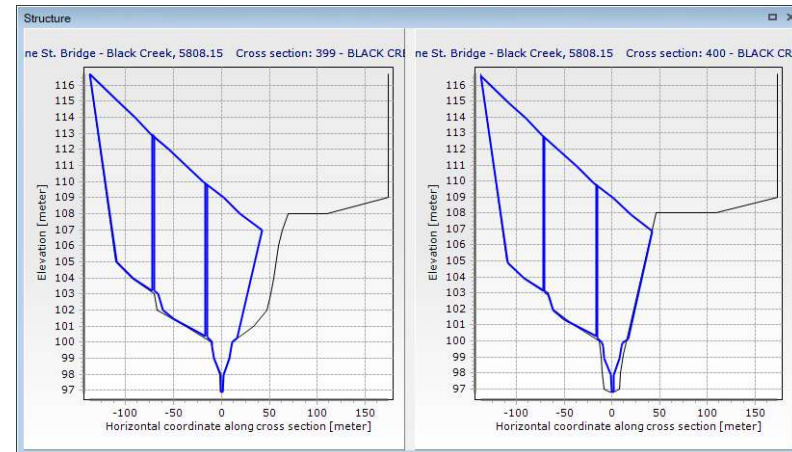
Jane St. Culvert (Existing)

Upstream invert:	<input type="text" value="97.76"/>
Downstream invert:	<input type="text" value="97.17"/>
Length:	<input type="text" value="45"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



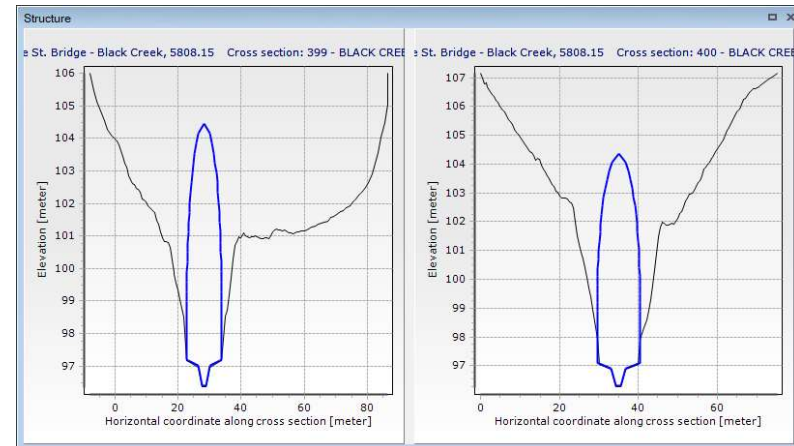
Jane St. Culvert (Alt 1)

Upstream invert:	<input type="text" value="96.9"/>
Downstream invert:	<input type="text" value="96.8"/>
Length:	<input type="text" value="45"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



Jane St. Culvert (Alt 2)

Upstream invert:	<input type="text" value="96.4"/>
Downstream invert:	<input type="text" value="96.3"/>
Length:	<input type="text" value="45"/>
No. of culverts:	<input type="text" value="1"/>
Section type:	<input type="text" value="Closed"/>



Jane St. Culvert (Alt 3)

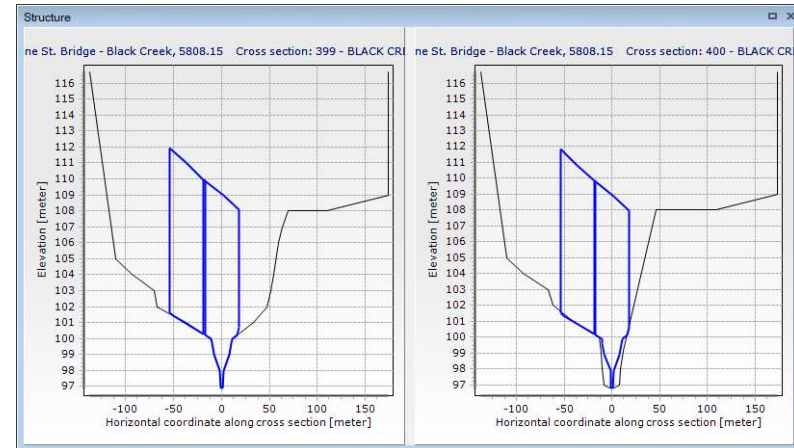
Upstream invert:

Downstream invert:

Length:

No. of culverts:

Section type:



Jane St. Culvert (Alt 4)

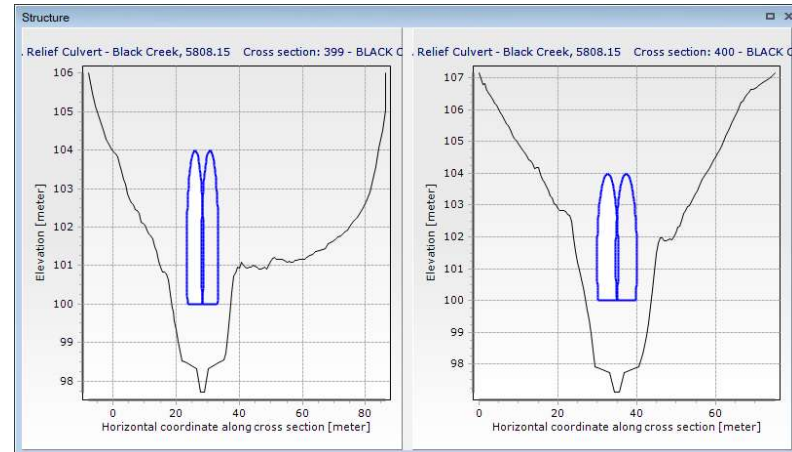
Upstream invert:

Downstream invert:

Length:

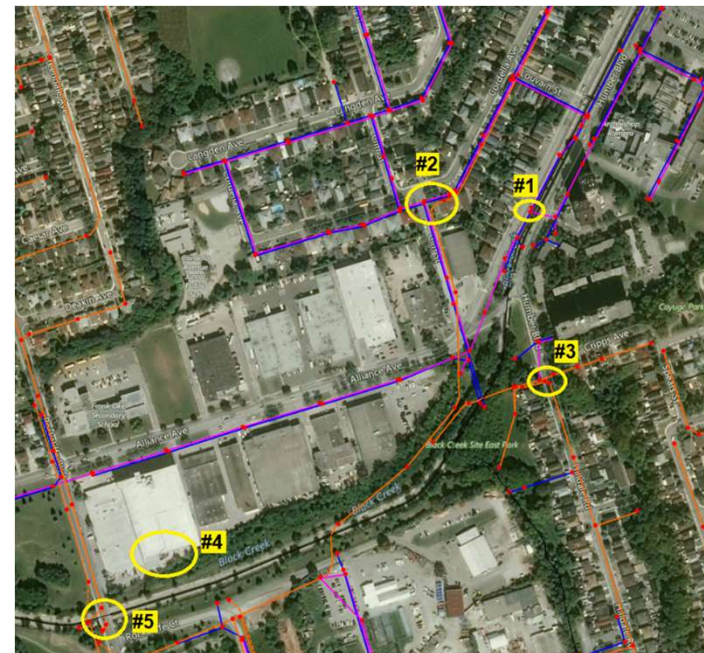
No. of culverts:

Section type:



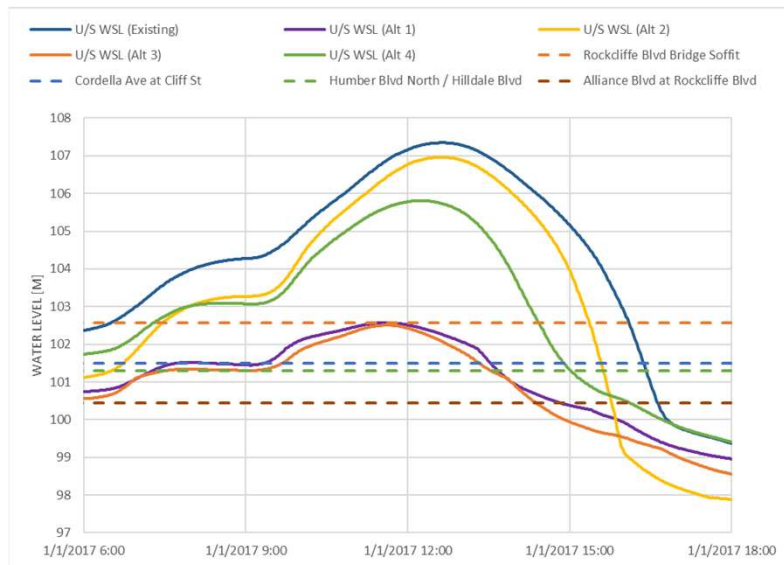
Results comparison – 1D Water Surface Elevation

1. Humber Blvd North: max WSE of 101.30 m (Black Creek)
2. Cordella Ave at Cliff St: max WSE of 101.50 m (Black Creek)
3. Hilldale Blvd: max WSE of 101.30 m (Lavendar)
4. Alliance Blvd at Rockcliffe Blvd: Basement driveway elevation of 100.45 m
5. Rockcliffe Blvd bridge soffit 102.57 m

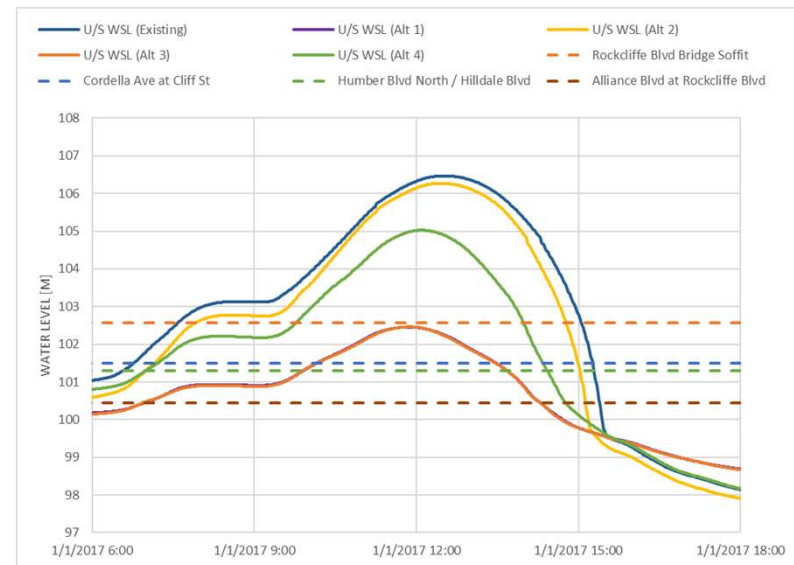


Results comparison – regional event – Jane St

Latest model (r13)

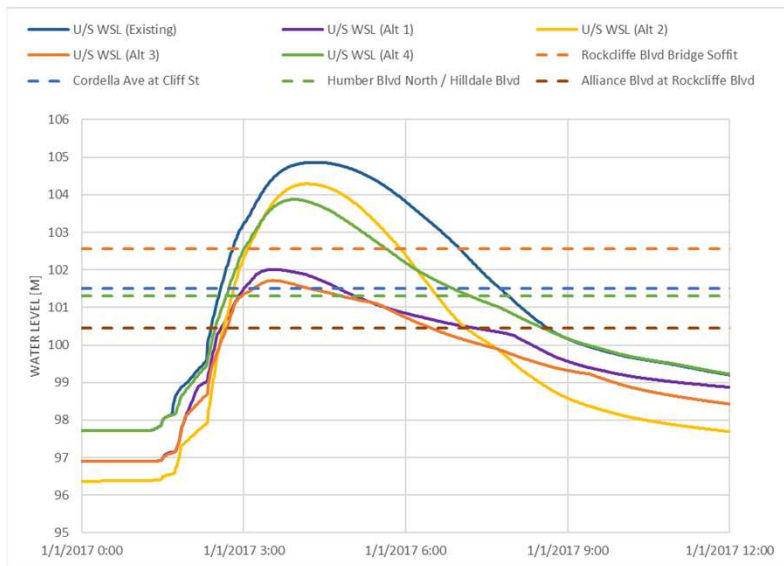


Last model (r11)

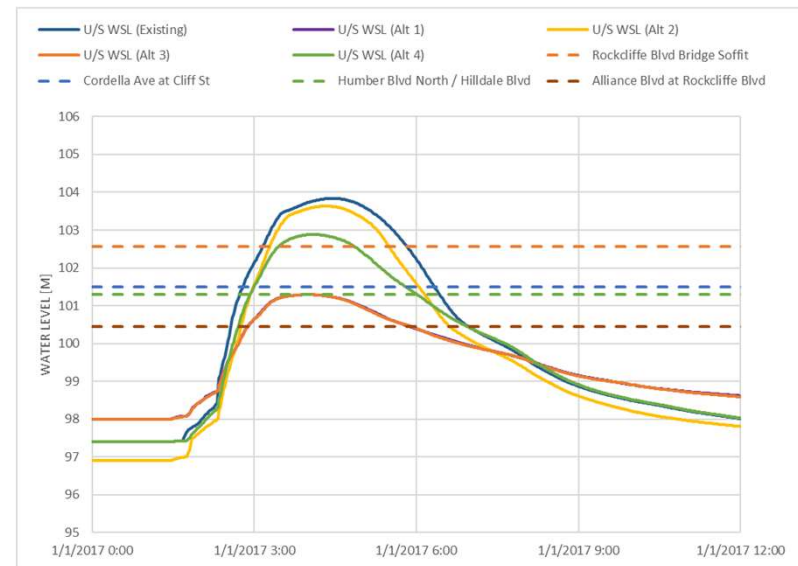


Results comparison – 350Yr – Jane St

Latest model (r13)

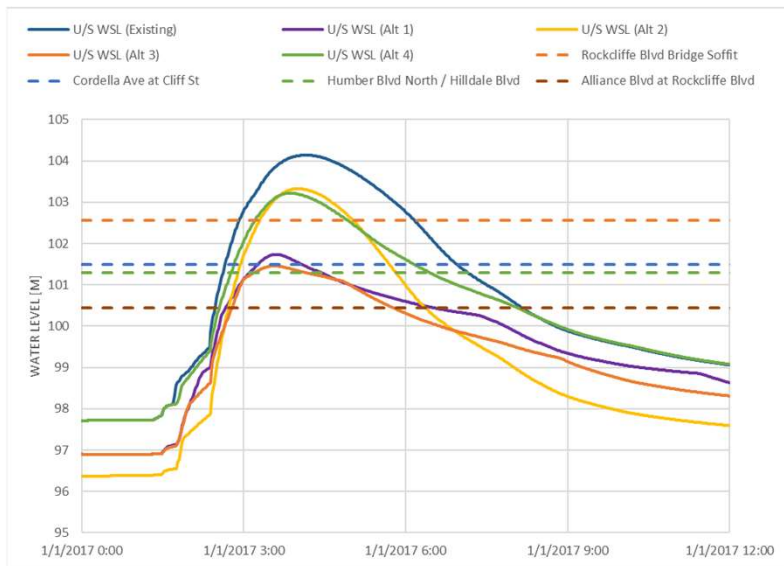


Last model (r11)

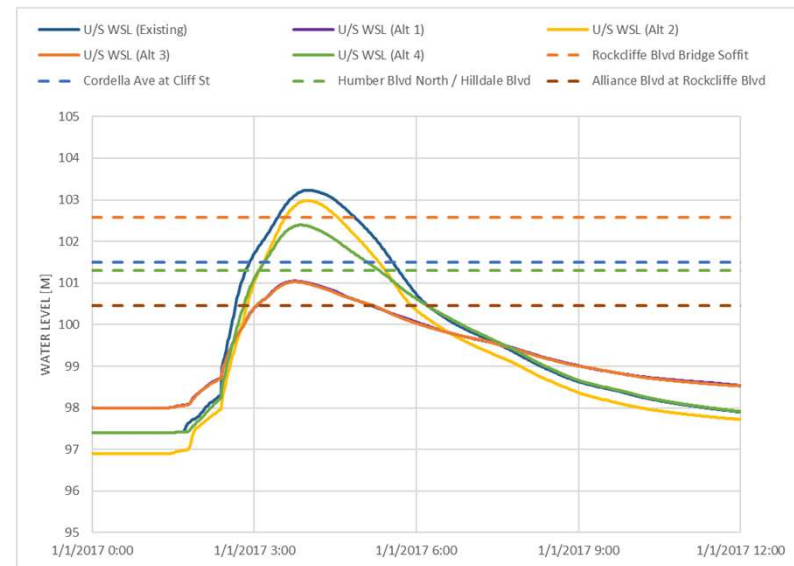


Results comparison – 100Yr – Jane St

Latest model (r13)

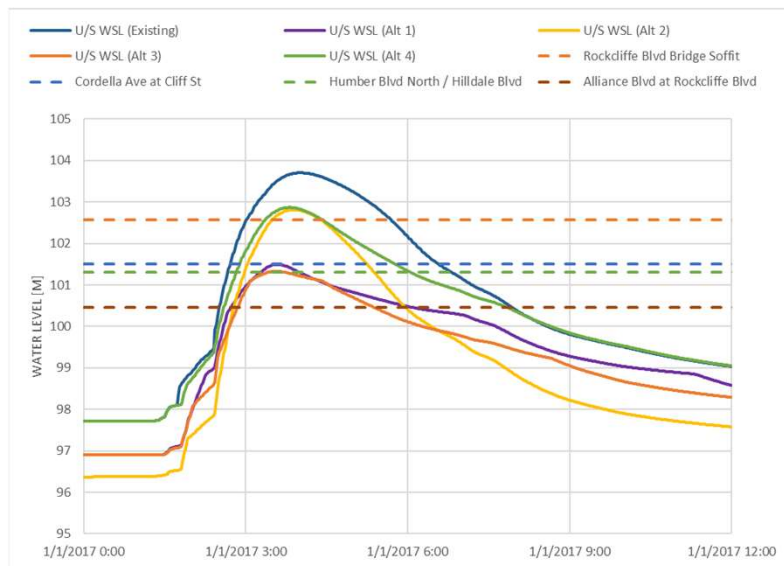


Last model (r11)

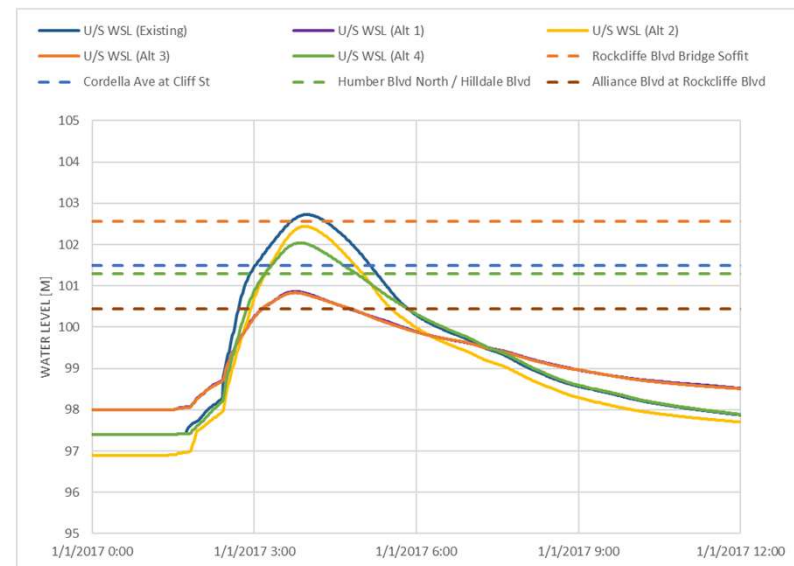


Results comparison – 50Yr – Jane St

Latest model (r13)

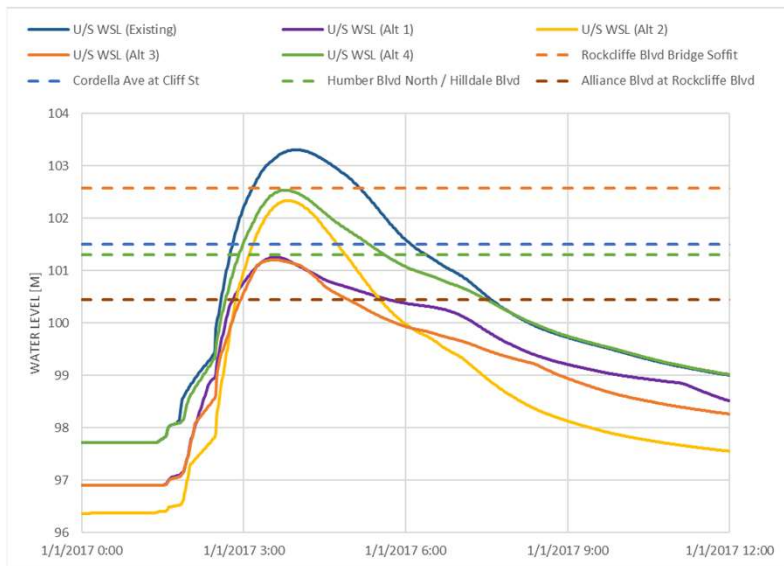


Last model (r11)

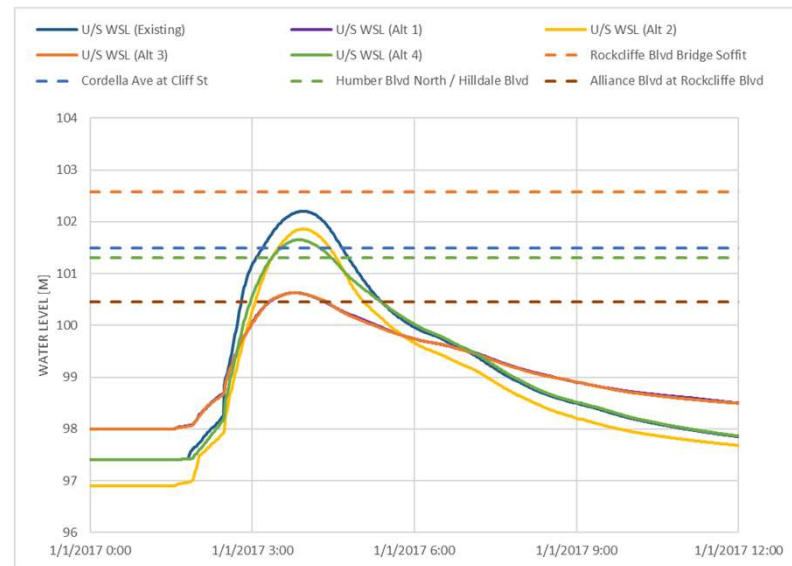


Results comparison – 25Yr – Jane St

Latest model (r13)

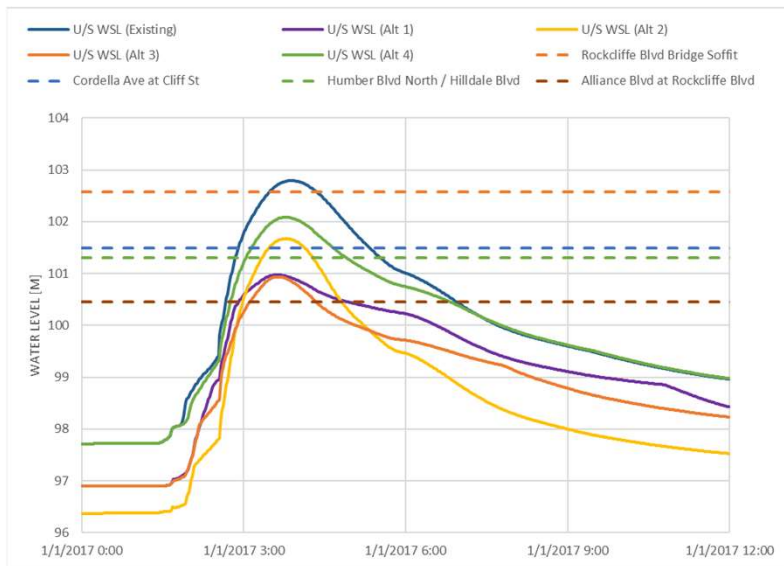


Last model (r11)

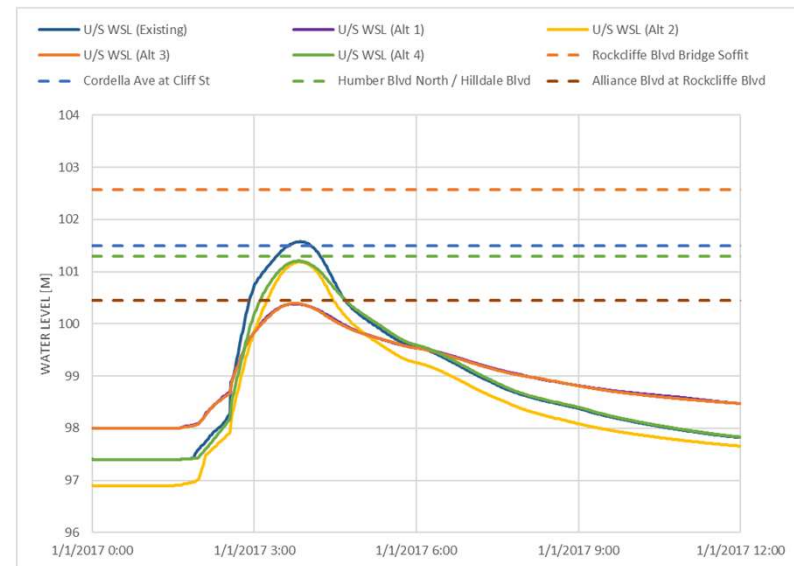


Results comparison – 10Yr – Jane St

Latest model (r13)

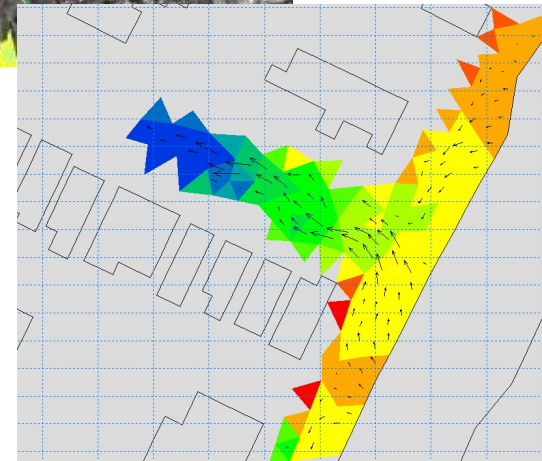
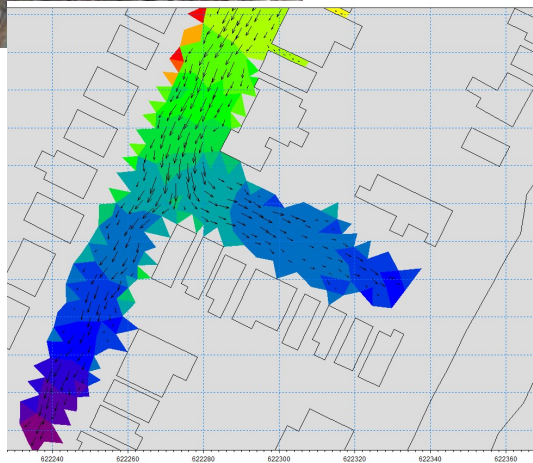


Last model (r11)



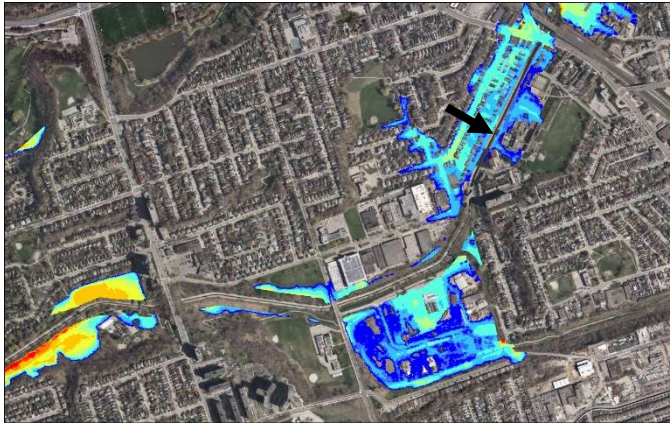
Results Comparison – 2D Max Depth

Black arrow indicates flow direction on Louvain St when it's first flooded

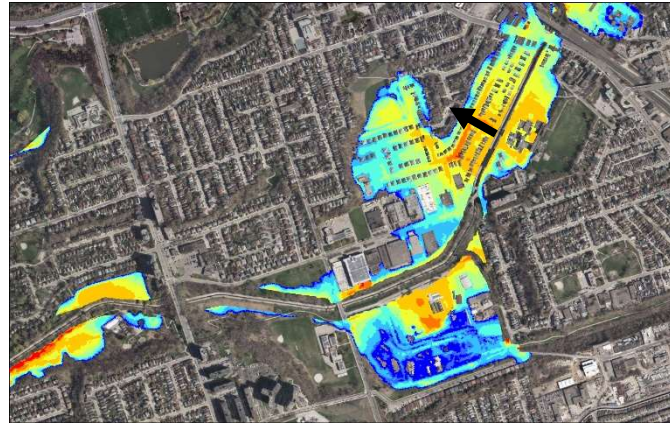


Results Comparison – Regional Event, Max Depth

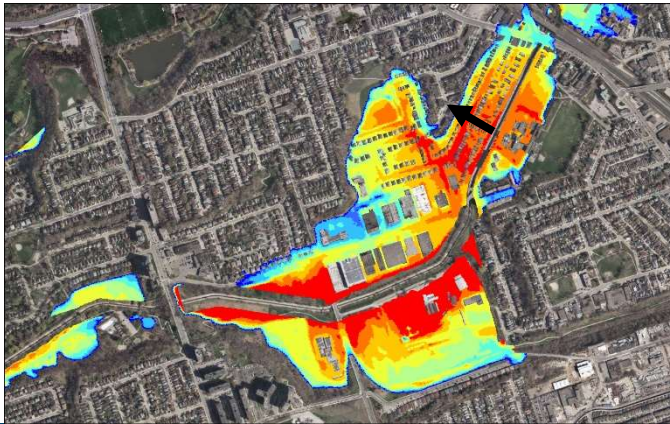
Alt 1



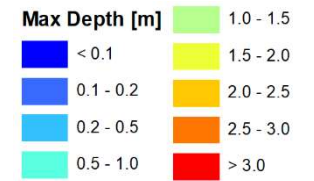
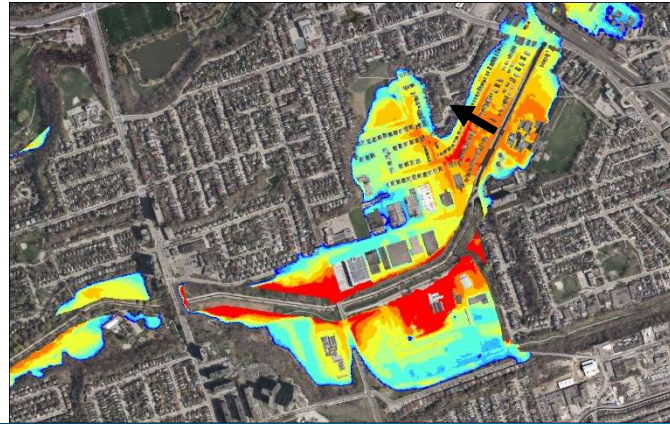
Alt 1



Alt 2



Alt 2

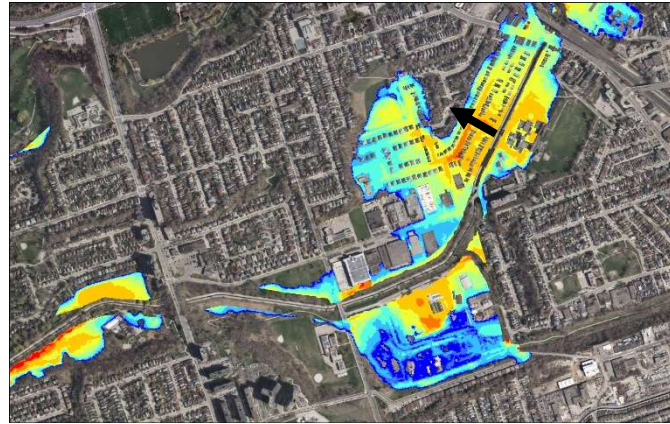


Results Comparison – Regional Event, Max Depth

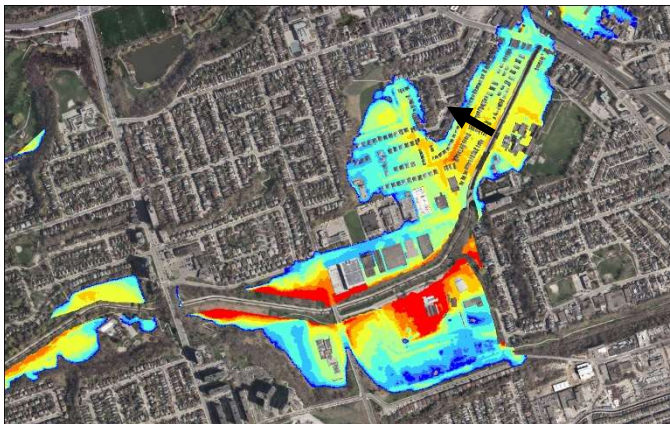
Alt 3



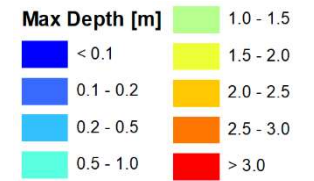
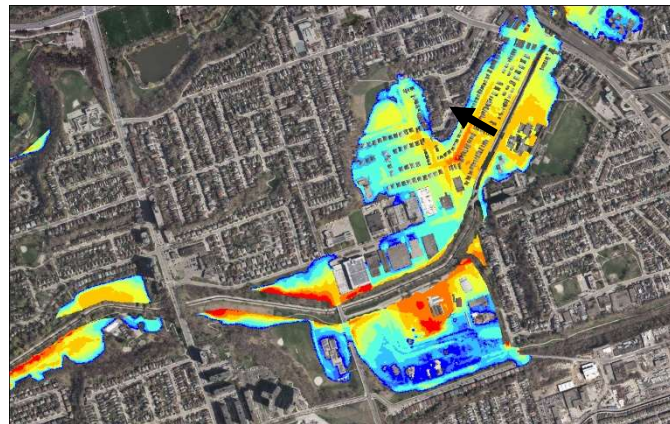
Alt 3



Alt 4

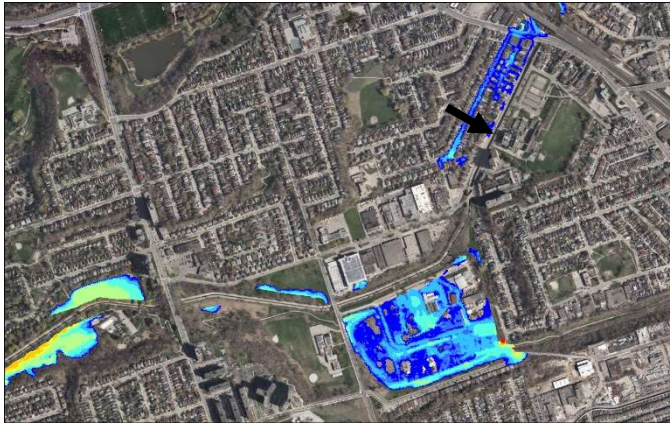


Alt 4



Results Comparison – 350Yr Event, Max Depth

Alt 1



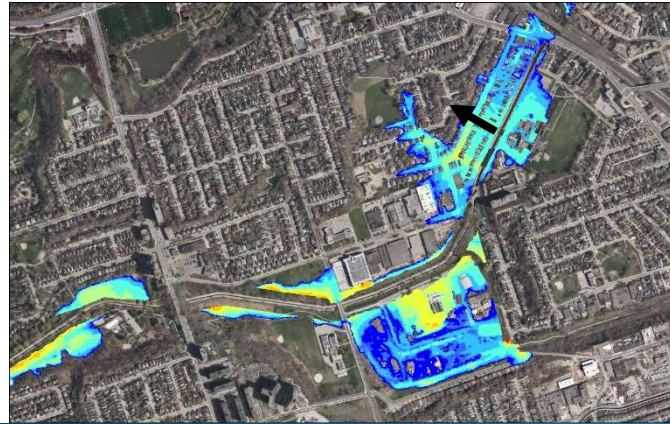
Alt 1



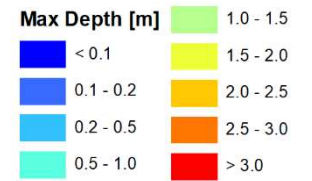
Alt 2



Alt 2



Add an arrow to show how humber blvd flood is connected to channel



Results Comparison – 350Yr Event, Max Depth

Alt 3



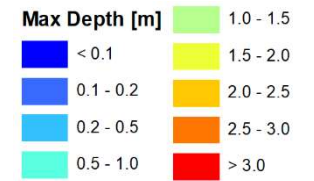
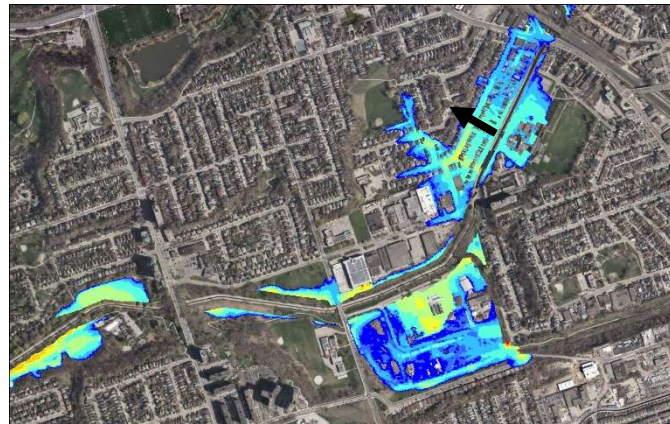
Alt 3



Alt 4



Alt 4



Results Comparison – 100Yr Event, Max Depth

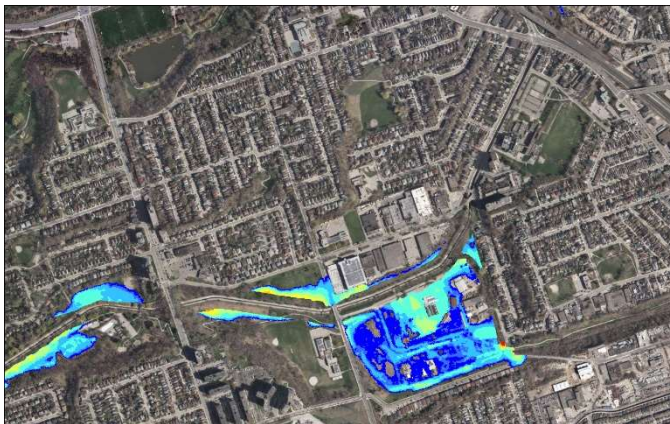
Alt 1



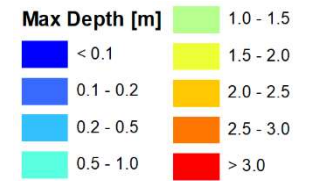
Alt 1



Alt 2

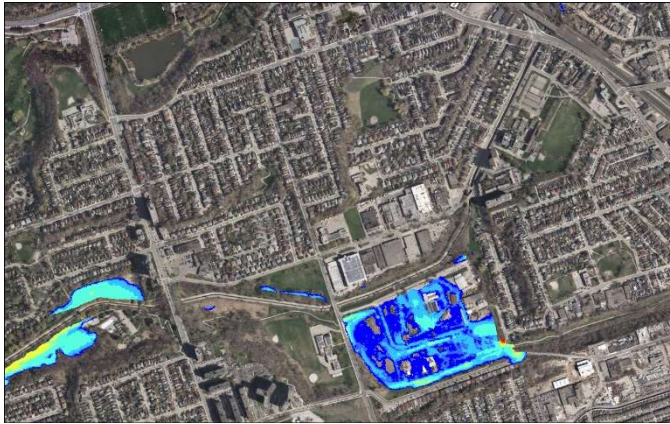


Alt 2



Results Comparison – 100Yr Event, Max Depth

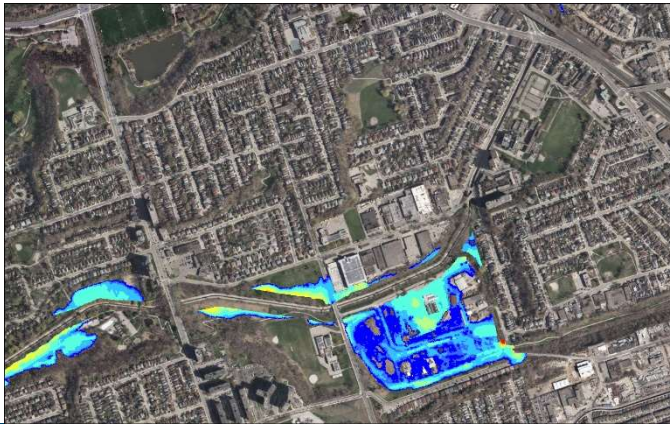
Alt 3



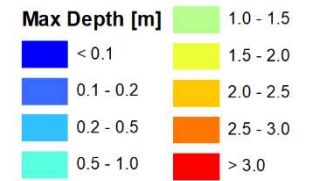
Alt 3



Alt 4



Alt 4



Results Comparison – 50Yr Event, Max Depth

Alt 1



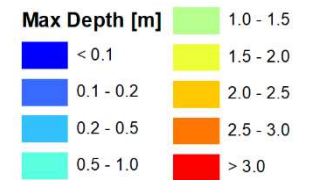
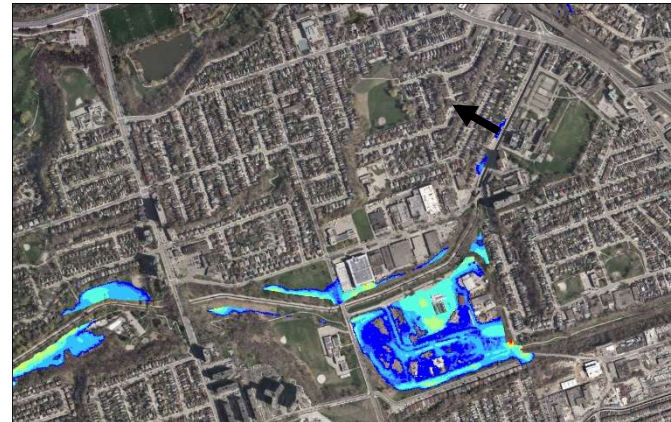
Alt 1



Alt 2



Alt 2



Results Comparison – 50Yr Event, Max Depth

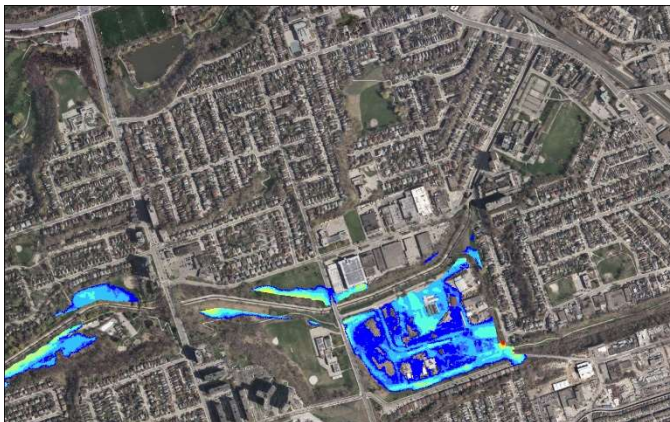
Alt 3



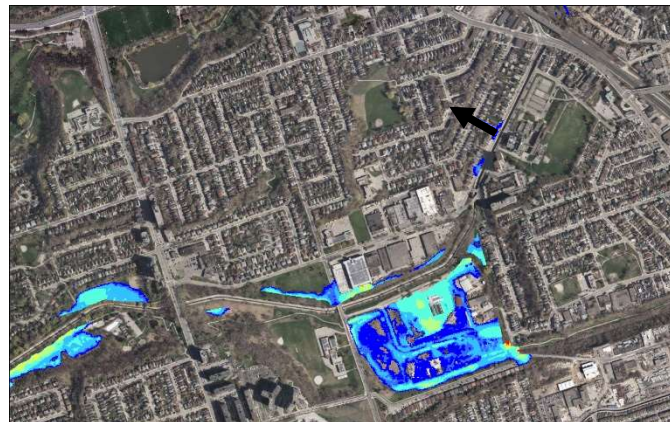
Alt 3



Alt 4



Alt 4



Results Comparison – 25Yr Event, Max Depth

Alt 1



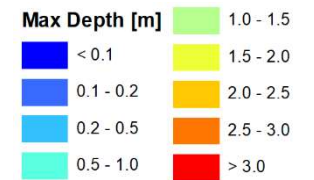
Alt 1



Alt 2



Alt 2



Results Comparison – 25Yr Event, Max Depth

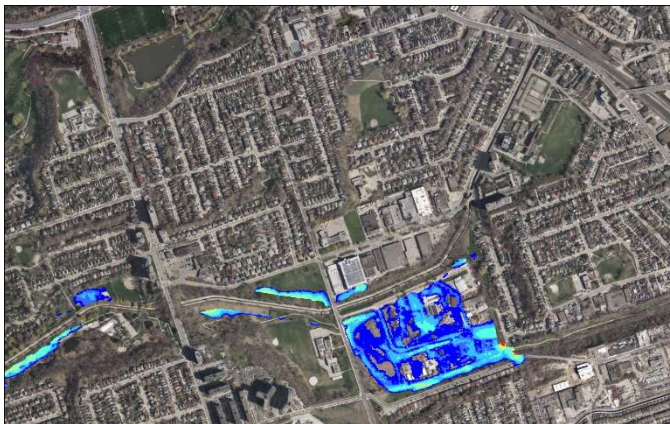
Alt 3



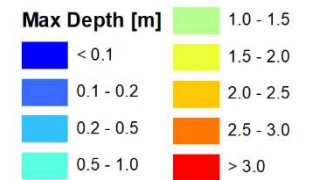
Alt 3



Alt 4



Alt 4



Results Comparison – 10Yr Event, Max Depth

Alt 1



Alt 1



Alt 2



Alt 2



Results Comparison – 10Yr Event, Max Depth

Alt 3



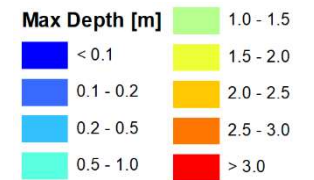
Alt 3



Alt 4



Alt 4



wood.

**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

woodplc.com





wood.

FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

**December 20, 2019 Phase 2B Results Review
Milestone Meeting #4**



Agenda

1. Introductions (Wood)
2. Review of November 21, 2019 Meeting Minutes (Wood)
3. Geotechnical Investigation Update (Wood)
4. Transportation and Traffic Assessment (Wood)
5. Jane Street Level of Service Assessment Summary (Wood)
6. Phase 2B Lavender Creek Assessment (Wood/DHI)
7. Phase 2C Humber Blvd. Reach Assessment (Wood)
8. Next Steps (Wood)
9. Project Schedule (Wood)
10. Other Business (All)



1. Introductions

1. Introductions (Wood)

- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff
- DHI - Hydraulics



2. Review of November 21, 2019 Meeting Minutes (Wood)

2. Review of November 21, 2019 Meeting Minutes

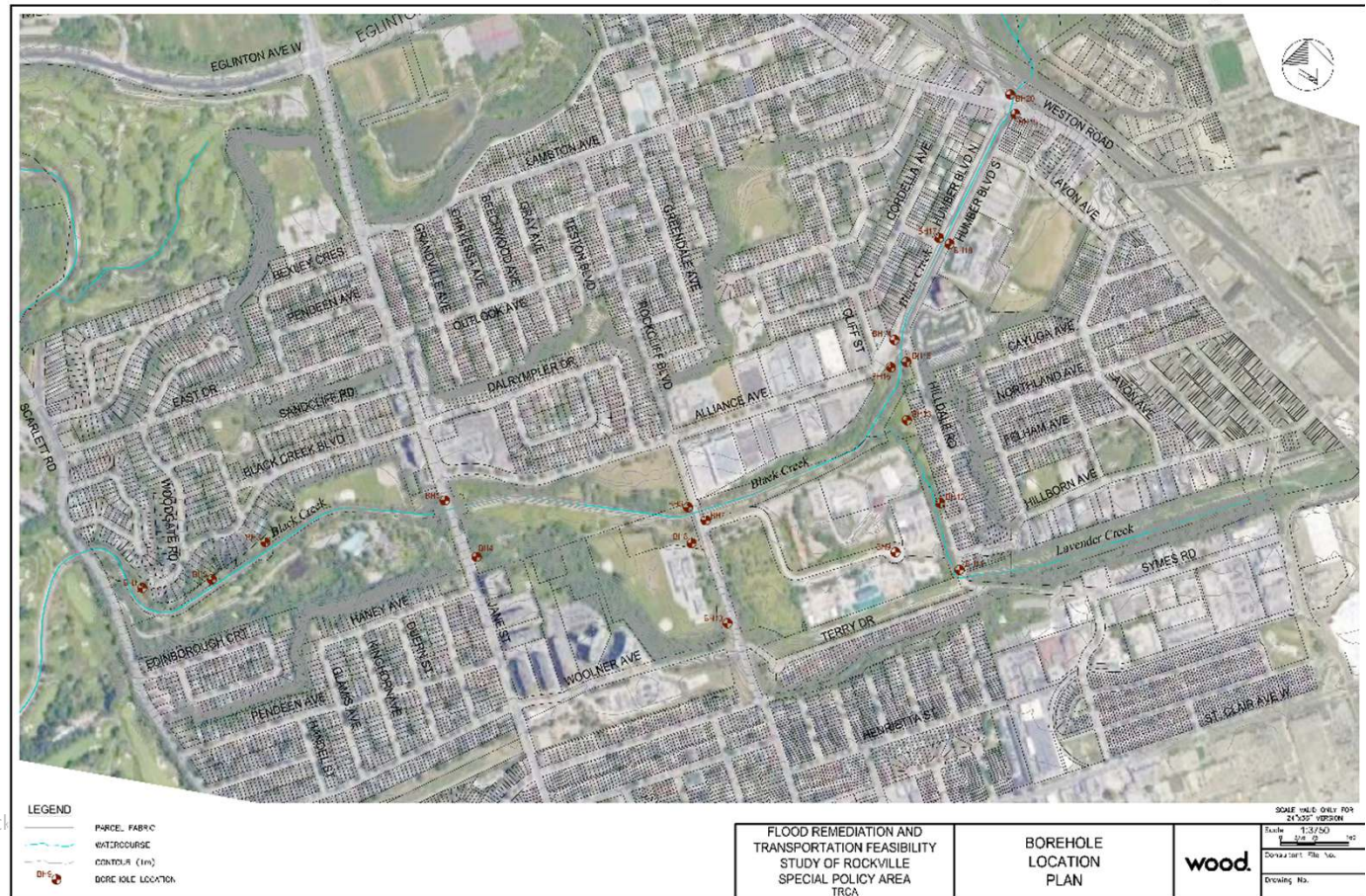
Open Minutes



3. Geotechnical Investigation Updates (Wood)

3. Geotechnical Investigation Update

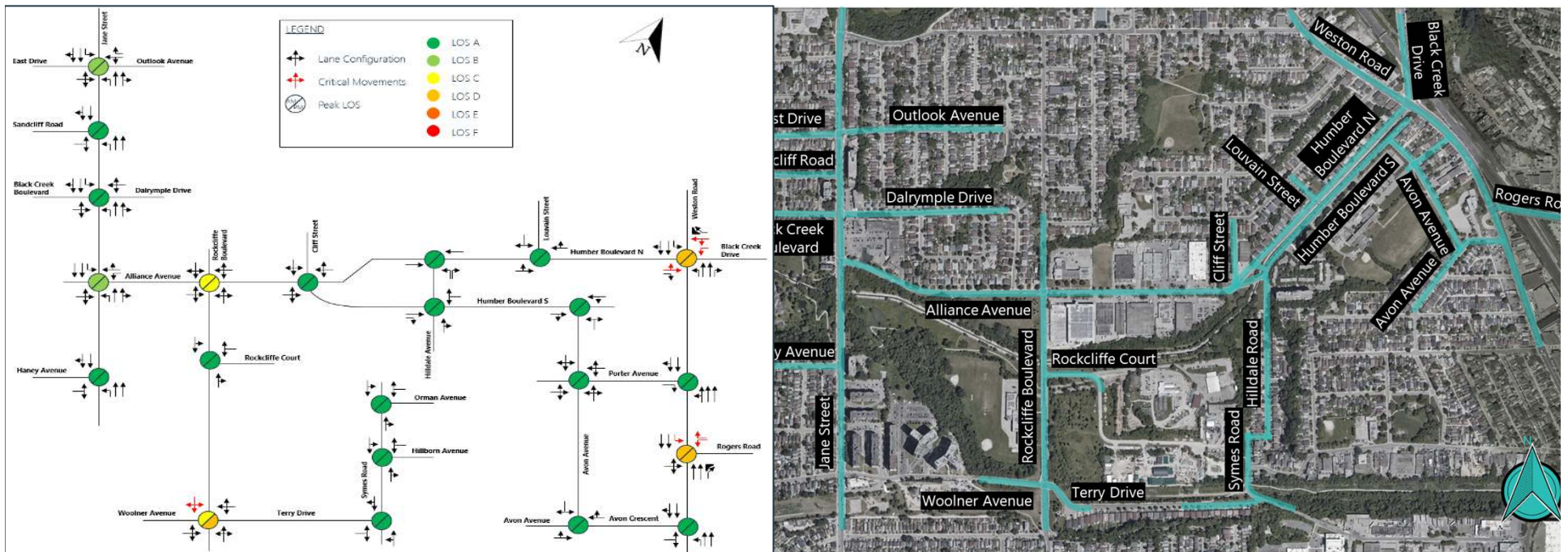
- Borehole logs have been completed
- Geotechnical Assessment Memo preparation commenced, was originally to be prepared for December 2019. Will now be in January 2020.



4. Transportation and Traffic Assessment (Wood)

4. Traffic and Transportation Assessment (Wood)

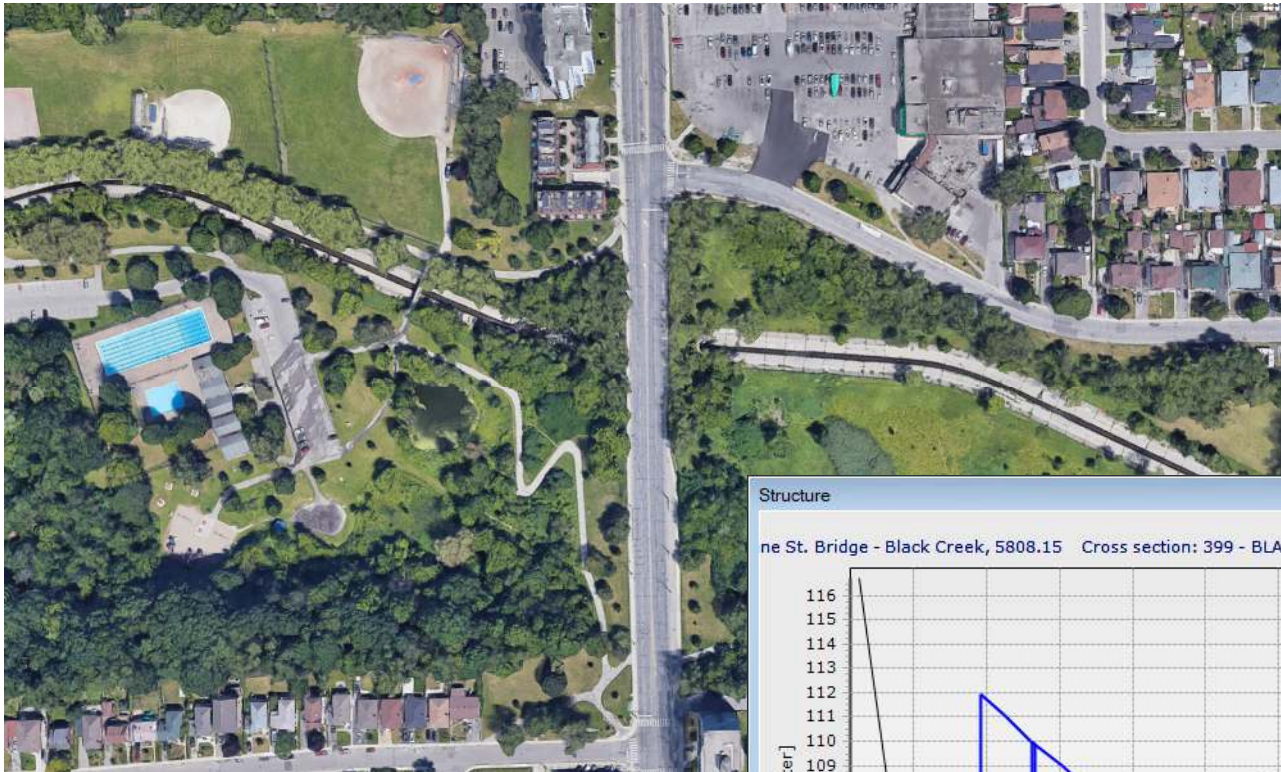
- Existing Traffic Conditions Report submitted November 18, 2019 has been updated based on City's comments and resubmitted as of December 17, 2019



5. Jane St. Level of Service Assessment Summary (Wood)

6. Jane Street Level of Service Assessment

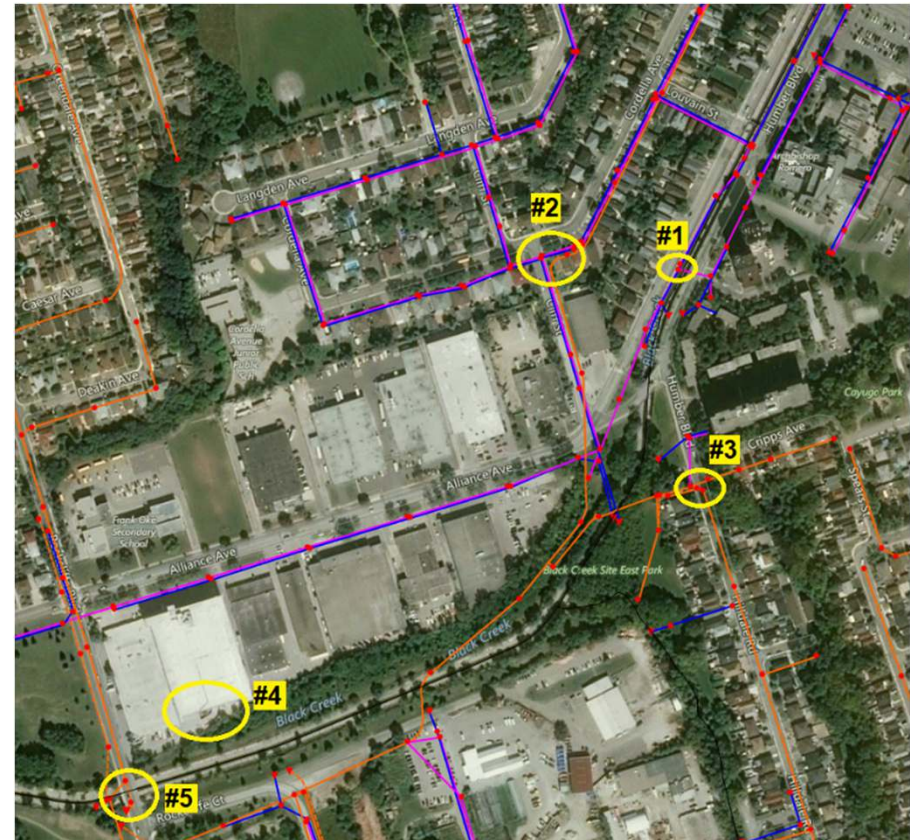
Alternative 3: 72 m Span Bridge



5. Phase 2A Results Discussion (Wood)

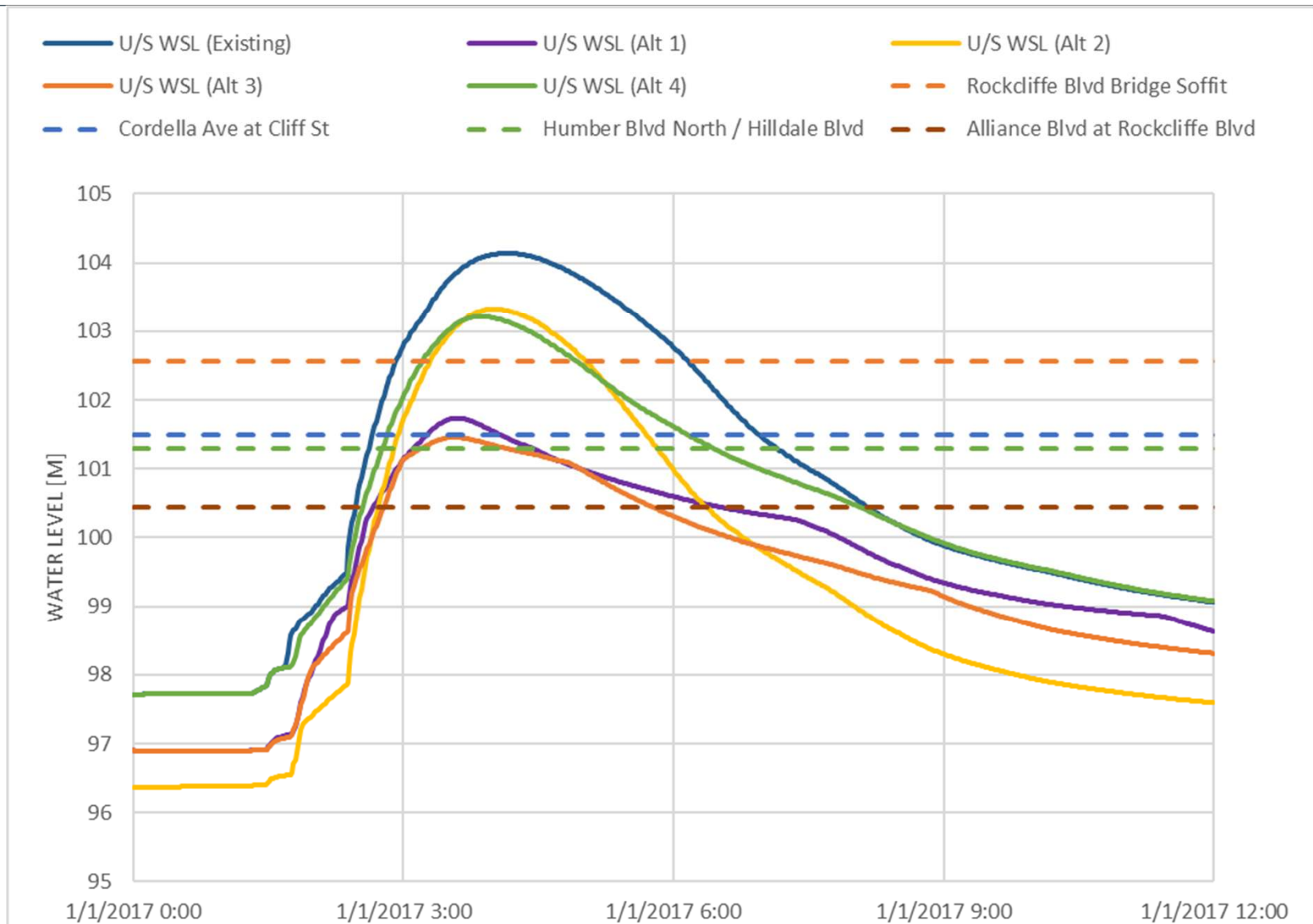
Alternative 3: 72 m Span Bridge

1. Humber Blvd North: max WSE of 101.30 m (Black Creek)
2. Cordella Ave at Cliff St: max WSE of 101.50 m (Black Creek)
3. Hilldale Blvd: max WSE of 101.30 m (Lavender Creek)
4. Alliance Blvd at Rockcliffe Blvd: Basement driveway elevation of 100.45 m
5. Rockcliffe Blvd bridge soffit 102.57 m



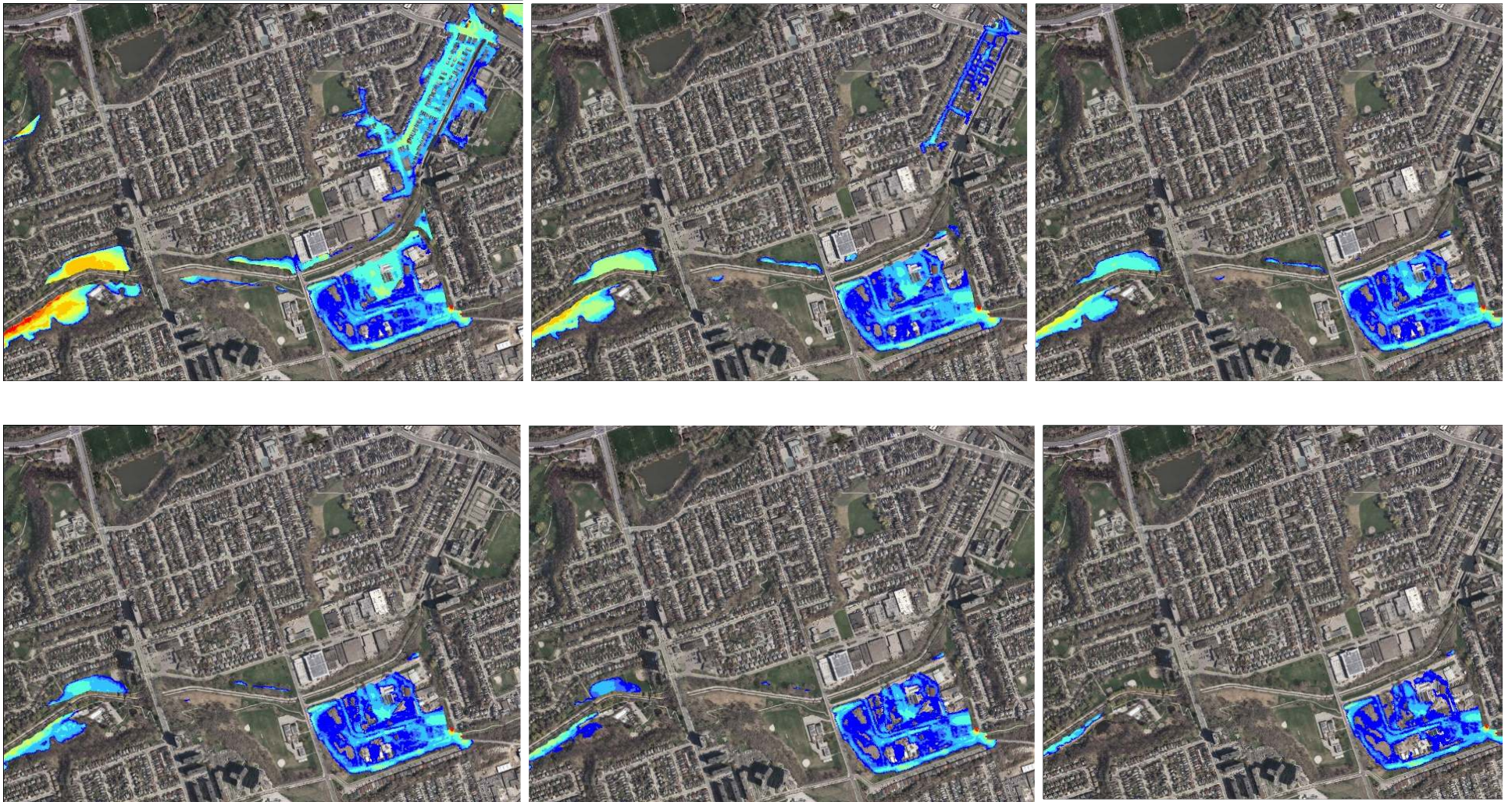
5. Phase 2A Results Discussion (Wood)

Alternative 3: 72 m Span Bridge



5. Phase 2A Results Discussion (Wood)

Alternative 3: 72 m Span Bridge



5. Phase 2A Results Discussion (Wood)

Summary of Buildings Impacted by Flooding and (Benefitting) for Each Alternative

	Reg.	350 Yr	100 Yr	50 Yr	25 Yr	10 Yr	5 Yr	2 Yr
Existing	366	215	113	57	47	33	26	15
Alternative 1 200 m Span Bridge	282 (84)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 2 Lowering Channel	301 (65)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 3 72 m Span Bridge	282 (84)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)
Alternative 4 Relief Culverts	290 (76)	173 (42)	82 (31)	18 (39)	11 (36)	5 (28)	1 (25)	0 (15)

*Values shown in parenthesis indicate numbers of properties or buildings benefiting from alternatives, in comparison with the existing scenario.



