HC3 Research Laboratory

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ÉTS, Construction Engineering, Montreal
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Université du Québec

MY SPONGE PROPERTY

Private-Sector Adaptation Measures to Enhance the Resilience of the Built Environment to Stormwater Flooding

HC3 Research Laboratory
February 27, 2026

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longueuil

éco habitation

Montréal

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Introduction

Canada → Increase in intensity and frequency of extreme rainfall events

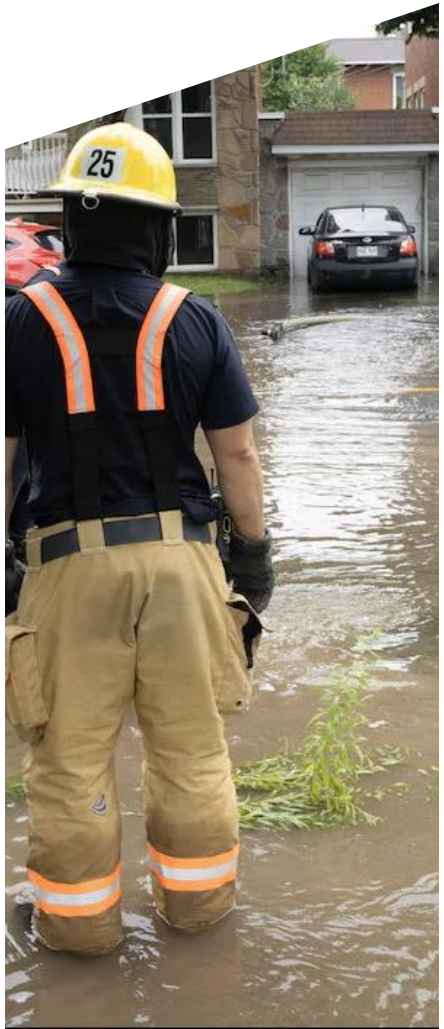
Montreal → Affected by extreme rainfall events

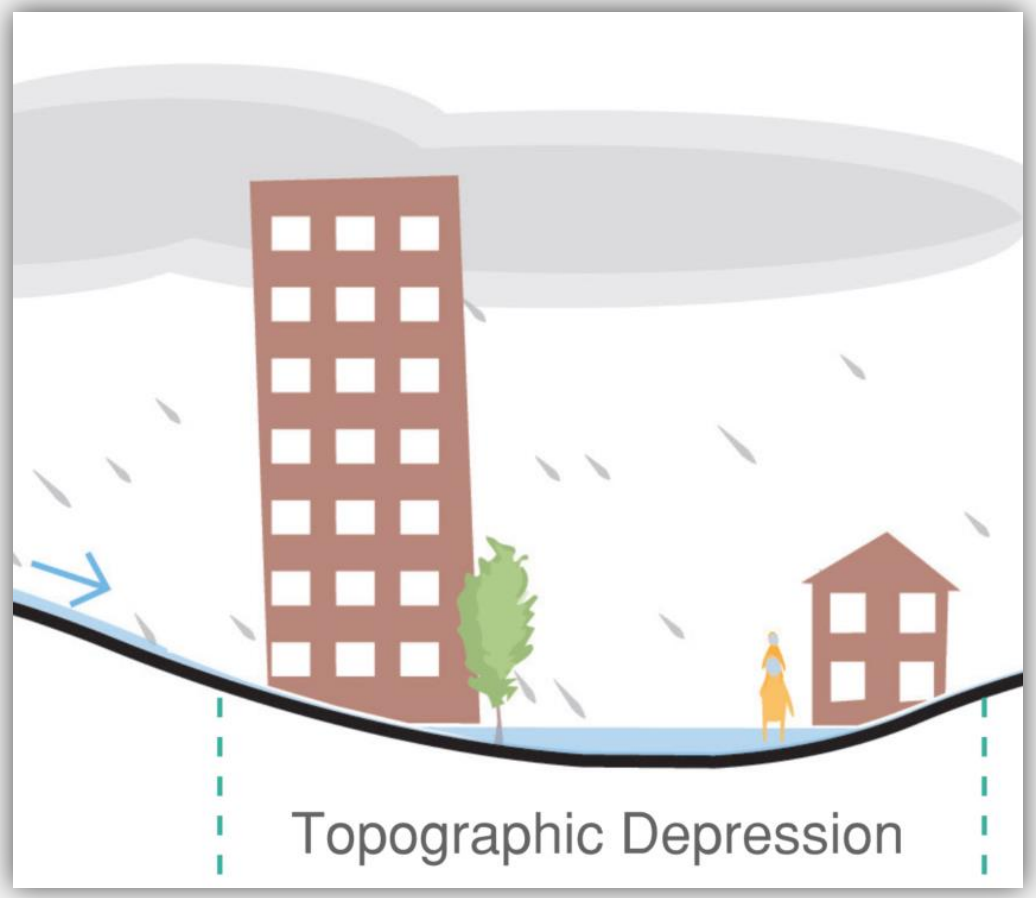
- September 13, 2019
- Hurricane Debby – August 9, 2024

