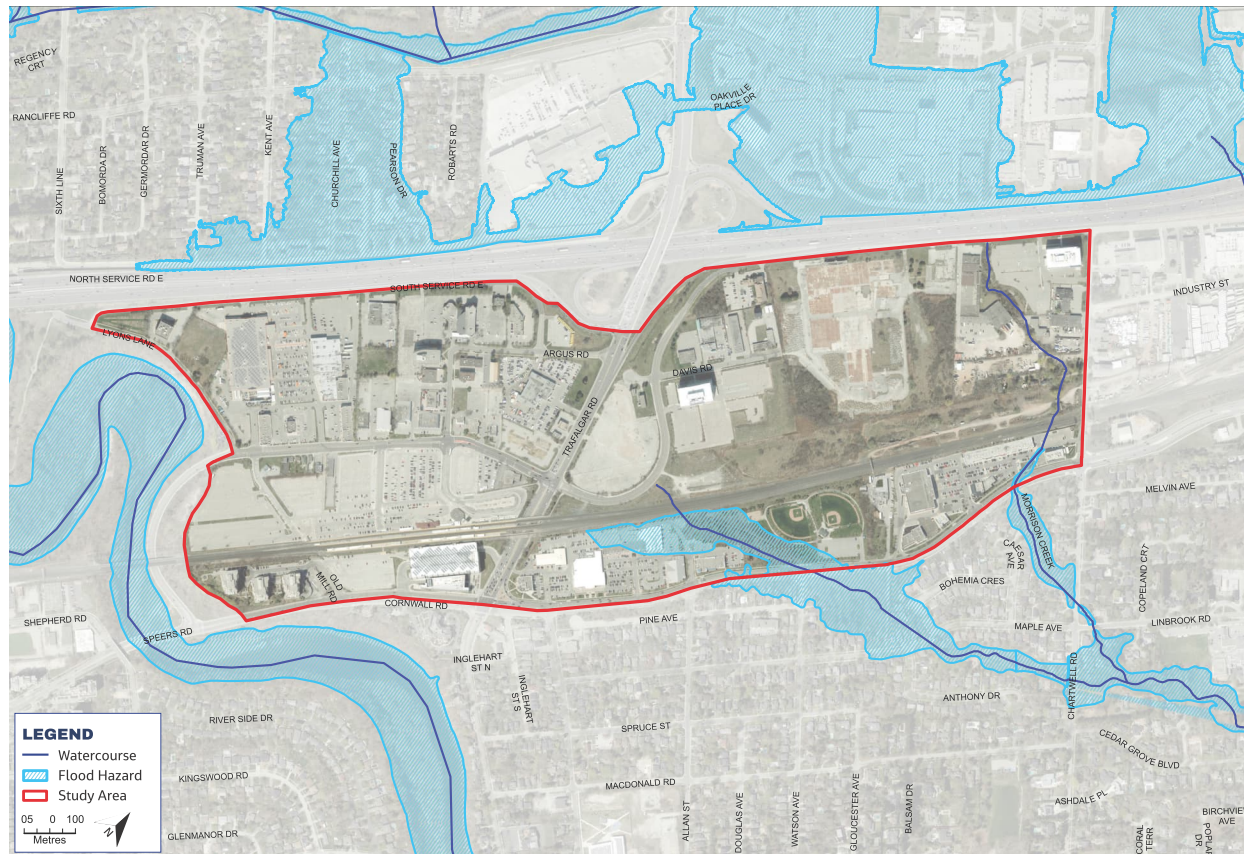


Appendix I. Public and Agency Consultation



Existing Condition



PURPOSE

The Stormwater Management (SWM) Master Plan manages rain and runoff to support growth and development based on the updated OPA and road network.



Existing Drainage

Currently, storm runoff is directly connected to storm sewers, without intermediary collection or treatment, essentially going straight to the sewer system and eventually to Lower Morrison Creek and 16-Mile Creek. Sewer surcharge and surface ponding is predicted during high intensity storm events across the study area.

Existing drainage infrastructure primarily consists of curbs, gutters, drainage inlets and storm sewers. Average imperviousness is approximately 75%, typical of mixed-use urban areas.

