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2026
Conference

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Building Capacity to Scale up Green Infrastructure (GI) Implementation for a More Resilient Toronto

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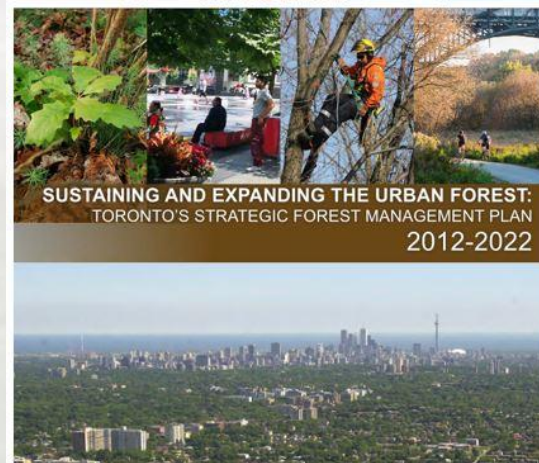
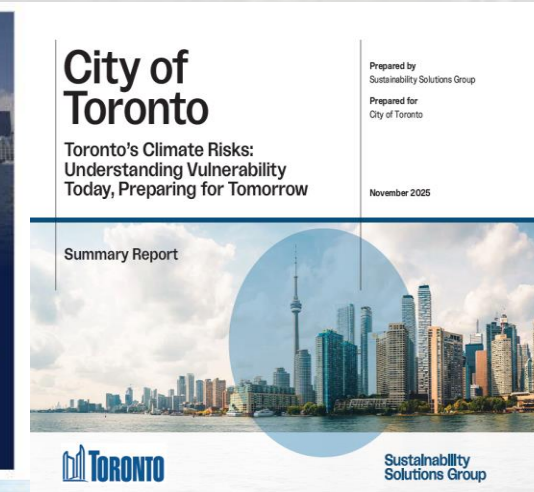
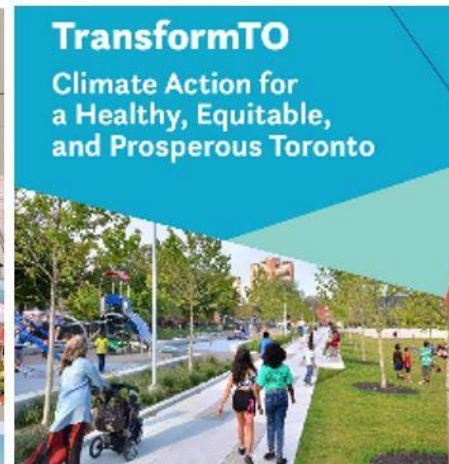
Source to Stream Conference
March 31st, 2026



