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CVC Floodplain Mapping Program Update

Flood Modelling, Mapping & Management Workshop

March 6th, 2019

By Jing Liu

Outline

- Current floodplain mapping projects through NDMP
- Conducting projects In-House vs. sourcing externally
- Our Experience with backwater areas caused by bridges and culverts
- Floodplain mapping products and applications

Current Floodplain Mapping Projects Through NDMP

- Floodplain mapping for 10 creeks through NDMP funding
- Hydrologic and hydraulic tasks are at various completion stages
- 1D and 1D-2D hydraulic models are being developed
- All NDMP projects to be completed by March 2020

Conducting Projects In-House

- Key requirements:
  - A team with various backgrounds and skill sets
  - Standards and guidelines

- Benefits:
  - Project team has a thorough understanding of the modelling process and project specific issues
  - All projects can be completed consistently due to set standards and guidelines

Conducting Projects by Sourcing Externally

- Reasons for sourcing projects externally
- Preparation prior to request for proposal
- Review process of final products

No.	Item/Section	Description	Completed
1	Lateral Stucture	Flow optimization needs to be turned on for the Lateral Spill	Yes
2	Section Numbering	Make sure first section is starting at the correct station	Yes
3	10001	May need to add ineffective area to both banks	Yes
4	10001	Try lowering bottom of channel to eliminate critical depth (suggest 74.2m btm)	Yes
5	10001	Change description to St#1-Richey Cres. Outlet	Yes
6	10009	Revise and georeference section (copy from Structure Characteristic spreadsheet)	Yes
7	10009	Change blocked obstruction to ineffective flow area	Yes
8	10009	Adjust ineffective elevations	Yes
9	10042	Revise and georeference bridge (copy from Structure Characteristic spreadsheet)	Yes
10	10042	Change description to: St#1-Richey Cres. Structure opening based on Civica 2015 HEC-RAS model	Yes
11	10042	Add Node name: 1-Richey Cr	Yes
12	10083	Revise section (copy from Structure Characteristic spreadsheet)	Yes
13	10083	Adjust ineffective elevations	Yes
14	10083	Change blocked obstruction to ineffective flow area	Yes
15	10083	Change description to St#1-Richey Cres. Inlet	Yes
16	10102	Remove items from description box	Yes
17	10121	Increase height of blocked obstruction	Yes
18	10121	Adjust bank stations	Yes
19	10122	Change description to: St#2-Lateral Structure upstream of Richey Cres. Upstream invert based on Civica Survey Downstream invert and culvert size and length based on Shoreplan Engineering Ltd Design Drawing Sheet 1 Plan No. 94-079-01 (Oct 24, 1994) Entrance loss set to 0.9 to simulate debris in grate	Yes
20	10155	Realign left bank to be perpendicular to flow	Yes
21	10155	Add levee to left side	Yes
22	10202	Add levee to right side	Yes
23	10202	Change Manning's n on right side from 0.03 to 0.025	Yes
24	10232	Remove items from description box	Yes
25	10232	Add levee to right side	Yes
26	10232	Increase height of blocked obstruction	Yes
27	10254	Lower ineffective elevation	Yes
28	10254	Change Manning's n on left side from 0.25 to 0.025	Yes
29	10254	Change description to St#3-Enola Ave. Outlet	Yes
30	10263	Change description to: St#3-Enola Ave. Structure opening based on MMM Oct. 2015 survey	Yes
31	10263	Add Node name: 3-Enola Ave	Yes
32	10272	Adjust ineffective elevation to match top of overflow elev	Yes
33	10272	Change description to St#3-Enola Ave. Inlet	Yes
34	10302	Remove items from description box	Yes
35	10302	Add levee to right side	Yes
36	All	Descriptions at sections need to be revised	Yes
37	Structures	Node names need to be added to structures	Yes
38	Structures	Revise structure numbers and descriptions in description box	Yes
		Adjust chanel length to match dist. between bounding sections in GeoHECRAS	