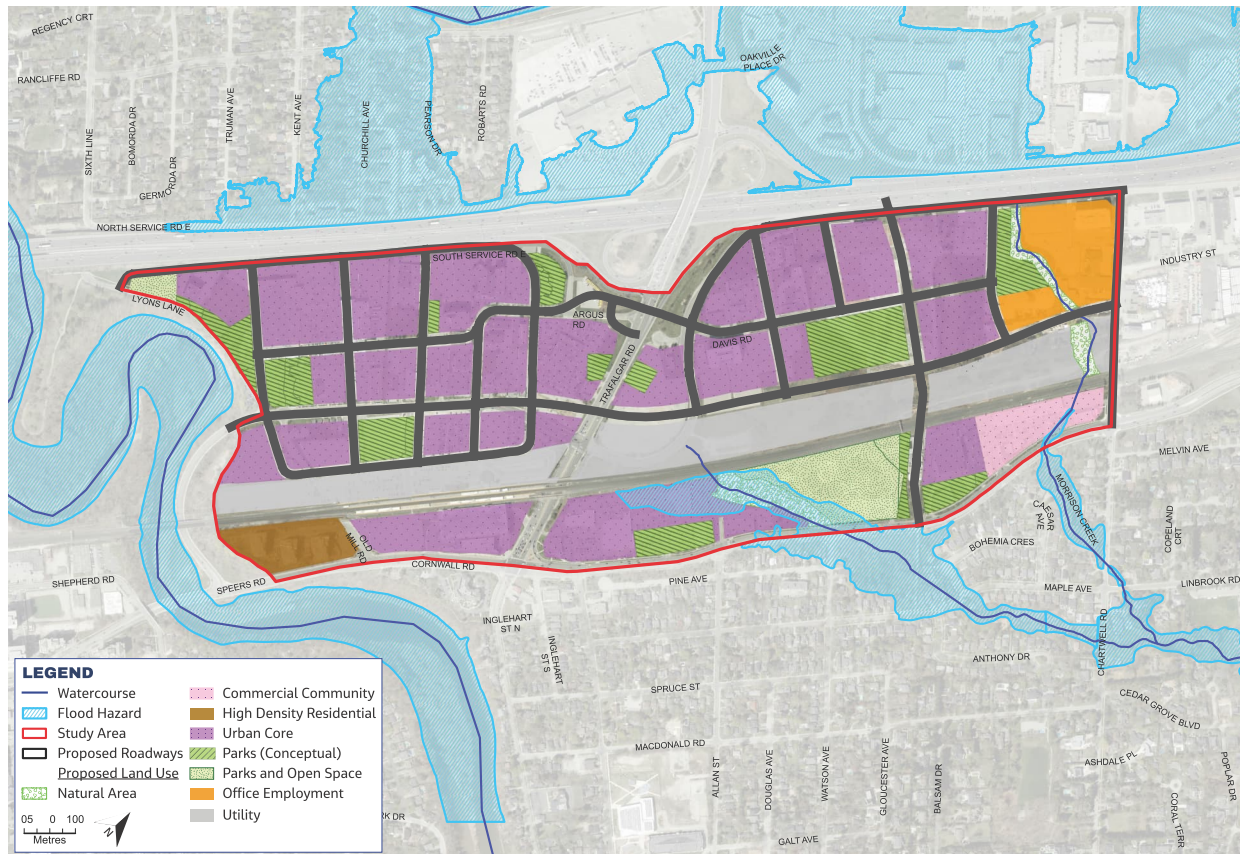


Riverine Flooding

Potential riverine flooding immediately downstream of the CN Railway along Lower Morrison West Branch. Potential spill flooding hazard from the Diversion Channel north of the QEW is being investigated by Conservation Halton through its Flood Hazard Mapping and Spill Flood Hazard Policy in coordination with the Town of Oakville.



Future Condition



Redevelopment of Midtown provides opportunities to improve stormwater management across the study area. Hydrologic and hydraulic models have been developed to investigate this impact, evaluate the effectiveness of existing drainage infrastructure, and screen a list of alternative solutions.

CHALLENGES



New Roads, Connections And Crossings

New Impervious areas + changes in drainage pathways = storm sewer capacity concerns + potential riverine flooding.



Future Drainage

If left uncontrolled, future areas draining into Lower Morrison Creek and 16 Mile Creek would result in increase peak flows. This Master Plan and the development process will ensure that this is not the case.

OPPORTUNITIES



Policy Direction

Provincial and municipal policy direction for stormwater management (MECP, Conservation Halton and Town of Oakville) includes achieving quantity and quality control and water balance objectives and targets.