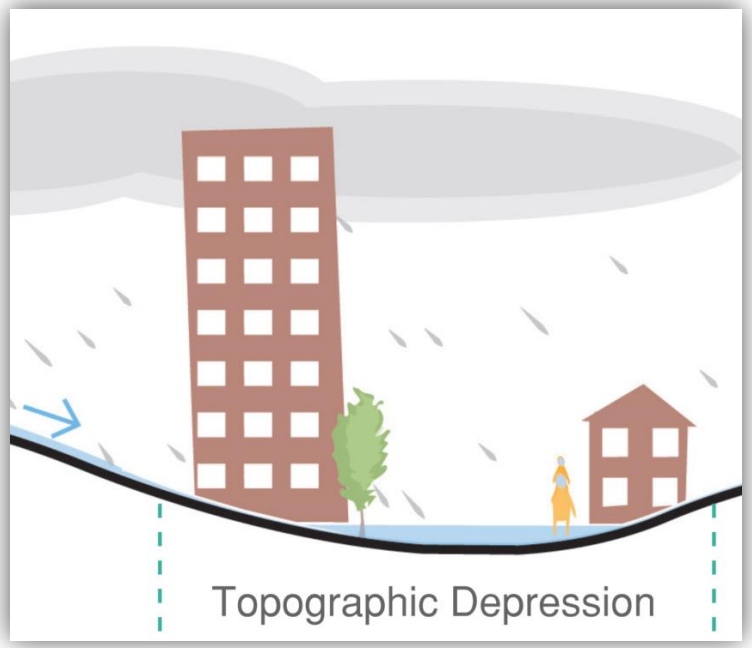
Costliest natural disaster in Quebec !

- Intense rainfall of July 13, 2025

What's in common in most of the flooded urban areas?




Topographic Depression



My Sponge Property

« *Identify strategies to reduce the risk of building flooding* »

Rain gardens

Rain barrels

Blue roofs

Where can we implement them ?

Public domain → It is costly
Hypothesis : Private property → Effective + lower budget

Case study

Insurance claims → Confidential

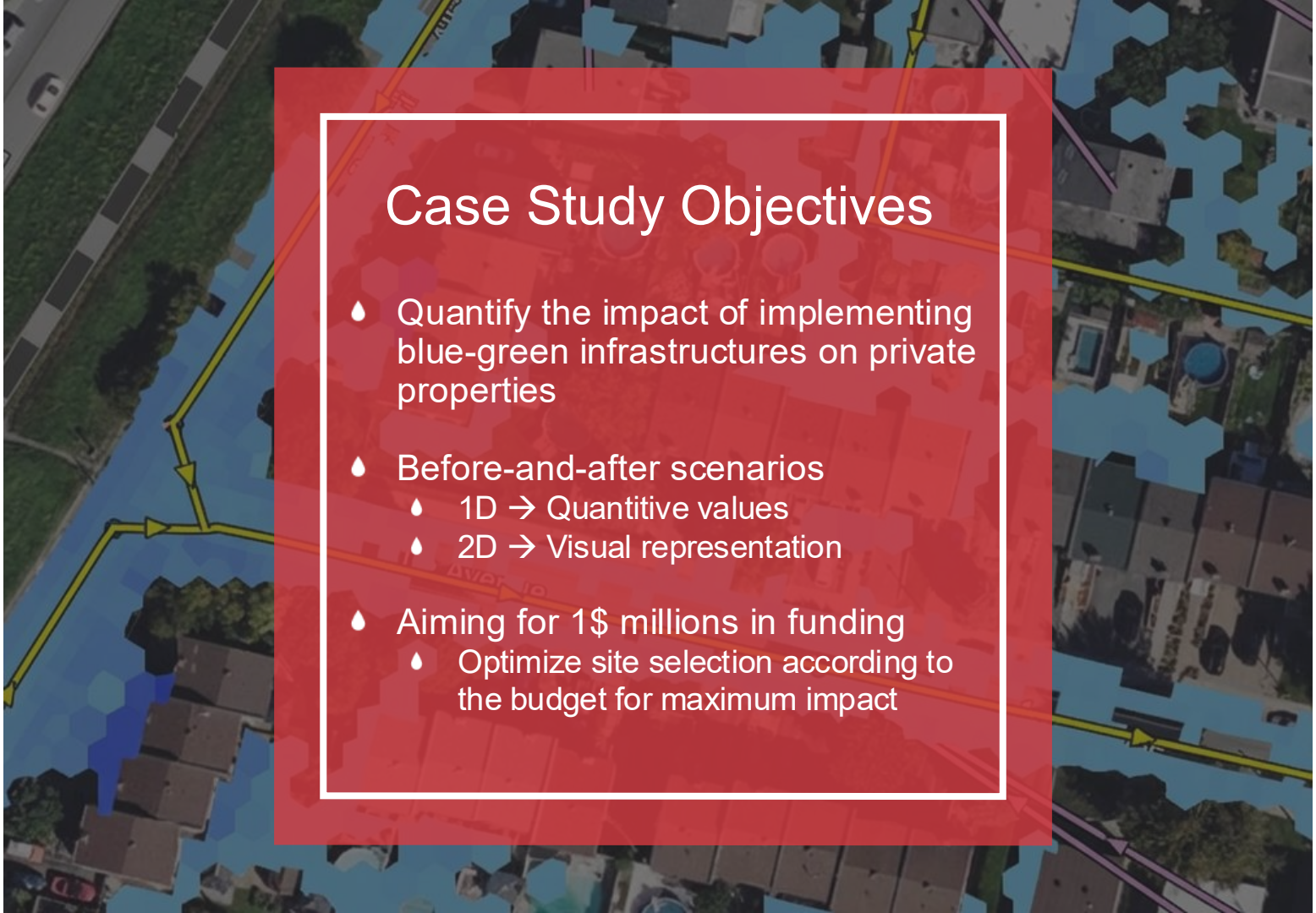
Presentation of the actual models without the exact location

Pilot projet → Funding

Social acceptability
Resident must agree !