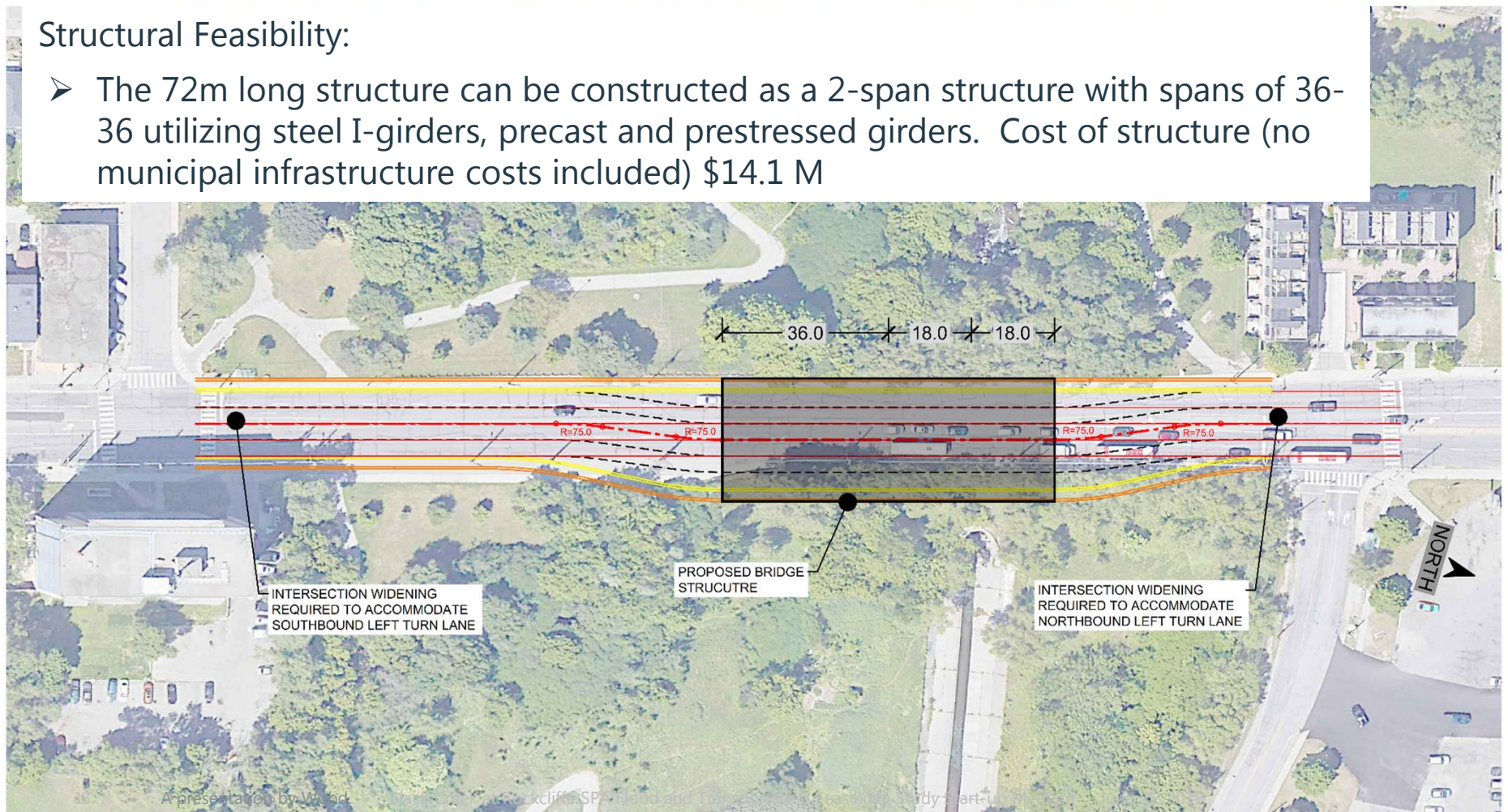
6. Jane Street Level of Service Assessment

Alternative 3: 72 m Span Bridge

JANE STREET - OPTION - 72m BRIDGE

Structural Feasibility:

- The 72m long structure can be constructed as a 2-span structure with spans of 36-36 utilizing steel I-girders, precast and prestressed girders. Cost of structure (no municipal infrastructure costs included) \$14.1 M



7. Phase 2B Lavender Creek Assessment (Wood/DHI)

7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment

- Six (6) Scenarios to be assessed as per the Work Plan
- **Scenario 1:** Lavender Creek Flow Conveyance Improvements:
 - Jane Street 72m span bridge
 - Rockcliffe Road upgraded to 52 m span 4.9 m rise bridge (15.2 m by 4.6 m now)
 - Channel widening upstream of Rockcliffe Blvd to Alliance Avenue as per Phase 2A (50-55m)
 - Symes Road Crossing Upgrade to 15 m span by 1.97 m rise (3.66 m by 0.90 m rise, 40.2 m long)
 - Eliminate upstream private crossing – it is not being used
 - Downstream private crossing upgraded to 15 m span by 3.87 m rise (4.8 m by 3 m now)
 - Widen channel from Symes Road to Black Creek: 15m wide concrete rectangular channel – rise would vary depending on adjacent grades. Channel slope of 0.5%.



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment

- Six (6) Scenarios to be assessed as per the Work Plan
- **Scenario 1a:** Lavender Creek Flow Conveyance Improvements:
 - As per Scenario 1, but channel revised from a 15 m wide concrete channel to a 30 m wide natural channel with 2:1 side slopes.
- **Scenario 1b:** Lavender Creek Flow Conveyance Improvements:
 - As per Scenario 1a, but private downstream crossing revised to a 20 m span.



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment

- **Scenario 2:** As per Scenario 1 but with Symes Road crossing eliminated. Invert at Symes Road maintained. Channel slope of 0.7%
- **Scenario 2a:** As per Scenario 2 but channel revised from a 15 m wide concrete channel to a 30 m wide natural channel with 2:1 side slopes.
- **Scenario 2b:** As per Scenario 2 but downstream private crossing widened from 15 m to 20 m.



7. Phase 2B Lavender Creek Assessment

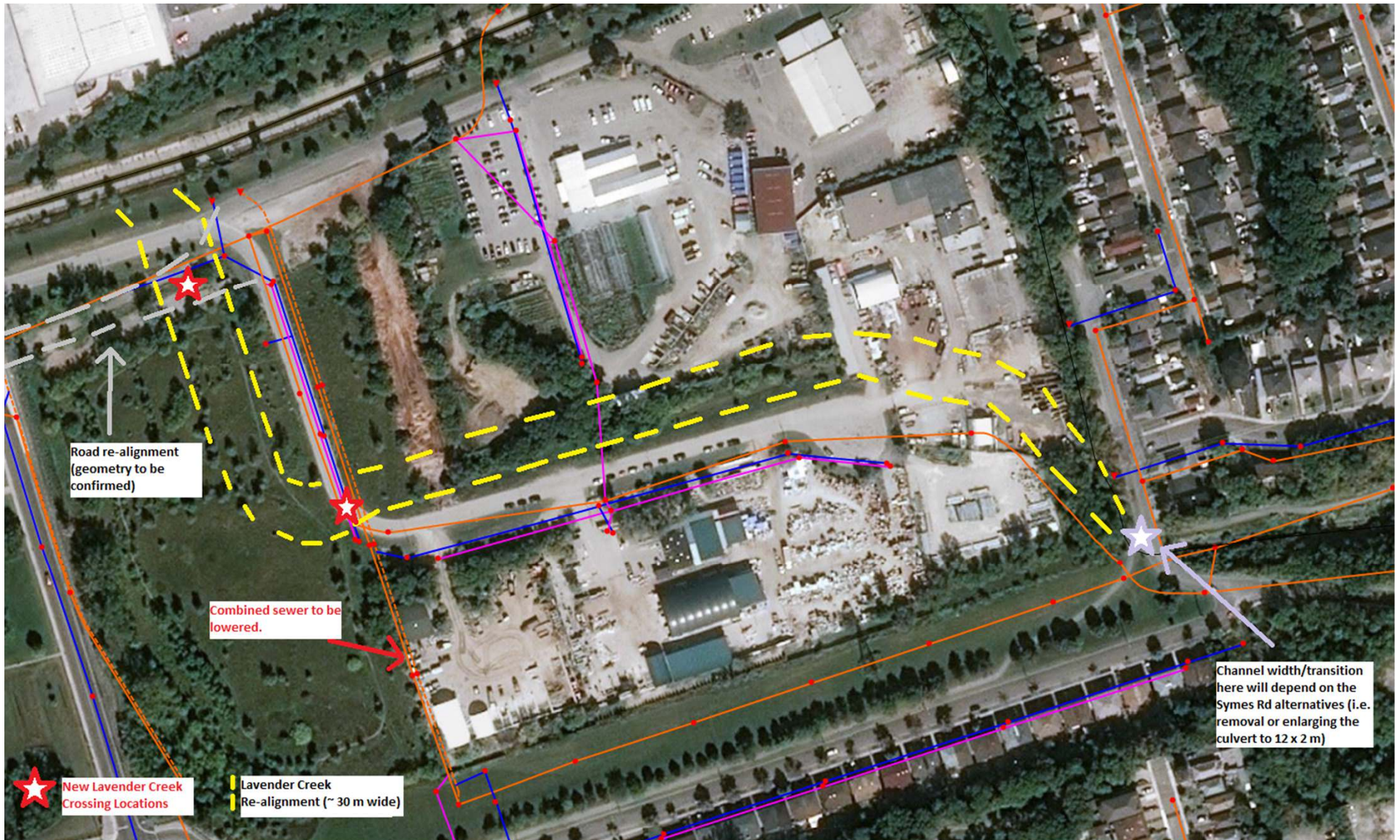
Phase 2B Alternatives Assessment

- **Scenario 3:** As per Scenario 2 but with the 2nd downstream private crossing eliminated
- **Scenario 4:** Realign Lavender Creek
 - Jane Street – preferred alternative
 - Rockcliffe Road upgraded to 52 m+/- (need to confirm span). Channel widening upstream of Rockcliffe Blvd to Alliance Avenue as per Phase 2A
 - Realign Lavender Creek downstream of Symes Road to Black Creek – through properties north and east of Rockcliffe Court
- **Scenario 5:** As per Scenario 4 but with the Symes Road crossing eliminated
- **Scenario 6:** One of Scenarios 1-5 selected with flood protection berm/ wall in place (if necessary)



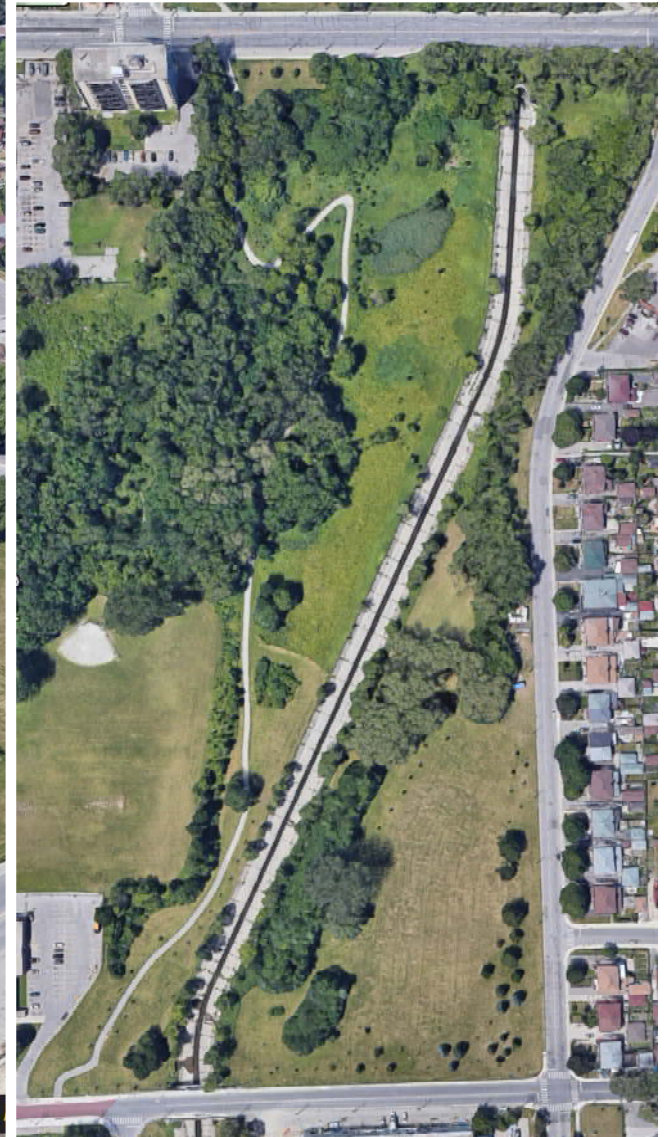
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Scenarios 4 and 5: Realign Lavender Creek (Screened Out)



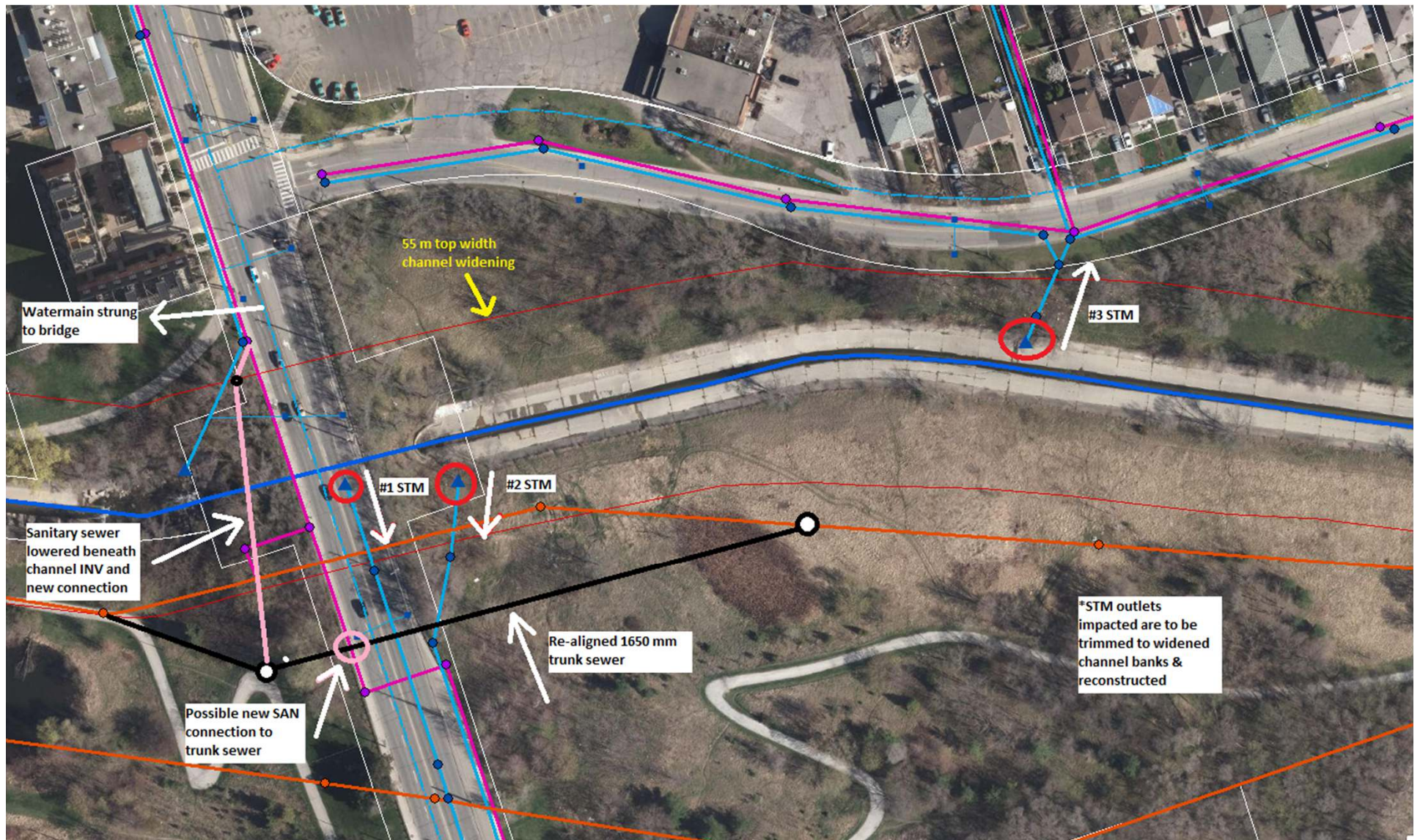
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Jane Street – Rockcliffe Blvd.)



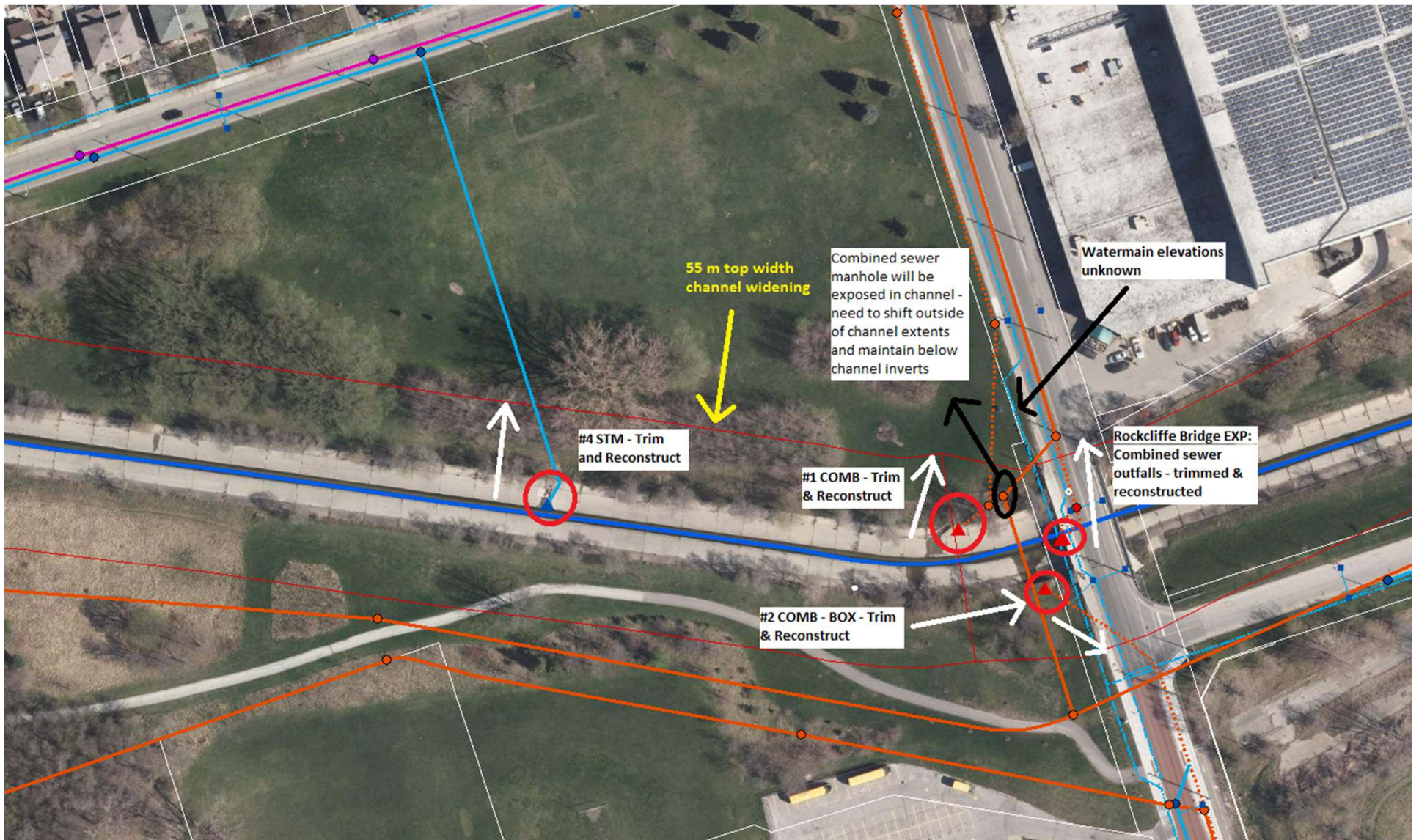
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Jane Street – Rockcliffe Blvd.)



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Jane Street – Rockcliffe Blvd.)



7. Phase 2B Lavender Creek Assessment

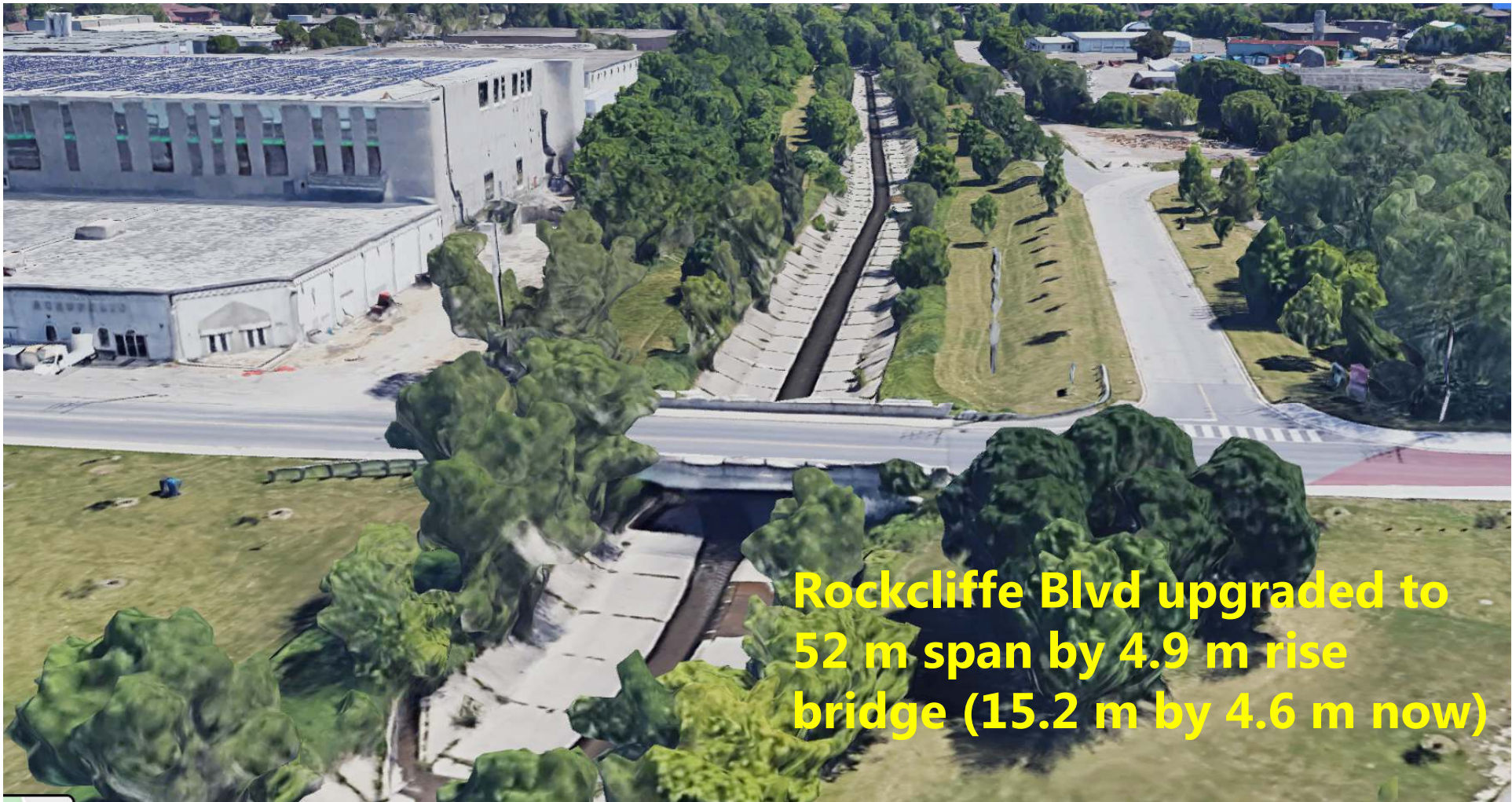
Phase 2B Alternatives Assessment: Widen Black Creek (Jane Street – Rockcliffe Blvd.)

- Outfalls to be trimmed/reconstructed:
 - 4 storm sewers (450 mm, 525 mm, 600 mm, 700 mm)
 - 2 combined sewers (1050 mm, 1524 x 4115 mm)
- Combined sewer re-alignment outside of channel extents:
 - 1650 mm trunk sewer surrounding Jane St
 - 450 mm D/S of Rockcliffe Blvd
- Jane Street infrastructure:
 - Watermain strung to bridge (300 mm)
 - Sanitary sewer re-configuration and connection to re-aligned trunk sewer
- Note: does not include utilities
- Infrastructure relocation costs of approx. **\$3.5 M**
- Channel works (concrete removal, earth removal/widening, and naturalization) approx. **\$3.4 M**



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Rockcliffe Blvd Crossing



**Rockcliffe Blvd upgraded to
52 m span by 4.9 m rise
bridge (15.2 m by 4.6 m now)**



7. Phase 2B Lavender Creek Assessment

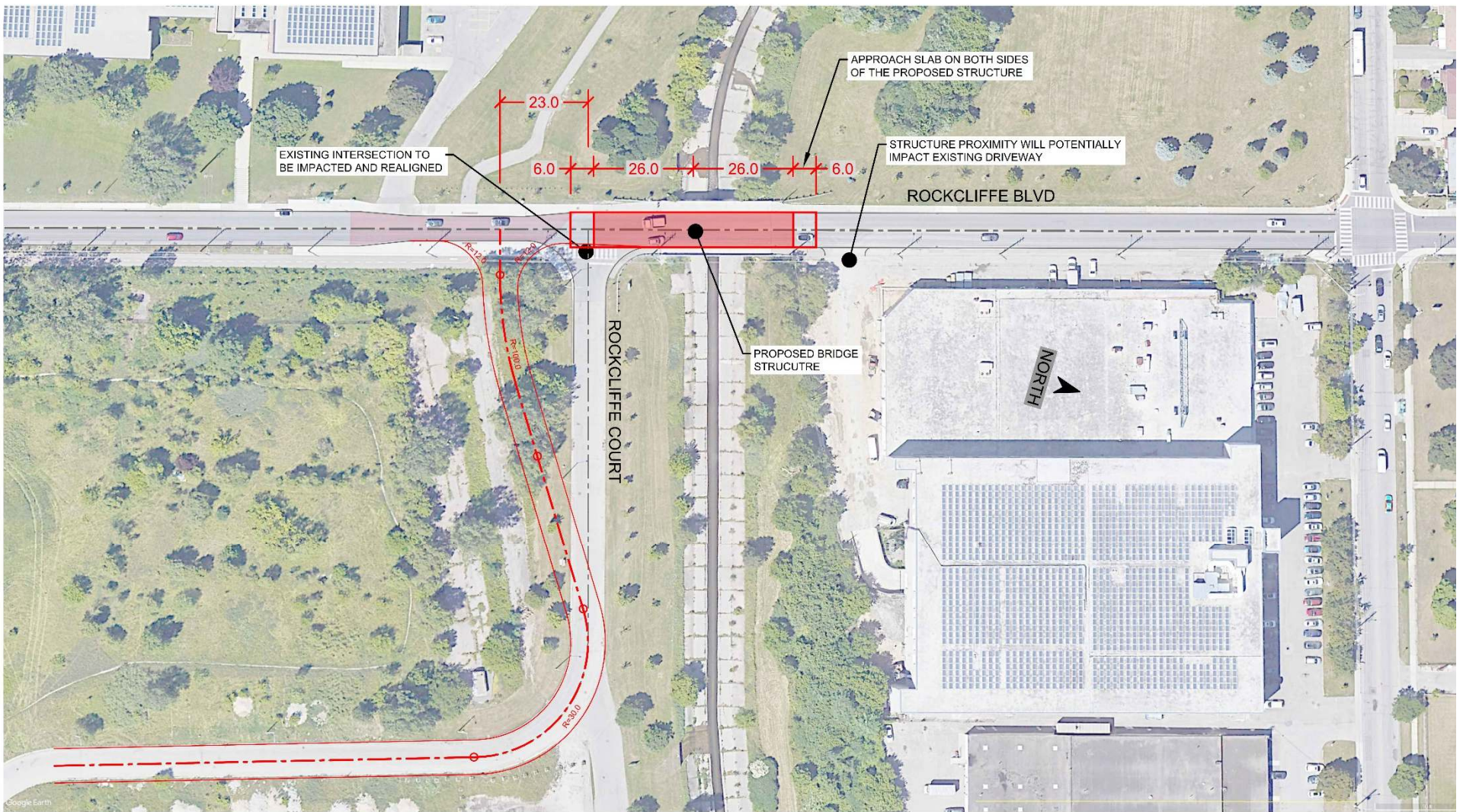
Phase 2B Alternatives Assessment – Rockcliffe Blvd Crossing

- Bridge would use 2-26 m spans prestressed concrete box girders with a 1m wide pier. Bridge span selected to accommodate the creek widening. Bridge would require relocation of Rockcliffe Court.
- Side by side girders would be used to minimize the vertical depth and improve hydraulic capacity. The soffit and road profile would be raised 0.3m from the existing condition.
- Construction would require 1 lane of traffic to be open, based on existing traffic counts, transit routes and the two (2) schools located in proximity to the crossing.
- Bridge cost of approximately **\$5.6 M** without infrastructure relocation costs.



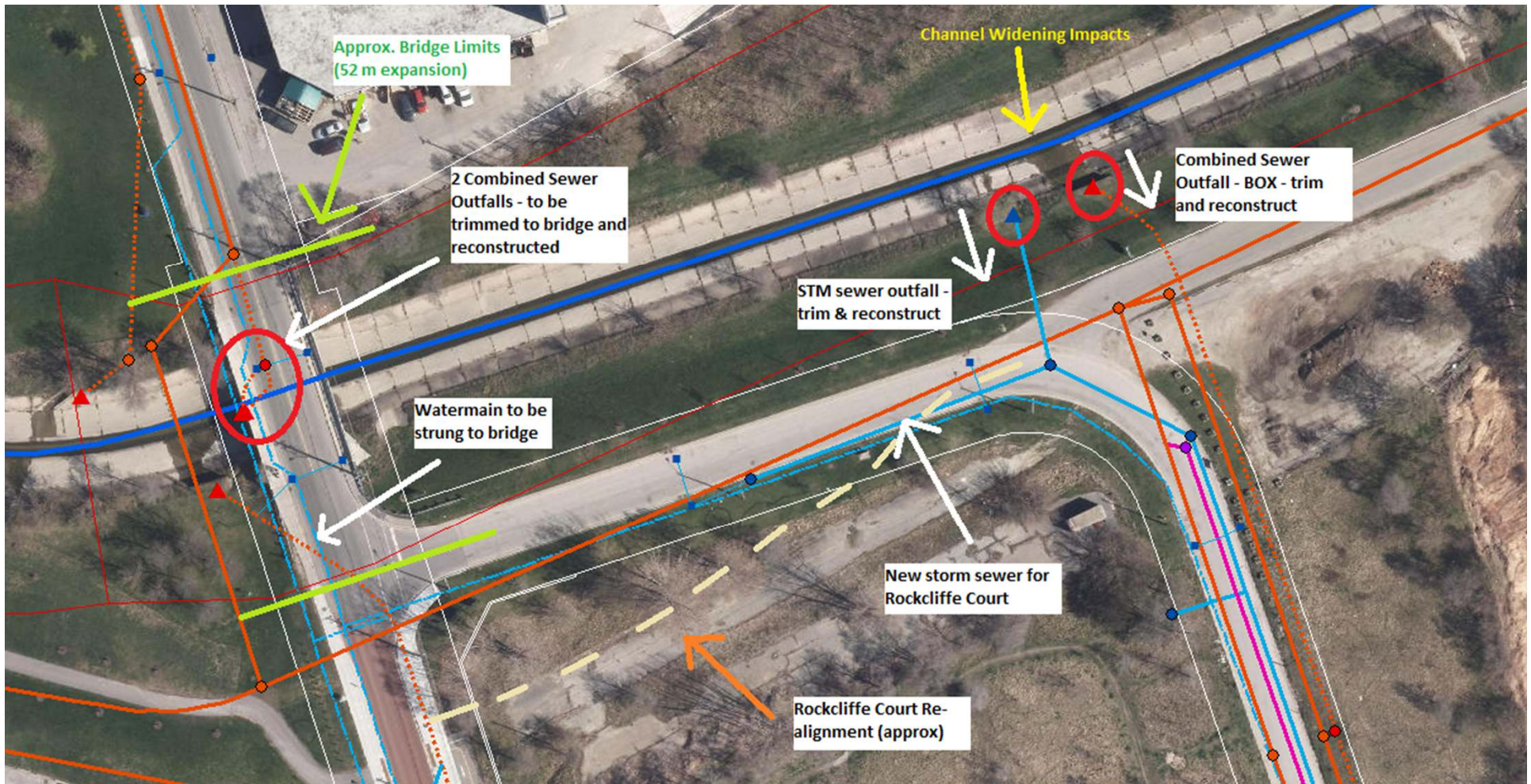
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment – Rockcliffe Blvd Crossing



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment – Rockcliffe Blvd Crossing



7. Phase 2B Lavender Creek Assessment

Phase 2A Alternatives Assessment Considerations – Rockcliffe Blvd Crossing

- Outfalls to be trimmed/reconstructed:
 - Combined sewer overflow (600 mm, 1200 mm)
- Watermain strung to bridge (500 mm and 300 mm)
- Rockcliffe Court Re-alignment
 - Storm sewer reconstruction
- Infrastructure relocation costs, including road realignment – approx.
\$350 K



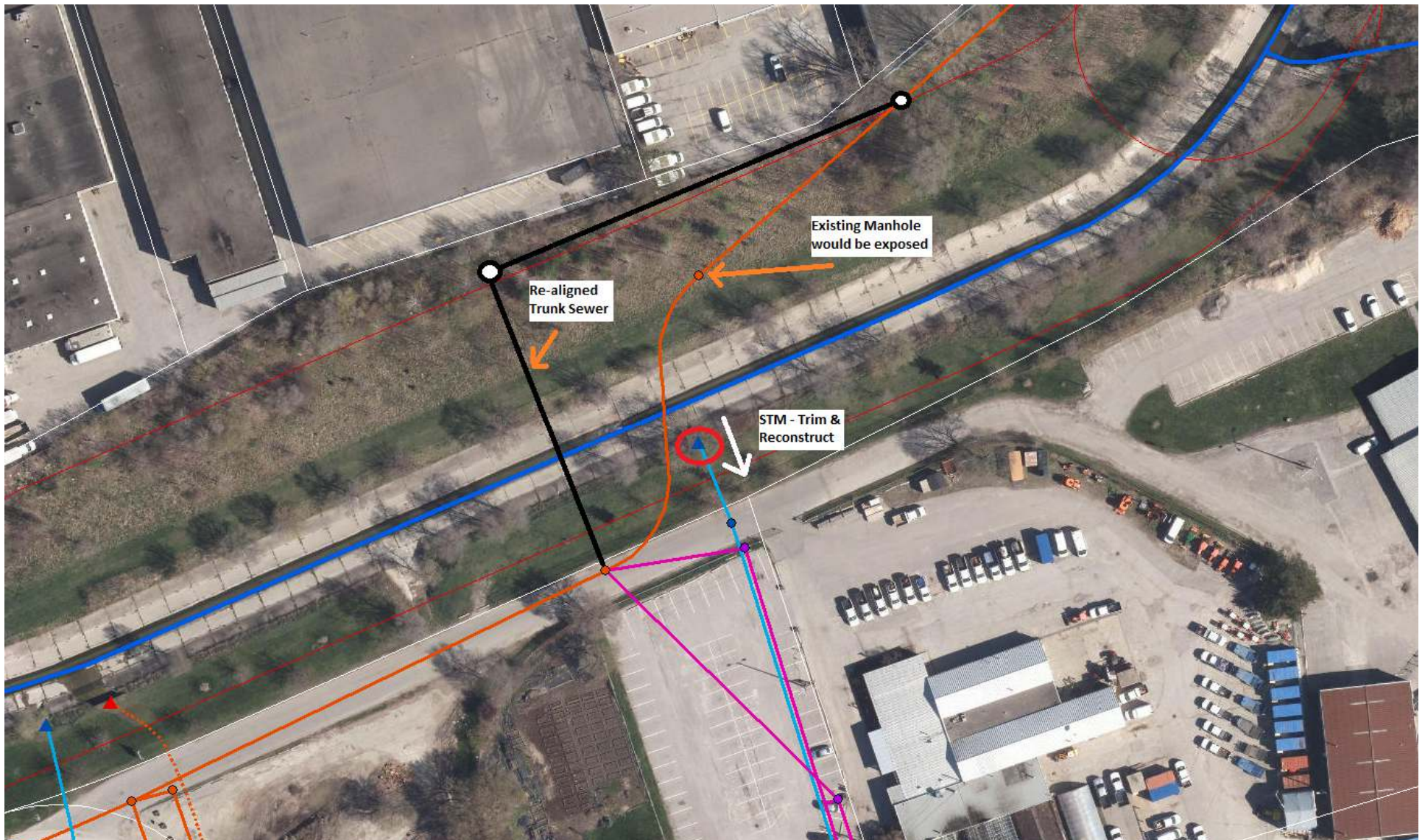
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Rockcliffe Blvd. – Alliance Ave.)



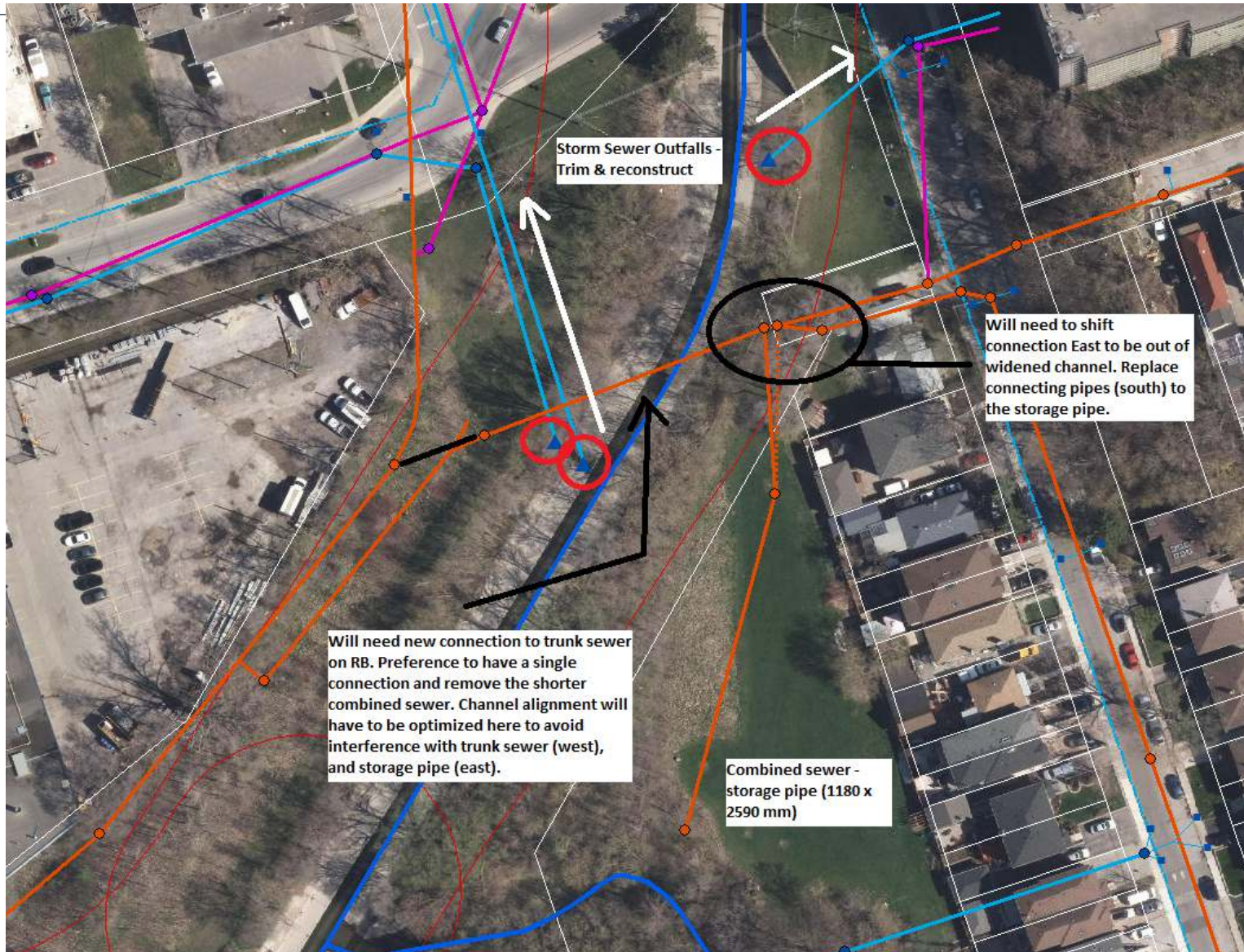
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Rockcliffe Blvd. – Alliance Ave.)



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Black Creek (Rockcliffe Blvd. – Alliance Ave.)



7. Phase 2B Lavender Creek Assessment

Phase 2A Alternatives Assessment: – Widen Black Creek (Rockcliffe Blvd. – Alliance Ave.)

- Outfalls to be trimmed/reconstructed:
 - 5 storm sewers (300 mm, (2) 900 mm, 975 mm, 1050 mm)
 - 1 combined sewers (1524 x 4115 mm)
- Combined sewer re-alignment outside of channel extents:
 - 1350 mm trunk sewer along right bank of Black Creek and beneath
- Combined sewer removal and re-configuration
 - Multiple combined sewer pipes and overflow pipes to be removed and shifted outside of channel extents
 - Re-configure connection to trunk sewer and ensure elevations beneath channel invert
- Infrastructure relocation costs of approx. **\$1.15 M**
- Channel works (concrete removal, earth removal/widening, and naturalization) approx. **\$3.9 M**



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment – Widen Lavender Creek



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek

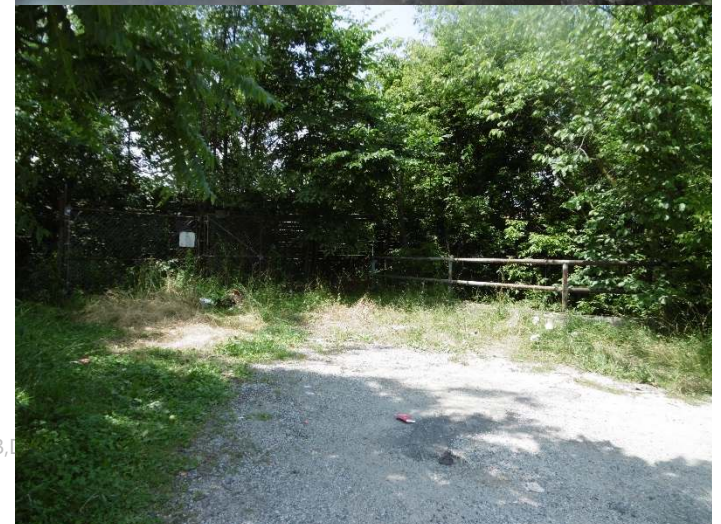
- Northern Private Crossing 4.8 m by 3 m
- Widen Structure to 20 m span by 3.87 m rise. Span almost accommodates 22.5 m wide creek
- Bridge cost of approximately **\$5.6 M** without infrastructure relocation costs.



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek

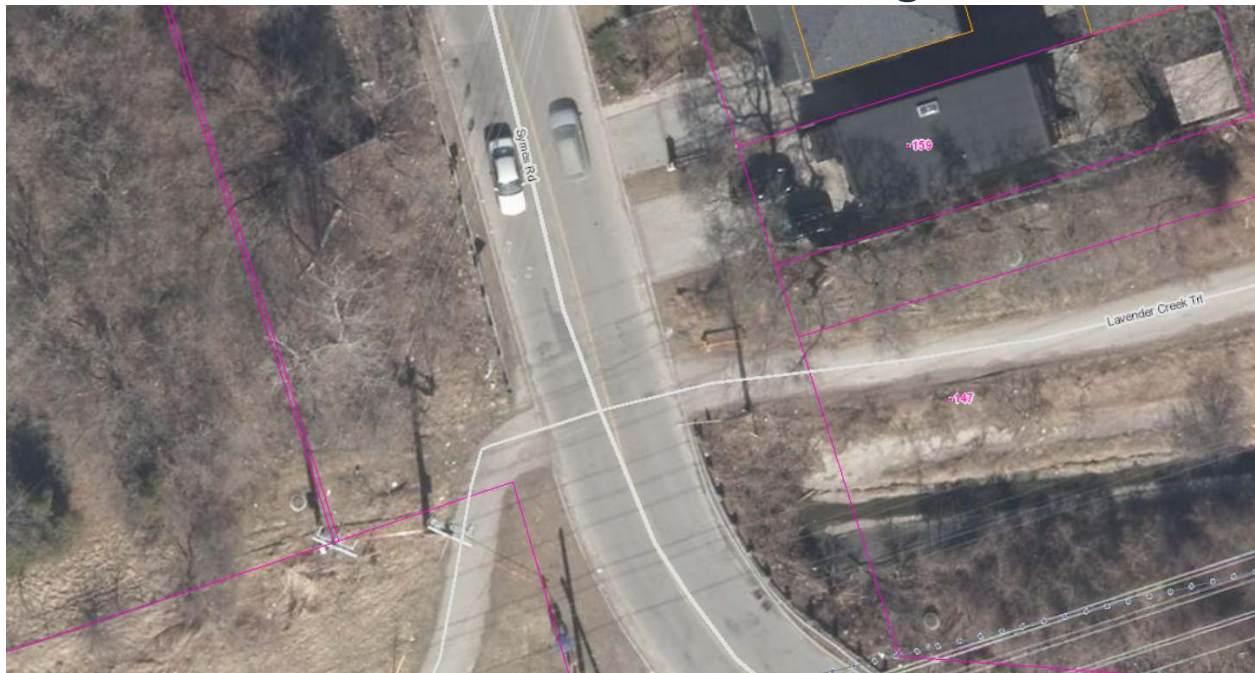
- Southern Private Crossing 4.8 m by 2.1 m
- Remove structure due to lack of use
- Costs would just be for structure removal



7. Phase 2B Lavender Creek Assessment

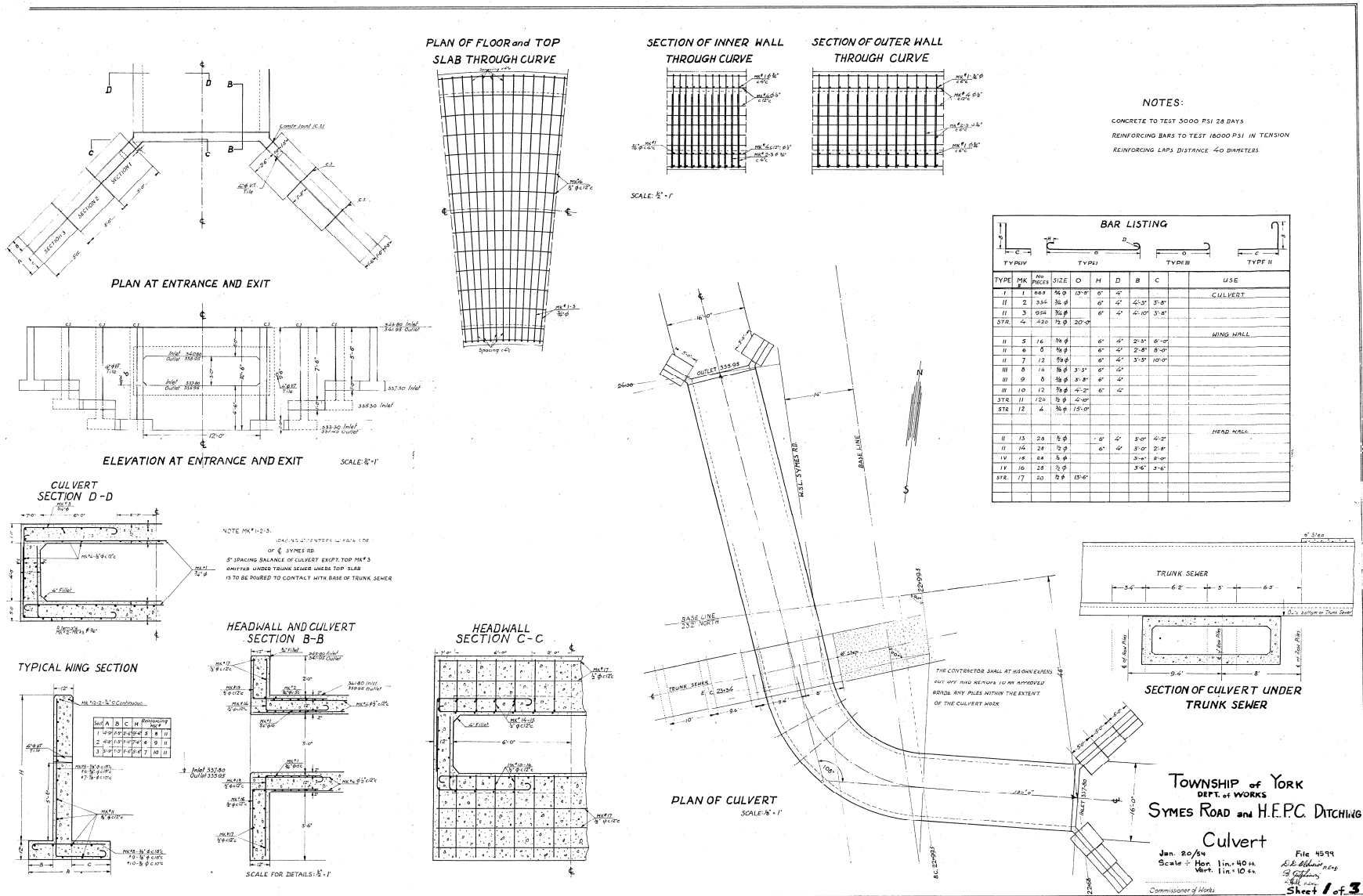
Phase 2B Alternatives Assessment: Widen Lavender Creek

- Symes Road Crossing 3.66 m by 0.90 m rise, 40.2 m long
- Widen Structure to two (2) 5.4 m by 1.8 m
- Culverts cost approximately **\$2.7 M** without infrastructure relocation/ repair costs
- Potential to reduce culvert length



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment – Widen Lavender Creek



7. Phase 2B Lavender Creek Assessment

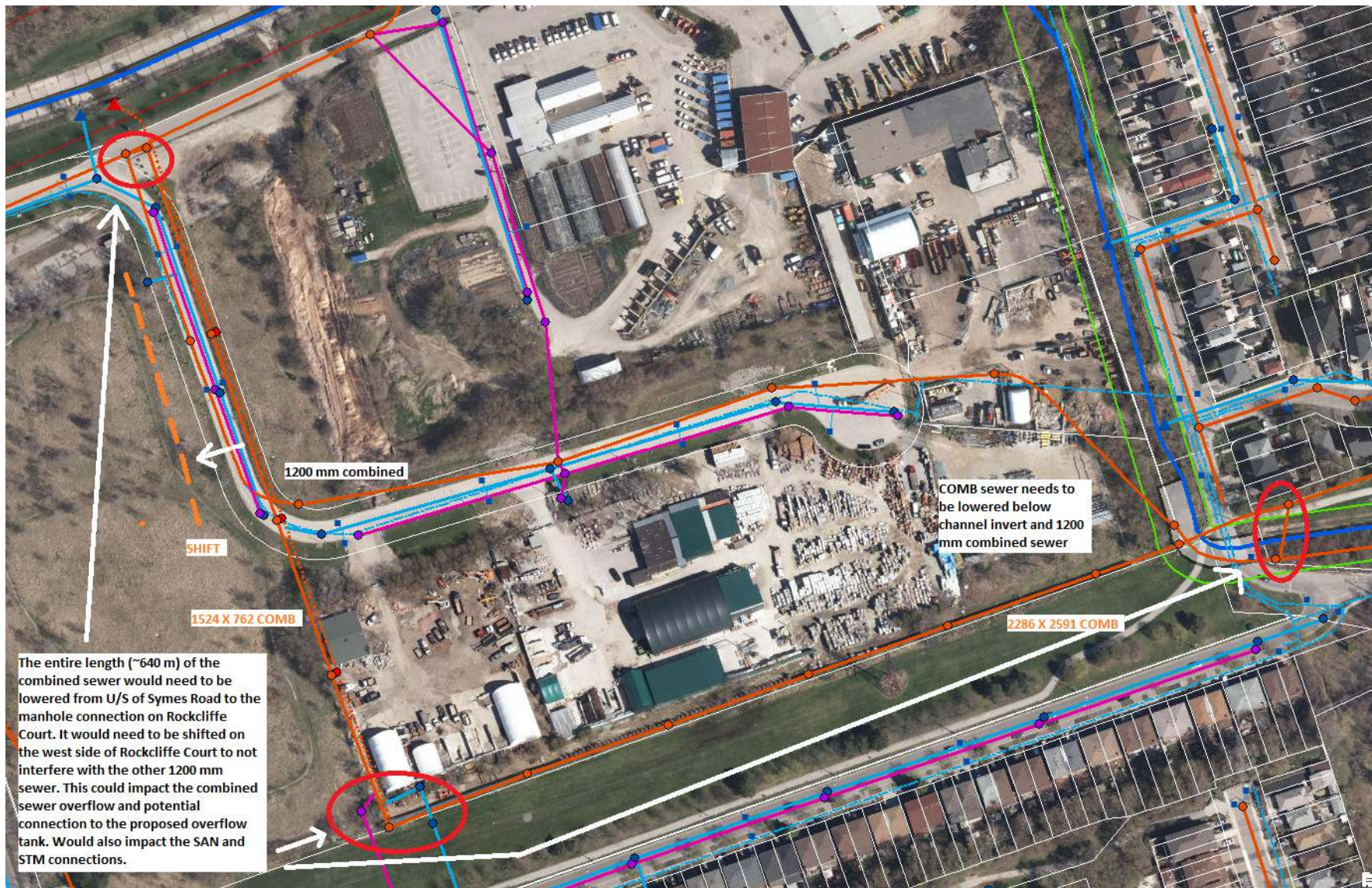
Phase 2B Alternatives Assessment: Widen Lavender Creek

- Culvert Crossing 3.6 m by 0.9 m
- Culvert crossing inv. 102.96 m, bottom conc. 102.83 m
- Road at 106.1 m +/-
- Combined trunk sewer 2.6 m by 2.3 m sits on culvert, inv. 103.88 m +/- at 0.26 % slope. To eliminate Symes Road Crossing
 - 1200 mm sanitary crosses under trunk sewer at invert 100.04 m
 - Need combined sewer invert upstream of Symes Road at 97.00 m +/-
 - Need a drop of the combined trunk sewer by 6.88 m + (assuming same size pipe)
 - Connection to 1650 mm combined at 95.89 m at bend at Rockcliffe Court
 - 680 m pipe lowered and partial relocation; average slope 0.16%



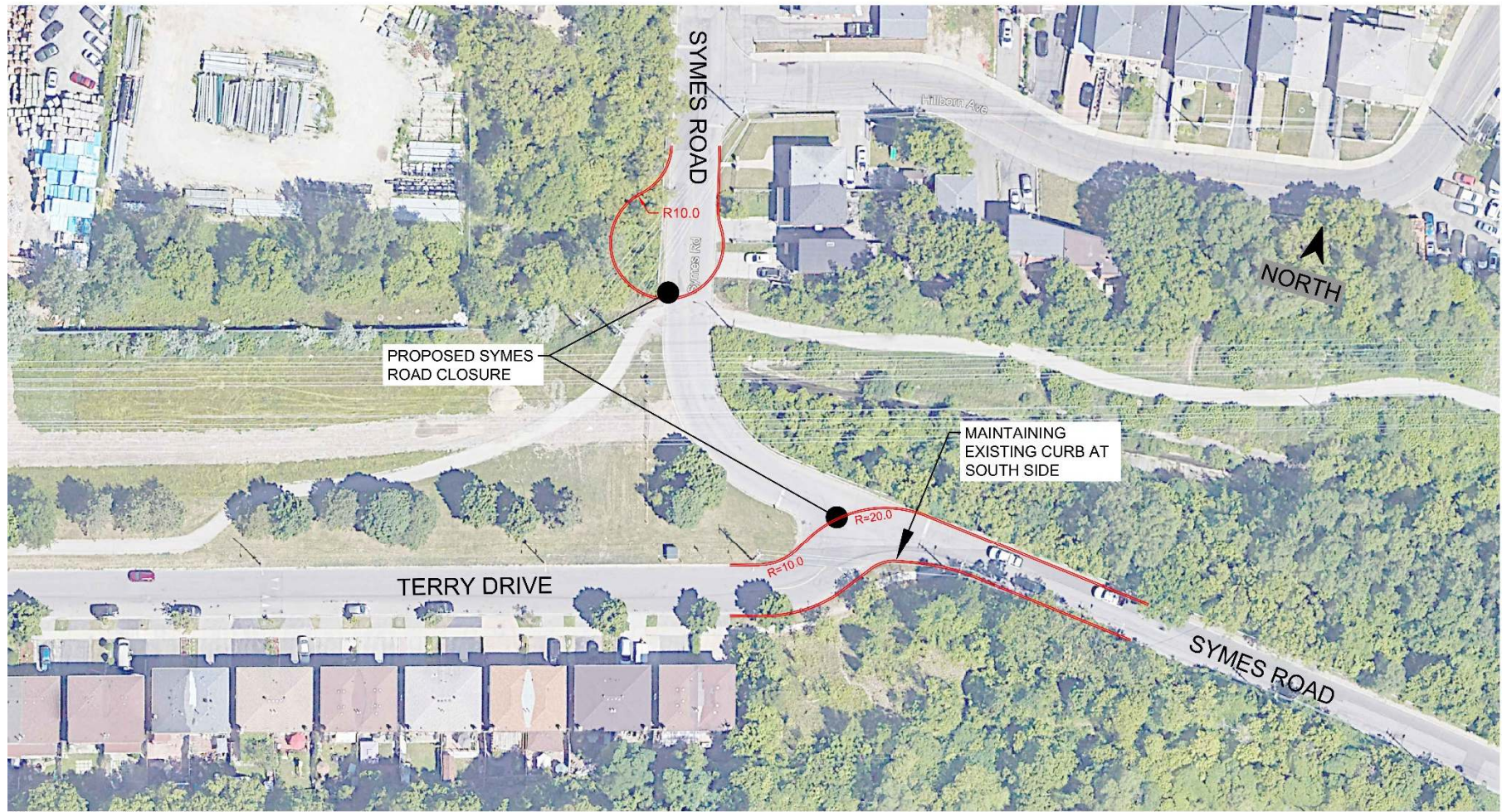
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek



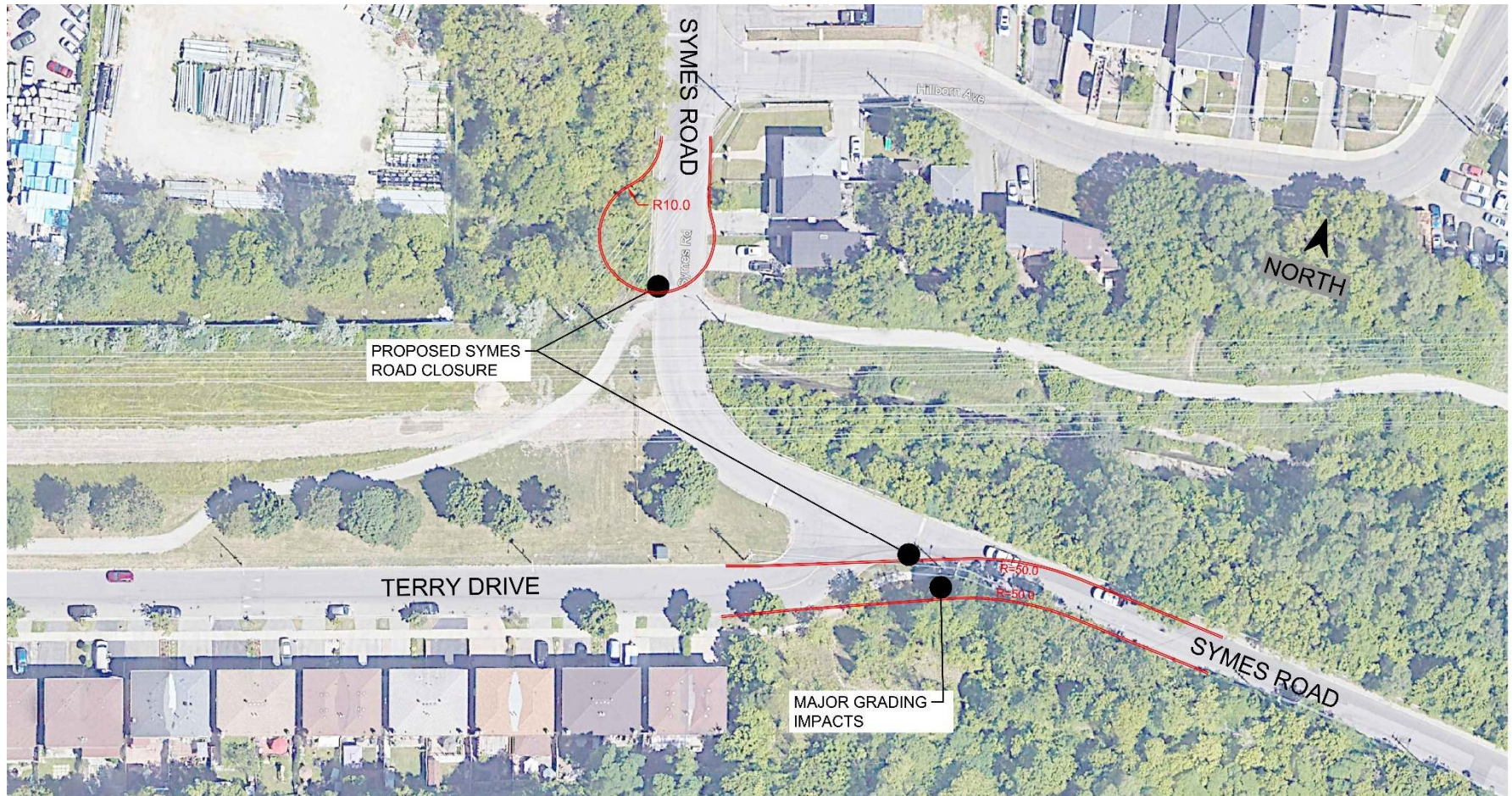
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek



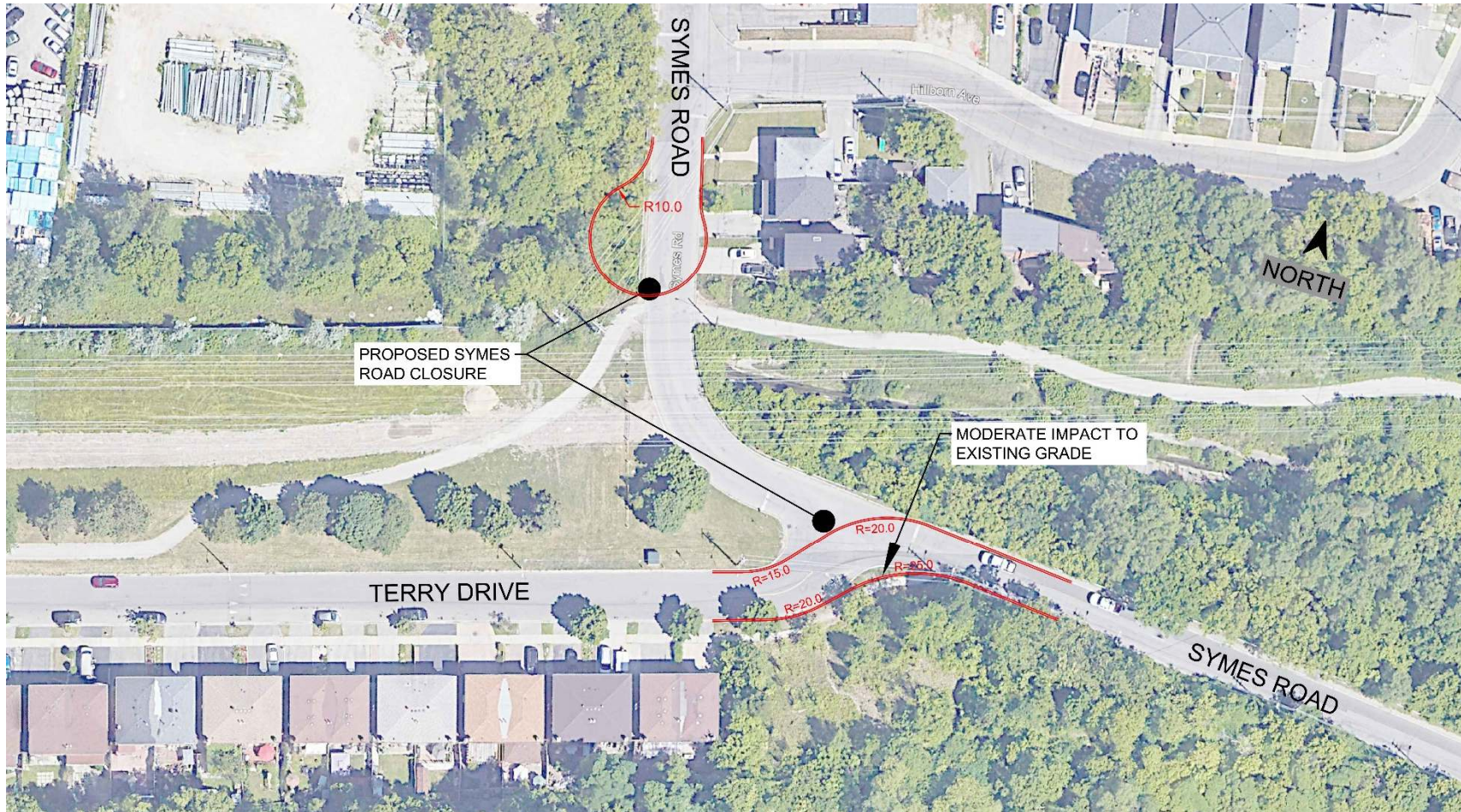
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek



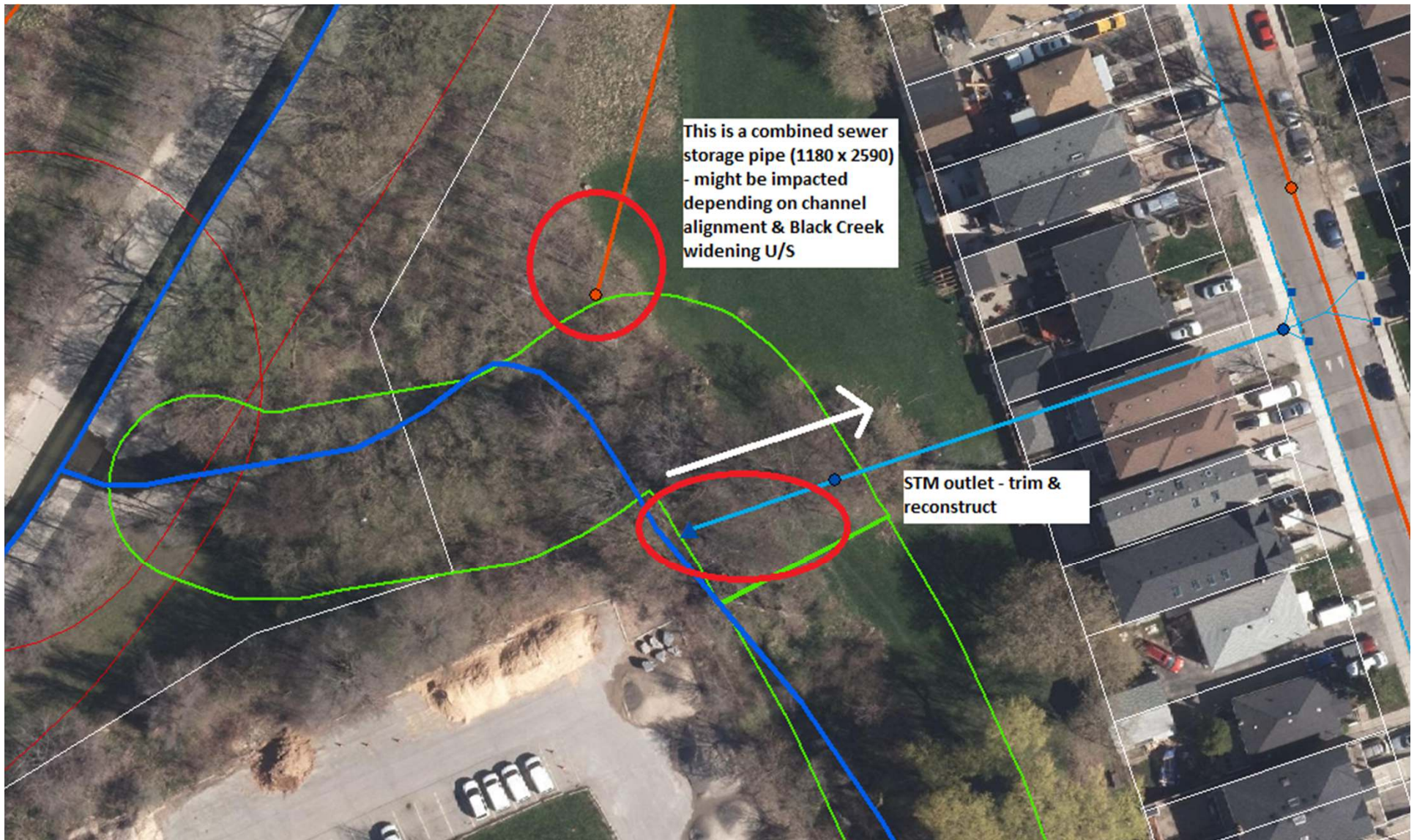
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment: Widen Lavender Creek



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment : Widen Lavender Creek



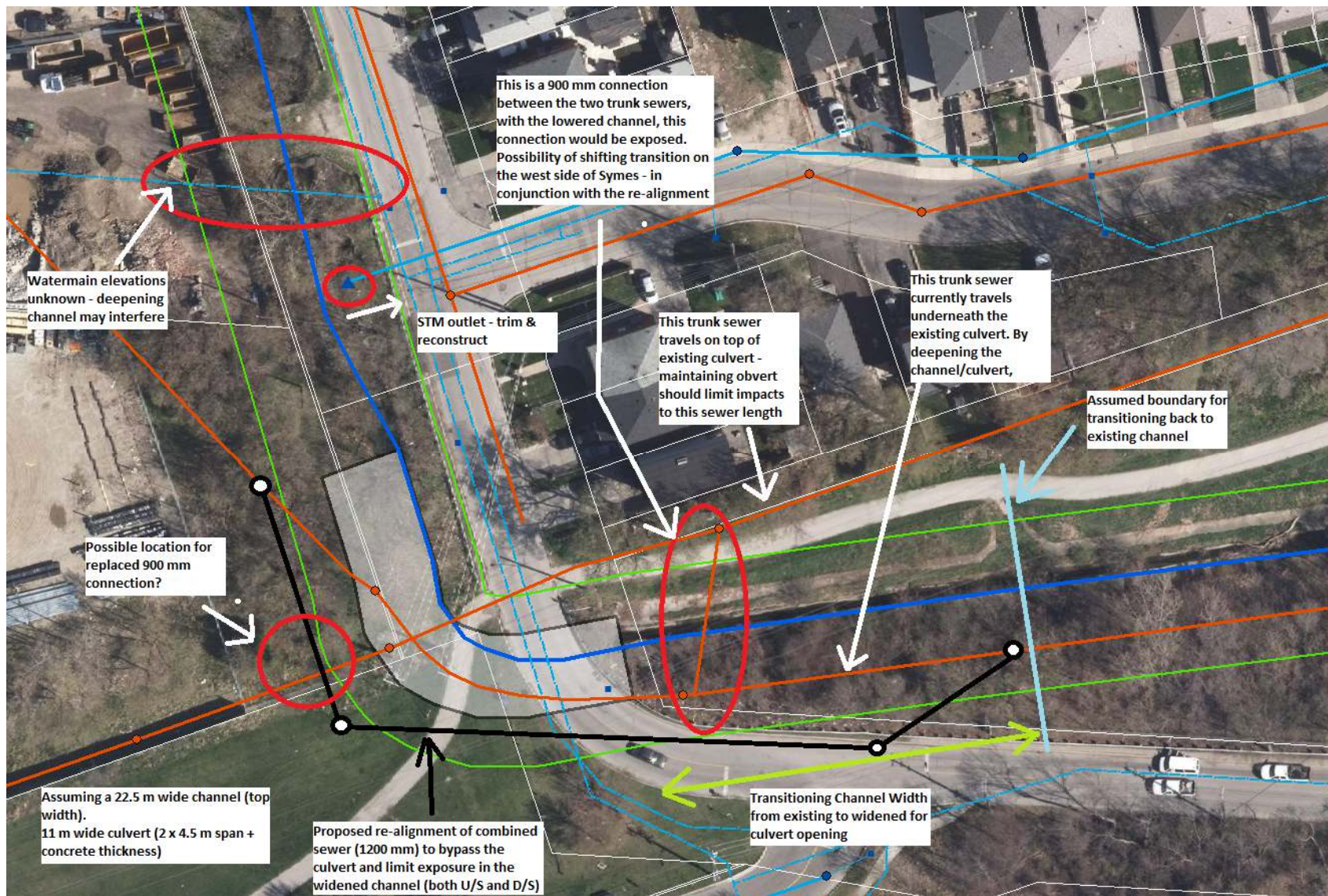
7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment : Widen Lavender Creek



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment : Widen Lavender Creek



7. Phase 2B Lavender Creek Assessment

Phase 2B Alternatives Assessment : Widen Lavender Creek

- Outfalls to be trimmed/reconstructed:
 - 3 storm sewers (300 mm, 525 mm, 675 mm)
- Watermains – Re-aligned/Deepened
 - (2) 150 mm water mains (crossing channel and along bank)
- Combined sewer / storage tank re-alignment outside of channel extents:
 - 1880 x 2590 mm storage pipe to be re-aligned
- Combined trunk sewer re-configuration
 - 1200 mm trunk sewer would need to be re-aligned outside of channel/culvert extents
 - 900 mm connection U/S of Symes would need to be removed
- Infrastructure relocation costs of approx. **\$1.4 M**
- Channel works (concrete removal, earth removal/widening, and naturalization) approx. **\$1.2 M**



7. Phase 2B Lavender Creek Assessment

Phases 2A and 2B Alternatives Assessment : Summary

- Jane Street Bridge **\$15 M**
- Widen Black Creek (Jane Street to Rockcliffe Blvd. **\$6.9 M** (includes \$3.5 M for infrastructure works along channel and at Jane Street Bridge)
- Rockcliffe Blvd. Bridge: **\$6.0 M**
- Widen Black Creek (Rockcliffe Blvd.to Alliance Ave.) **\$5.05 M**
- Private crossing of Lavender Creek **\$5.6 M**
- Symes Road culverts: **\$2.7 M**
- Widen Lavender Creek: **\$2.6 M**
- **TOTAL \$43.85 M**



8. Phase 2C Humber Blvd. Reach Assessment (Wood)

8. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

- Alternatives that need to be considered for Phase 2C include:
 - Alliance Avenue crossing removal and new crossing
 - Humber Boulevard Crossing Removal
 - Channel Section Widening and Humber Boulevard South Removal
 - Weston Road crossing overflow
 - Upstream hydrology and potential flow attenuation



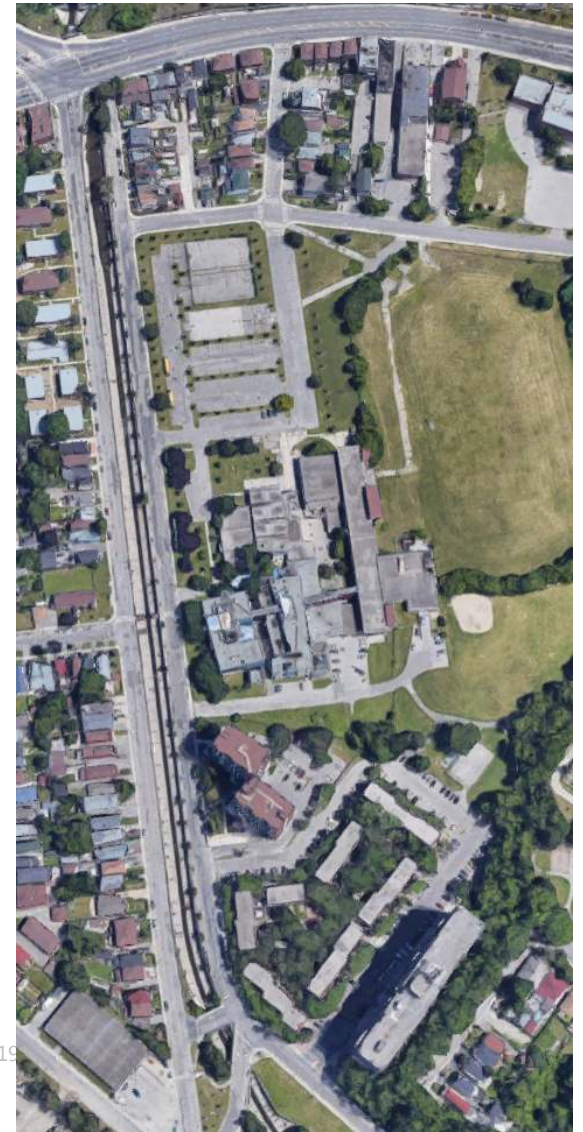
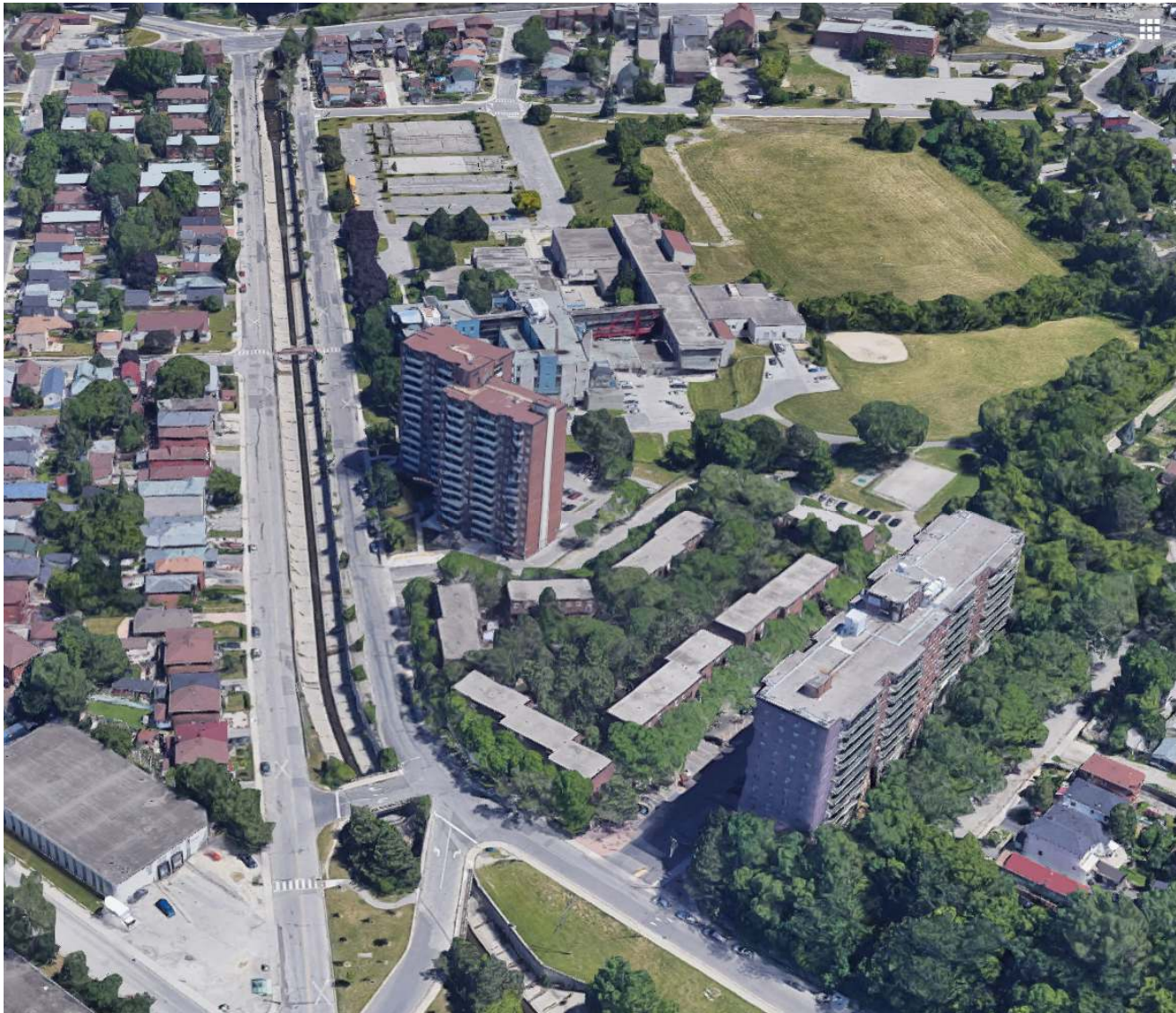
8. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



8. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



2019

8. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

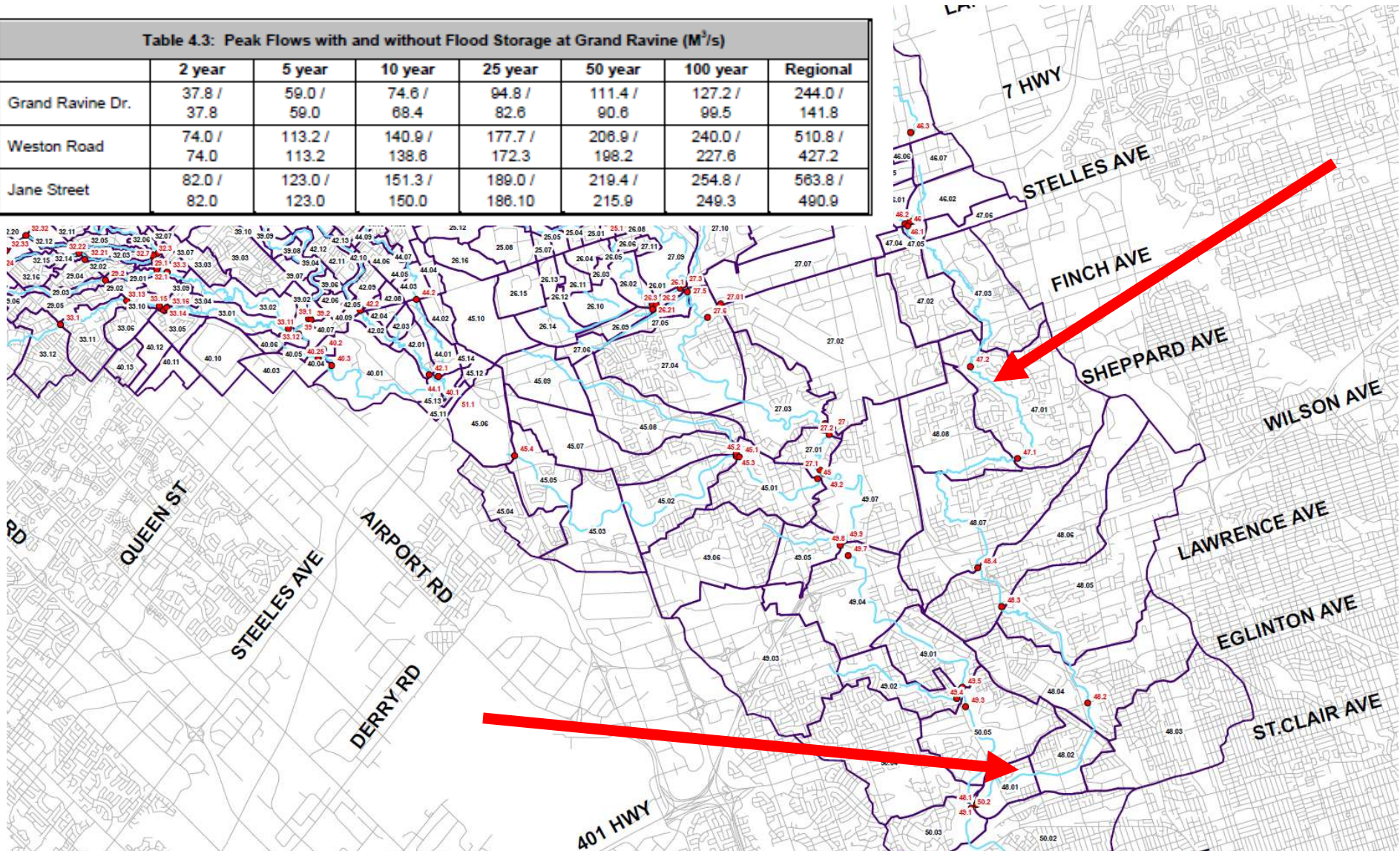


8. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

Table 4.3: Peak Flows with and without Flood Storage at Grand Ravine (M³/s)

	2 year	5 year	10 year	25 year	50 year	100 year	Regional
Grand Ravine Dr.	37.8 / 37.8	59.0 / 59.0	74.6 / 68.4	94.8 / 82.6	111.4 / 90.6	127.2 / 99.5	244.0 / 141.8
Weston Road	74.0 / 74.0	113.2 / 113.2	140.9 / 138.6	177.7 / 172.3	208.9 / 198.2	240.0 / 227.6	510.8 / 427.2
Jane Street	82.0 / 82.0	123.0 / 123.0	151.3 / 150.0	189.0 / 186.10	219.4 / 215.9	254.8 / 249.3	563.8 / 490.9



9. Next Steps (Wood)

9. Next Steps (Wood)

1. Select Preferred Lavender Creek Alternatives
2. Commence Phase 2C – Assessment of Alliance Avenue to Weston Road
3. Finalize Phase 2A Report
4. Prepare Phase 2B Report



10. Project Schedule (Wood)

9. Project Schedule (Wood)

- Open Schedule



10. Other Business (All)

Discussion

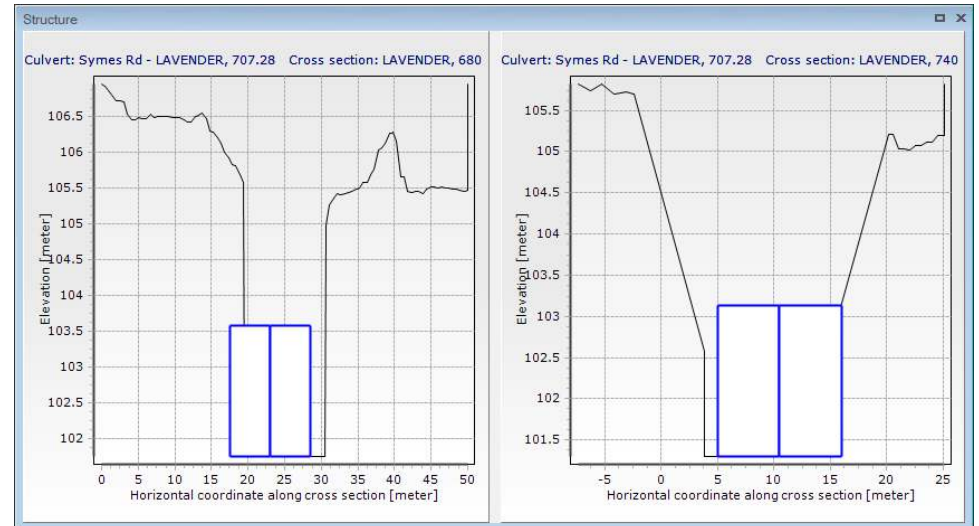
Rockcliffe Model Update

Scenario 5

- Based on scenario 1
- Symes Road Crossing Upgrade to two 5.486 m by 1.829 m box culverts (0.3 m concrete walls)
- Maintain top of culvert at same elevation for sewers
- Widen channel from Symes Road to Black Creek: 22.5 m wide natural channel and 2:1 side slope
- $n = 0.03$ for natural channel

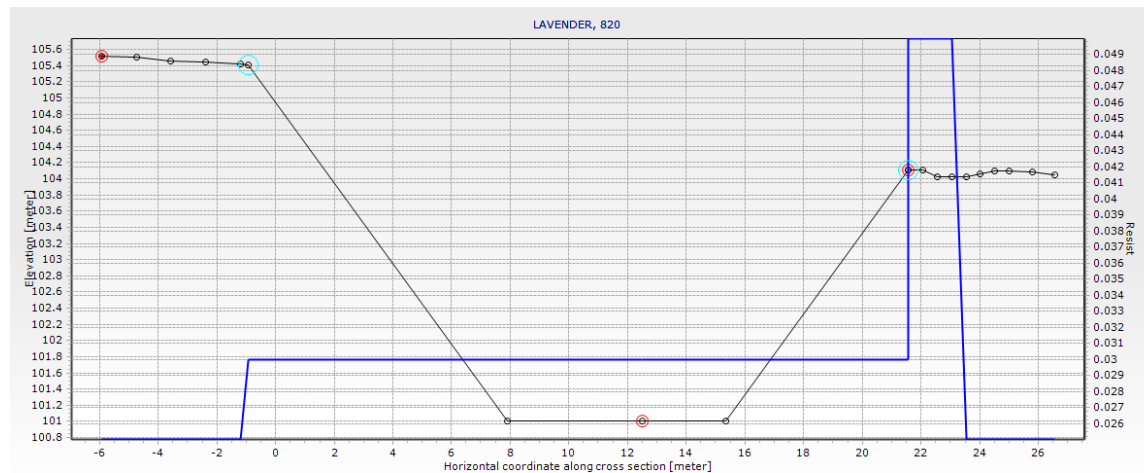
Symes Rd Crossing Design

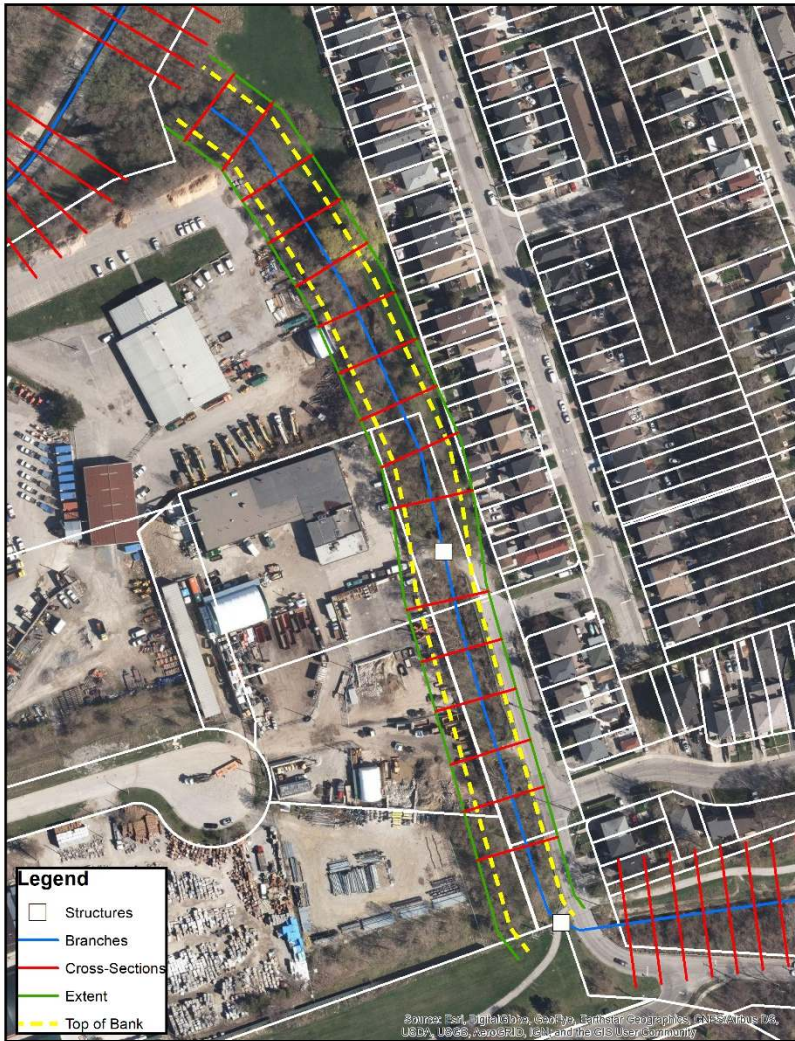
General		Flow Conditions													
Location															
ID:	Symes Rd	Head loss													
Branch name:	LAVENDER	Manning's n:	0.013												
Chainage:	707.28	<table border="1"> <thead> <tr> <th></th> <th>Inflow</th> <th>Outflow</th> <th>Free overflow Bends</th> </tr> </thead> <tbody> <tr> <td>Positive flow</td> <td>0.5</td> <td>1</td> <td>1</td> </tr> <tr> <td>Negative flow</td> <td>0.5</td> <td>1</td> <td>0</td> </tr> </tbody> </table>			Inflow	Outflow	Free overflow Bends	Positive flow	0.5	1	1	Negative flow	0.5	1	0
	Inflow	Outflow	Free overflow Bends												
Positive flow	0.5	1	1												
Negative flow	0.5	1	0												
Type:	Regular	Flow blockage													
Graphics		<input type="checkbox"/> Apply flow factor Flow factor: 1													
Horizontal offset from maker 2:	5 <input type="button" value="Plot/Refresh"/>	<table border="1"> <tbody> <tr> <td>Upstream invert:</td> <td>101.75</td> </tr> <tr> <td>Downstream invert:</td> <td>101.3</td> </tr> <tr> <td>Length:</td> <td>43.2</td> </tr> <tr> <td>No. of culverts:</td> <td>2</td> </tr> <tr> <td>Section type:</td> <td>Closed</td> </tr> </tbody> </table>		Upstream invert:	101.75	Downstream invert:	101.3	Length:	43.2	No. of culverts:	2	Section type:	Closed		
Upstream invert:	101.75														
Downstream invert:	101.3														
Length:	43.2														
No. of culverts:	2														
Section type:	Closed														
Attribute															
Valve:	None														
Geometry															
Type:	Rectangular														
Width:	5.486														
Height:	1.829														



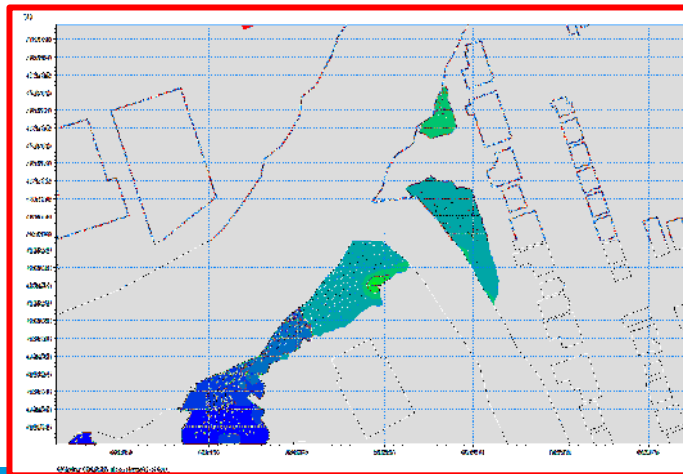
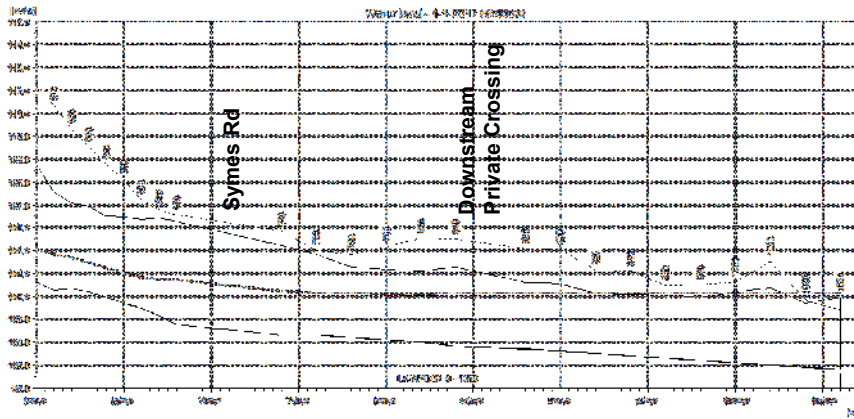
Channel widening

- As per Scenario 1 but with channel widened to 22.5 m total width and 2:1 side slope.
- $n = 0.03$ for natural channel
- Cross sections upstream from Symes Road are gradually widened.

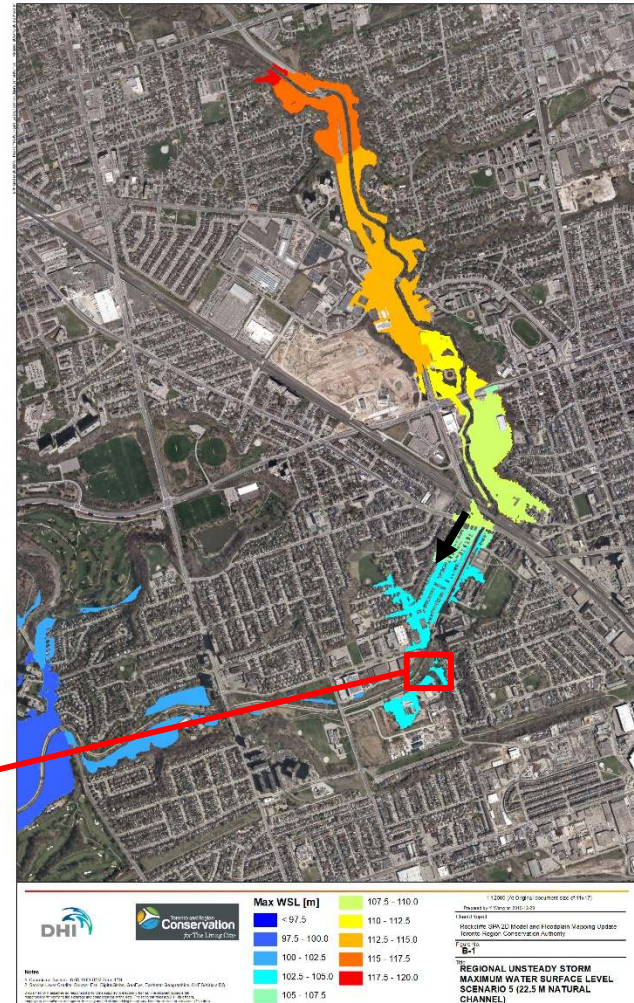




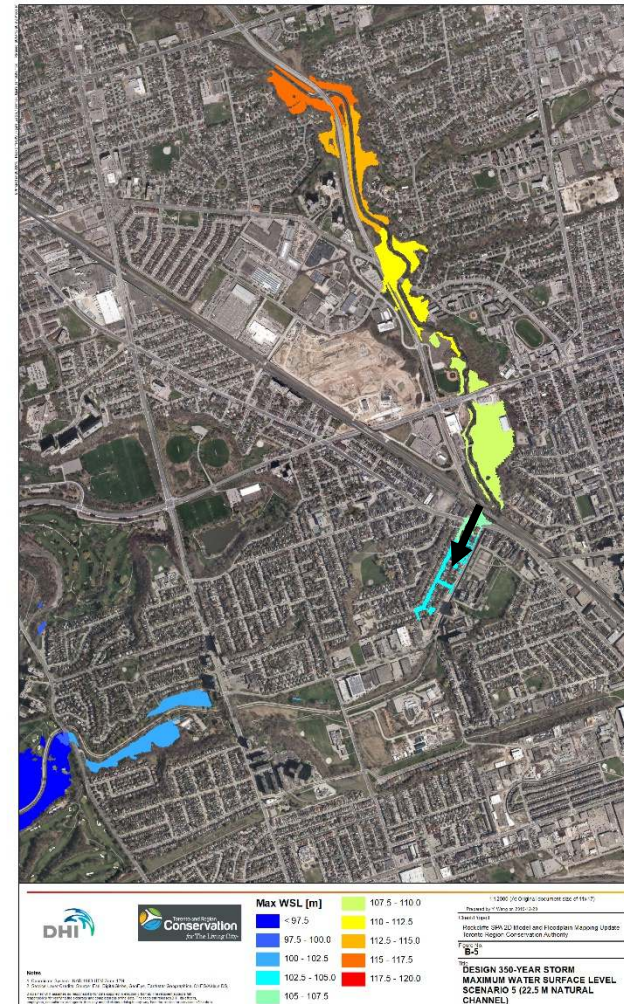
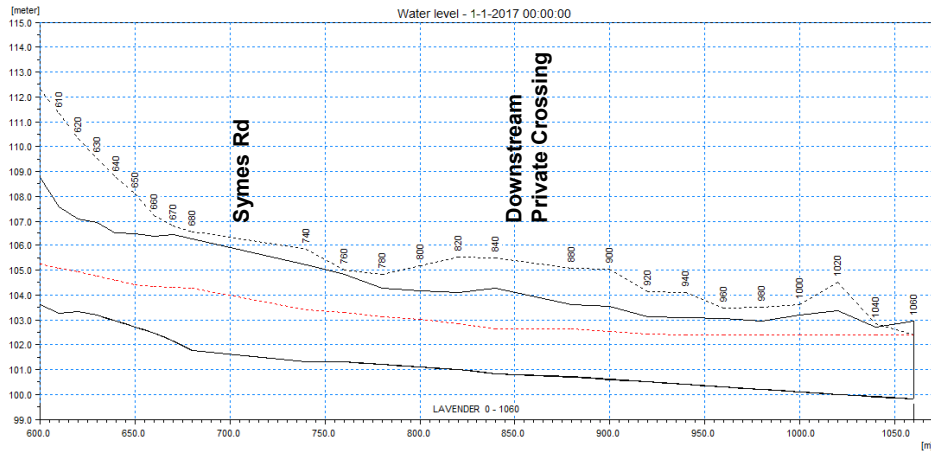
Scenario 5 – Regional Event



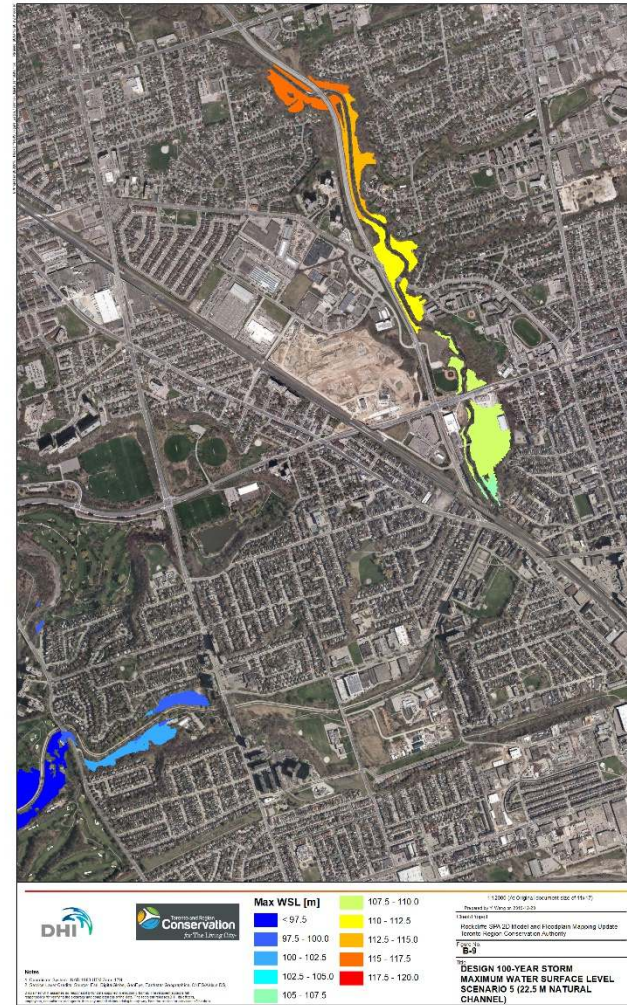
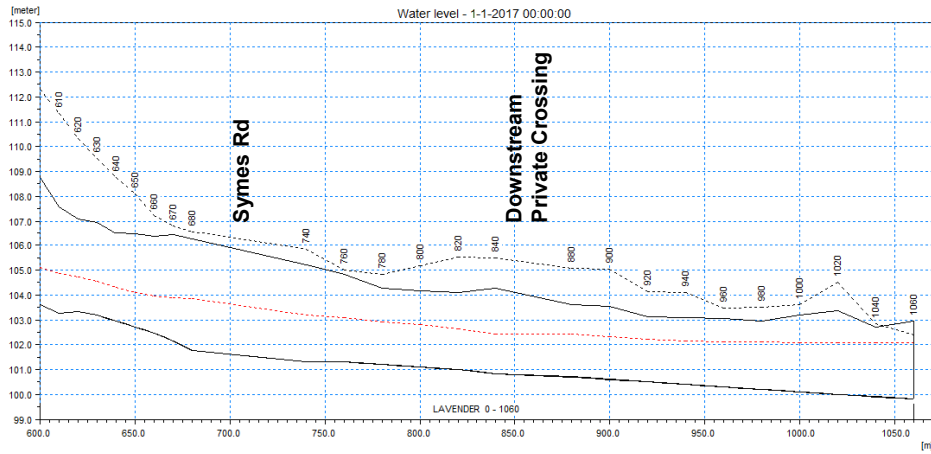
© DHI



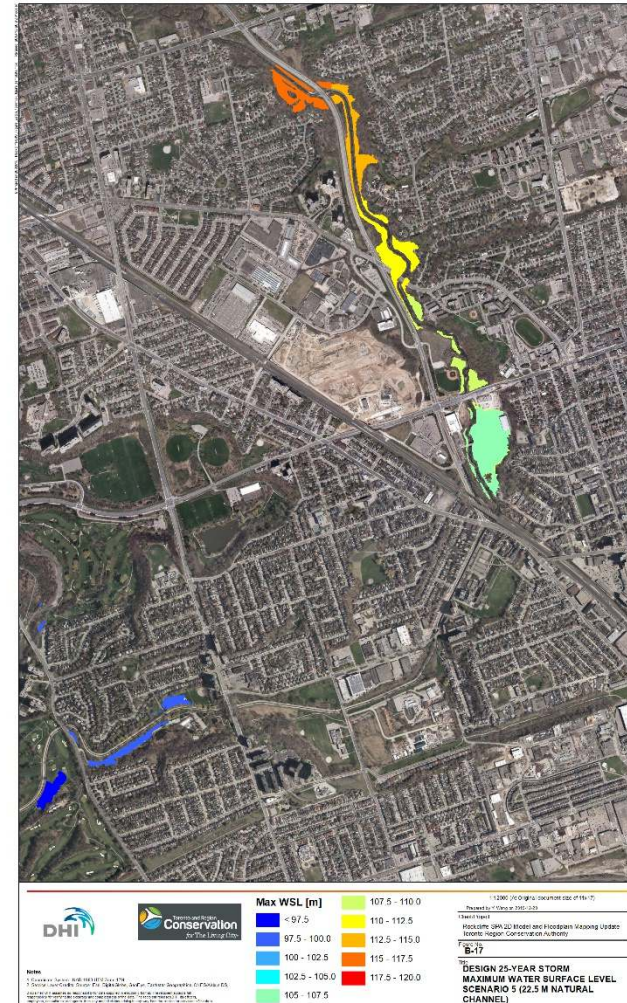
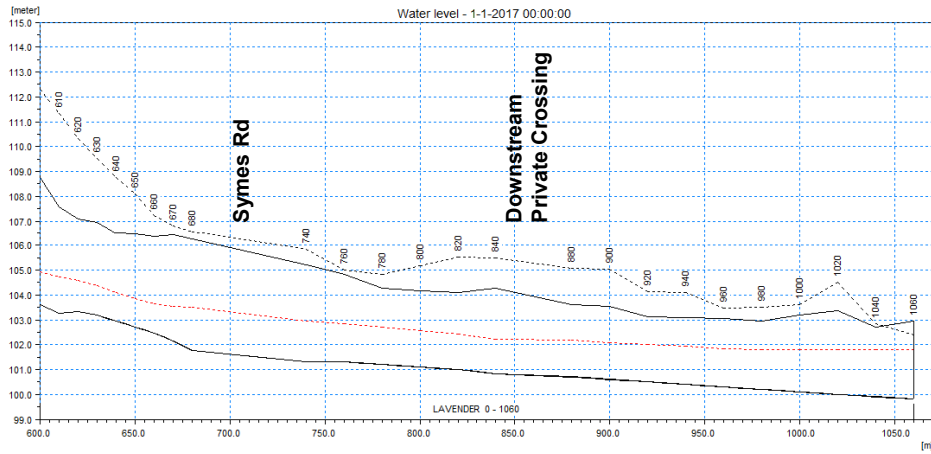
Scenario 5 – 350Yr Event



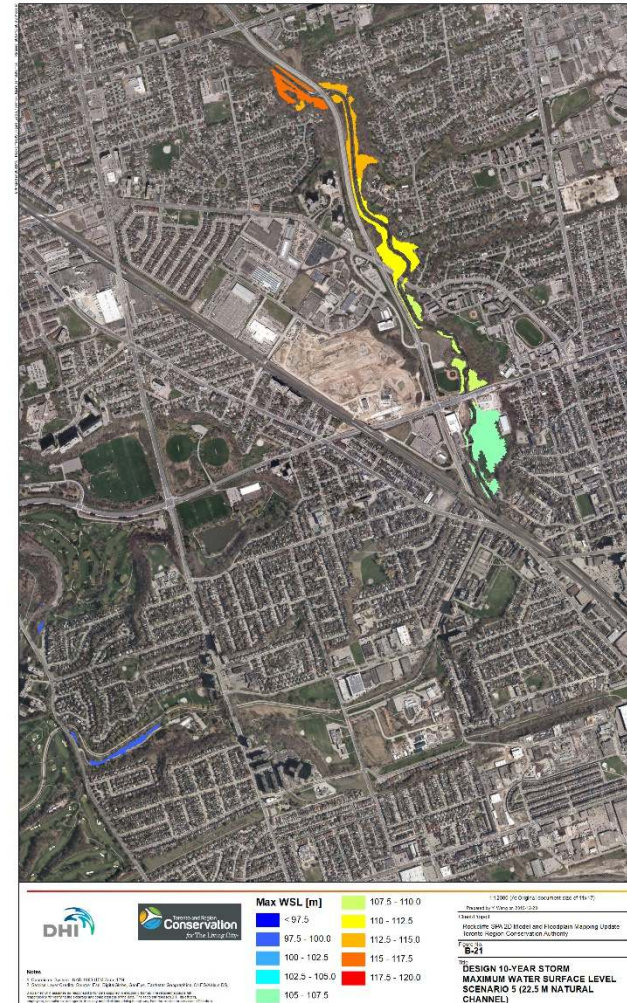
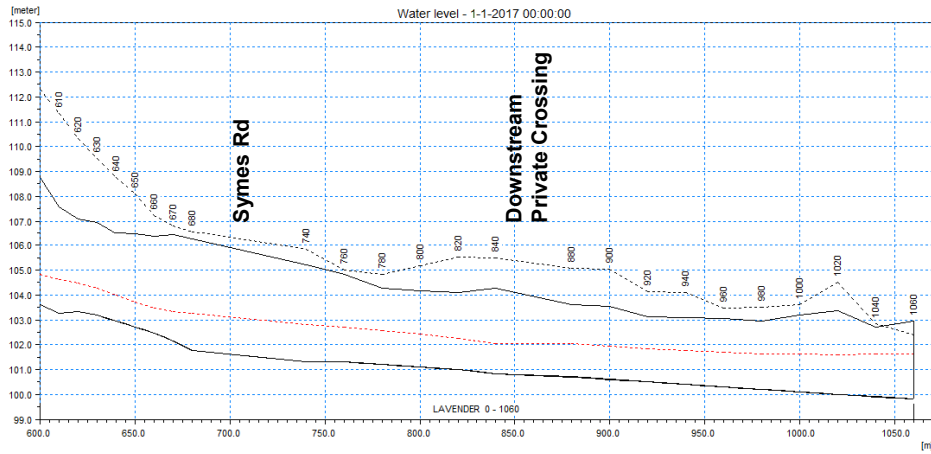
Scenario 5 – 100Yr Event



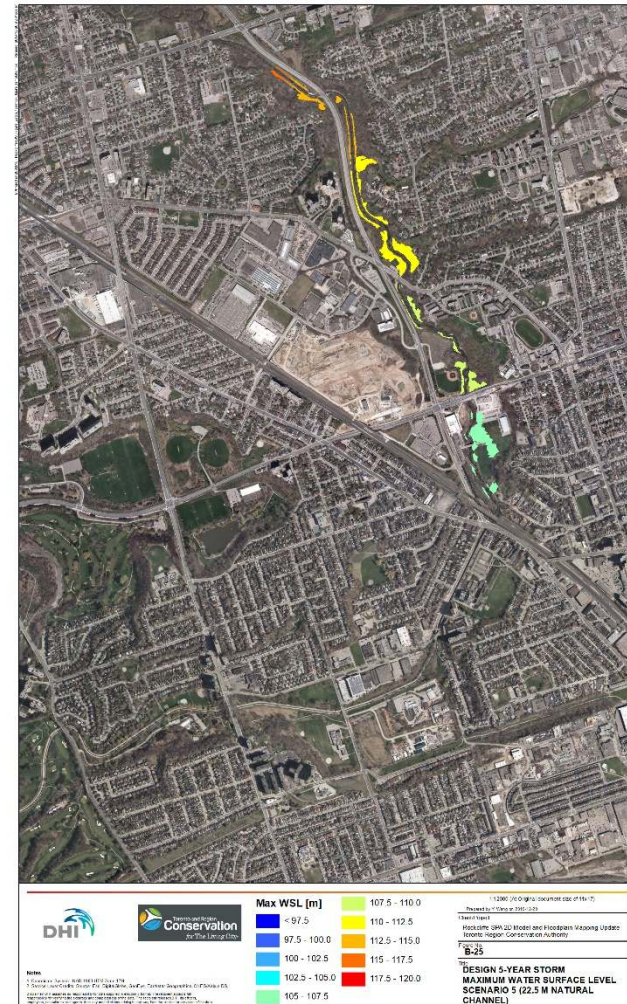
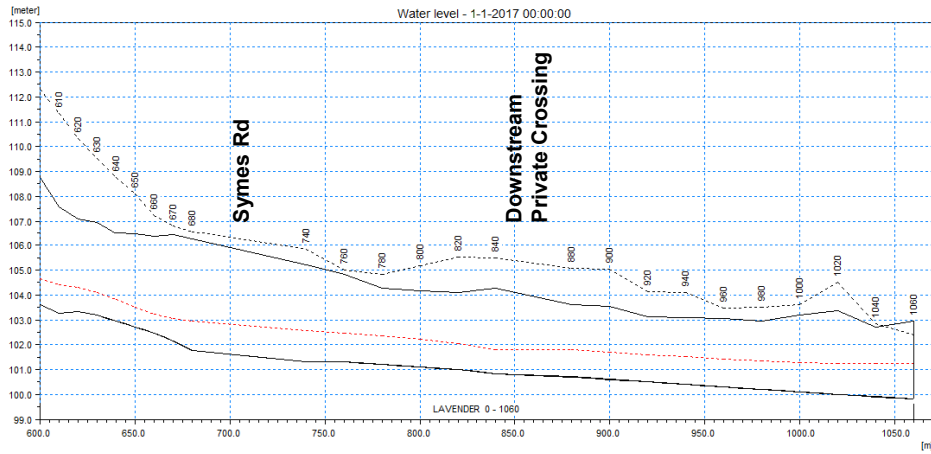
Scenario 5 – 25Yr Event



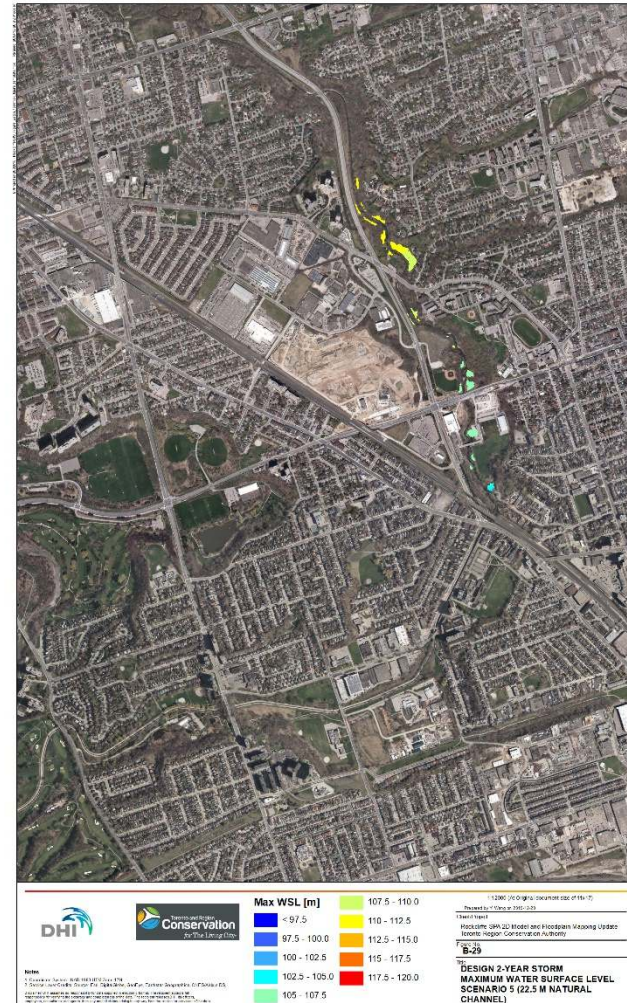
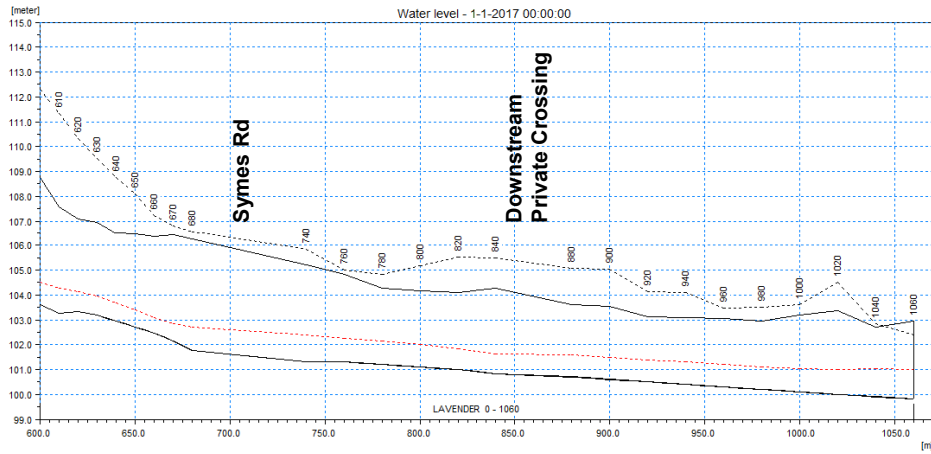
Scenario 5 – 10Yr Event



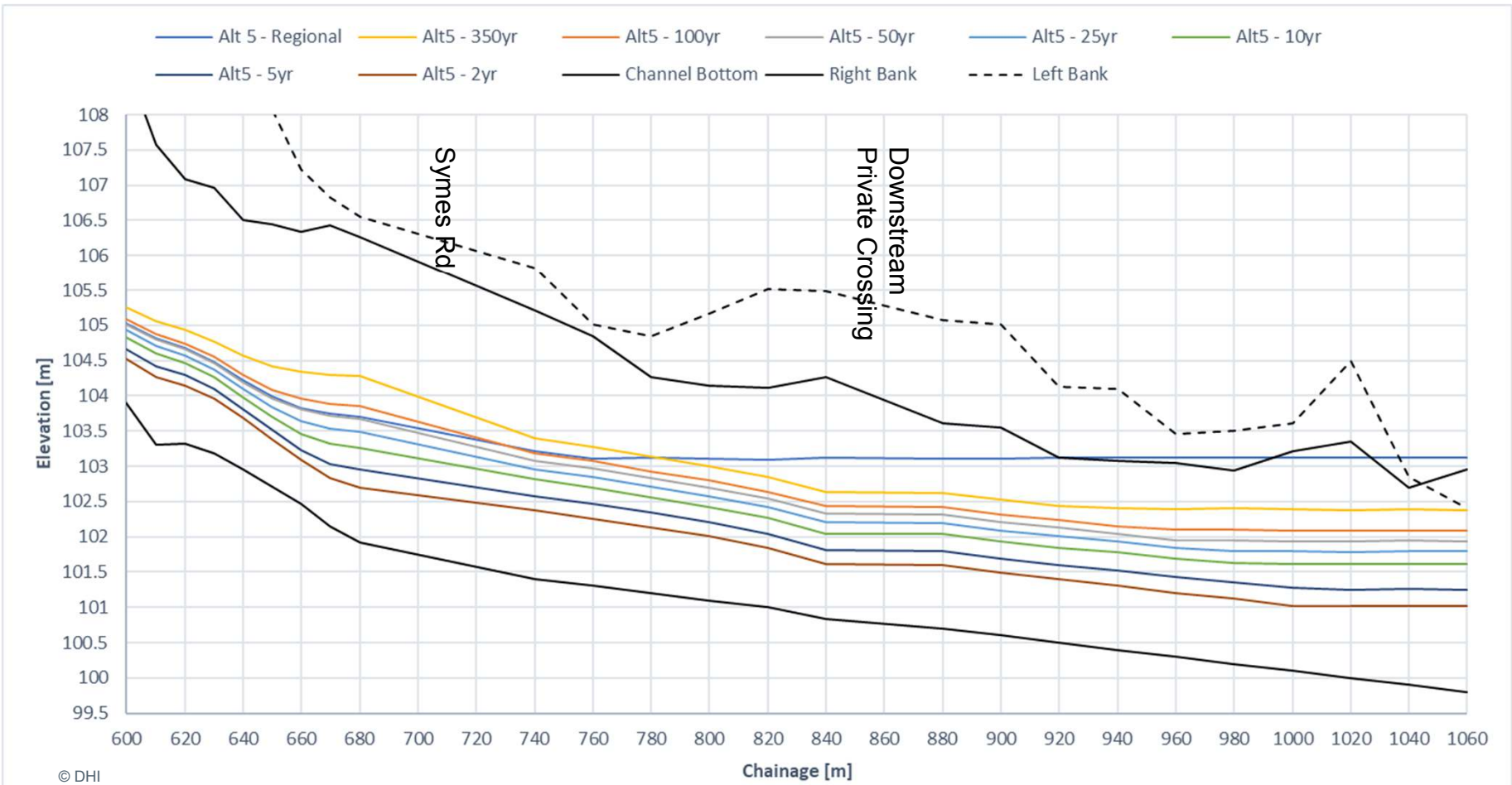
Scenario 5 – 5Yr Event



Scenario 5 – 2Yr Event

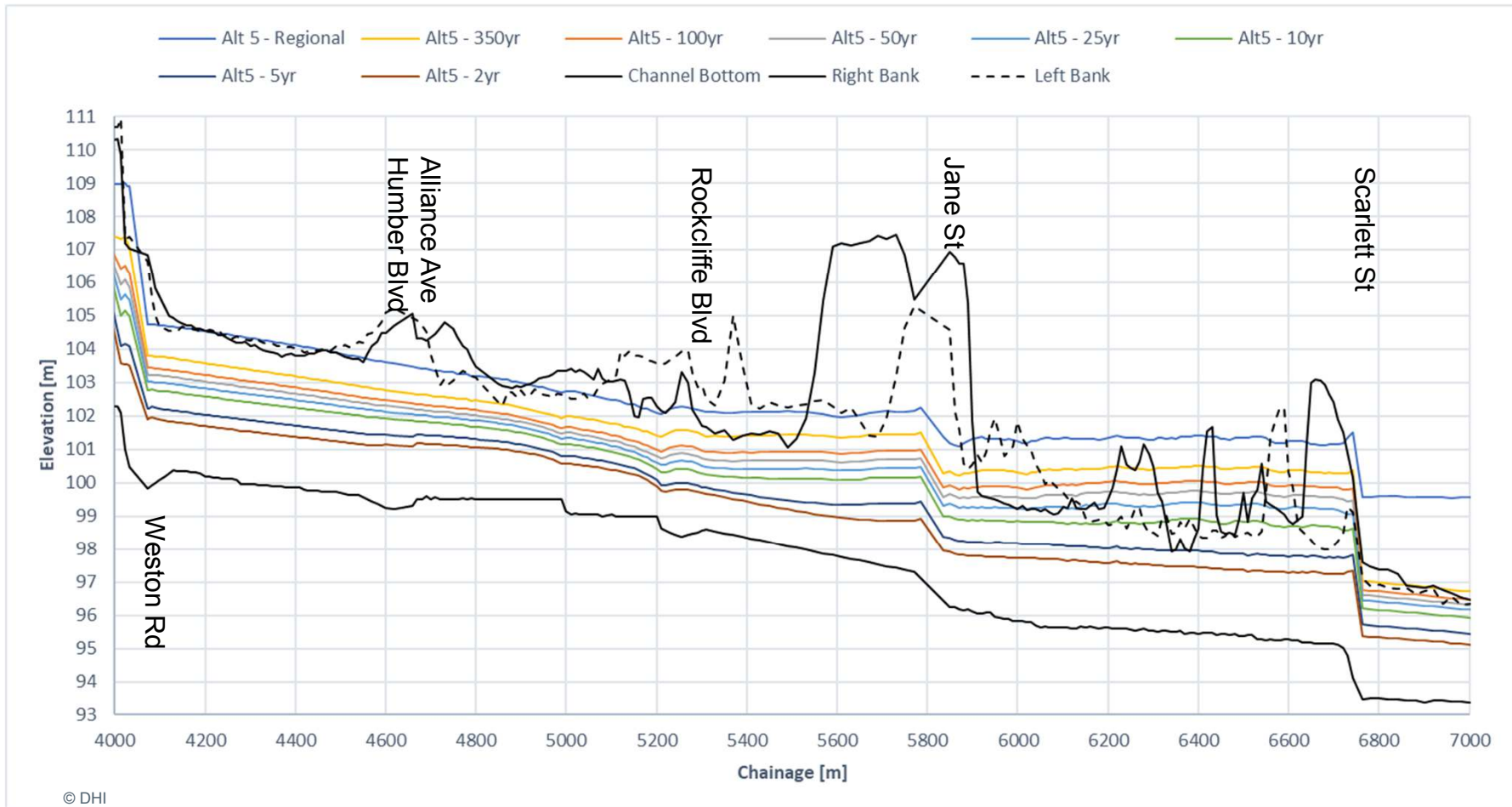


Max. Water Surface Level in All Events



Max. Water Surface Level in All Events

Max. Water Surface Level in All Events



wood.

**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

woodplc.com





wood.

FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

**February 12, 2020 Phase 2C Results Review
Milestone Meeting #5**



Agenda

1. Introductions (Wood)
2. Review of December 20, 2019 Meeting Minutes (Wood)
3. Geotechnical Investigation Update (Wood)
4. Phase 2A and 2B Recap (Wood)
5. Phase 2C Humber Blvd. Reach Assessment (Wood/ DHI)
6. Next Steps (Wood)
7. Project Schedule (Wood)
8. Other Business (All)



1. Introductions

1. Introductions (Wood)

- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff
- DHI - Hydraulics



2. Review of December 20, 2019 Meeting Minutes (Wood)

2. Review of December 20, 2019 Meeting Minutes

Open Minutes



3. Geotechnical Investigation Updates (Wood)

3. Geotechnical Investigation Update

- Geotechnical Assessment Memo prepared detailing existing conditions. Recommendations for flood mitigation measures underway, with recommendations to be completed in February.