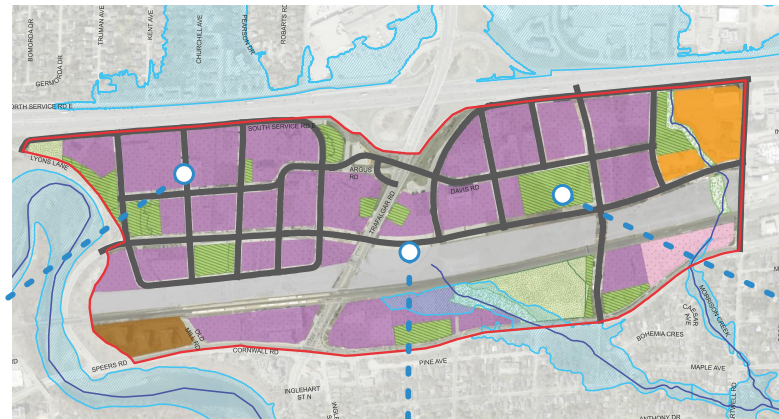
Stormwater Management Strategy

A combination of conventional Stormwater Management Strategy measures and green infrastructure practices that collectively minimize the impact of future development. Future developments would be required to not increase flood risk for neighbouring and downstream properties.



Stormwater Management Alternative Solutions

Alternative solutions will follow current provincial and municipal guidelines and policies, including the Stormwater Management Planning and Design Manual (MECP, 2003), Town of Oakville's Development Engineering Procedures and Guidelines (2023) and the Treatment Train approach as recommended by Conservation Halton Guidelines for Stormwater Management Engineering Submissions (2021). As a single measure can rarely perform all the necessary functions of a stormwater management system, a combination of lot-level (source), conveyance and end-of-pipe practices may be needed to meet water quantity, water quality, water balance, and erosion targets (Engineering criteria). Types of stormwater control mechanisms to achieve these targets include storage, infiltration, and pretreatment.



Rain gardens and bioretention curb extensions



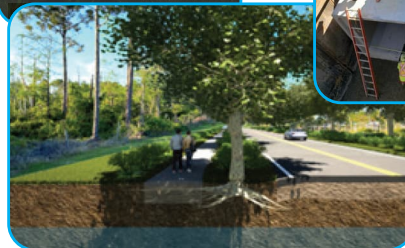
Permeable pavement

LOCAL ROADS/DEVELOPMENTS

Bioswale



Storm sewer upsizing and superpipe storage



Tree trenches with soil cells

CONVEYANCE VIA MAJOR ROADS

Dry pond – above-ground temporary water storage



Underground storage

Underground storage

TREATMENT AT
PARKS AND LARGER
SPACES



Stormwater Draft Evaluation Criteria

The list of alternative solutions will be evaluated based on draft criteria, including engineering, natural environment, social and cultural, and financial criteria. This evaluation process will include hydrologic and hydraulic analyses and subsequently the verification and confirmation that stormwater quantity and quality targets have been addressed and can be implemented considering constraints and opportunities at various scales.

The evaluation process will conclude with the selection of Stormwater Management preferred solutions.

Criteria - Main categories used for the assessment of alternative solutions

Indicators - Qualitative or quantitative metrics used to assess performance

Engineering



- Provides stormwater quantity control and flood protection
- Provides stormwater quality control
- Improves water balance
- Mitigates against erosion to receiving watercourses

Natural Environment



- Improves aquatic habitat
- Improves terrestrial habitat
- Enhances groundwater regime
- Integrates with existing environment by incorporating green infrastructure

Social and Cultural



- Results in community benefits, such as beautification associated with infrastructure upgrades and additional park space
- Ensures public safety, including safe access, ingress and egress

Cost



- Minimizes capital expenditure
- Minimize operation and maintenance cost



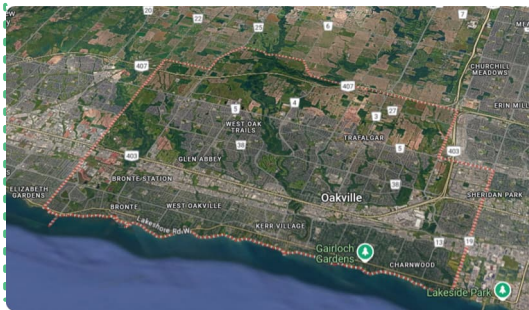
Midtown Stormwater Plan

WE ARE HERE

*Stormwater management is guided by Townwide, area and site specific studies and analysis.