Interested parties

- Ecohabitation
- City of Longueuil
- City of Montreal
- Residents



Case Study Objectives

- Quantify the impact of implementing blue-green infrastructures on private properties
- Before-and-after scenarios
  - 1D → Quantitive values
  - 2D → Visual representation
- Aiming for 1$ millions in funding
  - Optimize site selection according to the budget for maximum impact

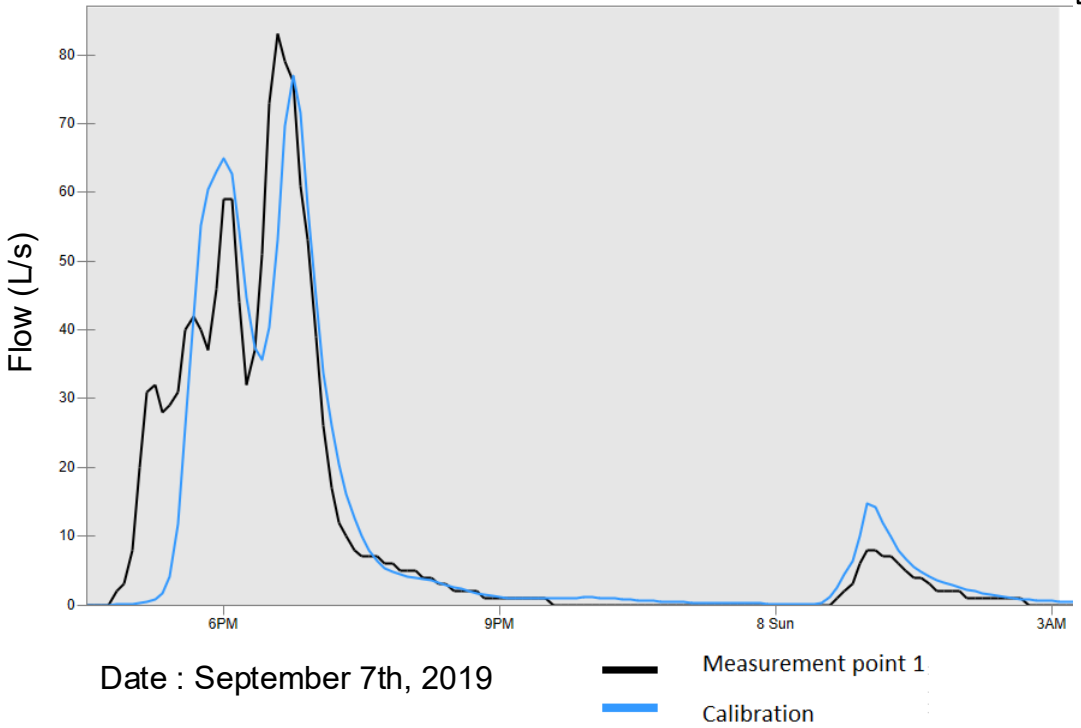
Step 1 → Calibration

City-provided inputs :

- 1D model
- Measuring campaign
  - Six measurement points
    August 2019 – October 2019
  - Data from two rain gauges
    August 2019 – October 2019

Total area	143 ha
Residential	50%
Public land (streets and parks)	24%
Commercial	17%
Institutional	9%

Exemple of calibration result



Date : September 7th, 2019

Measurement point → 1

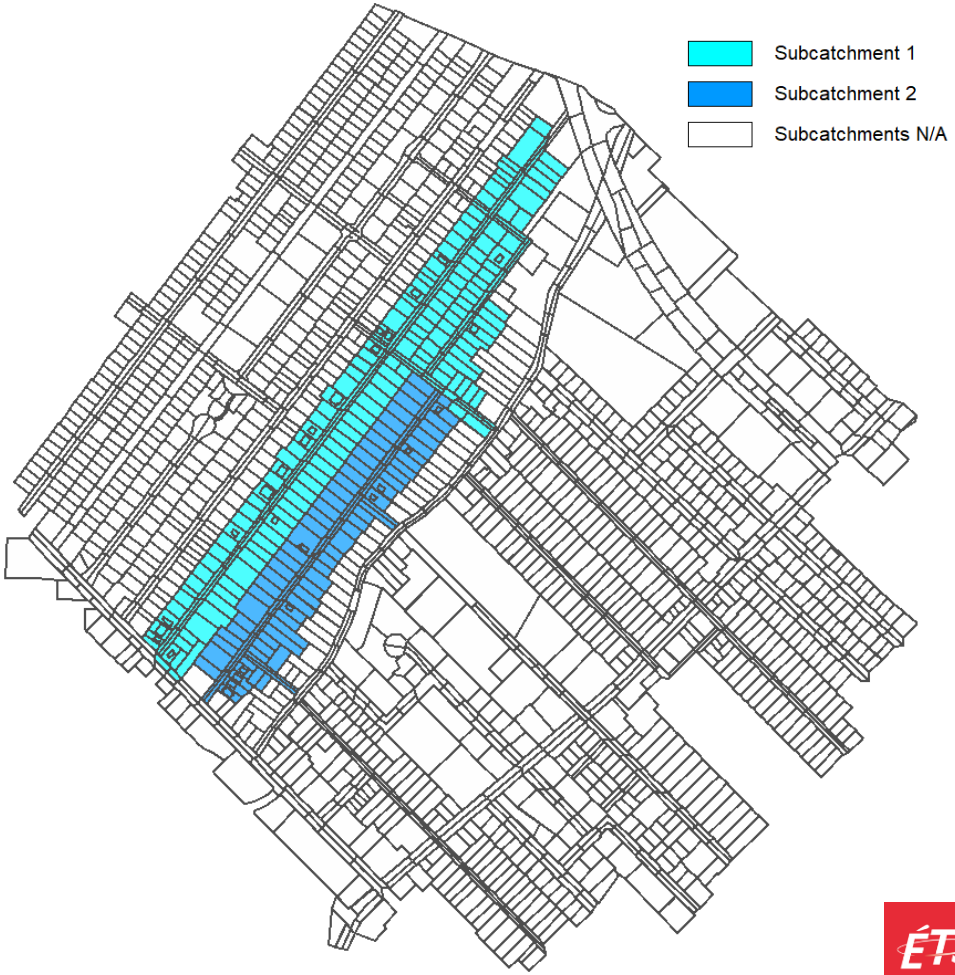
Event → September 7, 2019

NSE → 0.826

Subcatchments used for ICWMM 2026 presentation → 1 and 2

→ Areas most affected by surface flooding

Total area	18.5 ha
Residential	82.0%
Public land (streets and parks)	15.0%
Commercial	1.5%
Institutional	1.5%