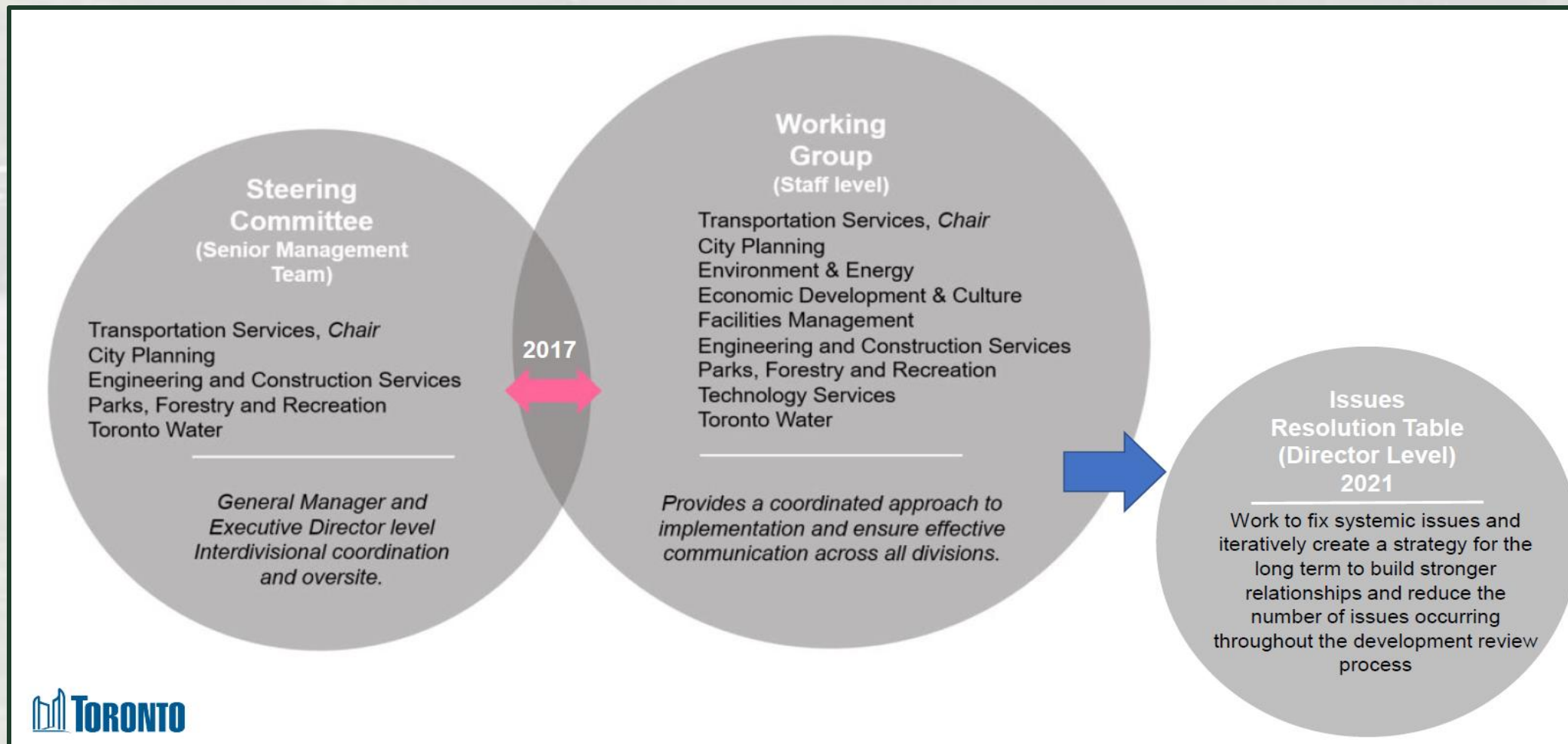
Agenda

- City of Toronto Policy and Strategies related to GI Implementation
- Demonstration Projects
- City of Toronto GI Standards and Guidelines
- City of Toronto Green Streets Program
- Design and construction challenges
- Capacity Building for Staff and Industry
- Design and Construction Tools and Trainings
- Green Streets Key Performance Indicators
- Next Steps

City of Toronto, Policy and Strategies



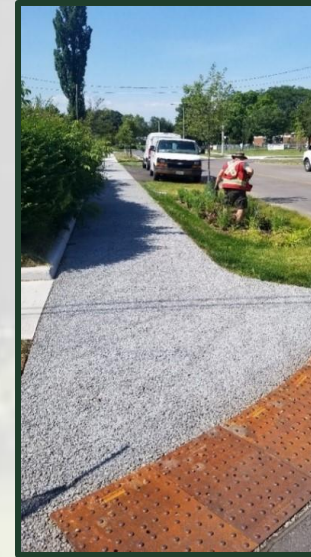
Green Streets Program Governance



Initiation Period (2017-2021)