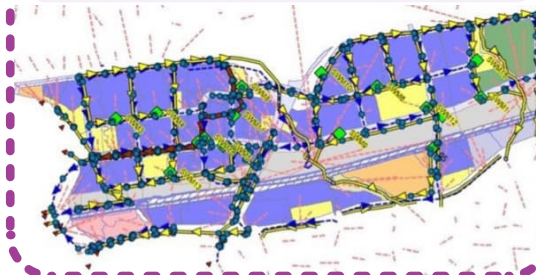
Town-wide and Subwatershed Studies

- Identify constraints and opportunities for future growth and development
- Set targets and develop criteria for:
 - Stormwater quantity and quality control
 - Runoff volume reduction and erosion control
 - Climate change adaptation and resilience



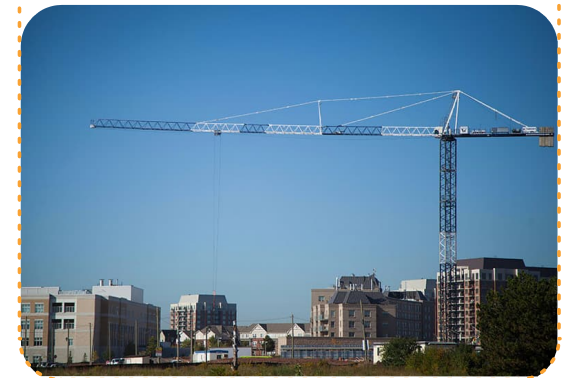
The Midtown Stormwater Plan

- The Midtown Stormwater Plan manages rain and runoff to support growth and development based on the updated OPA and road network
- Confirm constraints and opportunities for Midtown area and assess existing and future drainage conditions, to demonstrate the proposed work does not negatively impact adjacent land
- Update and verify targets and criteria established by previous studies
- Identify, evaluate and propose stormwater management measures for private and public areas to address provincial, municipal and environmental targets, policies and guidelines
- Establish a strategy and an implementation plan with policy direction



Development Applications and Site-Scale Studies

- Follow the Town's policies and procedures for drainage and stormwater management
- Apply stormwater criteria, targets and policies established by the Midtown Stormwater Plan and confirm drainage capacity and functionality
- Develop drainage plans, grading plans and specific SWM strategies and implementation plans





Stormwater Challenges and Opportunities



CHALLENGES

- Future development, including proposed roadways causes the following impacts :
 - Changes in drainage pathways
 - Pressure on the existing storm sewer system
 - Downstream flood hazard - Sixteen Mile and Lower Morrison East and West

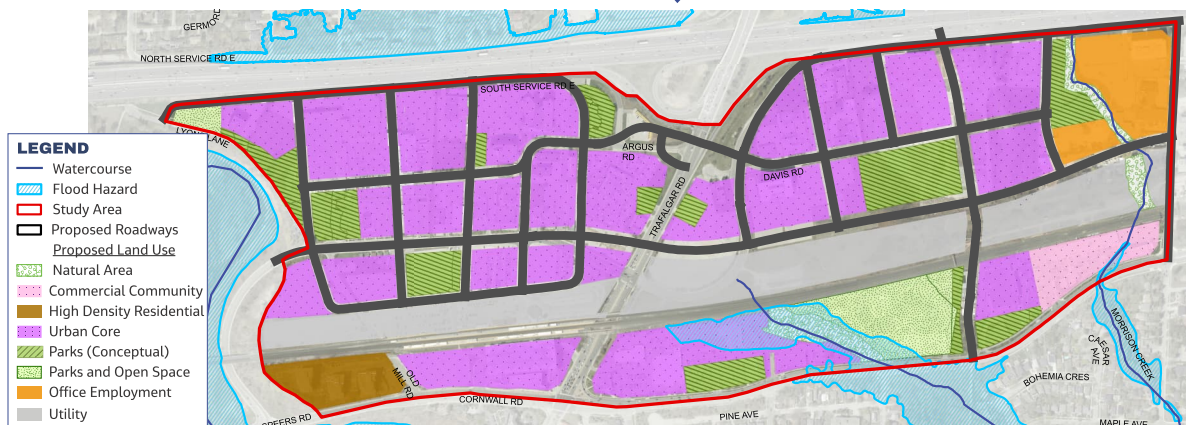
OPPORTUNITIES

- Control on private properties, including quantity, quality and water balance
- Control using above and below-grade infrastructure along the proposed roads and within parks
- Retention opportunities (Infiltration + Reuse), Filtration opportunities (Absorption + Increase of depression storage)
- Water quality treatment