4. Phase 2A and 2B Recap (Wood)

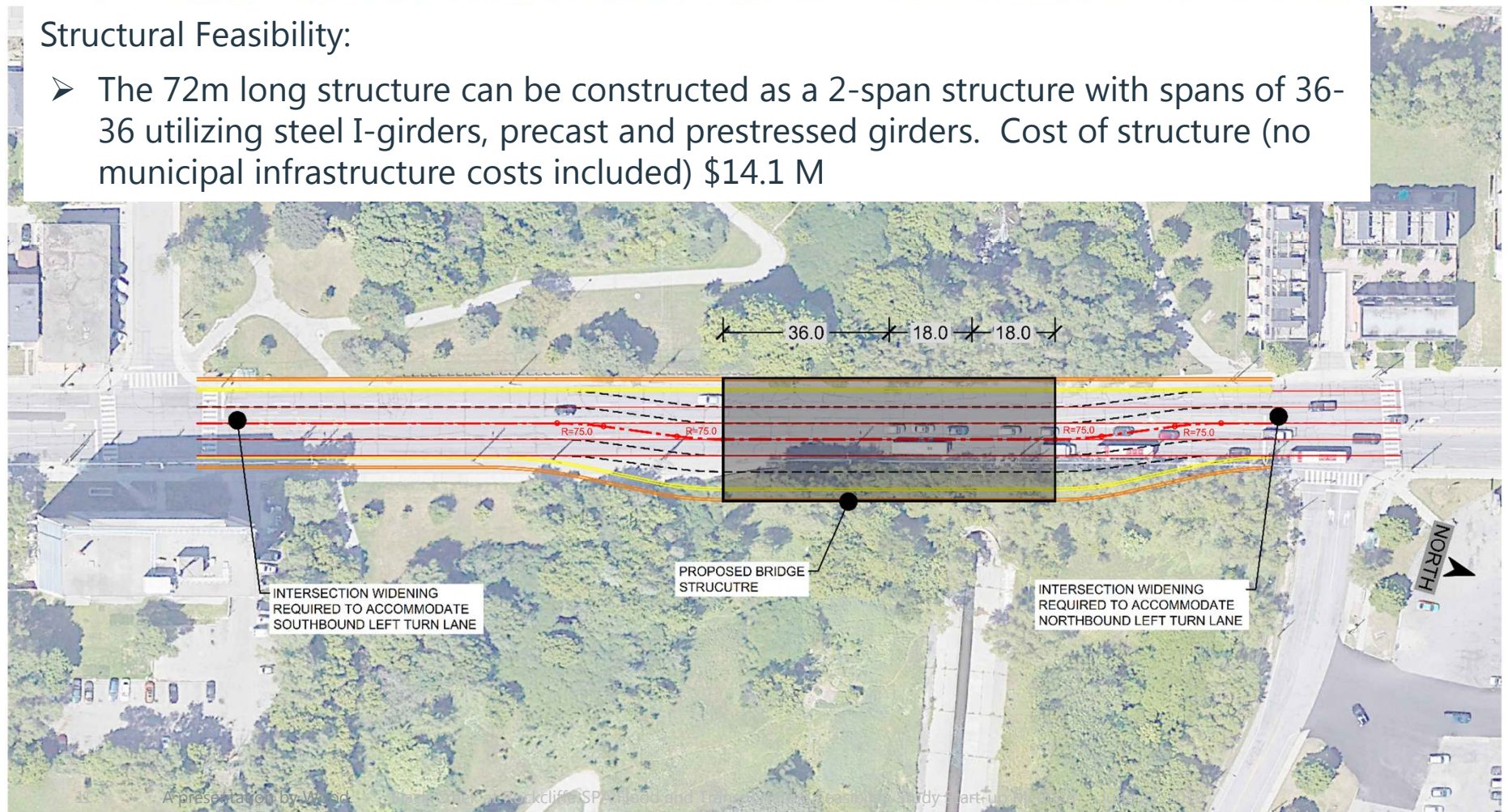
4. Phase 2A and 2B Recap (Wood)

Jane Street 72 m Span Bridge

JANE STREET - OPTION - 72m BRIDGE

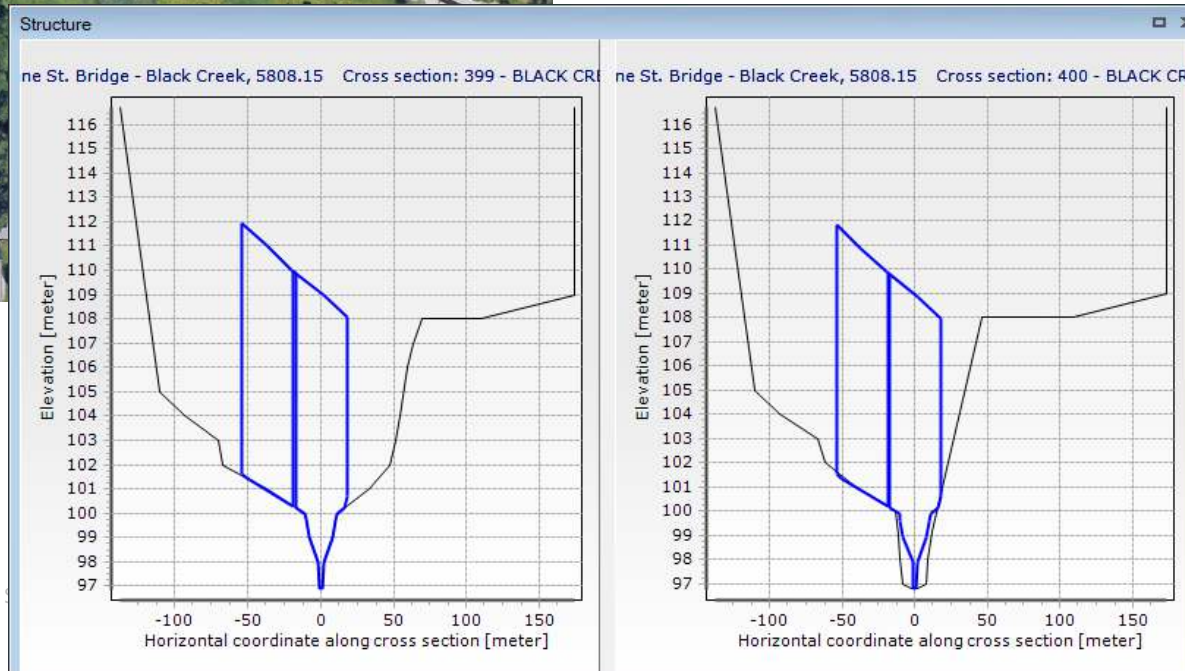
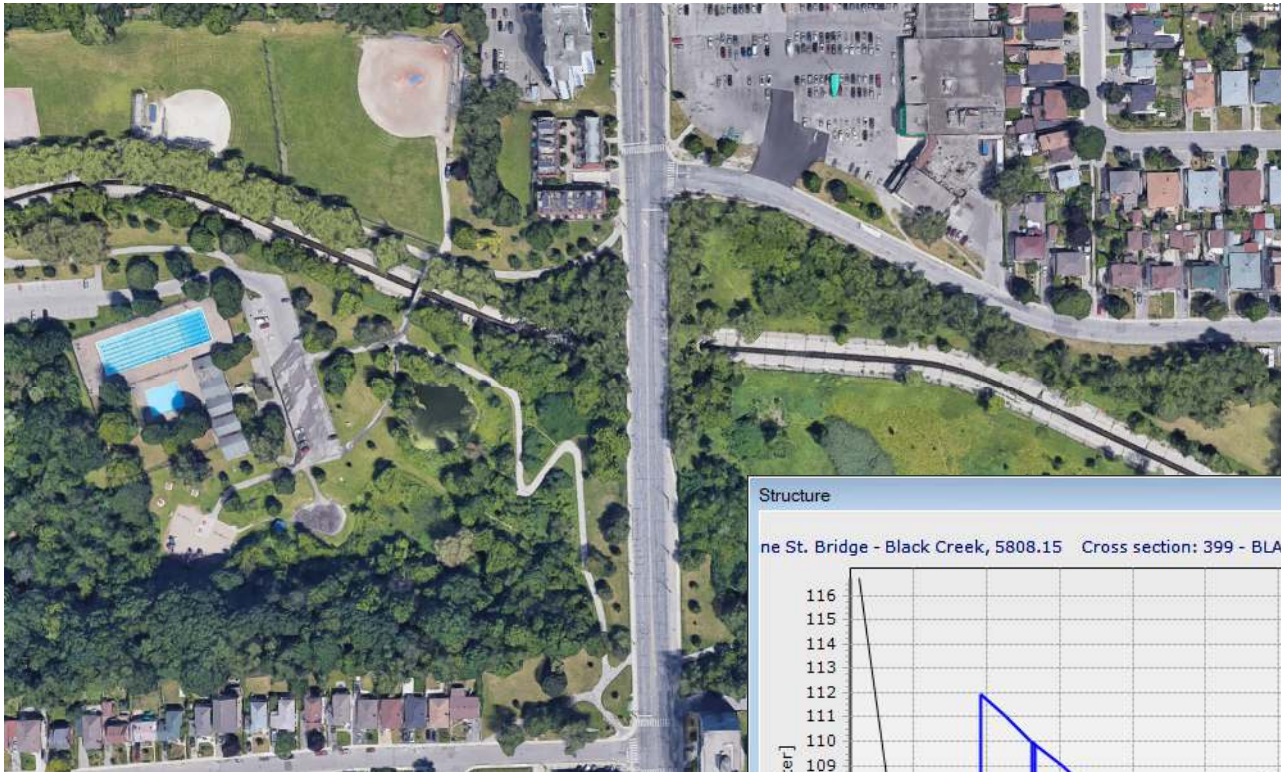
Structural Feasibility:

- The 72m long structure can be constructed as a 2-span structure with spans of 36-36 utilizing steel I-girders, precast and prestressed girders. Cost of structure (no municipal infrastructure costs included) \$14.1 M



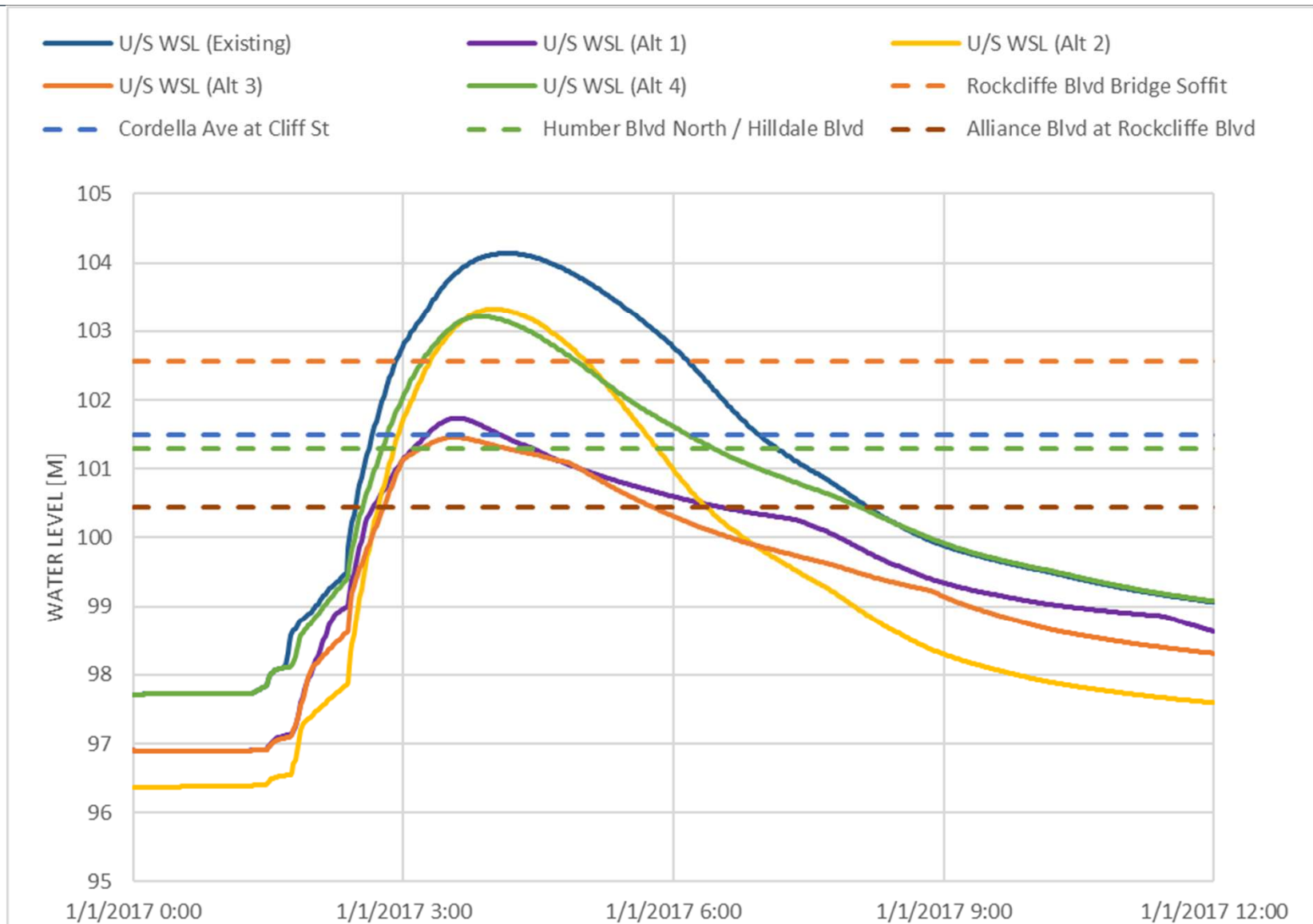
4. Phase 2A and 2B Recap (Wood)

Alternative 3: 72 m Span Bridge



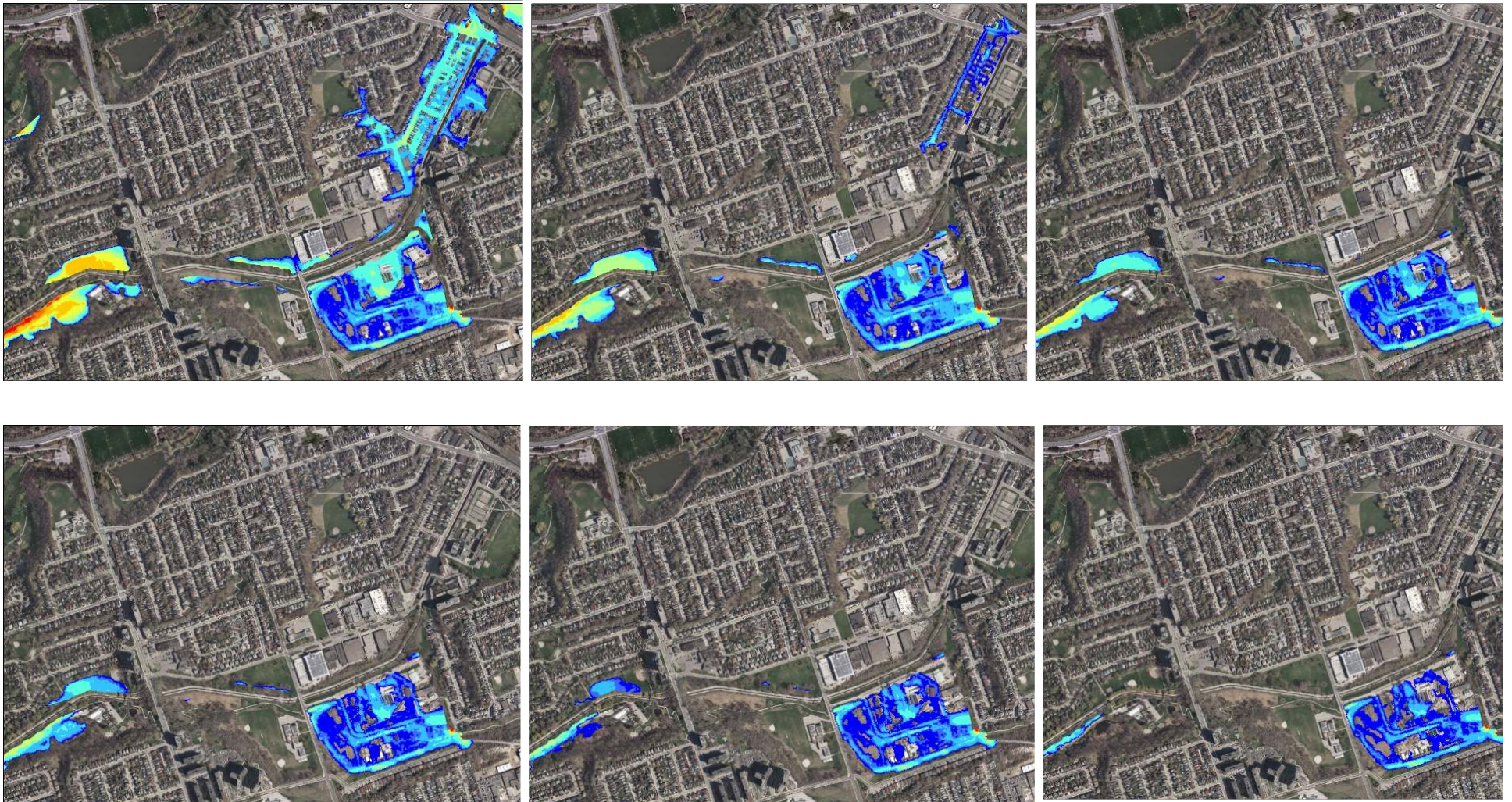
4. Phase 2A and 2B Recap (Wood)

Jane Street 72 m Span Bridge



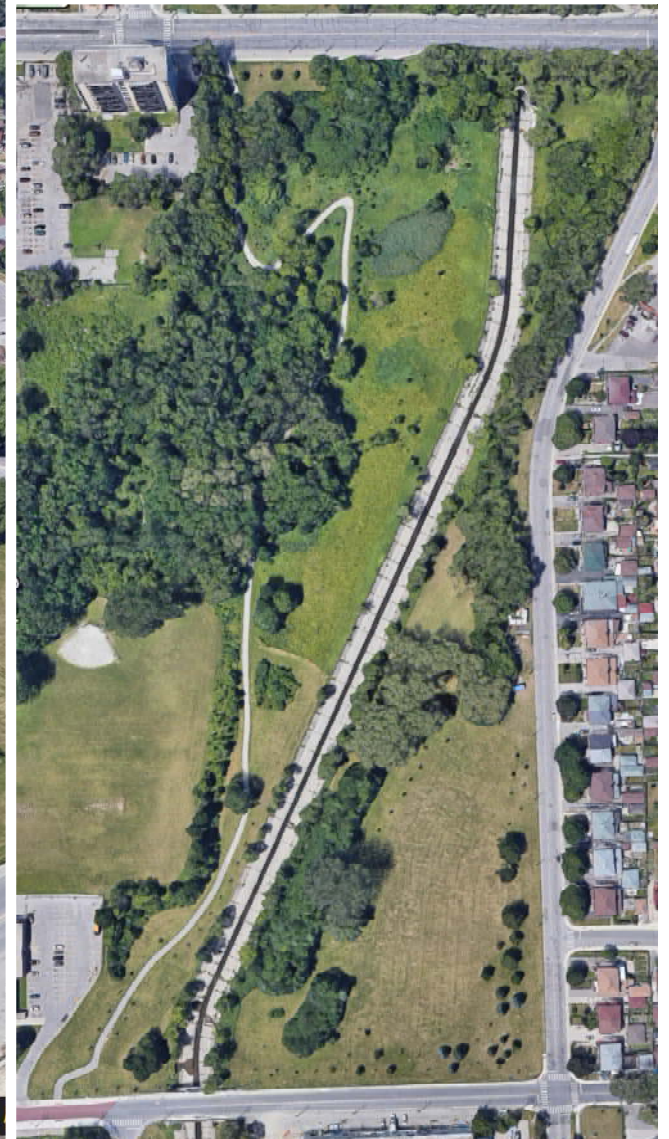
4. Phase 2A and 2B Recap (Wood)

Jane Street 72 m Span Bridge



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Black Creek (Jane Street – Rockcliffe Blvd.)



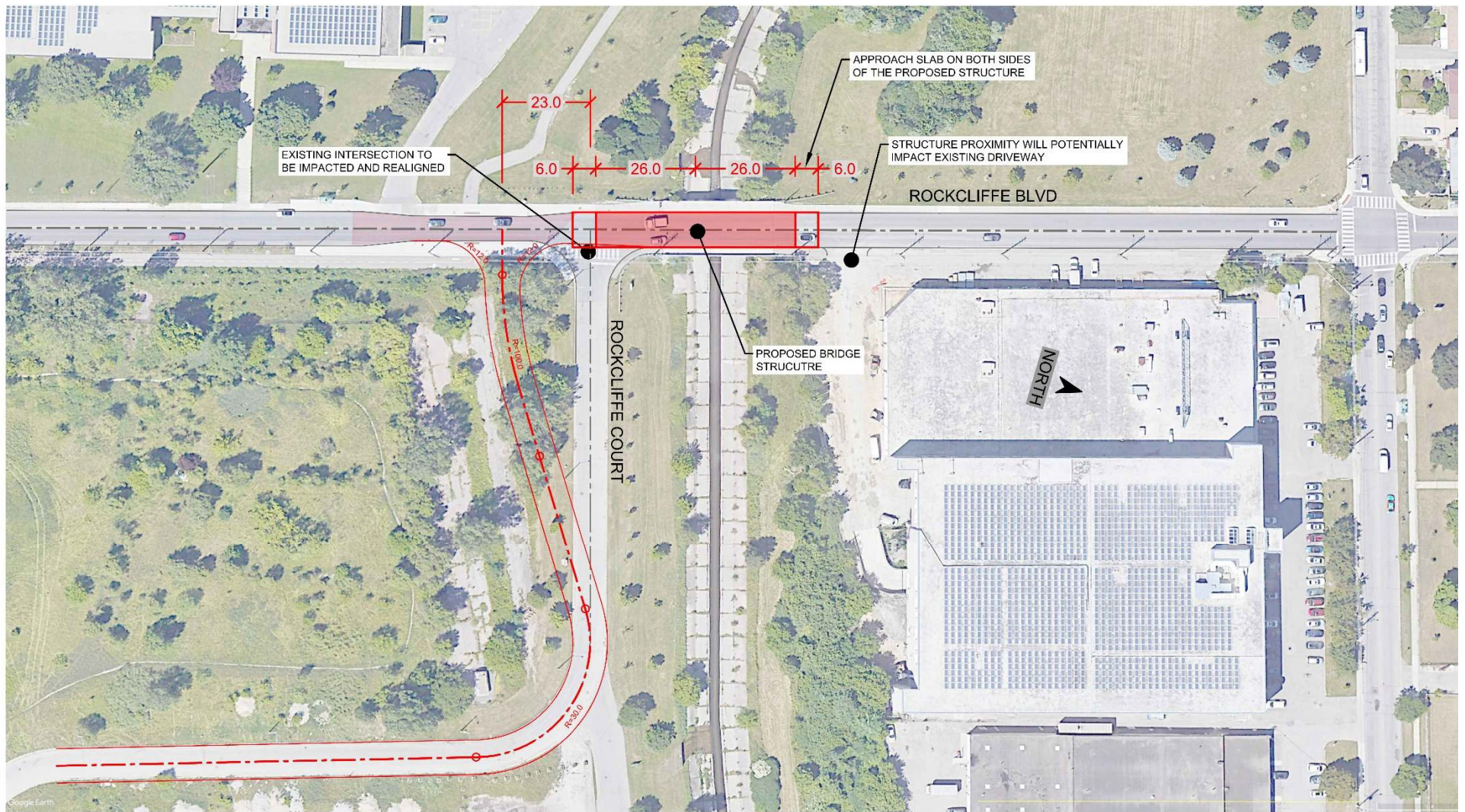
4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Rockcliffe Blvd Crossing



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment – Rockcliffe Blvd Crossing



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Black Creek (Rockcliffe Blvd. – Alliance Ave.)



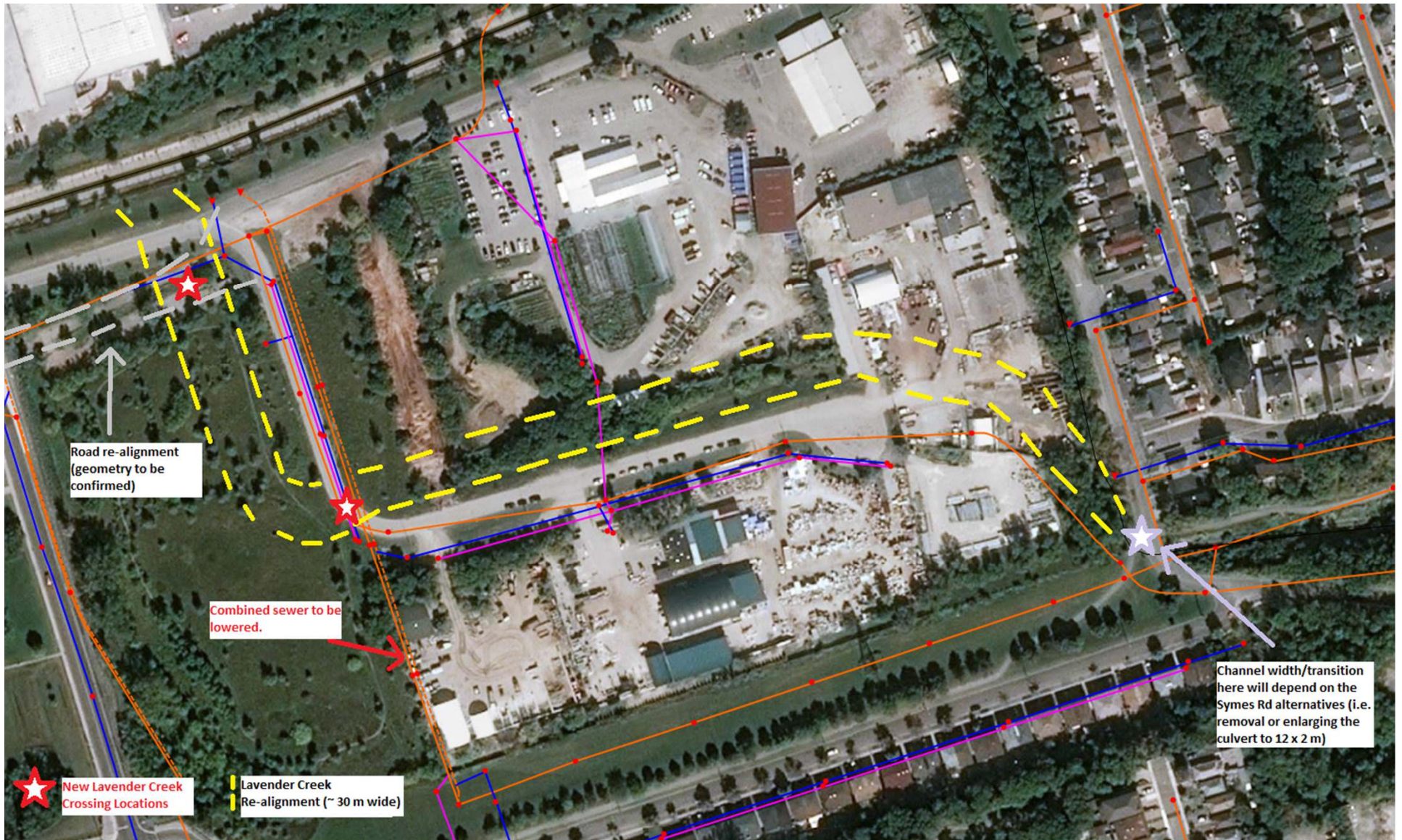
4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment – Widen Lavender Creek



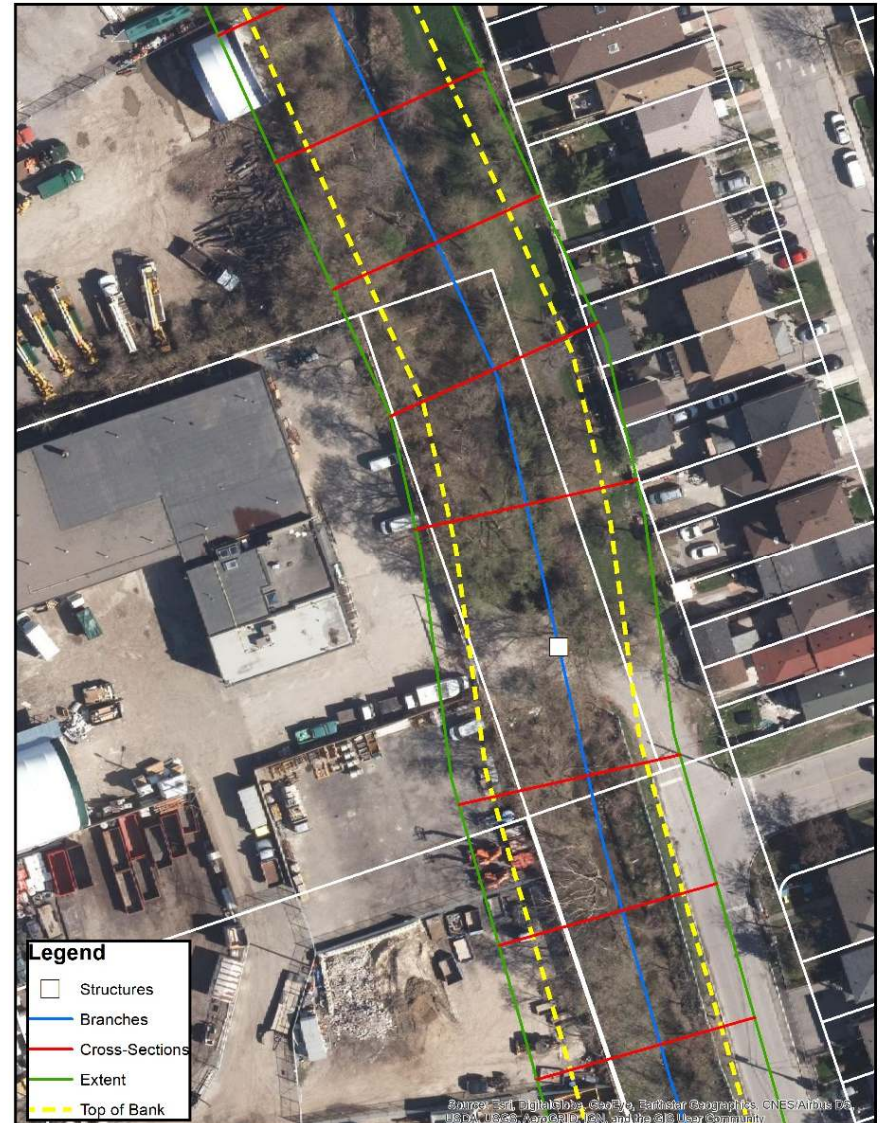
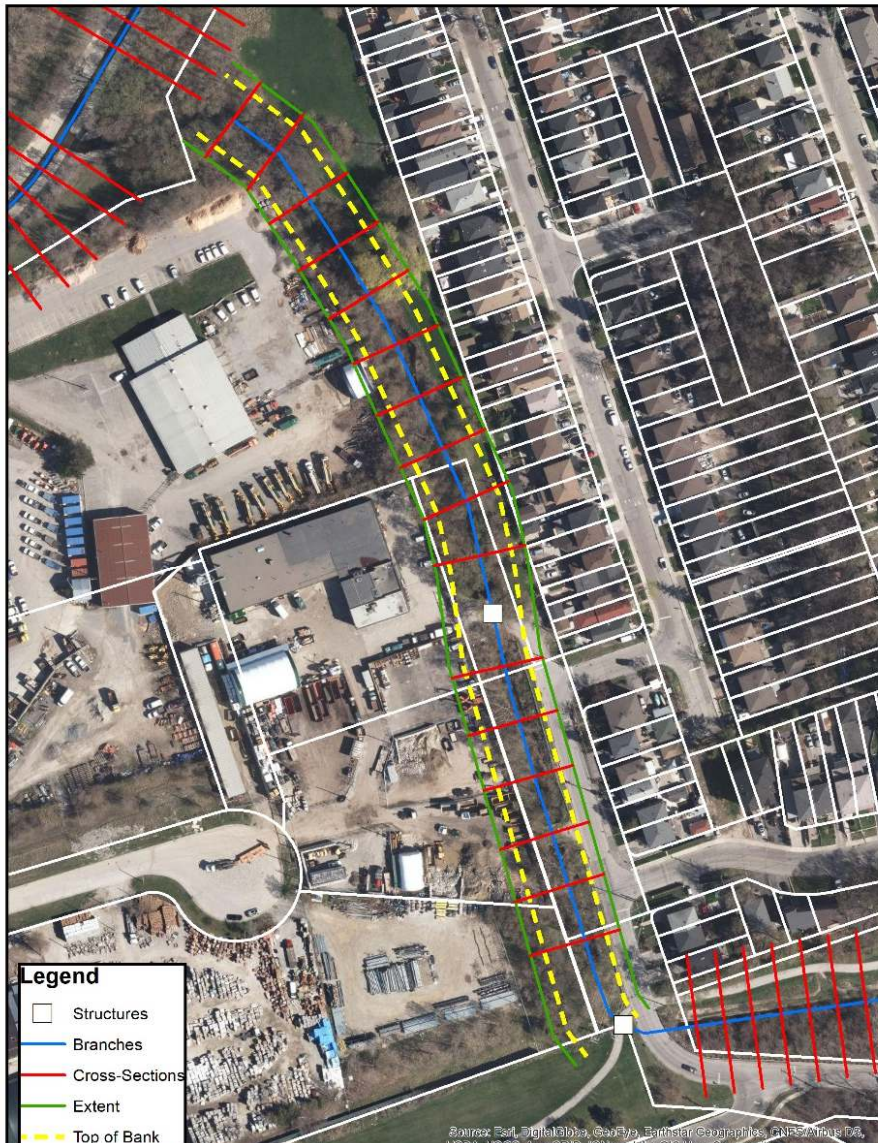
4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Scenarios 4 and 5: Realign Lavender Creek (Screened Out)



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Lavender Creek



tatio

4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Lavender Creek

- Northern Private Crossing 4.8 m by 3 m
- Widen Structure to 20 m span by 3.87 m rise. Span almost accommodates 22.5 m wide creek
- Bridge cost of approximately **\$5.6 M** without infrastructure relocation costs.



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Lavender Creek

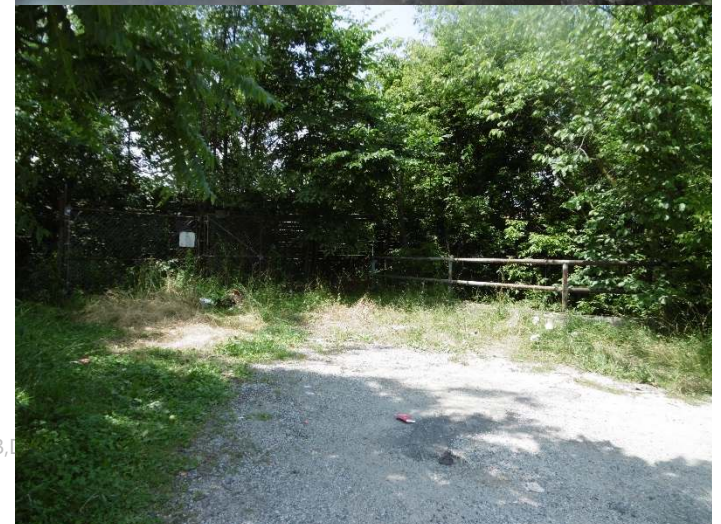
- Northern Private Crossing 4.8 m by 3 m
- Widen Structure to 20 m span by 3.87 m rise. Span almost accommodates 22.5 m wide creek
- Bridge cost of approximately **\$5.6 M** without infrastructure relocation costs.



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment: Widen Lavender Creek

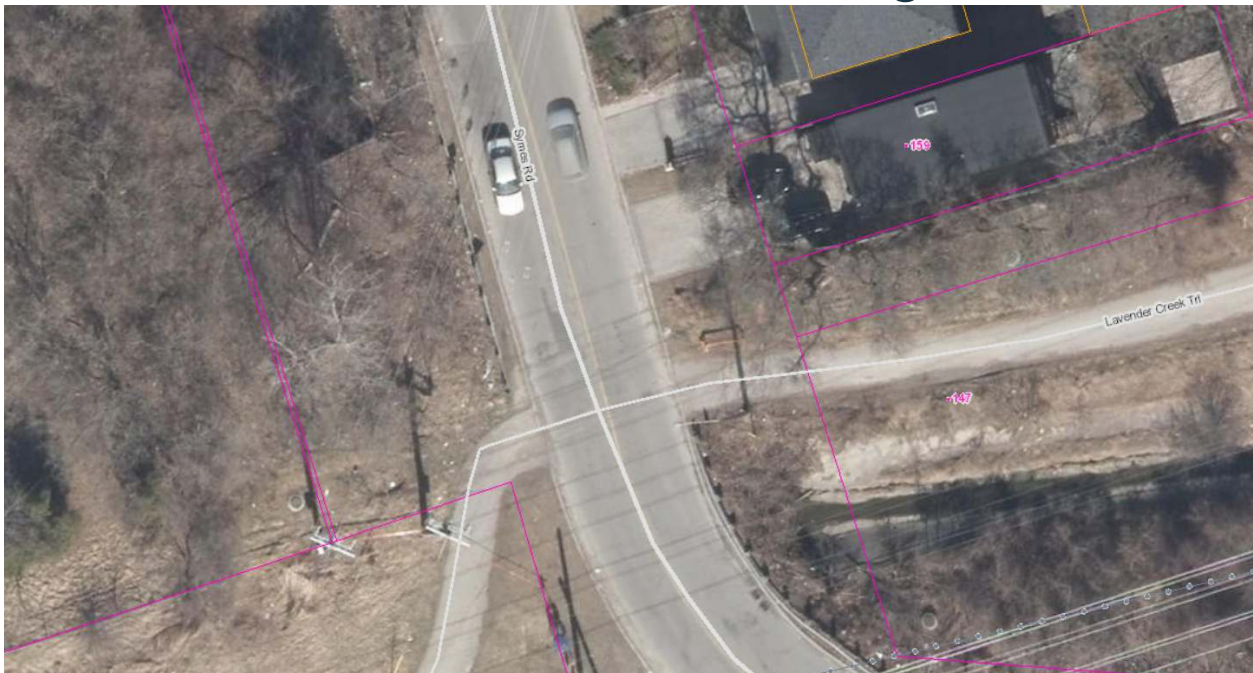
- Southern Private Crossing 4.8 m by 2.1 m
- Remove structure due to lack of use



4. Phase 2A and 2B Recap (Wood)

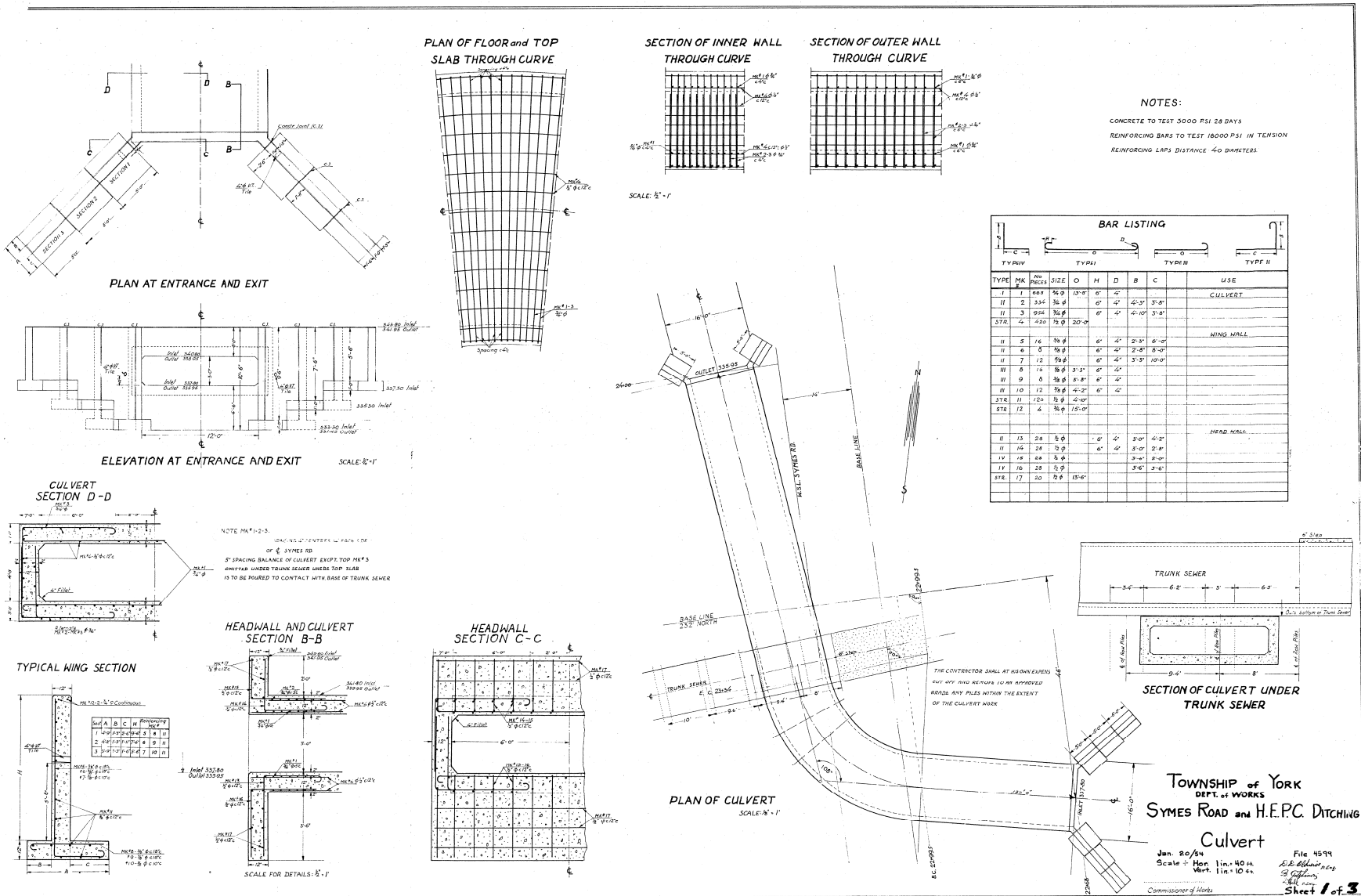
Phase 2B Alternatives Assessment: Widen Lavender Creek

- Symes Road Crossing 3.66 m by 0.90 m rise, 40.2 m long
- Widen Structure to two (2) 5.4 m by 1.8 m
- Culverts cost approximately **\$2.7 M** without infrastructure relocation/ repair costs
- Potential to reduce culvert length



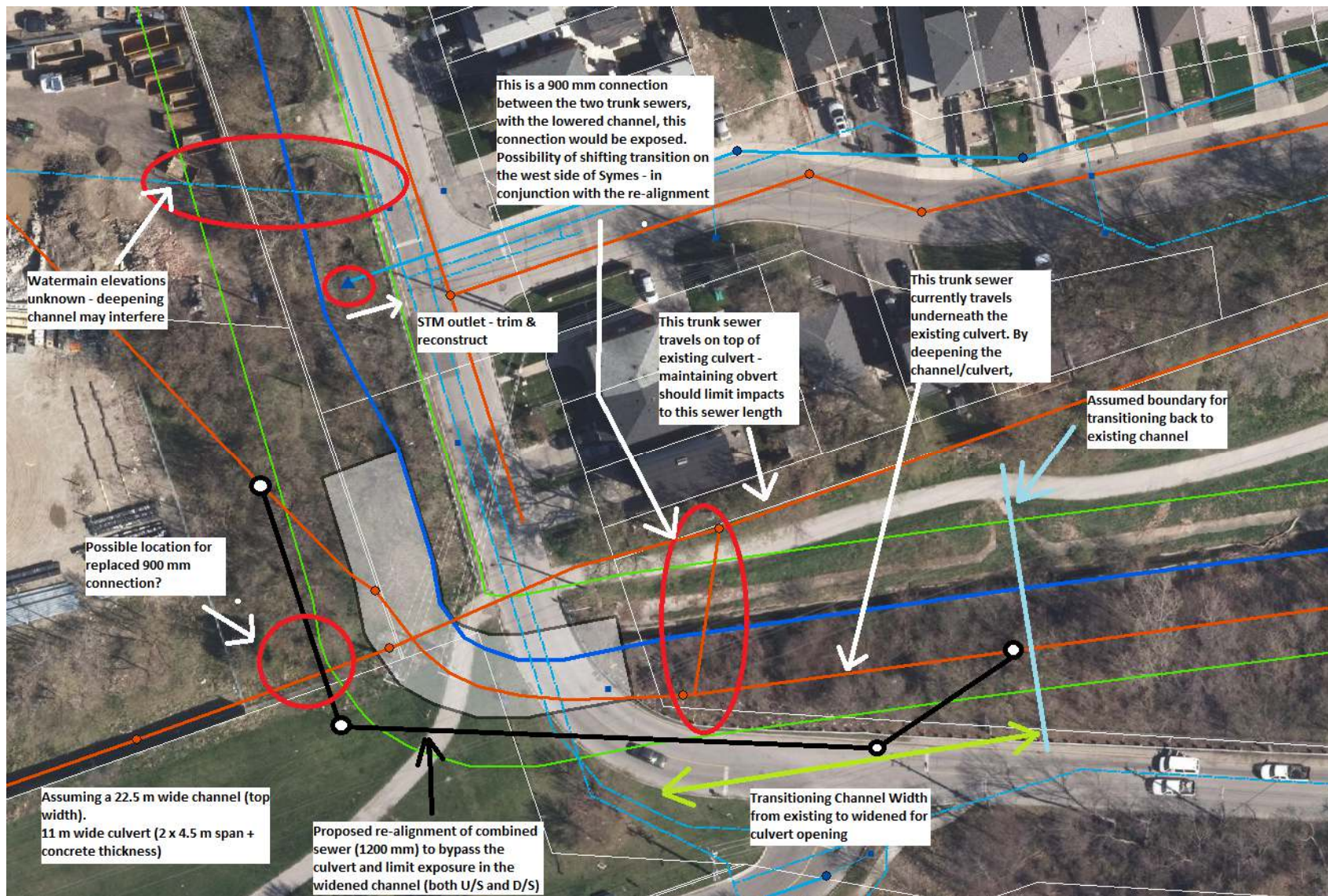
4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment – Widen Lavender Creek



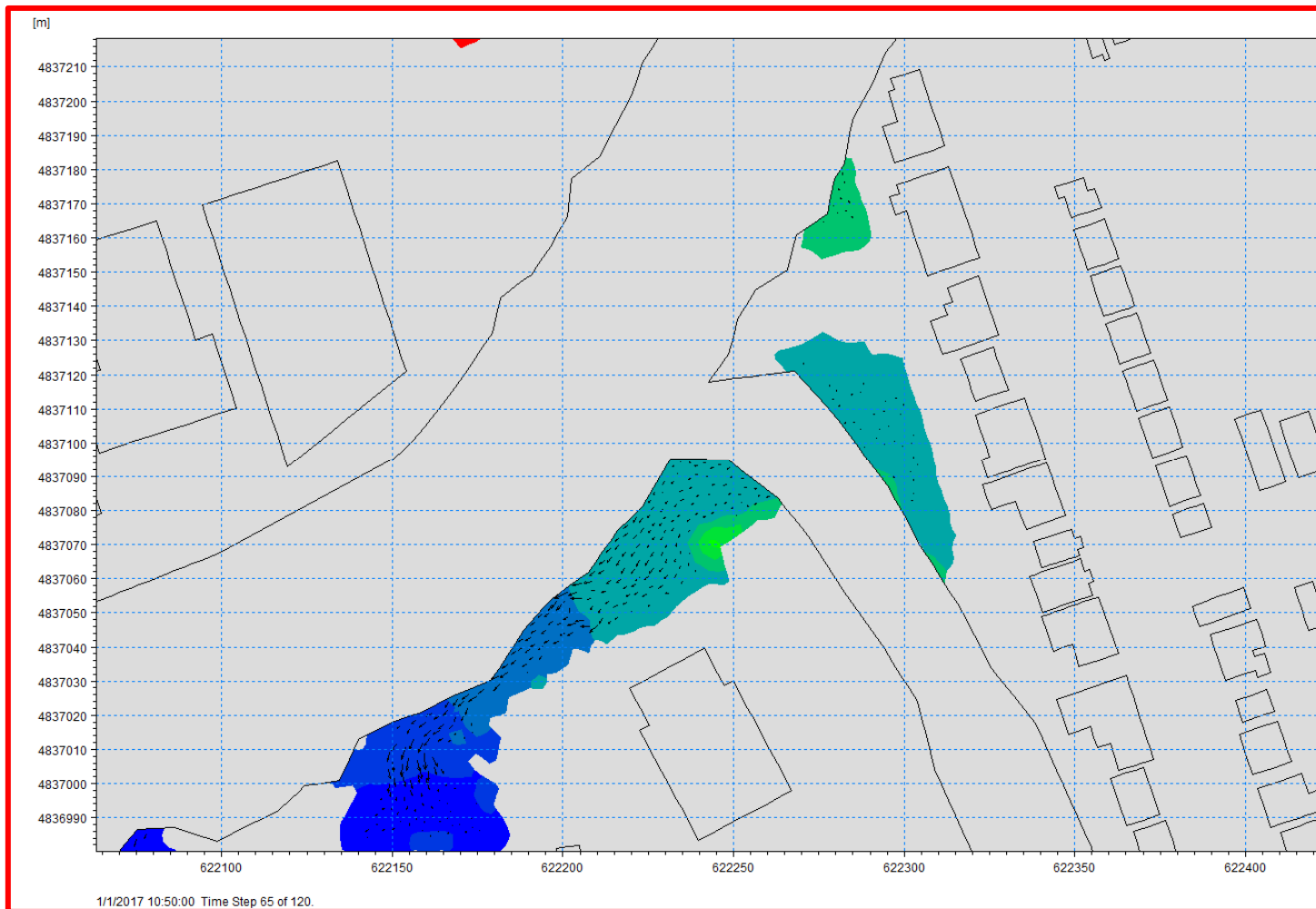
4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment : Widen Lavender Creek



4. Phase 2A and 2B Recap (Wood)

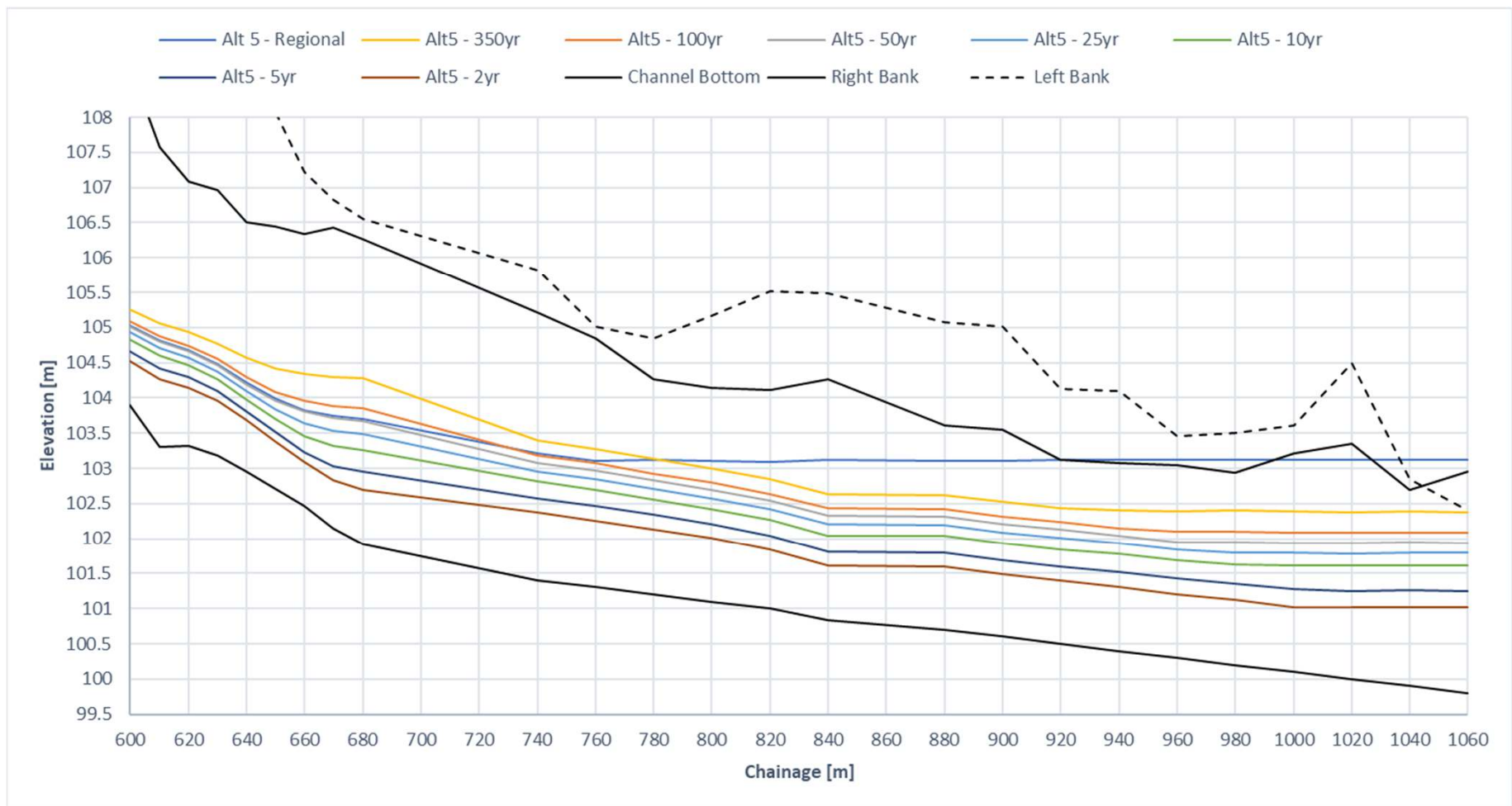
Phase 2B Alternatives Assessment – Widen Lavender Creek



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment – Widen Lavender Creek

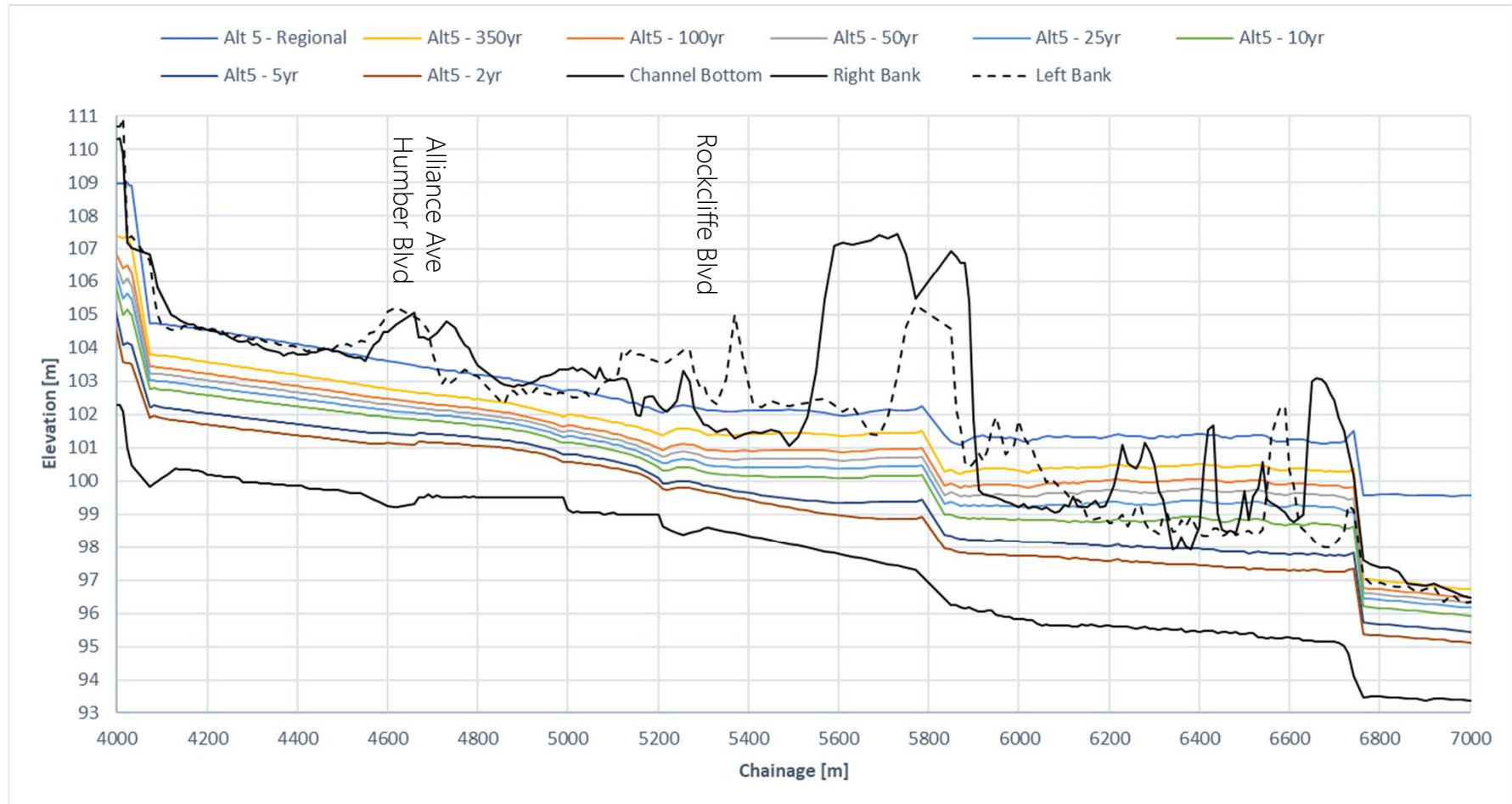
Max. Water Surface Level in All Events



4. Phase 2A and 2B Recap (Wood)

Phase 2B Alternatives Assessment – Widen Lavender Creek

Max. Water Surface Level in All Events



4. Phase 2A and 2B Recap (Wood)

Phases 2A and 2B Alternatives Assessment : Summary

- Jane Street Bridge **\$15 M**
- Widen Black Creek (Jane Street to Rockcliffe Blvd. **\$6.9 M** (includes \$3.5 M for infrastructure works along channel and at Jane Street Bridge)
- Rockcliffe Blvd. Bridge: **\$6.0 M**
- Widen Black Creek (Rockcliffe Blvd.to Alliance Ave.) **\$5.05 M**
- Private crossing of Lavender Creek **\$5.6 M**
- Symes Road culverts: **\$2.7 M**
- Widen Lavender Creek: **\$2.6 M**
- **TOTAL \$43.85 M**

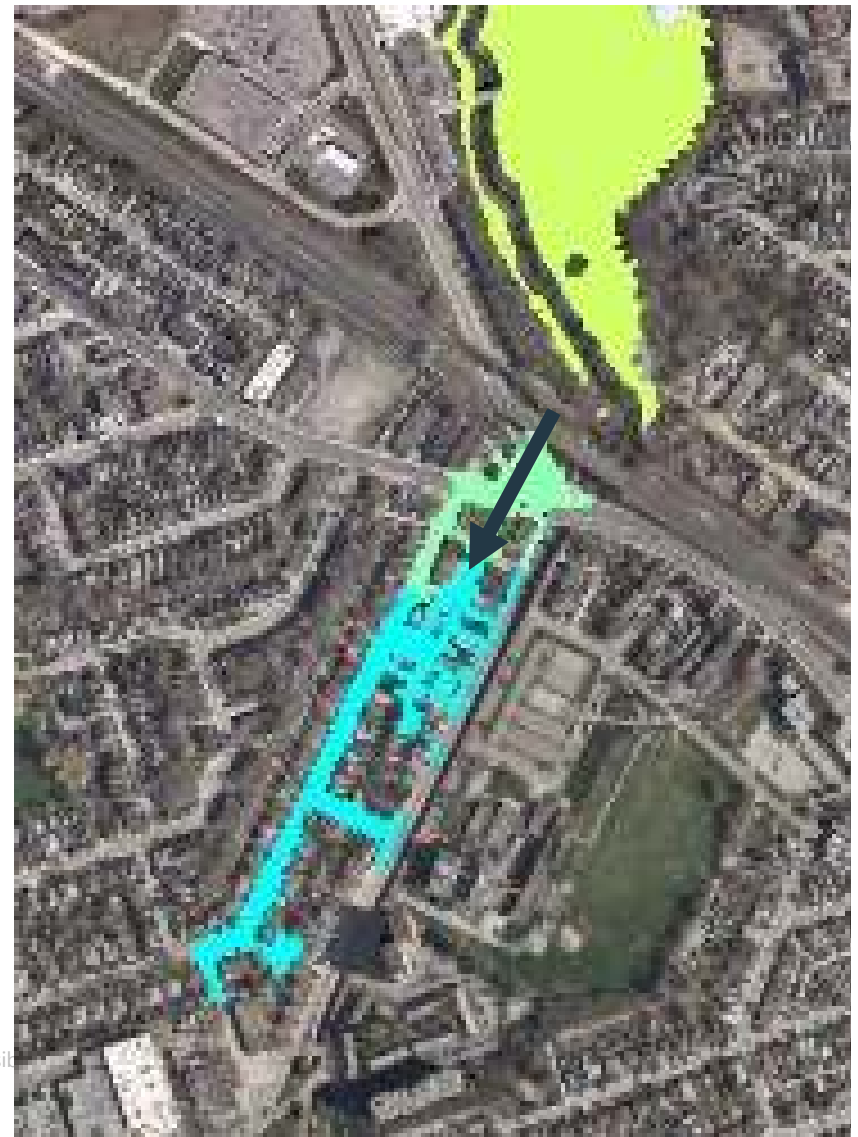
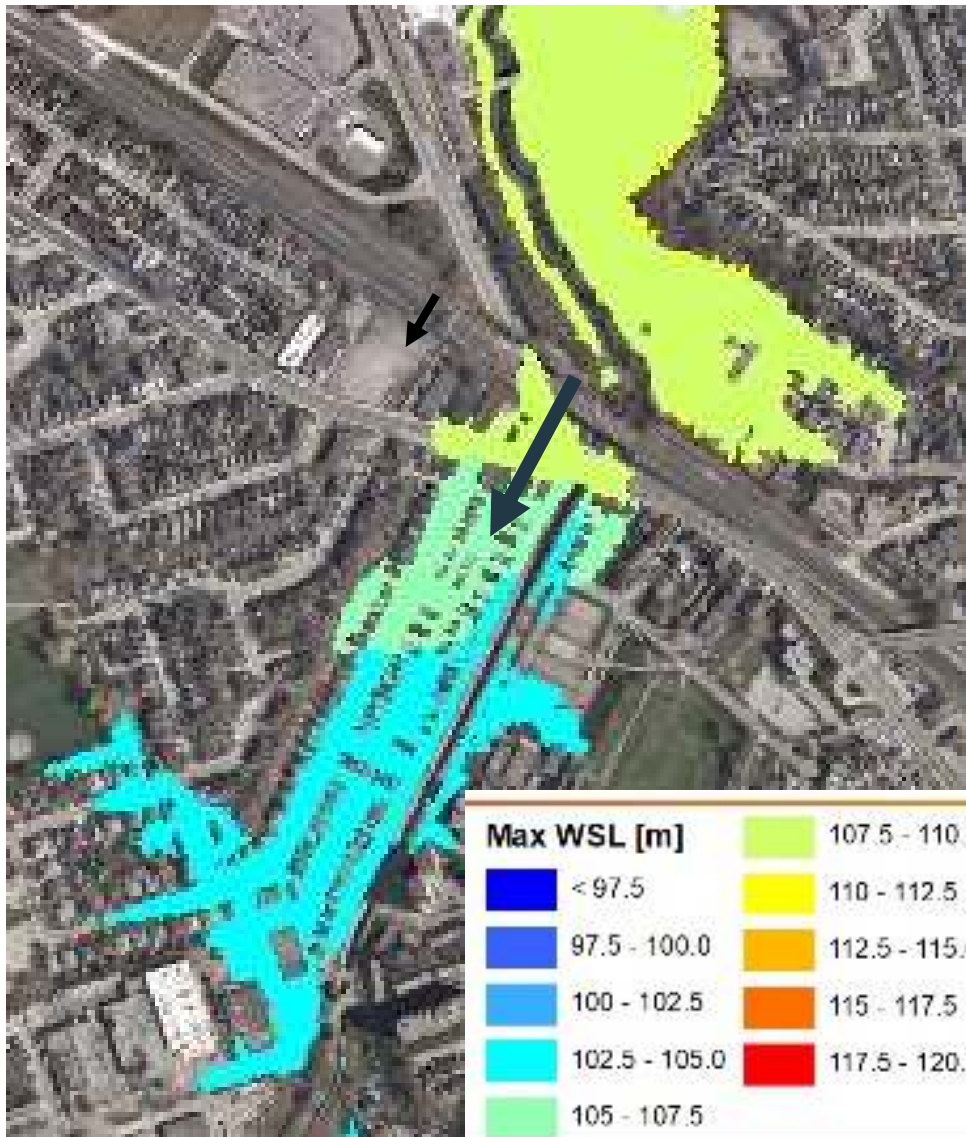
- **Does not include removal of private crossing of Lavender Creek**
- **Costs will go up based on Preferred Alternative Assessment**



5. Phase 2C Humber Blvd. Reach Assessment (Wood/ DHI)

5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



Feasibility

5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

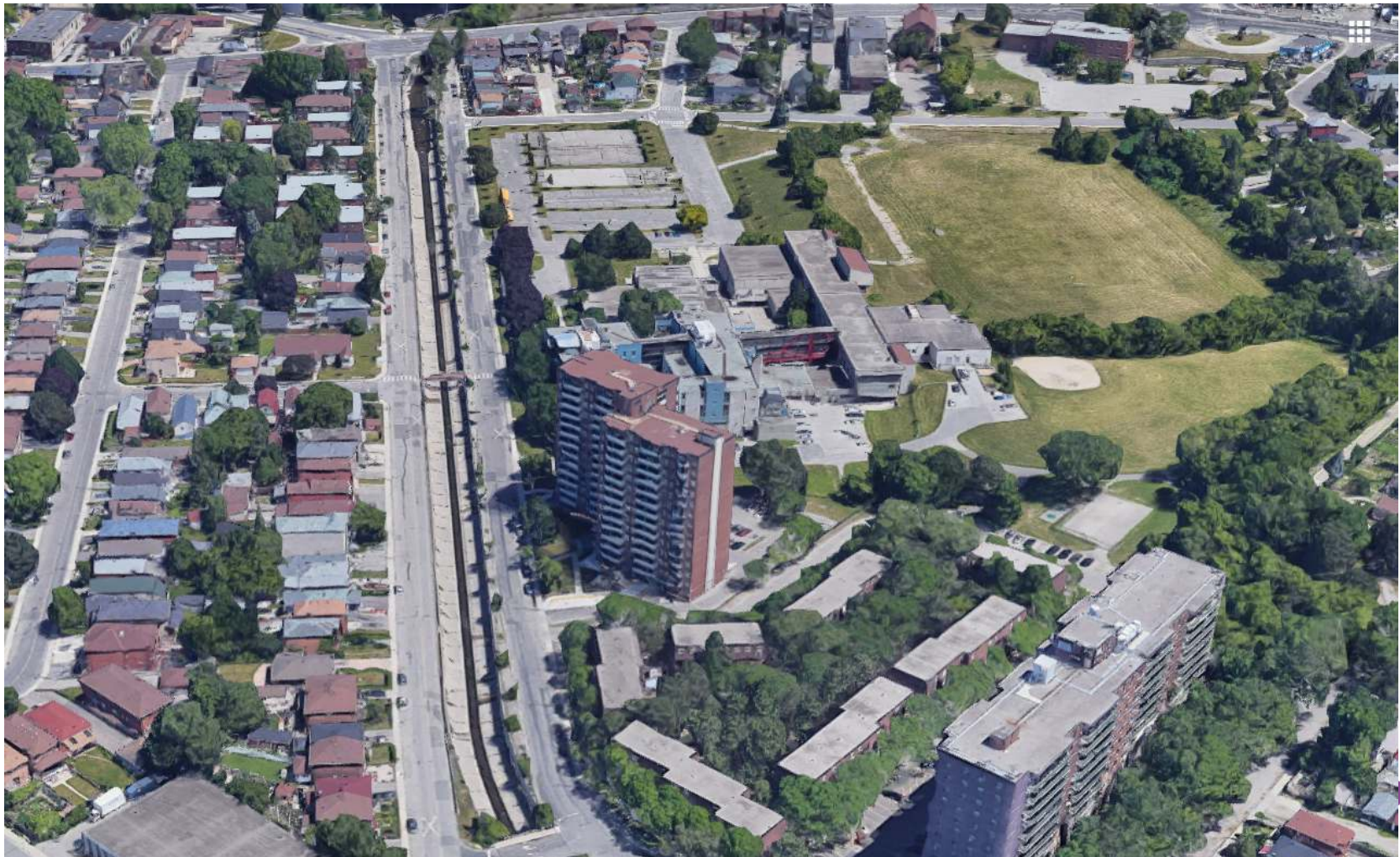
- Alternatives that originally needed to be considered for Phase 2C included:
 - Alliance Avenue crossing removal and new crossing (screened out)
 - Humber Boulevard crossing removal (screened out)



5. Phase 2C Humber Blvd. Reach Assessment

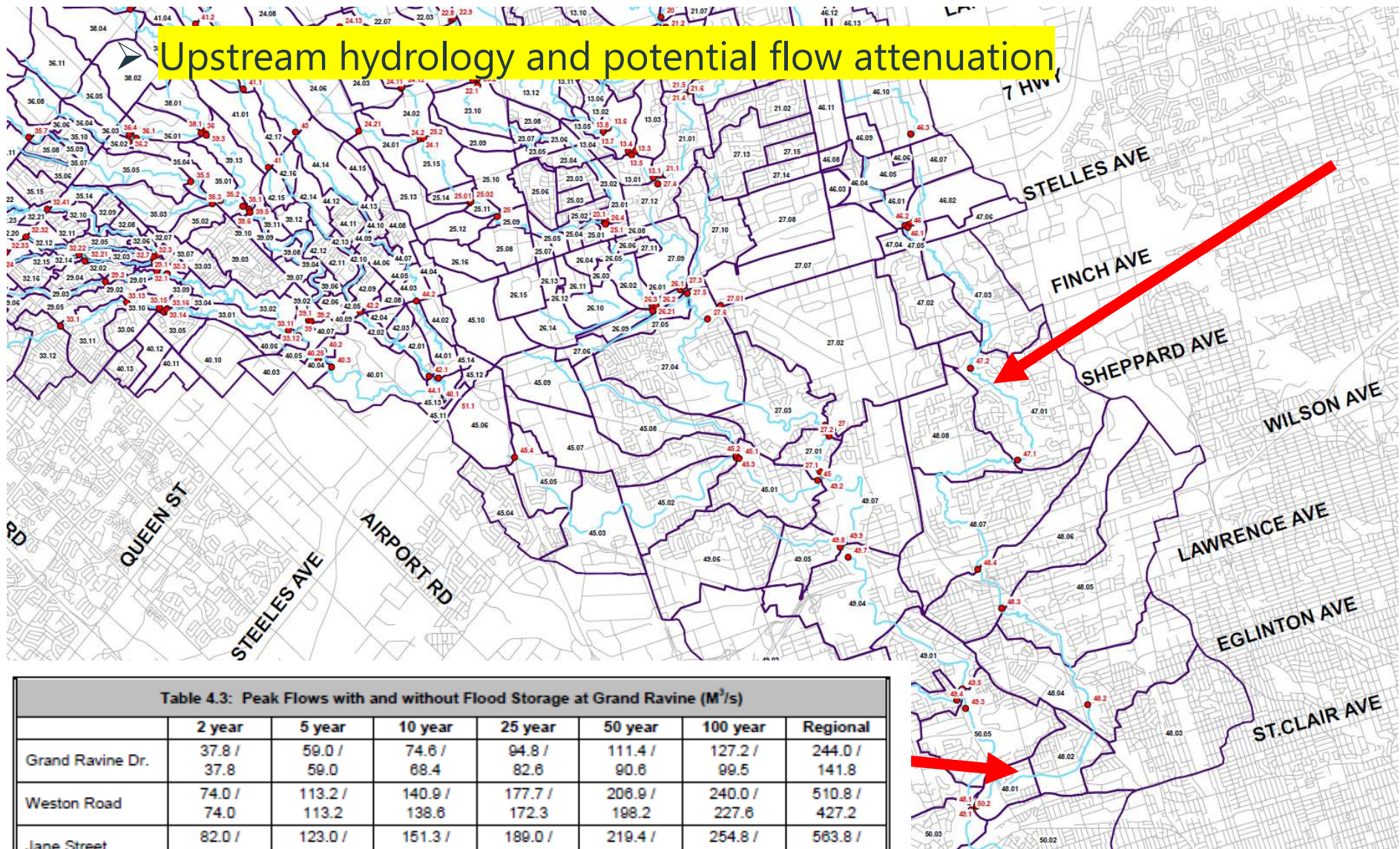
Phase 2C Alternatives Assessment Considerations

- Channel section widening and Humber Boulevard South removal
(screened out)



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

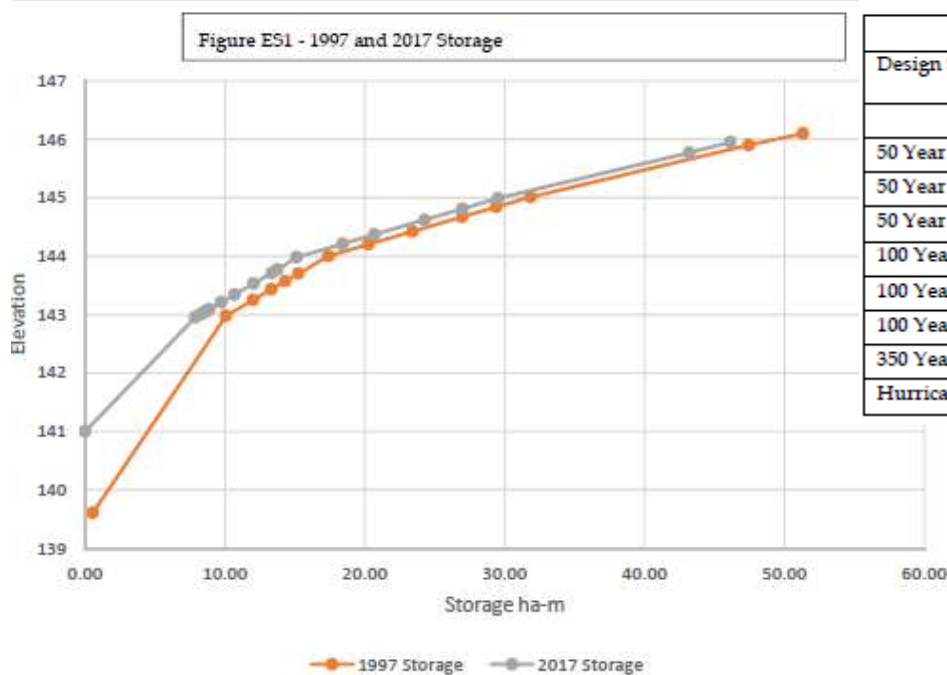
Phase 2C Alternatives Assessment Considerations

Upstream Hydrology and Potential Flow Attenuation

- Black Creek Dam Safety Review, December 2017
- Dam located upstream of Jane St. and Troutbrooke Drive
- Dam provides up to 1.4% reduction in Regional Storm, as such not considered effective in reducing Regional Storm peak flow.

