Niagara Peninsula CONSERVATION
nature for all

Coyle Creek and Draper's Creek Floodplain Mapping

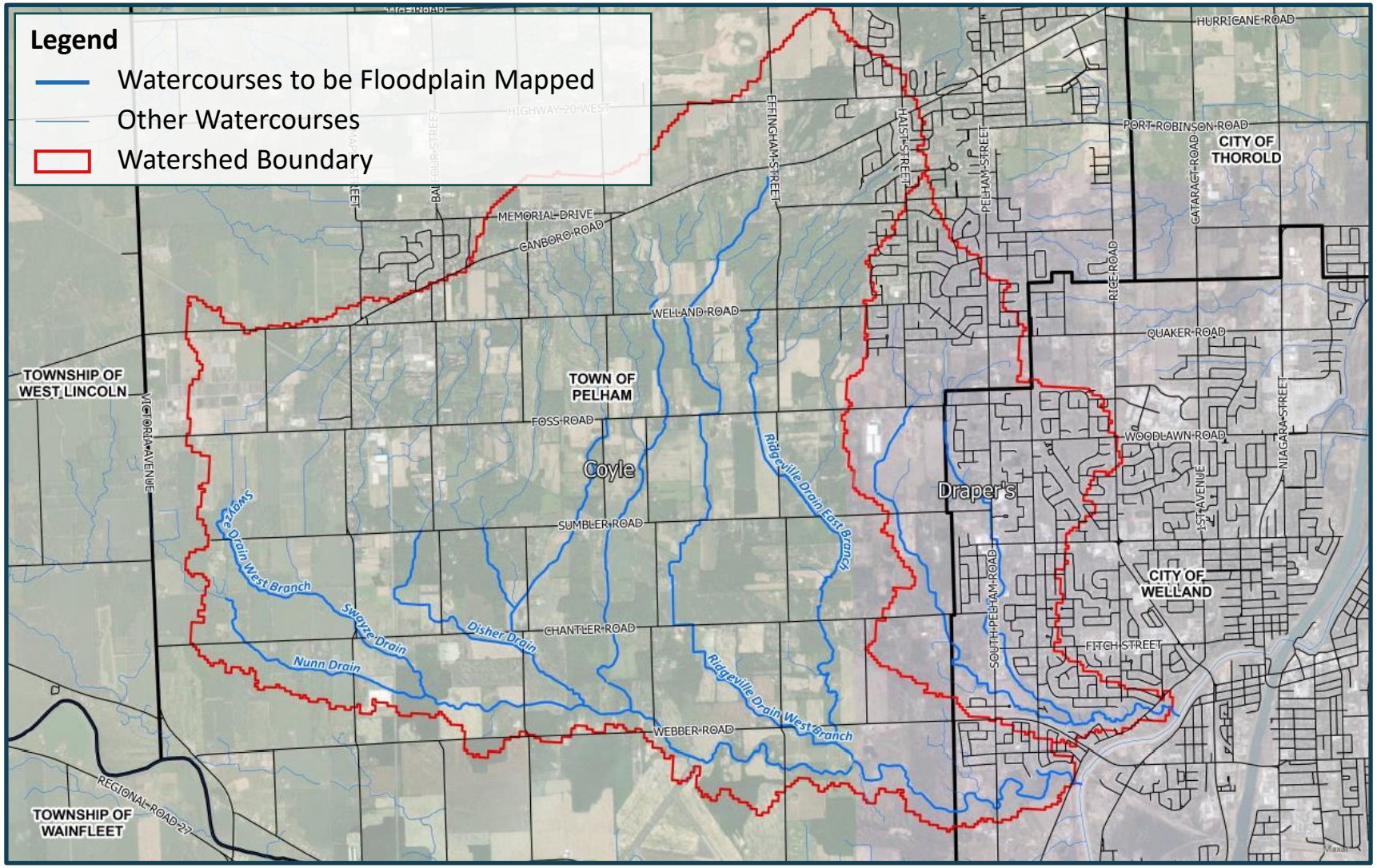
Second Public Engagement Meeting
October 26, 2023

Coyle Creek and Draper's Creek Floodplain Mapping
Second Public Engagement Meeting

Speakers

- Leilani Lee-Yates, Director, Planning and Development, NPCA
- Tim Mereu, Program Manager, NPCA
- Rob Amos, Project Manager, Aquafor Beech Ltd.
- David Deluce, Senior Manager, Environmental Planning & Policy, NPCA

Coyle Creek and Draper's Creek Study Area



Flooding Does Happen – It is serious and it is costly

dddd



In 1954, Hurricane Hazel pounded the Toronto region with 270 mm of rain over approximately 12 hours. 81 people were killed.

Flooding Does Happen – It is serious and it is costly





The Calgary flood of 2013 caused $5 billion of damages.

Coyle Creek and Draper's Creek Floodplain Mapping

It is almost impossible to stop a river from flooding, but we can reduce the consequence of flooding

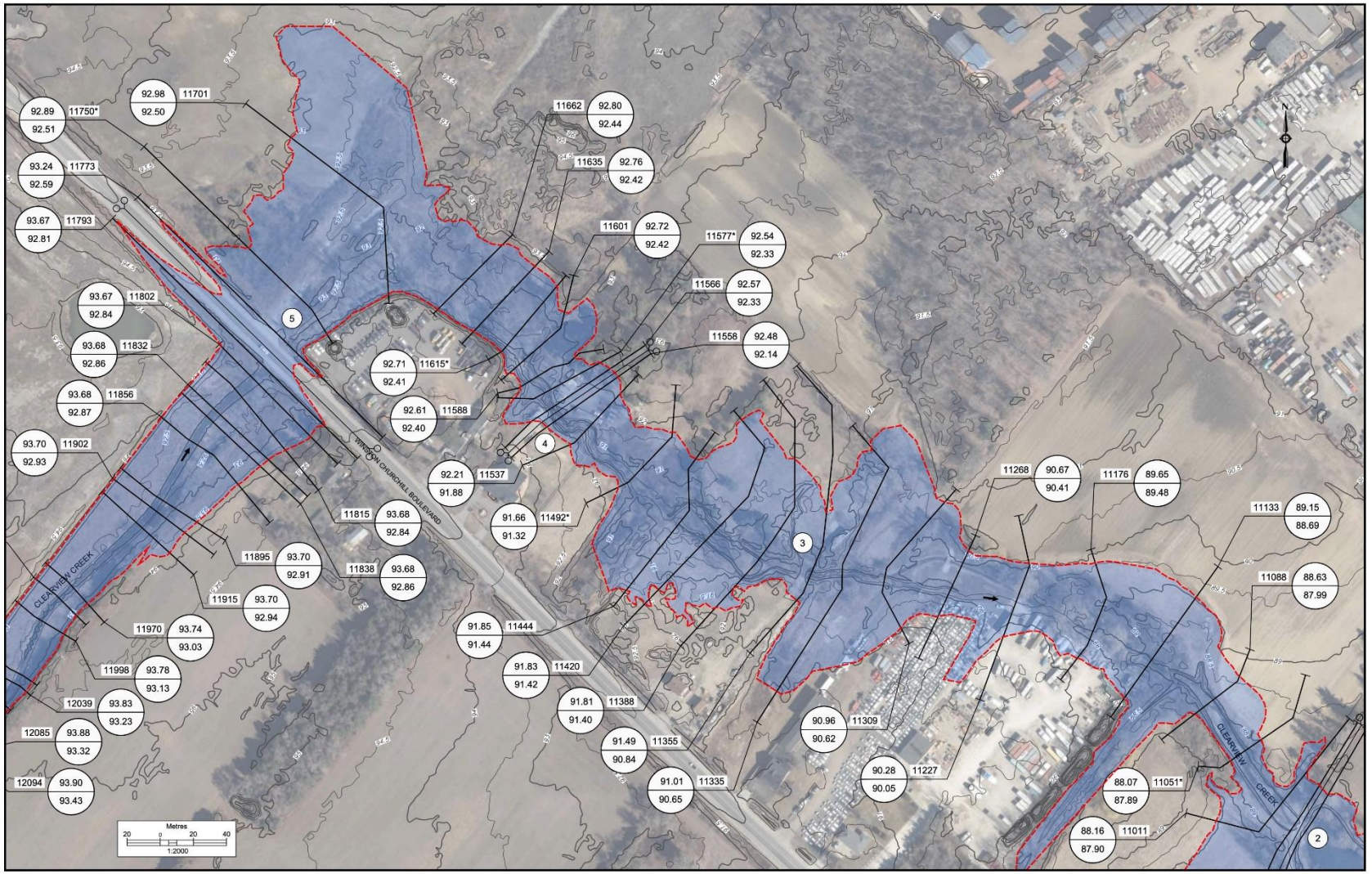


- Create floodplain maps that illustrate the frequency and depth of flooding
- Manage development in the floodplain

Typical Floodplain Map

The first step to reduce the cost of flood damage within a community is to have mapping that accurately shows the flood hazard.

These maps help people prepare for and respond to potential flooding.

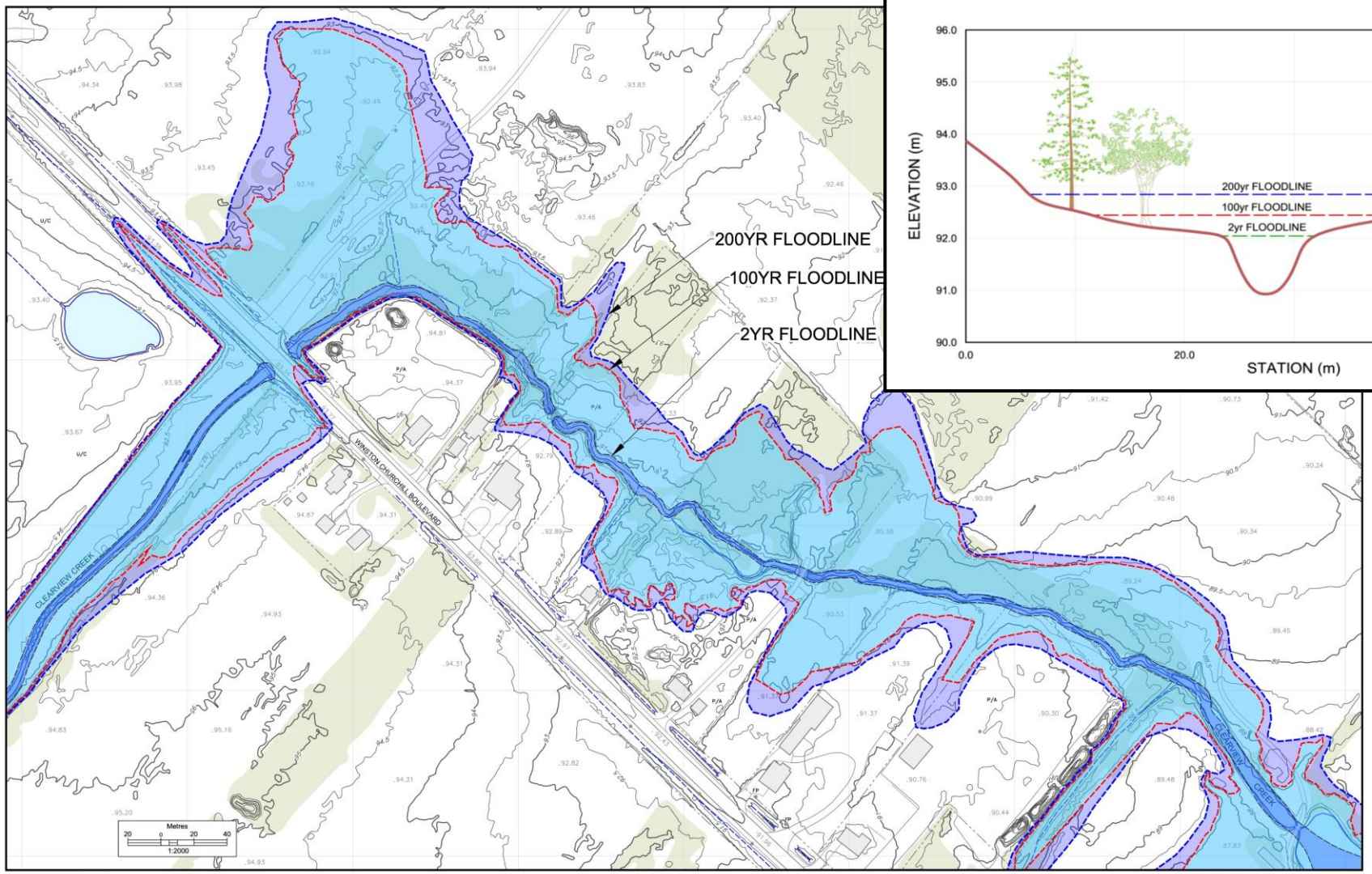


What is the 1:100 year flood and why is it used to map and regulate floodplains?