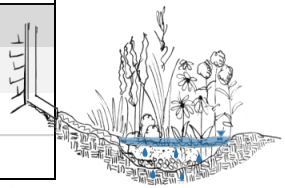


PCSWMM Parameters (1D/2D)

Sloped roof

Rain Barrel	
1x per sloped roof	
Dimensions	1 m X 0.2 m²
Capacity	0.2 m³

Rain Garden	
± 30 m² per sloped roof	
Berm height	300 mm
Thickness of soil	450 mm



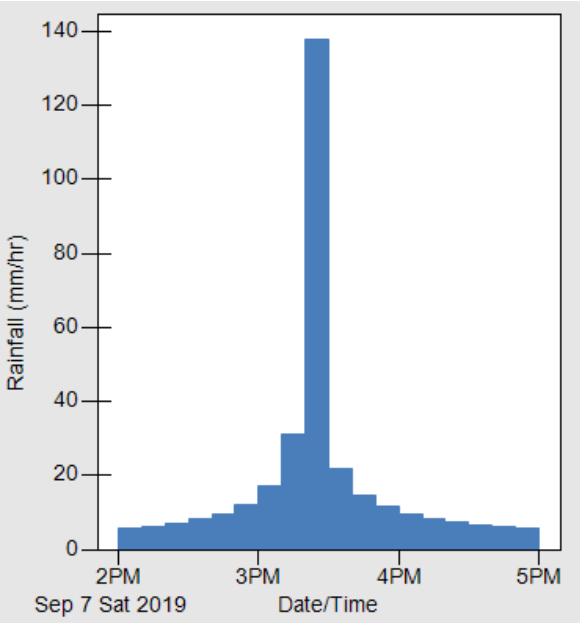
Flat roof

Blue roof	
1x per flat roof	
Capacity	150 mm accumulation

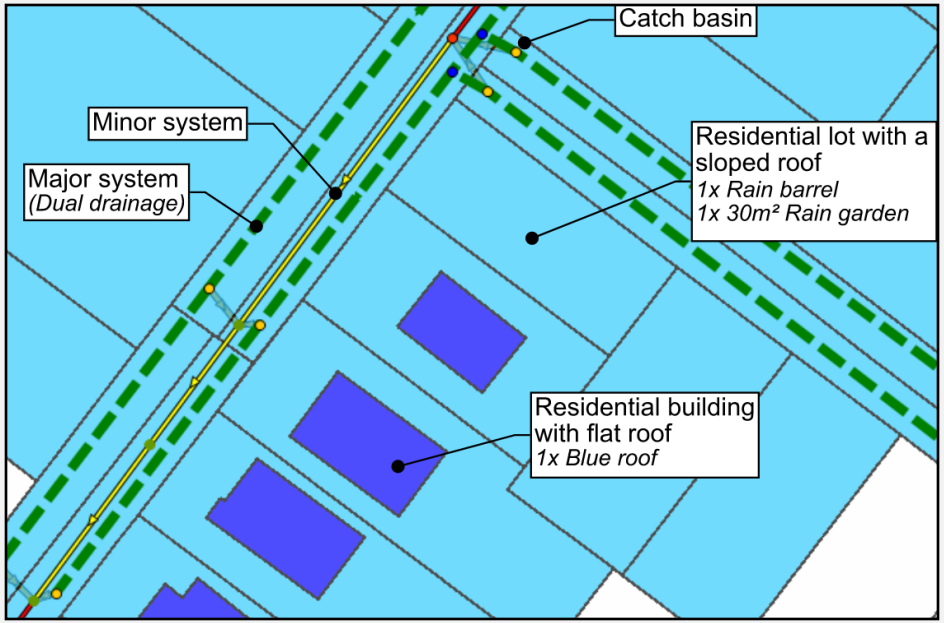
Design storm

10-year, 3-hour Chicago storm

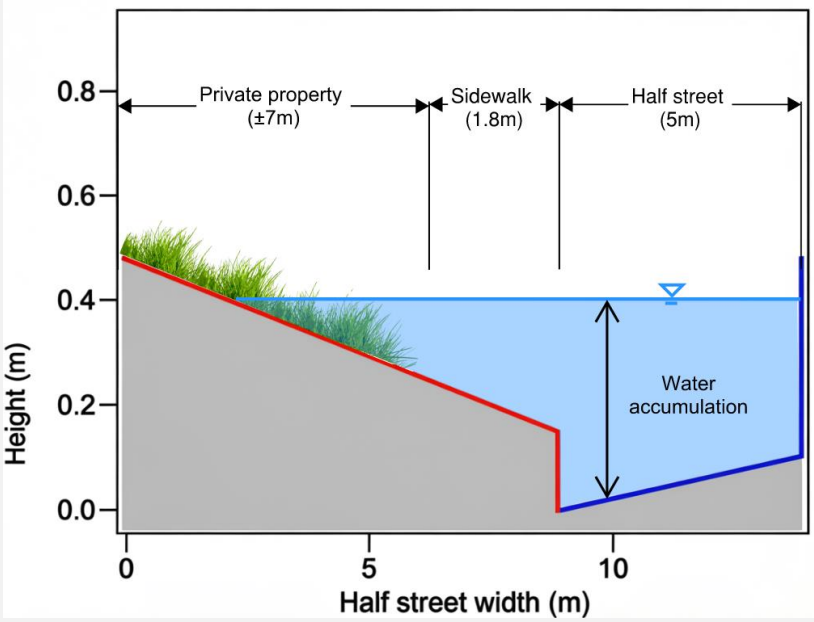
+30% CC (BNQ 3660-004)



