

City of Guelph

Stormwater Management Master Plan

Appendix E – Infiltration Policy Recommendations

November 2022



Stormwater Management Master Plan

Appendix E: Infiltration Policy Recommendations

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1 Introduction

The use of infiltration practices to reduce runoff and restore natural hydrologic processes is crucial to improving the City of Guelph's Natural Heritage System and Water Resource System, maintaining the viability of local stormwater infrastructure, and contributing to climate change adaptation and mitigation strategies. This stormwater infiltration policy will outline requirements to protect local groundwater and surface water resources using a risk-based approach developed based on current and future risks.

2 Purpose

This memo identifies existing policies related to the infiltration of stormwater runoff and contains recommendations for policies to identify site specific opportunities, constraints and approaches. It is intended that these recommendations will be integrated into the City of Guelph Stormwater Management Master Plan (SWM-MP) policies and would be utilized to identify, manage, and implement infiltration-based stormwater management controls, commonly referred to as Low Impact Development (LID) controls. This document will also help to inform infiltration policies and guidance for future watershed studies as part of the Natural Heritage Action Plan work.

The infiltration policies outlined in this memo are primarily intended to be used for retrofit opportunities and/or the redevelopment of land within the City's current built-up area. Within the built-up area, existing SWM infrastructure has generally not have been sized to account for infill and redevelopment; permitting infiltration practices may prevent the existing infrastructure from being overwhelmed. Where an implementation strategy has been developed through a Subwatershed Study, Master Drainage Plan, Secondary Plan or other planning study the infiltration recommendations contained within these detailed studies will generally supersede the SWM-MP infiltration policy recommendations (see **Section 4** for additional details).

The recommendations and identification of site-specific opportunities, constraints and approaches discussed in this memo relate directly to the protection of local groundwater resources and not the identification of opportunities to maximize groundwater recharge.

3 Existing Policy

Several existing policies provide a framework for the development of an infiltration policy within the City. It is recognized that as new policies are developed and technical studies are completed by planning authorities, the policies outlined in this memo will adapt to changes as part of an adaptive management approach. Existing policies that provide a framework include:

3.1 Provincial Policy Statement (MMAH, 2020)

The Provincial Policy Statement (PPS) provides policy direction on matters of provincial interest related to land use planning and development. Section 1.6.6.7 of the PPS states that planning for stormwater management shall:

- a) Be integrated with planning for sewage and water services and ensure that systems are optimized, feasible and financially viable over the long term;
- b) Minimize, or, where possible, prevent increases in contaminant loads;
- c) Minimize erosion and changes in water balance, and prepare for the impacts of a changing climate through the effective management of stormwater, including the use of green infrastructure;

- d) Mitigate risks to human health, safety, property and the environment;
- e) Maximize the extent and function of vegetative and pervious surfaces; and
- f) Promote stormwater management best practices, including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

Stormwater management is also discussed in the PPS under section 2.2.1 water wherein it is stated that Planning authorities shall protect, improve or restore the quality and quantity of water by:

- i) Ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

3.2 Stormwater Management Planning and Design Manual (MECP, 2003)

The Stormwater Management Planning and Design Manual (SWMPDM) provides technical and procedural guidance for the planning, design, and review of stormwater management practices. The 2003 SWMPDM recognizes that lot level and conveyance controls are “required to maintain the natural hydrologic cycle to the greatest extent possible”. Appendix G of the 2003 SWMPDM manual discusses methodology for the retrofitting of existing infrastructure to achieve water balance, water quantity, water quality, and erosion and flood control goals.

3.3 Grand River Watershed Water Management Plan (GRCA, 2014)

The Water Management Plan addresses the management of surface and ground water resources in the Grand River watershed to 2031. The Watershed Plan pulls together plans such as forestry, fisheries, natural heritage, drinking water source protection, recreation and other planning processes so that linkages can be made for larger scale watershed planning. Section 5.2.1.3.2 of the Grand River Watershed Water Management Plan references Urban Stormwater. MOE’s 2003 SWMPDM states that municipalities within the GRCA jurisdiction are collaborating to compose a list of best practices for stormwater control for both new and existing developments. This was released as the *Best Practice Guide for Reducing Urban Non-point Source Pollution in the Grand and Speed Rivers*. This guide includes thirteen recommendations that fall under three categories, including: improved stormwater management governance; sustainable funding; and enhanced stormwater management education.

3.4 City of Guelph Official Plan (City of Guelph, March 2018 Consolidation)

The City of Guelph Official Plan (OP) is used to direct growth and provide a policy framework and guidance to the development of the City. The use of LID stormwater management practices and infiltration are discussed in several policies in the OP.

The OP defines Low Impact Development as:

a stormwater management strategy that seeks to mitigate the impacts of increased runoff and stormwater pollution by managing runoff as close to its source as possible. LID comprises a set of site design strategies that minimize runoff and distributed, small scale structural practices that mimic natural or pre-development hydrology through the processes of infiltration, evapotranspiration, harvesting, filtration and detention of stormwater. Site specific designs that can be used to control stormwater include, but are not limited to, rainwater harvesting, green roofs, bio-retention, permeable pavers, infiltration facilities and vegetated swales.