Problem / Opportunity Statement

The Midtown Stormwater Plan will determine how the town's stormwater infrastructure will support growth in a sustainable and financially responsible manner. The proposed Stormwater Plan will identify stormwater quantity and quality measures for both private and public areas to address relevant provincial and municipal policies and guidelines. Based on a comprehensive multi-criteria evaluation, preferred solutions will be proposed to be implemented at various scales to achieve a multitude of municipal and environmental targets.

The Stormwater Management (SWM) Master Plan is a key component of the overall Midtown Oakville program and must be fully integrated with the Transportation Master Plan and the public realm and servicing objectives.





Stormwater Management Alternative Solutions



Alternative #1: Conveyance and Storage

- **Conveyance improvements measures:**
These measures include pipe upsizing and super pipes to control peak flows along the Right of Way (ROW)
- **Underground Storage Facilities:**
These measures include manufactured storage facilities that could provide stormwater quantity management and runoff volume reduction, including detention, retention and infiltration. The implementation of these measures may take place within private properties, along the right of way and within parks and open spaces.



Alternative #2: Conveyance, Storage and Green Infrastructure

- In addition to conveyance improvements and underground storage, Green Infrastructure (GI) can provide storm quality management and runoff volume reduction in addition to runoff quantity control.
- Green Infrastructure measures are proposed as part of a Treatment Train approach, whereby it can be implemented within private properties and in the public realm. Types of green infrastructure measures include bioretention systems, stormwater tree pits, and permeable surfaces.



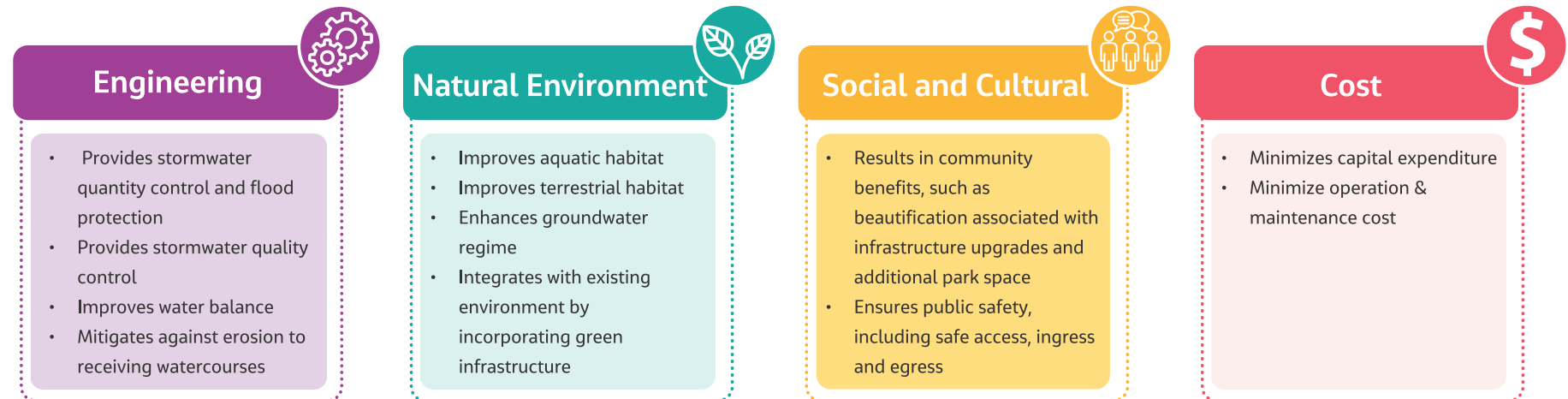
Stormwater Evaluation Criteria

The list of alternative solutions has been evaluated based on multi-faceted criteria, including engineering, natural environment, social and cultural, and financial criteria. This evaluation process includes hydrologic and hydraulic analyses and the verification and confirmation of stormwater quantity and quality targets.

The evaluation process concludes with the selection of a Stormwater Management preferred solution.