PCSWMM Parameters : 1D model



Street cross section



PCSWMM Parameters : 2D model

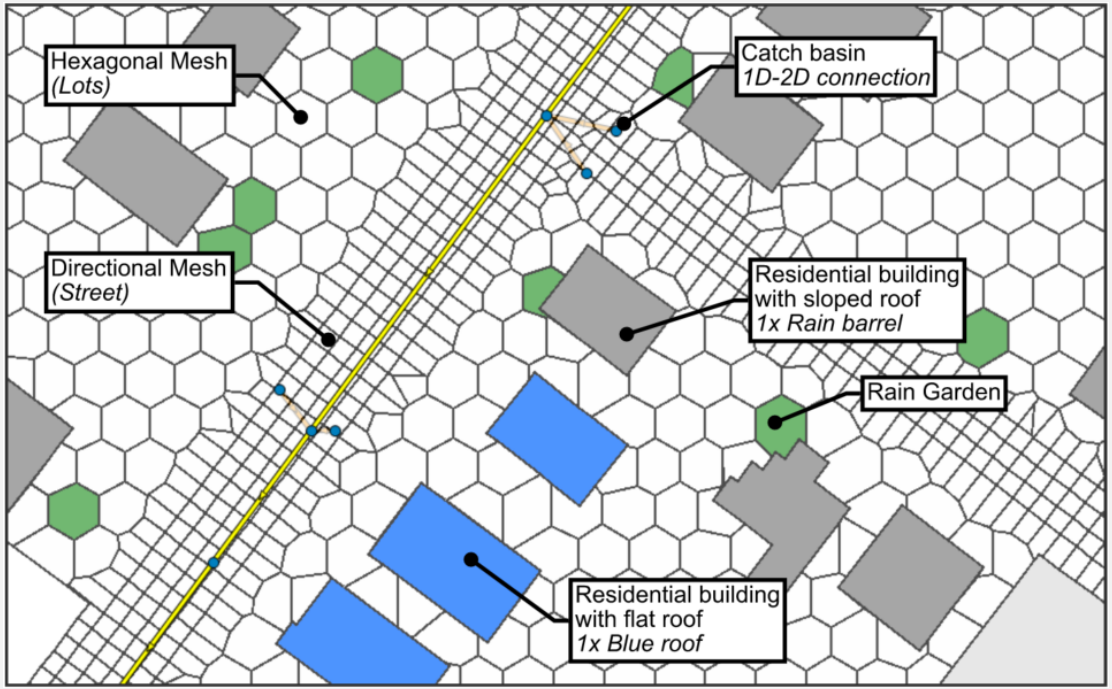
Hexagonal Mesh
- Resolution : 5m
- Lots

Directional Mesh
- Resolution : 2m
- Street

Obstruction
- Building

Connection 1D-2D
- Direct to nodes

Boundary Outfalls → None



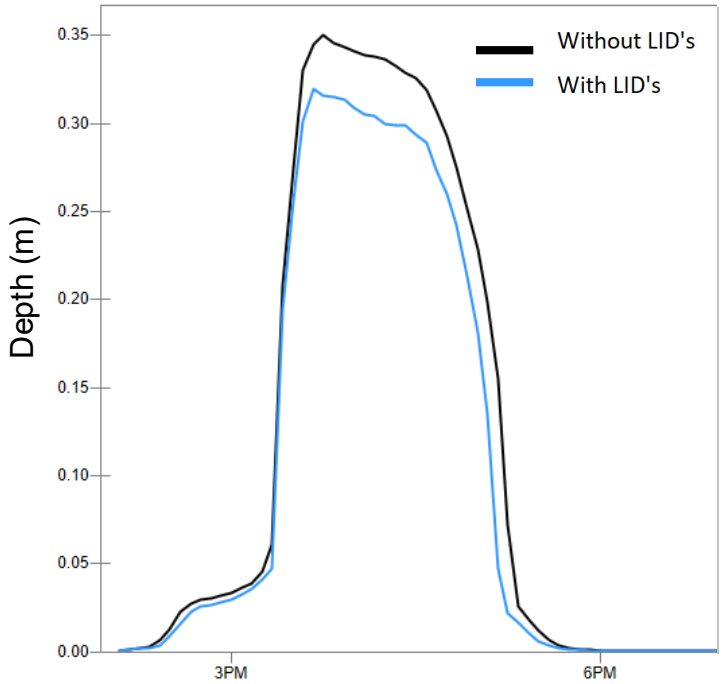
Zoom-in

1D / 2D Results

- Without LID’s
- With LID’s
  - Sloped roof
    - 1x Rain Barrel
    - 1x 30m² Rain Garden
  - Flat roof
    - 1x Blue roof