In-House vs. External Tasks

- In-house Tasks
  - Data processing for modelling
  - Development of standards and guidelines
  - 1D and 2D hydraulic modelling
  - Floodplain mapping development
  - Review and finalization of projects

- External Tasks
  - Data collection and processing
  - Base mapping development
  - Hydrologic modelling
  - 1D and 2D hydraulic modelling
  - Floodplain mapping development

Bridges and Culverts Backwater Areas Special Cases

- Bridges and culverts often create a backwater area
- Typically, the flood lines are delineated using peak flows generated by the hydrologic models without any flow attenuation
- However, some backwater areas can be so significant that the inundation extent of unattenuated flow is highly improbable

Downstream of a Bridge or Culvert

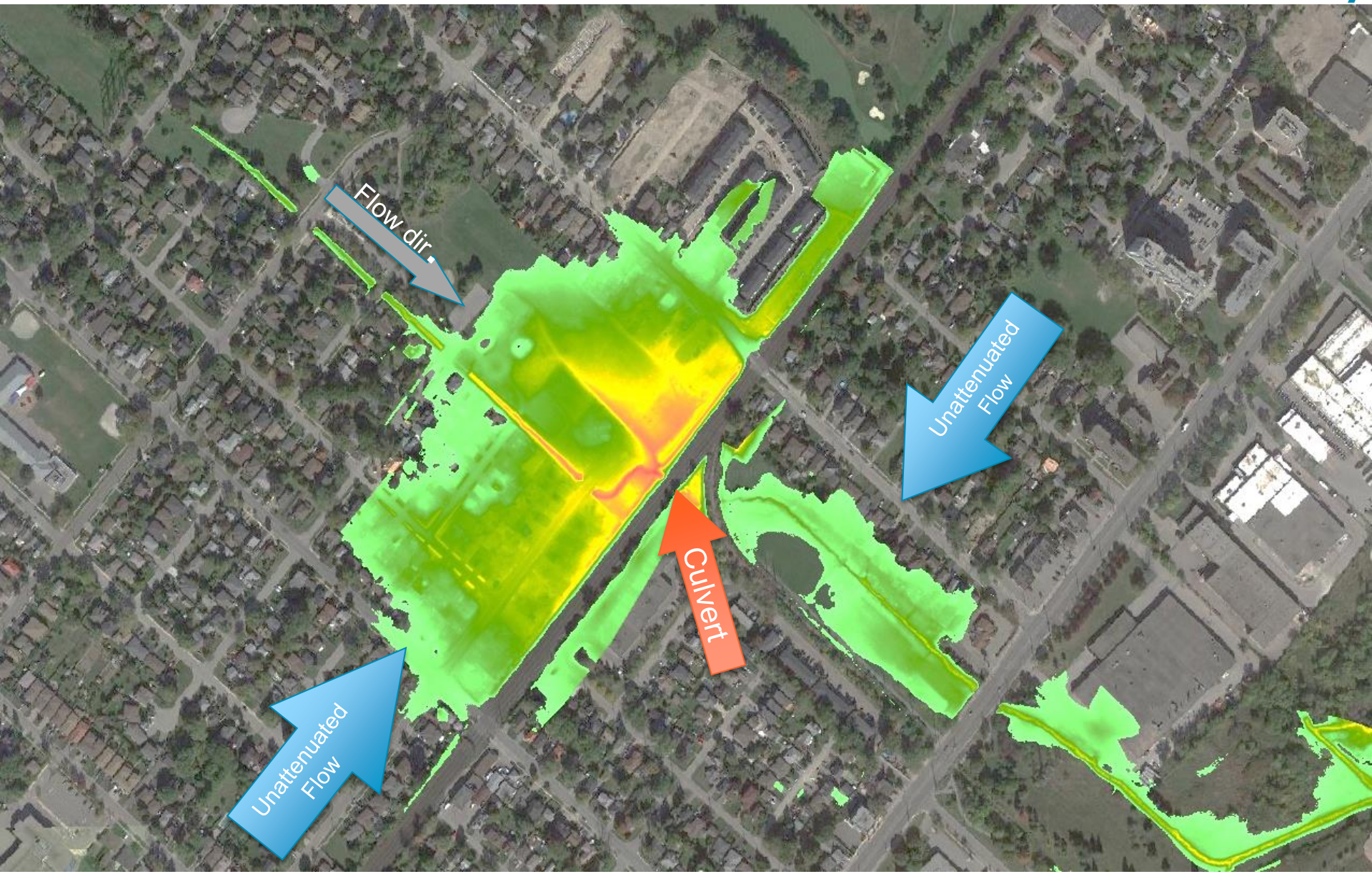
- "The natural flood line should be used for delineating the flood hazard, making no allowance for the temporary upstream ponding" (backwater) – MNR 2002