Stormwater management policies are covered in Section 6.4 of the OP. This section includes the following policies relating to infiltration of stormwater:

- (1)** All development shall occur in accordance with Subwatershed Plans or Stormwater Management Master Plans, as approved by the City of Guelph and the Grand River Conservation Authority.
- (3)** Development shall require the preparation of a detailed Stormwater Management and Engineering Report in accordance with policies 6.4.1 or 6.4.2 above, to the satisfaction of the City and the Grand River Conservation Authority, where applicable, that addresses the following matters and other issues as may be required by the City:
 - (iii)** Geotechnical and hydrogeologic information to identify soil infiltration rates, depths to the seasonally high water table and deeper regional aquifers beneath the site and in the surrounding area;
 - (iv)** Information on the potential impacts in terms of quality and quantity of any proposed stormwater management techniques on the City's groundwater resources.
- (4)** The City will require appropriate use of on-site infiltration measures, within the stormwater management design.
- (5)** The City encourages the use of landscape-based stormwater management planning and practices (also referred to as Low Impact Development) including rainwater harvesting, green roofs, bioretention, permeable pavement, infiltration facilities and vegetated swales in the design and construction of new development where site conditions and other relevant technical considerations are suitable.
- (6)** The City encourages approaches to stormwater management that include a combination of lot level, conveyance and end-of-pipe stormwater controls to maintain the natural hydrologic cycle, protect water quality and quantity and minimize erosion and site alteration and flooding impacts.

Sustainable urban design policies are covered in Section 8.1 of the OP. This section includes the following policy relating to infiltration of stormwater:

- (1)** The design of site and building development will support energy efficiency and water conservation through the use of alternative energy systems or renewable energy systems, building orientation, sustainable building design, low impact stormwater infiltration systems, drought-resistant landscaping and similar measures.

Source protection policies are covered in Section 4.3.3 of the OP. This section includes the following policies relating to infiltration of stormwater:

- (1)** The entire city area is considered to be a recharge area for municipal drinking water supply. To protect this valuable water resource, the City will introduce conditions of development approval that:
 - (i)** Protect wetlands and other areas that make significant contributions to groundwater recharge;
 - (ii)** Ensure that stormwater management systems protect water quality and quantity;
 - (v)** Require impact studies and risk management plans where proposed development has the potential to affect the quantity or quality of groundwater resources.

Section 11.1.2.2 outlines core principles for the Downtown area. Principle 7 aims to Embody Guelph's Green Ambitions, including the following target:

- (iii) Decrease overall stormwater running off impermeable surfaces into sewers and increase water infiltration and recycling.

Stormwater management in the Downtown area is outlined in Section 11.1.6.3 of the OP. This section includes the following policy relating to infiltration of stormwater:

(11.1.6.3.2) Low Impact Development (LID) measures intended to minimize stormwater run-off and recharge groundwater systems, including rainwater harvesting and reuse systems, bio-swales or water features, infiltration measures, permeable paving materials and green roofs, shall be encouraged.

(11.1.6.3.3) The City will explore opportunities to integrate end-of-pipe stormwater management storage and treatment facilities, including constructed wetlands/ponds, and LID measures into the public realm areas such as open space, amenity areas and right of ways, where feasible and appropriate.

Stormwater management in the Guelph Innovation District is outlined in Section 11.2.3.4 of the OP. This section includes the following policy relating to infiltration of stormwater:

(1) Development within the GID shall be in accordance with the watershed planning and water resources policies, and stormwater management policies of the Official Plan and the following:

(a) Low Impact Development (LID) measures intended to minimize stormwater run-off and recharge groundwater, including but not limited to rainwater harvesting and reuse systems, bio-swales or water features, infiltration facilities, permeable pavement and green roofs, shall be encouraged; and

(b) The City will explore opportunities to integrate LID measures into the public realm areas such as open space, amenity areas and right-of-ways, where feasible and appropriate.

3.5 Grand River Source Protection Plan (LERSPC, 2016)

Drinking water source protection plans identify the risks to municipal water quality and water supplies, and the policies and programs that will reduce the risks. Volume II of the Grand River Source Protection Plan covers the City of Guelph. Specific policies relating to Stormwater Management within Wellhead Protection Areas (WHPA) can be found in policy **CG-MC-15**.

CG-MC-15: For the existing or future discharge of stormwater from a stormwater management facility within vulnerable areas where this activity is or would be a significant drinking water threat, the Ministry of the Environment shall ensure that the Environmental Compliance Approval that governs the stormwater management facility includes appropriate terms and conditions to ensure that the activity ceases to be and/or never becomes a significant drinking water threat.

In addition, specific policies relating to the Handling and Storage of Road Salt can be found in policies CG-CW-28 to CG-CW-31.

CG-CW-28: To ensure that the future handling and storage of road salt never becomes a significant drinking water threat within the vulnerable areas, where this activity would be a significant drinking water threat, within two (2) years of the date that the Source Protection Plan comes into effect, the City of Guelph shall amend the Salt Management Plan to identify the location of Wellhead Protection Areas and utilize best management practices in these areas.

CG-MC-29: To ensure that the future handling and storage of salt never becomes a significant drinking water threat, where this activity would be a significant drinking water threat, the City of Guelph shall require new development to be designed based on best management practices regarding handling and storage.

CG-MC-30: To ensure that future storage of road salt of greater than 5,000 tonnes never becomes a significant drinking water threat within vulnerable areas, where this activity would be a significant drinking water threat, this activity shall be prohibited using tools under the Planning Act.

CG-CW-31: To ensure that the future handling and storage of road salt never becomes a significant drinking water threat within the vulnerable areas, where this activity would be a significant drinking water threat, the City of Guelph shall establish or enhance the education and outreach programs for the private and public sector, as well as the general public, about the impacts of road salt on drinking water sources and the use of best management practices. It is recommended that the key messages be the efficient use of road salts and the use of alternatives.

Wellhead Protection Zones A, B, C: Most of the City of Guelph is within Wellhead Protection Zones A-C, with the exception of the far southern end of the City, generally south of Serena Lane.

Issue Contributing Areas (ICAs): The Ontario Clean Water Act, 2006, defines a Drinking Water Threat as “an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water, and includes an activity or condition that is prescribed by the regulation as a drinking water threat.”