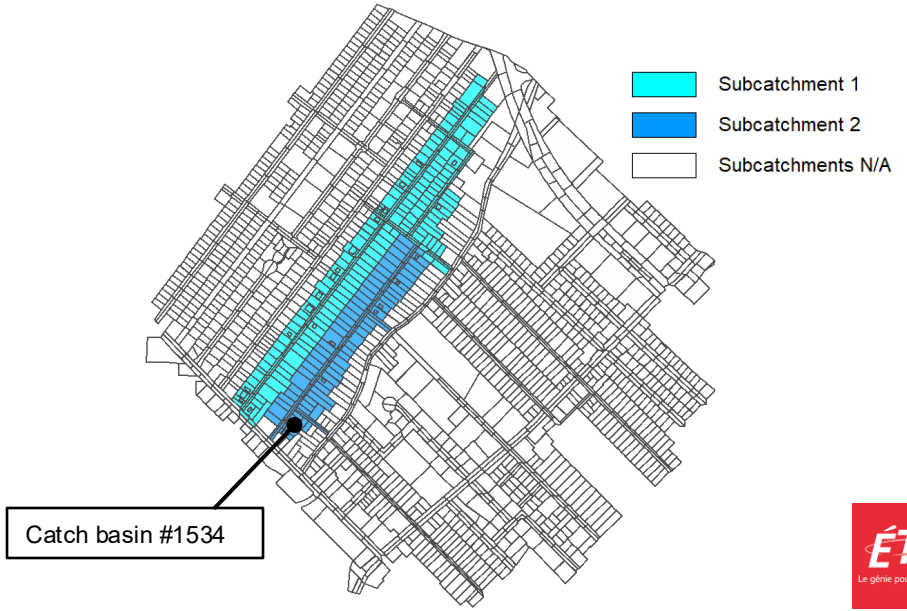
Results → Water accumulation

Depth (m) for catch basin #1534

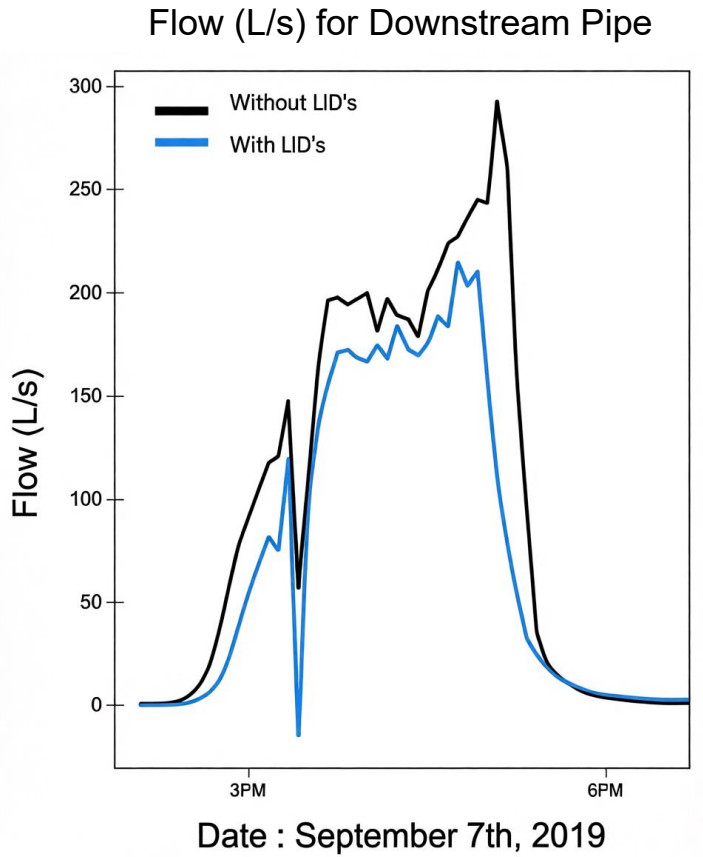


Date : September 7th, 2019

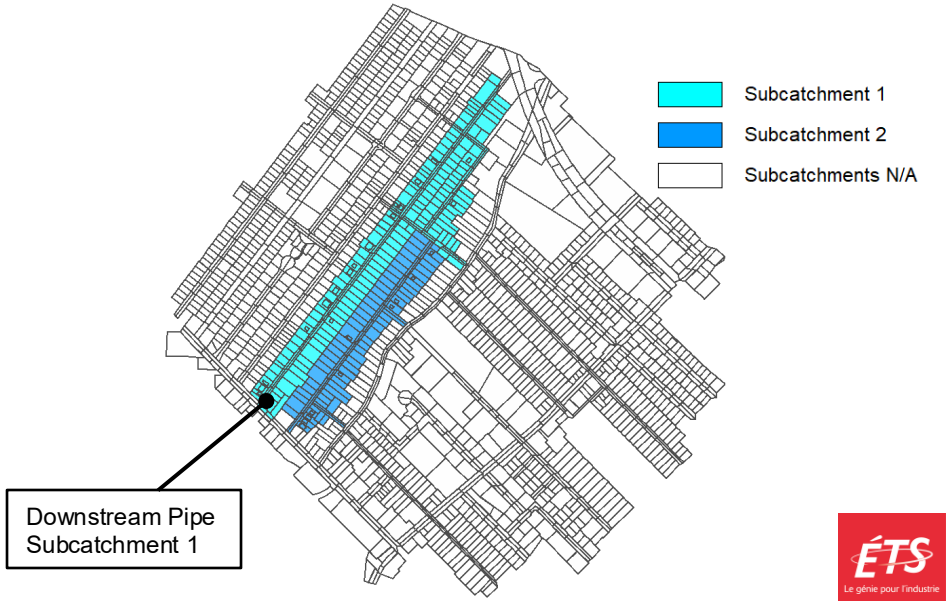
	Catch basin #1534	
	Maximum accumulation (mm)	Relative difference (%)
Without LID's	350	-8.9% → - 31 mm
With LID's	319	