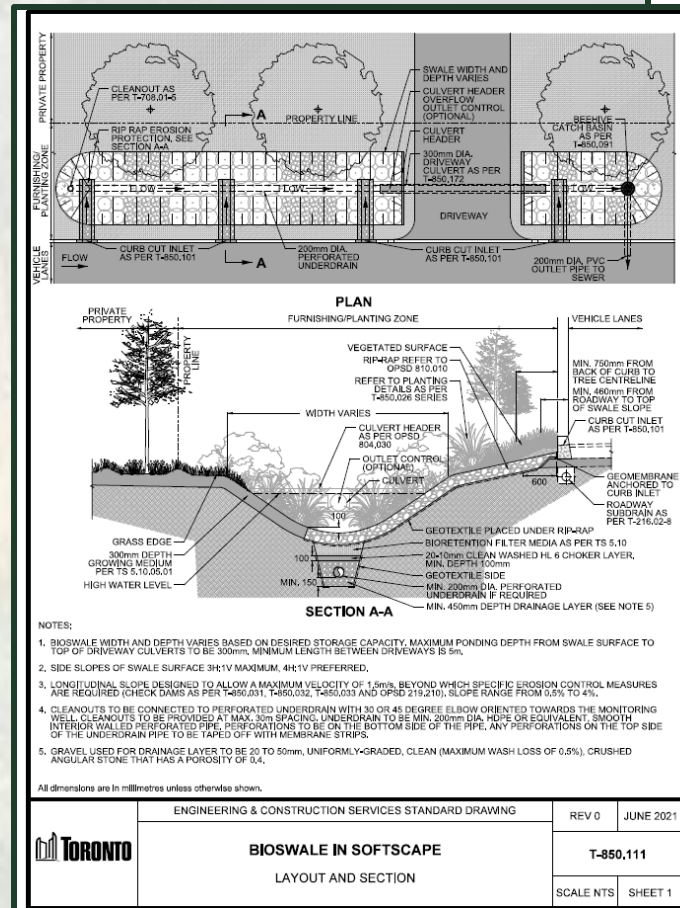
Demonstration Projects - Byng and Thorncrest

- **Urban and Rural Cross-sections**
- **Lessons learned**
 - Need GI standards and guidelines
 - Need standard contract language for GI
 - Need for qualified GI contractors
 - Need for public engagement and communication
 - Provided training for staff, consultants and contractors



Transition Period (2021-2026) Development of Standard Drawings and Guidelines

- Over 100 standard drawings
- 8 construction specifications
- Design Guideline
- Lifecycle Activities (maintenance and monitoring) Guideline
- Community Engagement Guideline



Engineering & Construction
Services Division
Standard Specifications for
Road Works

