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# An Alternate Public-Private Approach to Stormwater Management

*Presented by: Credit Valley Conservation and Scheckenberger & Associates Ltd.*

*Date: March 22, 2023*

*The water component of STEP is a collaborative of:*



# Presentation Overview

1. Synopsis
2. SWM Current vs. Future
3. Background to Aggregation
4. Overview of Aggregation Methodology
5. Feasibility Study

# 1. Synopsis

# 1. Synopsis

- Traditional stormwater management is typically implemented on public lands by public authorities (SWMF)
- With the advent of Low Impact Development (LID) measures more focus is on the private side of implementation
- Uptake, particularly in redeveloping or existing areas has been limited due to a variety of barriers
- CVC/WSP/SAL have advanced an alternate approach termed “Aggregation” which attempts to address some of these barriers

# 1. Synopsis

From MECP Municipal Wastewater and Stormwater Discussion Paper (January 2022):

## 3. Changing the Way Stormwater is Managed in Urban Areas

*“How can greater municipal adoption of green stormwater infrastructure/low impact development practices on public, private and commercial/industrial property be encouraged?”*

# 1. Synopsis

## CLI ECA – Privately Owned Stormwater Works

5.2 Any alteration of the stormwater management facilities made under condition 5.1 is subject to the following conditions:

- 5.2.6 **When it is necessary to use privately owned stormwater works in the stormwater treatment train to achieve Appendix A criteria** as per condition 5.2.1.d, the following conditions apply:
  - a) The owner, through **legal instruments or binding agreements**, has the right to access, operate and maintain the privately owned stormwater works;
  - b) The owner ensures on-going operation and maintenance of the privately owned stormwater works; and
  - c) The privately owned stormwater works have obtained separate approval under the OWRA, as required.



## 2. Stormwater Mgt – Current vs. Future

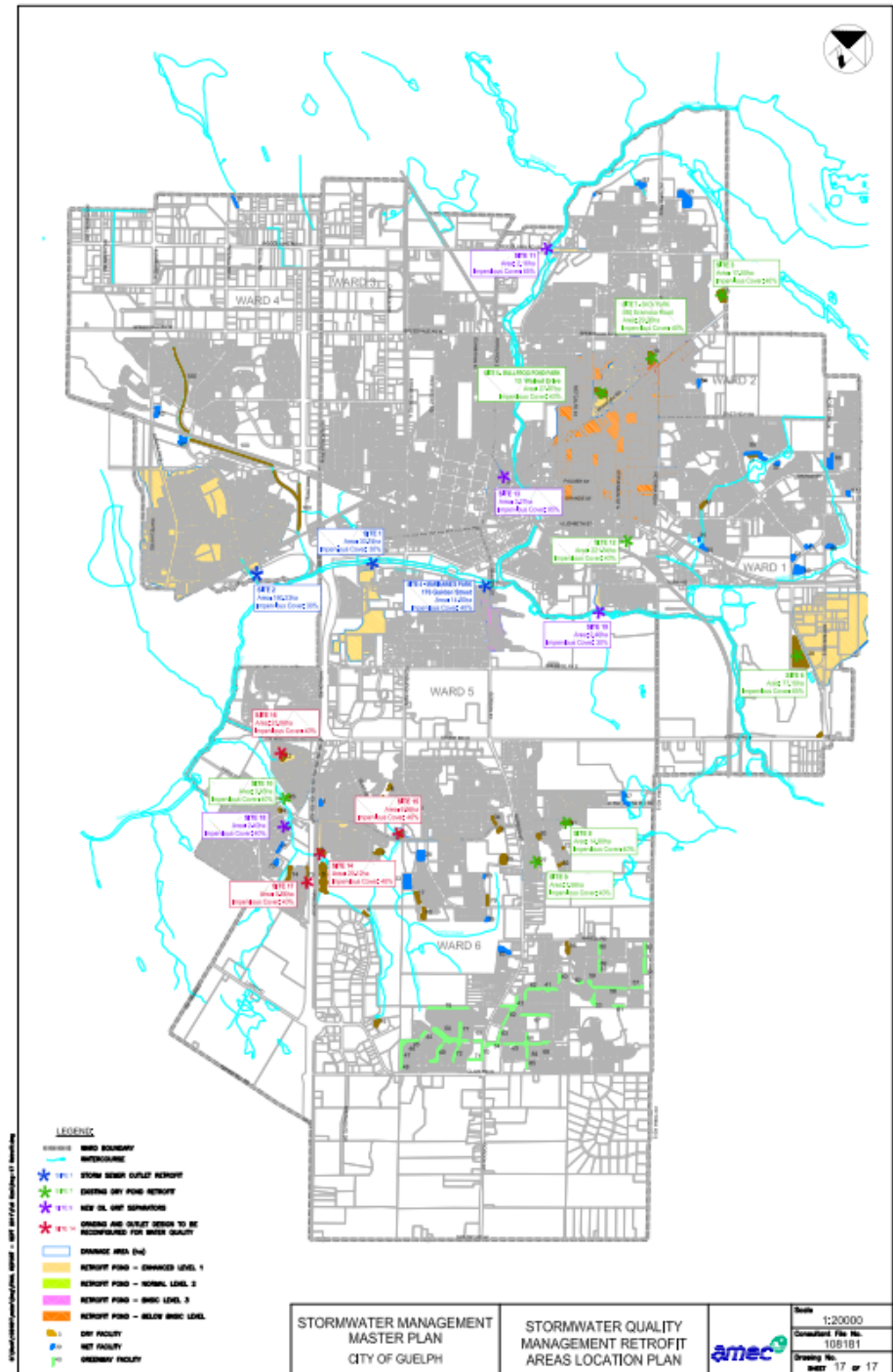


## 2. Stormwater Management Current vs. Future

Majority of developed areas in municipalities have no (or limited) SWM.

SWM Retrofit plans (Master Plans) are good but limited by public land availability and ability to effectively retrofit existing infrastructure (\$\$\$).

SWM on private lands through public-private partnerships represents an untapped resource and opportunity.



# 3. Background to Aggregation

# Barriers - Stormwater Management on Private Property

## Private Property Owner Barriers

- **Cost**
- Extended Pay back period for SWM retrofits
- Lack of effective mechanism for aggregation with neighbouring properties

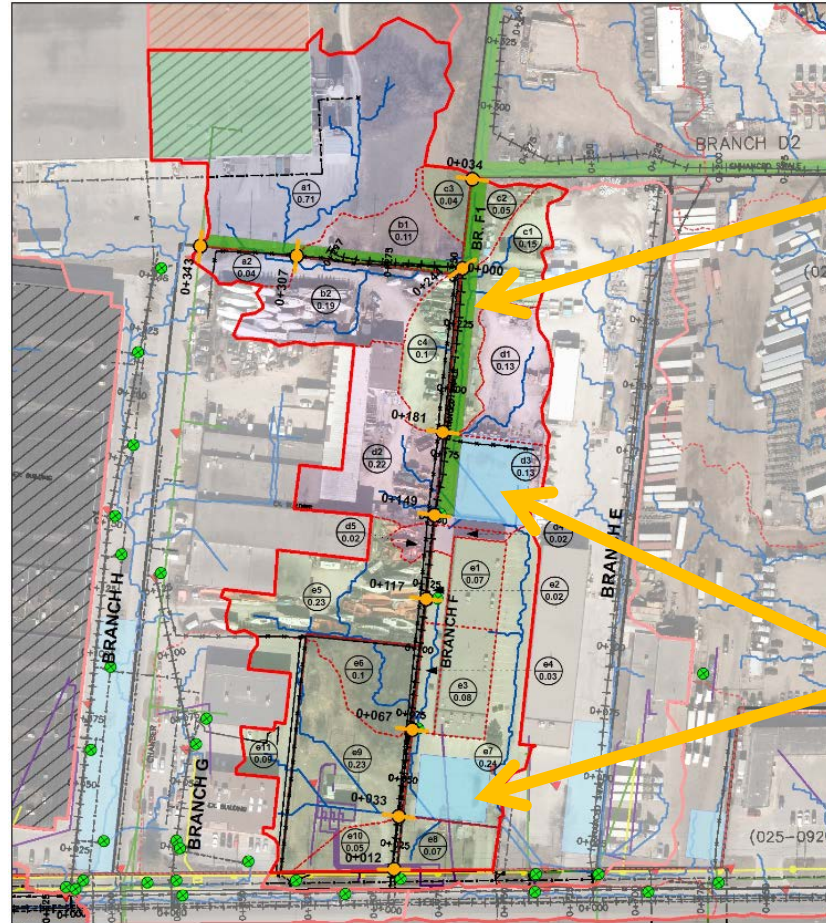
## Municipal Barriers

- Complexity of involving private landowners in municipal SWM solutions
- Reliance on private O&M
- Legal risks
- Lack of effective mechanism for aggregation in the master planning process



# What is Aggregation?

Aggregation is the process by which multiple private properties are combined (or aggregated) to provide fiscal and functional benefits for the application of low impact development



Enhanced Grass Swale



Underground Storage

# Benefits of Aggregation



- Economies of scale
  - One designer
  - One contractor
  - One maintenance provider
- Maximize performance
- Maximize savings (stormwater, water, wastewater, energy)

# Aggregation Considerations

- Who finances/collects funding?
- Who is responsible to inspect/maintain stormwater infrastructure?
- What happens when properties change hands?
- Is there a process for implementation?