- 1% chance of happening in any given year
- The Province requires the 1:100-year flood to be mapped and the lands in the floodplain to be regulated
- To illustrate more severe flooding associated with climate change, also map floodplain with 20% increase in flows



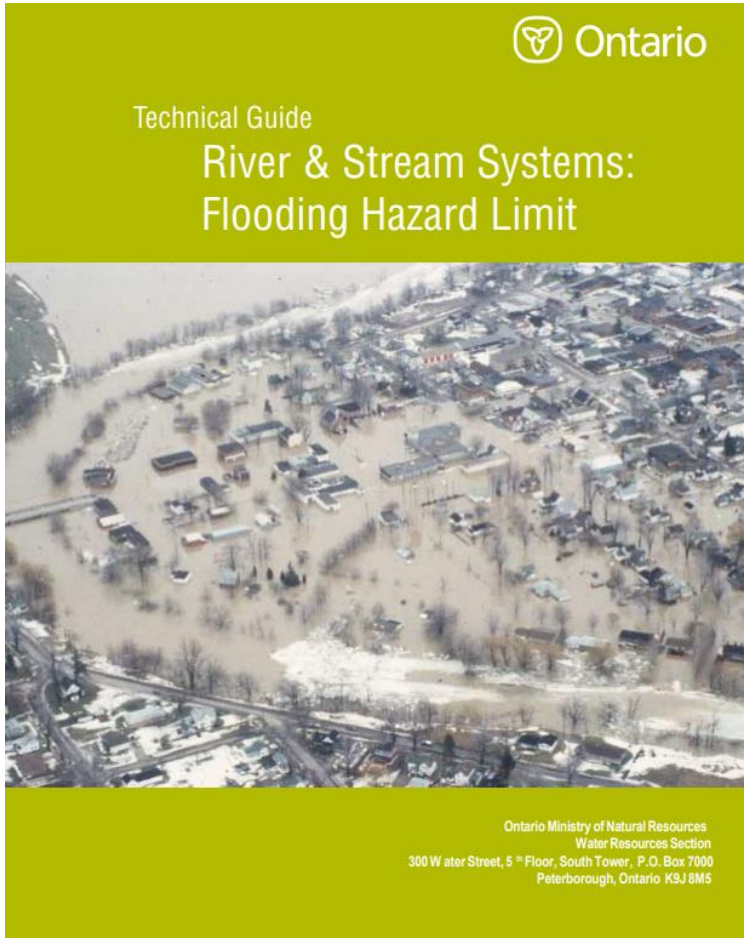
Floodplain Map: 1:2 year, 1:100 year; 1:200 year



Guidelines for Creating Floodplain Maps

- Floodplain mapping must be undertaken in a manner consistent with the Provincial Technical Guide for River and Stream Systems.

- This guide is used by all Conservation Authorities undertaking floodplain mapping projects.



Coyle Creek and Draper's Creek Floodplain Mapping

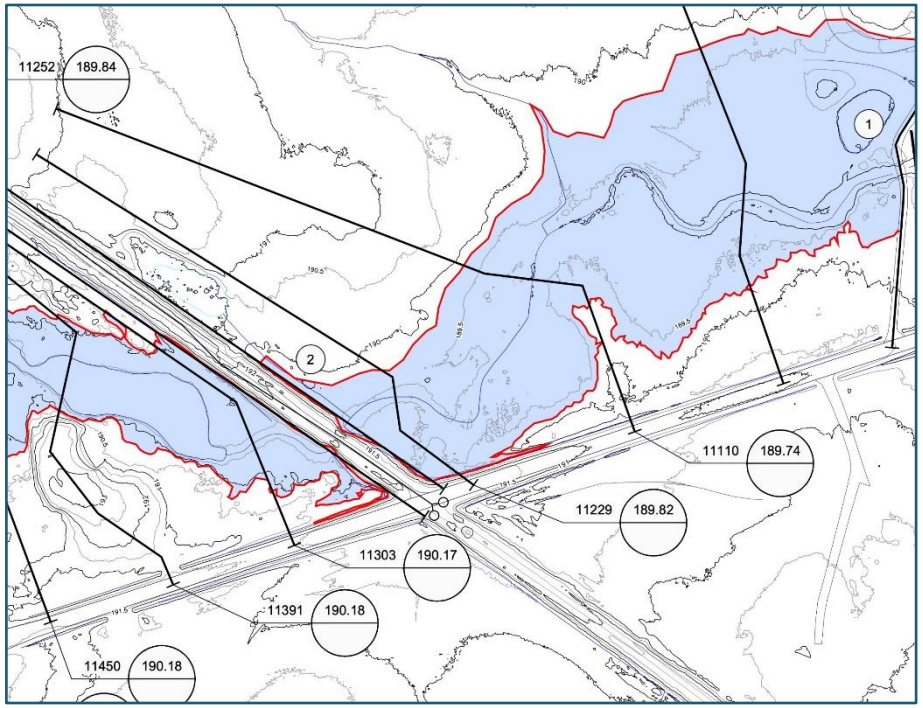
What are the key steps in preparing a floodplain map?

- **Base Mapping**
- **Survey bridges and culverts**
- **Calculate the 1:100 year flow rate**

PIC No. 2

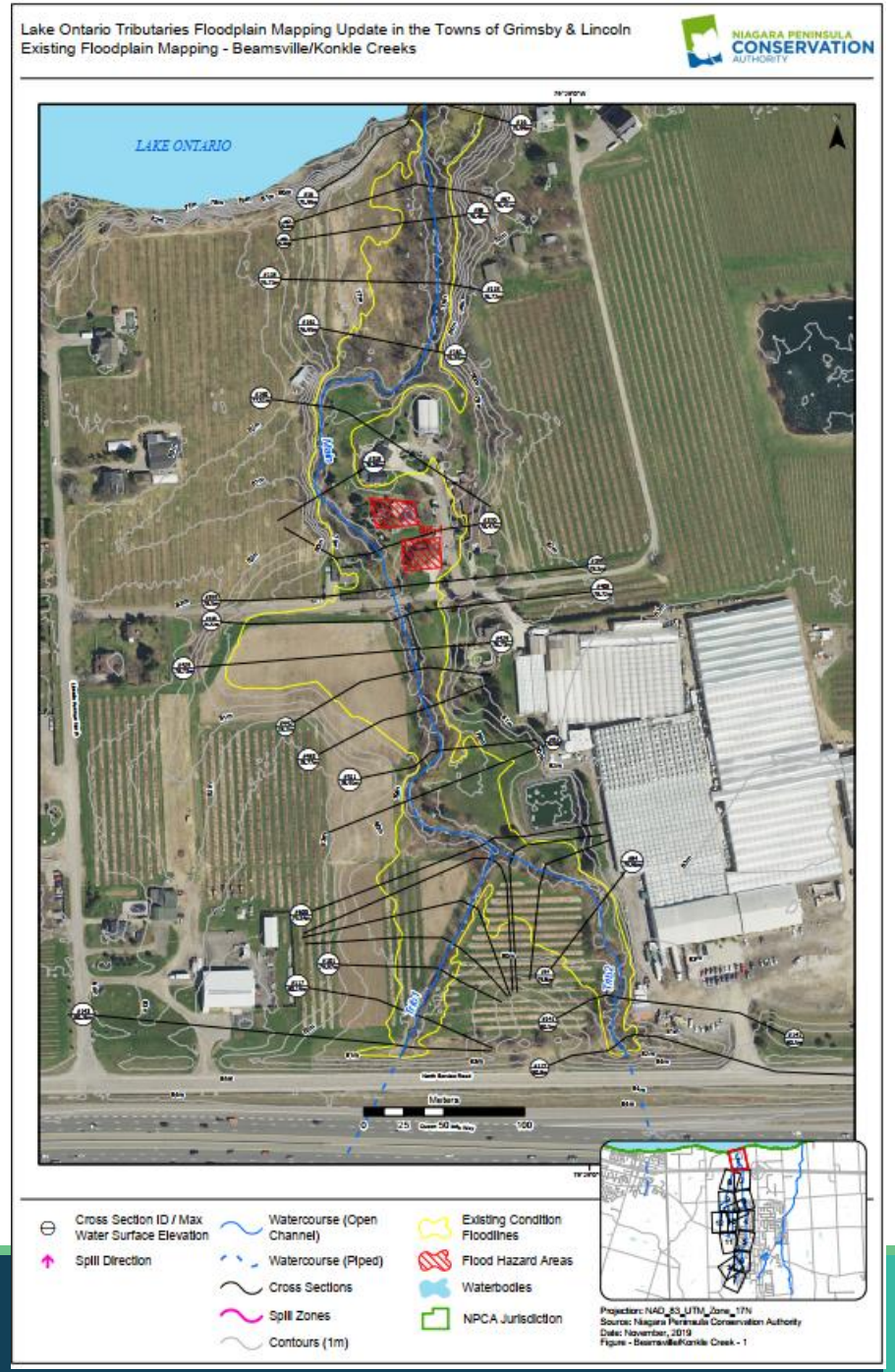
- Develop a computer model that combines all of the above to estimate flood elevations
- Prepare the floodplain maps

PIC No. 3



Sample Floodplain Map:

Towns of Grimsby and Lincoln Floodplain Mapping Study – Completed by Aquafor in 2018/2019



Aquafor Beech Limited

Company Profile:

- **Aquafor Beech Limited** (Aquafor) is a Canadian company, incorporated in 1990, providing engineering and environmental services to a broad range of public (e.g., municipalities, conservation authorities) and private sector clients.
- Specific Area of Expertise:
  - Hydrologic & hydraulic modelling for flood hazard delineation & Regulatory Floodplain mapping
  - Development of Stormwater Management Master Plans
  - Watershed planning
  - Natural channel and hydraulic structure design
- Aquafor Employes: 55
- Two Offices: Mississauga (head office) & Guelph
- Project Experience: CANADA - Ontario, BC, Labrador,
  USA – Vermont, Texas, California

Aquafor's Team

Attending Person:
Rob Amos, Project Manager
amos.r@aquaforbeech.com
416.705.2367

Coyle & Draper's Creeks Floodplain Mapping Study

NIAGARA PENINSULA CONSERVATION AUTHORITY & Aquafor Beech Limited

PROJECT MANAGEMENT SUPPORT
Senior Project Advisor & QA/QC
Dave Maunder, MSc., P.Eng.