Criteria - Main categories used for the assessment of alternative solutions





Indicators - Qualitative or Quantitative metrics used to assess performance





Evaluation Summary

☐ Least Preferred
 ☐ Less Preferred
 ☒ Most Preferred

	Description	Engineering 	Natural Environment 	Social and Cultural 	Cost 
Business as Usual "Base Scenario"	Planned "Business as Usual" (BAU) Improvements <ul style="list-style-type: none"> Committed and planned projects Serves as a "base" for all alternatives 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="radio"/>
Alternative #1	Conveyance + Storage: Onsite Control on Private Properties and Increasing Storm Sewer Capacity along ROW	<input type="radio"/> Improves conveyance and runoff quantity control but lacks water quality and water balance control	<input type="radio"/> As this option mostly deals with conveyance, it does not improve linkages with aquatic and terrestrial habitat	<input type="radio"/> Provides limited healthy living opportunities. Does not add to beautification. Received lowest score in previous PIC	<input type="radio"/> Low to moderate capital and maintenance costs.
Alternative #2	Conveyance, Storage and Green Infrastructure: Combination of Stormwater Control Measures	<input checked="" type="radio"/> Improves water quality and balance, mitigate erosion in conjunction with conveyance control	<input checked="" type="radio"/> Improves aquatic and terrestrial habitat and integrates with the natural environment	<input type="radio"/> Provides healthy living opportunities and beautification. May require more social awareness	<input type="radio"/> Moderate to high capital and maintenance costs. May require additional costs for integrating with conveyance measures



Alternative #2: Combination of SWM Measures

Control within Private Properties

Onsite Quantity Control and Water Balance within Private Properties

Onsite Quality Control within Private Properties (Achieving 80% TSS removal)

Control along ROW

Green Infrastructure along ROW (e.g. Soil Cells and Permeable Pavement)

Pipe upsizing / Superpipes

Manufactured Treatment Devices along ROW (e.g. OGS and CB Shields), part of Treatment Train approach

Control within Parks

Underground Storage + Green Infrastructure

SWM Measure	Type of Infrastructure	Quantity Control Target	Quality Control Target	Water Balance Control Target
Onsite Quantity Control and Water Balance within Private Properties	Storage Tanks	Yes	N/A	Yes
Onsite Quality Control within Private Properties (Achieving 80% TSS removal)	Water Quality Treatment	N/A	Yes	N/A
Pipe upsizing / Superpipes	Conveyance Pipes with Detention	Yes	N/A	N/A
Green Infrastructure along ROW (e.g. Soil Cells and Permeable Pavement)	Green Infrastructure	Yes	Yes	Yes
Manufactured Treatment Devices along ROW e.g. Oil and Grit Separator (OGS) and Catch Basin (CB) Shields, part of Treatment Train approach	Water Quality Treatment	N/A	Yes	N/A
Underground Storage + Green Infrastructure	Storage + Green Infrastructure	Yes	Yes	Yes



Alternative #2: Combination of SWM Measures

Control within Private Properties

1

ONSITE QUANTITY CONTROL AND WATER BALANCE WITHIN PRIVATE PROPERTIES



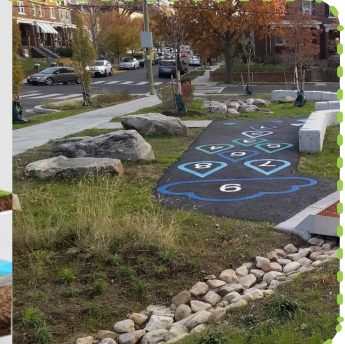
ONSITE QUALITY CONTROL WITHIN PRIVATE PROPERTIES



Control within Parks

3

UNDERGROUND STORAGE + GREEN INFRASTRUCTURE



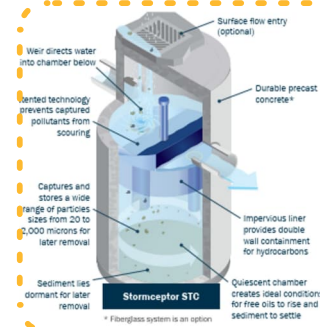
Control along ROW

2

GREEN INFRASTRUCTURE ALONG ROW



MANUFACTURED TREATMENT DEVICES ALONG ROW



Oil and Grit Separator



PIPE UPSIZING / SUPERPIPES





Stormwater Modelling with Alternative #2 Combination of SWM Measures

A Dual-Drainage model, comprising minor and major drainage systems, was developed. Catchments included future private properties and proposed roads. Peak flows, including Regional storm, were evaluated under uncontrolled and controlled scenarios.