Within the City of Guelph, two ICAs have been identified. One ICA for trichloroethylene (TCE) extends through much of the City. The second ICA, for nitrate and TCE, is a small area between Arkell Road, Victoria Road and Stone Road, centred around Torrance Creek. The corresponding ICAs are illustrated in **Figure 3.1**. The ICAs were delineated based on the detection of TCE or nitrate in four municipal wells, including:

- Smallfield: TCE was detected at elevated concentrations in 1993, at which point the well was taken offline. In 2008, TCE concentrations were approximately 25 µg/L, still significantly above the Ontario Drinking Water Standard Maximum Acceptable Concentration (MAC) of 5 µg/L. Handling and storage of DNAPLs occurred at 117 properties within the Smallfield and Sacco capture zones, and handling and storage of organic solvents occurred at 29 properties; one or more of these properties could be contributing to the high TCE concentrations (AquaResource, 2010).
- Emma: TCE concentrations are elevated but below half of the MAC. Within the Emma capture zone, four properties operated a waste disposal site, 45 properties handled and stored DNAPLs, and 2 properties handled and stored organic solvents (AquaResource, 2010).
- Membro: TCE concentrations are elevated but below half of the MAC. Within the Membro capture zone, one property operated a waste disposal site, 352 properties handled and stored DNAPLs, and 91 properties handled and stored organic solvents (AquaResource, 2010).

- Carter: The two Carter wells are classified as “groundwater under the direct influence of surface water with effective in-situ filtration” (City of Guelph, 2020). Since 2002, nitrate concentrations in the Carter wells have been above the Ontario Drinking Water Standard; however, water from the wells is mixed with water from the Arkell Spring Grounds so that the water entering the distribution system is below the standard (AquaResource, 2010). The land application of fertilizer and/or manure may be contributing to the elevated nitrate concentrations.

Although ICAs have not been identified for sodium and chloride within the City, groundwater concentrations of these elements have been increasing. At some wells, sodium concentrations have exceeded 20 mg/L, the level at which the local Medical Officer of Health needs to be notified. Based on these trends, both sodium and chloride have been identified as contaminants to be addressed as part of this infiltration policy. Since the majority of the City is within Wellhead Protection Zones A-C, infiltration restrictions related to sodium and chloride will apply to the entire City.

3.6 Natural Heritage Action Plan (City of Guelph, 2020)

The Natural Heritage Action Plan (NHAP) is the implementation framework for the natural heritage system and watershed planning policies outlined in the Official Plan. In conjunction with other municipal plans, the NHAP guides the management of the City’s natural heritage system and water resources. The guiding objective of the NHAP is from the Official Plan and is to practice and encourage effective management of stormwater in order to maintain or enhance the water resources of the city. The NHAP acknowledges the important role infiltration plays in the hydrology of wetlands, headwater tributaries and aquifers, and therefore includes the following recommendations which relate to stormwater infiltration:

- Developing Guelph-specific LID standards for stormwater management to assist development and capital projects in integrating alternative designs for supporting water quality and quantity protection consistent with the Ministry of Environment, Conservation and Parks LID companion document to the Stormwater Management Planning and Design Manual; and
- Reviewing and updating the City’s design principles for stormwater management, demarcation and park naturalization policies in the context of the City’s current natural heritage, urban forest and parks and recreation objectives.

3.7 Low Impact Development Planning and Design Guide (STEP, 2020)

Although not a policy, the Low Impact Development Planning and Design Guide developed by the Sustainable Technologies Evaluation Program (wiki.sustainabletechnologies.ca) provides highly relevant guidance to the design of LID facilities throughout southern Ontario. It is recommended that the design guidance from this document be followed for all LID facilities implemented within the City of Guelph. The SWM-MP will identify which LID facilities are acceptable for implementation within the City, when implemented per the Infiltration Policy and the appropriate design guidelines.



4 Applicability of Policy

4.1 Other Planning Studies

The infiltration policies outlined in this memo are primarily intended to be used for retrofit opportunities and/or the redevelopment of land within the City’s current built up area. Where a stormwater strategy has been developed through a Subwatershed Study, Master Drainage Plan, Secondary Plan or other planning study the infiltration recommendations contained within these detailed studies will generally supersede the SWM-MP infiltration policy recommendations.

However, where a planning study was completed prior to Source Water Protection Planning, the infiltration requirements from the applicable study will apply, with consideration for the infiltration restrictions from the Infiltration Policy, and with the following exemptions:

- At the City’s discretion and on a case-by-case basis, for sites located within 200 metres of a surface water receiver, an appropriate analysis may be conducted including, but not limited to, a site-specific hydrogeological study to determine the ultimate fate of infiltrated water. Despite restrictions placed on infiltration due to WHPA Vulnerability Scoring in the Infiltration Policy, infiltration of road runoff may be permitted if the ultimate fate of infiltrated road runoff is determined, through a site-specific hydrogeological study, to be a surface water receiver; and
- Where infiltration is not permitted by the Infiltration Policy, filtration measures (both LID and conventional, mechanical treatment) may be considered at the discretion of the City. LID filtration shall be subject to the use of an approved liner (see **Section 5.3**).

Table 4.1 and **Figure 4.1** present the areas of the City with existing infiltration requirements that have been identified by a Subwatershed Study, Master Drainage Plan, Secondary Plan or other planning study. Future studies may supersede these existing requirements, or may put new requirements in place where none currently exist.