Project Manager
Rob Amos, MASc., P.Eng.

BACKGROUND REVIEW & FIELD WORK

Background Review

Background Review Lead
Dave Maunder, MSc., P.Eng

Hydrologic
Tim Koen, B.Sc., P.Eng

Hydraulics
Julie Michel, MSc., EIT

GIS
Jakub Ripley, B.A

Field Work and Data Collection

Field Work Lead
Rob Amos, MASc., P.Eng

Survey
Alex Verville, B.A
Jakub Ripley, B.A

Hydraulics
Julie Michel, MSc., EIT

MODELLING

Hydrologic Modelling

Hydrologic Modelling Lead
Tim Koen, B.Sc., P.Eng

Hydrologic Support
Kyle Haley, BASc., P.Eng
Gabriel Dubé, MSc., EIT

Hydrologic Modelling Technologist
Julie Michel, MSc., EIT

Hydraulic Modelling

Hydraulic Modelling Lead
Kyle Haley, BASc., P.Eng

Hydraulic Support
Julie Michel, MSc., EIT

Hydraulic Modelling Technologist
Gabriel Dubé, MSc., EIT

TECHINCAL MEMO, REPORTS and MAPPING

Deliverables

Coordinator / Reviewer
Rob Amos, MASc., P.Eng
Dave Maunder, MSc., P.Eng

Hydrologic Report Writing Lead
Tim Koen, B.Sc., P.Eng

Hydraulic Report Writing Lead
Kyle Haley, BASc., P.Eng

GIS & Floodplain Mapping
Alex Verville, B.A
Jakub Ripley, B.A

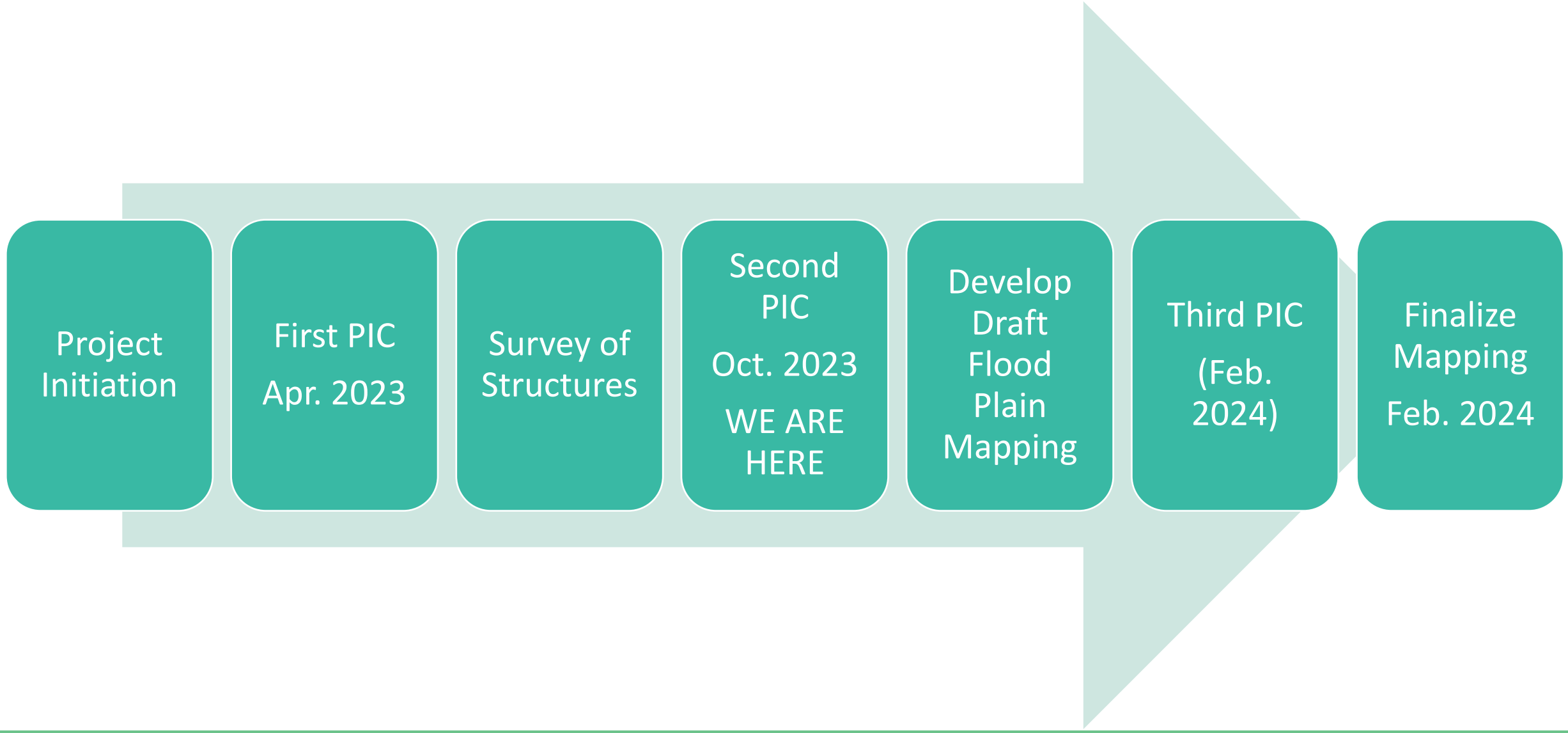
Hydrologic/Hydraulic Report Writing Support
Gabriel Dubé, MSc., EIT
Julie Michel, MSc., EIT

PUBLIC CONSULTATION

Public Consultation

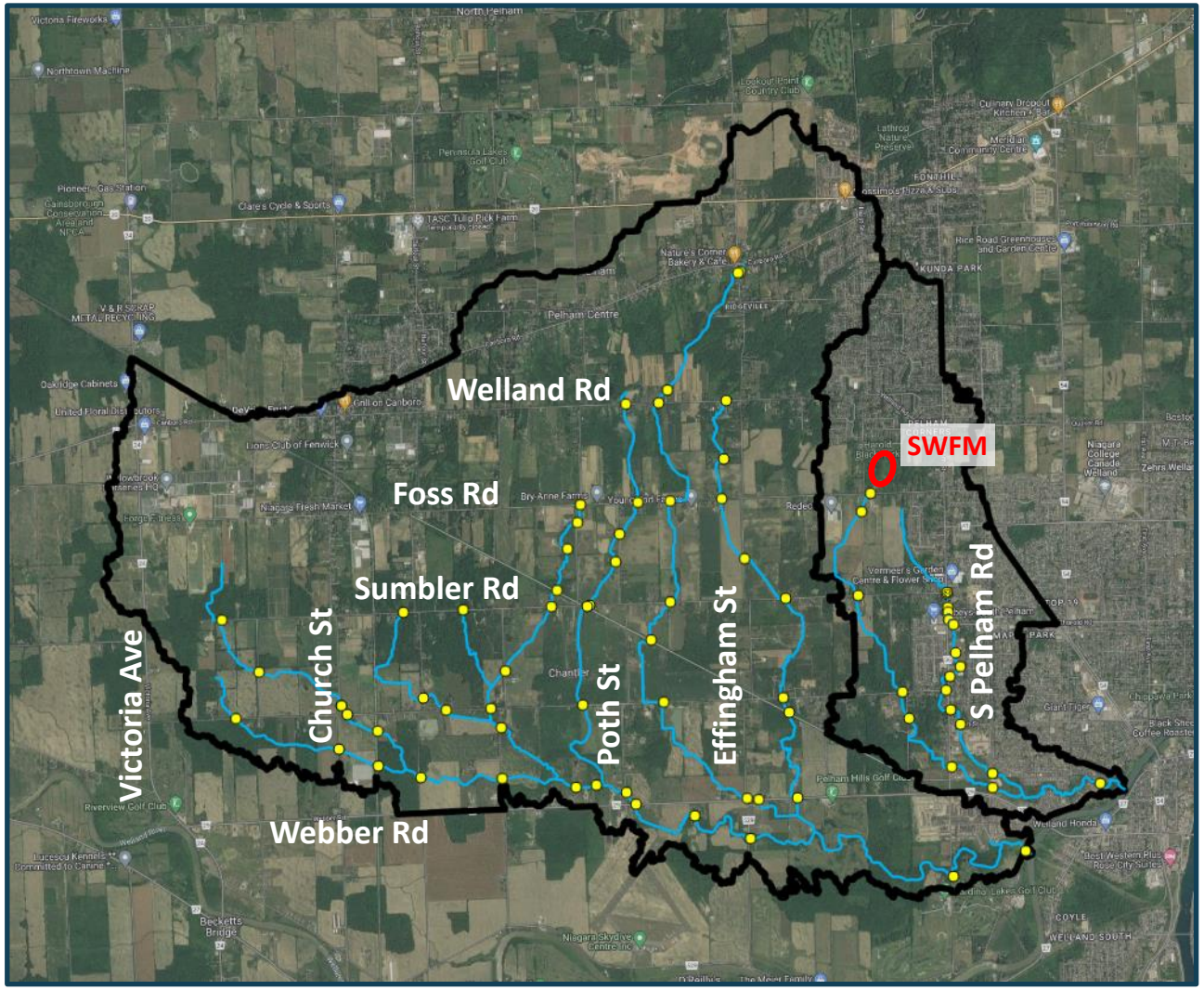
Lead / Coordinator
Rob Amos, MSc., P.Eng