# Implementation Mechanisms

- There are various approaches for aggregating to implement stormwater features. The available methods include:
  - Easements
  - Mutual Agreement Drains
  - Condominium Act
  - **Drainage Act – holds the most promise** (see links to more information at end of presentation)

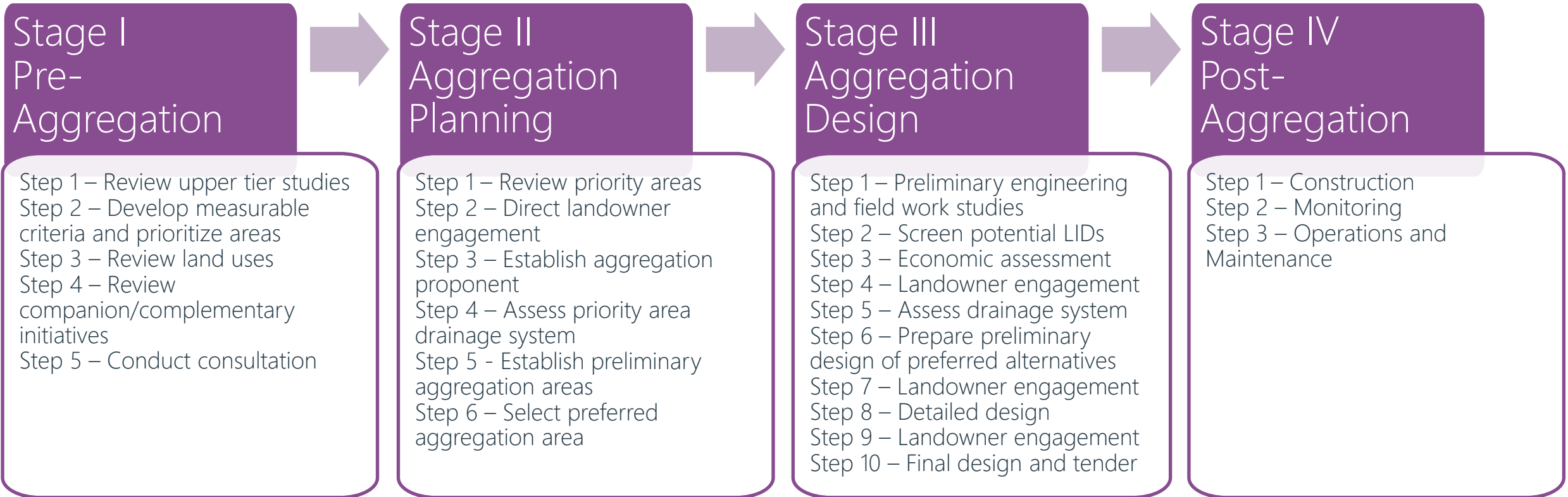
# 4. Overview of Aggregation

## Methodology:

### Guidance Document for Communal LID Retrofits on Private Property



# Four Stages of Methodology



## Stage I – Pre-aggregation – *Priority Setting*

- Municipalities need to have a basis for their decision making – for instance *“why has it selected this area over others?”* and *“why/how has it determined that Aggregation is the preferred solution?”*
- The Class EA process addresses the need for clear and traceable decision making and inherently allows municipalities to confidently plan their infrastructure
- Stage I sets the framework for municipalities' future action related to those existing parts of the community most in need of stormwater improvements

**Stage I**  
**Pre-Aggregation (Macro)**  
**Establishment of Priority Areas**  
Proponent: Municipality / Community  
and / or Conservation Authority

**Step 1: Review Upper Tier Studies**

- Watershed / Subwatershed Plans
- Master Plans, Master Environmental Servicing Plans (MESPs), Class Environmental Assessments (Class EAs)
- Document at Municipality / Community and / or Conservation Authority (CA) Scale

**Broad-scale Characterization**

- Topography
- Land use (general)
- Groundwater
- Soils

**Identify Issues (High-level)**

- Flooding (pluvial / fluvial)
- Erosion (major / minor)
- Water quality impairment
- Base flows





# Attributes and Benefits of Stage I – Pre-Aggregation:

- Existing developed land base in community is assessed for drainage and environmental issues
- Public feedback/engagement assists municipalities in establishing priorities
- Sets the stage for future detailed assessments
  - locally based EA's can consider Aggregation as one of several opportunities to assess system deficiencies (Note: Stage I does not imply nor infer application of Aggregation Methodology)
- “No regrets” undertaking – leads to:
  - Priority Areas
  - Ranked based on systematic community-wide approach
  - Consideration of stakeholder input
  - Support and alignment with new Provincial CLI ECA

## Stage II – “Aggregation Planning” - *Class EA*

- Imperative to have a systematic and transparent process which establishes priorities based on a robust framework
- The application of LID Aggregation solutions to problems is no different than any other municipally, taxpayer supported work
- Class EA fully evaluates the problem(s) and associated remediation alternatives, and systematically selects the preferred solution(s) which may or may not include Aggregation

**Stage II**  
**Aggregation - Planning (Meso)**  
Proponent: Municipality

From Stage I



**Step 1: Review Priority Areas (PA)**

- Select highest PA
- Document rationale for selection
- First-order Economics for selected PA



**Step 2: Direct Landowners Engagement**

- Discuss project opportunities
- Present preliminary economics
- Feedback on proponency
- Review potential synergies / constraints



**Step 3: Establish Aggregation Proponent**

- Landowner Group
- Municipality / Stormwater Utility
- Conservation Authority
- Other



**Step 4: Assess PA Drainage System**

**EA Begins Here**

**Economics**

- Stormwater Rate Credit Potential
- Landowner Contributions (\$ / in kind)
- Other Funding Sources/Opportunities
- Monetize Other Benefits

**Social**

- Ownership / parcels
- Physical / spatial constraints
  - Buildings, equipment, parking
- Site uses / accessibility
- Long-term plans

**Environmental**

- Site specific issues
- System constraints

**Evaluate Alternatives  
Is Aggregation a  
Preferable Solution?**

No

End

Yes

To Step 5



**Step 5: Establish Preliminary LID BMP Aggregation Areas (AA)**

- Subdivide PA into smaller manageable units with suitable characteristics to facilitate LID BMP Aggregation (i.e. AA)
- Rank based on suite of local scale criteria *[Note: Scale of Application will vary and will need to be flexible but will usually consider a contiguous drainage network to a common outfall]*

**Step 6: Select Preferred AA / Landowner Engagement**

- Based on ranking above select preferred AA; document rationale for selection
- Second Order Economics for Preferred AA
- Define directly affected Landownership base (private or public), and engage in a review of the AA and associated economics (Project Scoping Management / On-site Meeting)
- Present long-list of Potential LID BMPs
- Receive feedback from Landowners and Public entities