Table 4.1: Existing Infiltration Targets

Policy Area	Location	Infiltration
1	Hanlon Industrial Business Park [‡]	<ul style="list-style-type: none"> • Recharge[†] Volume (acre feet) = 5-year peak flow (ft³/s) x 0.035
2	HCBP Pond 1 [‡]	<ul style="list-style-type: none"> • Block-by-block recharge rates to be met*
3	HCBP Pond 2 & 4 [‡]	<ul style="list-style-type: none"> • Block-by-block recharge rates to be met*
4	Hanlon Creek Subwatershed [‡]	<ul style="list-style-type: none"> • No urban drainage permitted to the headwaters of Tributary E or F, except for lands that currently have positive drainage outlet, unless a pilot scale (15-20ha) development demonstrates the effectiveness of the proposed infiltration system over a five-year period. • Areas adjacent to Clair Road can drain into greenway system of Upper Hanlon area subject to the same design criteria. • Areas south of Clair Road but isolated by hummocky topography from any direct outlet must rely on internal drainage by means of infiltration/evaporation. • Upper part of Tributary A – see HCBP (Policy Areas 2 and 3)

Policy Area	Location	Infiltration
5	Torrance Creek Subwatershed [†]	<ul style="list-style-type: none"> • Zone 1 (Catchments 101, 130, 132, 135, 145, 140, 150, 160) <ul style="list-style-type: none"> ○ Zero runoff requirement (1:100 year volume captured, all water infiltrates) • Zone 2 (Catchments 102-120, 124, 126) <ul style="list-style-type: none"> ○ Infiltration target of between 100 and 150mm/yr • Zone 3 (Catchments 162, 165, 170, 175 and 180) <ul style="list-style-type: none"> ○ Infiltration targets of between 100 and 150 mm/yr
6	The Ward	<ul style="list-style-type: none"> • No infiltration BMPs permitted
7	Guelph Innovation District	<ul style="list-style-type: none"> • 27mm capture in infiltrative LID BMPs
8	Clair-Maltby	<ul style="list-style-type: none"> • 20 mm captured within LID BMPs
9A	Guelph Downtown – Dublin/Gordon	<ul style="list-style-type: none"> • No infiltration BMPs permitted
9B	Guelph Downtown – Quebec/Macdonell	<ul style="list-style-type: none"> • No infiltration BMPs permitted
10	Clythe Creek Subwatershed [‡]	<ul style="list-style-type: none"> • Maintain pre-development water balance
11	Mill Creek Subwatershed [‡]	<ul style="list-style-type: none"> • Maintain existing recharge and discharge characteristics
12	Southgate and Irish Creek Subwatershed	<ul style="list-style-type: none"> • Minimum groundwater recharge target of 300 mm/year • Quantity and proportion of runoff to Wetlands B and E should be maintained • Runoff quantities to Wetlands A-H should be maintained • Retain and infiltrate up to Regional Storm Event
13	City-Wide	<ul style="list-style-type: none"> • Maintain predevelopment recharge rate, volume and hydroperiods at post-development conditions

[†] It has been assumed that recharge, a term typically used in older reports, is equivalent to infiltration.

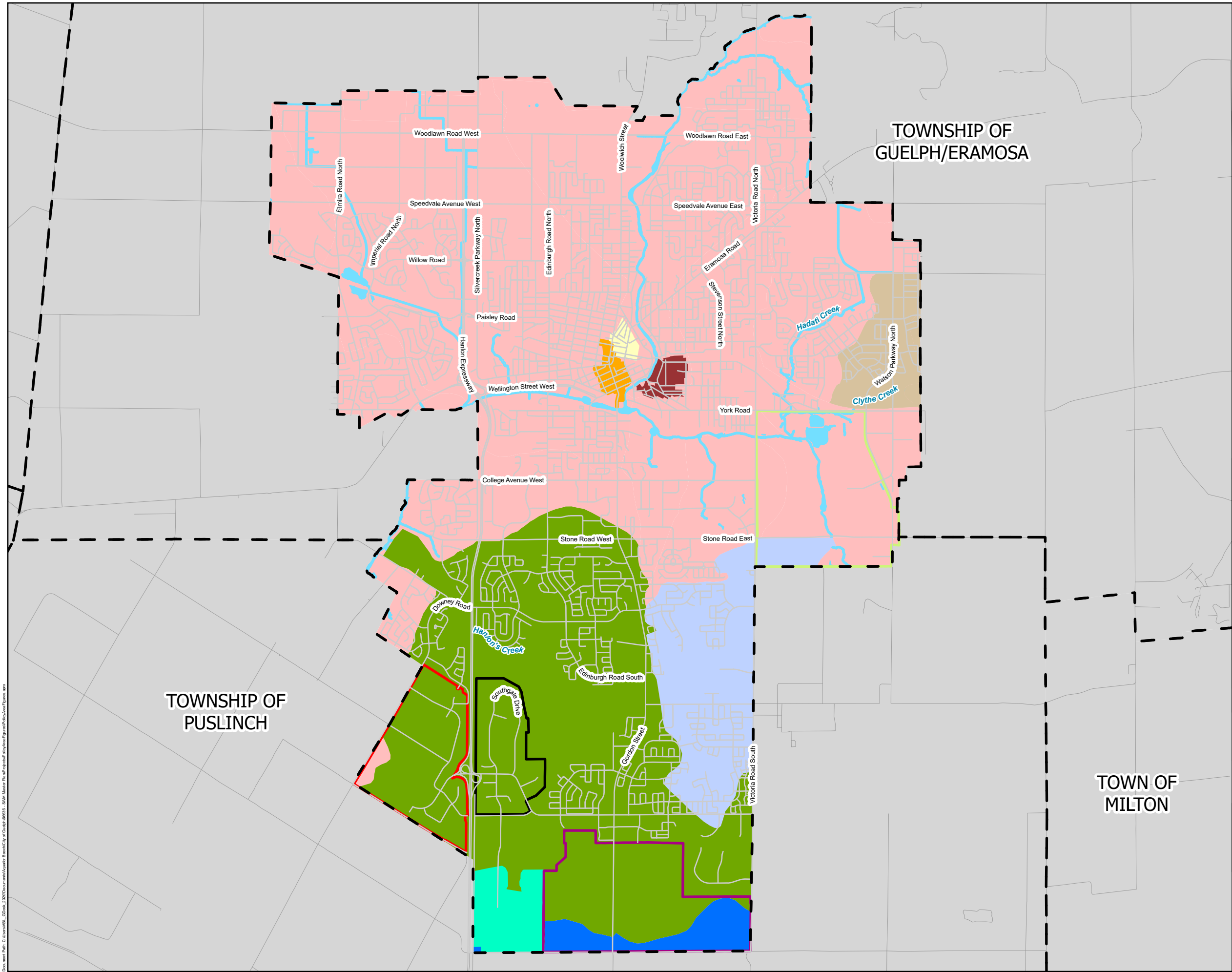
^{*} As outlined in Figure 17 and Table 4 from the HCBP EIR Hydrogeology Report (May 2008, Banks Groundwater Engineering Limited)

[‡] Study was completed prior to the approval of Grand River Source Protection Plan in November 2015.