TS 857

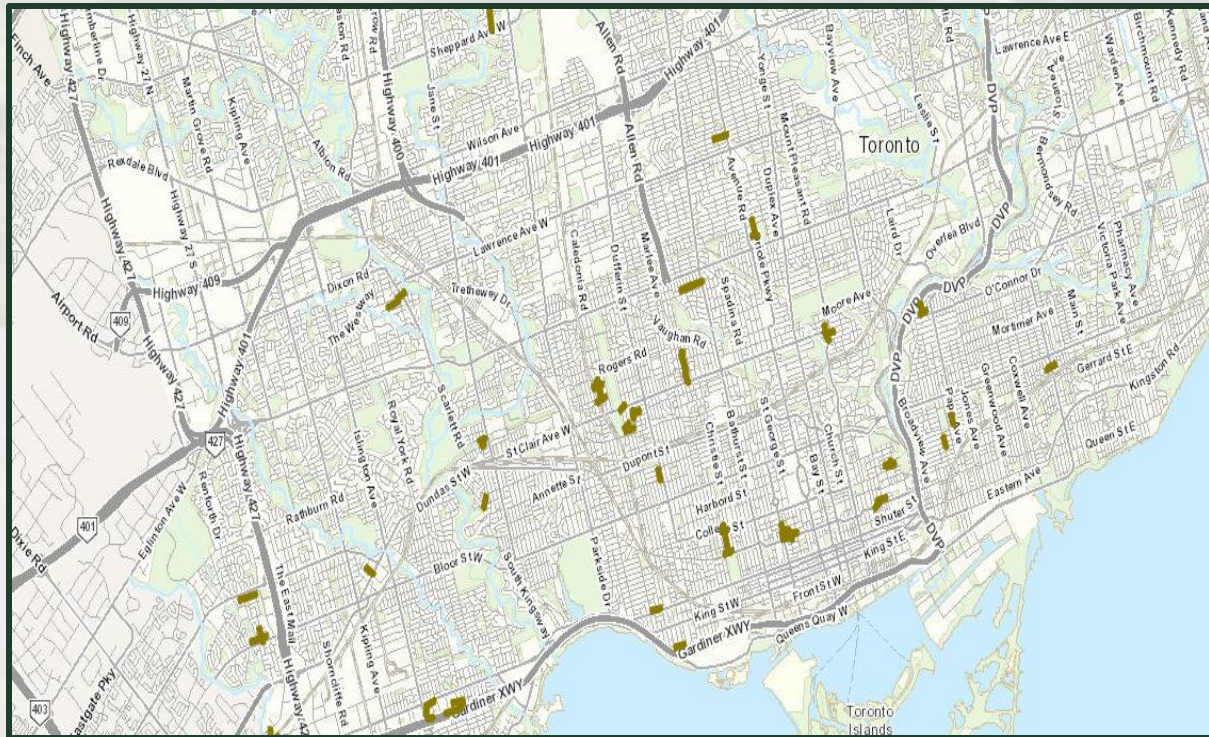
September 2021

Construction Specification for Inlets in Green Infrastructure

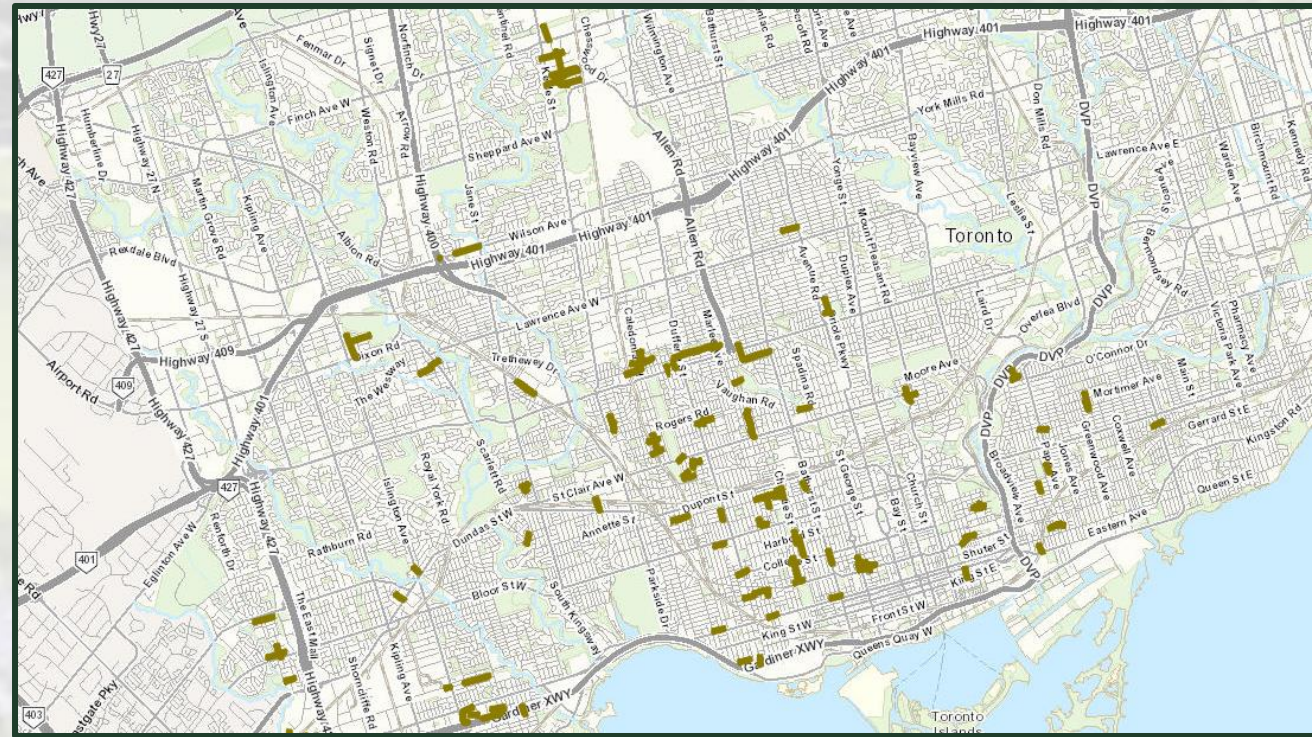
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The Evolution of Green Streets



2021-2025



2026-2031

GI benefits and Co-benefits



Managing stormwater runoff to enhance water quality, to reduce erosion in receiving water bodies, and to enhance urban resilience.