- Modelling Approach:
  - Peak flow is generated using hydrologic model without flow attenuation
  - The flood line will not change when the bridge or culvert is upsized or removed/fails

Upstream of a Bridge or Culvert

- "It is recommended, that the upstream flood line should make allowance for the backwater effects caused by the structure." – MNR 2002

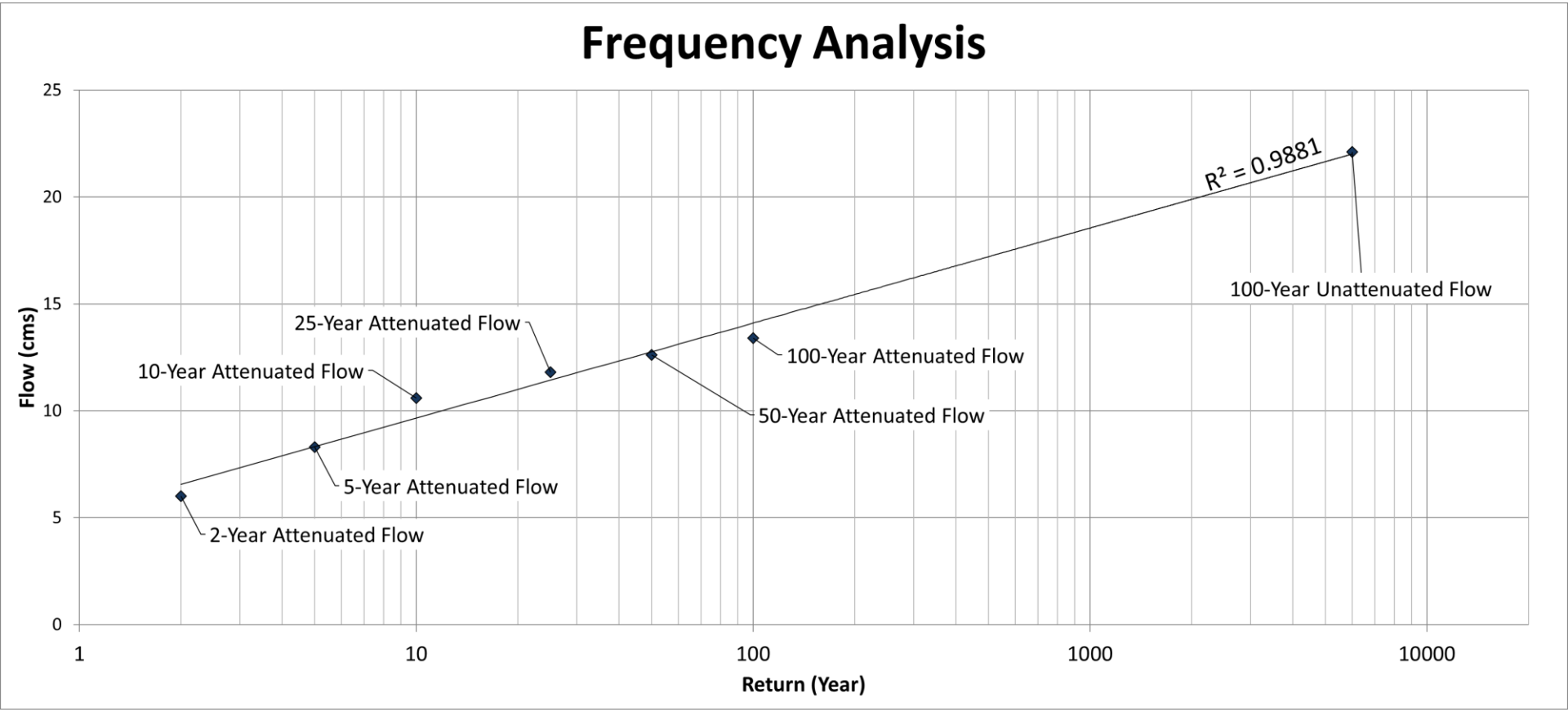
- Modelling approach:
  - Peak flow in the backwater area is generated using hydrologic model without flow attenuation
  - Downstream flood line is not affected
  - Peak flow immediately upstream of the structure is generated using hydrologic model with flow attenuation