**Review Support for Aggregation Area**

No

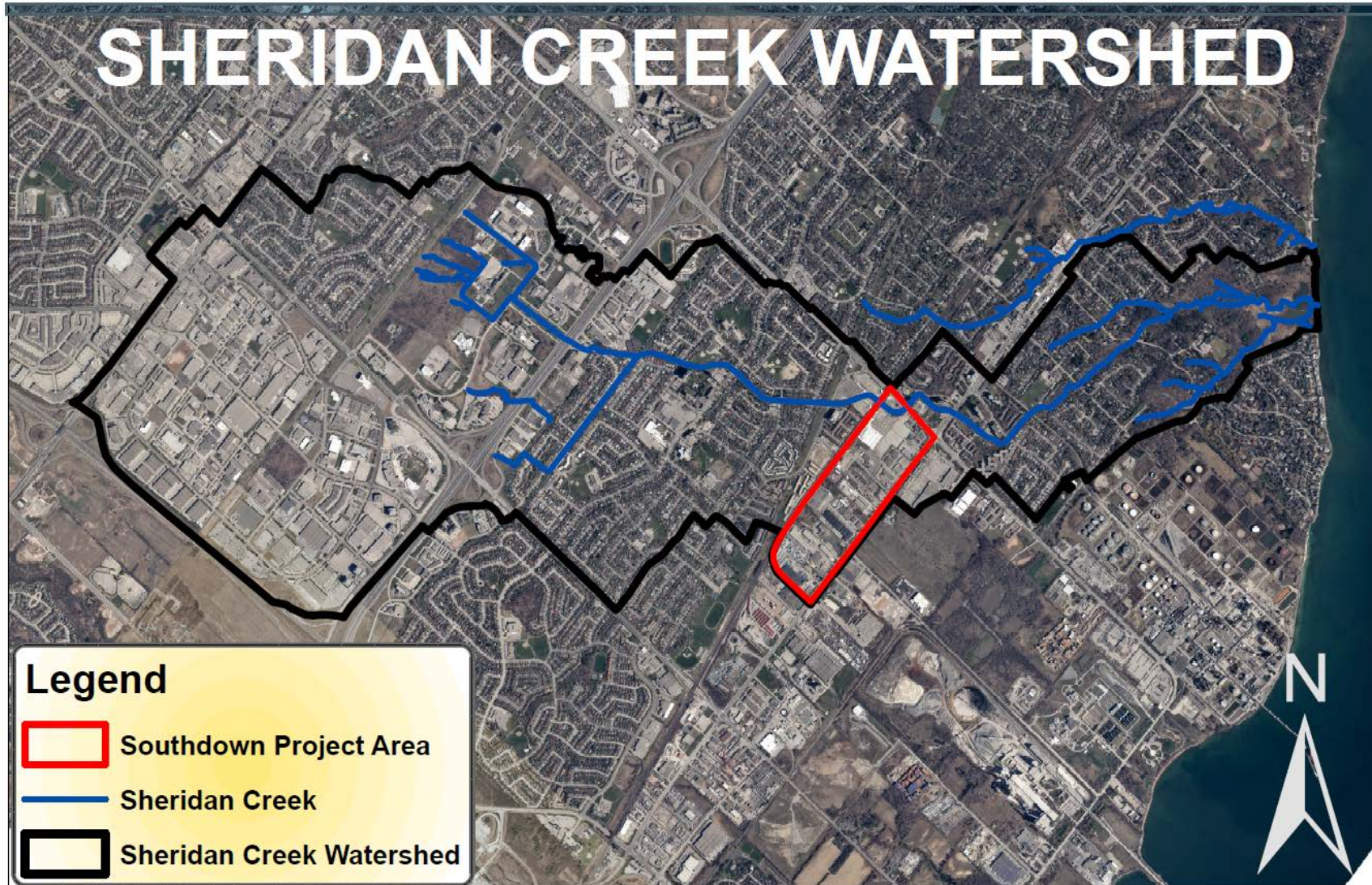
Yes

To Stage III

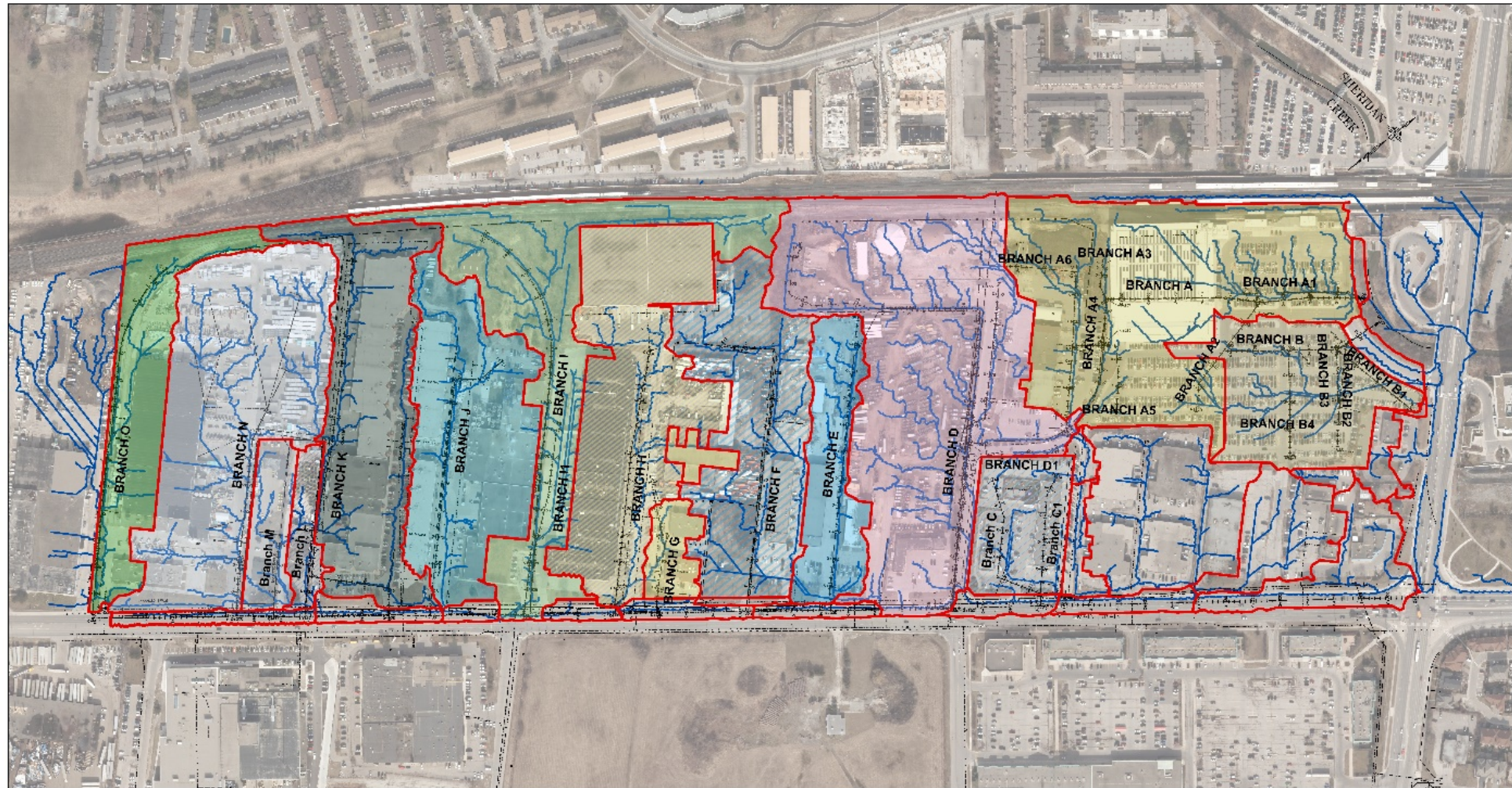
# Outcomes of Stage II - Planning

- Highest Priority Areas (PA) assessed using Class EA principles to determine preferred solutions for addressing problems unique to each PA
- Aggregation is assessed along side other opportunities/solutions and evaluated in a consistent and systematic manner
- Local Stakeholder/Landowner feedback offers a level of interest and potential for success in applying the Aggregation approach as part of future remediation of PA problems in sub-units referred to as Aggregation Areas (AA)