Provide opportunities to enhance biodiversity



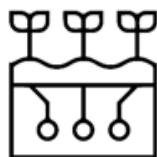
Mitigating urban heat island effect



Enhancing the extent and longevity of the urban forest



Enhancing air quality



Promoting infiltration



Conserving / generating energy



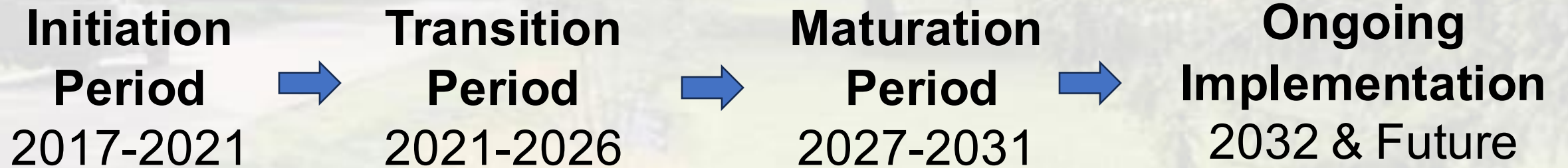
Beauty

Benefits are Achieved When Implementation is at All Scales

- Resilient strategy and adaptation initiative requires GI at large scale
- Green and grey infrastructure should operate in coordination.
- Strategic large-scale implementation of GI will help achieve the City-wide green initiatives



Build Capacity – The Process



GI Design Considerations

- Planning
 - GI type selection based on street typology (laneway, residential, neighbourhood)
 - Identify candidate locations for GI sites
- Preliminary design
 - Data collection
 - Survey
 - GI siting (low points, upstream of catchbasins)
 - Geotechnical investigation
 - Subsurface utility investigation (SUE-B and SUE-A)
 - Detailed design
 - Calculate the dimensions, depths, etc
 - Inlet and outlet sizing
 - Sewer connections
 - Growing medium and plant selections



Typical GI Construction Procedure

GI construction steps:

- Site preparation
- Excavation and grading
- Washed stone and underdrain installation
- Backfilling and growing medium installation
- Final grading
- Planting (vegetated GI)



GI Construction Pitfalls

- Erosion and sediment controls
- Construction sequencing
- Proper grading and adherence to design drawings
- Material specifications and storage on-site
- Unknown utilities
- Equipment types and usage
- Vegetation and plantings



Building Capacity Workplan: Training & Tools

Design		Construction	
Training	Tools	Training	Tools
<ul style="list-style-type: none"> • SWM calculations • Grading • Geotechnical planning and investigation • GI sizing and geometry determination • Inlet and outlet details • High-level suitable planting and growing medium type 	<ul style="list-style-type: none"> • Design training modules housekeeping (stored in ELI) • Design checklist • Sample cross sections • Lessons learned reports • Public notifications mechanisms • Develop KPIs for the program and built GIs • Mapping and monitoring • MCR and DIPs update • Intake process checklist • Pre-qualified consultants • Cost estimating tools 	<ul style="list-style-type: none"> • Inspection during and after construction (capital and development) • Material specification and verification • Construction phasing • Erosion and sediment control • Field visits • Train GI contractors on a regular basis 	<ul style="list-style-type: none"> • Construction inspection checklist • Tender standard specifications development • Tender standards price list items • Engineering cost estimates • Public educational templates • Develop KPIs for the overall program performance and individual GI facilities • Post-construction monitoring data gathering and analysis for lessons learnt leading to improvement • Pre-qualified contractors

Capacity Building for City and Industry - Design Training

- Step-by-step GI Design Workshops
- Annual GI Refreshers to Staff
- Recorded training sessions on City's learning platform for new staff and refresher for existing staff



Capacity Building for City and Industry - Construction Training

- Annual GI construction inspection training to staff and consultants
- Recorded training sessions on City's Learning Platform



GI Design Tools

- Design Training Modules
- Design Checklist
- Design and Construction Cost-estimating tools
- Documentation of lessons learned
- Public notification mechanisms
- Development of KPIs and metrics
- Pre-qualified consultants
- Mapping and monitoring