Project Milestones

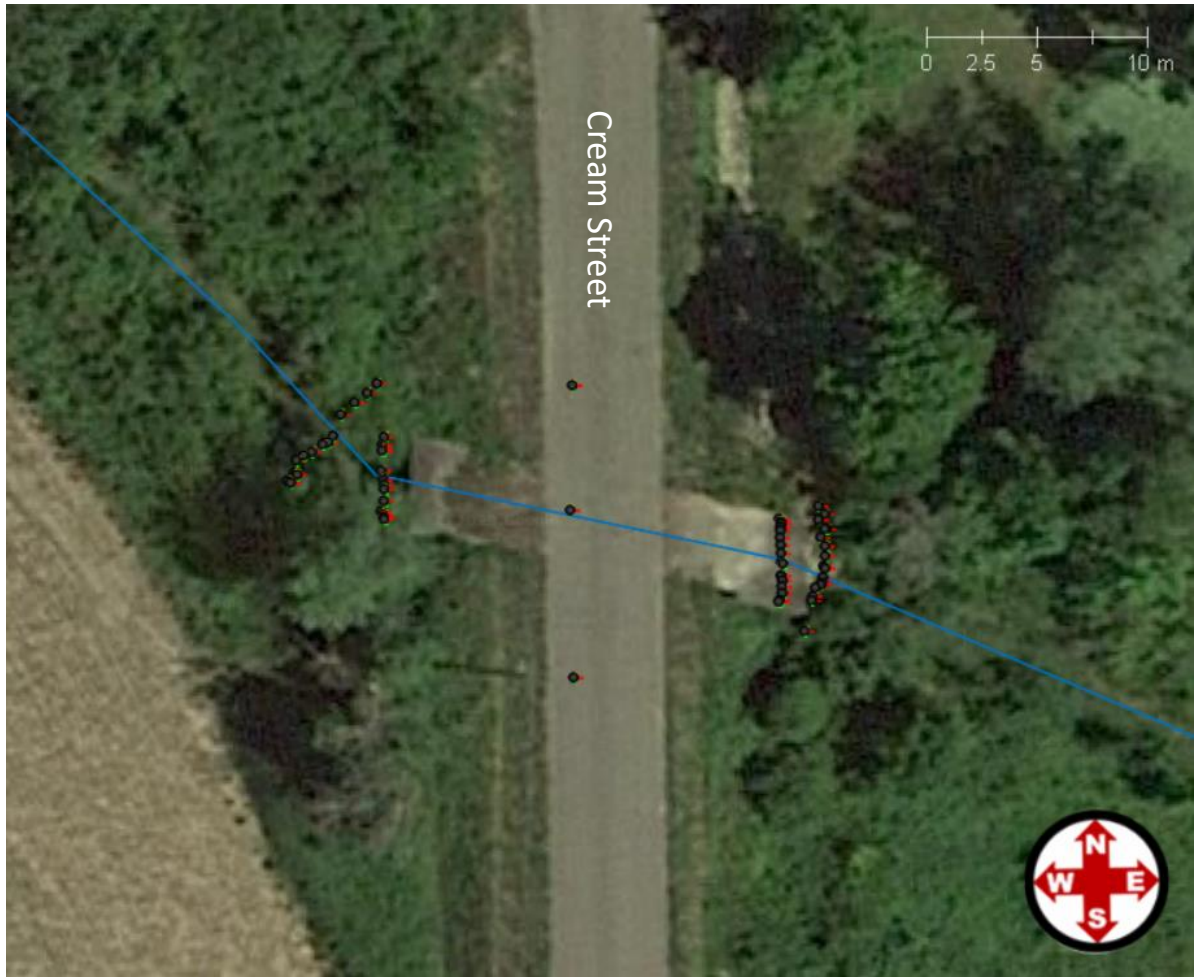


Locations of Surveyed Structures

- 83 Hydraulic Structures Surveyed
- Draper's Creek Stormwater Management Facility (SWMF) Surveyed



Locations of Surveyed Structures



Coyle Creek - Typical Culvert
Topographic Survey



Draper's Creek - Upstream SWMF Topographic Survey

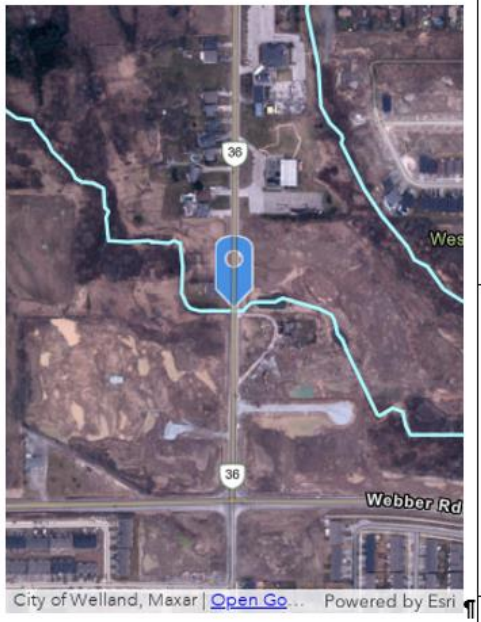
Example Structure Inventory Sheet

HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yyyy): 04/24/2023	Structure Type: Road Bridge, Culvert	Shape: Circular	Flow Present (Y/N): Y
Field Crew: MT, CM	Number of Cells: 2	Open Footing (Yes/No): N	Approx. Depth of Water (mm): 200
ABL ID: ABL_54	Material (Concrete/Steel): Steel		Approx. Velocity:
Watershed Name: Draper's Creek	Height (m) x Width (m) or Diameter (m): 0.95 / 1.05		Upstream Erosion (Y/N): N
Subcatchment Name:	Length (m): 15.1		Downstream Erosion (Y/N): N
Municipality:	U/S Invert Elev. (m): 175.77	U/S Obvert Elev. (m):176.87	Additional Information: Second cell is 1.05m CSP. DS channel is newly/still under comstruction. Poorly formed channel cross section has resulted in wide shallow pooling.
Location (Road Name/Intersection): South Pelham RD	D/S Invert Elev. (m): 175.75	D/S Obvert Elev. (m): 176.8	
	Inlet Type (Projecting/Mitered/Headwall): Projecting		
	Skew Angle of Crossing (Degrees): 0		
	Depth of Siltation (mm): 0		

Site Photograph and Additional Field Notes

Site Sketch:





Upstream Face



Upstream Channel



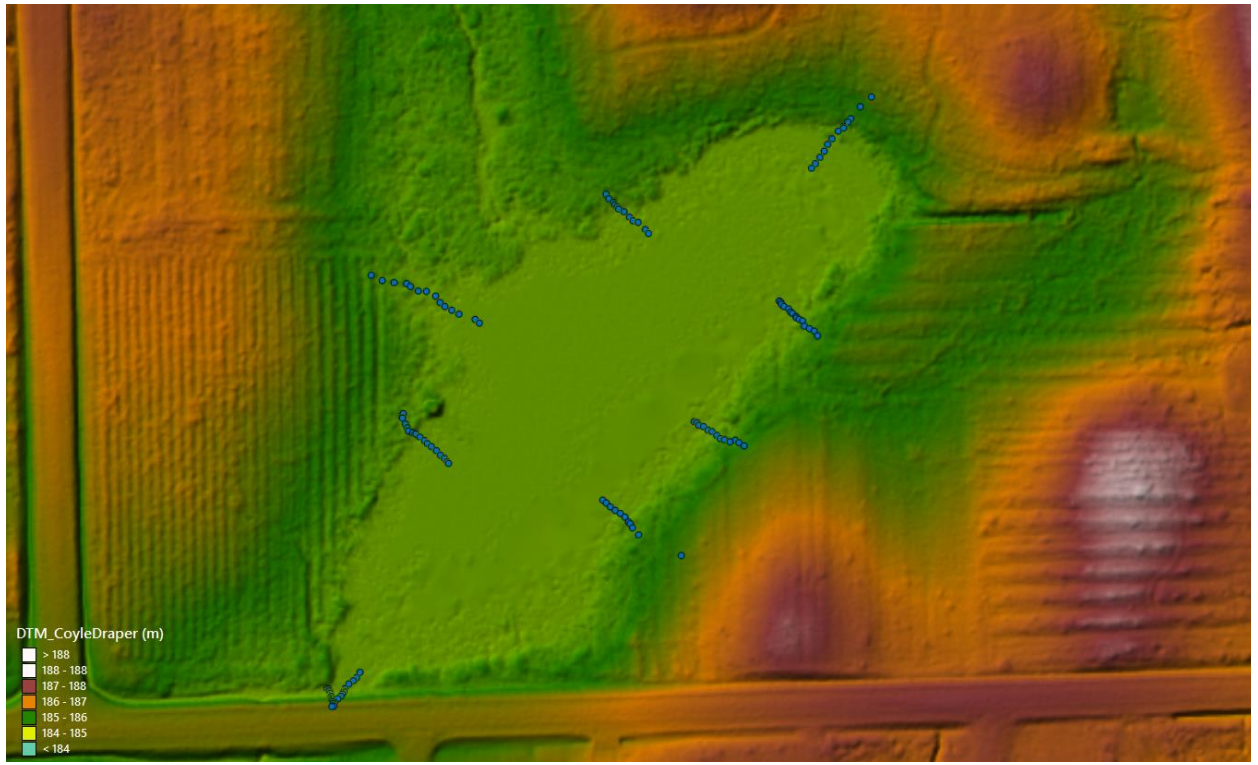
Downstream Face



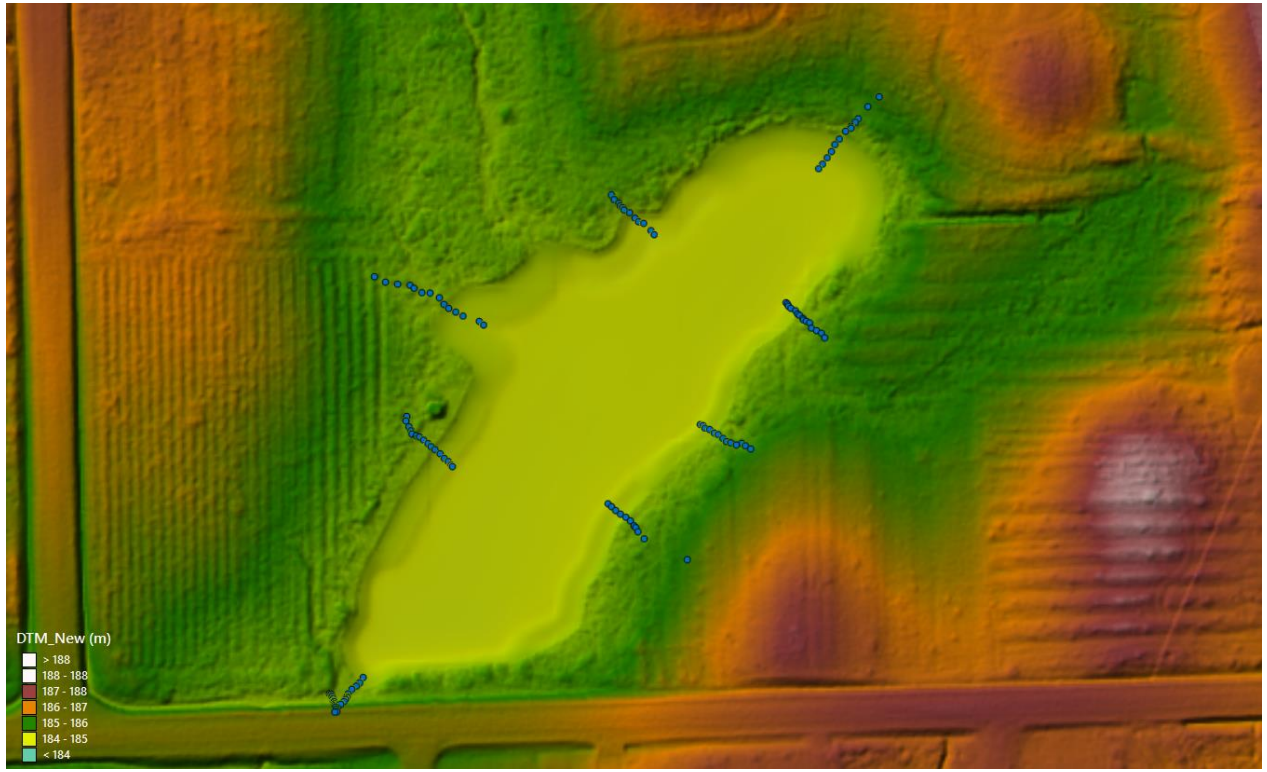
Downstream Channel

Description of Photograph:

Locations of Surveyed Structures

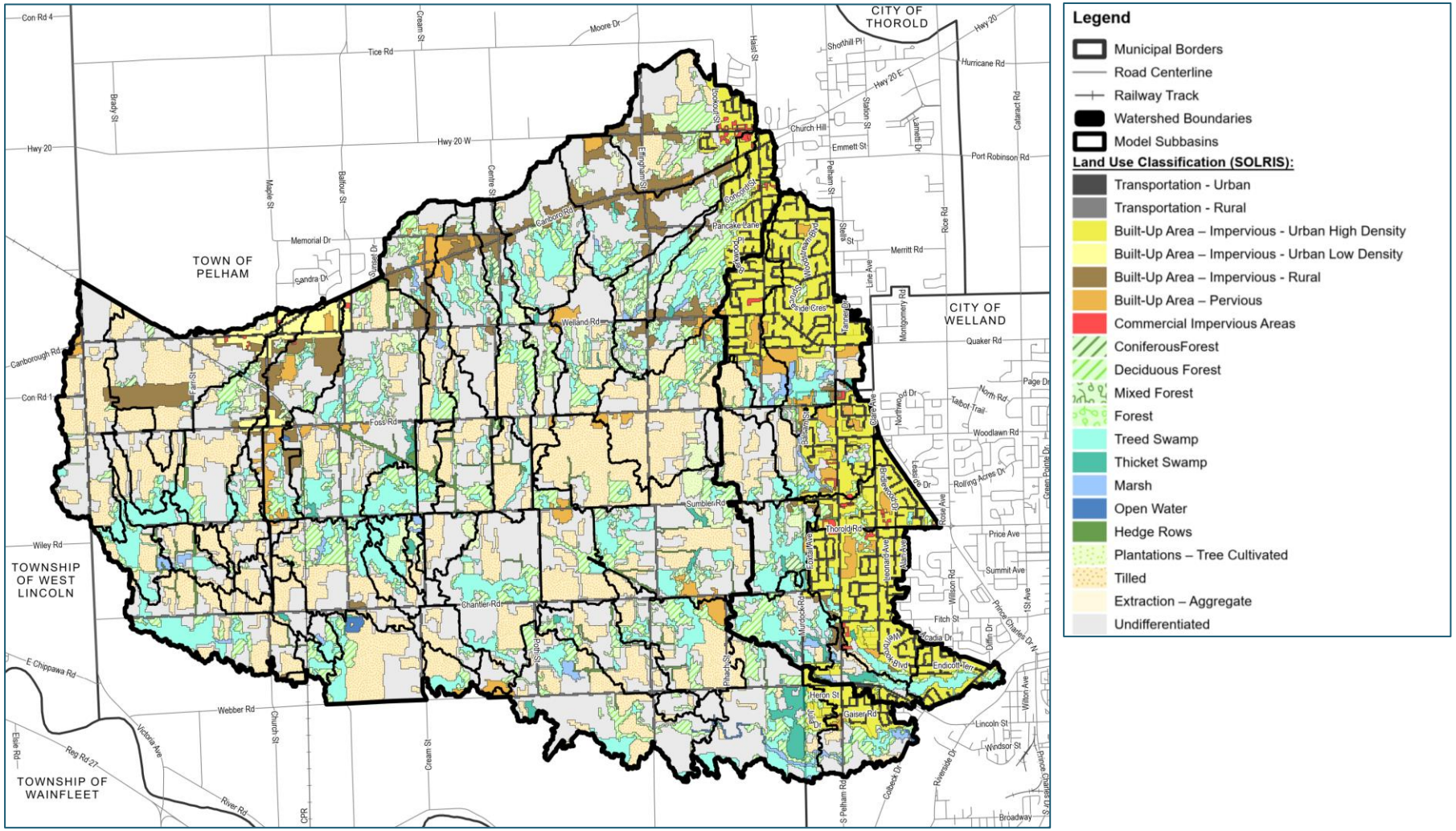


Original Digital Terrain Model at the SWMF



Corrected Digital Terrain Model using Survey Data

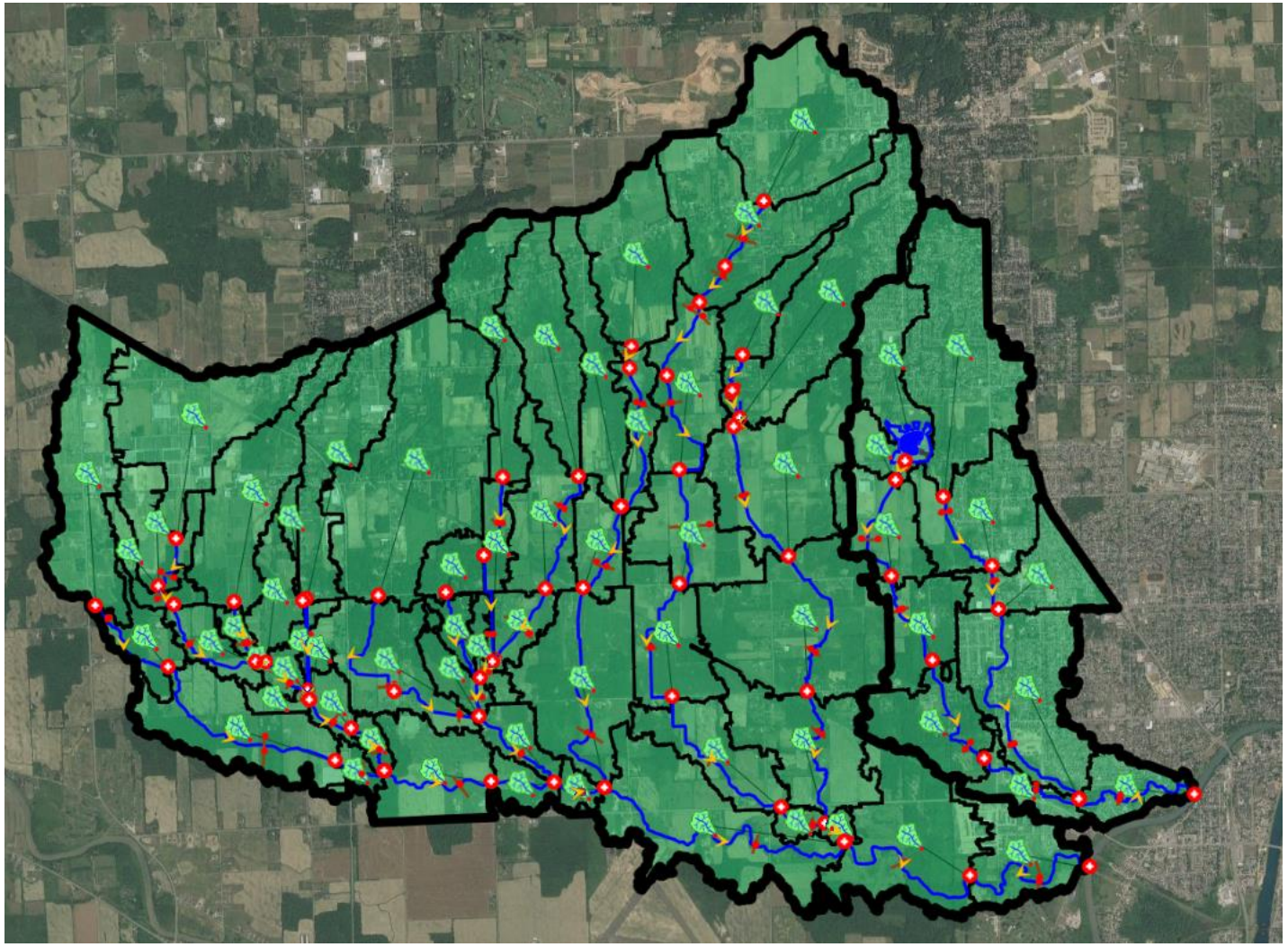
Soil & Land Use Data Acquired → Compute Infiltration/Runoff Coefficients



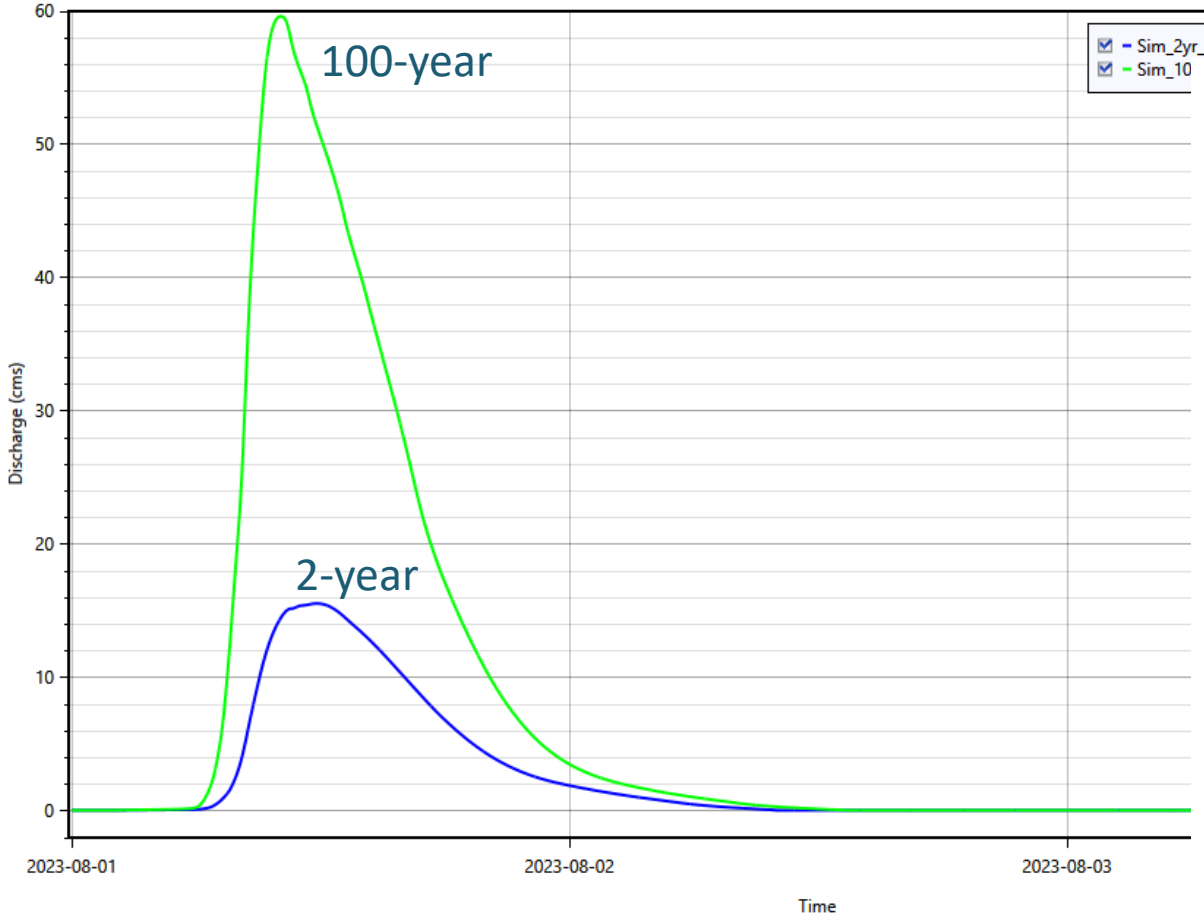
Land Use within the Study Area Watersheds