Toronto Region Conservation Authority
Dam Safety Review of Black Creek Dam

Page ES8



Design Storm	Inflow Peak (m ³ /s)	Outflow Peak Flow (m ³ /s)		Percent Change
		1997 Storage	2017 Storage	
50 Year 6 Hour AES	79.7	63.2	76.6	21%
50 Year 12 Hour AES	63.3	55.5	62.7	13%
50 Year 24 Hour AES	50.7	48.4	50.6	5%
100 Year 6 Hour AES	90.0	73.2	83.9	15%
100 Year 12 Hour AES	73.4	65.3	72.7	11%
100 Year 24 Hour AES	58.1	55.9	58.0	4%
350 Year 24 Hour AES	111.8	98.4	101.2	3%
Hurricane Hazel	213.8	210.2	209.8	0%



5. Phase 2C Humber Blvd. Reach Assessment

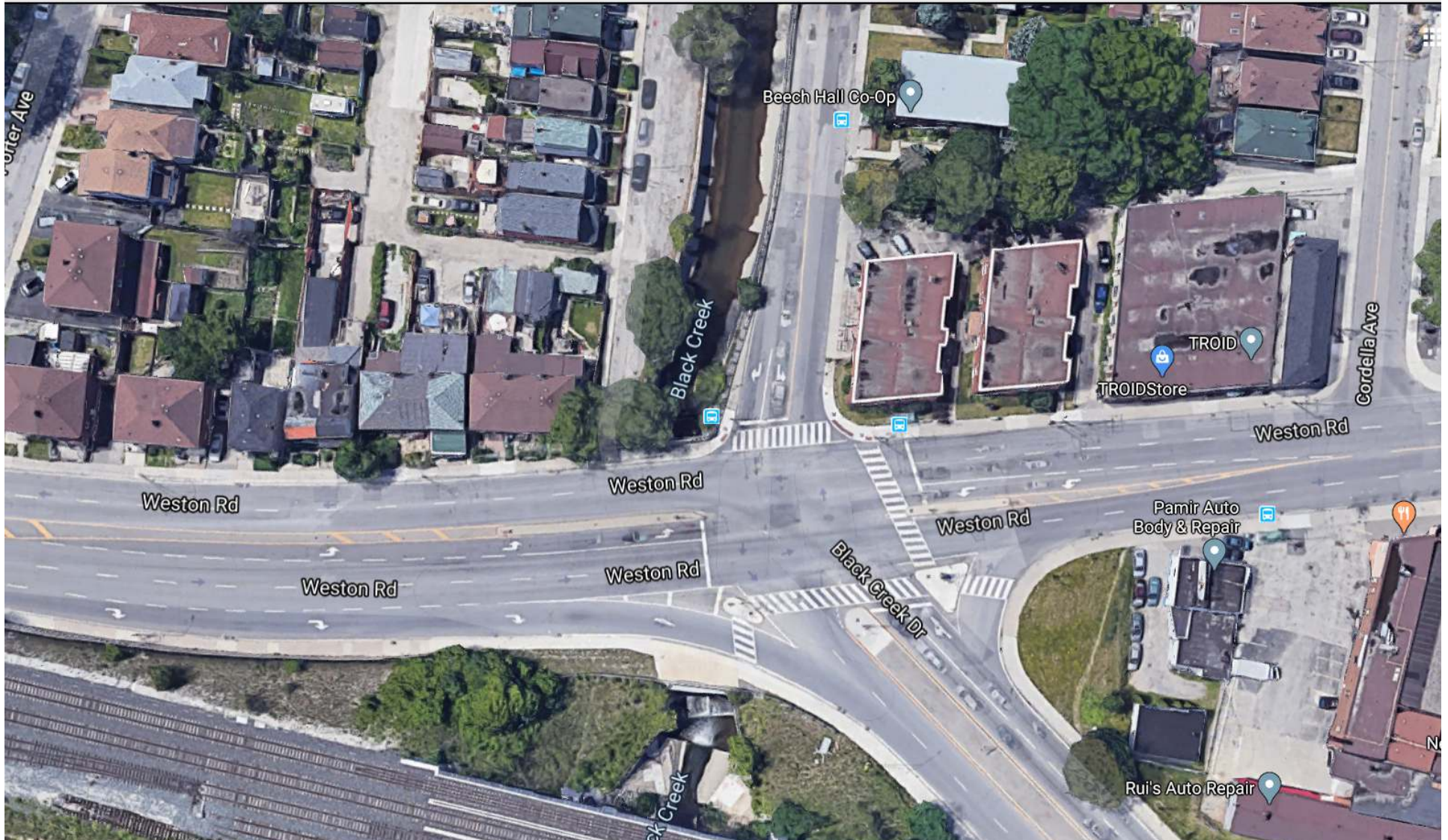
Phase 2C Alternatives Assessment Considerations

Weston Road Overflow Mitigation



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

Weston Road Overflow Mitigation

- Existing crossing
 - 38m long by 12.65m wide by 5.45m rise
 - Structure has retaining walls on both the upstream and downstream sides
 - Two (2) drop structures upstream of the crossing
 - Road has 2 lanes east bound, 2 lanes west bound and left and right turning lanes , with centre median
 - Intersection of Black Creek Drive, Humber Blvd. North and Weston Road.



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

Weston Road Overflow Mitigation

- Increase flow conveyance under Weston Road
 - Twin 3m diameter concrete culverts on west side of Weston Road
 - Culverts offset from existing crossing by 2m, with a minimum of 1m between the 2 culverts
 - Culverts would be 55m and 60m in length at a grade of 1%.
 - Culverts would be placed by tunneling
 - Alternative not preferred based on construction feasibility of installing two (2) structures adjacent to each other (tunnelling or Sequential Excavation Method - SEM)



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

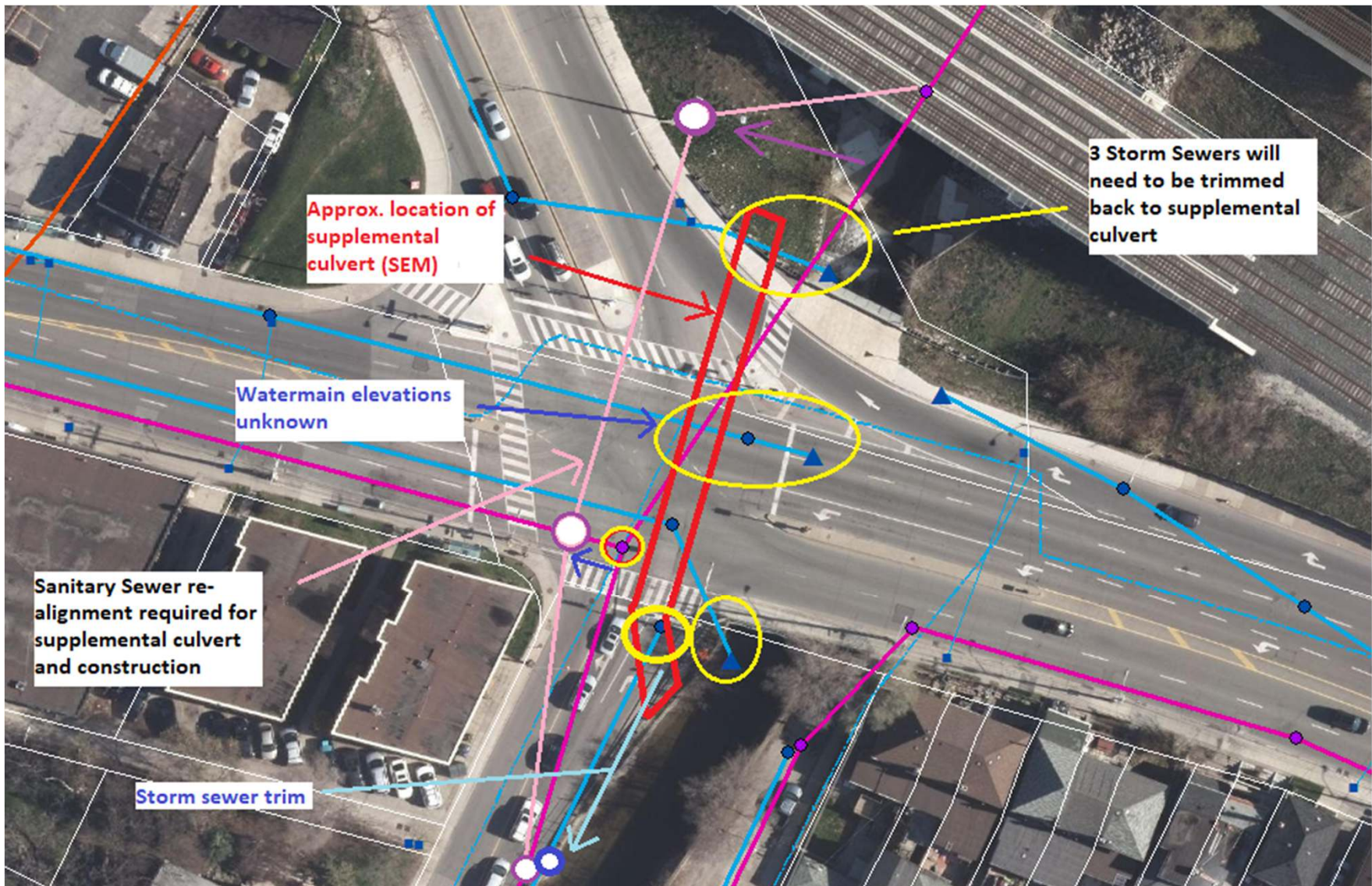
Weston Road Overflow Mitigation

- Increase flow conveyance under Weston Road
 - Single 3.25 by 3.25 m concrete arch culvert on west side of Weston Road
 - Offset from existing bridge by 4 m
 - Minimum cover of 3 m
 - Inlet elevation of 100.50m +/- at top of existing concrete channel
 - Longitudinal slope of 1% +/-
 - SEM; with soil injection



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

Weston Road Overflow Mitigation

- Infrastructure adjustments (3.25 by 3.25 m concrete arch culvert)
 - Adjust storm sewer outlets (300, 600, 900 mm)
 - Relocate 450mm diameter sanitary sewer and MH
 - Watermain (4 valves, junction) above new structure
 - \$6 M for structure
 - \$0.5 M for infrastructure and other items



5. Phase 2C Humber Blvd. Reach Assessment

Phase 2C Alternatives Assessment Considerations

Weston Road Overflow Mitigation

- Flood protection wall (up to 1m height)
 - Remove SGGR
 - \$0.45 M for wall



9. Next Steps (Wood)

9. Next Steps (Wood)

1. Select Phase 2C Alternatives
2. Continue with Preferred Alternative assessment
3. Finalize Phase 2B Report
4. Commence with Draft Final Report



10. Project Schedule (Wood)

9. Project Schedule (Wood)

- Open Schedule

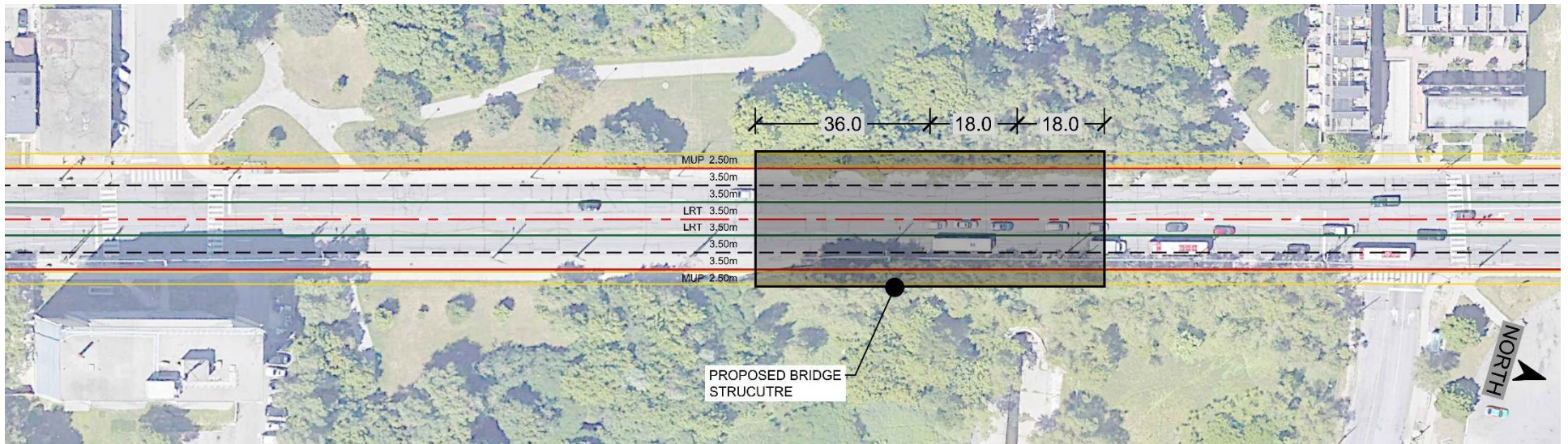


10. Other Business (All)

10. Other Business (Wood)

Jane Street Configuration

- Same amount of lanes for Jane Street, as of today.
- Cycling track at both sides of Jane Street (2.5m on each side)
- BRT / LRT (7 Meters in total)
- Minimum 26m width required
- Significant property impacts along corridor



10. Other Business (Wood)

Symes Road (Bridge 709)

- North crossing to be widened to 20 m span by 3.87 m rise
- Currently 13.5m wide, with 2 lanes and no sidewalks
- What does the city require for road configuration – lane width, shoulders, sidewalks?
- Note no sidewalk on Symes
- Are there width requirements to facilitate business operations?

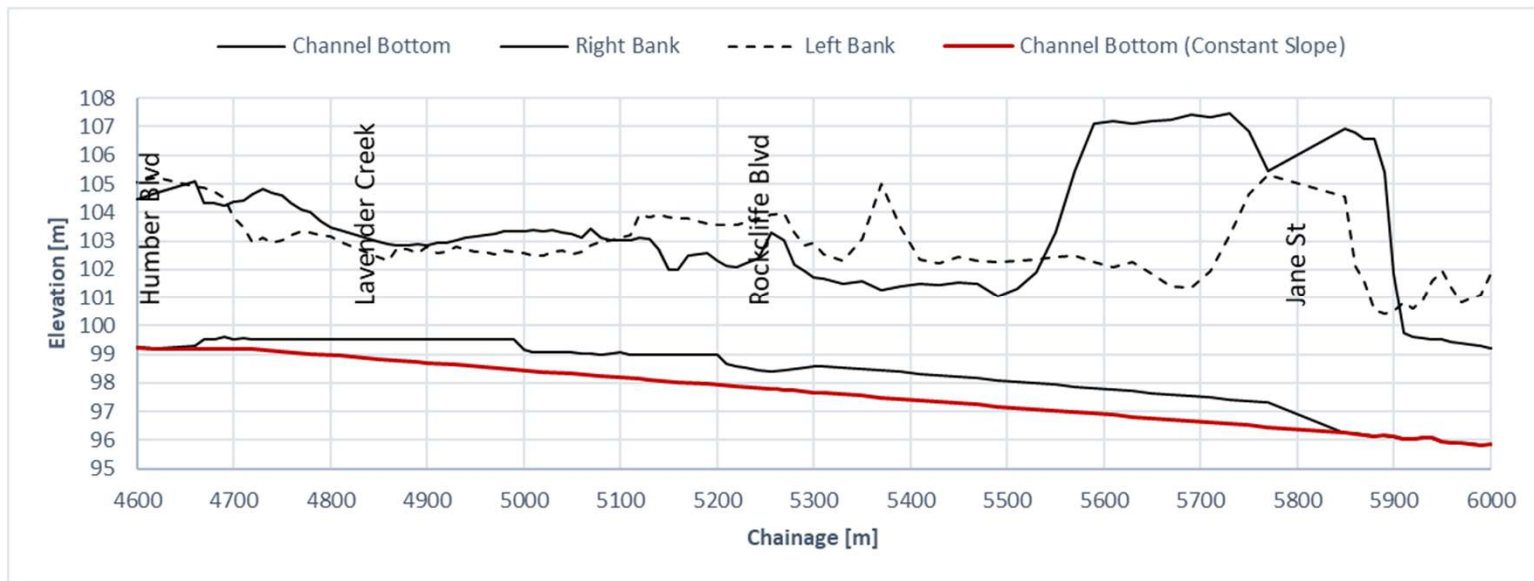


Discussion

Rockcliffe Model Update

Black Creek Upgrade (since Weston v2)

- Channel invert updated from downstream of Alliance Ave to downstream of Jane St to have a constant slope
- Rockcliffe Blvd and Jane St invert levels updated according to the channel bottom

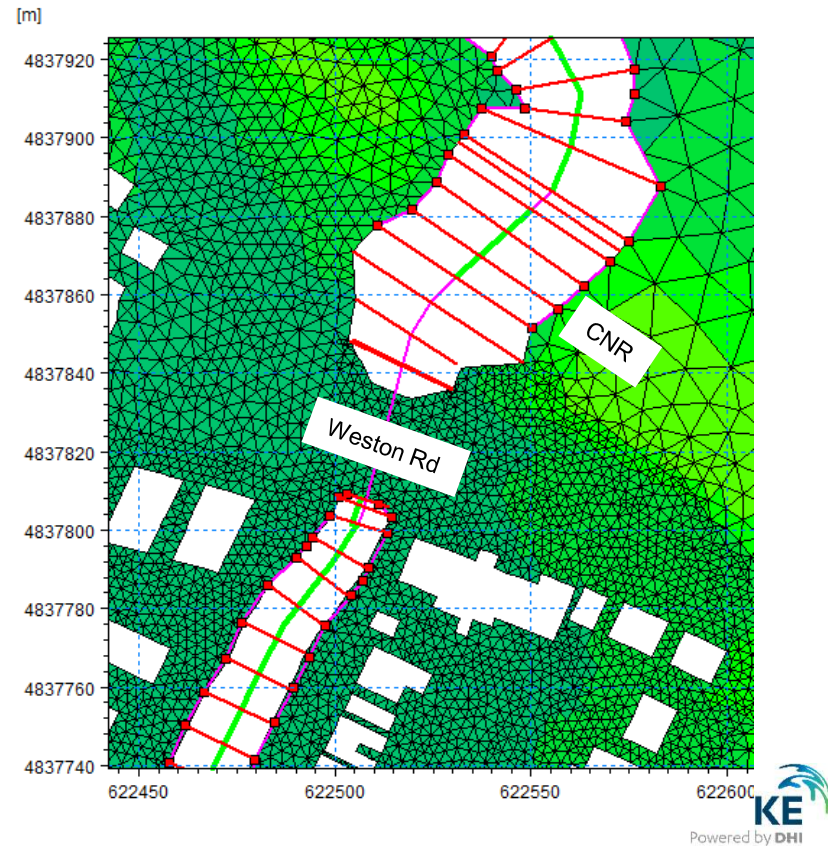


Weston Road Upgrade Alternatives

- Alt 1: Berm at upstream side of bridge
- Alt 2: Relief culvert on west side of existing opening – 3.25 m Arch
- Alt 3: Dual relief culverts on west side of existing opening – 3 m dia
- Alt 4: Alt 2 with berm on upstream side of bridge
- Alt 5: Alt 3 with berm on upstream side of bridge

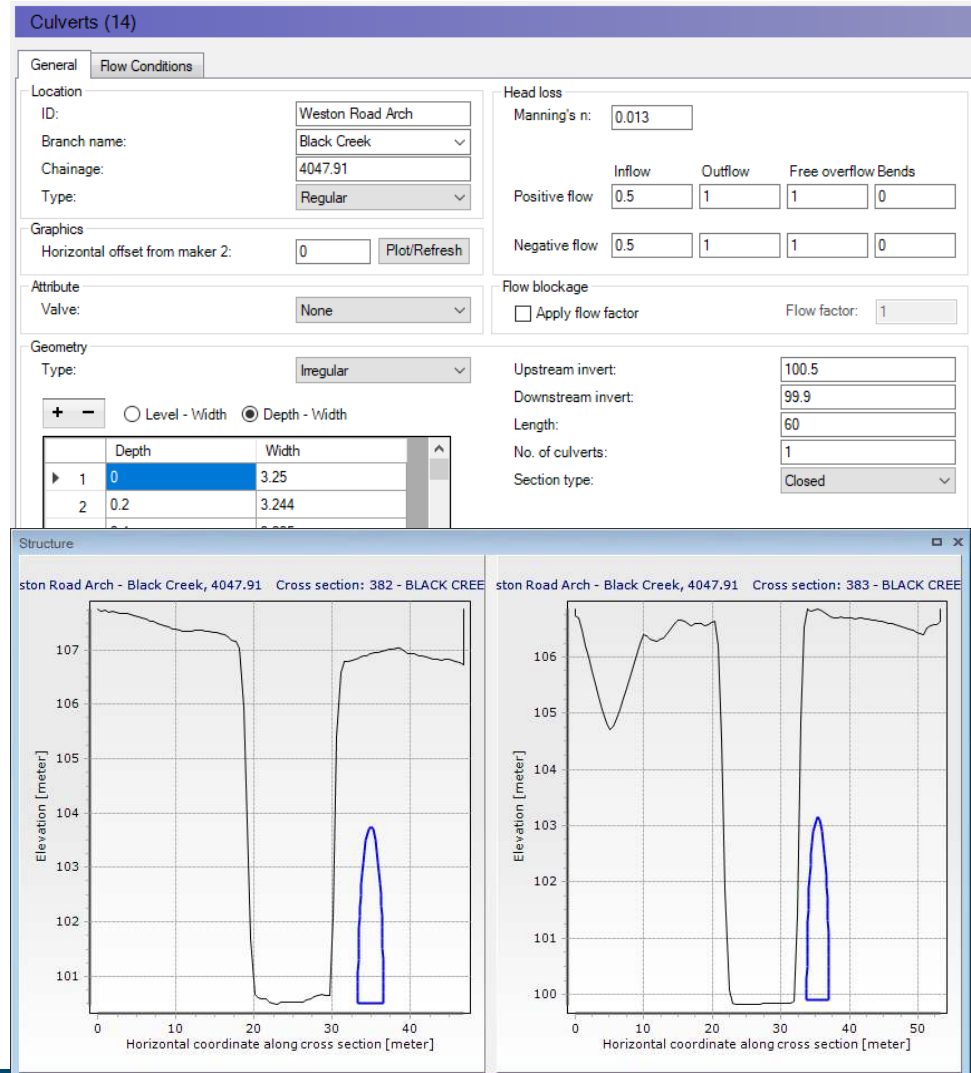
Alt 1 - Berm on Upstream Side of Weston Rd Bridge

- Removed lateral links between CNR and Weston Road
- Removed the standard link and the 'WestonRdWeirUS' branch (bridge overtopping)



Alt 2 - Relief Culvert (3.25 m Arch)

- Upstream invert: 100.5 m
- Downstream invert: 99.9 m
- Length: 60 m
- Slope: 1%
- The existing channels are not widened



Alt 3 - Dual Relief Culverts (3 m dia)

- Upstream invert: 100.5 m
- Downstream invert: 99.9 m and 99.95 m
- Length: 60 m and 55 m
- Slope: 1%
- The existing channels are not widened

Culverts (15)

General | **Flow Conditions**

Location
ID: Weston Road Relief1
Branch name: Black Creek
Chainage: 4047.91
Type: Regular

Head loss
Manning's n: 0.013

	Inflow	Outflow	Free overflow Bends	
Positive flow	0.5	1	1	0
Negative flow	0.5	1	1	0

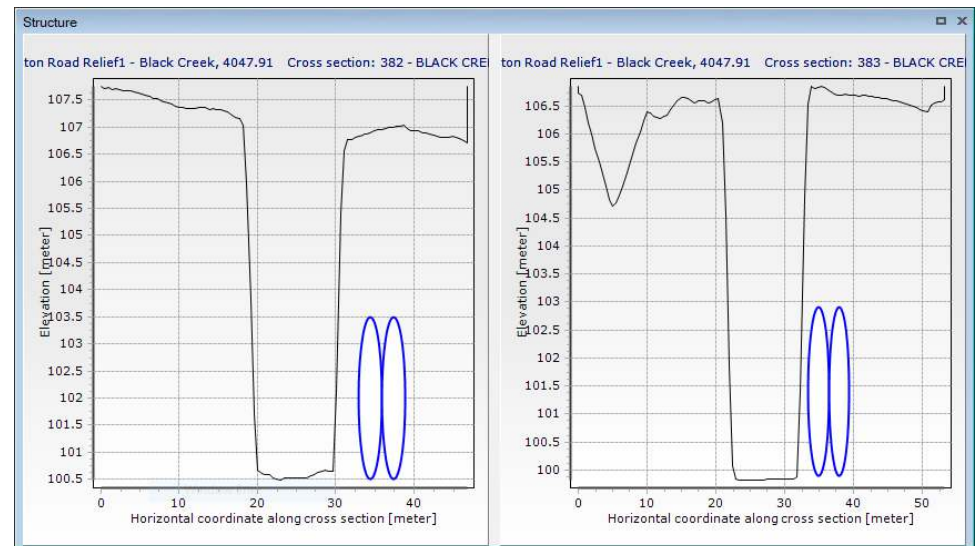
Graphics
Horizontal offset from maker 2: 13

Attribute
Valve: None

Flow blockage
 Apply flow factor Flow factor: 1

Geometry
Type: Circular
Diameter: 3

Upstream invert: 100.5
Downstream invert: 99.9
Length: 60
No. of culverts: 1
Section type: Closed



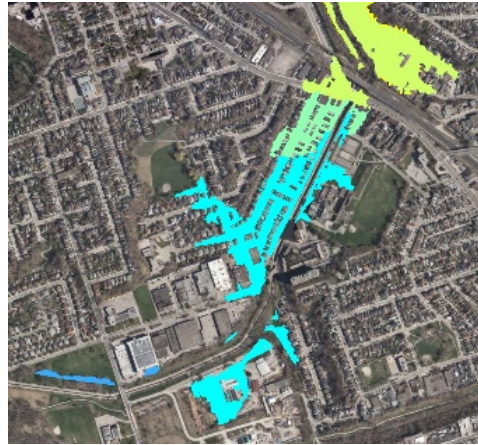
Regional Storm

For Comparison Purposes...

Current Proposed Conditions

- Lavender Creek Improvements
- Rockcliffe Blvd Bridge – 52 m span
- Jane Street Bridge – 72 m span
- Black Creek channel widening from Alliance to Jane Street
- No Weston Rd improvements

Regional



Current Proposed Conditions

- 115 m³/s overtopping Weston Rd

Existing Conditions

- 123 m³/s overtopping Weston Rd

350 Year



Current Proposed Conditions

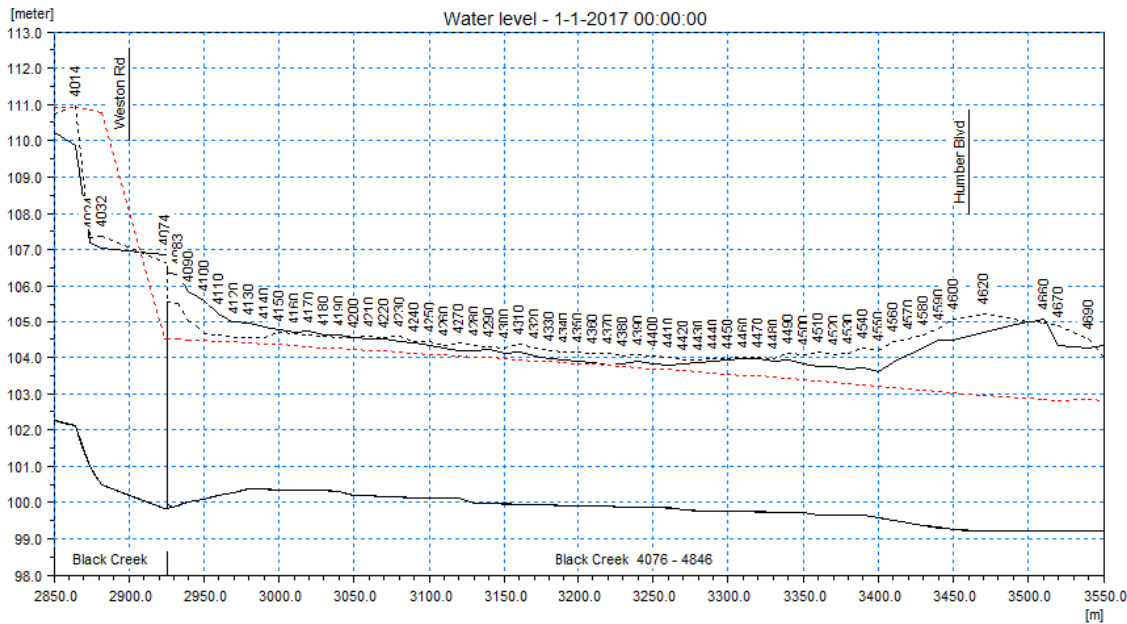
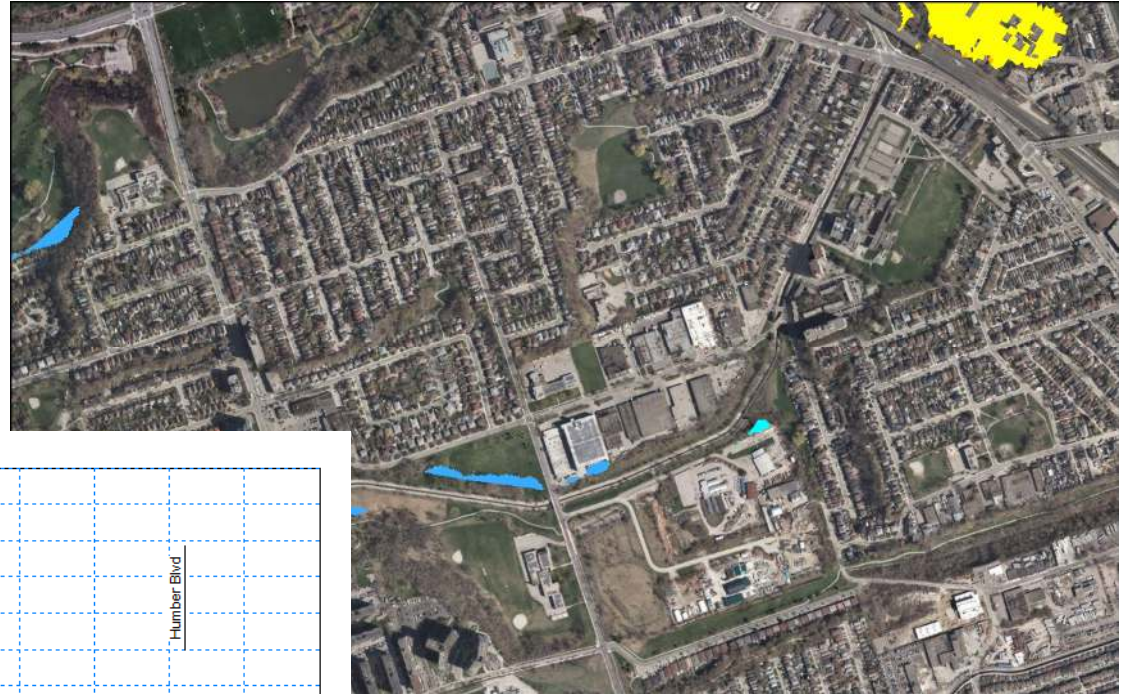
- 4 m³/s overtopping Weston Rd

Existing Conditions

- 4 m³/s overtopping Weston Rd

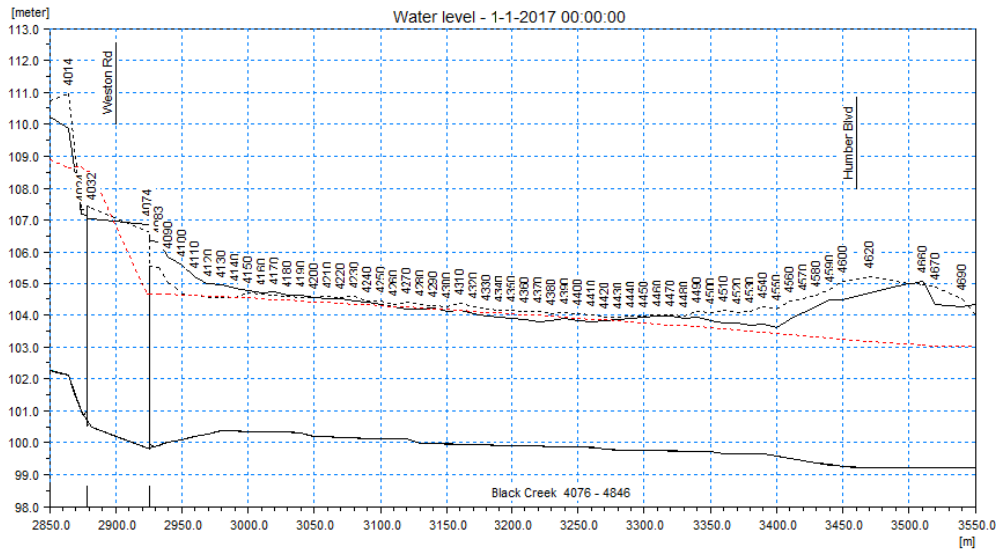
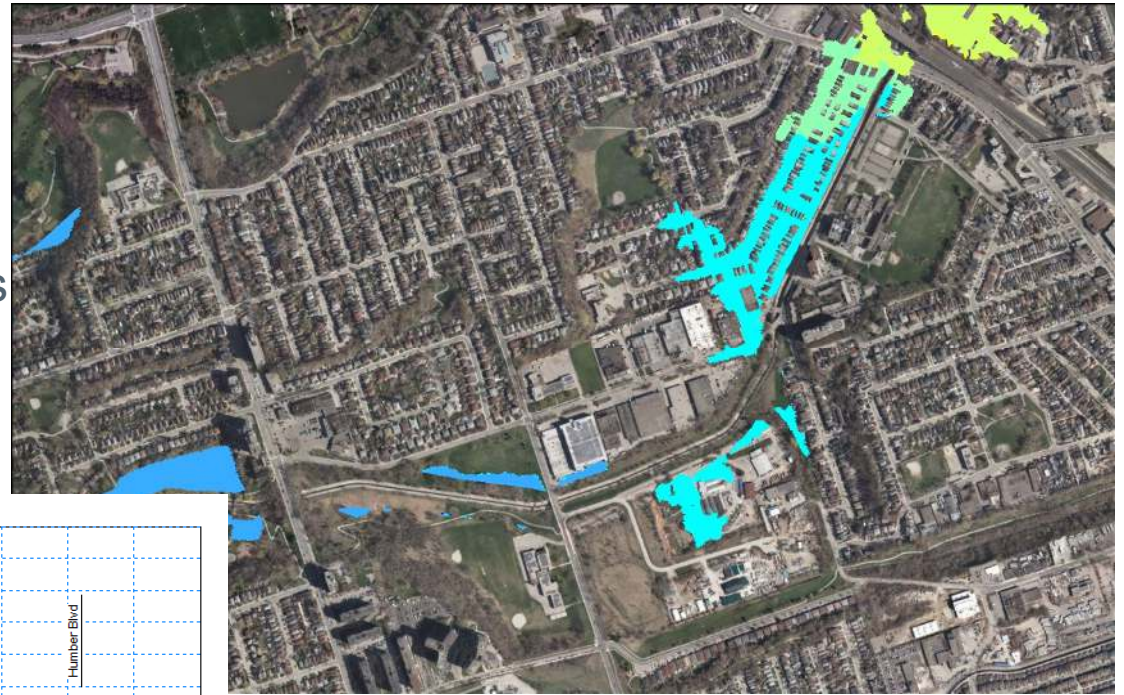
Alt 1 – Berm

- No flooding between Weston Rd and Alliance Ave.
- Expanded flooding immediately upstream of Weston Rd



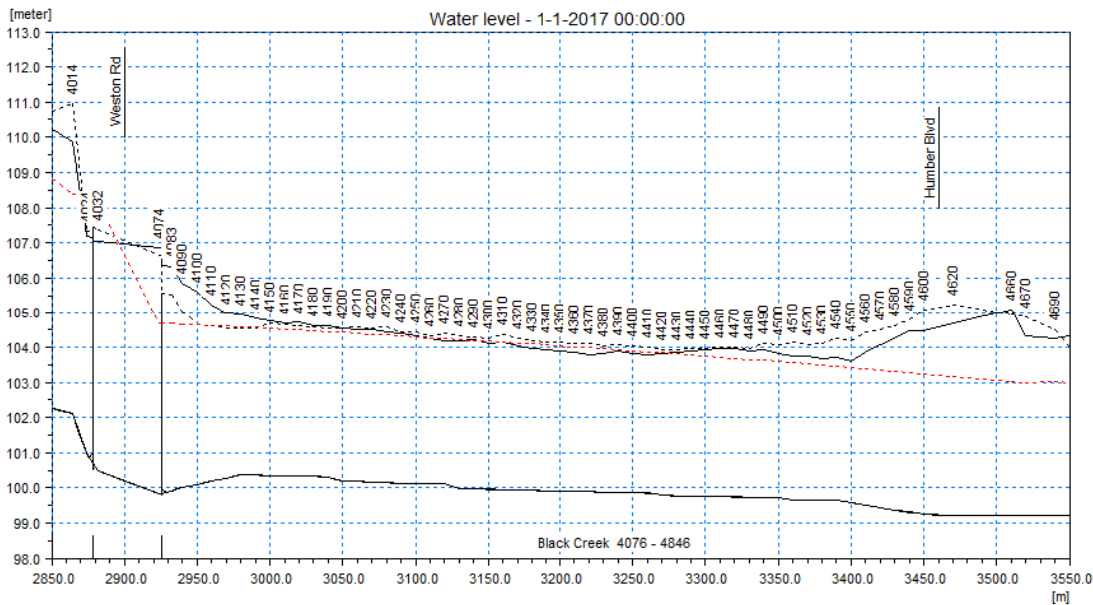
Alt 2 – Arch Culvert

- Weston Rd is overtopped
- Max overflow reduced to 73 m³/s
- No meaningful improvements to flooding on Cordella or Humber



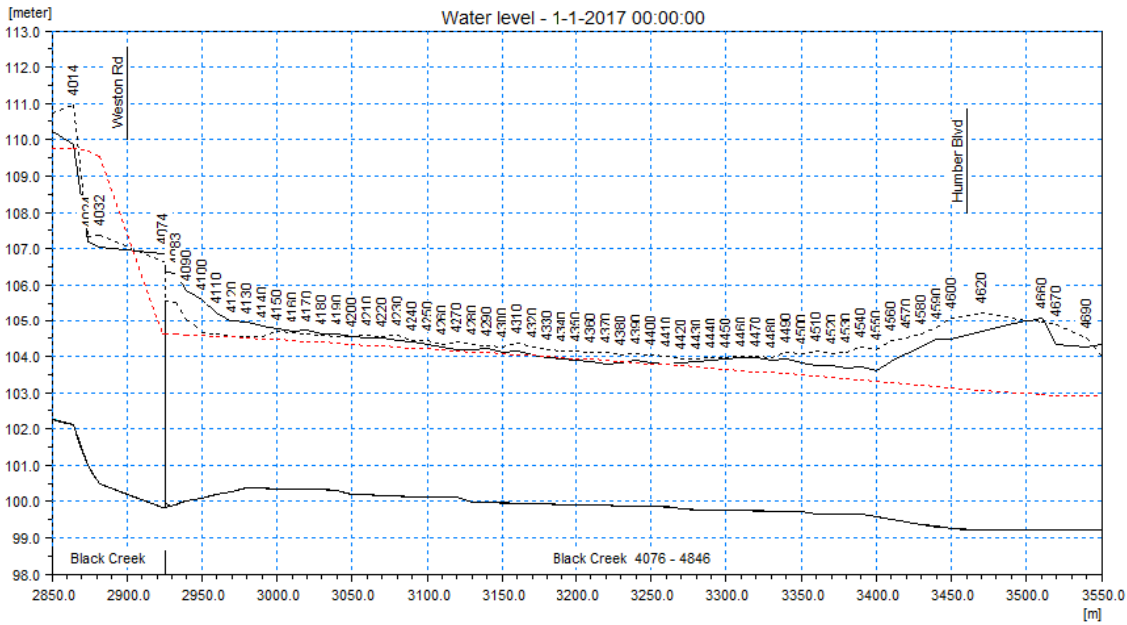
Alt 3 – Dual Culverts

- Weston Rd is overtopped
- Max overflow reduced to 50 m³/s
- No meaningful improvements to flooding on Cordella or Humber



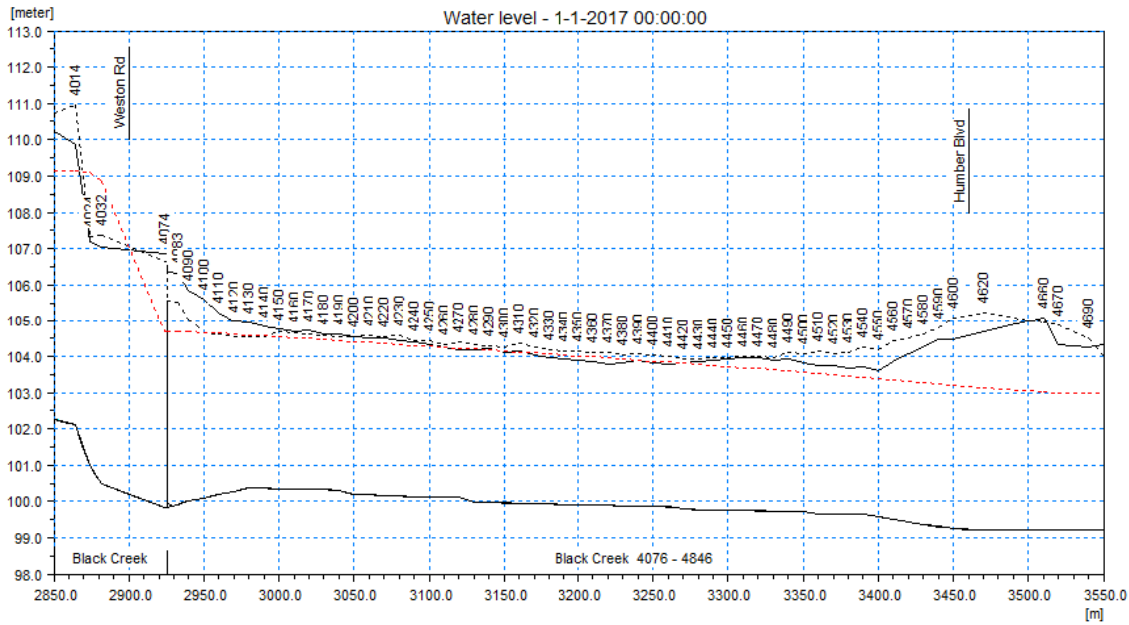
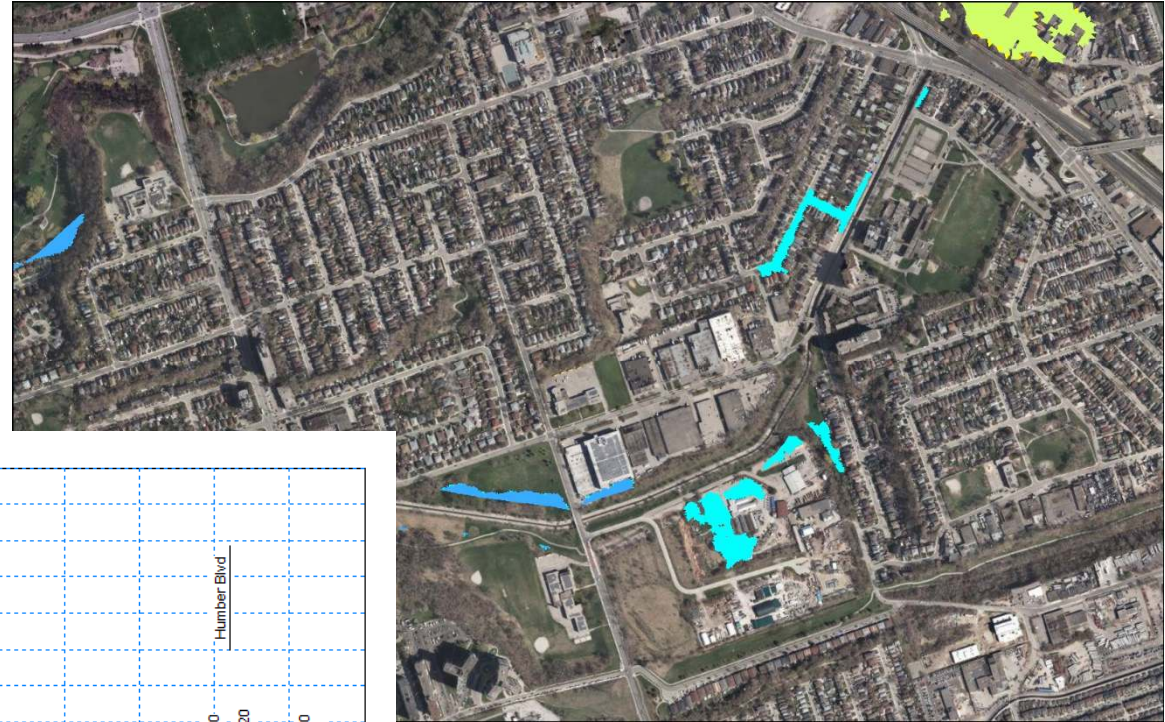
Alt 4 – Berm + Arch Culvert

- Louvain St is flooded due to overtopping of channel



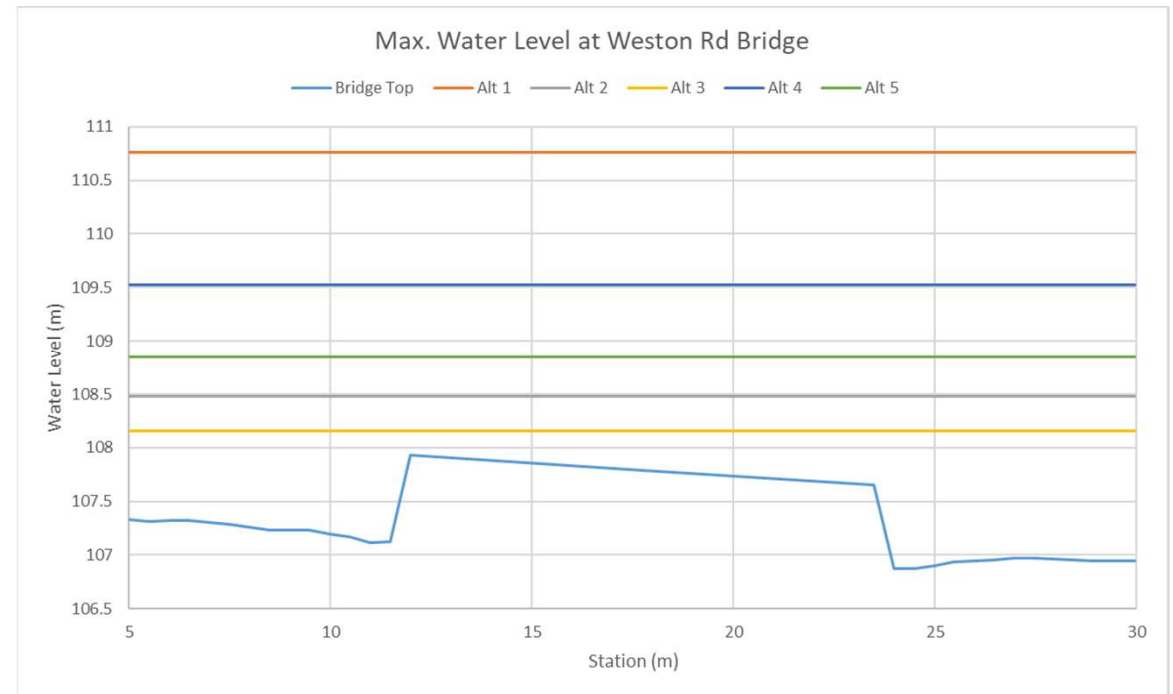
Alt 5 – Berm + Dual Culverts

- Louvain St is flooded due to overtopping of channel



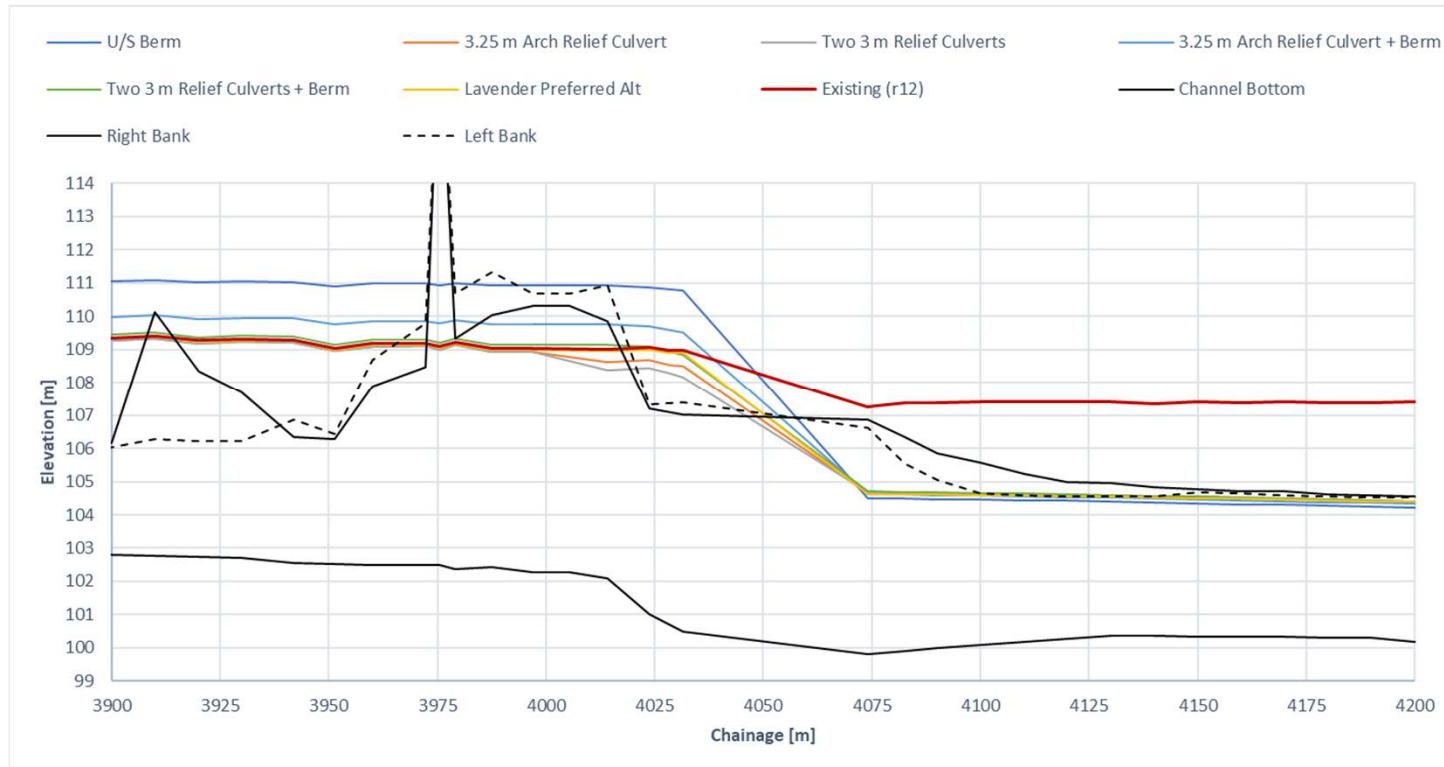
Summary - Regional

- Culverts without the berm provide minimal benefit
- Alt 4 – Arch Culvert is the most practically feasible but still requires a 3 m berm/wall and increases flooding upstream of Weston Rd



Alternatives	Details	Max Level U/S Bridge (m)	Max Culvert Flow (Combined, m ³ /s)	Western Rd Bridge Overtopped?	Louvain St Flooded?	Humber Bridge Soffit Reached?
Alt 1	Berm	110.8	444.9	No	Yes	No
Alt 2	3.25 m Arch	108.5	422.9	Yes	Yes	No
Alt 3	3 m Culvert * 2	108.1	446.1	Yes	Yes	No
Alt 4	3.25 m Arch + Berm	109.5	469.3	No	Yes	No
Alt 5	3 m Culvert * 2 + Berm	108.8	486.5	No	Yes	No

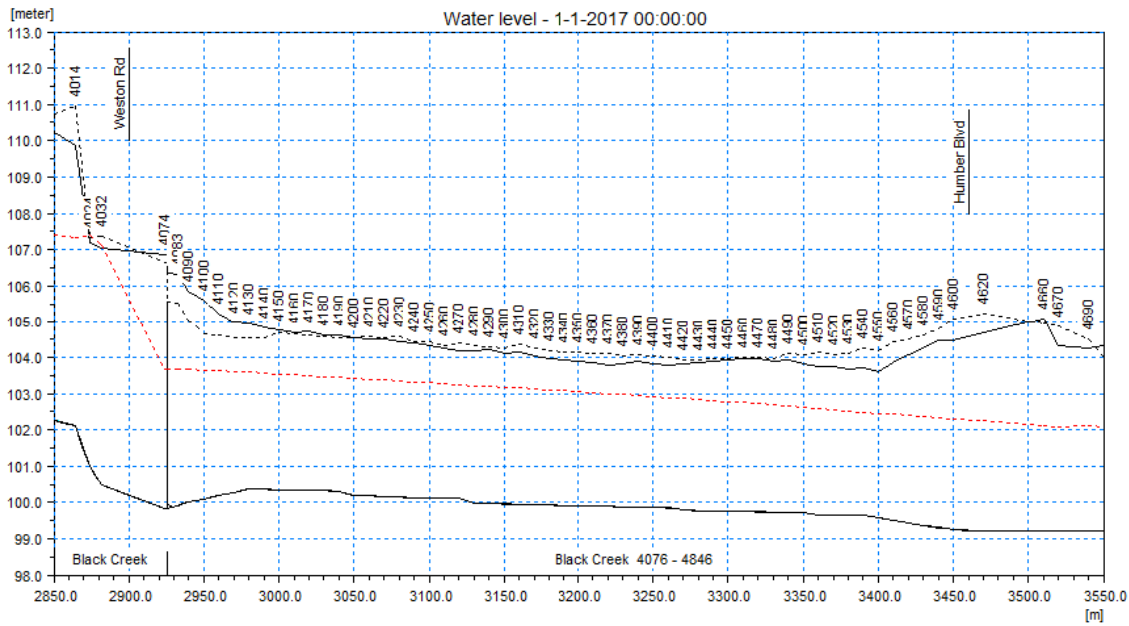
Max. Water Surface Level at Weston Rd



Design 350-Year Storm

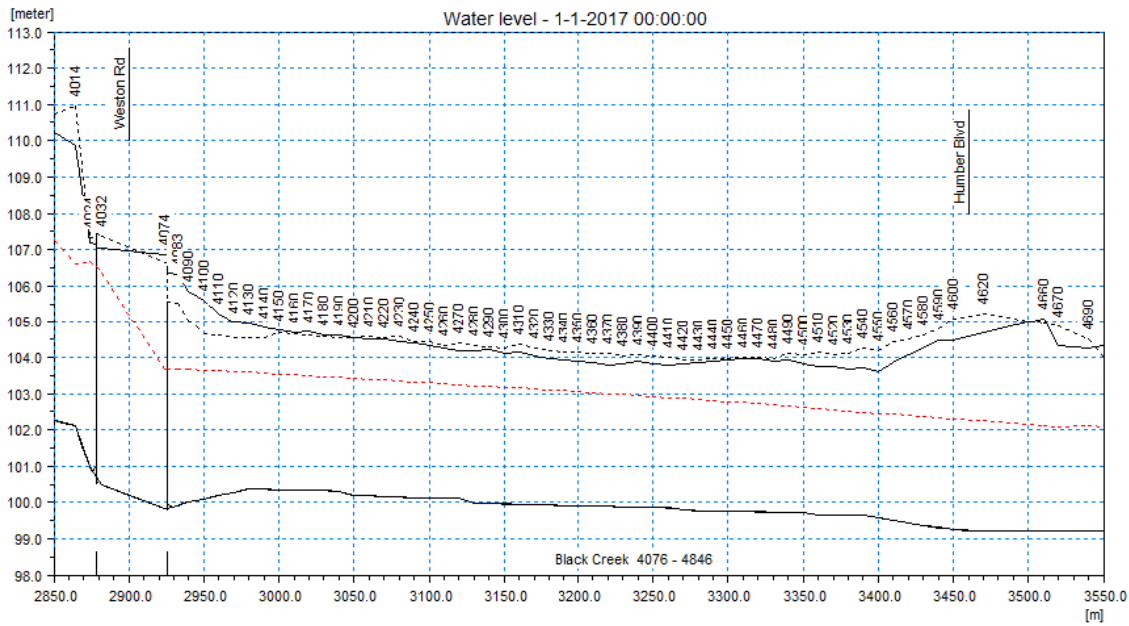
Alt 1 – Berm

- No flood between Weston Rd and Rockcliffe Blvd.



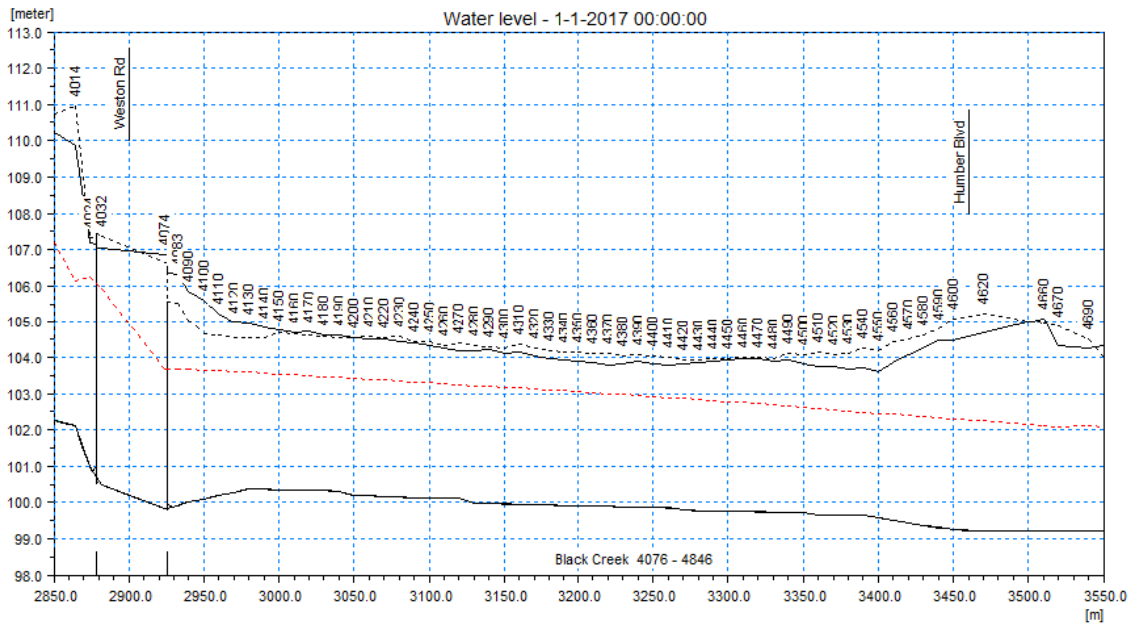
Alt 2 – Arch Culvert

- No flood between Weston Rd and Rockcliffe Blvd.