4.2 Criteria Boundaries

Sections 5 and 6 outline the applicable criteria to determine infiltration restrictions and opportunities for private and municipal property, as well as for municipal roads. Where a subject site crosses a boundary (eg. is partially within WHPA 10 and partially within WHPA 8), the relevant restrictions and opportunities will apply to each side of the boundary.

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Legend

- Municipal Boundary
- Rivers
- Road Centreline

Policy Area:

- Policy Area 1: Hanlon Industrial Business Park
- Policy Area 2 & 3: Hanlon Creek Business Park Ponds 1, 2 & 4
- Policy Area 4: Hanlon Creek Subwatershed
- Policy Area 5: Torrance Creek Subwatershed
- Policy Area 6: The Ward
- Policy Area 7: Guelph Innovation District
- Policy Area 8: Clair-Maltby
- Policy Area 9A: Guelph Downtown - Dublin/Gordon
- Policy Area 9B: Guelph Downtown - Quebec/Macdonell
- Policy Area 10: Clythe Creek Subwatershed
- Policy Area 11: Mill Creek Subwatershed
- Policy Area 12: Southgate and Irish Creek Subwatershed
- Policy Area 13: City-Wide

LOCATOR MAP

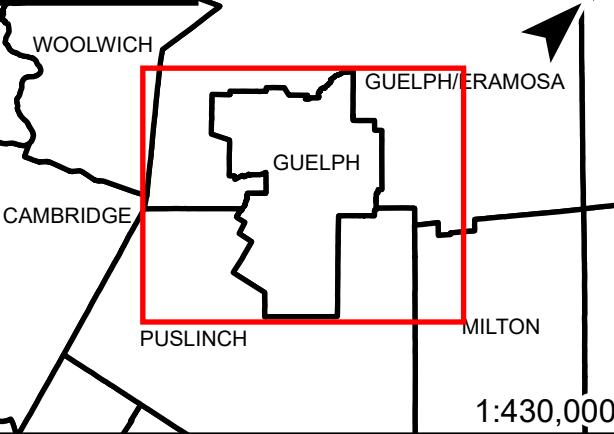
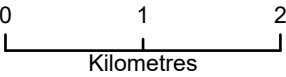


Figure 4.1

Existing Infiltration Target Boundaries
(note: future studies may supersede existing studies or areas without studies)

Date: 2022-11-09
Projection: NAD83_UTM_Zone_17N
Data Source: City of Guelph, GRCA, Natural Resource Solutions
Created by: A.V.



5 Infiltration Plan for Private and Municipal Property

Stormwater infiltration opportunities and constraints are identified below. The general goal of this risk-based approach is to provide an effective way of identifying infiltration opportunities to minimize ecological and hydrologic impacts of runoff while protecting local groundwater resources from contamination, specifically identified issues and threats such as TCE and nitrate, as well as emerging threats such as sodium and chloride.

5.1 High-risk Site Activities

For all sites, infiltration practices (eg. infiltration-based LID practices) should not accept runoff from drainage areas within the site which are associated with higher risks such as fueling stations, waste disposal areas, vehicle washing stations, salt storage areas, stockpiling areas and shipping and receiving areas. Instead of infiltration-based stormwater practices, pollution prevention practices in the form of administrative and engineering controls should be applied in these areas, with stormwater management provided through conventional approaches.

Table 5.1 identifies individual high-risk site activities based on O.Reg. 153/04 and O.Reg. 287/07. High-risk site activities are defined as those with the potential for high levels of contamination such as hydrocarbons, metals, organic and inorganic compounds, and sediments. At this scale of study, it is impossible to predict the long-term site-specific activities of individual sites; however, **Table 5.1** can be used as a screening framework for identifying **portions** of each site where additional focus and review is needed to where LIDs should be discouraged, due to risk associated with the specific uses.

While salt is recognized as a Prescribed Drinking Water Threat, it is being managed through restriction of infiltration practices to low-risk areas of the City and is therefore considered separately from the other high-risk activities within **Table 5.1**. Restrictions on infiltration due to salt are discussed further in **Sections 5.12** and **5.3**.

Additional high-risk sites include brownfield sites, defined as undeveloped or previously developed properties that may be contaminated. They are usually, but not exclusively, former industrial or commercial properties that may be underutilized, derelict or vacant. An Environmental Site Assessment (ESA) is required to develop brownfield sites. These sites are different from Greyfield sites, which are previously developed sites that are known or have been shown not to be contaminated.

Infiltration practices are prohibited for sites with anthropogenically contaminated soils that have not been fully remediated due to the possibility and risk of mobilizing the contaminants (EPA, 2008). If remediation plans are developed and approved by the City, and remediation is to occur as part of the site development activities which will remove the contamination and/or reduce the risk to groundwater and/or mobilization of the contaminants off-site, then infiltration-based LID may be permitted.