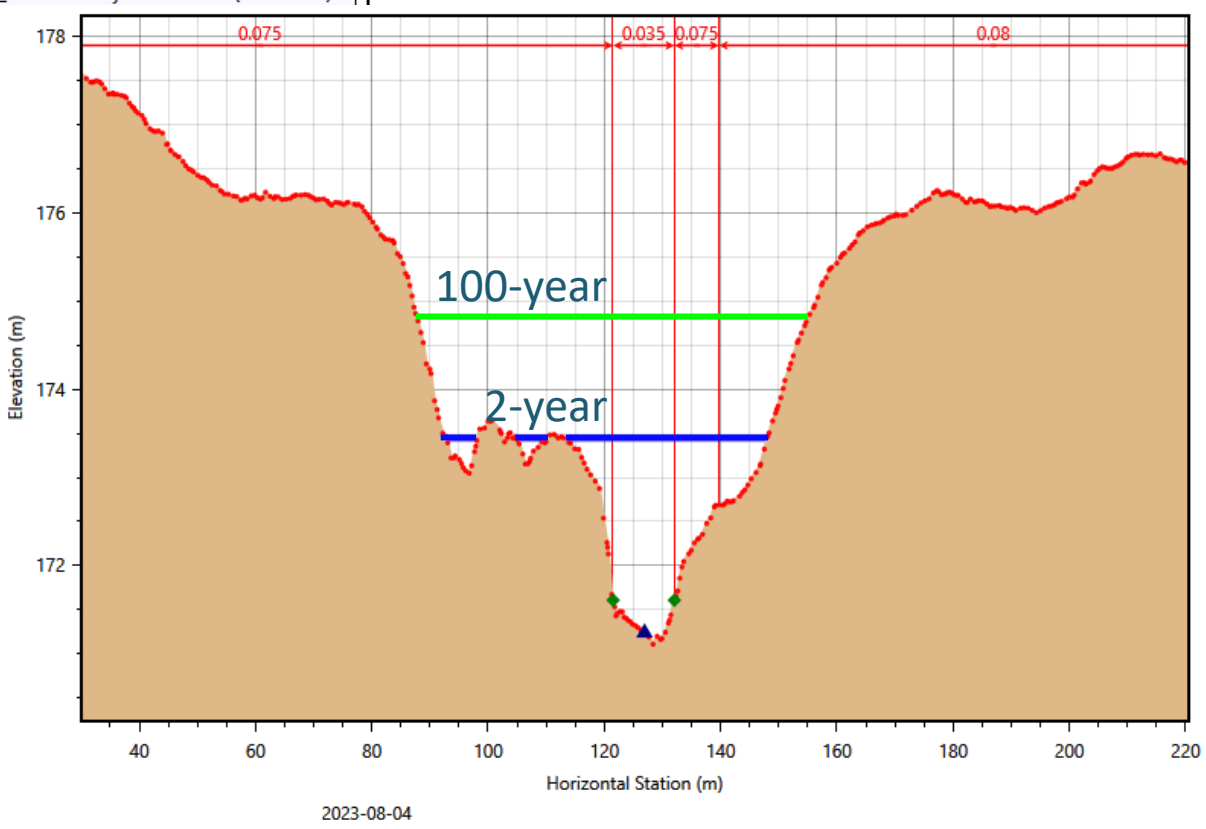
Hydrologic Model Setup

- 40.6 Km^2 for Coyle Creek
- 8.9 Km^2 for Draper's Creek
- 67 Sub-Basins
- 88 Junctions



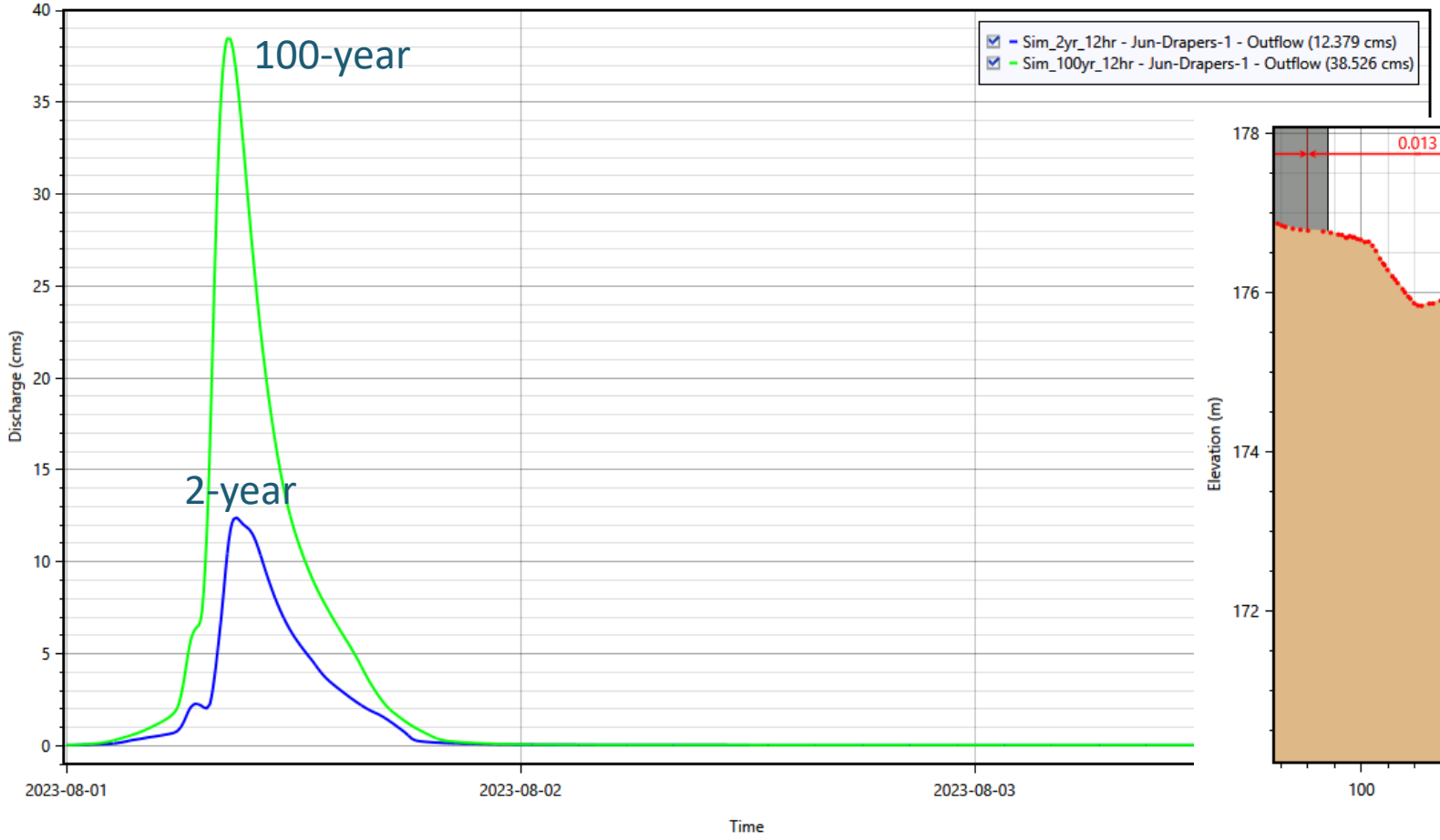
Results: Coyle Creek Downstream Flows

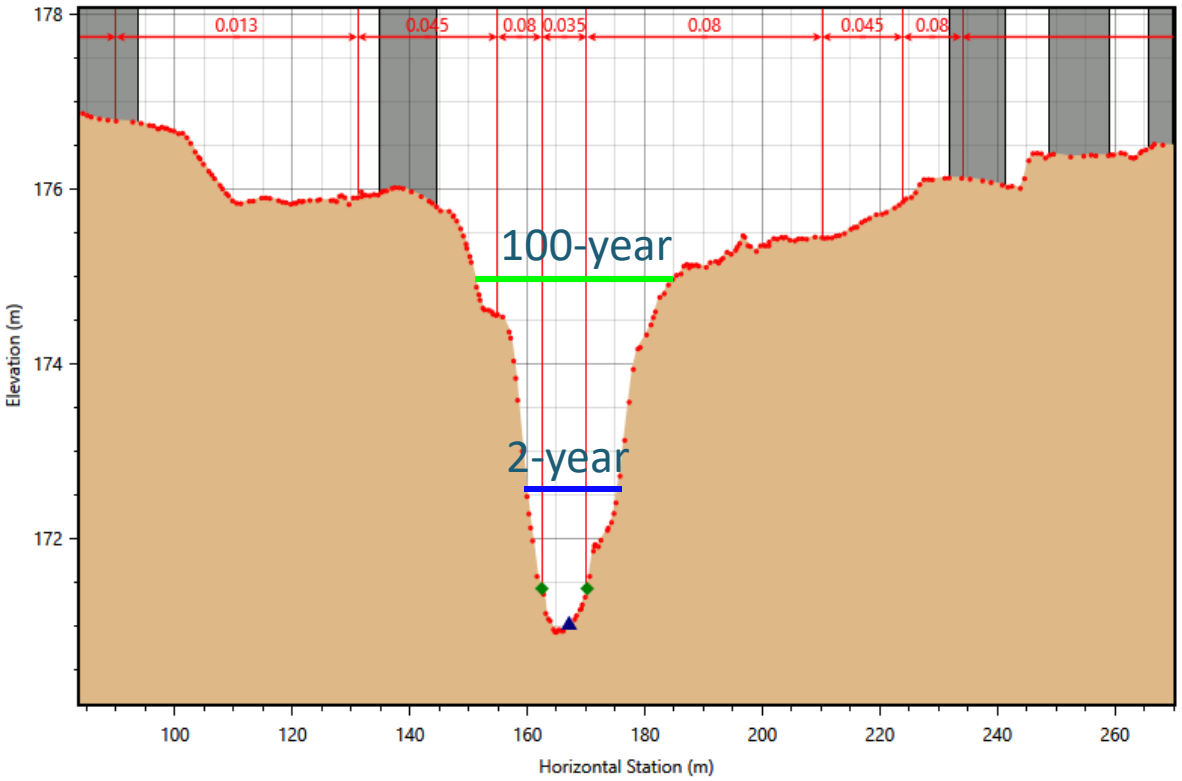




2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	100-yr Rain-on-Snow
15.5	22.4	28.6	39.3	50.4	59.6	76.2	42.4