# Example - Map of full watershed – Priority Area (PA)

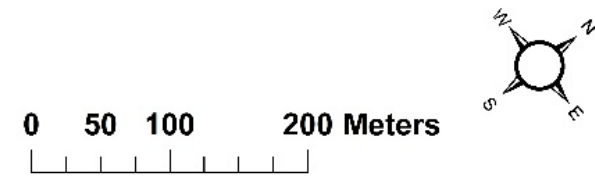


# Example - CVC Study Area – Aggregation Area (AA)



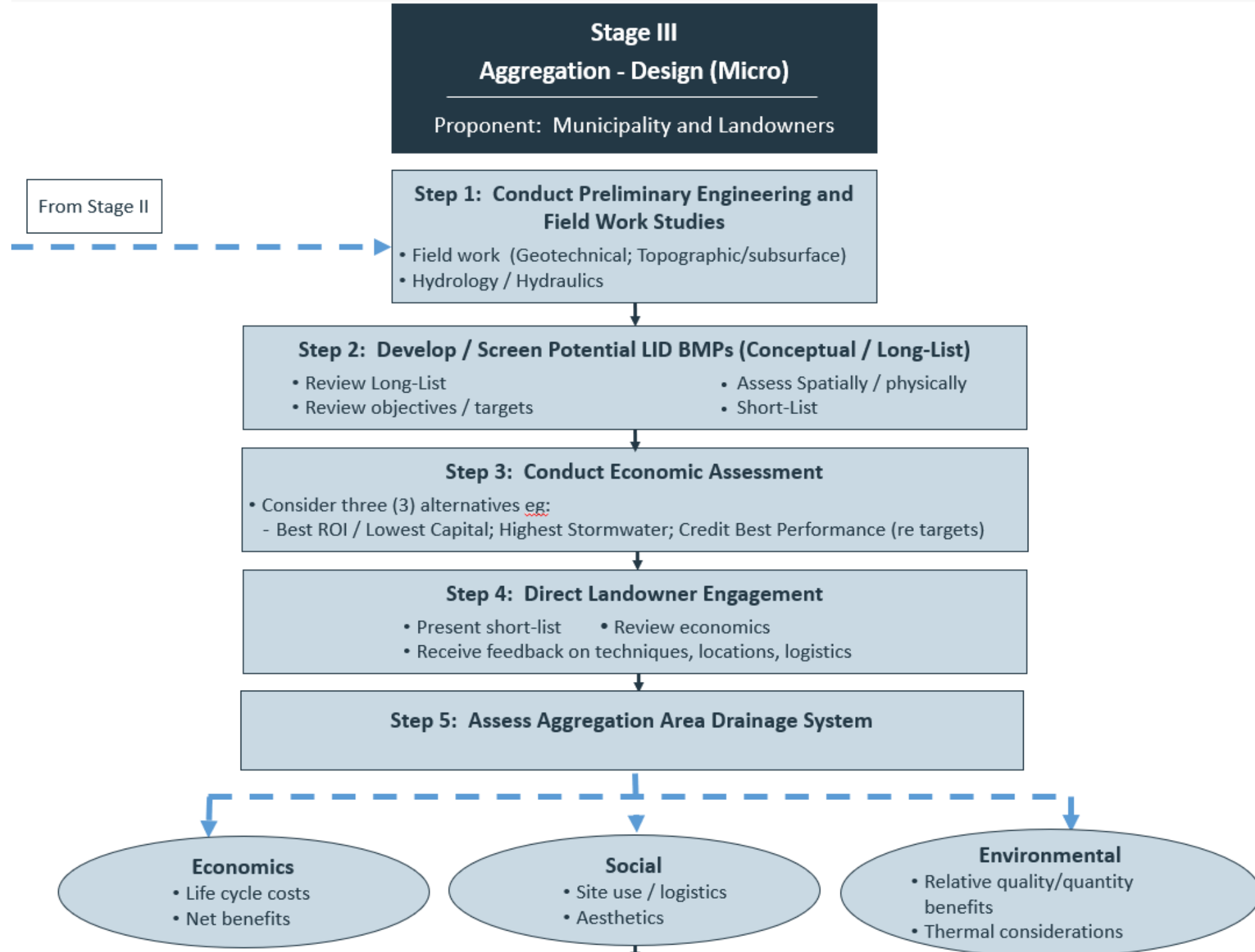
## Legend

-  Minor System Boundaries
-  Overland flow routes
-  Chainage



## Stage III – Design

- Conditional on Stage II (Class EA) leading to Aggregation as part of the preferred solution for a PA (AA), the Municipality would move to the next stage of implementation focused on “Design” of the specific LID measures for the AA
- Requires local studies and direct “one-on-one” landowner engagement





# Stage IV – Post Aggregation – Implementation, Monitoring and O&M

- Support Construction
- Monitor effectiveness
- Establish O&M – private vs. public



**Stage IV**  
**Post-Aggregation Implementation,  
Monitoring and  
Operations and Maintenance**

From Stage III



**Step 1: Construction**

- Determine need / potential for staging
- Other?



**Step 2: Monitoring**

- As condition of Permitting
- Voluntary for Municipality and Watershed Manager
- Assess against objectives / targets



**Step 3: Operations and Maintenance**

- Define Public versus Private requirements
- Review Economics and effectiveness

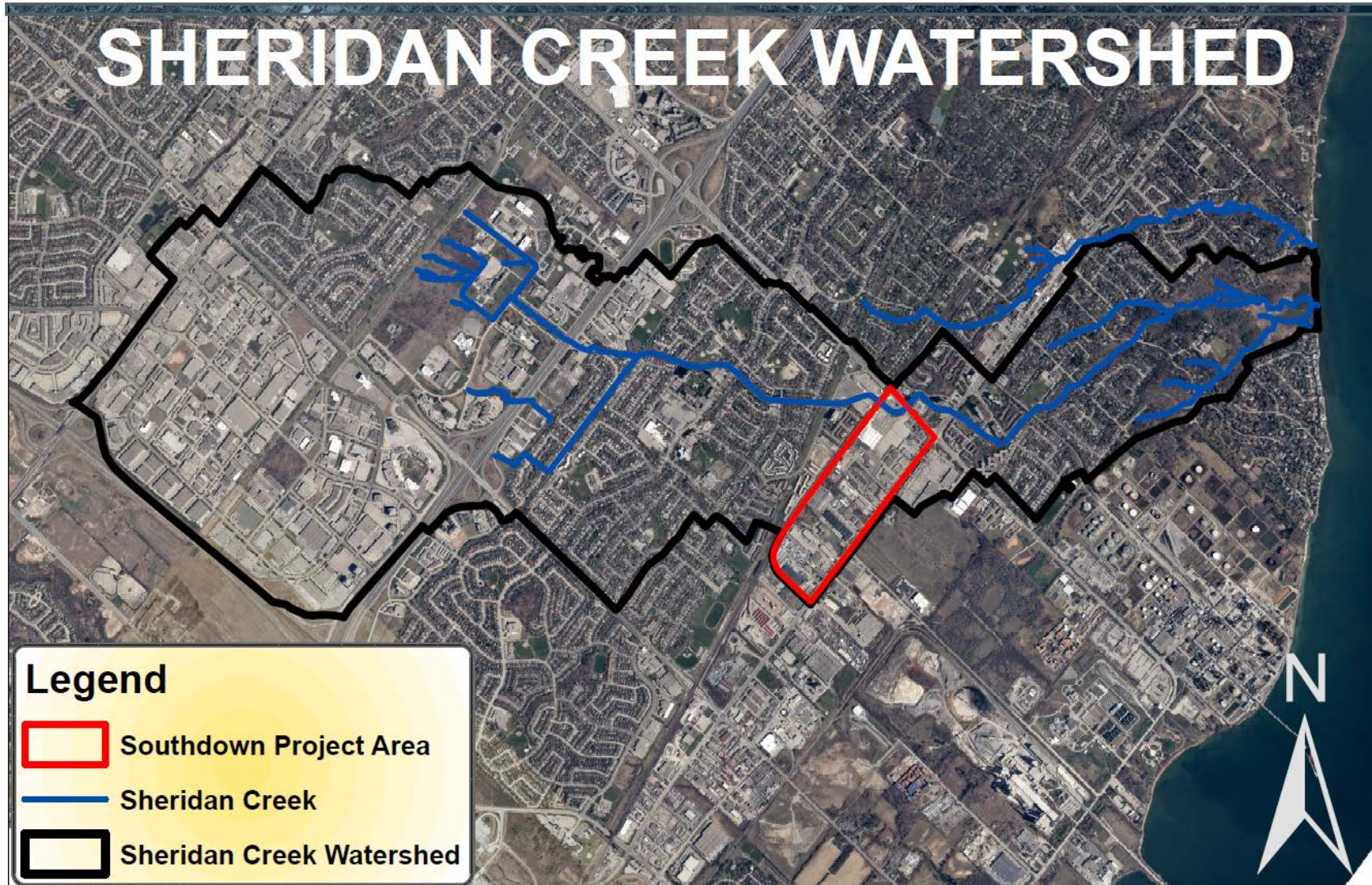
# Summary of Benefits/Outcomes

- Systematic Methodology moving from High-Level to Locally specific action – supported by Class EA principles – transparent and traceable
- Direct and Indirect Benefits include:
  - Alignment with local landowner needs
  - Reduced land needs, infrastructure costs and major maintenance
  - Co-benefits (environmental and social)
  - Distributed solutions at source promote functional benefits (e.g. water balance, thermal etc.)
  - Reduction in Stormwater Rate payments