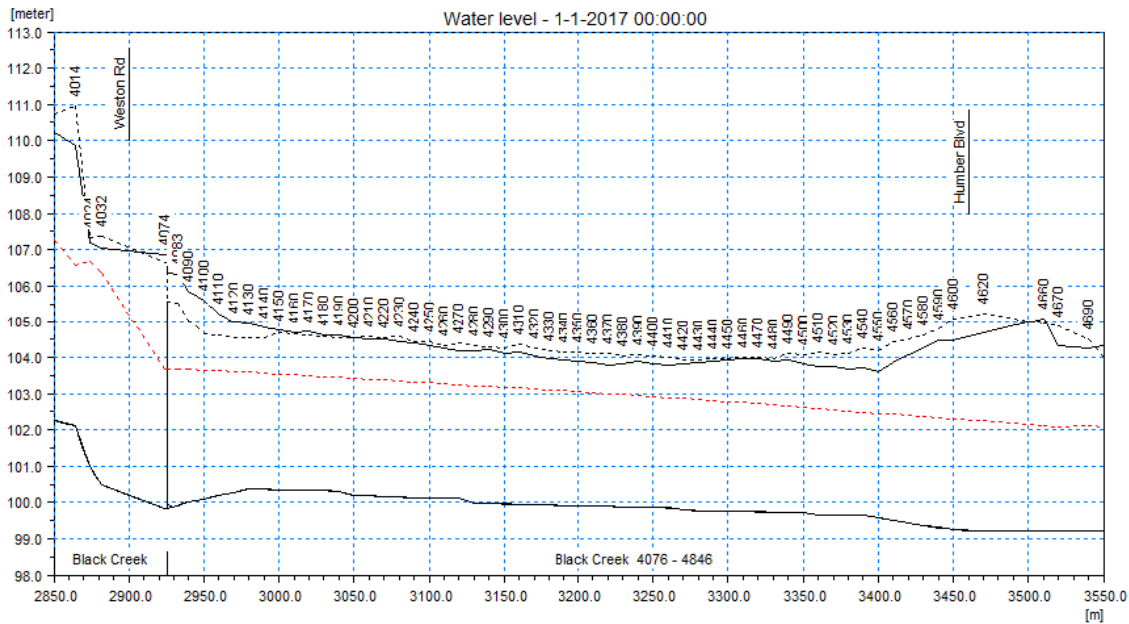
Alt 3 – Dual Culverts

- No flood between Weston Rd and Rockcliffe Blvd.



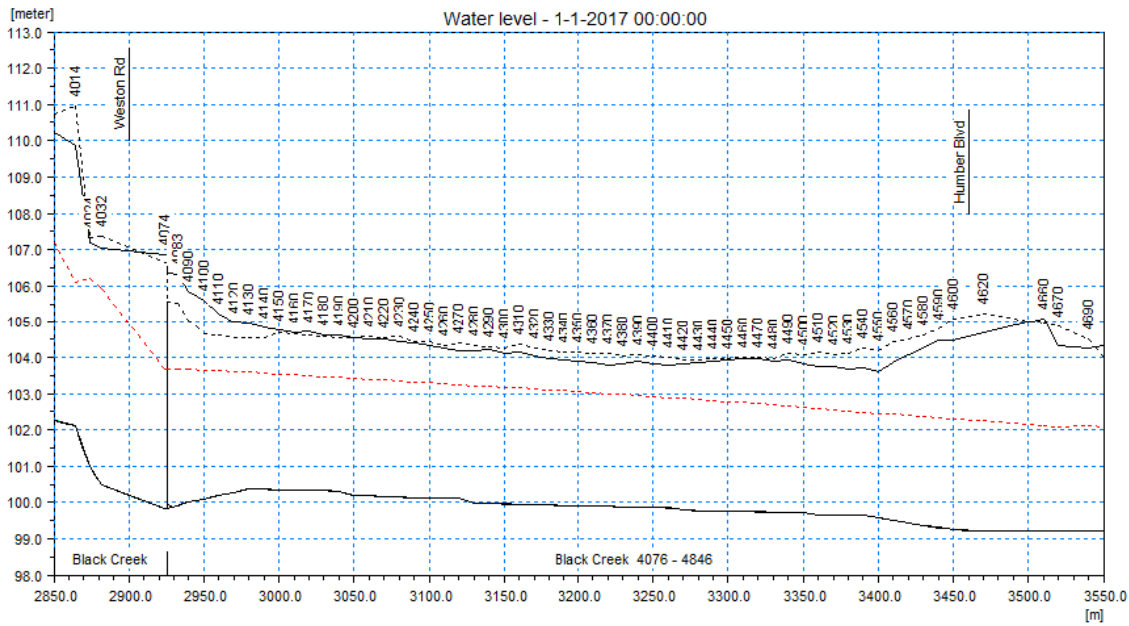
Alt 4 – Berm + Arch Culvert

- No flood between Weston Rd and Rockcliffe Blvd.



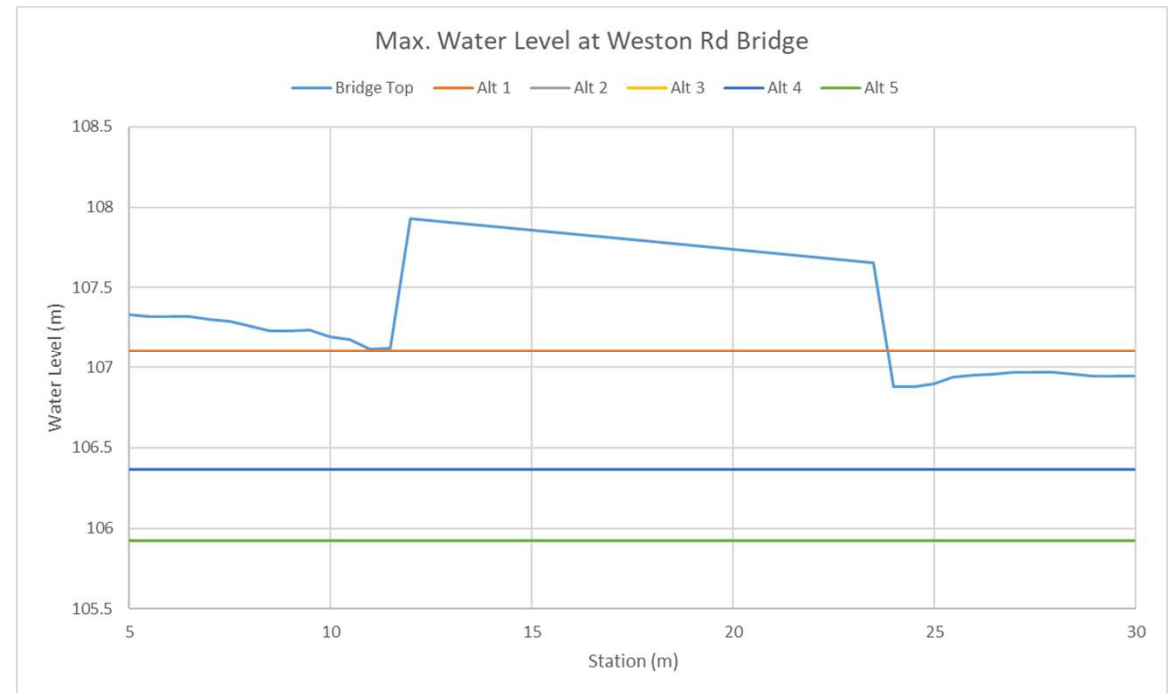
Alt 5 – Berm + Dual Culverts

- No flood between Weston Rd and Rockcliffe Blvd.



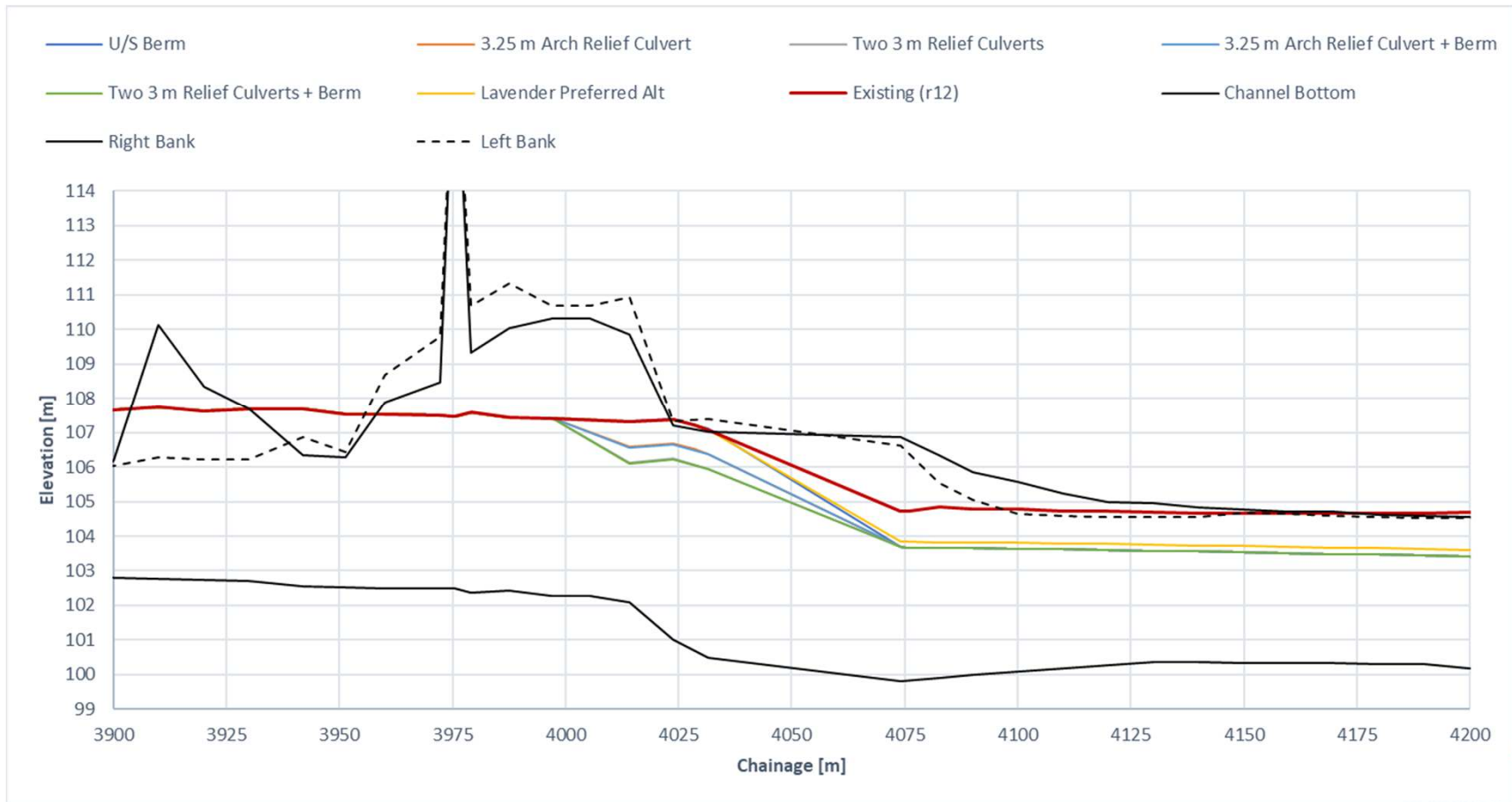
Summary

- All alternatives prevent overtopping of Weston Rd
- No berm is required if using relief culverts
- A 0.5 m height berm is required for Alternative 1
- Alt 1 is most practically feasible has best ROI



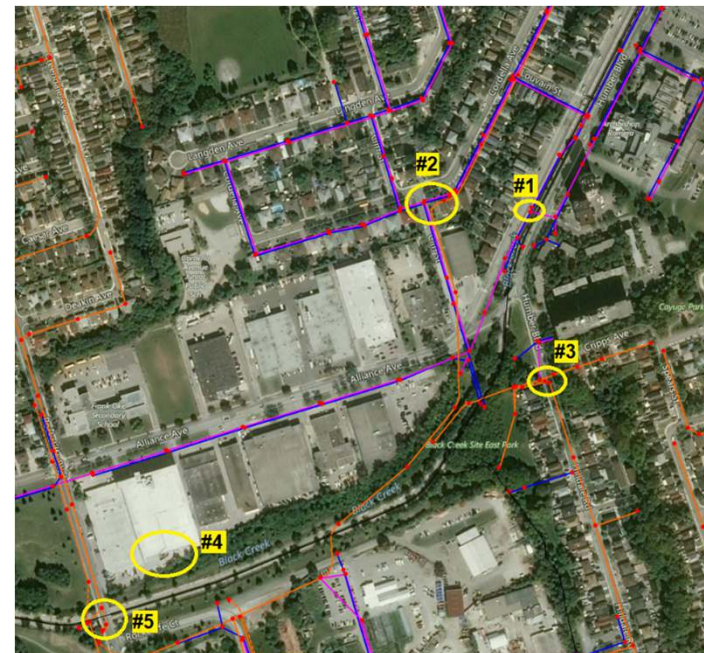
Alternatives	Details	Max Level U/S Bridge (m)	Max Culvert Flow (Combined, m ³ /s)	Western Rd Bridge Overtopped?	Louvain St Flooded?	Humber Bridge Soffit Reached?
Alt 1	Berm	107.1	291.3	No	No	No
Alt 2	3.25 m Arch	106.4	291.3	No	No	No
Alt 3	3 m Culvert * 2	105.9	291.3	No	No	No
Alt 4	3.25 m Arch + Berm	106.4	291.3	No	No	No
Alt 5	3 m Culvert * 2 + Berm	105.9	291.3	No	No	No

Max. Water Surface Level at Weston Rd



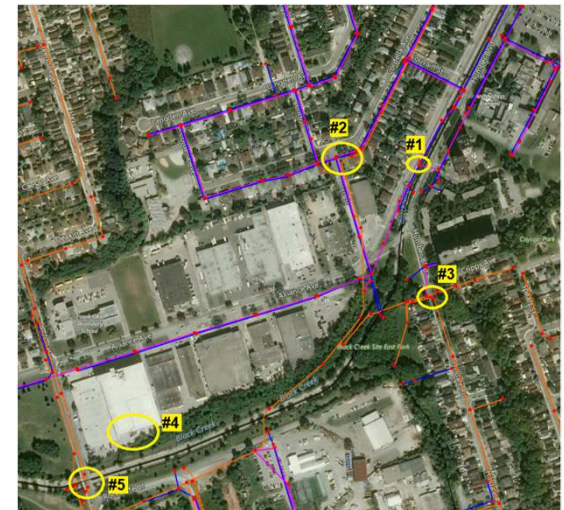
Sewer impact analysis

1. Humber Blvd North: max WSE of 101.30 m (Black Creek)
2. Cordella Ave at Cliff St: max WSE of 101.50 m (Black Creek)
3. Hilldale Blvd: max WSE of 101.30 m (Lavendar)
4. Alliance Blvd at Rockcliffe Blvd: Basement driveway elevation of 100.45 m
5. Rockcliffe Blvd bridge soffit 102.57 m



Sewer impact analysis (not including Weston Rd Alternatives)

	Max	5	10	25	50	100	350	Reg
1	101.3	101.3	101.75	102.0	102.2	102.4	102.7	103.65
2	101.5	100.65	101.05	101.3	101.5	101.75	102.0	103.0
3	101.3	100.75	101.3	101.5	101.7	101.9	102.2	103.25
4	100.45	99.7	100.25	100.65	100.85	101.15	101.5	102.5
5	103.3	99.7	100.25	100.65	100.85	101.15	101.5	102.5





**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

March 6, 2020 Transportation Assessment



Agenda

1. Introductions
2. Review of Existing Traffic Conditions
3. Future (2031) Traffic Conditions
4. Questions



1. Introductions

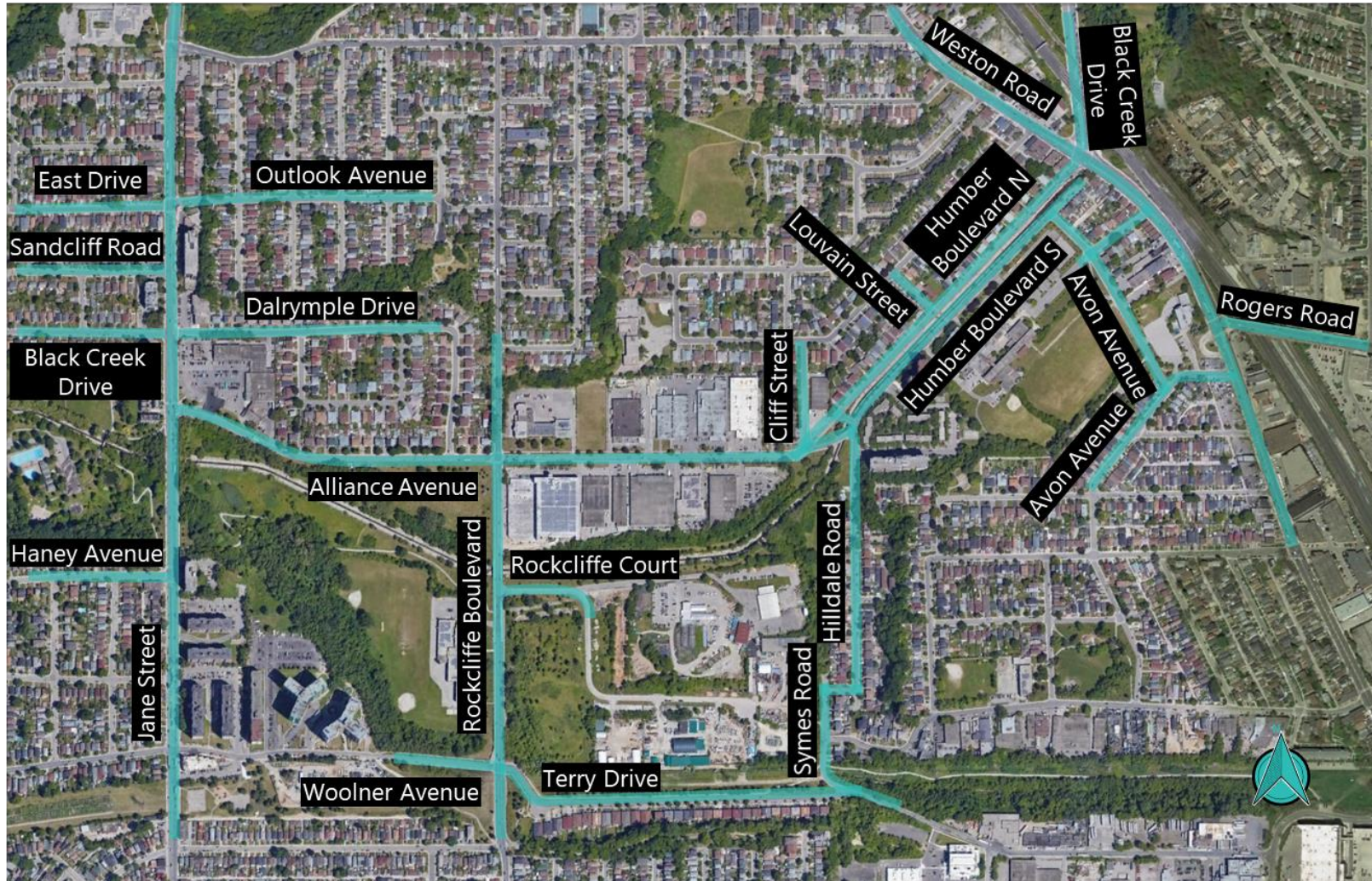
- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff



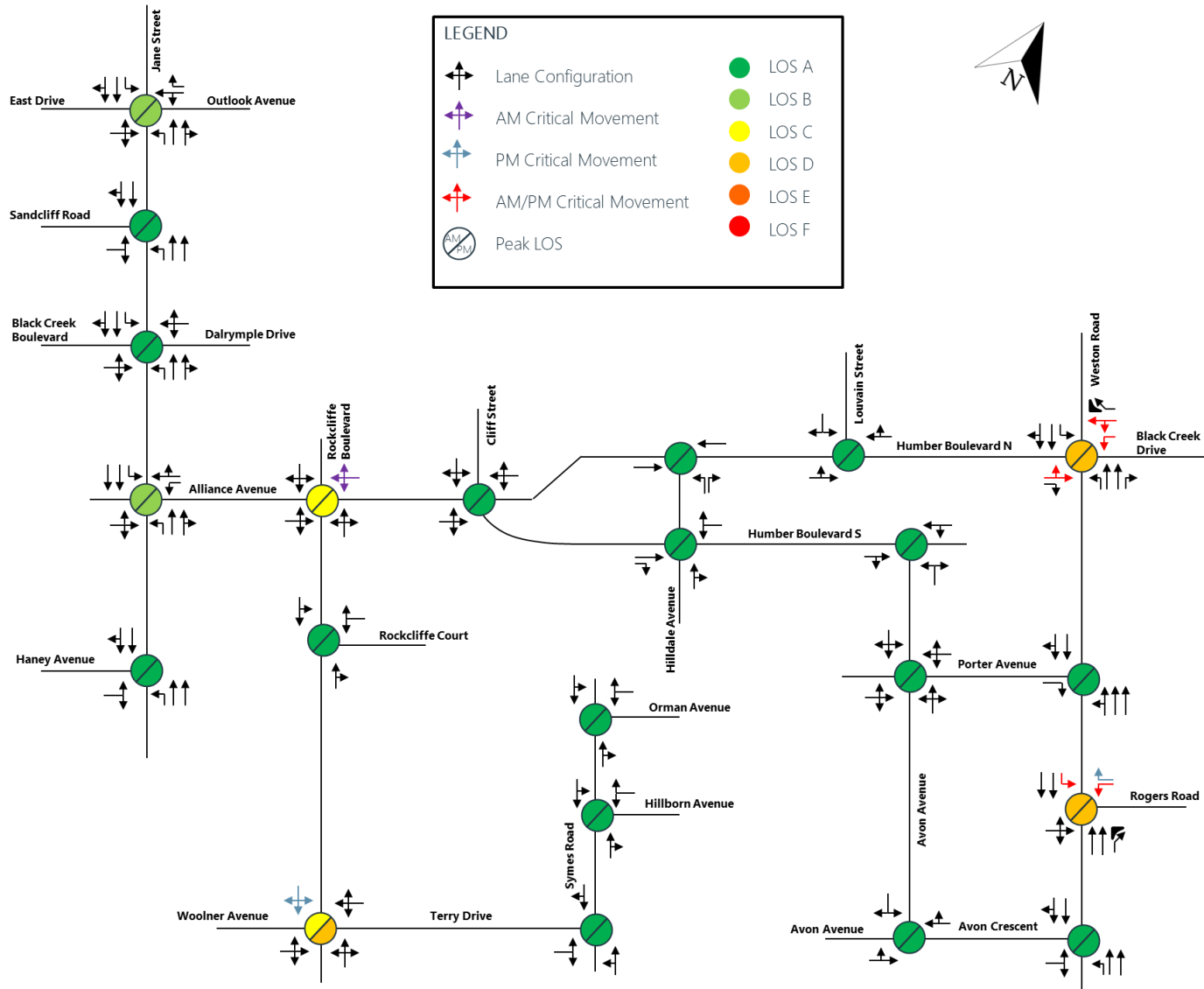
2. Review of Existing Traffic Conditions

3. Review of Existing Traffic Conditions

Study Area



3. Review of Existing Traffic Conditions



4. Future (2031) Traffic Conditions

4. Future (2031) Traffic Conditions

Approach and Assumptions

- Only the preferred alternative for Jane Street would have an impact on traffic and was considered for further traffic assessment
- The following two scenarios analyzed under future (2031) conditions:
 - ✓ **Scenario 1:** without Improvements (“Do-Nothing”)
 - ✓ **Scenario 2:** with Improvements + LRT



4. Future (2031) Traffic Conditions

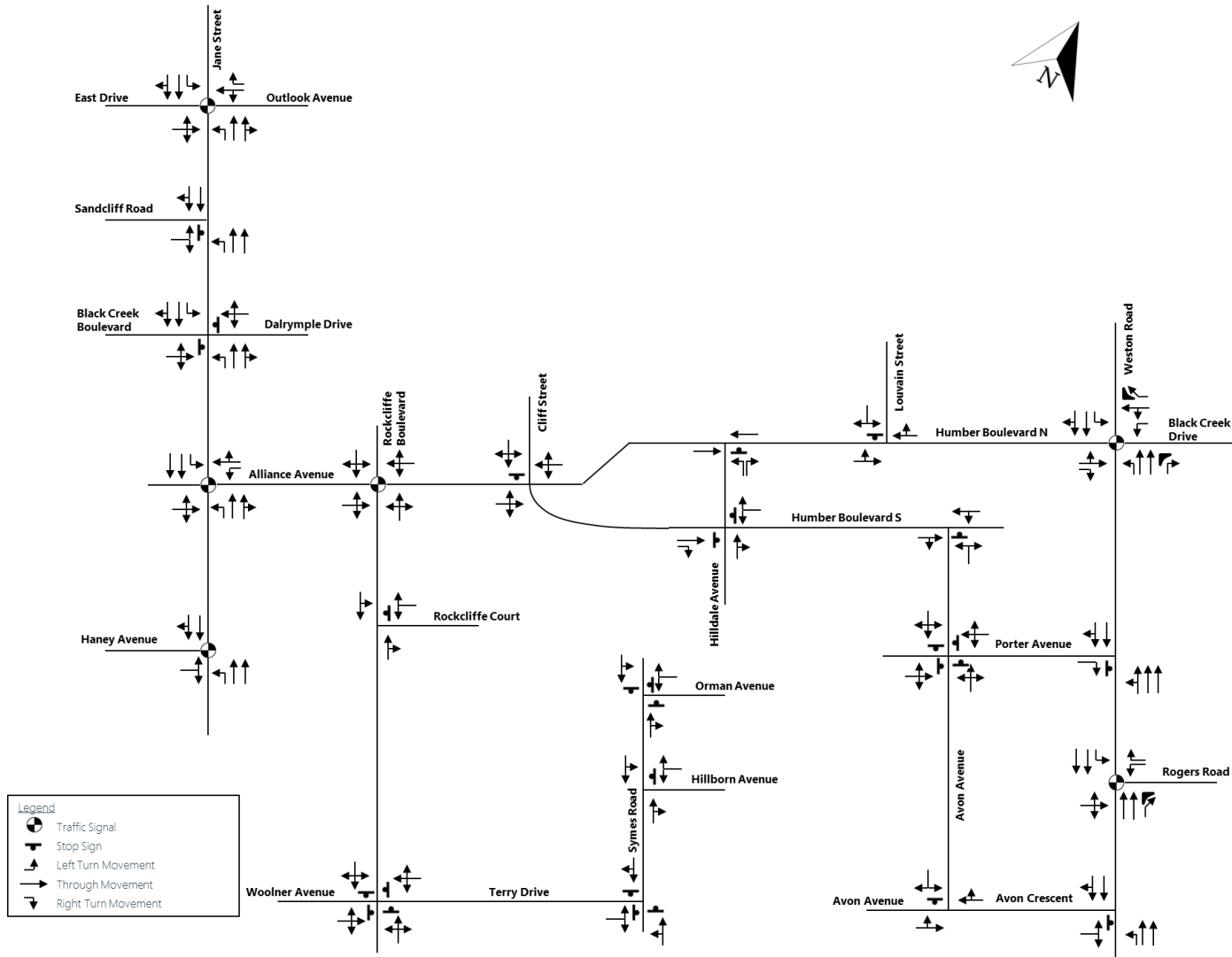
Approach and Assumptions

- Scenario 1:
 - ✓ A compound growth rate of 0.5% per annum was applied to existing traffic volumes to determine the future (2031) volumes.
- Scenario 2:
 - ✓ Introduced fully-protected left turn movements along Jane Street due to the LRT and recalculated the clearance times for the E/W direction
 - ✓ Unsignalized intersections were assumed to become right-in-right-out with traffic diverted to adjacent signalized intersections
 - ✓ Increased the cycle lengths from 100s to 120s during AM and PM peak hours to accommodate longer E/W pedestrian times



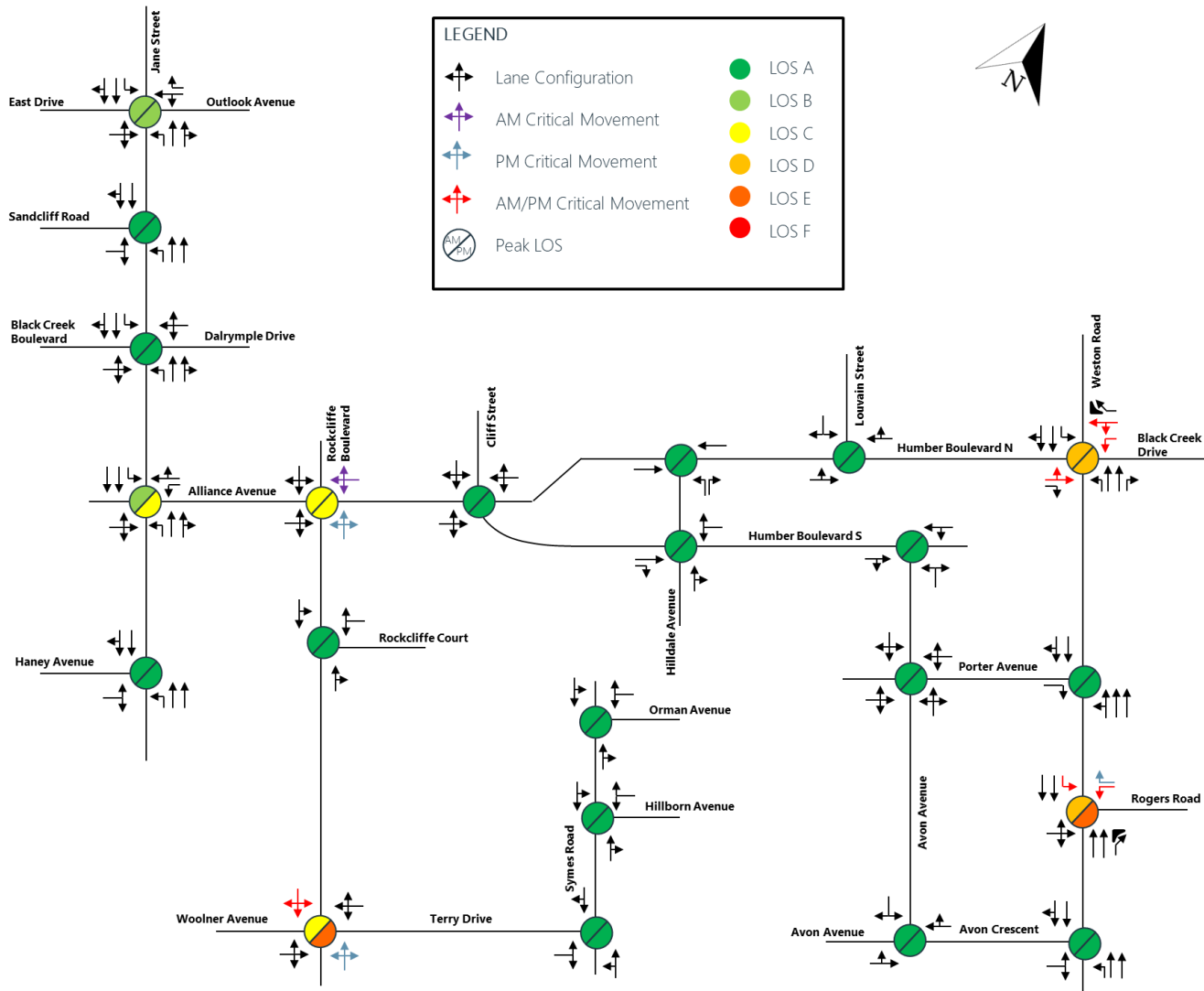
4. Future (2031) Traffic Conditions

Scenario 1 – without Improvements (Do-Nothing) - Road Network



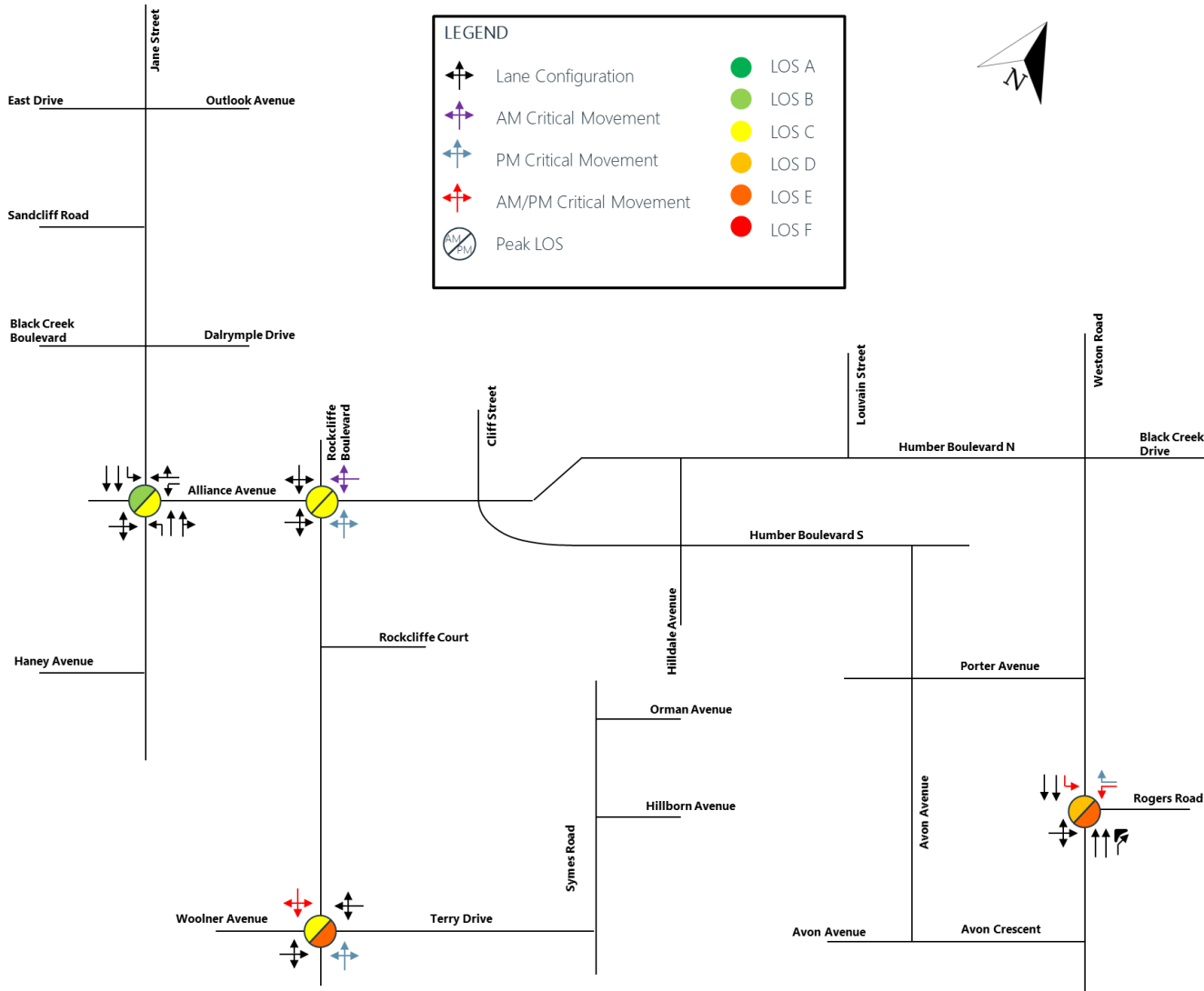
4. Future (2031) Traffic Conditions

Scenario 1 – without Improvements (Do-Nothing) – Intersection Capacity and LOS



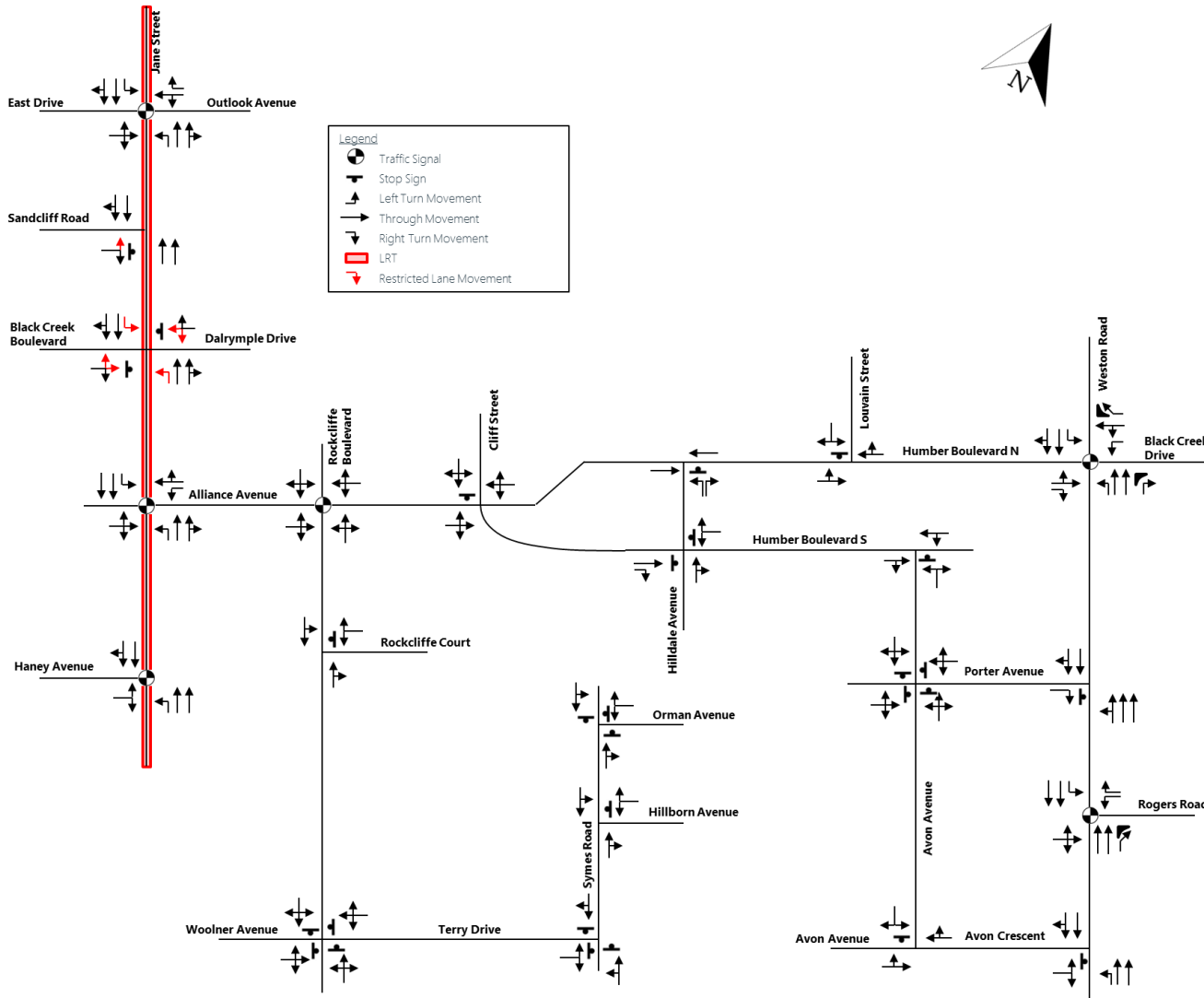
4. Future (2031) Traffic Conditions

Scenario 1 – without Improvements (Do-Nothing) – Intersection Capacity and LOS



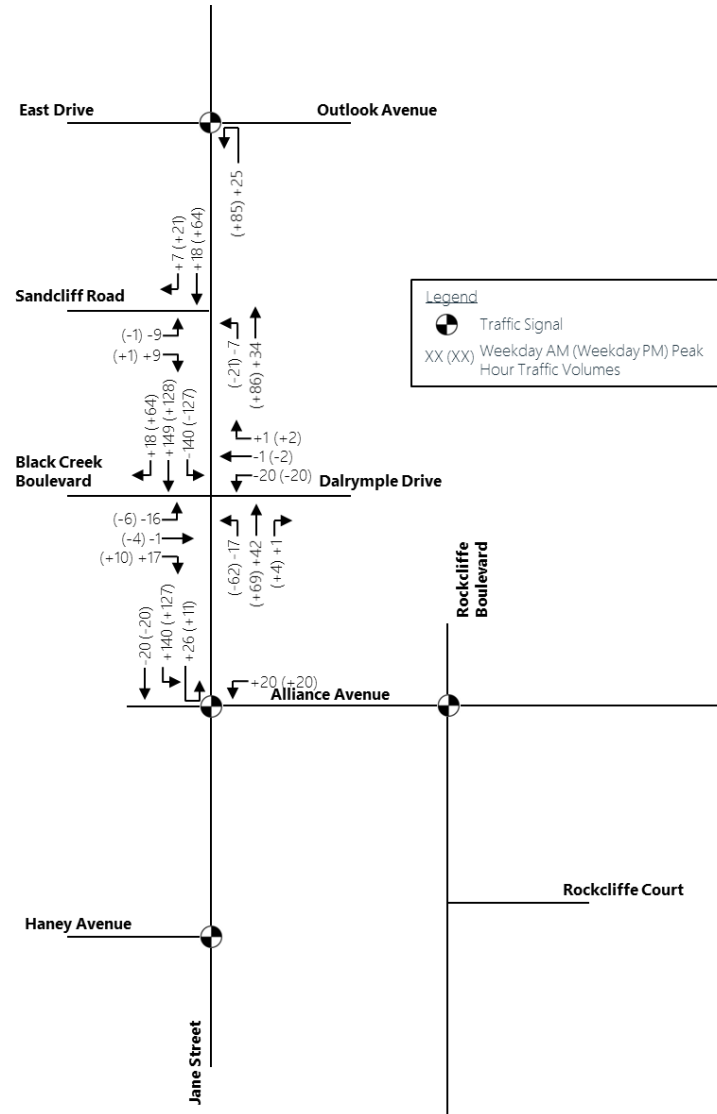
4. Future (2031) Traffic Conditions

Scenario 2 – with Improvements + LRT – Road Network



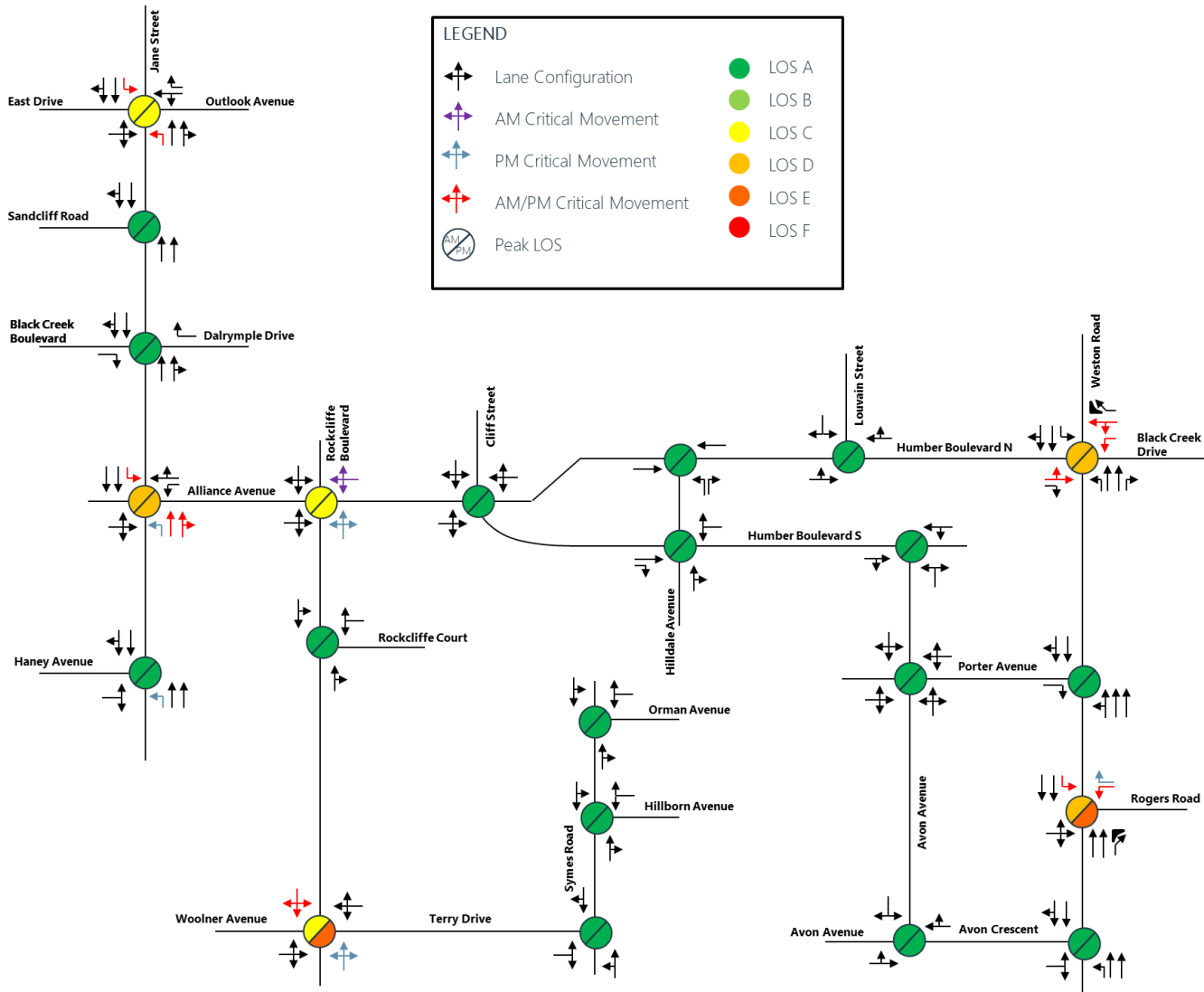
4. Future (2031) Traffic Conditions

Scenario 2 – with Improvements + LRT – Diverted Traffic Volumes



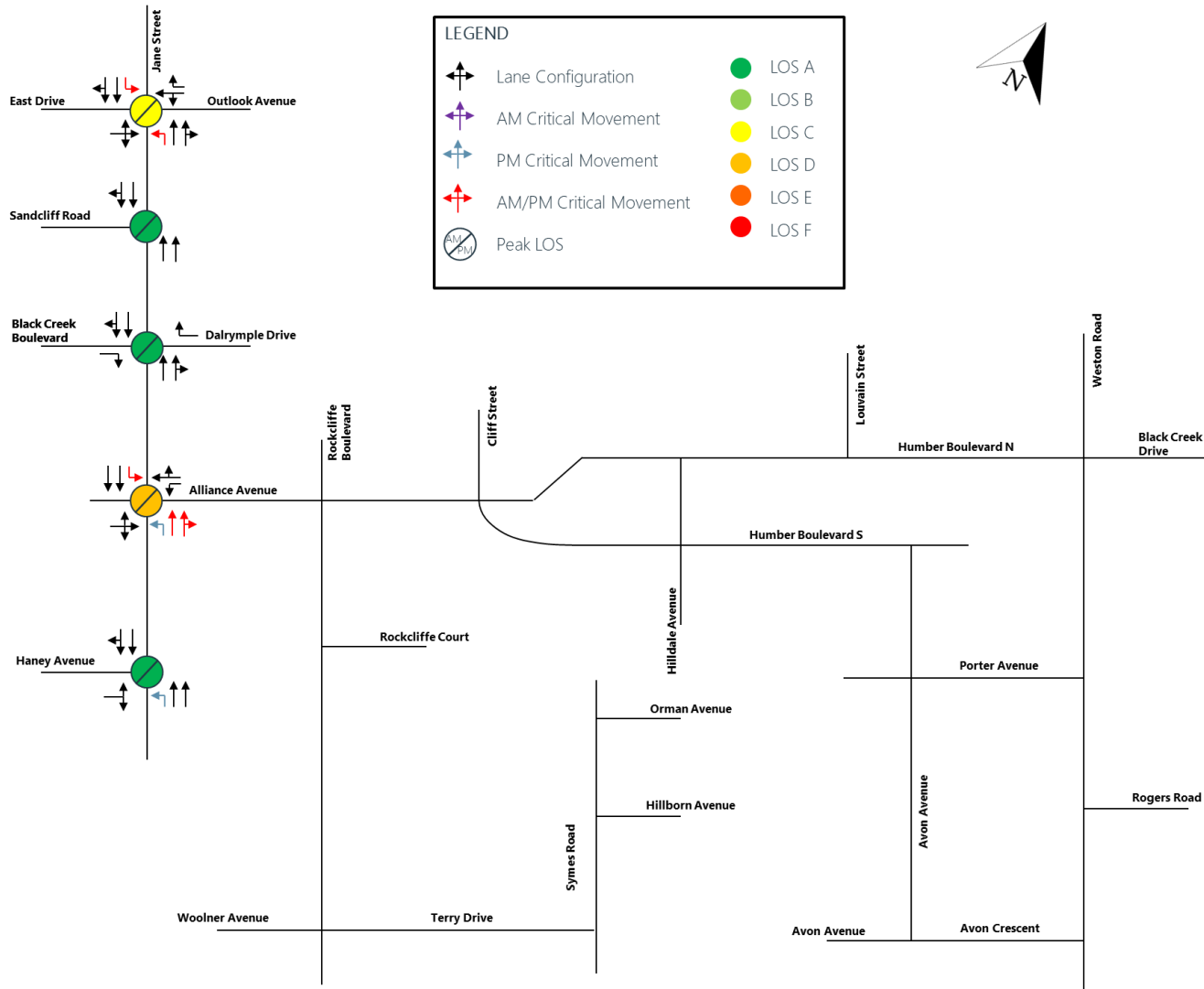
4. Future (2031) Traffic Conditions

Scenario 2 – with Improvements + LRT – Intersection Capacity and LOS



4. Future (2031) Traffic Conditions

Scenario 2 – with Improvements + LRT – Intersection Capacity and LOS



5. Conclusion

5. Conclusion

1. It can be concluded that future changes in traffic operations from existing conditions are due to the LRT and not the flood mitigation measures.



Questions

wood.

**FLOOD REMEDIATION AND
TRANSPORTATION FEASIBILITY STUDY
OF THE ROCKCLIFFE SPECIAL POLICY
AREA IN THE CITY OF TORONTO**

TRCA/ City of Toronto

woodplc.com





wood.

FLOOD REMEDIATION AND TRANSPORTATION FEASIBILITY STUDY OF THE ROCKCLIFFE SPECIAL POLICY AREA IN THE CITY OF TORONTO

**April 17, 2020 Preferred Alternatives
Implementation
Milestone Meeting #7**



Agenda

1. Introductions (Wood)
2. Review of February 12, 2020 Meeting Minutes (Wood)
3. Existing Conditions Recap – Modelling/ Flooding (DHI)
4. Preferred Alternatives and Results (Wood/ DHI)
5. Define Flood Remediation Plan (Wood/ DHI)
6. Next Steps (Wood)
7. Other Business (All)



1. Introductions

1. Introductions (Wood)

- TRCA Staff - Team
- City of Toronto Staff
- Wood Staff
- DHI - Hydraulics



2. Review of February 12, 2020 Meeting Minutes (Wood)

2. Review of February 12, 2019 Meeting Minutes

Minutes Dated February 29, 2020:

Summary of Action Items:

- 2 ii) City to provide EMME transportation model output
- 2 iii) City and TRCA to continue working on TOR for Municipal Class EA.
- 3. Wood to provide digital Geotechnical Existing Conditions Report
- 5 ii) City to confirm that additional transportation assessment of Alliance Avenue and Humber Boulevard crossings and Humber Boulevard South is required.
- 5 iv) Wood to confirm geotechnical BH locations at Weston Road can be used for assessment of a flood protection wall.



2. Review of February 12, 2019 Meeting Minutes

Minutes Dated February 29, 2020:

Summary of Action Items:

- 5 vi) Man-Kit Koo to pass on hydraulic modelling results, once finalized, to Basement Flood Protection Team.
- 6) Wood to prepare Phase 2C report.
- 8i) City to review Jane Street 26 m pavement width for Jane Street beyond Black Creek Valley within the future Municipal Class EA.
- 8ii) City to review width requirements for the northern Lavender Creek crossing bridge within the future Municipal Class EA.



3. Existing Conditions Recap – Modelling/ Flooding (DHI)

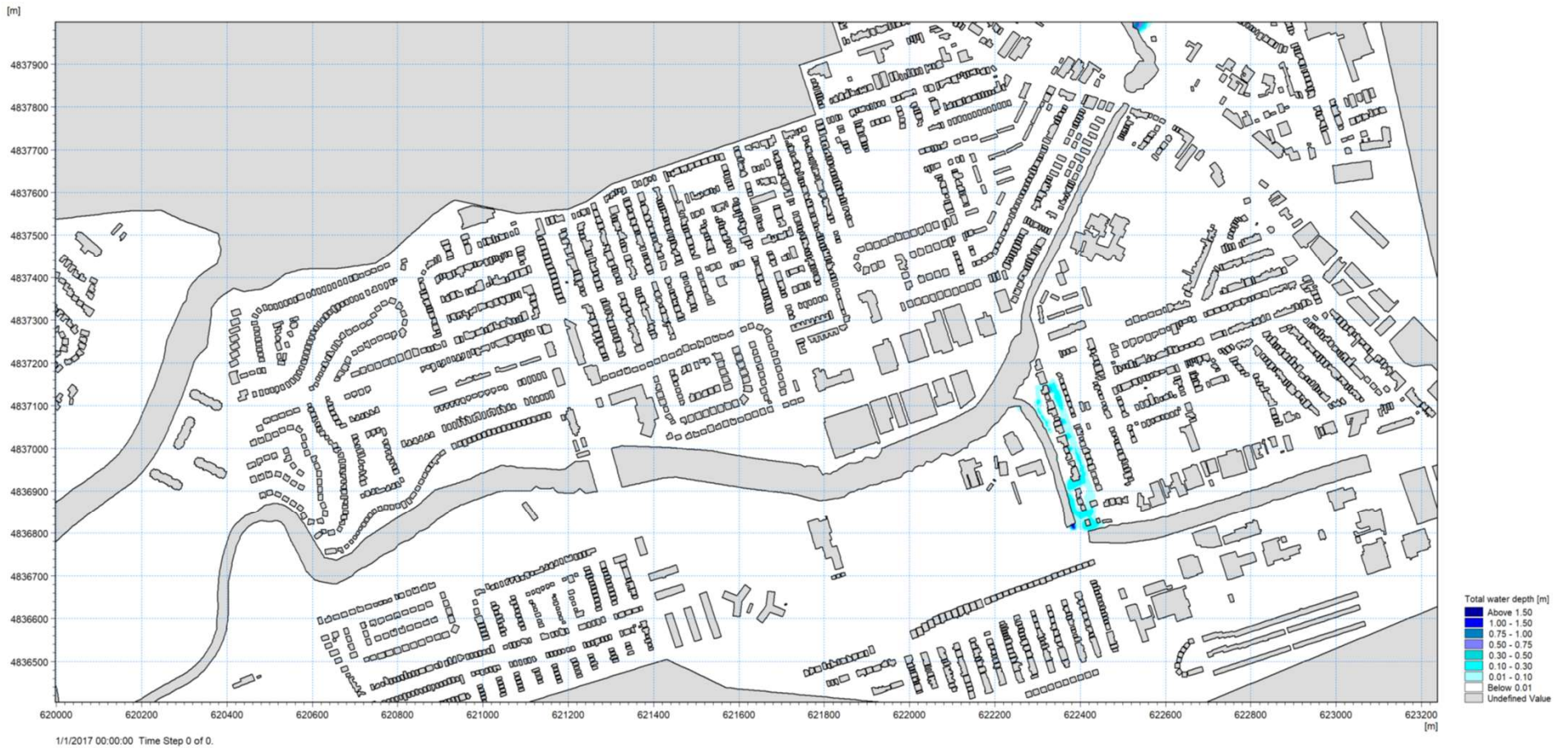
3. Existing Conditions Recap

- Summary of Buildings Impacted by Flooding:
 - 2 Year: 15
 - 5 Year: 26
 - 10 Year: 33
 - 25 Year: 47
 - 50 Year: 57
 - 100 Year: 113
 - 350 Year: 215
 - Regional Storm: 366