Results → Flow in the Downstream Pipe

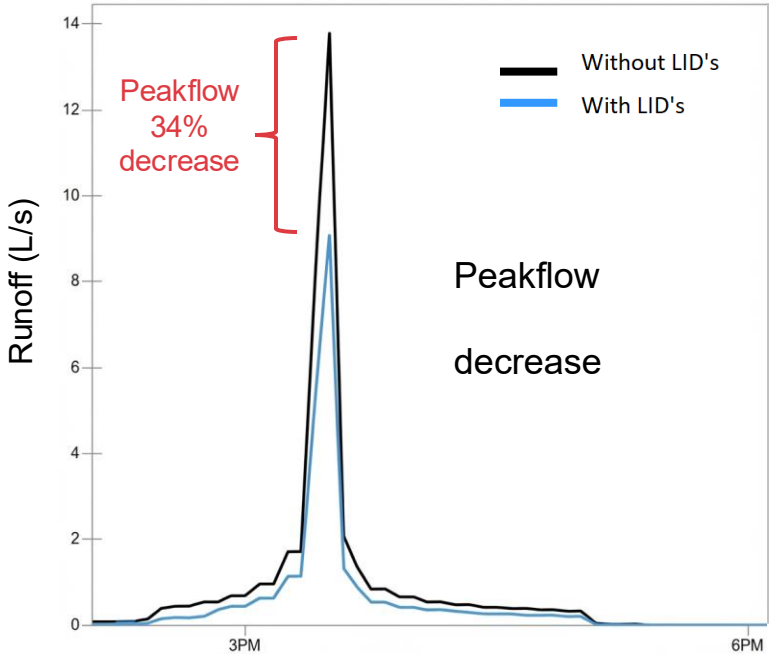


	Total Flow Downstream pipe (m^3)	Relative difference (%)
Without LID's	1665	-21.6% → -360 m^3
With LID's	1305	



Results → Runoff on average subcatchment (±700 m²)

Runoff (L/s) for average residential subcatchment



Date : September 7th, 2019

	Runoff for average residential subcatchment (m³)	Relative difference (%)
Without LID's	12.8	-35.9% → - 4.6 m³
With LID's	8.2	

Total Runoff

	Total Runoff Subcatchments 1-2 (m³)	Relative difference (%)
Without LID's	5965	-26.4% → -1573 m³
With LID's	4392	

2D Visual Results

Without LID's

With LID's

2D cells - Max. Depth (m)

0 0.57

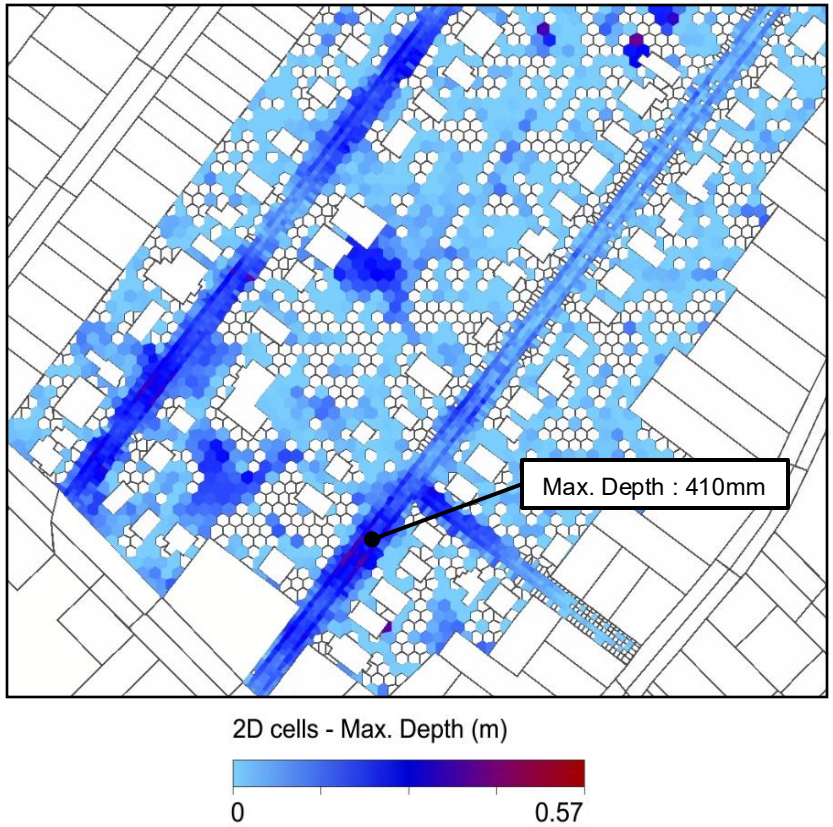
Color scale

2D cells - Max. Depth (m)