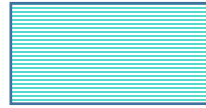
# 5. Feasibility Study

Southdown District – City of Mississauga

# Study Area – Sheridan Creek Watershed, Mississauga



# Study Area - Municipal Class EA



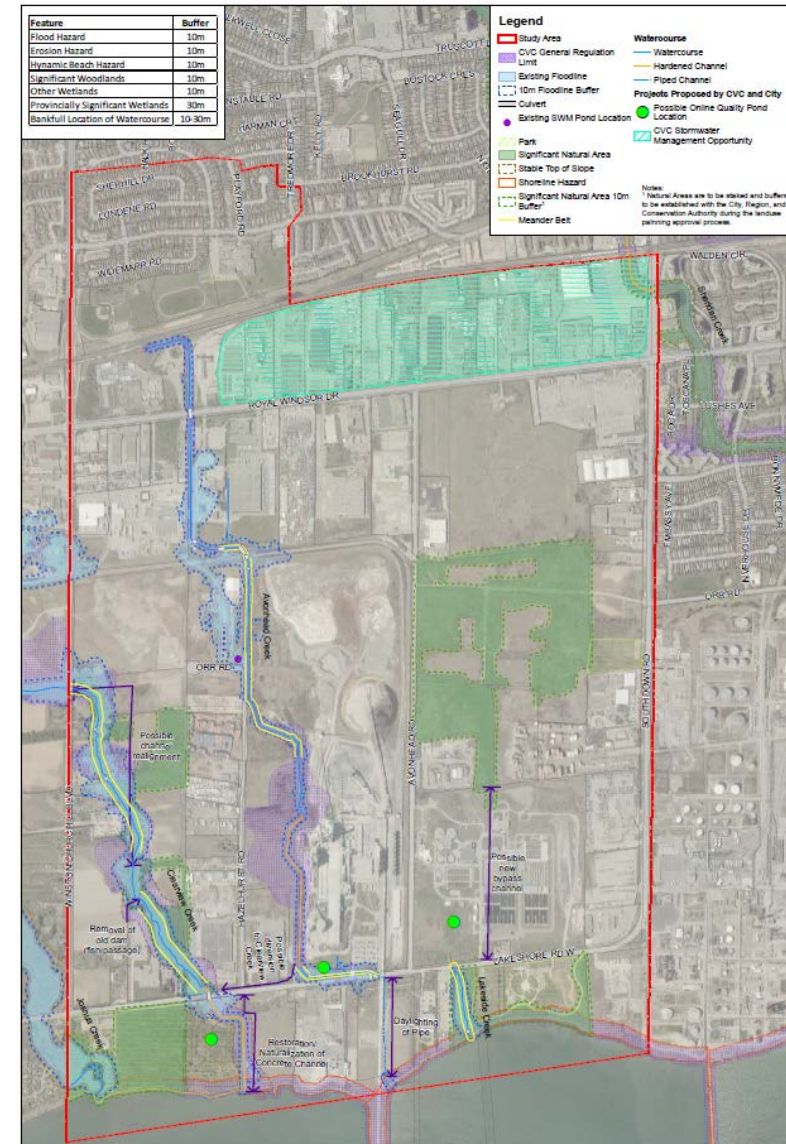
CVC Study Area

City of Mississauga initiated a study (2019) to address flooding, erosion, and water quality issues in support of future urban development and re-development within Southdown District

*The Southdown District Flood and Erosion Class EA is a good example of Stage II Establish Aggregation Areas*

## Problem Statement:

- Watercourses highly impacted by past urbanization (i.e., confined, realigned, or hardened by concrete channels)
- Opportunities to enhance the existing open watercourse systems through realignment and naturalization.
- Opportunity to reduce flooding and erosion while improving water quality and enhancing environmental systems.



# Stormwater Management Scenarios

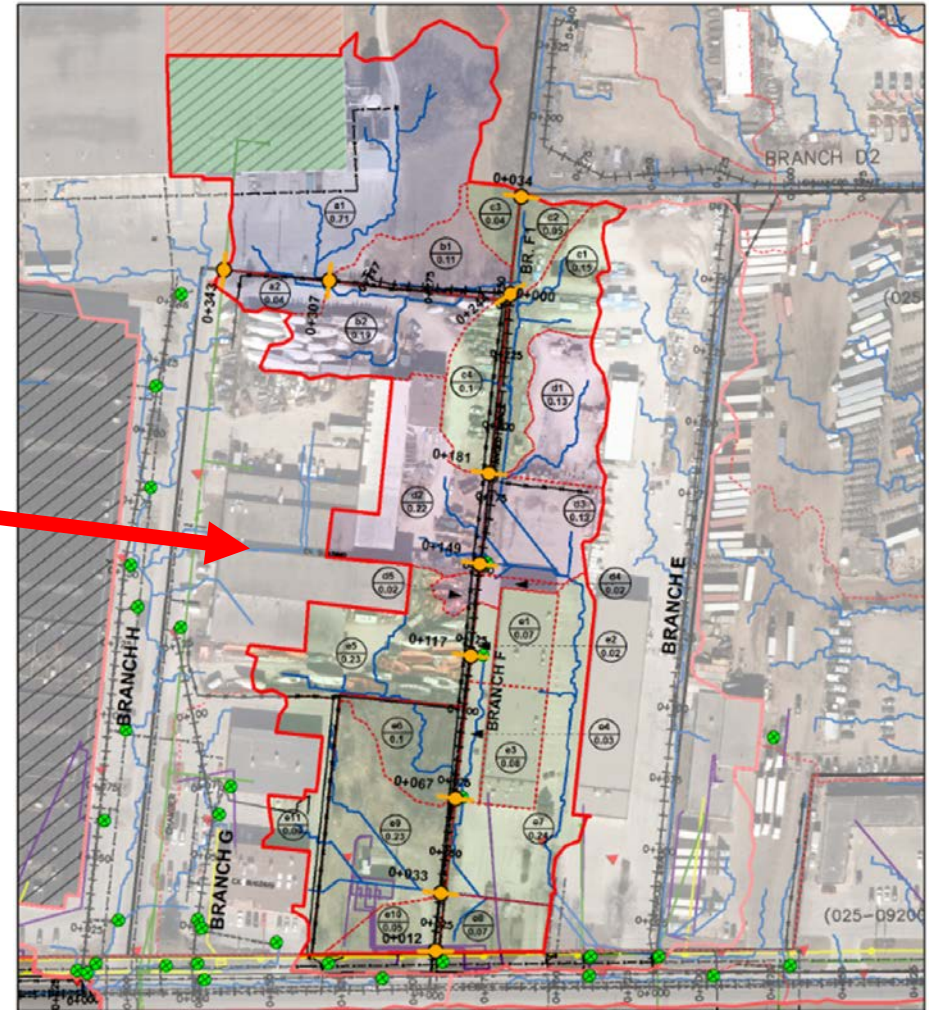
- Pre-development
- Existing conditions (2020 +/-)
- *Communal LID – Maximum Stormwater Credit*
- *Communal LID – One Water (co-benefits)*
- *End-of-pipe*