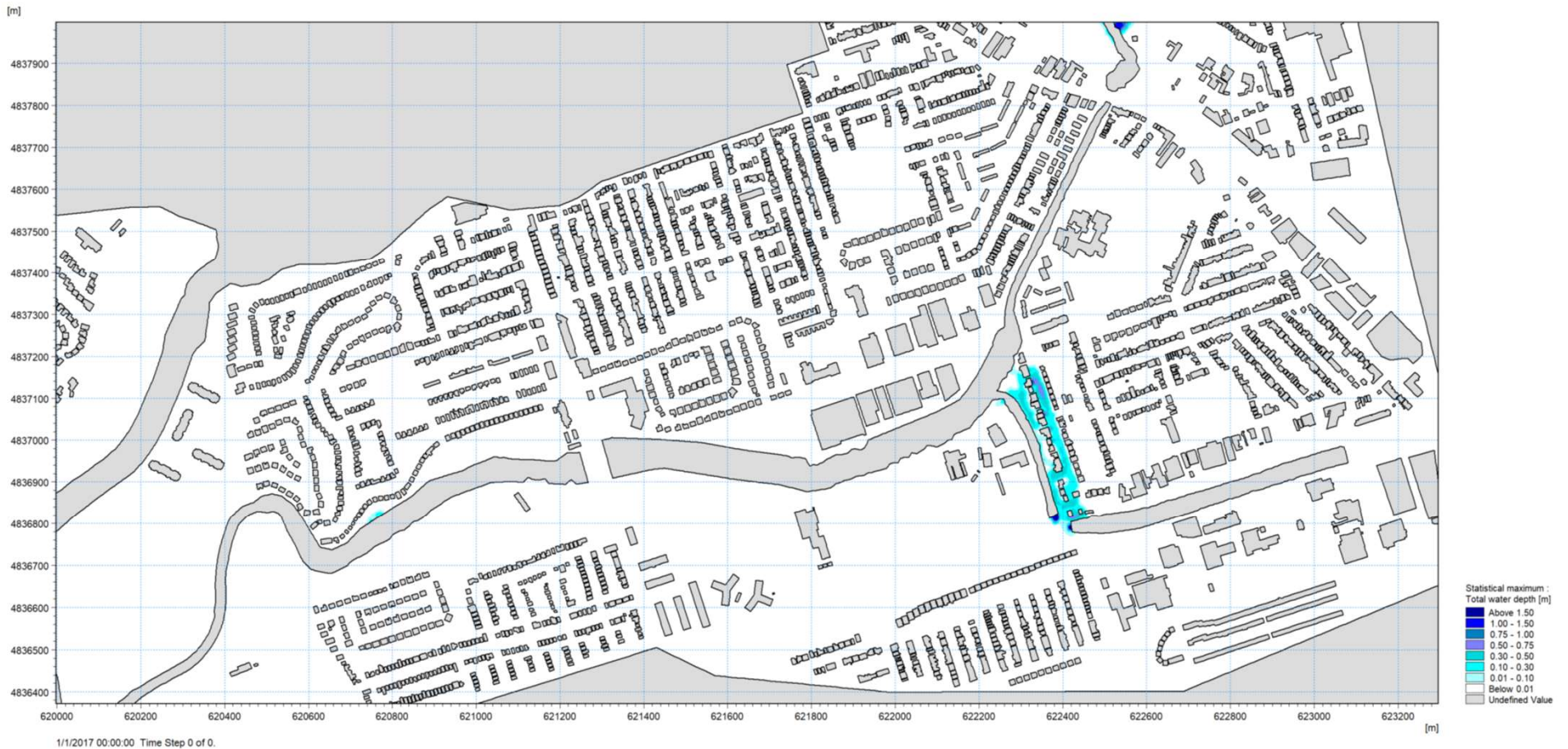
3. Existing Conditions Recap

- 2 Year – Max Depth



3. Existing Conditions Recap

- 5 Year – Max Depth



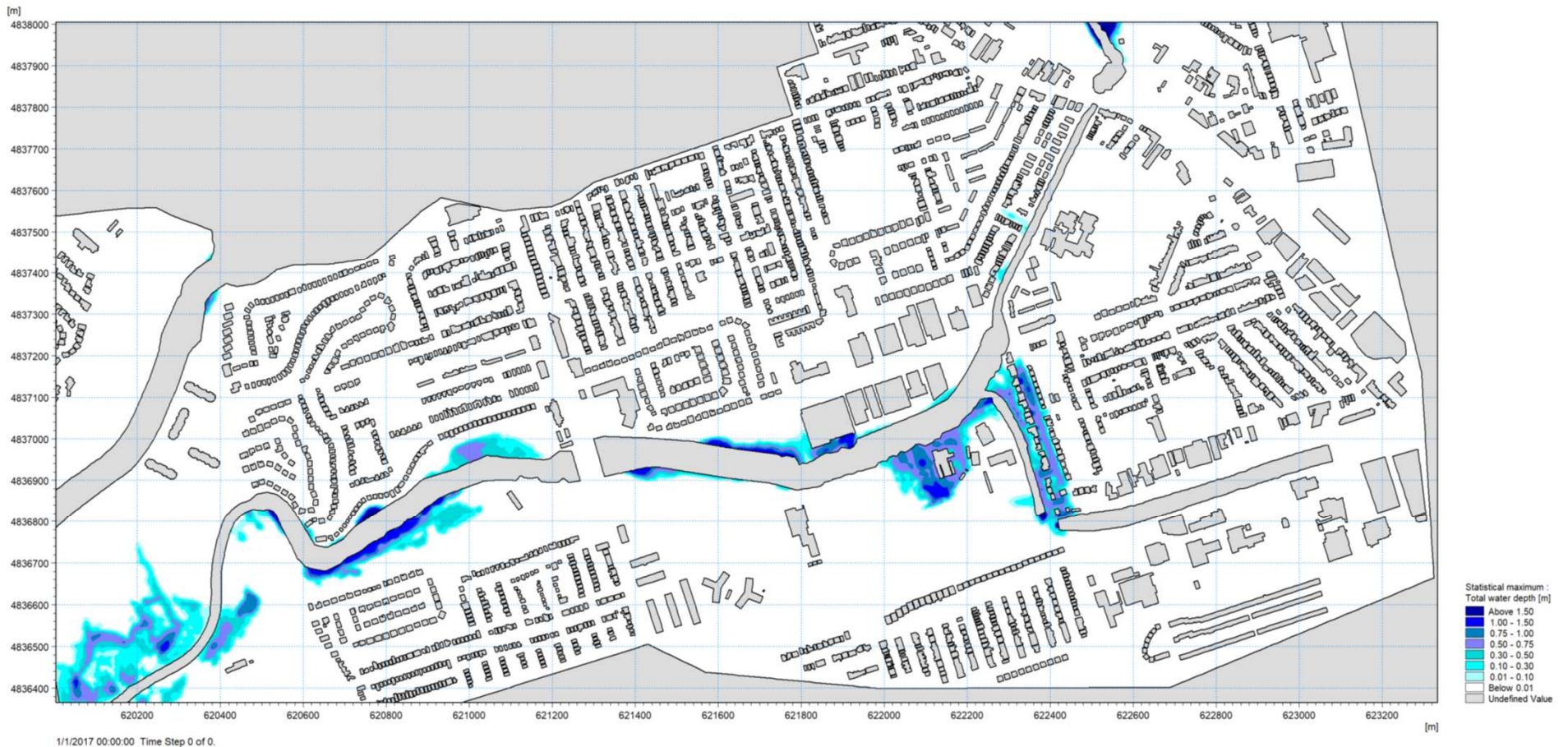
3. Existing Conditions Recap

- 10 Year – Max Depth



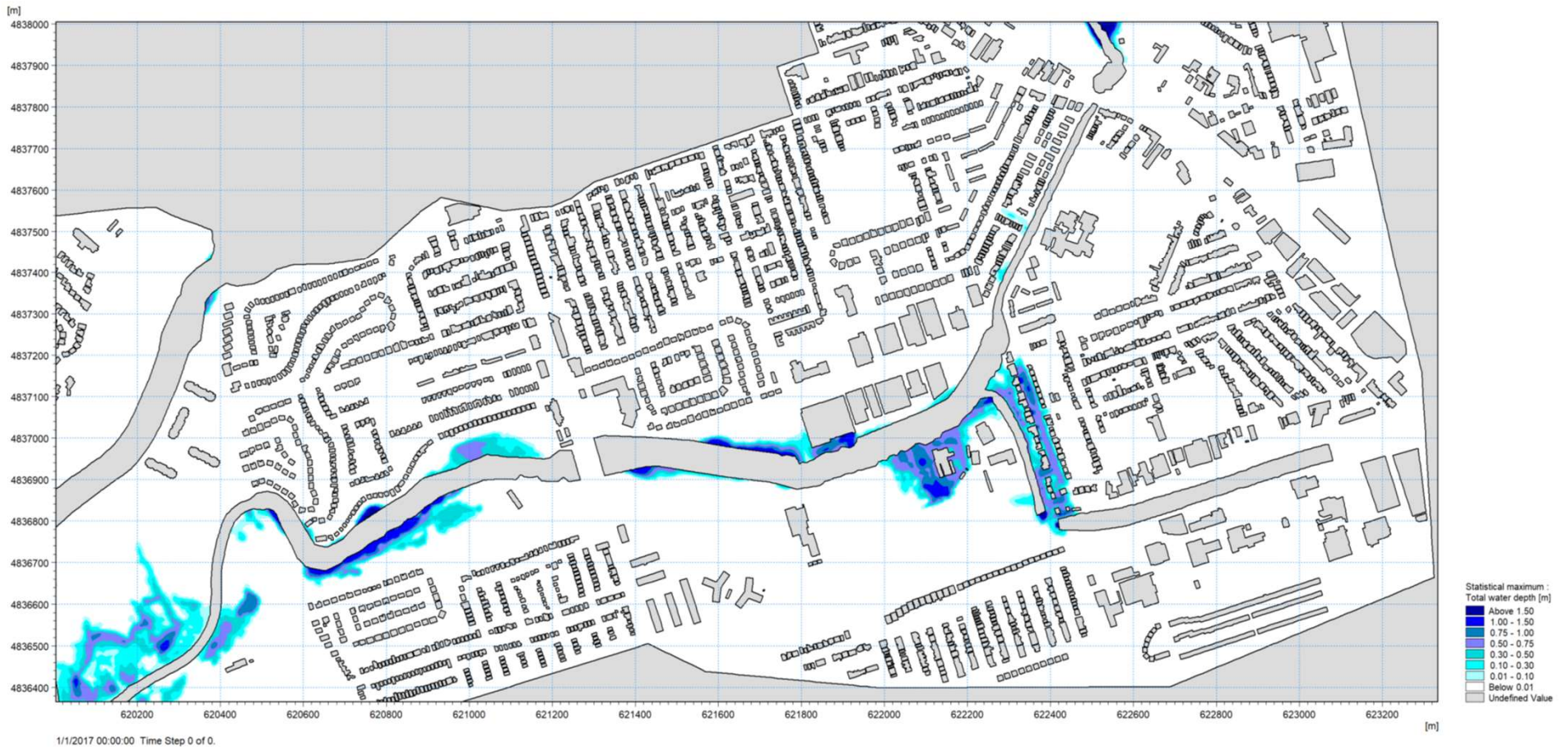
3. Existing Conditions Recap

- 25 Year – Max Depth



3. Existing Conditions Recap

- 50 Year – Max Depth



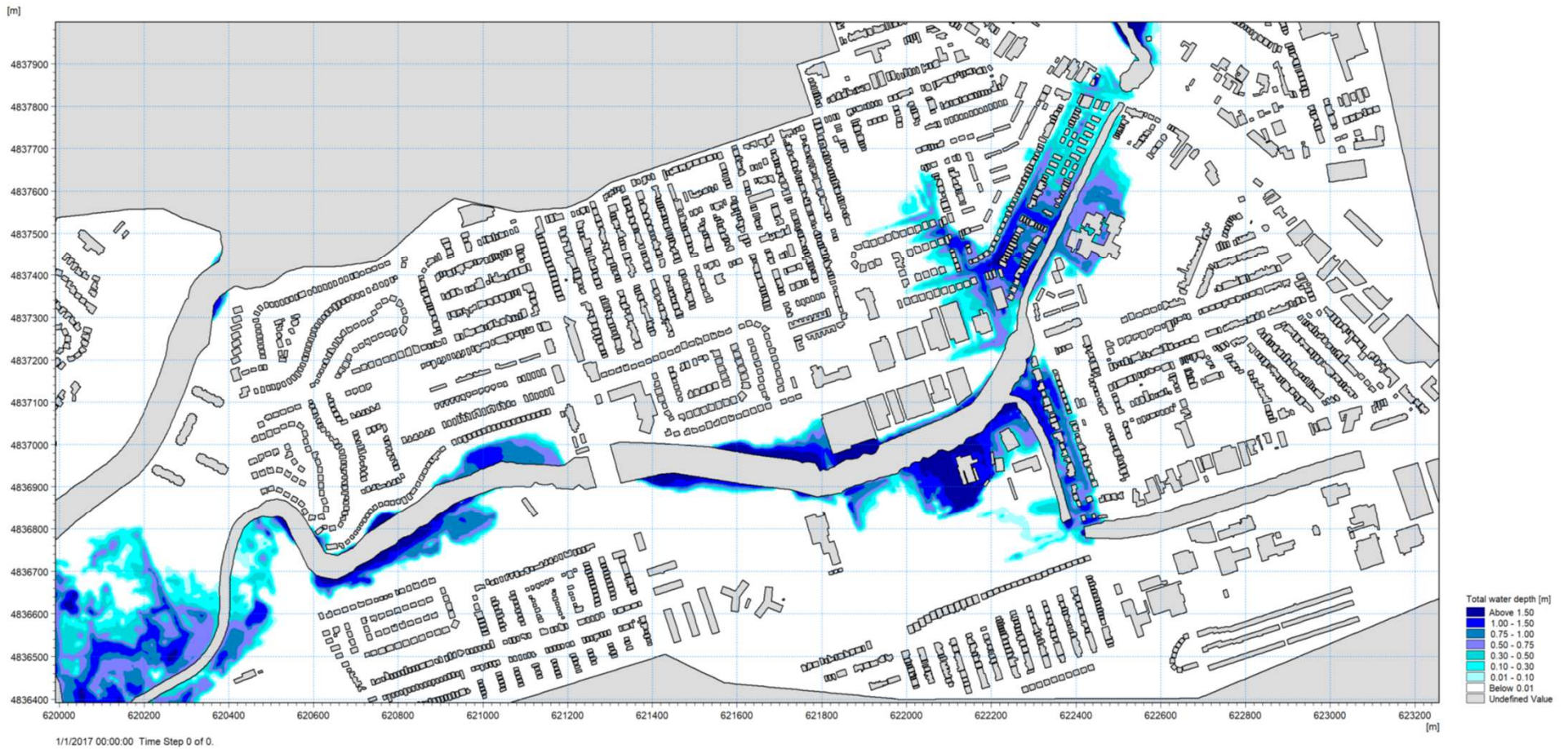
3. Existing Conditions Recap

- 100 Year – Max Depth



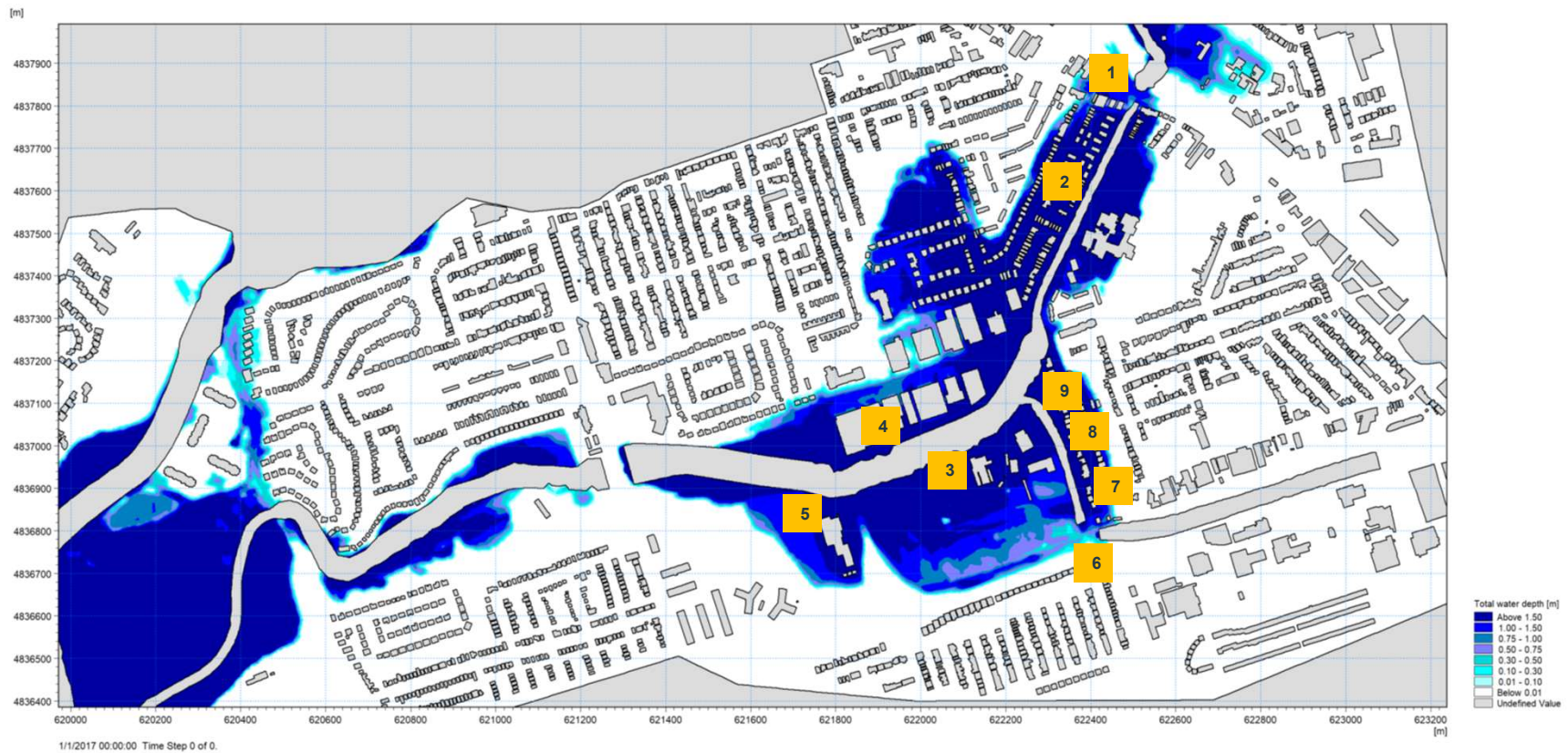
3. Existing Conditions Recap

- 350 Year – Max Depth



3. Existing Conditions Recap

- Regional Storm – Max Depth



3. Existing Conditions Recap

Summary of Flooding Conditions

1. Overtopping of Weston Road during the 350 year and Regional events (caused by backwater from Weston Road crossing).
2. Overtopping of Black Creek along Humber Boulevard North during the 50 year, 100 year, 350 year, and Regional events (caused by backwater from Rockcliffe Boulevard bridge and Jane Street crossing).
3. Overtopping of Black Creek upstream of Rockcliffe Boulevard adjacent to Rockcliffe Court during the 10 year to 350 year and Regional event (caused by backwater from Rockcliffe Boulevard bridge and Jane Street crossing).
4. Overtopping of Black Creek upstream of Rockcliffe Boulevard adjacent to Alliance Avenue during the 10 year to 350 year and Regional events (caused by backwater from Rockcliffe Boulevard bridge and Jane Street crossing).



3. Existing Conditions Recap

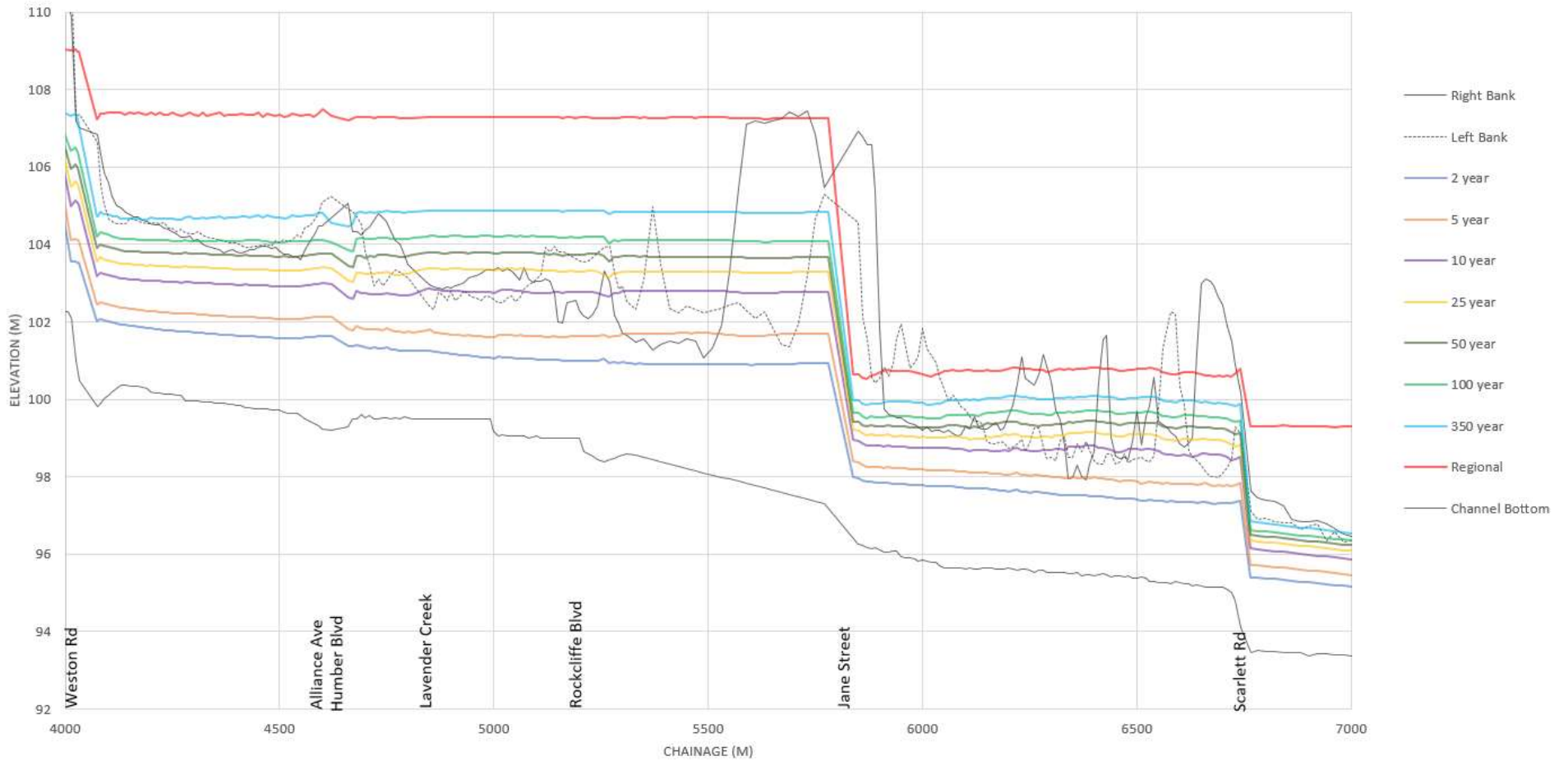
Summary of Flooding Conditions

5. Overtopping of Black Creek downstream of Rockcliffe Boulevard at Rockcliffe Middle School (caused by backwater from Rockcliffe Boulevard bridge and Jane Street crossing).
6. Overtopping of Lavender Creek at Symes Road during the 2 year to 350 year and Regional events (caused by backwater from the Symes Road crossing).
7. Overtopping of Lavender Creek at the Upstream Private Crossing during the 10 year to 350 year and Regional events (caused by backwater from the Upstream Private Crossing).
8. Overtopping of Lavender Creek at the Downstream Private Crossing during the 5 year to 350 year and Regional events (caused by backwater from the Downstream Private Crossing).
9. Overtopping of Lavender Creek at the confluence of Black Creek during the 10 year to 350 year and Regional events (caused by high water levels in Black Creek).

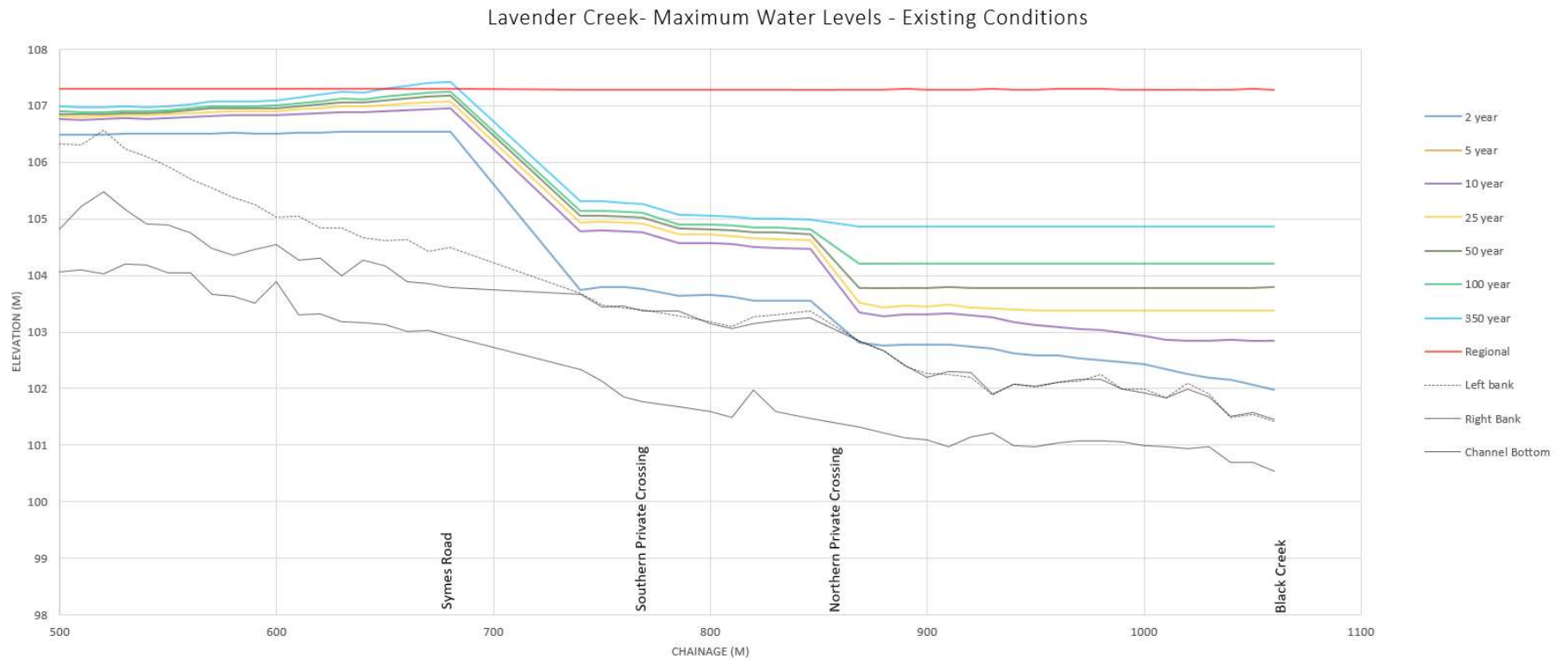


3. Existing Conditions Recap

Black Creek - Maximum Water Levels - Preferred Alternatives



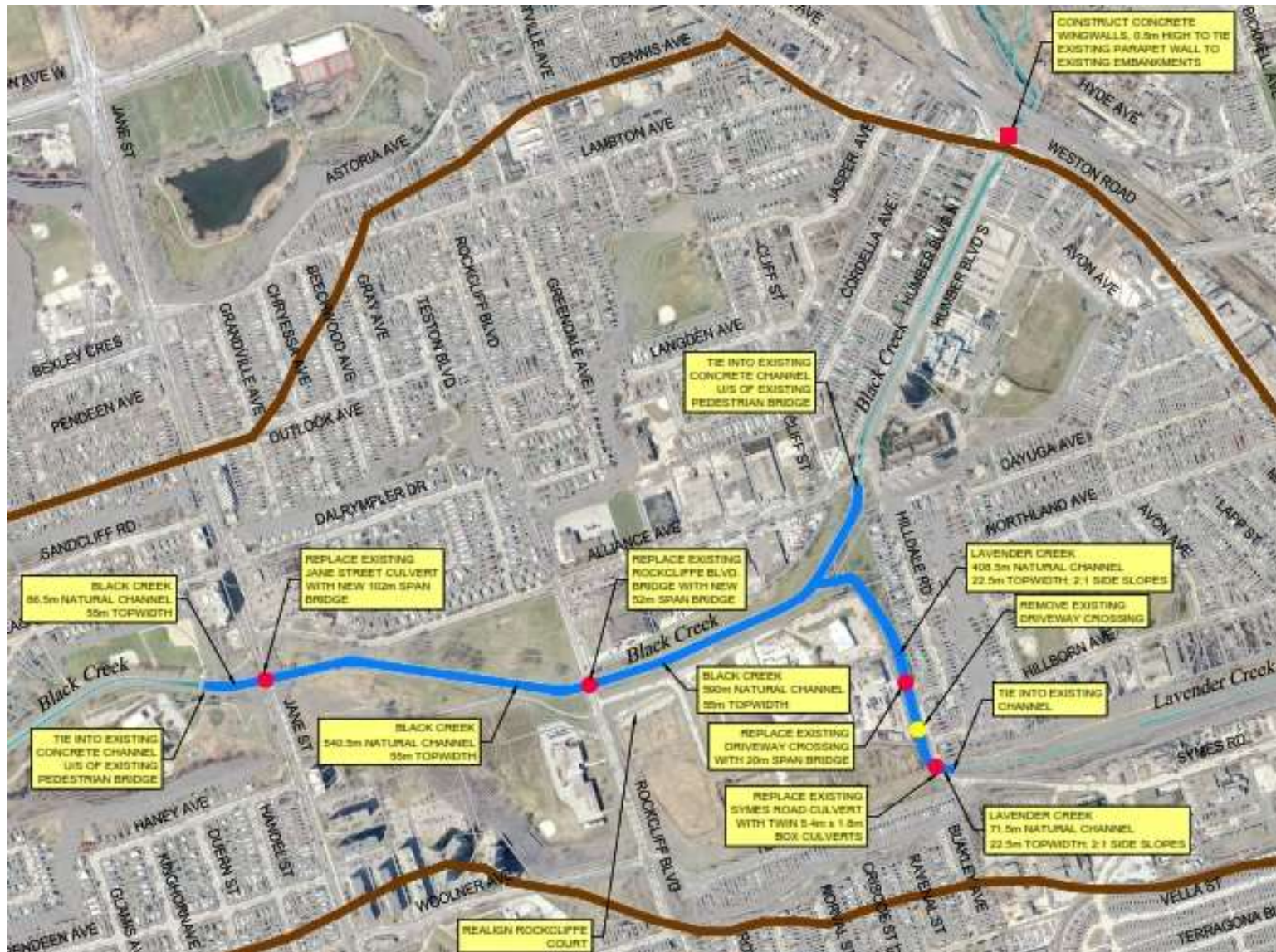
3. Existing Conditions Recap



4. Preferred Alternatives and Results (Wood/ DHI)

4. Preferred Alternatives and Results (Wood/ DHI)

Summary of Preferred Alternatives



4. Preferred Alternatives and Results (Wood/ DHI)

Summary of Black Creek Preferred Alternatives

- Replace 10.7 m span structure at Jane Street with a 72 m span bridge (Extend to 102 m due to geotechnical considerations).
- Naturalize, widen and deepen Black Creek from Jane Street to Rockcliffe Blvd. (55 m top width)
- Upgrade 15.2 m by 4.6 m Rockcliffe Blvd. bridge to a 52 m span by 4.9 m rise bridge and lower invert
- Naturalize, widen and deepen Black Creek from Rockcliffe Blvd. to downstream of Alliance Ave. (55 m top width)
- Construct a 0.5 m high flood protection wall at Weston Road



4. Preferred Alternatives and Results (Wood/ DHI)

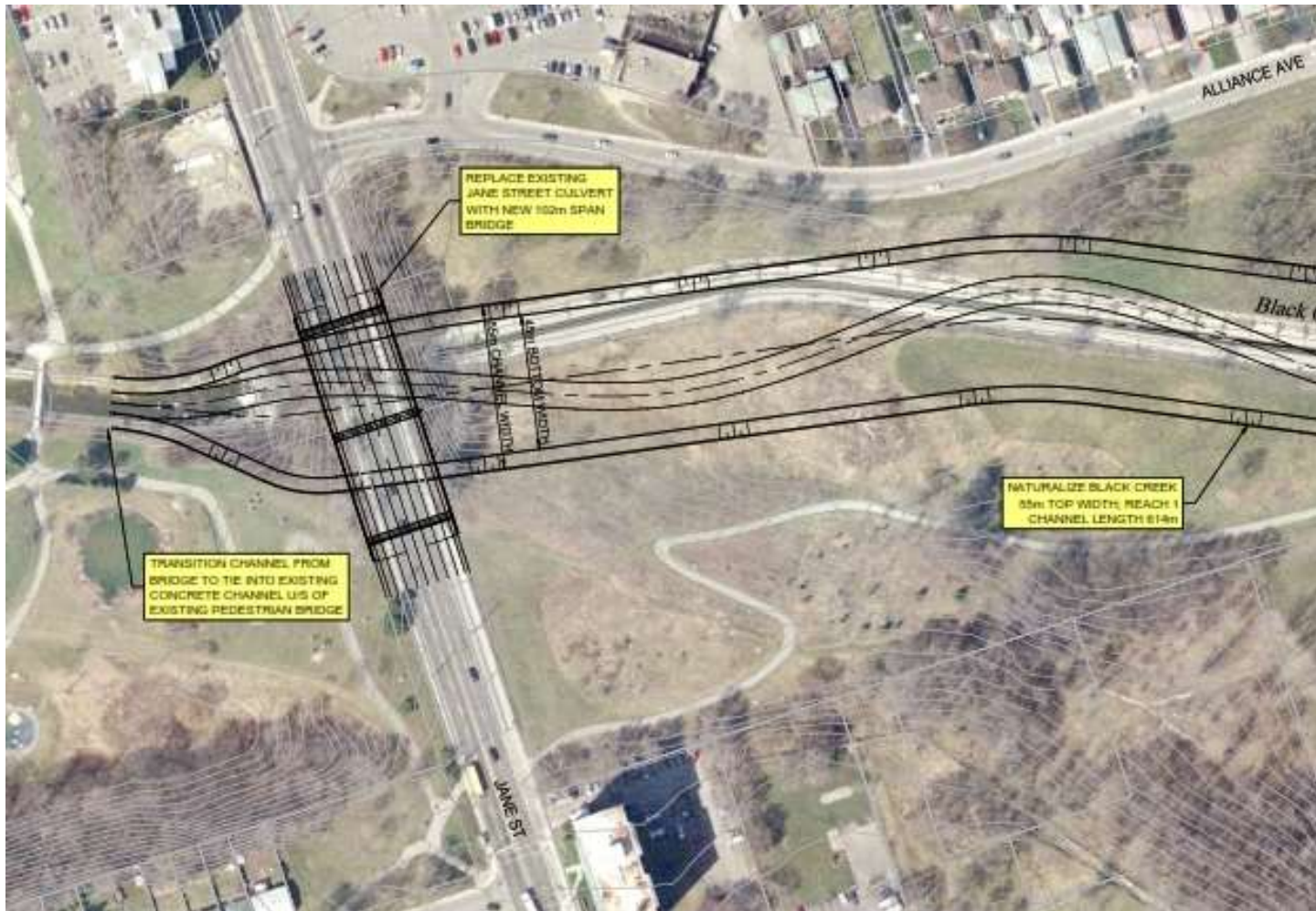
Summary of Preferred Lavender Creek Alternatives

- Naturalize and widen Lavender Creek to 22.5 m top width from Black Creek to Symes Road
- Remove south crossing of Lavender Creek 4.8 m by 2.1 m
- Replace Lavender Creek northern 4.8 m by 2.3 m crossing with a 20 m span by 3.87 m rise crossing
- Replace Symes Road crossing 3.66 m by 0.90 m rise, 40.2 m long, with twin 5.4 m span by 1.8 m rise culverts



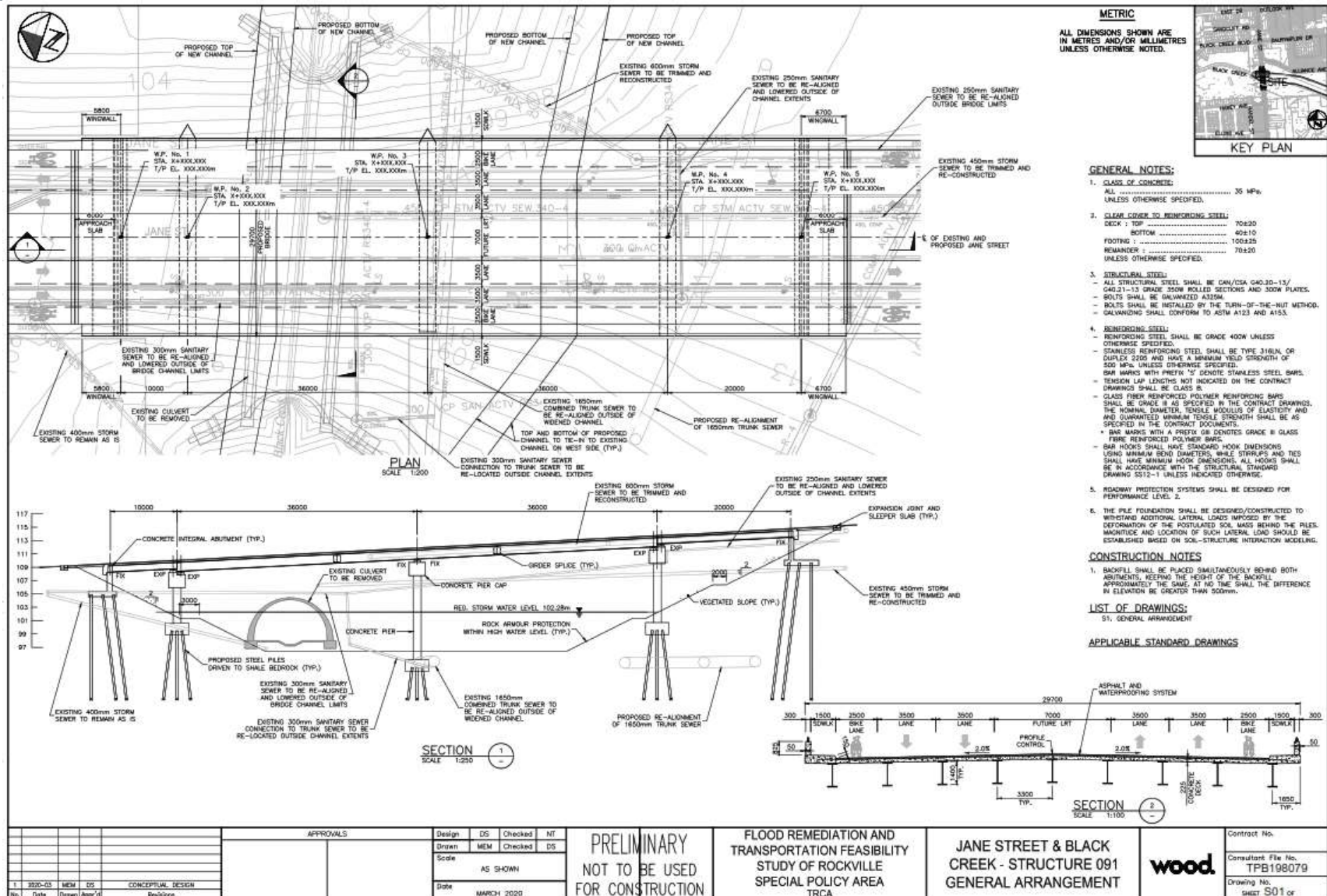
4. Preferred Alternatives and Results

Upgrade Jane Street Crossing - 102 m Span



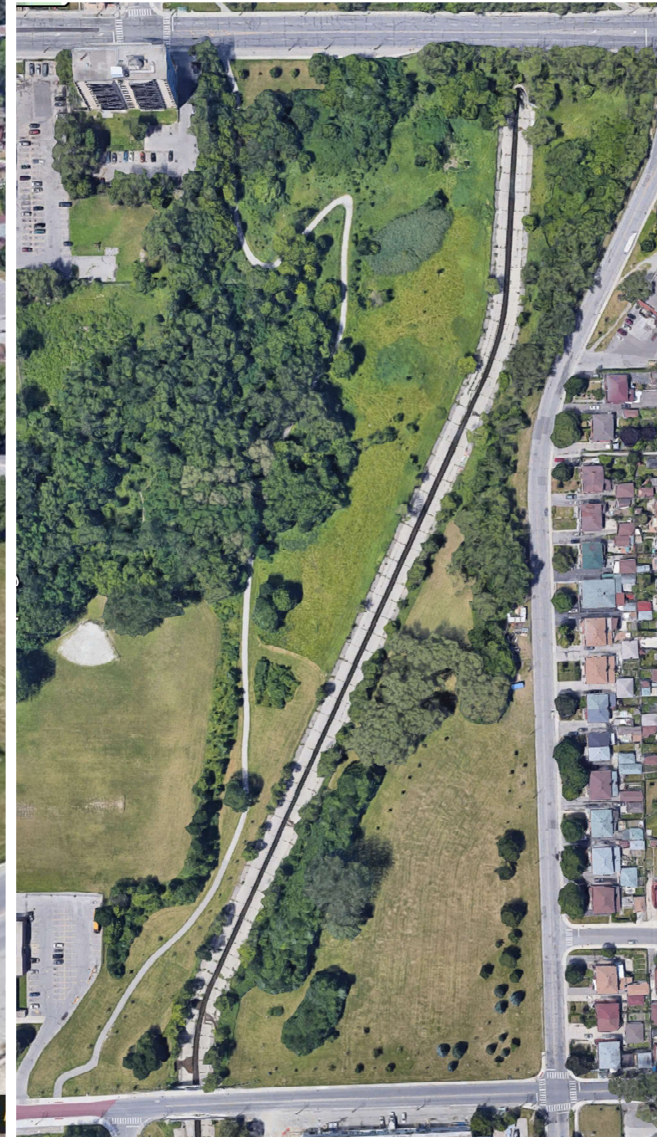
4. Preferred Alternatives and Results

Upgrade Jane Street Crossing – 102 m span



4. Preferred Alternatives and Results

Naturalize and Widen Black Creek Channel – 55 m Top Width (Jane Street to Rockcliffe Blvd.)



4. Preferred Alternatives and Results

Naturalize and Widen Black Creek Channel – 55 m Top Width (Jane Street to Rockcliffe Blvd.)



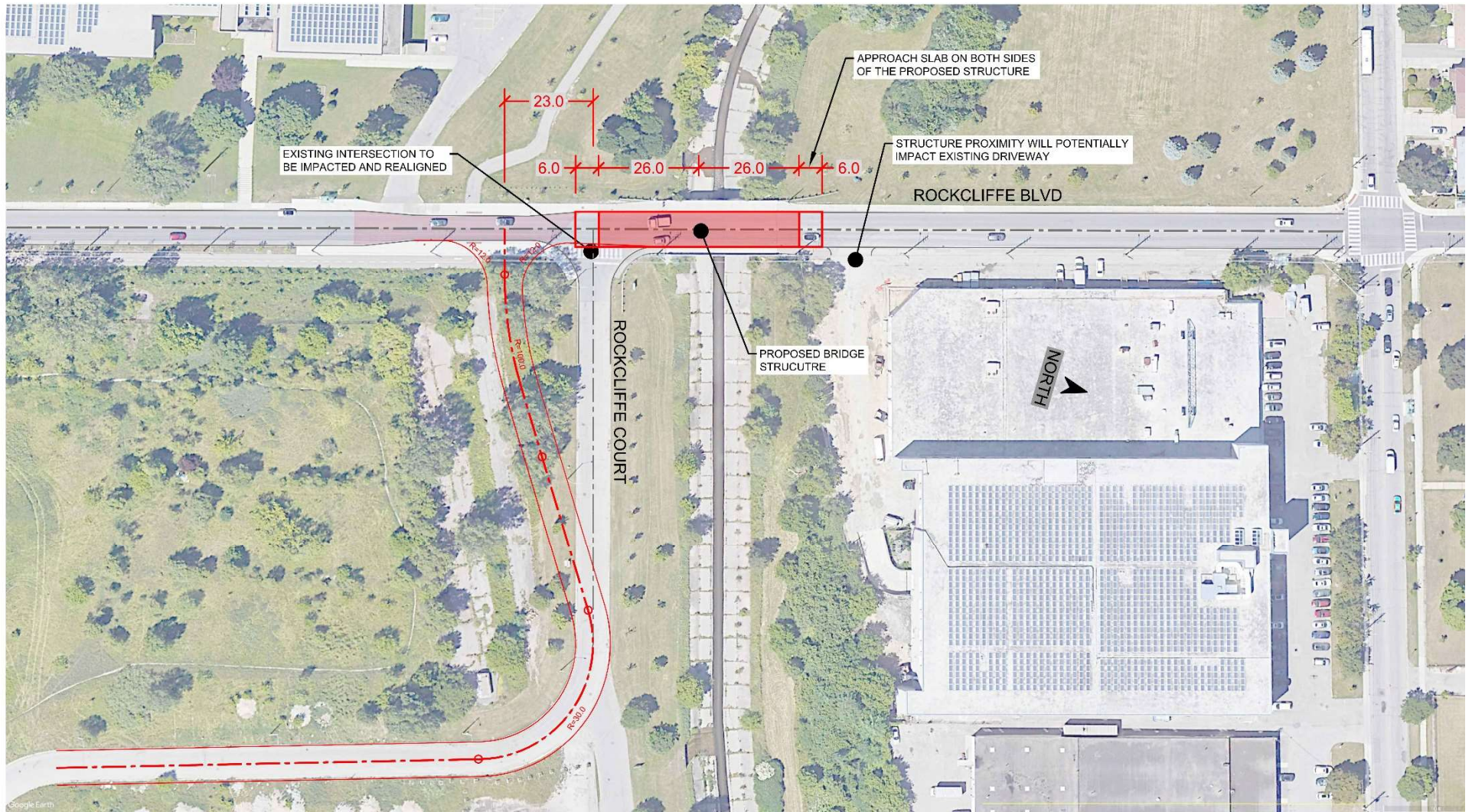
4. Preferred Alternatives and Results

Upgrade Rockcliffe Blvd Crossing – 52 m span



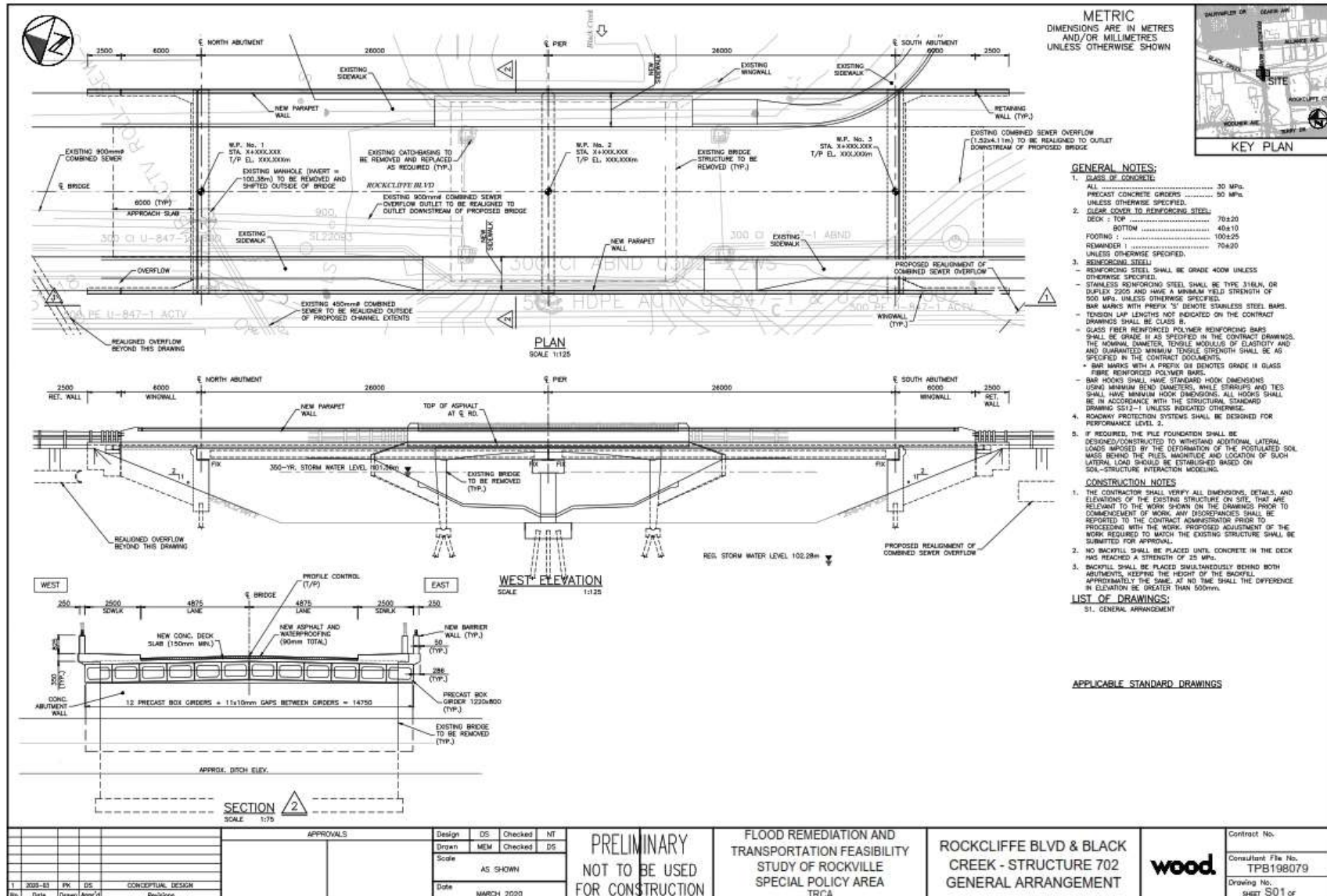
4. Preferred Alternatives and Results

Upgrade Rockcliffe Blvd Crossing – 52 m span



4. Preferred Alternatives and Results

Upgrade Rockcliffe Blvd. Crossing – 52 m span



Preferred Alternatives and Results

Naturalize and Widen Black Creek – 55 m Top Width (Rockcliffe Blvd. – Alliance Ave.)



4. Preferred Alternatives and Results

Naturalize and Widen Black Creek – 55 m Top Width (Rockcliffe Blvd. – Alliance Ave.)



4. Preferred Alternatives and Results

Weston Road Flood Protection Wall

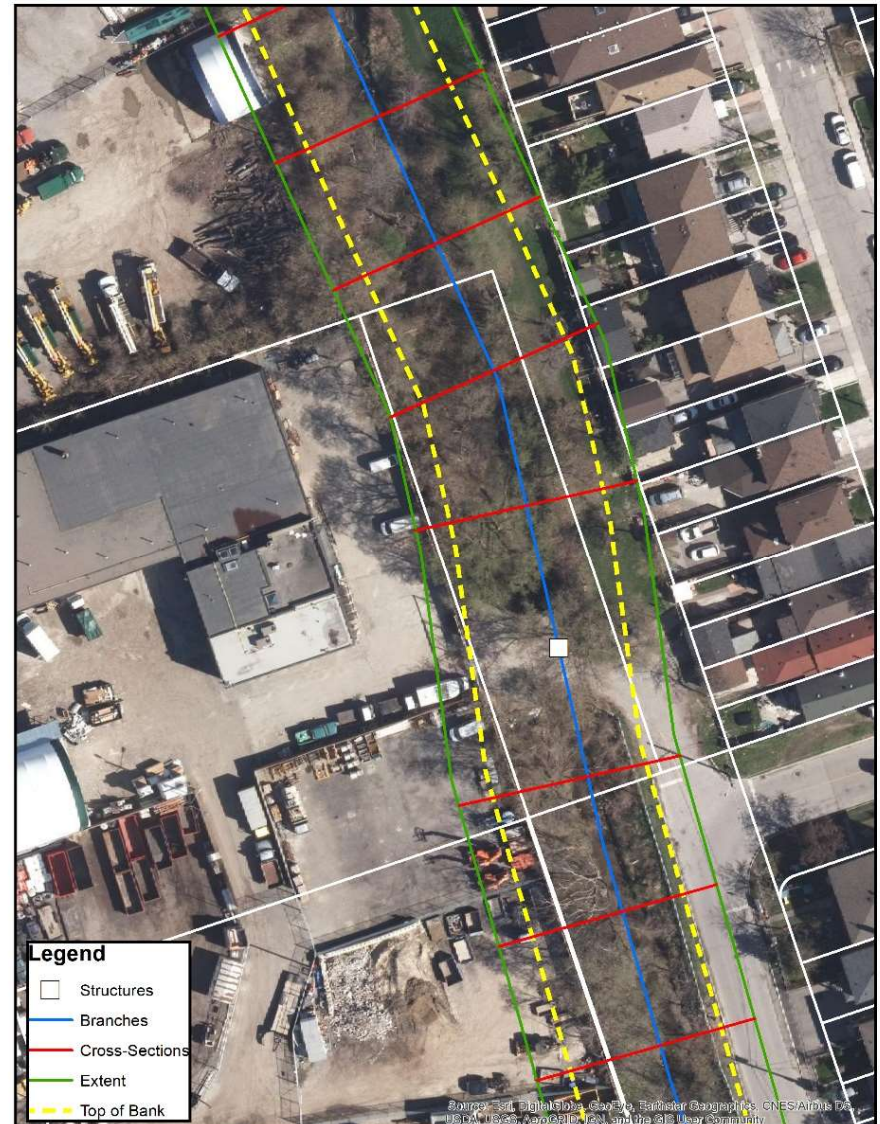
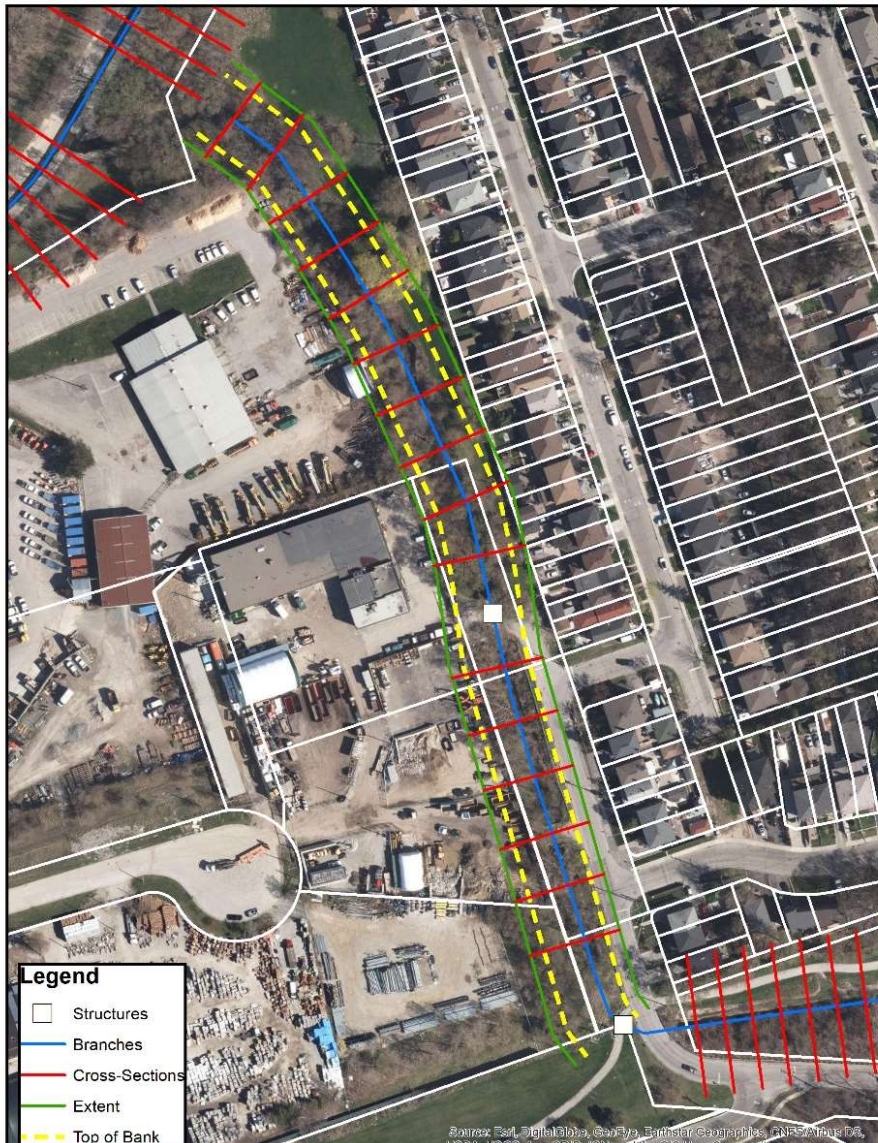
Weston Road Overflow Mitigation

- Flood protection wall (0.5 m +/- height)



4. Preferred Alternatives and Results

Naturalize and Widen Lavender Creek – 22.5 m (Black Creek to Symes Road)



tatio

4. Preferred Alternatives and Results

Remove Southern Crossing of Lavender Creek

- Crossing 4.8 m by 2.1 m
- Remove structure due to lack of use



4. Preferred Alternatives and Results

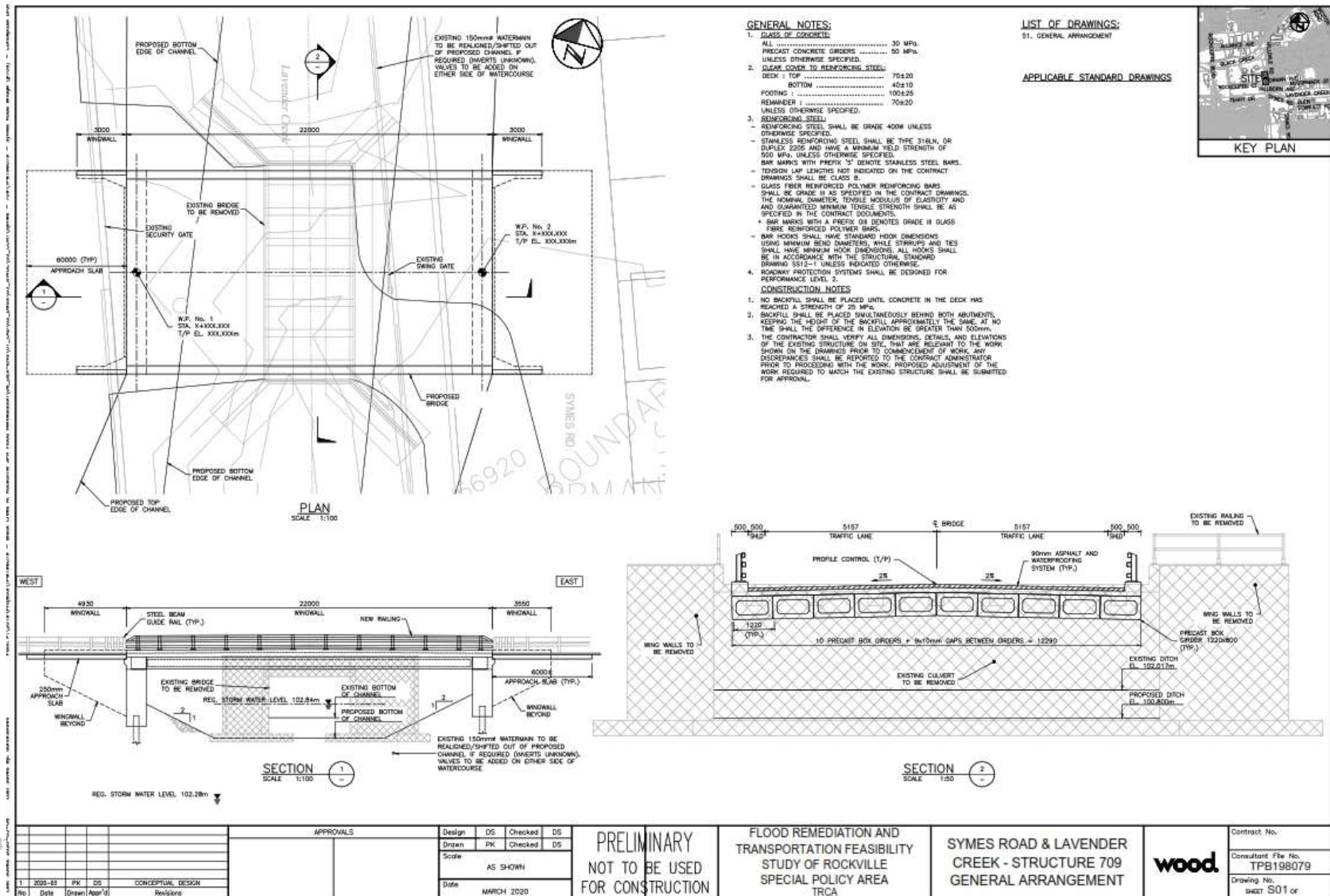
Upgrade Northern Crossing of Lavender Creek – 20 m Span

- Northern Private Crossing 4.8 m span by 3 m rise
- Widen Structure to 20 m span by 3.87 m rise



4. Preferred Alternatives and Results

Upgrade Northern Crossing of Lavender Creek – 20 m Span



4. Preferred Alternatives and Results

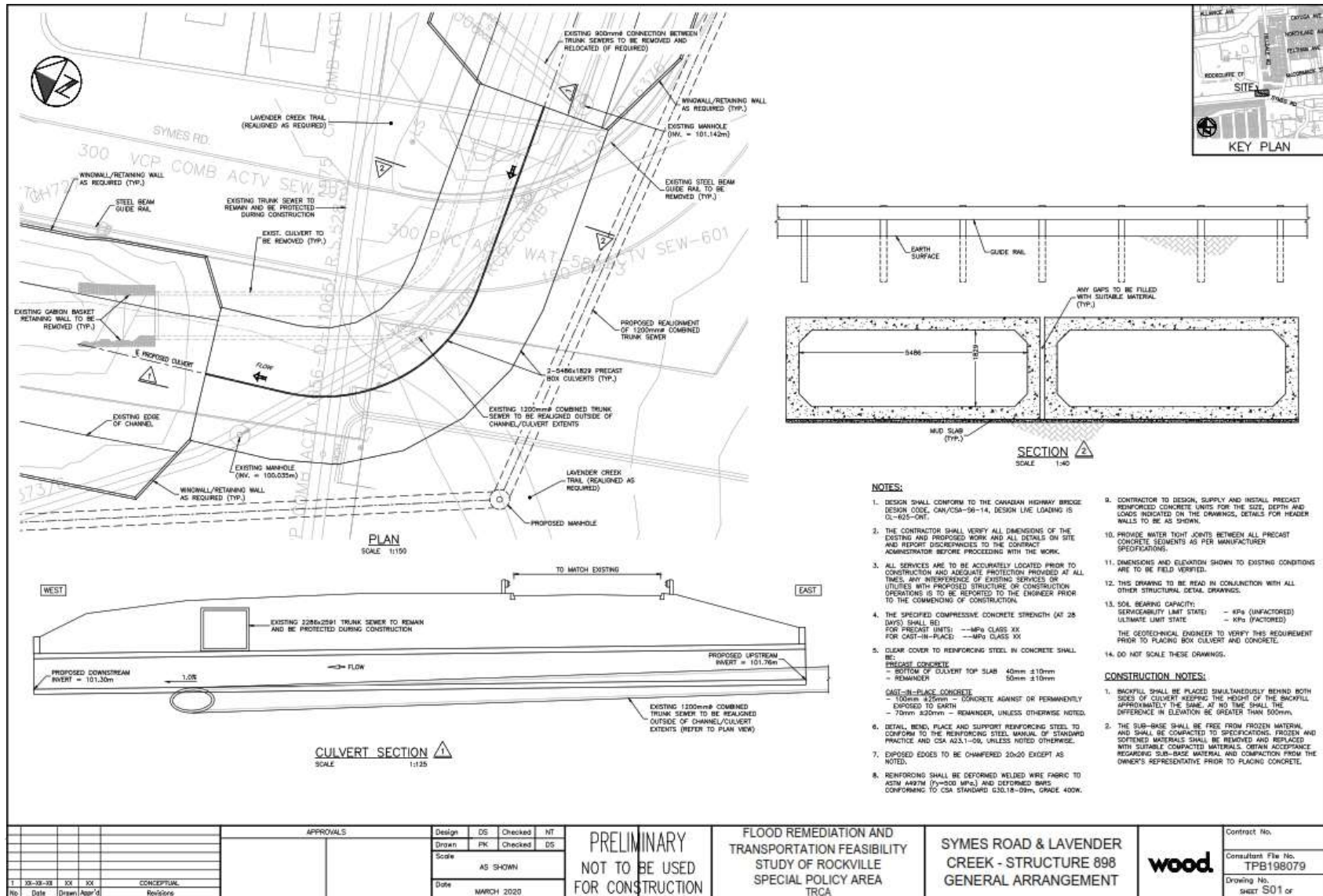
Upgrade Symes Road Crossing of Lavender Creek

- Symes Road Crossing 3.66 m span by 0.90 m rise, 40.2 m long
- Widen Structure to Twin 5.4 m span by 1.8 m rise



4. Preferred Alternatives and Results

Upgrade Symes Road Crossing of Lavender Creek



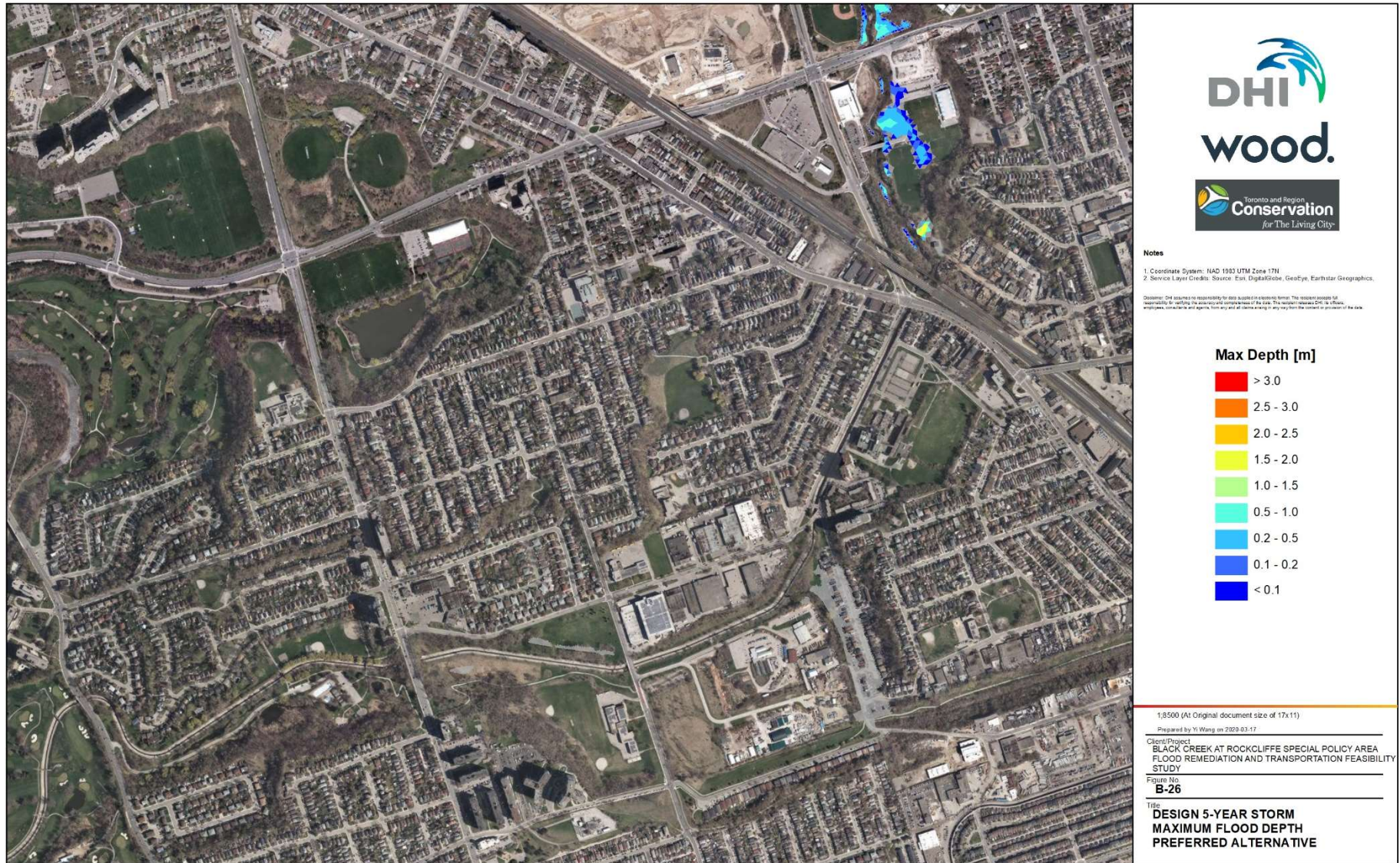
4. Preferred Alternatives

2 Year – Max Depth



4. Preferred Alternatives

5 Year – Max Depth



Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Source Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,
Disaster: DHI assumes no responsibility for data quality or accuracy. The document is not
intended for use in any way that may be construed as an offer of insurance, investment, or
any other financial product. The document is not intended to be used in any way that may be construed as an offer of insurance, investment, or
any other financial product.