Drainage areas containing a site with high-risk activities (**Table 5.1**) and/or contaminated soils will generally be discouraged from incorporating LID techniques that utilize infiltration as its primary function within the identified catchment because of the associated risk to groundwater contamination. **However, high-risk site activities do not preclude the use of those LID techniques that utilize filtration, evapotranspiration (ET) or re-use as the primary processes.** Additionally, the infiltration of rainwater from catchments that are isolated from the respective high-risk site activities such as rainwater emanating from rooftops, employee parking facilities or directly falling on permeable surfaces is generally considered relatively 'clean' and should not be excluded from infiltration into clean soils (ie, not contaminated soils).

Table 5.1: High-Risk Site Activities Which Preclude the Use of Infiltration-Based LID BMPs Within the Contributing Catchment Area

Potentially Contaminating Activities (O.Reg 153/04 Table 2)		
<ul style="list-style-type: none">• Acid and Alkali Manufacturing, Processing and Bulk Storage• Adhesives and Resins Manufacturing, Processing and Bulk Storage• Airstrips and Hangars Operation• Antifreeze and De-icing Manufacturing and Bulk Storage• Asphalt and Bitumen Manufacturing• Battery Manufacturing, Recycling and Bulk Storage• Boat Manufacturing• Chemical Manufacturing, Processing and Bulk Storage• Coal Gasification• Commercial Autobody Shops• Commercial Trucking and Container Terminals• Concrete, Cement and Lime Manufacturing• Cosmetics Manufacturing, Processing and Bulk Storage• Crude Oil Refining, Processing and Bulk Storage• Discharge of Brine related to oil and gas production• Drum and Barrel and Tank Reconditioning and Recycling• Dye Manufacturing, Processing and Bulk Storage• Electricity Generation, Transformation and Power Stations• Electronic and Computer Equipment Manufacturing• Explosives and Ammunition Manufacturing, Production and Bulk Storage• Explosives and Firing Range• Fertilizer Manufacturing, Processing and Bulk Storage	<ul style="list-style-type: none">• Fire Retardant Manufacturing, Processing and Bulk Storage• Fire Training• Flocculants Manufacturing, Processing and Bulk Storage• Foam and Expanded Foam Manufacturing and Processing• Garages and Maintenance and Repair of Railcars, Marine Vehicles and Aviation Vehicles• Gasoline and Associated Products Storage in Fixed Tanks• Glass Manufacturing• Importation of Fill Material of Unknown Quality• Ink Manufacturing, Processing and Bulk Storage• Iron and Steel Manufacturing and Processing• Metal Treatment, Coating, Plating and Finishing• Metal Fabrication• Mining, Smelting and Refining; Ore Processing; Tailings Storage• Oil Production• Operation of Dry-Cleaning Equipment (where chemicals are used)• Ordnance Use• Paints Manufacturing, Processing and Bulk Storage• Pesticides (including Herbicides, Fungicides and Anti-Fouling Agents) Manufacturing, Processing, Bulk Storage and Large-Scale Applications• Petroleum-derived Gas Refining, Manufacturing, Processing and Bulk Storage• Pharmaceutical Manufacturing and Processing	<ul style="list-style-type: none">• Plastics (including Fibreglass) Manufacturing and Processing• Port Activities, including Operation and Maintenance of Wharves and Docks• Pulp, Paper and Paperboard Manufacturing and Processing• Rail Yards, Tracks and Spurs• Rubber Manufacturing and Processing• Salt Manufacturing, Processing and Bulk Storage• Salvage Yard, including automobile wrecking• Soap and Detergent Manufacturing, Processing and Bulk Storage• Solvent Manufacturing, Processing and Bulk Storage• Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems• Tannery• Textile Manufacturing and Processing• Transformer Manufacturing, Processing and Use• Sewage Treatment and Sewage Holding Facilities• Vehicles and Associated Parts Manufacturing• Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste, other than use of biosoils as soil conditioners• Wood Treating and Preservative Facility and Bulk Storage of Treated and Preserved Wood Products
Prescribed Drinking Water Threats (O.Reg. 287/07)		
<ul style="list-style-type: none">• The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.• The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.• The application of agricultural source material to land.• The storage of agricultural source material.• The management of agricultural source material.• The application of non-agricultural source material to land.• The handling and storage of non-agricultural source material.	<ul style="list-style-type: none">• The application of commercial fertilizer to land.• The handling and storage of commercial fertilizer.• The application of pesticide to land.• The handling and storage of pesticide.• The application of road salt.¹• The handling and storage of road salt.• The storage of snow.• The handling and storage of fuel.• The handling and storage of a dense non-aqueous phase liquid.• The handling and storage of an organic solvent.	<ul style="list-style-type: none">• The management of runoff that contains chemicals used in the de-icing of aircraft.• An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.• An activity that reduces the recharge of an aquifer.• The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.• The establishment and operation of a liquid hydrocarbon pipeline. O. Reg. 385/08, s. 3; O. Reg. 206/18, s. 1.
Other Threats		
<ul style="list-style-type: none">• Anthropogenically contaminated soils that have not been fully remediated		

¹ Although salt is included as a Prescribed Drinking Water Threat, it is being managed through restrictions to infiltration in high-risk areas and through City and Private Salt Management Plans, and therefore does not automatically prohibit infiltration.

5.2 Infiltration Policy Recommendations

There is generally less risk of groundwater contamination associated with the infiltration of runoff from pervious surfaces and relatively clean impervious surfaces such as roof tops, which should be considered a priority for infiltration. There is, however, a need to infiltrate runoff from other impervious surfaces in order to reduce runoff and restore natural hydrologic processes. Taking these objectives and constraints into consideration, the policy recommendations outlined in **Section 5.2** take a tiered risk-based approach. The policies take into consideration both the source of runoff and groundwater vulnerability. The policies impose greater restriction on infiltration practices within WHPAs. **Table 5.2** summarizes the respective policy recommendations for the various site constraints and opportunities and outlines the potential LID controls that are acceptable for implementation. **Figure 5.1** provides a flow-chart which summarizes the infiltration restrictions outlined in **Sections 5.2.1** to **5.2.5**.