# Characterize Drainage System



Southdown Project Area

- Legend**
- Major Subcatchment
  - Minor Subcatchment
  - Overland flow routes
  - Property Line
  - Sanitary Pipes
  - Sanitary MH
  - Water Line
  - Chainage
  - Bell
  - Alectra
  - Rogers
  - Major system flow only
  - Minor flow to Br. N & Major flow to Br. M
  - Minor flow to Br. K & Major flow to Br. M
  - Minor flow to Br. L & Major flow to Br. M
  - Minor flow to Br. L & Major flow to Br. M
  - Minor flow to Br. H & Major flow to Br. F
  - Minor flow to Br. H & Major flow to Br. I1
  - Minor flow to Br. G & Major flow to Br. H
  - Minor flow to Br. J & Major flow to Br. I
  - Minor flow to Br. A2 & Major flow to Br. B
  - Minor flow to Br. D
  - Minor flow to Br. A
  - Minor flow to Br. D1
  - Minor flow to Br. B2
  - Minor flow to Br. C1
  - Minor flow to Br. C



Southdown Project Area: Branch F

# Communal LID Scenarios

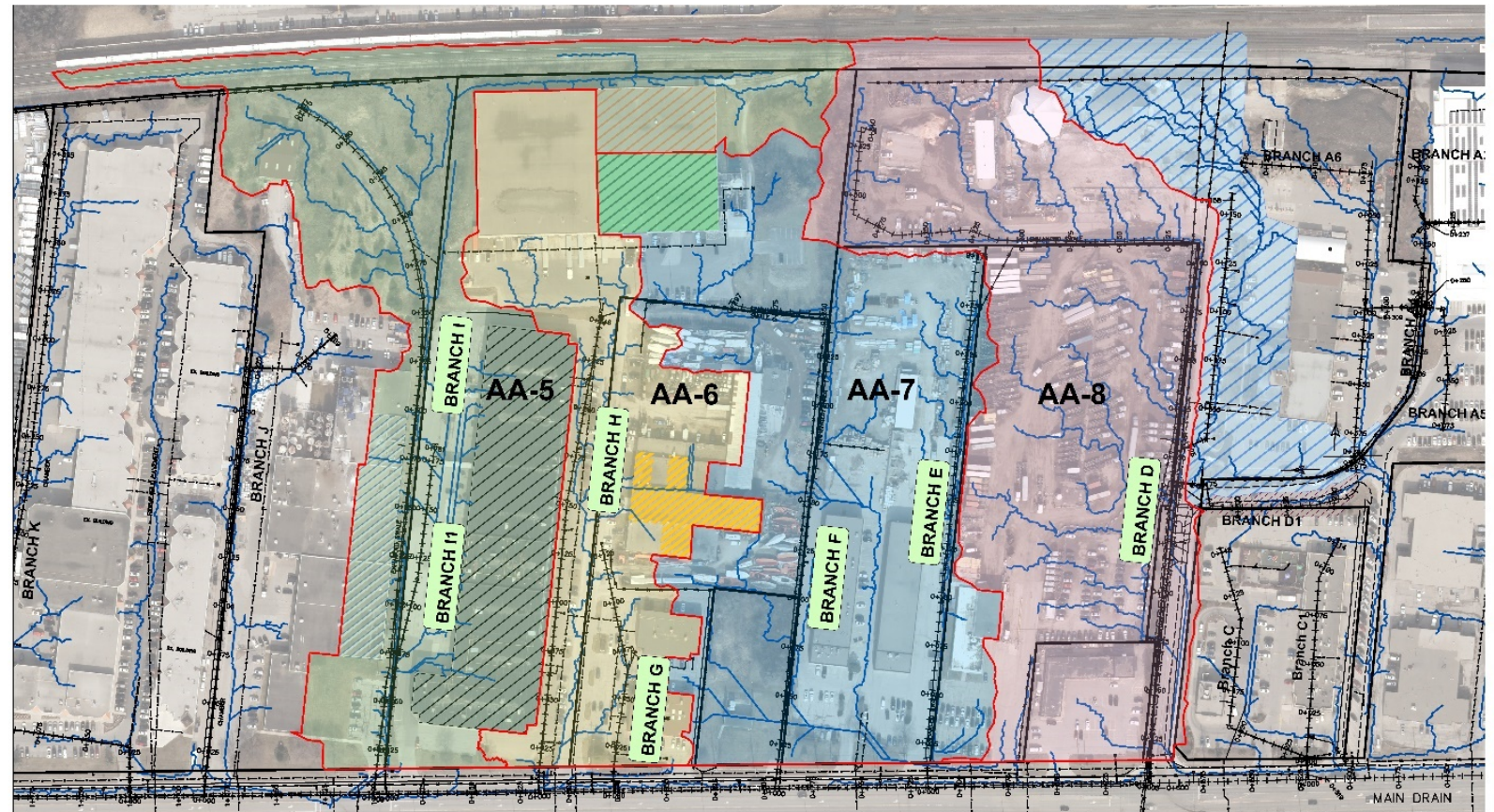
## Scenarios and Drivers:

### 1. Maximum Credit Scenario

- Municipal Stormwater Credit Program

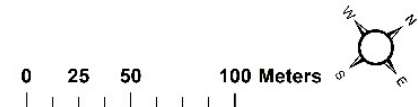
### 2. One Water Scenario

- Natural Infrastructure
- Water Conservation
- Inflow and Infiltration
- Urban heat island



#### Legend

Major Subcatchment	Minor flow to Br. H & Major flow to Br. I	Minor flow to Br. J & Major flow to Br. I
Overland flow routes	Minor flow to Br. H & Major flow to Br. F	Minor flow to Br. D
Property Line	Minor flow to Br. H & Major flow to Br. I1	Minor flow to D1
Chainage	Minor flow to Br. G & Major flow to Br. H	

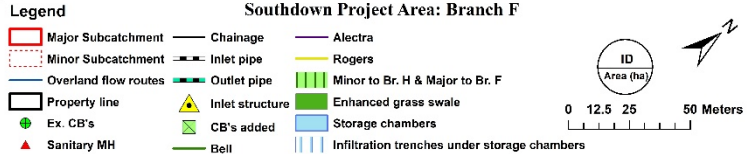
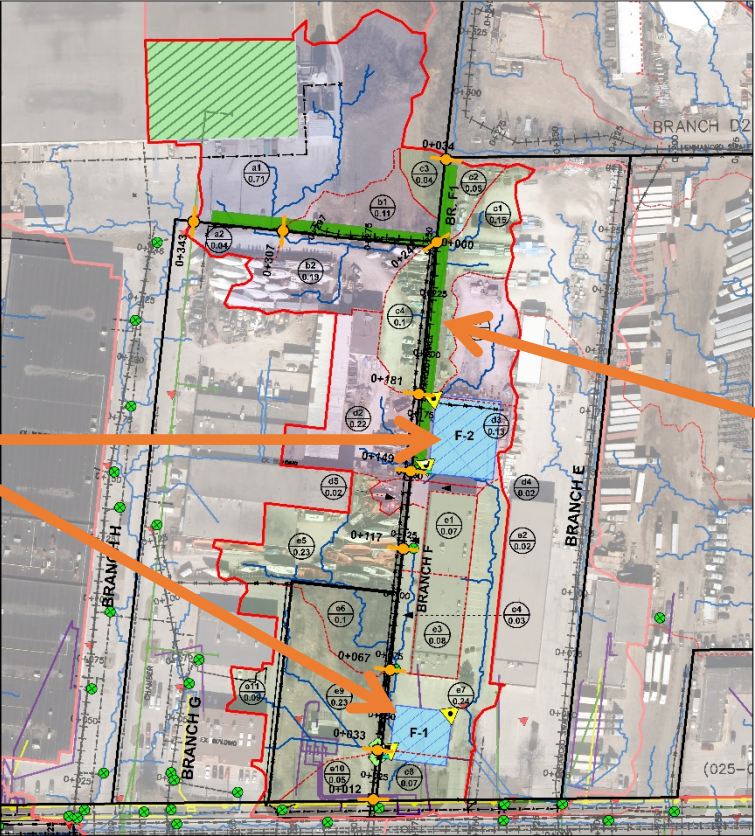