Bioswale Plant Palette

Option 1: Purples, Pinks, Whites

(N) Native hardy species
 (C) Cultivar / Hybrid of a native hardy species
 (O) Non-native naturalized hardy species
 (S) Shrubs and taller growing species - avoid planting in areas where views may be obstructed (e.g. sightlines between pedestrians and vehicles at intersections)

Zone 1: Perimeter Planting (Sample Planting Palette)



Anemone canadensis Canada Anemone (N) | *Echinacea purpurea* Purple Coneflower (N) | *Liatris spicata* Prince-Bishop's Star (N) | *Pycnanthemum virginianum* Virginia Mountain Mint (N)(S)

Additional Species:

1. *Carex pensylvanica* Oak sedge (N)
2. *Myrica pensylvanica* Northern Bayberry (N)(S)
3. *Rosa rugosa* 'Foxy Pavement' Foxy Pavement Rose (C)(S)

The perimeter zone provides a transition from the bioswale to the adjacent area. Selected plants thrive in urban conditions (tolerant of salt spray and other pollutants), and are both drought tolerant as well as able to withstand occasional wet conditions.

Zone 2: Slope Planting (Sample Planting)



Carex crinita Fringed Sedge (N)(S) | *Cheilone glabra* White Turtlehead (N)(S) | *Eupatorium maculatum* Joe-Pye Weed (N)(S) | *Veronicastrum virginicum* Culvers Root (N)(S)

Additional Species:

1. *Ceanothus americanus* New Jersey tea (N)(S)
2. *Myrica gale* Sweet Gale (N)(S)
3. *Rhus aromatica* Fragrant Sumac (N)(S)

Planting to the sides of the bioswale are tolerant of wetter conditions and help stabilize the slopes.

Plants are selected for visual interest in colour and form, as well as biodiversity and wildlife benefit with species that attract pollinators (bees and butterflies).

Zone 3: Low Point Planting (Sample Planting)



Carex vulpinoidea Fox Sedge (N) | *Eupatorium perfoliatum* Boneset (N)(S) | *Symphyotrichum puniceum* Swamp Aster (N) | *Thalictrum pubescens* Tall Meadow-Rue (N)

Additional Species:

1. *Acorus calamus* 'variegatus' Sweet Flag (O)
2. *Mimulus ringens* Monkey Flower (N)

Plant material for this area must be the most tolerant to temporal flooding and wet conditions.

Plants selections are naturally found in or adjacent to wetlands and are native species to Ontario.



GI Sizing Tool

Step 2: Describe GI Feature

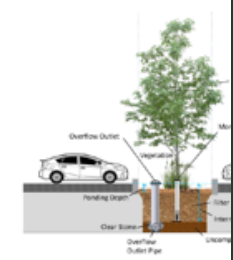
Select design scenario:

CoT standard dwg (if applicable):

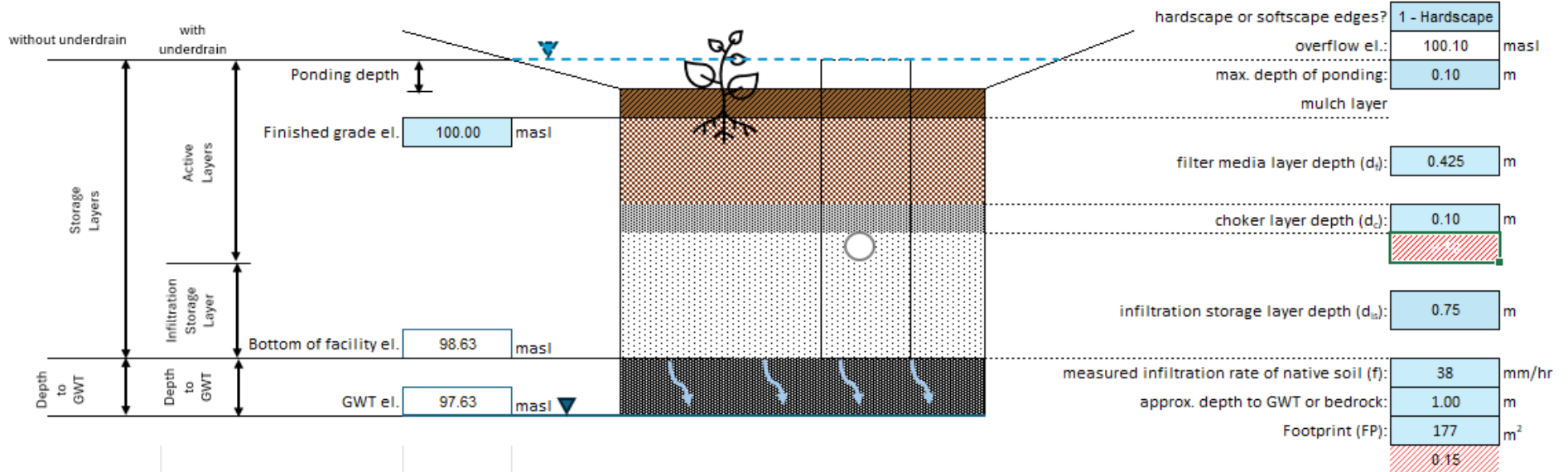
Is there an underdrain?