Inundation Extent by Conventional Modelling Approach

Inundation Extent by CVC Test Approach

What Does This Test Mean?



What Does This Test Mean?

- Backwater area
  - Based on the two modelling approaches, the difference in the backwater areas are significant

- Frequency Analysis
  - To obtain the same backwater (100-year flow) result using the conventional modelling approach, the CVC test model would require a highly improbable return flow

Floodplain Mapping Products

- Floodplain mapping products need to be tailored to the needs of different user groups.

- User groups include but are not limited to:
  - General public
  - Planners and developers
  - Emergency responders
  - Municipal and Regional partners

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FLOOD HAZARD MAP

LEGEND

Bridges
Building
Building Ruin
Building Under Construction
Contour Index
Contour Intermediate
Culvert Symbol
Culvert to Scale
Dam
Ditch
Dock,Wharf,Pier
Driveway
Falls,Rapids
Fire Hydrant
Flow Direction
Footbridge
Guiderail
Headwall
Hedge
Marsh
Municipal Boundary
Overhead Walkway
Parcel Fabric
Parking Lot
Pile
Pipe
Pit
Playground
Pole
Pool
Railway
Railway Abandoned
River,Creek,Shoreline
Road
Road Shoulder
Road Understruction (UC)
Sidewalk
Silo
Spot Height
Tank
Tower Base
Trail
Wall
Watershed Boundary
Waterbody Elevation
Wooded Area
Regulatory Floodline
Section
Overflow Section
Structure ID
Spill
Regulatory Flood Elevation
Section Number
100 Year Flood Elevation
(See General Note 6)

SHEET INDEX

SCALE 1:4000

Metres 100 0 100 200 METRES

CONTOUR INTERVAL 0.5 METRE

General Notes:

1. Contourlines on this map were generated by Airborne Imaging using the Spring of 2015 LiDAR point cloud, breaklines and hydrologic enforcement at bridges. The vertical accuracy of the original points is 0.10 metres RMSE.
2. The planimetric data was obtained from the City of Mississauga in 2017.
3. The vertical datum is mean sea level established by the CGVD 28, 1978 Southern Ontario adjustment.
4. The horizontal datum is North American Datum 1983 CSRS (Epoch 2010) UTM Zone 17.
5. To obtain City of Mississauga datum, add 0.121 metres to elevation data.
6. The Regulatory flood elevation and floodline is the greater of the Regional and 100 Year storms. A single elevation within the flood elevation section symbol indicates that the 100 Year storm is the Regulatory storm.