Results: Draper's Creek Downstream Flows

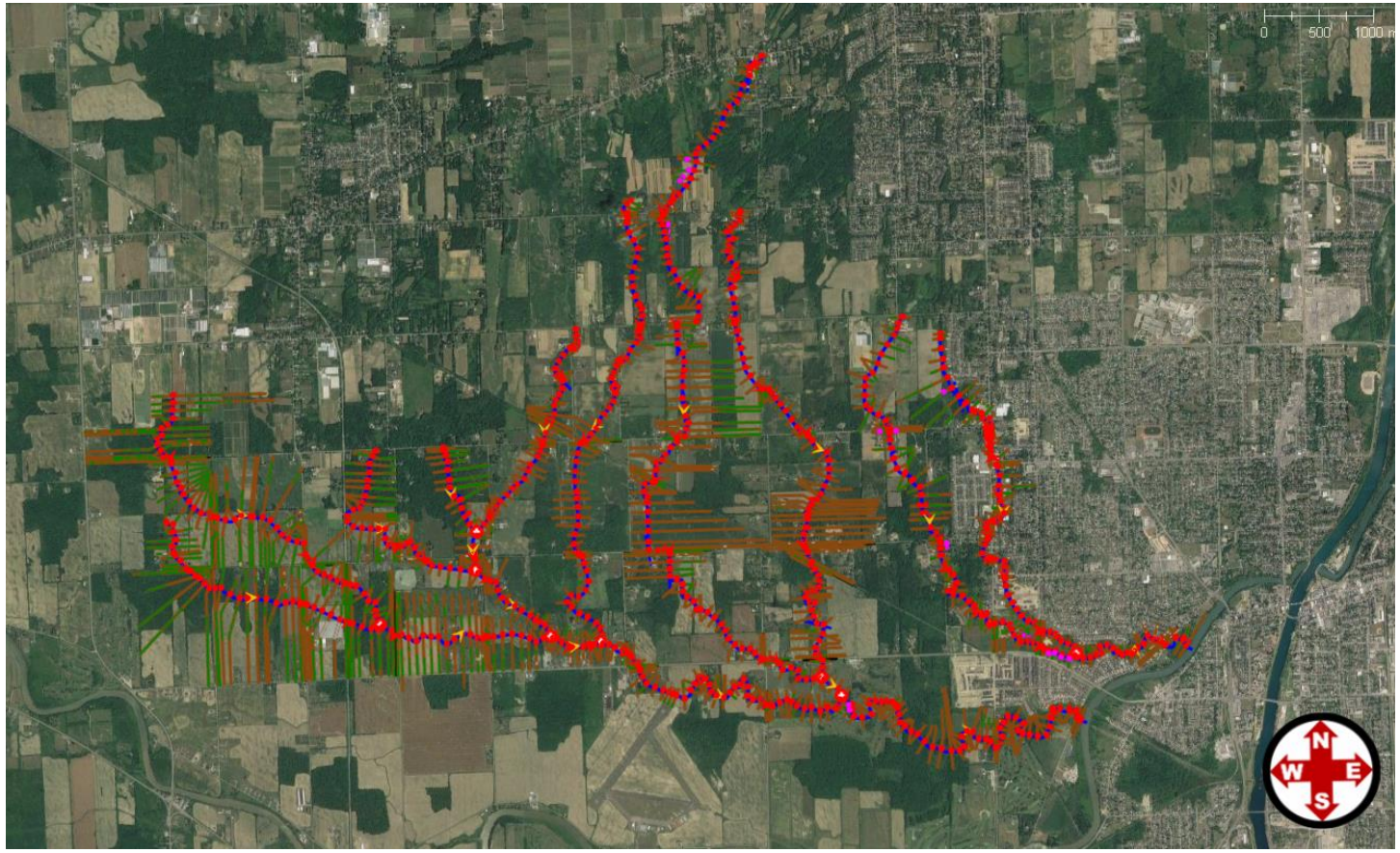




2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	100-yr Rain-on-Snow
12.4	16.7	21.0	27.6	33.4	38.5	47.3	21.2

Hydraulic Model Development

- Models Completed
  - 847 River Cross-Sections
  - 76 Hydraulic Structures
  - Stream/Floodplain Roughness Values Assigned
  - Building Obstructions Defined (conveyance obstruction)

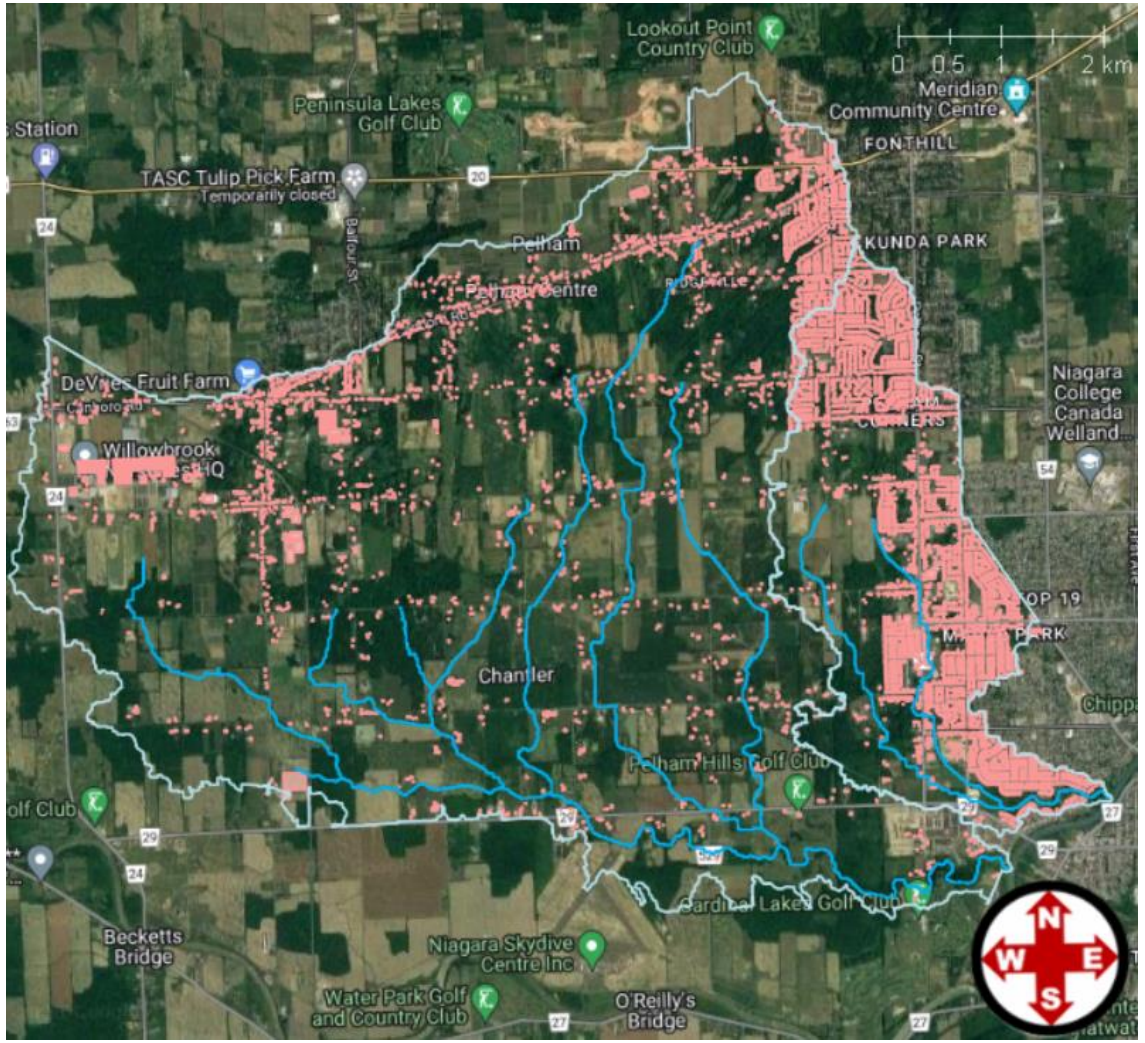


Aquafor Hydraulic Model

Hydraulic Model Development

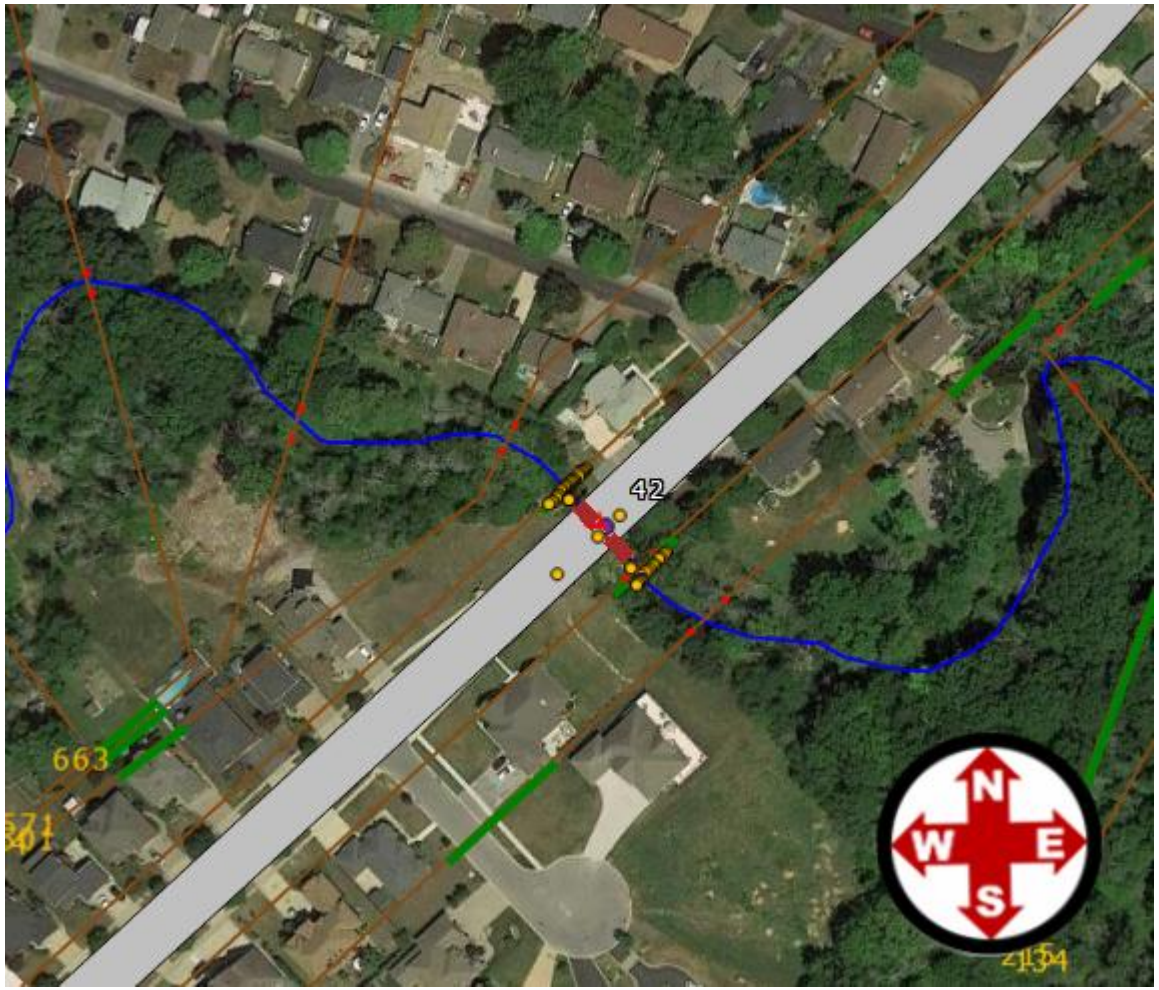
Land Use Classification (SOLRIS)	Manning Roughness
Built-up Area Impervious - Rural	0.02
Built-up Area Impervious - Urban High Density	0.045
Built-up Area Impervious - Urban Low Density	0.05
Built-Up Area – Pervious	0.055
Commercial	0.02
Coniferous Forest	0.07
Deciduous Forest	0.075
Extraction-Aggregate	0.011
Forest	0.07
Hedge Rows	0.06
Marsh	0.075
Mixed Forest	0.07
Open Water	0.035
Plantation - Tree Cultivated	0.06
Thicket Swamp	0.08
Tilled	0.055
Transportation - Rural	0.013
Transportation - Urban	0.013
Treed Swamp	0.08
Undifferentiated	0.05