Is there infiltration?

Where is the underdrain located?

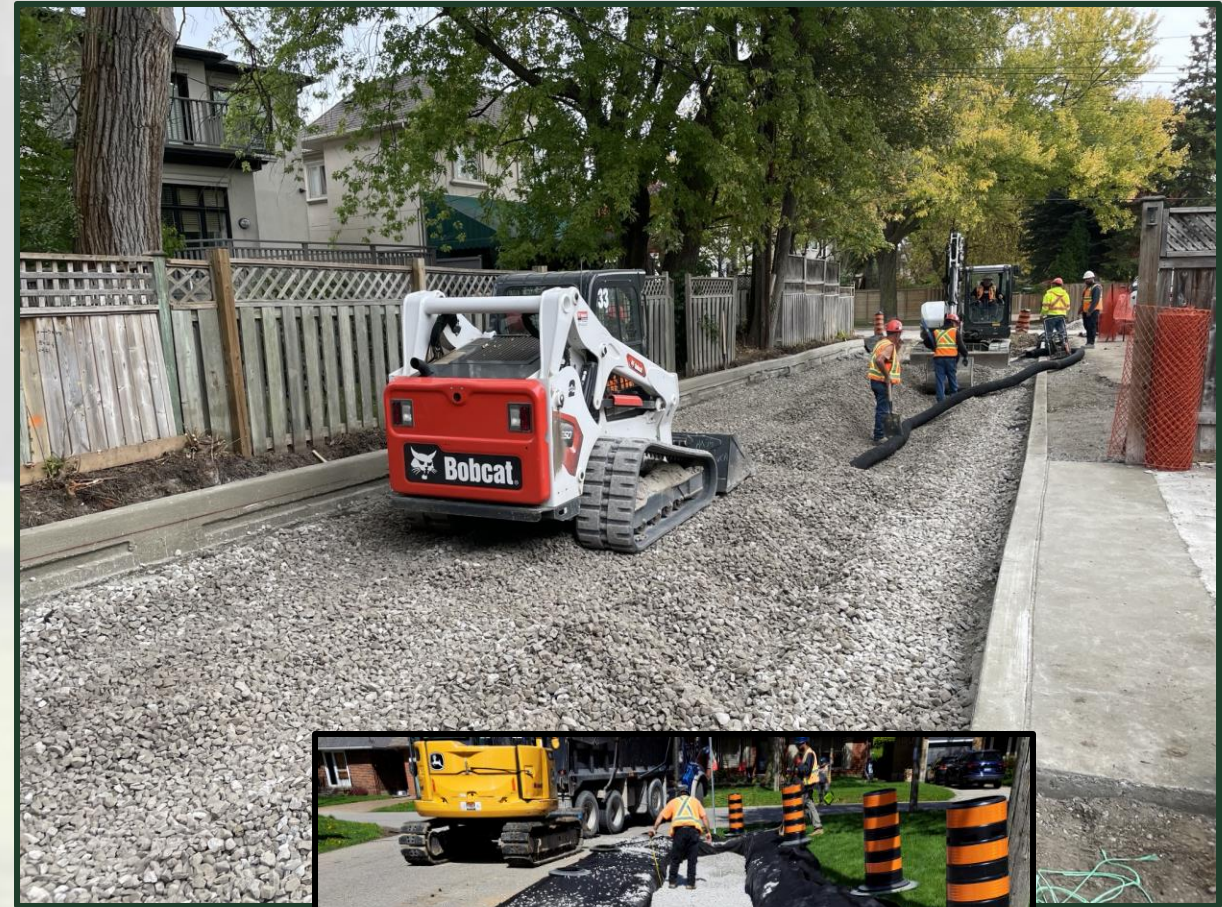


GI Cross Section Schematic (NTS)



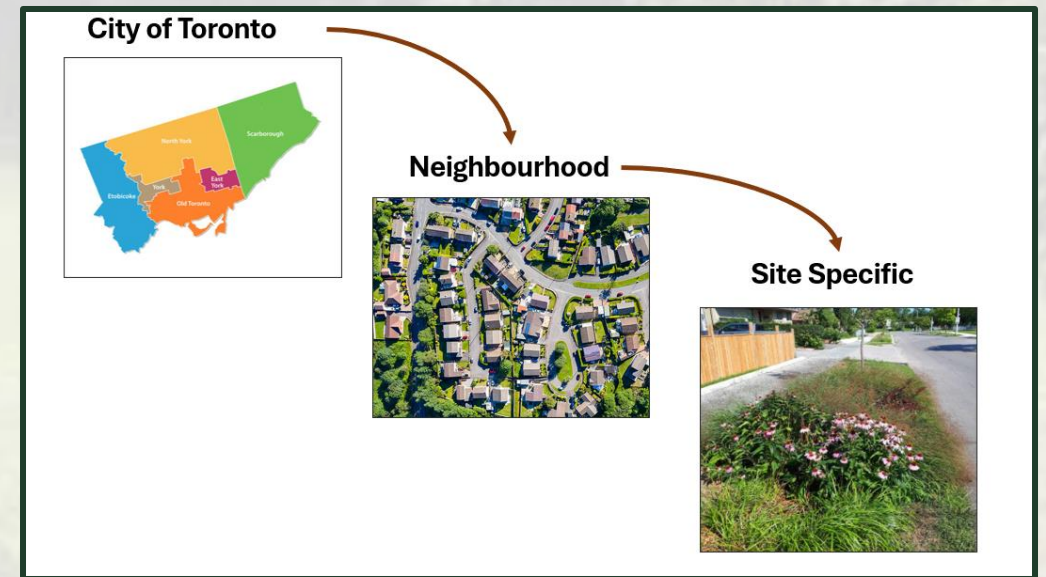
Construction Tools

- GI Tender Specifications
- Construction cost-estimating tools
- Construction Administration and Inspection Guide
- GI Construction Inspection Checklist
- Established list of qualified subcontractors



Green Streets Program Key Performance Indicators (KPIs)

- Essential to measure the success of Green Streets program implementation and other green initiatives.
- Indicators can be determined from planning to implementation on three different scales.



Examples of KPI Metrics

SCALE	CAPACITY BUILDING	TOOLS
Watershed	<ul style="list-style-type: none">• No. of trainings• No. workshops• No. of conferences attended	<ul style="list-style-type: none">• No. of standards/specs updated per year• How many design guides created were updated
Neighbourhood	<ul style="list-style-type: none">• No. of trainings• No. of neighbourhood scale costing tools created	<ul style="list-style-type: none">• No. of strategies implemented to reduce CO2 emissions
Site-specific	<ul style="list-style-type: none">• No. of trainings• Number of site-specific scale costing tools created	<ul style="list-style-type: none">• No. of GI facilities designed to meet the targets outlined in the guides

Next Steps

- Document design and project delivery lessons learned
- Additional training and tools
- Pilot new initiatives
- Continue to update the City and overall industry knowledge-base



Questions?

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Stormwater Management Infrastructure

Design & Construction – Linear Underground Infrastructure

Engineering & Construction Services

City of Toronto



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