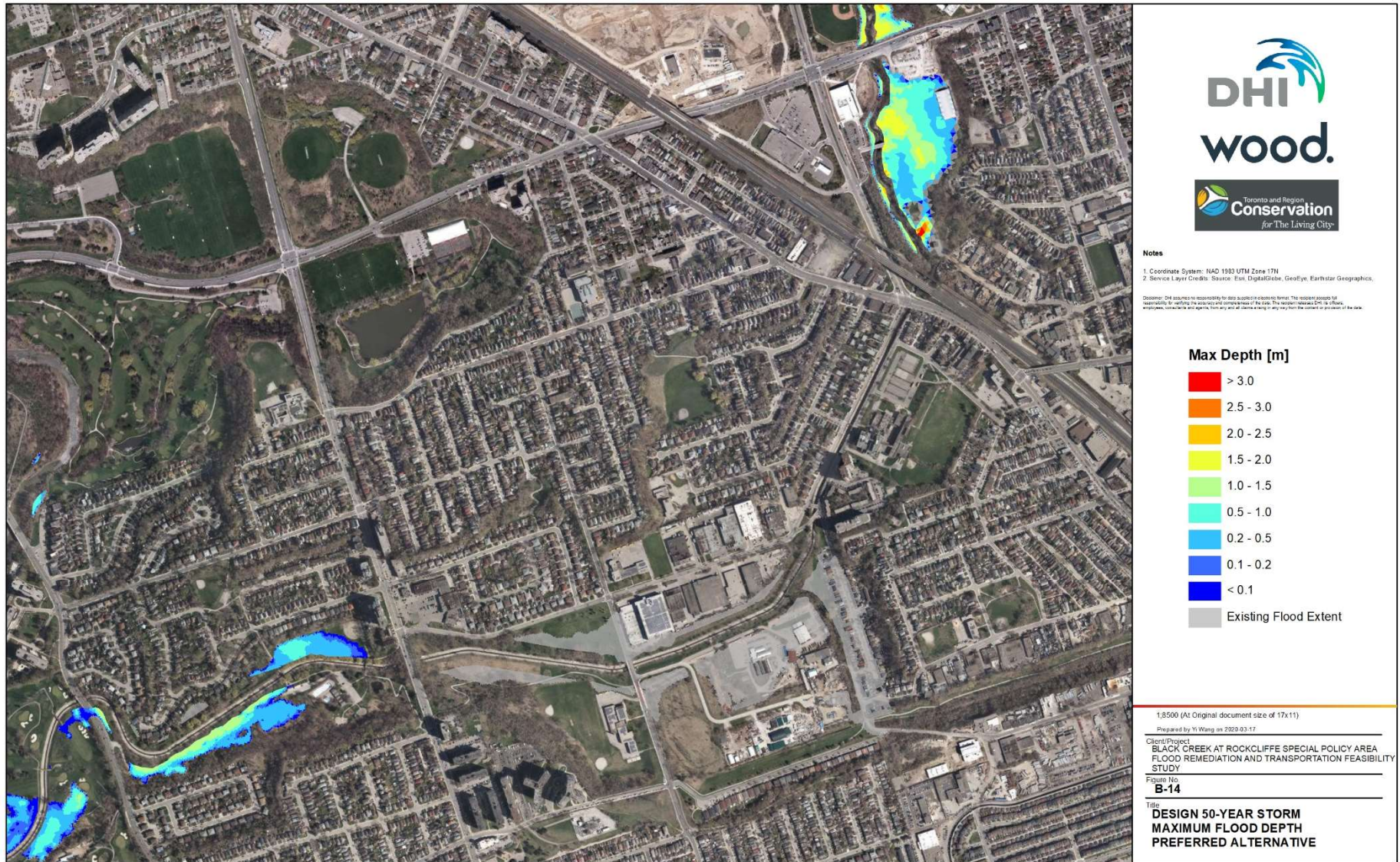
4. Preferred Alternatives

25 Year – Max Depth



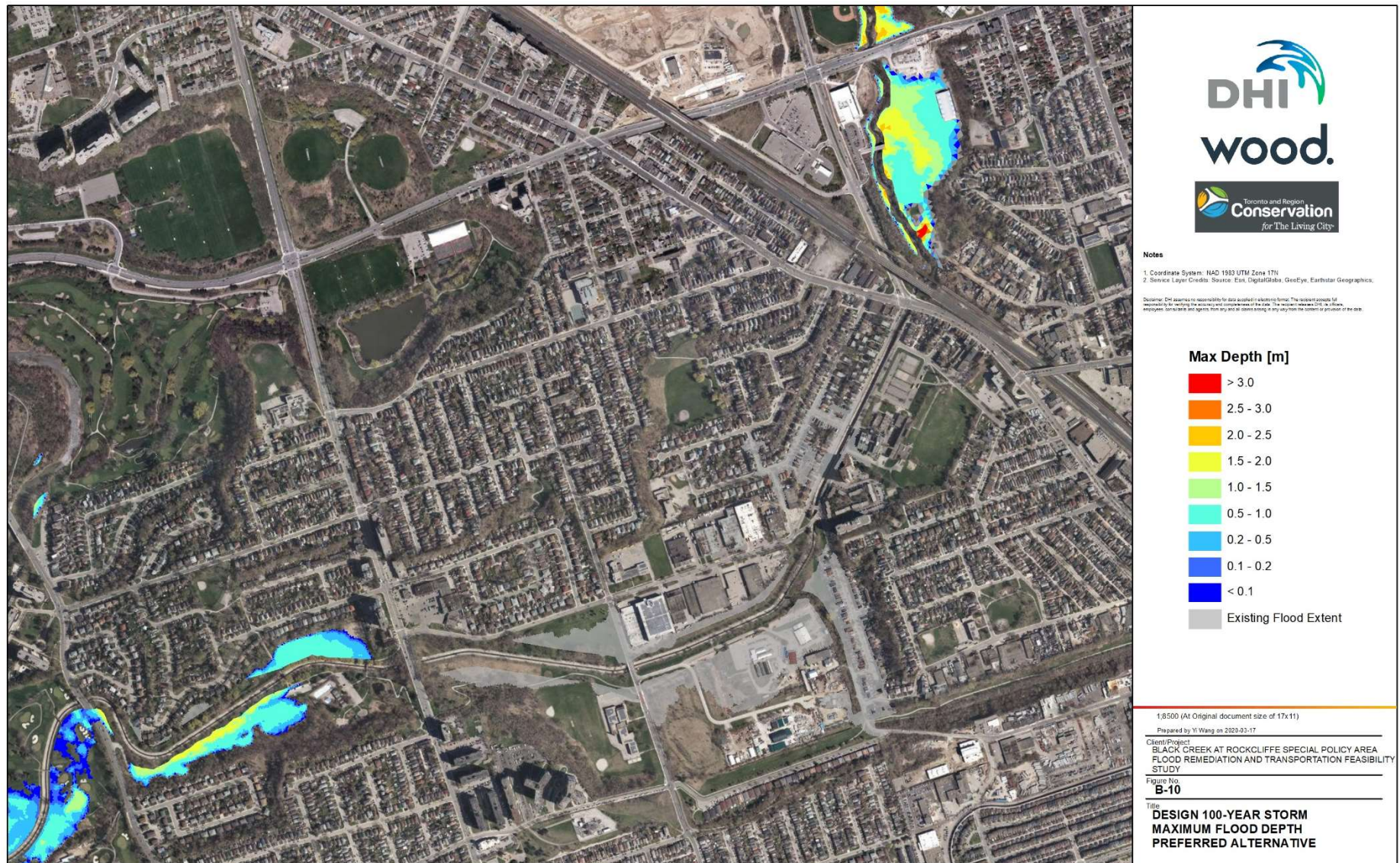
4. Preferred Alternatives

50 Year – Max Depth



4. Preferred Alternatives

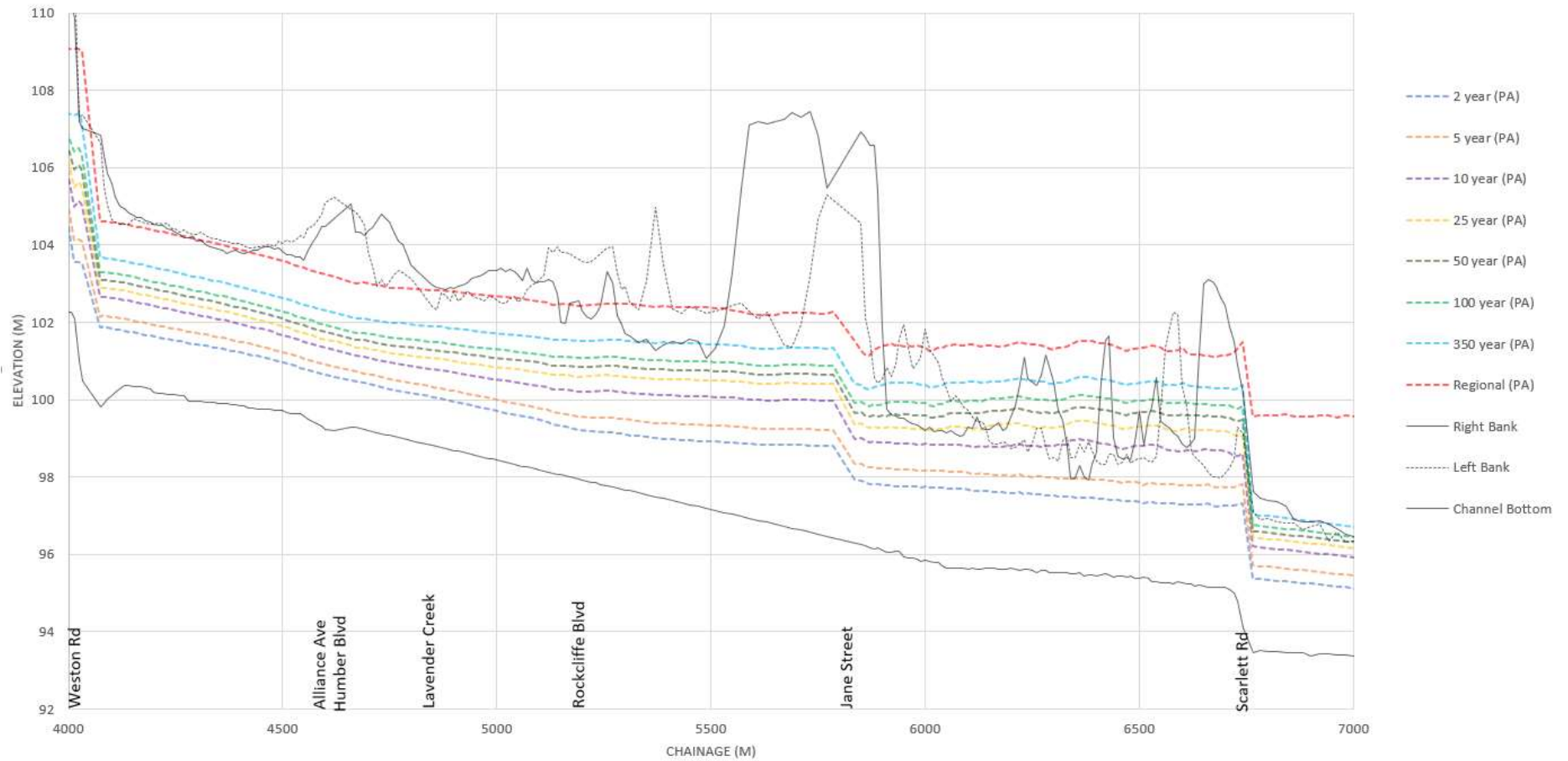
100 Year – Max Depth



4. Preferred Alternatives

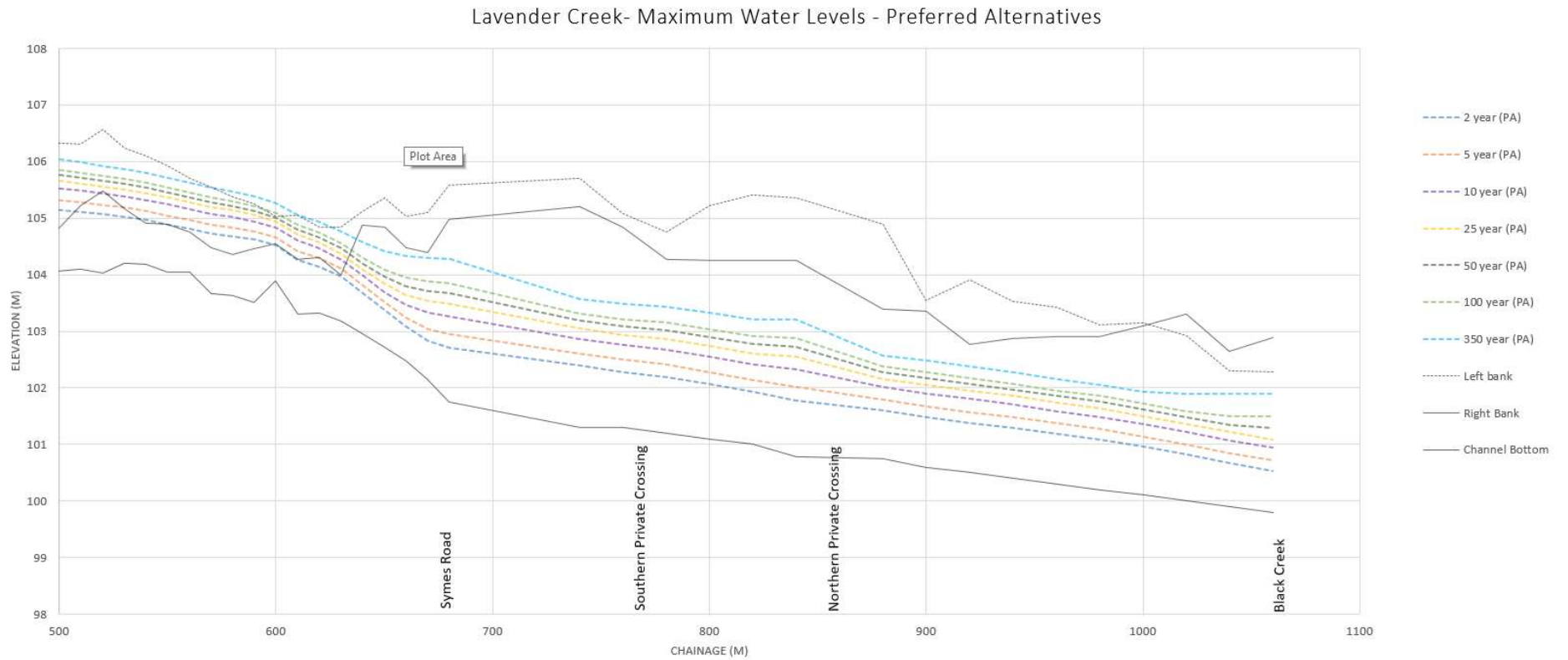
Maximum Water Level Profiles

Black Creek - Maximum Water Levels - Preferred Alternatives



4. Preferred Alternatives

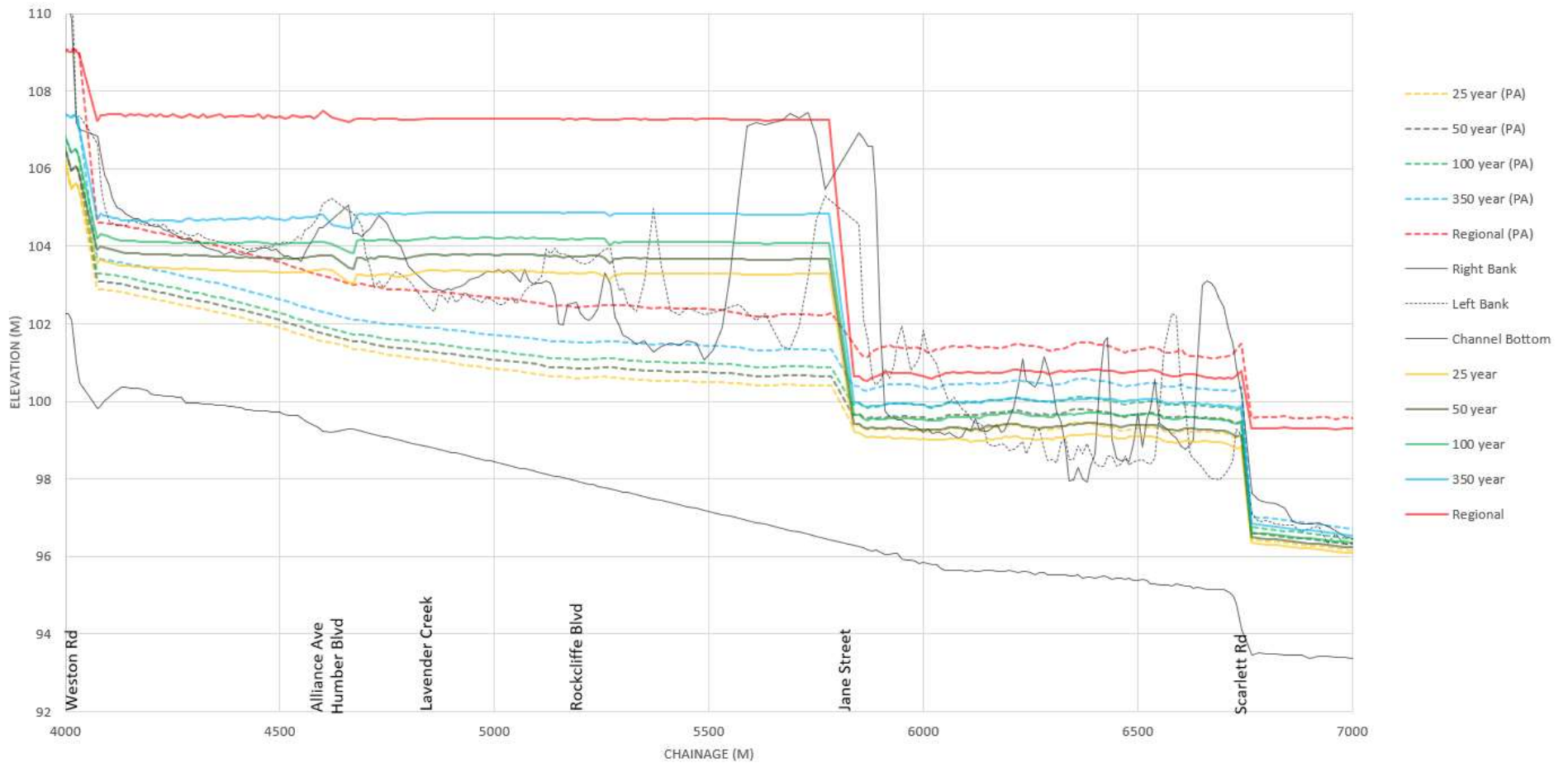
Maximum Water Level Profiles



4. Preferred Alternatives

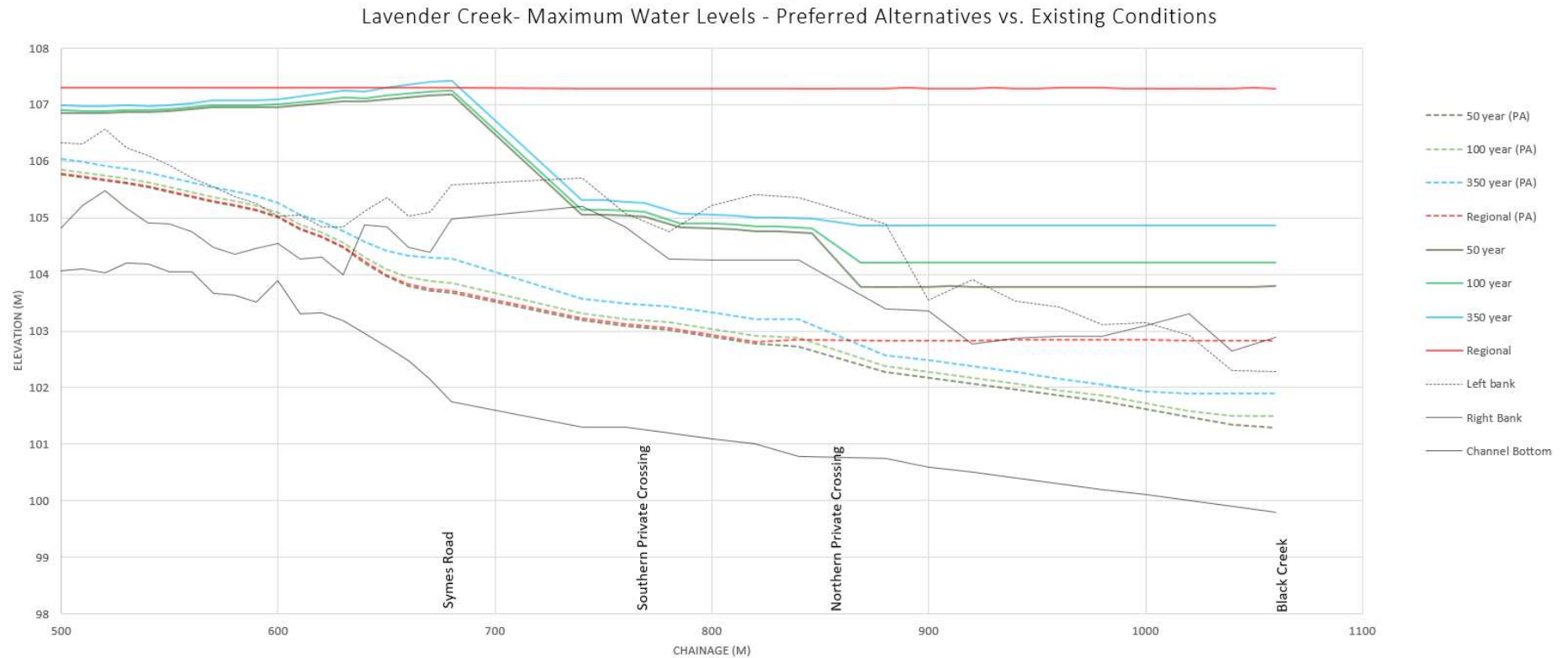
Maximum Water Level Profiles

Black Creek - Maximum Water Levels - Preferred Alternatives vs. Existing Conditions



4. Preferred Alternatives

Maximum Water Level Profiles



4. Preferred Alternatives and Results

Results – Buildings Flooded

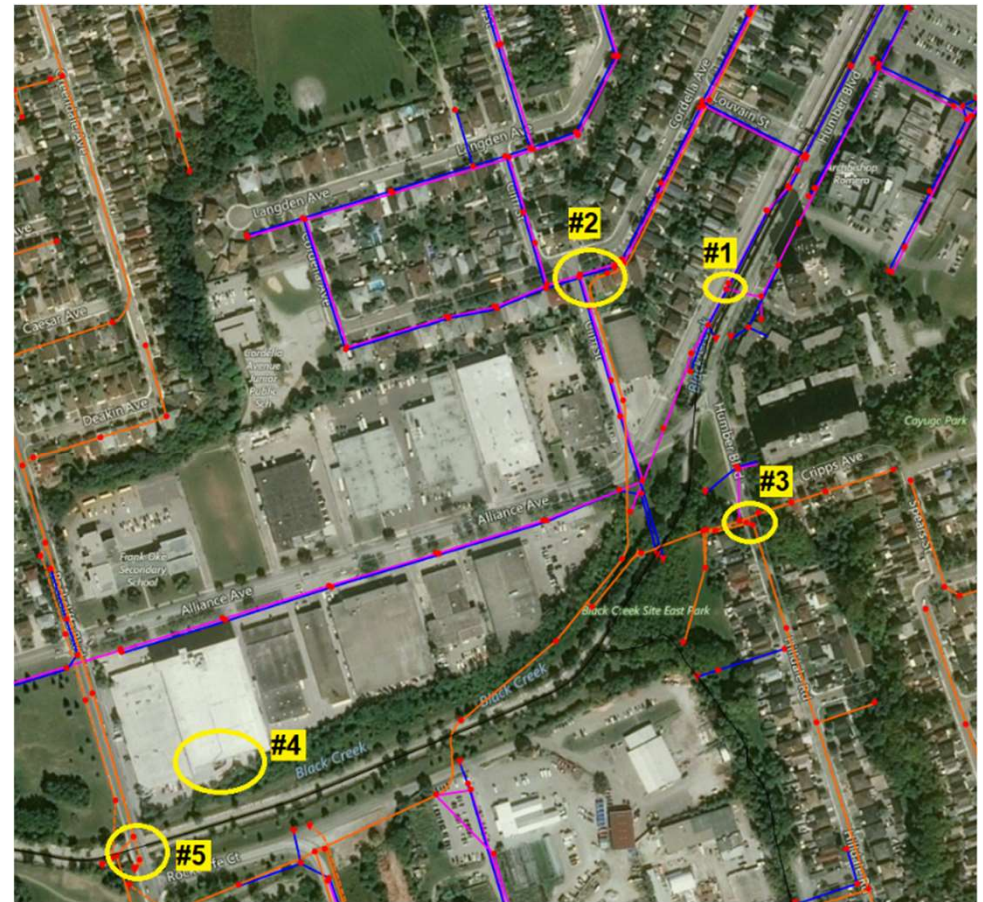
Storm Event Return Period	Existing Conditions	Preferred Alternatives
Regional Storm	366	184
350 yr	215	3
100 yr	113	3
50 yr	57	3
25 yr	47	2
10 yr	33	0
5 yr	26	0
2 yr	15	0



4. Preferred Alternatives and Results

Results (Target Elevations)

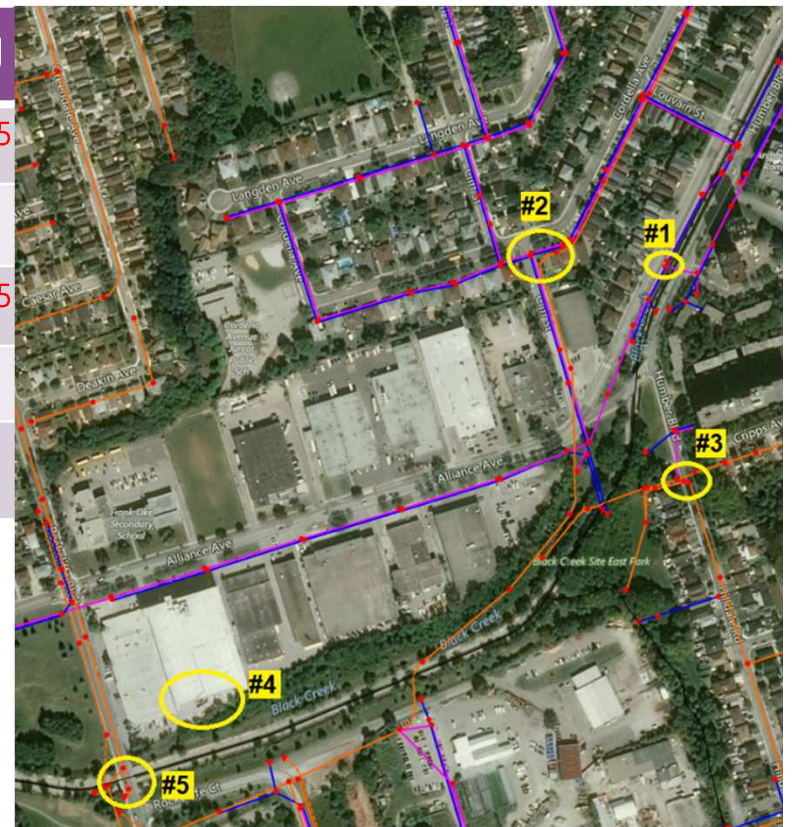
1. Humber Blvd North: max WSE of 101.30 m (Black Creek)
2. Cordella Ave at Cliff St: max WSE of 101.50 m (Black Creek)
3. Hilldale Blvd: max WSE of 101.30 m (Lavendar Creek)
4. Alliance Blvd at Rockcliffe Blvd: Basement driveway elevation of 100.45 m
5. Rockcliffe Blvd bridge soffit 102.57 m



4. Preferred Alternatives and Results

Results (Target Elevations)

	Max	5	10	25	50	100	350	Reg
1	101.3	101.3	101.75	102.0	102.2	102.4	102.7	103.65
2	101.5	100.65	101.05	101.3	101.5	101.75	102.0	103.0
3	101.3	100.75	101.3	101.5	101.7	101.9	102.2	103.25
4	100.45	99.7	100.25	100.65	100.85	101.15	101.5	102.5
5	103.3	99.7	100.25	100.65	100.85	101.15	101.5	102.5



5. Define Flood Implementation Plan (Wood/ DHI)

5. Define Flood Remediation Plan

Plan Summary

- Implementation Plan
 - EA Process
 - Schedules/ Proponency
 - Further Study Requirements
 - Approvals/ Permits
 - Costing
- Prioritization Plan/ Phasing of Preferred Alternatives
- Servicing and Utility Requirements
- Road Works - Transportation



5. Define Flood Remediation Plan

Implementation Plan – EA Process and Schedules/ Proponency

Description of Alternative	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEA/ COEA	Potential Proponent
General				
Widening of Bridge	<p>Schedule B (<2.4M) / Schedule C (>2.4M)</p> <p><i>25. Reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity or at the same location. (Capacity refers to either hydraulic or road capacity but does not include alterations to include or remove facilities for cycling, pedestrians or to support utilities.)</i></p>	Riverine Flooding	MCEA or COEA	TRCA/ City of Toronto

5. Define Flood Remediation Plan

Implementation Plan – EA Process and Schedules/ Proponency

- EA Process and Schedules/ Proponency

Description of Alternative	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEA/COEA	Potential Proponent
General				
Creek naturalization and channel widening	Schedule B – 17. Works undertaken in a watercourse for the purposes of flood control or erosion control, which may include: - relocation, realignment or channelization of watercourse	Riverine Flooding	MCEA or COEA	TRCA/ City of Toronto



5. Define Flood Remediation Plan

Implementation Plan – EA Process and Schedules/ Proponency

- EA Process and Schedules/ Proponency

Description of Alternative	Municipal Class Environmental Assessment (MCEA) Schedule Determination	Conservation Ontario Class Environmental Assessment (COEA)	MCEA/COEA	Potential Proponent
General				
Flood Protection Wall or Berm	Schedule B – 15. Construct berms along a watercourse for purposes of flood control in areas subject to damage by flooding	Riverine Flooding	MCEA or COEA	TRCA/ City of Toronto
	16. Modify existing water crossings for the purposes of flood control	Riverine Flooding	MCEA or COEA	TRCA/ City of Toronto



5. Define Flood Remediation Plan

Implementation Plan – Further Study Requirements

- Jane Street Corridor ultimate condition
- Lavender Creek North Crossing configuration
- Structural and transportation staging details
- Refine modelling – additional details
- Black Creek Blvd. Flood Wall/ Berm
- Utilities – (SUE Investigation – gaps/ concerns)
- Geotechnical – (soil quality)
- Environmental field studies
- Archaeologic Assessment – Stage 1 minimum
- Public consultation
- Agency consultation



5. Define Flood Remediation Plan

Implementation Plan – Approvals and Permits

- City of Toronto Approval
 - Toronto Water
 - Toronto Parks, Forestry & Recreation
 - Toronto Engineering & Construction Services
 - Toronto Transportation Services
 - Toronto Corporate Real Estate Management
- TRCA Regulatory Approval
- Private Utilities
- MECP (Potential ECAs)
- DFO - Fisheries
- Indigenous Communities
- Others



5. Define Flood Remediation Plan

Implementation Plan – Preliminary Costing

Preferred Alternative	Conceptual Cost Estimate
Jane Street Bridge Expansion	\$26,049,518
Black Creek Channel Widening – Jane Street to Rockcliffe Boulevard	\$6,241,782
Rockcliffe Boulevard Bridge Expansion	\$5,166,145
Black Creek Channel Widening – Rockcliffe Boulevard to Alliance Avenue	\$5,780,539
Weston Road Flood Wall	\$231,600
Lavender Creek Channel Widening	\$2,484,790
Symes Road Private Crossing Bridge	\$ 2,069,280
Symes Road Culvert Upgrade	\$3,982,718
Sub-Total Cost Estimate	\$ 52,006,372

5. Define Flood Remediation Plan

Implementation Plan – Prioritization Plan/ Phasing of Alternatives

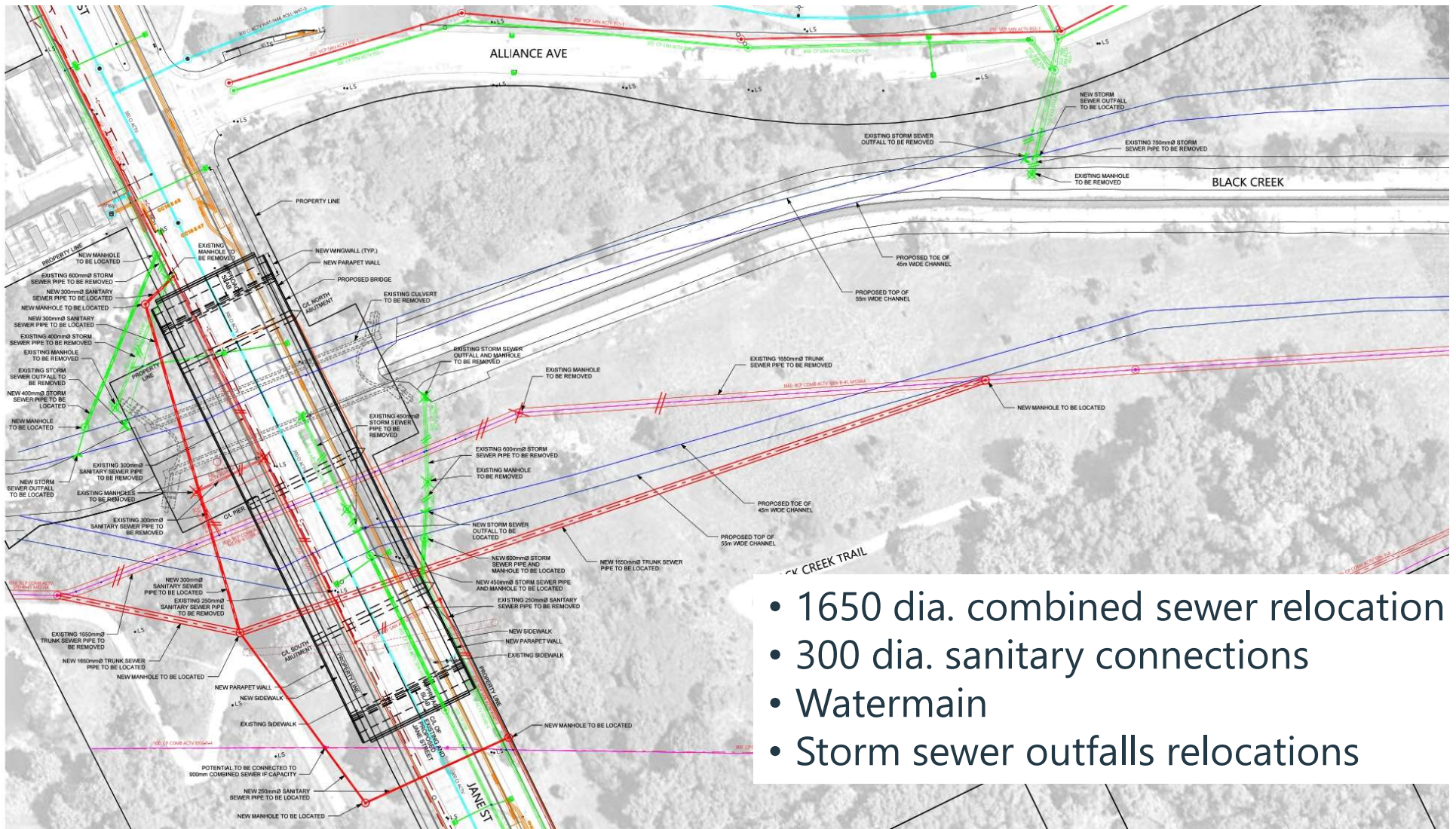
Prioritization Plan/ Phasing of alternatives has been developed based on being able to implement alternatives quickly, therefore requiring low costing alternatives first which would reduce flood risk, followed by alternatives providing the greatest flood risk reduction.

1. Upgrade Symes Road crossing of Lavender Creek and widen and deepen Lavender Creek to the southern crossing
2. Remove southern crossing of Lavender Creek
3. Construct flood wall/ berm at Weston Road
4. Upgrade Jane Street crossing
5. Naturalize, widen and deepen Black Creek – Jane Street to Rockcliffe Blvd.
6. Upgrade Rockcliffe Blvd. crossing
7. Naturalize, widen and deepen Black Creek – Rockcliffe Blvd. to Alliance Ave.
8. Widen and deepen Lavender Creek from southern crossing to confluence and upgrade northern private crossing



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

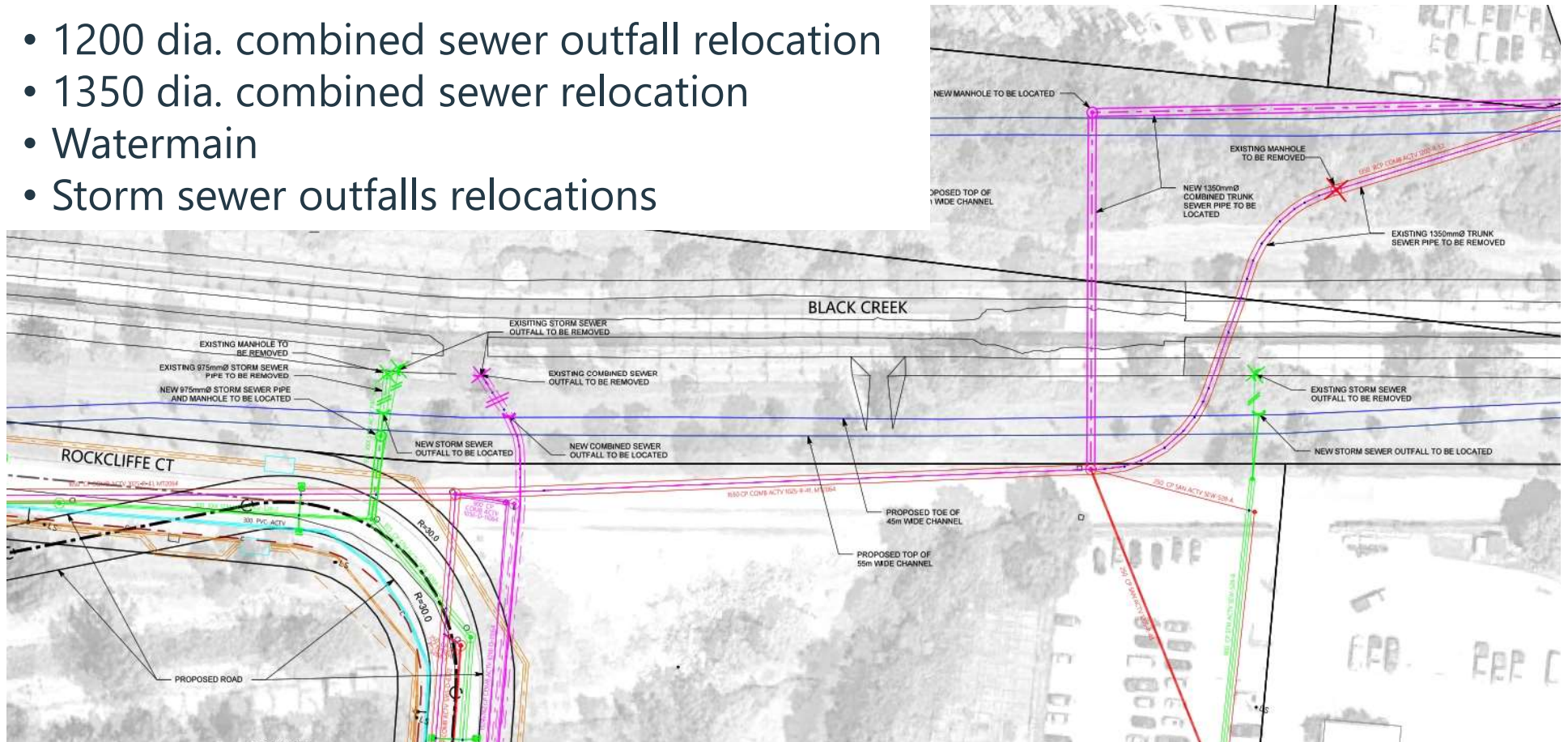


- 1650 dia. combined sewer relocation
- 300 dia. sanitary connections
- Watermain
- Storm sewer outfalls relocations

5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

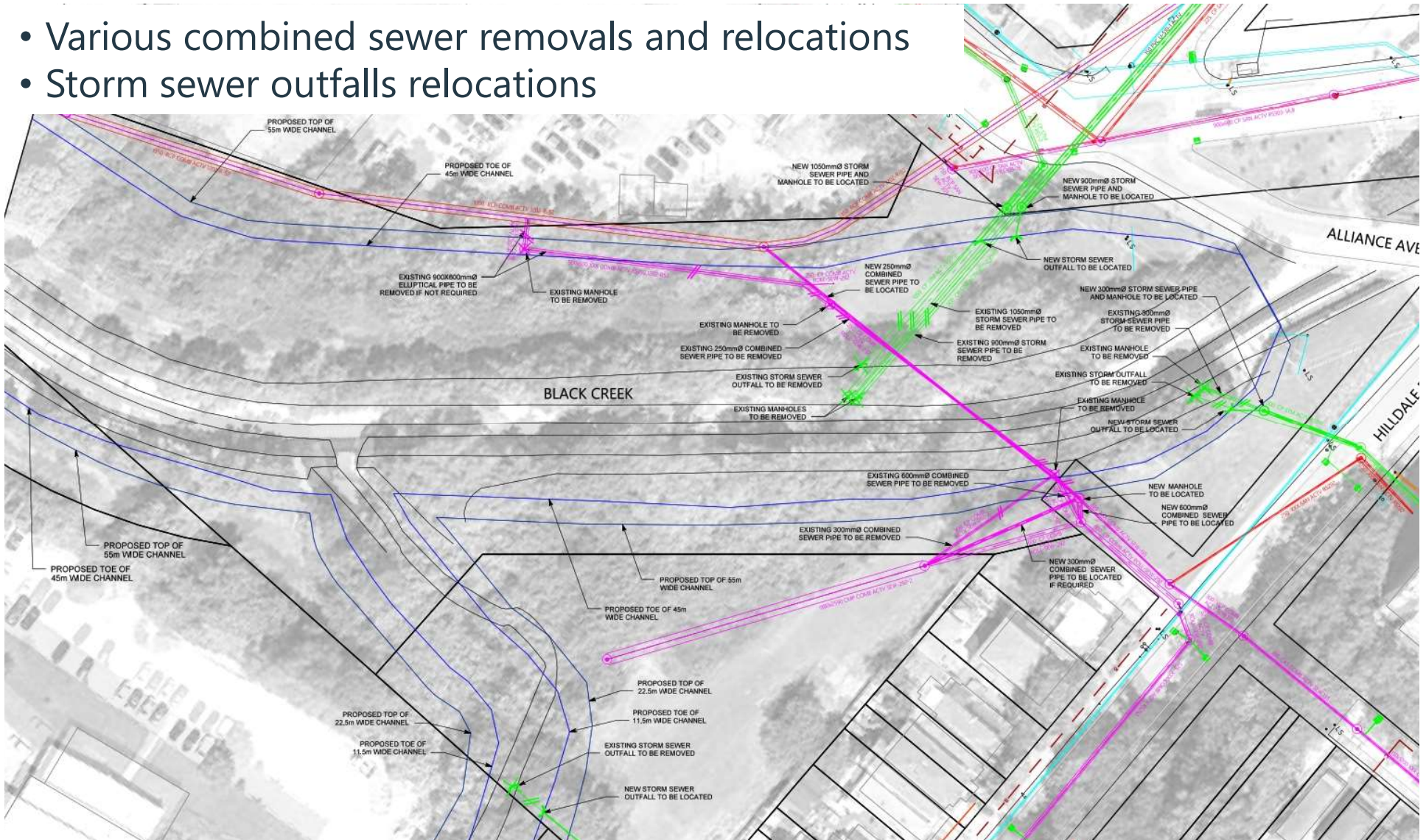
- 1200 dia. combined sewer outfall relocation
- 1350 dia. combined sewer relocation
- Watermain
- Storm sewer outfalls relocations



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

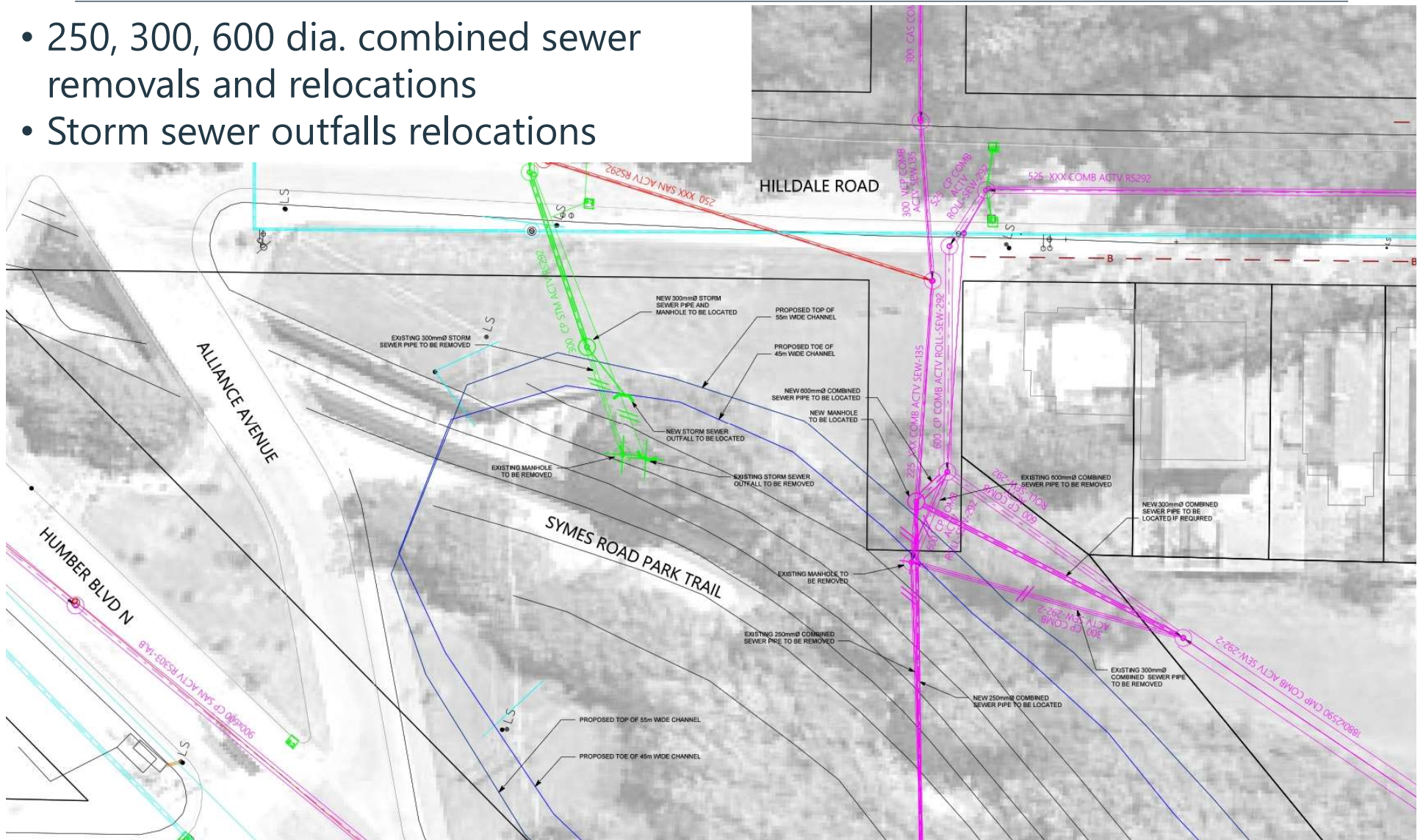
- Various combined sewer removals and relocations
- Storm sewer outfalls relocations



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

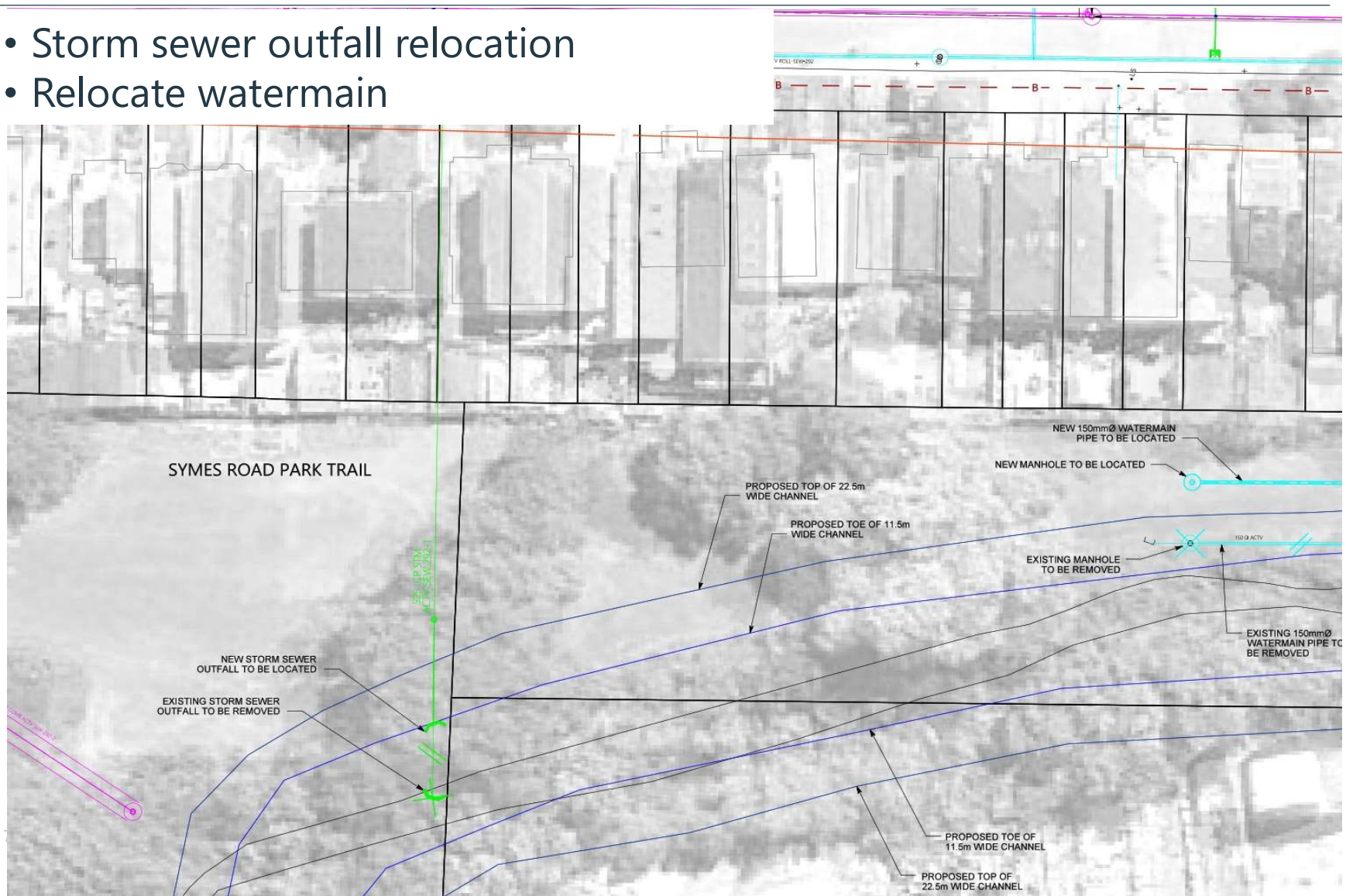
- 250, 300, 600 dia. combined sewer removals and relocations
- Storm sewer outfalls relocations



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

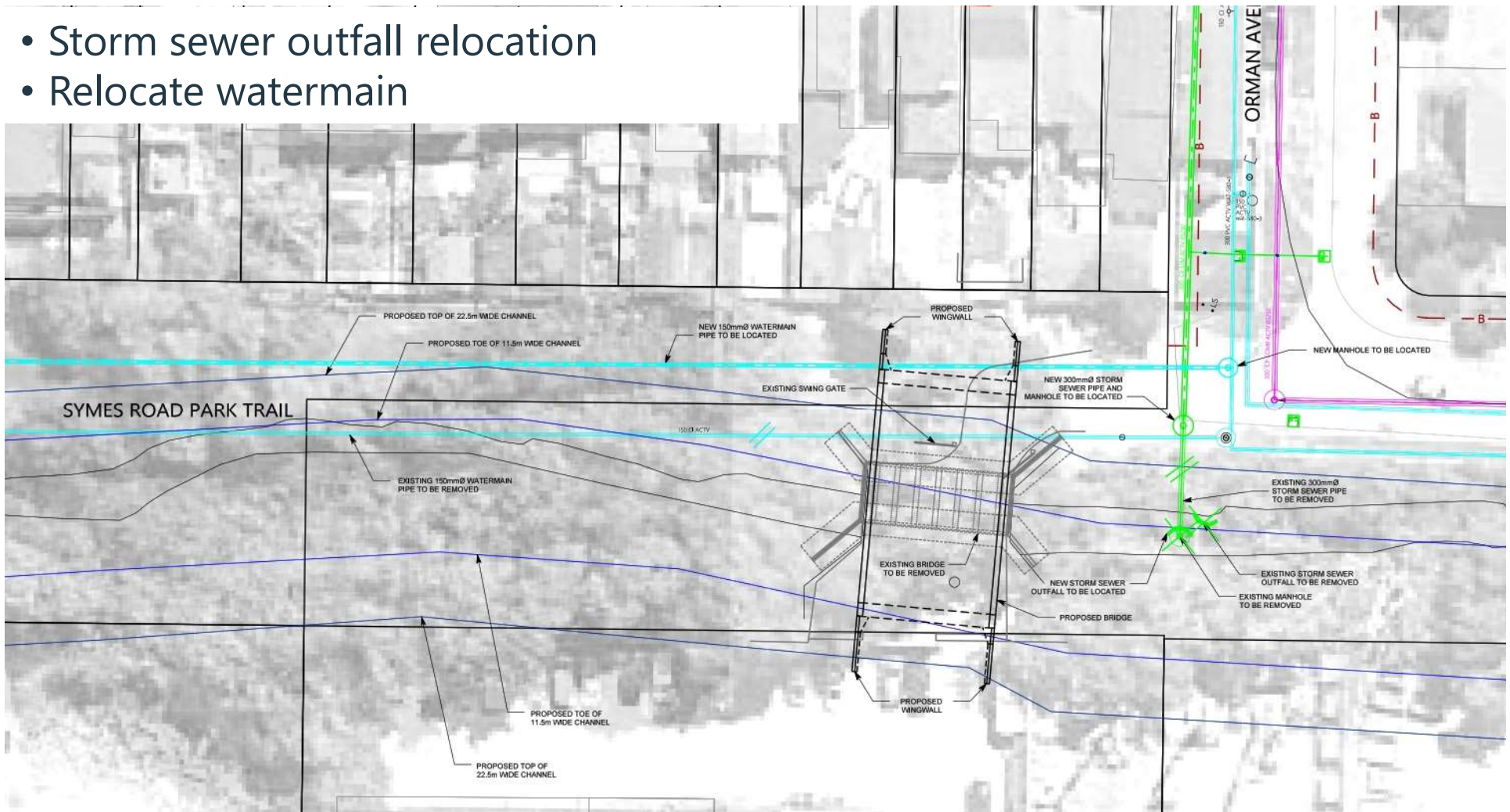
- Storm sewer outfall relocation
- Relocate watermain



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

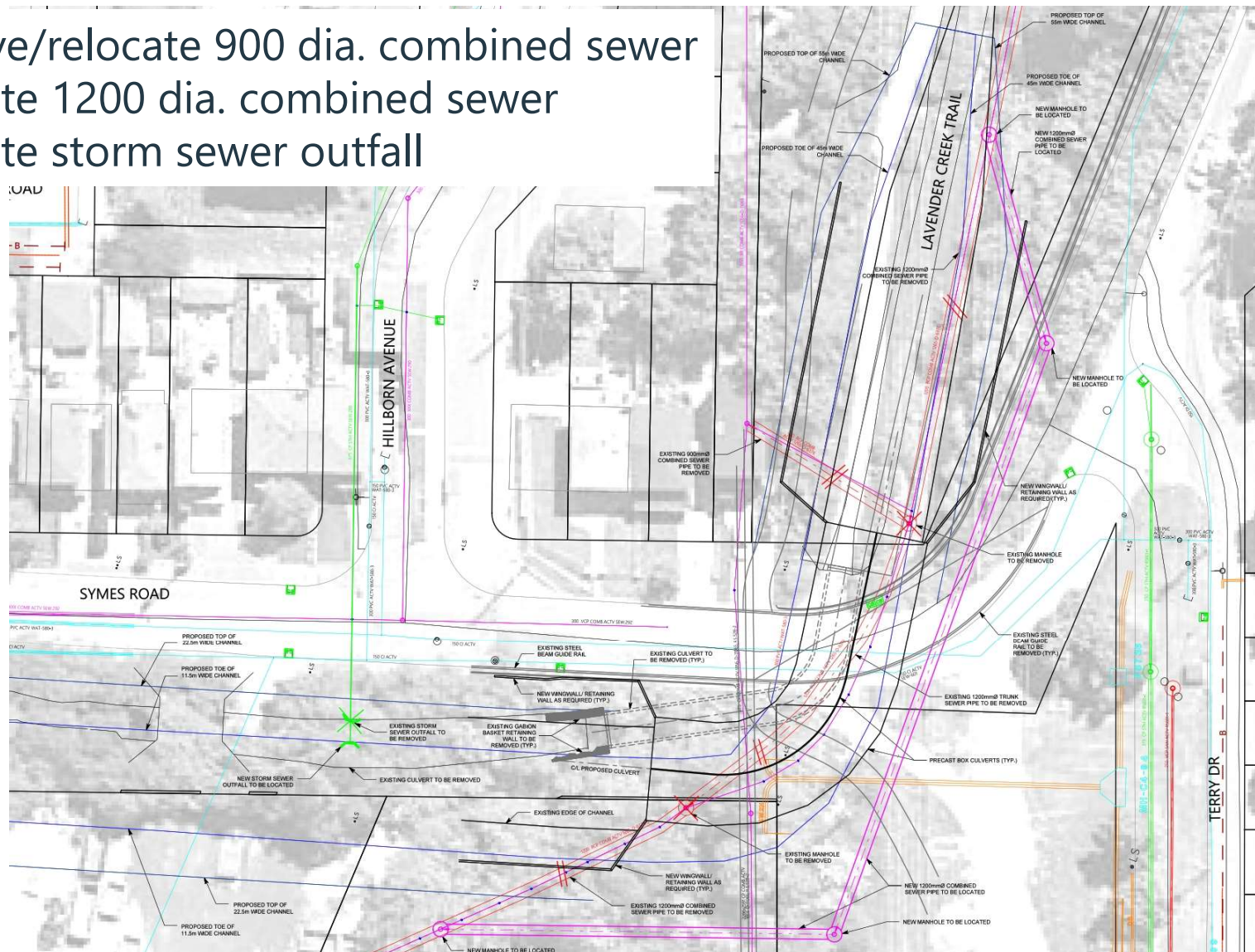
- Storm sewer outfall relocation
- Relocate watermain



5. Define Flood Remediation Plan

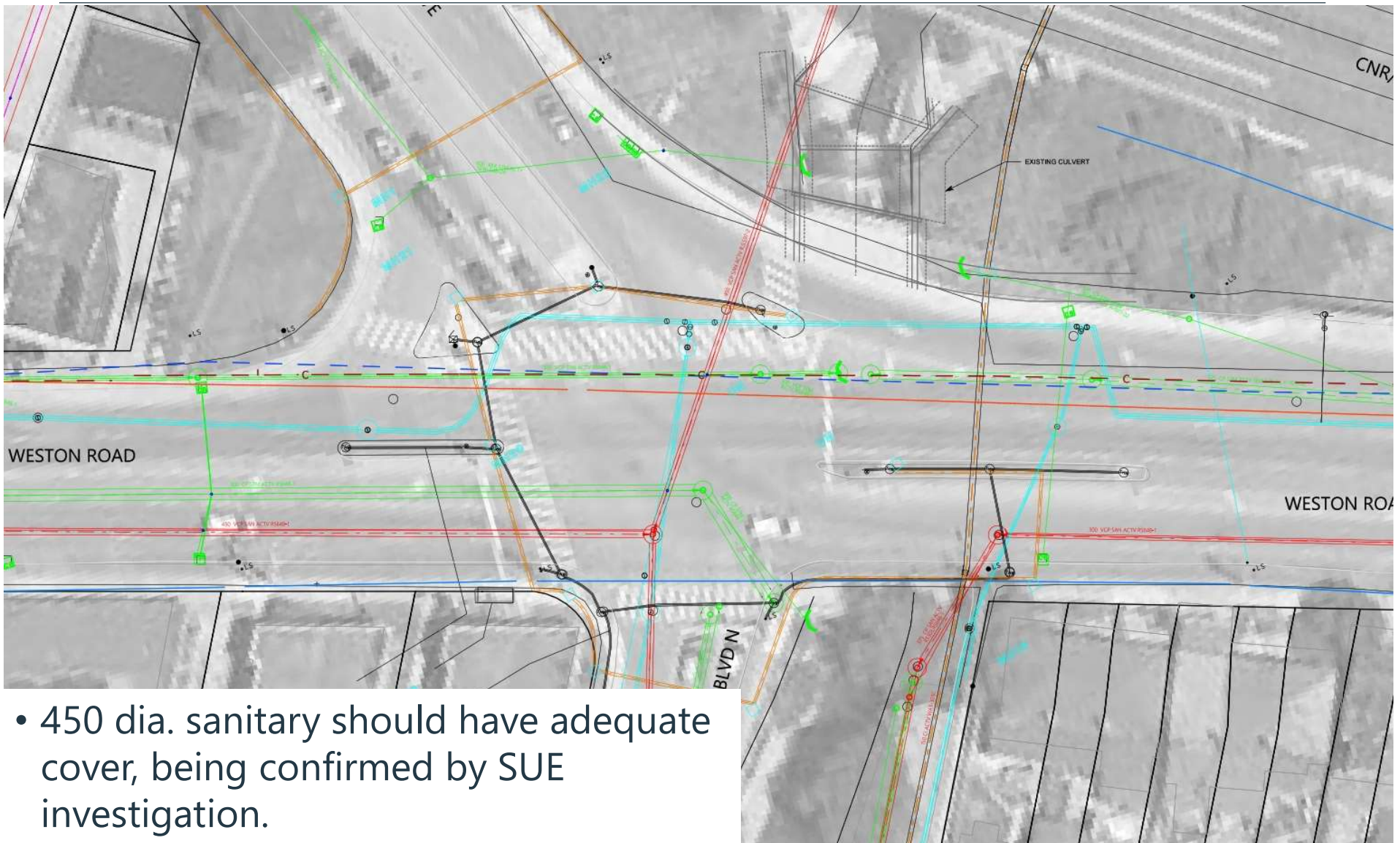
Implementation Plan – Servicing and Utility Requirements

- Remove/relocate 900 dia. combined sewer
- Relocate 1200 dia. combined sewer
- Relocate storm sewer outfall



5. Define Flood Remediation Plan

Implementation Plan – Servicing and Utility Requirements

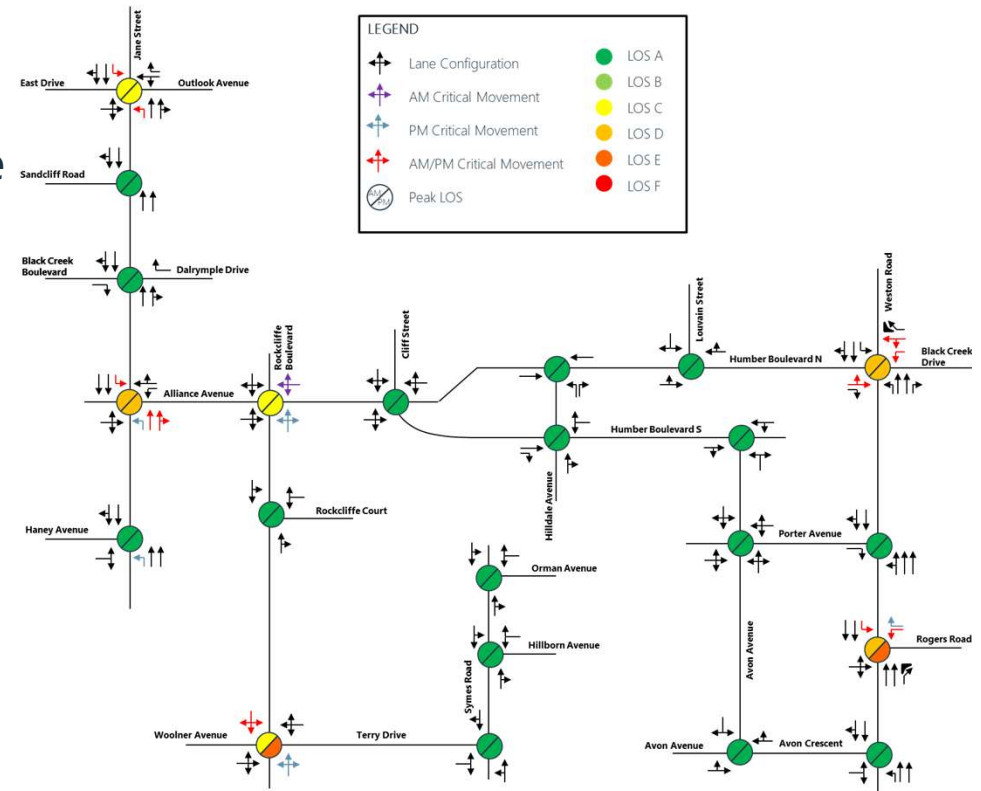


5. Define Flood Remediation Plan

Implementation Plan – Roads and Transportation

- Jane Street Bridge Construction

- Fully-protected left turn movements along Jane Street due to the LRT (protected signal phase to turn) and recalculated the clearance times for the E/W direction
- Unsignalized intersections were assumed to become right-in-right-out with traffic diverted to adjacent signalized intersections
- Increased the cycle lengths from 100s to 120s during AM and PM peak hours to accommodate longer E/W pedestrian times



5. Define Flood Remediation Plan

Implementation Plan – Roads and Transportation

- Jane Street Bridge Construction
 - Various construction staging options to be considered:
 - 2 stages (east side and west side) – only 1 lane in each direction open. Would impact traffic, by closing 1 lane per direction. Would require a traffic detour, to be determined at next stage of study.
 - 3 stages (east side, centre, west side), intent is to provide 2 lanes of traffic in each direction. No impact to traffic as 2 lanes maintained in each direction.
 - Staging to consider creek works and utilities



5. Define Flood Remediation Plan

Implementation Plan – Roads and Transportation

- Rockcliffe Blvd Bridge Construction
 - Considerations for construction staging
 - Realign Rockcliffe Court
 - Rockcliffe Elementary School
 - Frank Oke Secondary School
 - Creek work and utilities
 - Industrial building driveway
 - Keep 1 lane of traffic open



9. Next Steps (Wood)

9. Next Steps (Wood)

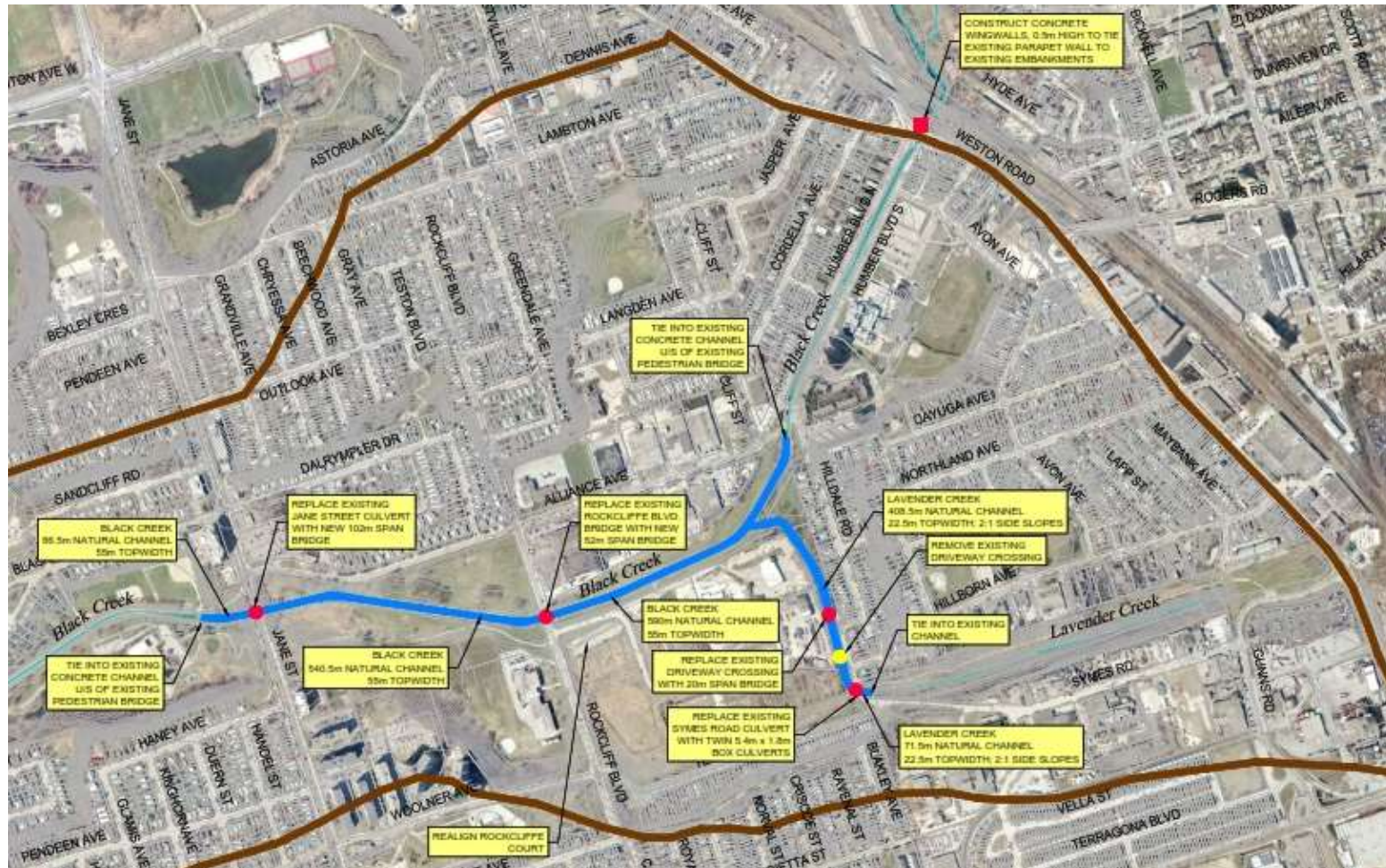
1. Complete Draft Final Report
2. TRCA and City Review Draft Final Report
3. SUE Investigation Completion
4. Finalize Draft Final Report



10. Other Business (All)

10. Other Business (Wood)

- Invoicing
- Other?



Discussion