Manning's Roughness Coefficients based on Land Use Classification

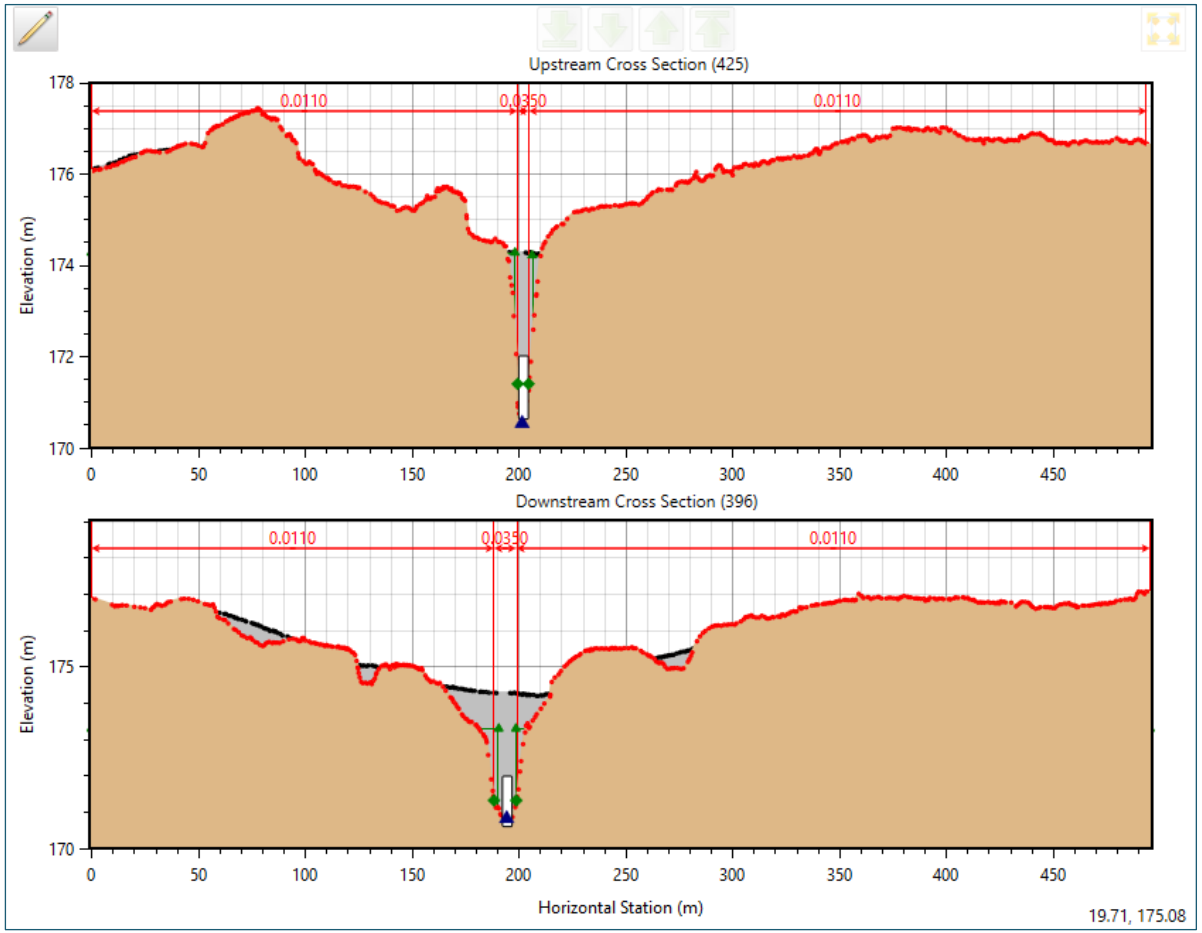


Distribution of Buildings

Example – Modelled Culvert Crossing at Colbeck Drive



HEC-RAS Planform with Topographic Survey



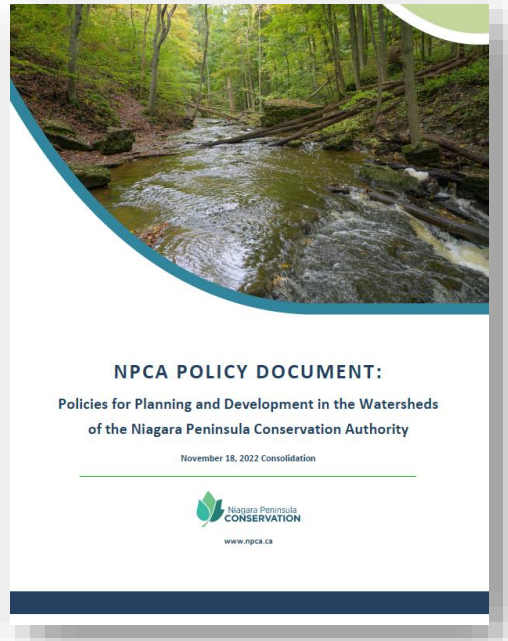
HEC-RAS Roadway Geometry Data

Niagara Peninsula CONSERVATION

nature for all

NPCA FLOODPLAIN POLICIES

October 2023



David Deluce, MCIP, RPP
Senior Manager, Environmental Planning and Policy

Legislative Context

- *Conservation Authorities Act* – Section 28
- *Ontario Regulation 155/06*
  - Subsection 2(1) – Development prohibited; and
  - Subsection 3(1) – Permission to Develop
  - New Regulation expected in the future
- *Planning Act*
  - Section 3 – Provincial Policy Statement, Natural Hazards



NPCA Polices



- Current policies approved November 2022
- Policies guide NPCA decision making
- Policies will need to be updated following Provincial approval of a new Conservation Authorities Act s.28 Regulation

What is Allowed?

- Passive open space uses
- Accessory structures (subject to criteria)
- Additions to existing buildings (up to 46.5 square metres)
- New agricultural buildings (subject to criteria)
- Up to 50 cubic metres of clean fill
- Balanced cut and fill
- Other uses not likely to incur damage from floodwaters



NPCA Role in Planning Applications

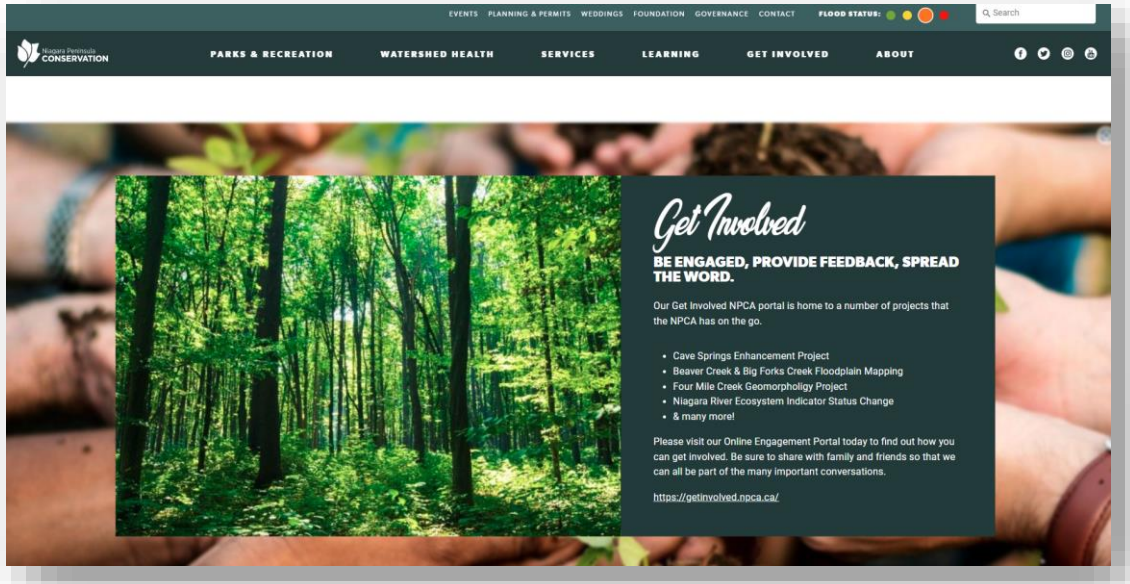
- Conservation Authorities required by Province to review applications for:
  - Consistency with Natural Hazards Policies of the Provincial Policy Statement
  - Conformity with Natural Hazards Policies of any applicable Provincial Plan
- NPCA seeks to avoid situations where a Planning approval is given but an NPCA Permit cannot be supported

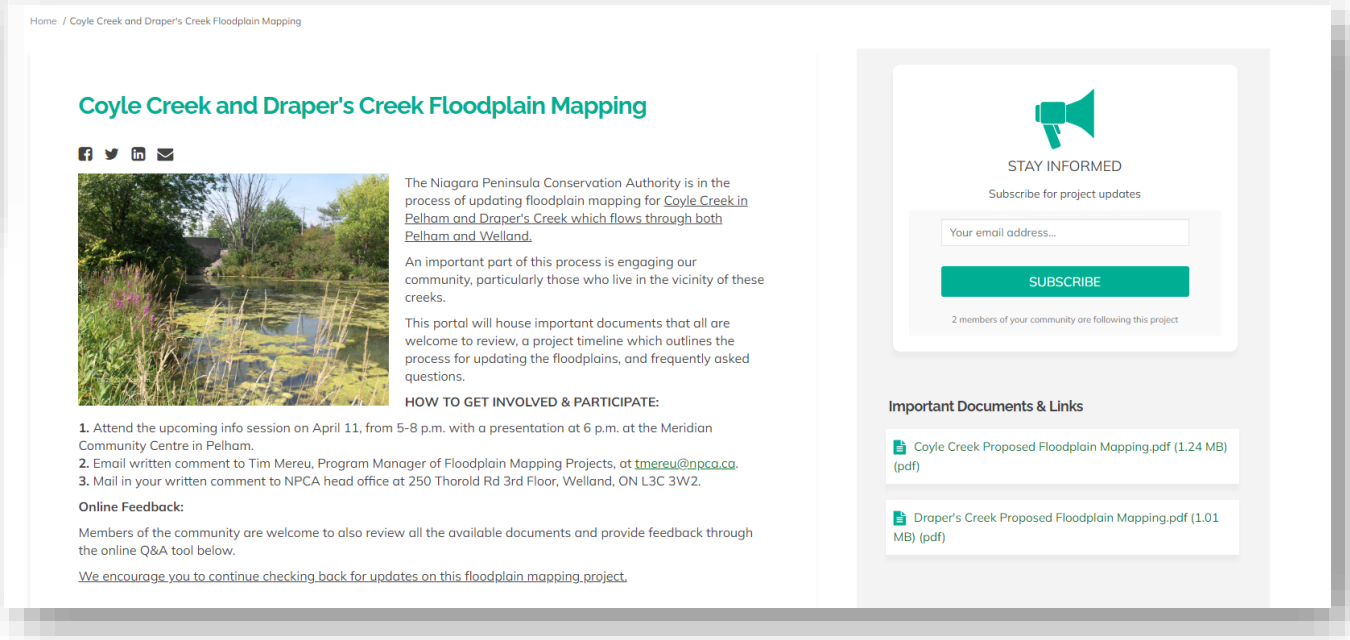
What is Not Allowed?

- Sensitive uses, such as hospitals, nursing homes, day-cares/pre-schools and schools
- Emergency services facilities
- Uses associated with the disposal, treatment, manufacturing/processing or storage of hazardous substances
- Any other use or development deemed to be inappropriate based on the following objectives:
  - Prevent loss of life;
  - Minimize property damage and social disruption;
  - Reduce the potential for incurring public costs associated with the impacts of flooding hazards;
  - Manage existing risks and reduce the potential for future risks;
  - Promote the conservation of land and a coordinated approach to the management of water.



Stay Informed and Have Your Say
www.npca.ca







Leilani Lee-Yates, Director, Planning and Development, NPCA

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