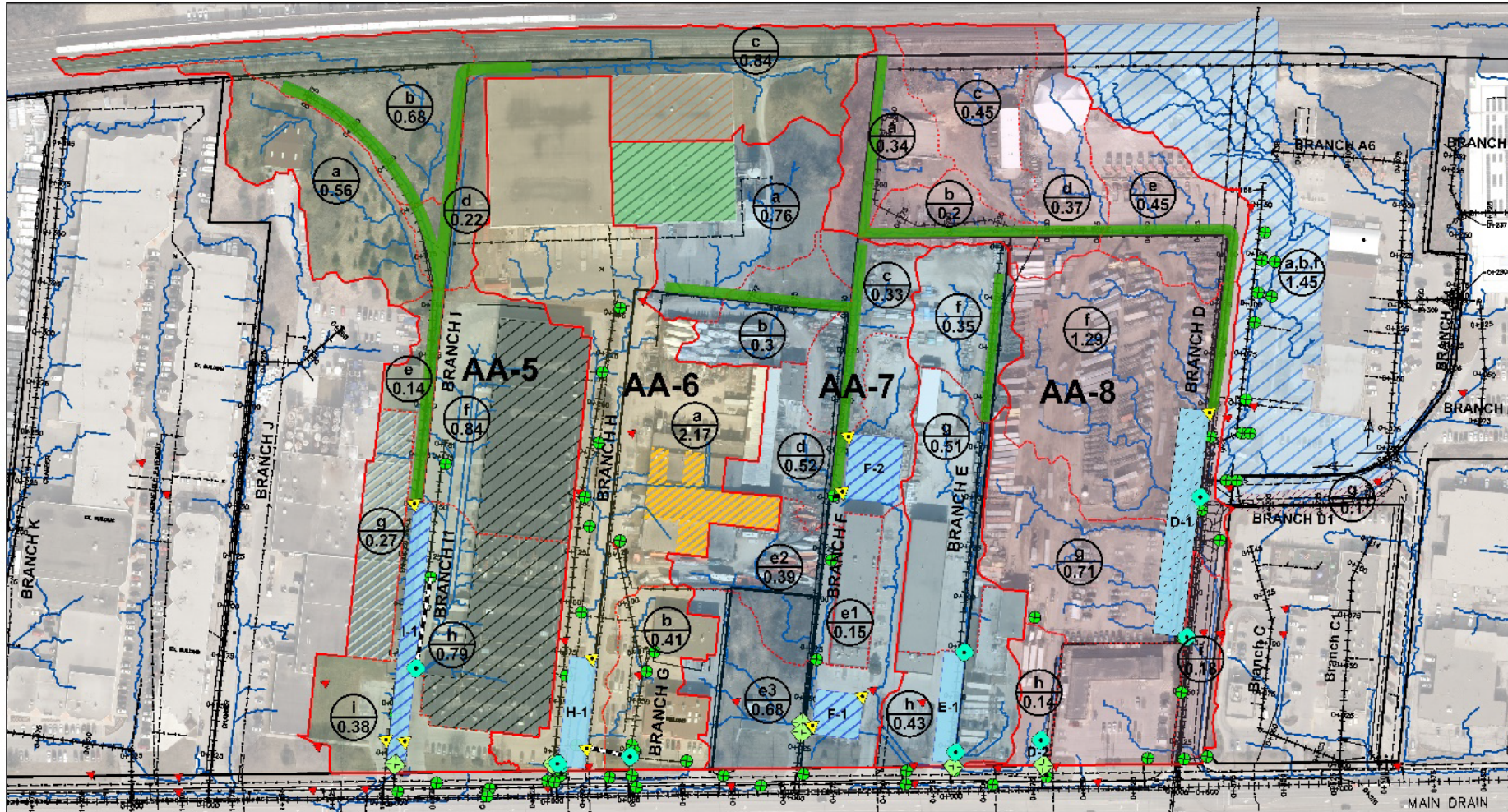
# Design Criteria



Category	Evaluation Criteria	Credit	Maximum Credit
<b>Peak Flow Reduction</b>	Per cent reduction of the 100-year storm to pre-development conditions	Up to 40%	Up to 50%
<b>Water Quality Treatment</b>	Per cent of hard surface receiving 80% TSS removal	Up to 10%	
<b>Runoff Volume Reduction</b>	Per cent capture of first 15 mm of rainfall during a single rainfall event	Up to 15%	
<b>Pollution Prevention Plan</b>	Develop and implement a pollution prevention plan.	Up to 5%	