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No	Amendment/Revision	By	Date

AIRBORNE IMAGING
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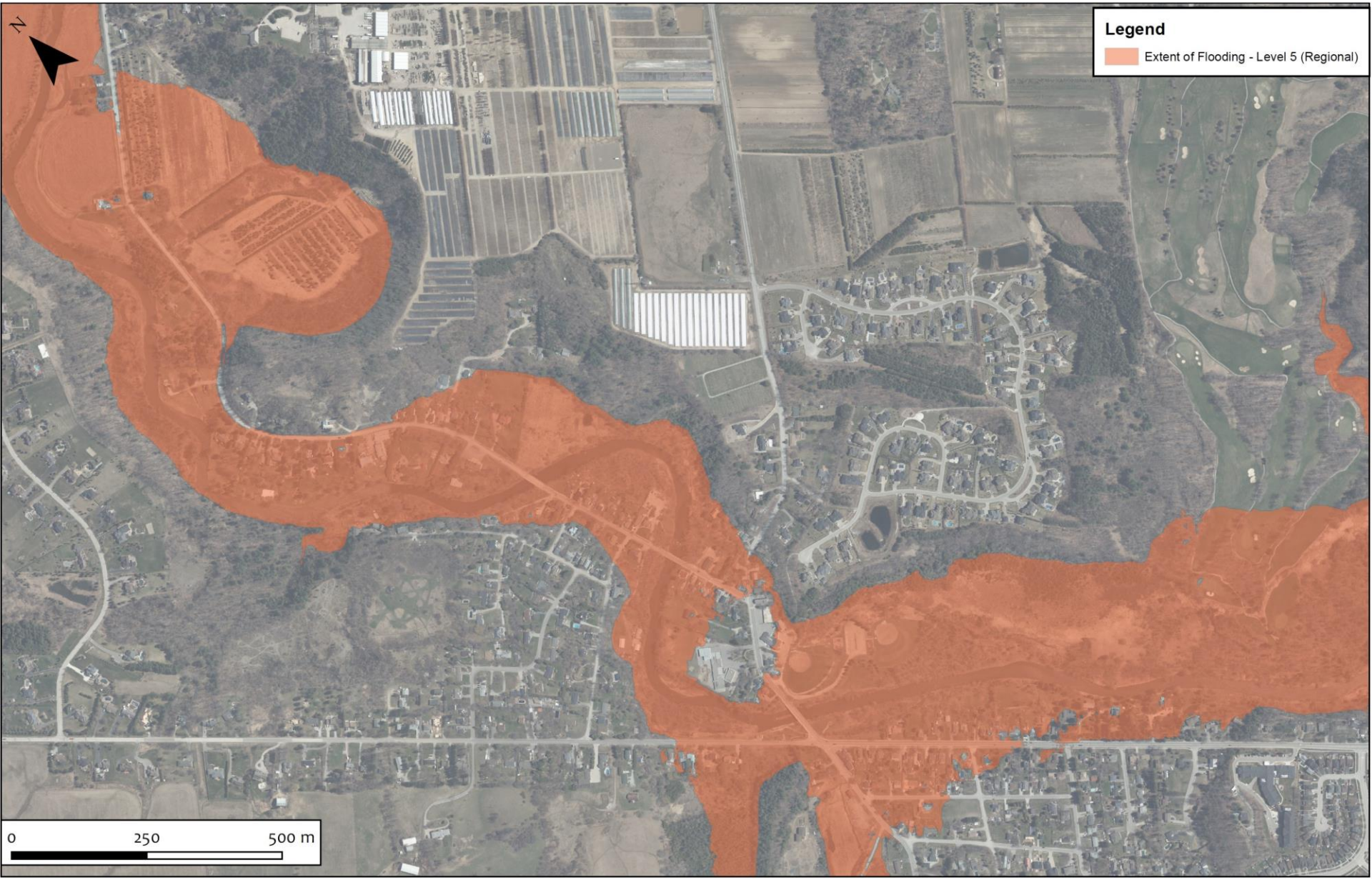
MISSISSAUGA