Performance of minor and major drainage systems

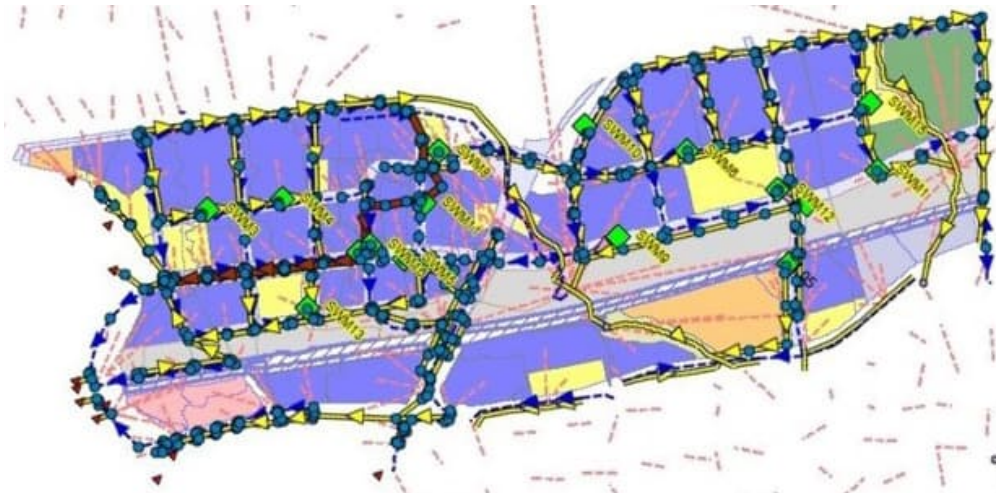
Storm sewer capacity is expected to improve significantly

Surface ponding along major roads will be eliminated or reduced to less than curb height (15 cm) for all storm events

Outfall Metrics

Peak flows were evaluated at outfalls draining into Sixteen Mile Creek, Lower Morrison East and Lower Morrison West

Results show that the 100-year storm event and the Regional storm will be controlled at all outfalls





Recommended Directions for Stormwater Management

Within Private Properties



- Future development is to demonstrate that target peak flows and minimum storage requirements as per the Midtown Stormwater Plan are met.
- Developer to design and construct stormwater management facilities in compliance with the Midtown Stormwater Plan.
- New development is required to meet Enhanced Level 1 Protection (80% long-term removal of TSS), as per the Ministry of Environment's Stormwater Management Planning and Design Manual (2003).
- Long-term perpetual groundwater discharges are not permitted (bathtub or added storage for groundwater).
- To accommodate site constraints and conform to provincial and municipal guidelines, a 25 mm runoff volume reduction (water balance) target shall follow a hierarchical order:
 1. Retention (Infiltration, reuse, or evapotranspiration)
 2. Filtration (Absorption and increased depression storage)
 3. Conventional stormwater management (Detention and attenuation)
- Step 3 should proceed only once Maximum Extent Possible has been attained for Steps 1 and 2 for retention and filtration.

Along Major Roads



- Implement underground storage facilities to control peak flows along major roads. The location, depth and connectivity to the municipal drainage system shall be subject to the approval of the Town in consultation with Conservation Halton.
- The capacity and functionality of proposed storm sewer pipes and super pipes shall be demonstrated. Hydraulic modelling using appropriate software shall be completed to quantify peak flows, required storage volumes, and determine Hydraulic Grade Line (HGL).
- A Treatment Train approach is encouraged to achieve water quality and runoff volume reduction targets.

Along Local Roads



- It is the responsibility of the developer to design and construct stormwater quantity and quality measures along local roads to achieve unitary storage targets stipulated in the Midtown Stormwater Plan.
- A Treatment Train approach is encouraged to achieve water quality and runoff volume reduction targets.

Within Parks:



- Parks shall be designed to support the broader stormwater management system across Midtown and as part of a Treatment Train approach to achieve stormwater quantity and quality targets, where appropriate subject to the parks' programming and recreational uses.

Collectively, the recommended private and public stormwater control measures identified below, including Green Infrastructure, shall ensure that there will be no increase in flooding within or downstream of Midtown.



Recommended Stormwater Management Measures Across Midtown