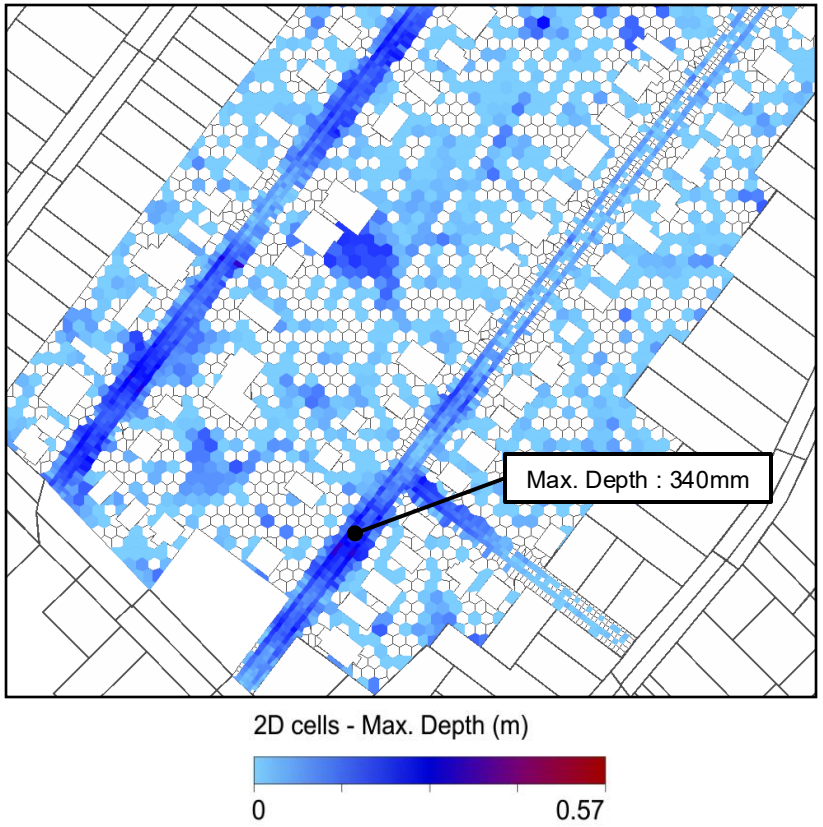
0 0.34

2D Visual Results

Without LID's

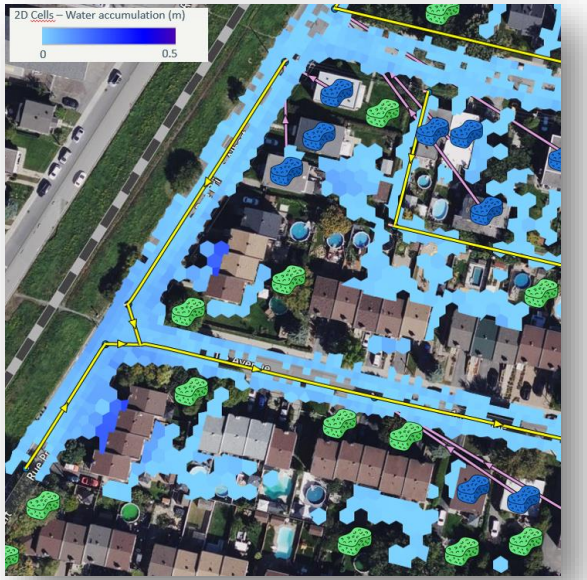


With LID's



Conclusion…

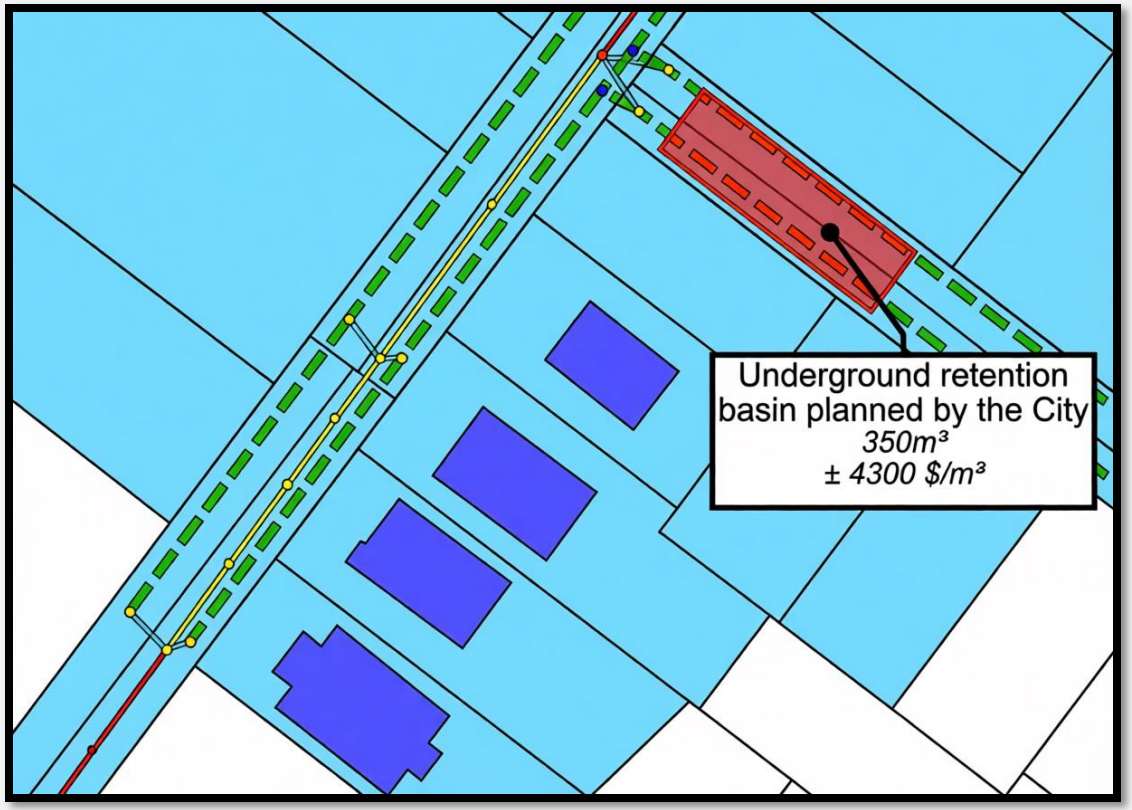
- The results indicate a reduction in water accumulation in topographic depressions.
- Blue-green infrastructure on private lots should be incorporated into solutions for flooding in topographic depressions.



… and next steps

- Integrate LID's into the four additional subcatchments (in red).
- Compare the complexity of executing the work on private versus public property.

Next step → Cost comparison




My request…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