# Maximum Credit Scenario – Branch F

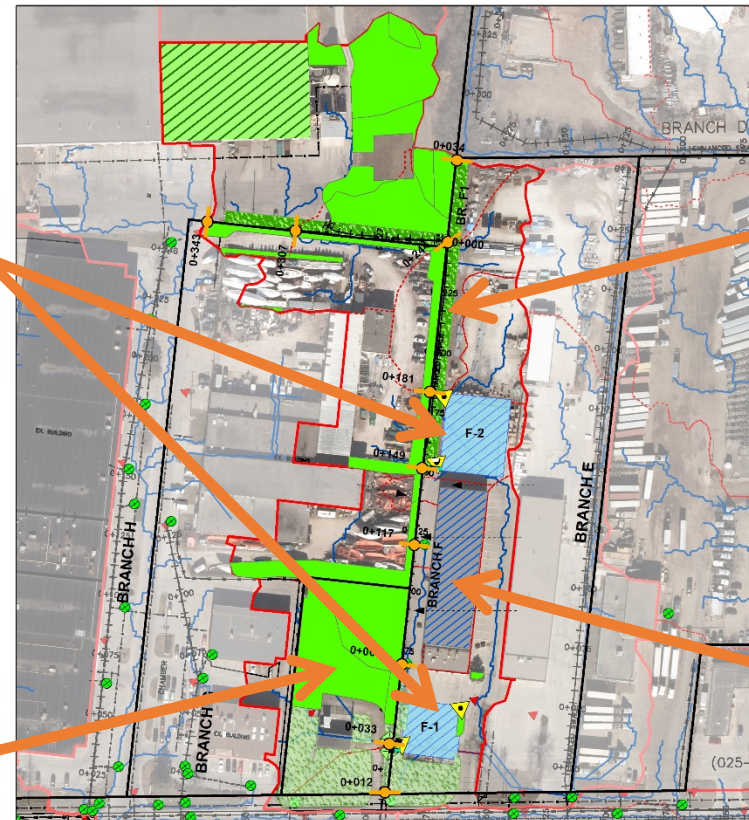


# Maximum Credit Scenario – SWM Plan








-  Enhanced Grass Swale
-  Underground Storage

# One Water Scenario – Branch F

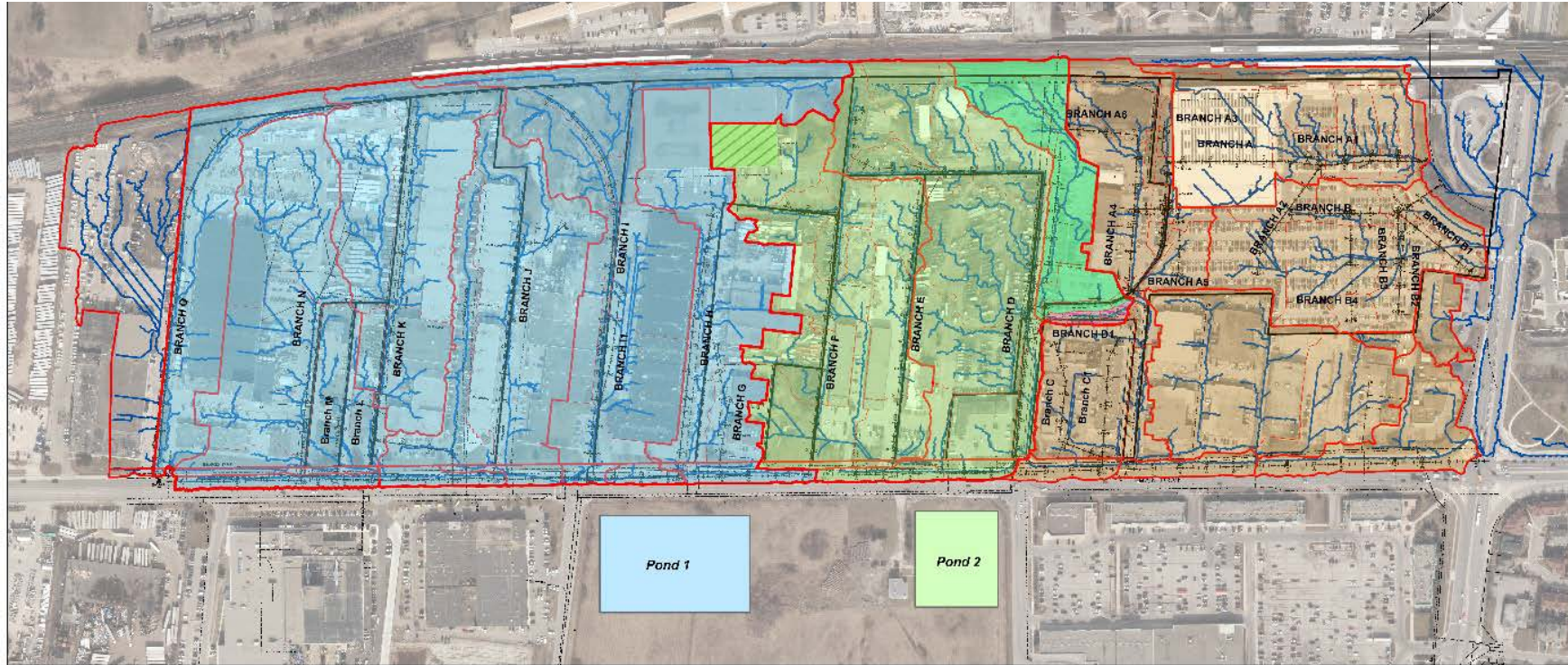


# One Water Scenario – SWM Plan



-  Bioswale
-  Underground Storage
-  Underground Storage with Infiltration Trench
-  Urban Forest
-  Rainwater Harvesting

# Conventional End of Pipe Scenario



# Aggregation Methodology Comparison Checklist

Stage	Step	Did CVC do this step?
Stage I – Pre-Aggregation	Step 1: Review Upper Tier Studies	✓
Stage I – Pre-Aggregation	Step 2: Develop Measurable Criteria/Prioritize Areas	
Stage I – Pre-Aggregation	Step 3: Review Land Uses/Property Ownership	
Stage I – Pre-Aggregation	Step 4: Review Companion/Complementary Initiatives	✓
Stage I – Pre-Aggregation	Step 5: Consultation	✓ (City)
Stage II – Aggregation Planning	Step 1: Review Priority Areas	
Stage II – Aggregation Planning	Step 2: Direct Landowner Engagement	✓
Stage II – Aggregation Planning	Step 3: Establish Aggregation Proponent	
Stage II – Aggregation Planning	Step 4: Assess Priority Area Drainage System (Class EA)	✓ (City)
Stage II – Aggregation Planning	Step 5: Establish Preliminary Aggregation Areas	
Stage II – Aggregation Planning	Step 6: Select Preferred Aggregation Area	✓
Stage III – Aggregation Design	Step 1: Conduct Preliminary Engineering and Field Work Studies	✓
Stage III – Aggregation Design	Step 2: Screening and Preliminary Design of Potential LID Practices	✓
Stage III – Aggregation Design	Step 3: Conduct Economic Assessments (Third Order)	✓
Stage III – Aggregation Design	Step 4: Direct Landowner Engagement	✓
Stage III – Aggregation Design	Step 5: Assess Aggregation Area Drainage System	✓
Stage III – Aggregation Design	Step 6: Prepare Preliminary Design of Preferred Alternatives	✓
Stage III – Aggregation Design	Step 7: Direct Landowner Engagement	✓
Stage III – Aggregation Design	Step 8: Detailed Design	
Stage III – Aggregation Design	Step 9: Direct Landowner Engagement	
Stage III – Aggregation Design	Step 10: Finalize Design and Tender	
Stage IV – Post-Aggregation	Step 1: Construction (Implementation)	
Stage IV – Post-Aggregation	Step 2: Monitoring	
Stage IV – Post-Aggregation	Step 3: Operations and Maintenance	

# Thank You

For more information:

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# More Information – STEP Website

## Aggregated, Communal Approaches to Green Infrastructure Implementation

The STEP Water partners have developed and monitored many successful projects that demonstrate the benefits of green infrastructure (GI) and low impact development (LID) for stormwater management. Despite the proven success and benefits of GI, there are still barriers preventing wide-scale implementation, particularly on private property in existing developments. This is largely due to the associated capital costs. The aim of this project is to find ways to overcome this hurdle through aggregation, where private and public properties are grouped together to facilitate the communal and cost-efficient management of stormwater.

As part of this project, the potential of the provincial Drainage Act (R.S.O., 1990) to assist in the aggregation process is being considered, since applying the mechanisms available within the Act will result in cost savings as well as the optimization of feature selection, sizing and overall performance.



- <https://sustainabletechnologies.ca/home/urban-runoff-green-infrastructure/aggregated-communal-approaches-to-gi-implementation/>

# More Information - Free Webinars

## Webinar – Use of the Drainage Act for Greenfield Development (Previously Recorded)

FREE – Online anytime!

Estimated time requirement: 4 hours

This webinar is mainly intended for development, infrastructure and/or stormwater engineers looking to gain knowledge of the Drainage Act and how it can assist in developing sustainable stormwater solutions

### Learning objectives:

- Gain a deeper understanding of the Drainage Act and its potential to facilitate economically sustainable, mutually-beneficial public-private drainage infrastructure
- Explore how the Draining Act can be used to facilitate adoption of communal, low impact drainage infrastructure in urban greenfield re-development
- Understand the role of the Drainage Superintendent in greenfield development
- Learn from two case studies in Ontario municipalities where the Drainage Act has been used for greenfield development
  - Radcliffe Subdivision Town of Erin, Wellington County
  - Villages of Long Point Bay Subdivision (Port Rowan), Norfolk County

Agenda and Presenters – [Click Here](#)

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**New Booking: Fri Oct 21, 2022**

### Workshop: Use of the Drainage Act for Greenfield Development

AVAILABLE

Book Now

Availability

<https://sustainabletechnologies.ca/events/webinar-use-of-the-drainage-act-for-greenfield-development-previously-recorded/>

## More Information - Free Webinars

# Operationalizing the Drainage Act: Lessons Learned in Greenfield Application and Operations

Previously Recorded – FREE – Online anytime!

Estimated time requirement: 2 hours

Municipalities across Ontario are faced with the challenge of managing and treating stormwater, while contending with increased flooding, rapid urban growth, climate change and aging, limited or no stormwater infrastructure. In fact, approximately 60% of Ontario communities' urban area were built before current stormwater management or flood control standards were developed. The extreme cost of retrofitting stormwater infrastructure within public lands (road right of ways) makes it untenable for most municipalities. This leaves communities, the Province, businesses, and its residents at greater risk of flooding and water quality impairments. A new approach is needed.

<https://sustainabletechnologies.ca/events/operationalizing-the-drainage-act-lessons-learned-in-greenfield-application-and-operations/>

## More Information

Making Green Infrastructure Mainstream: Improving the Business Case for Green Stormwater Infrastructure

[https://sustainabletechnologies.ca/app/uploads/2021/06/CVC\\_Making\\_Green\\_Infrastructure\\_Mainstream\\_English\\_May\\_2021\\_Final.pdf](https://sustainabletechnologies.ca/app/uploads/2021/06/CVC_Making_Green_Infrastructure_Mainstream_English_May_2021_Final.pdf)

Drainage Act FAQ for Urban Municipalities

[https://sustainabletechnologies.ca/app/uploads/2021/06/Drainage-Act-FAQ\\_06292021.pdf](https://sustainabletechnologies.ca/app/uploads/2021/06/Drainage-Act-FAQ_06292021.pdf)

The Drainage Act as a Tool to Facilitate the Aggregation and Wide-Scale Implementation of Green, Low Impact Drainage Infrastructure on Private Property

<https://sustainabletechnologies.ca/app/uploads/2020/11/Position-Paper-Drainage-Act-and-GI.pdf>

<http://www.omafra.gov.on.ca/english/landuse/drainage.htm>



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