SHEET No 7 of 26

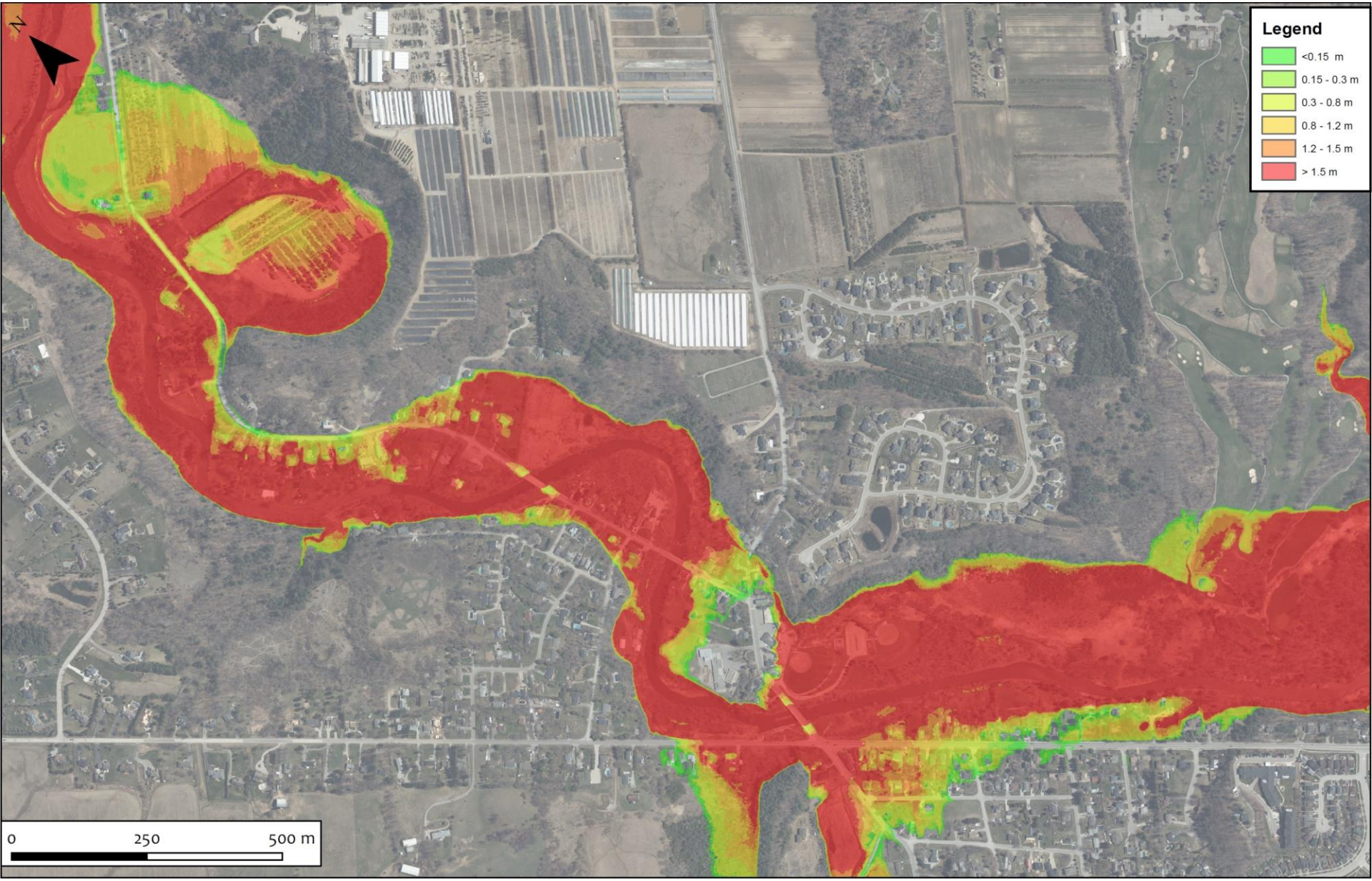
Flood Hazard Map

For Discussion Only



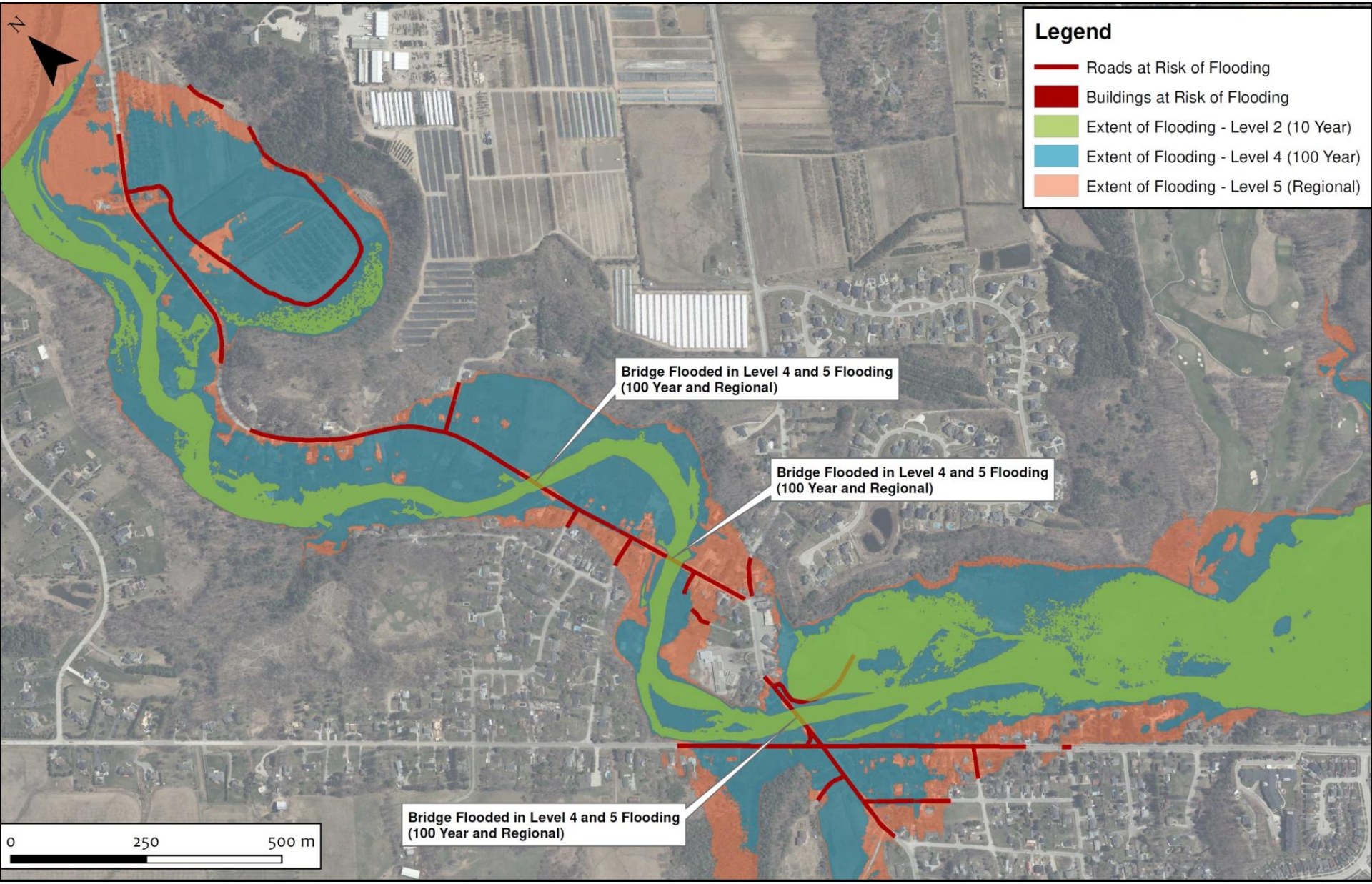
Inundation Extent Map

For Discussion Only



Flooding Depth Map

For Discussion Only



Flood Risk Map

questions?

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