5.2.1 High-Risk Site Activities

Infiltration practices shall be restricted from being constructed with contributing drainage areas that include facilities where spills can cause damage to the infiltration practices and/or contribute to the contamination of groundwater. These high-risk site activities include, but are not limited to those listed in **Table 5.1**. Examples of common high-risk site activities include automotive fueling stations, waste disposal areas, vehicle washing stations, salt storage areas, stockpiling areas (soils, aggregate, landscape products, etc.) and shipping and receiving areas.

5.2.2 Wellhead Protection Area

Since the City of Guelph relies on a distributed network of municipal water supply wells, much of the City is located within a WHPA (**Figure 3.1**). For all sites within WHPAs with vulnerability scores equal to or greater than 8, stormwater infiltration practices should not be used to treat runoff from paved surfaces (eg. parking surfaces). This is to prevent contamination of groundwater from salt-based de-icers commonly used on these surfaces in the winter.

5.2.3 Issue Contributing Areas

A TCE and a nitrate ICA are each present within the City of Guelph. However, as infiltration restrictions on high-risk site activities in **Table 5.1** provide adequate risk-mitigation for infiltration within the TCE ICA, and agricultural runoff is the primary issue for the nitrate ICA, neither ICA requires additional restrictions in infiltration within the City.

5.2.4 Sodium and Chloride

Sodium and chloride are emerging threats and as such, have not yet been mapped as an ICA. However, Golder (2019) completed a thorough assessment of risks to municipal drinking water systems in Guelph from the application of road salt. This assessment identified significant risk areas throughout the City where greater restrictions on infiltration of salt-laden water are required, which align very closely with the boundaries of WHPA 10. As the WHPA 10 boundaries are slightly larger than the significant risk areas, WHPA 10 was therefore used to represent the areas of highest risk of sodium and chloride.

5.2.5 Sources of Water

5.2.5.1 Rooftops

Roof surfaces of buildings across the City are ideal sources of clean water to be routed to infiltration practices. Infiltration of roof runoff should be encouraged wherever possible. However, scrubber units

are frequently placed on rooftops within Industrial areas. There is the potential for contamination especially from damaged or improperly maintained rooftop industrial scrubbers. A risk-based approach is recommended on these properties. As part the site plan review process, City staff will ask proponents whether a rooftop scrubber will be installed, and will, on a case-by-case basis, prohibit the infiltration of stormwater from industrial roofs with scrubbers and/or that house scrubber waste including all liquid solutions, solids, pastes and powder waste products.

5.2.5.2 Landscaped Areas and Manicured Lawns

Infiltration practices shall be generally encouraged for runoff originating from landscaped areas (front, side or rear yards) and from manicured lawns².

5.2.5.3 Driveways

Infiltration from driveways within Low-Density Residential areas (Zones R1-R2, and individual Townhouse driveways within R3, but excluding Townhouse Complex driveways) may be permitted, where feasible and appropriate across the City. The risks associated with runoff from these driveways is minimal.

5.2.5.4 Parking Lots

Salt application on parking lots can be very high, and as such, infiltration from parking lots is to be restricted. If the site is within a WHPA with vulnerability scores of 10, infiltration practices should not be used to treat runoff from parking lots. However, if the vulnerability score is equal to or less than 8, infiltration of parking lot runoff is encouraged only if a Private Salt Management Plan (PSMP) is completed for the subject property. The Private Salt Management Plan is to comply with the City's "Private Salt Management Plans in the City of Guelph: Guidance Document for Proponents" (2016, and as amended from time to time).

5.2.5.5 Other Paved Surfaces (Municipal Roads Excepted)

Other paved surfaces exist throughout the City, and include surfaces such as trails or sports facilities like tennis courts or basketball courts. If these surfaces receive winter maintenance, then infiltration practices should not be used to treat runoff from these surfaces if the site is within a WHPA with vulnerability scores of 10. If the vulnerability score is equal to or less than 8, infiltration of runoff is encouraged only if a Private Salt Management Plan (PSMP) is completed for the subject property. The Private Salt Management Plan is to comply with the City's "Private Salt Management Plans in the City of Guelph: Guidance Document for Proponents" (2016, and as amended from time to time).

Municipal roads are considered separately (see **Section 6**).

² A manicured lawn is a lawn which receives fertilizer application as organic or inorganic forms.

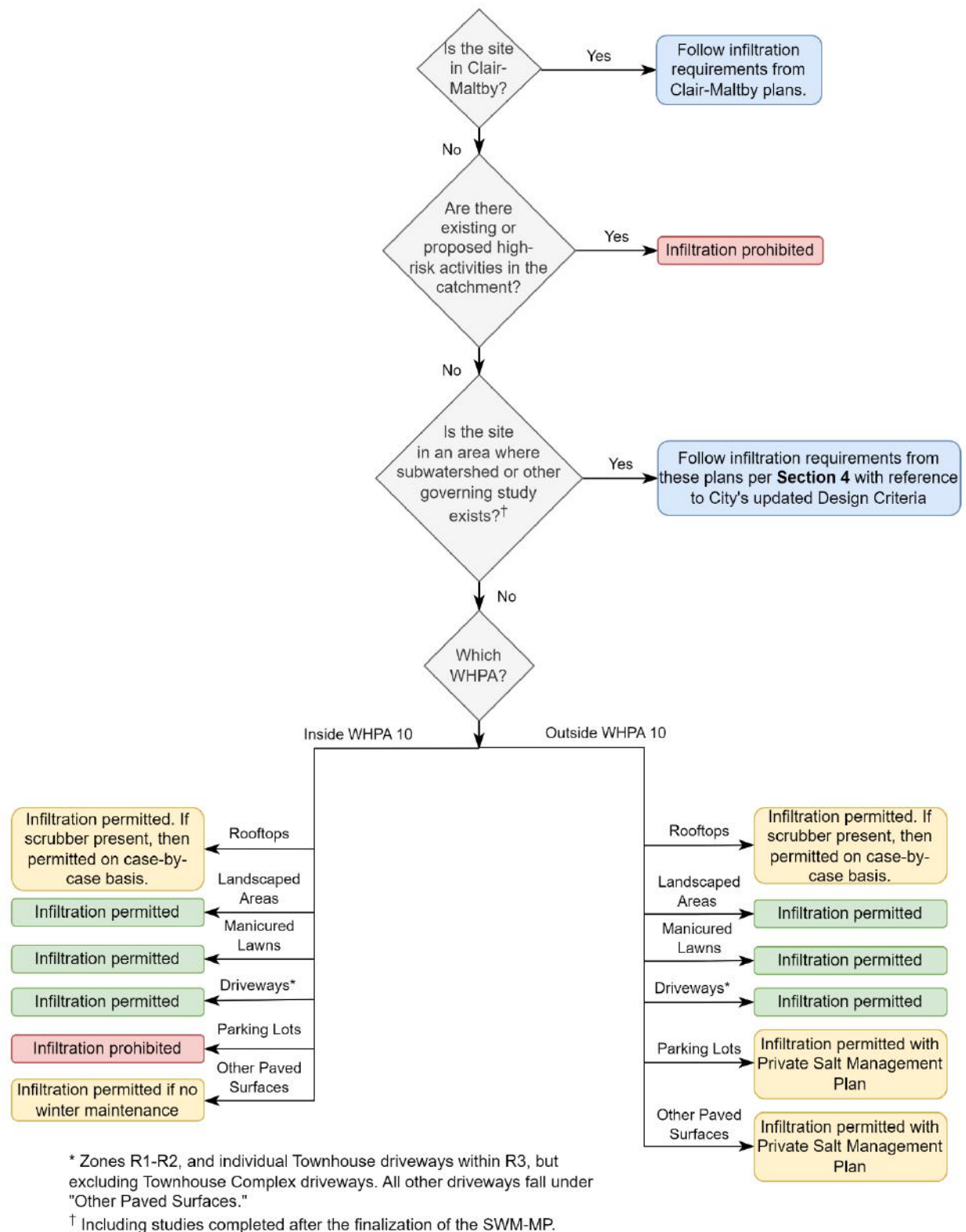
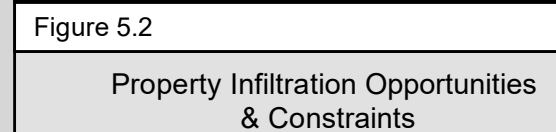
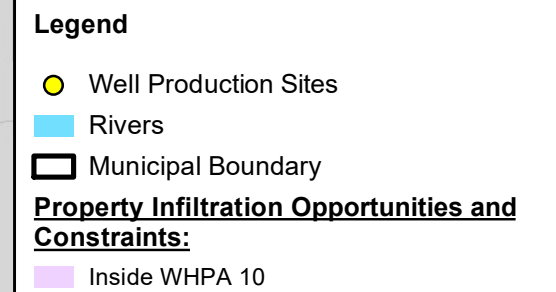


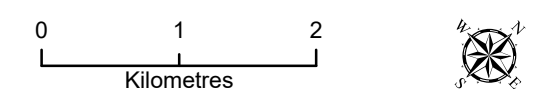
Figure 5.1: Infiltration Decision Flow-Chart

Table 5.2: Property Infiltration Opportunities and Constraints

		Rooftops	Landscaped Areas	Manicured Lawns ²	Driveways	Parking Lots	Other Paved Surfaces
Inside WHPA 10	Runoff Source Opportunities	Permitted	Permitted	Permitted	Permitted from freehold, single-owner properties	Prohibited	Permitted if no winter maintenance occurs
	Runoff Source Constraints	Industrial scrubbers on roof, High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	-	Winter Maintenance, High-risk Site Activities (Table 5.1), Contaminated Soils
	Acceptable Practices	Soakaways, Infiltration Trenches and Chambers; Downspout Disconnection; Bioretention	Soakaways, Infiltration Trenches and Chambers; Bioretention	Soakaways, Infiltration Trenches and Chambers; Bioretention	Permeable Pavement; Soakaways, Infiltration Trenches and Chambers; Bioretention	Lined Filtration Trenches and Chambers; Lined Bioretention	Permeable Pavement, Soakaways, Infiltration Trenches and Chambers; Bioretention; Lined Filtration Trenches and Chambers; Lined Bioretention
Outside WHPA 10	Runoff Source Opportunities	Permitted	Permitted	Permitted	Permitted from freehold, single-owner properties	Permitted with Private Salt Management Plan	Permitted with Private Salt Management Plan
	Runoff Source Constraints	Industrial scrubbers on roof, High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils	High-risk Site Activities (Table 5.1), Contaminated Soils
	Acceptable Practices	Soakaways, Infiltration Trenches and Chambers; Downspout Disconnection; Bioretention	Soakaways, Infiltration Trenches and Chambers; Bioretention	Soakaways, Infiltration Trenches and Chambers; Bioretention	Permeable Pavement; Soakaways, Infiltration Trenches and Chambers; Bioretention	Permeable Pavement; Soakaways, Infiltration Trenches and Chambers; Bioretention; Lined Filtration Trenches and Chambers; Lined Bioretention	Permeable Pavement; Soakaways, Infiltration Trenches and Chambers; Bioretention; Lined Filtration Trenches and Chambers; Lined Bioretention



Date: 2022-06-14
Projection: NAD83_UTM_Zone_17N
Data Source: City of Guelph, GRCA, Natural Resource Solutions
Created by: J.R.



5.3 Filtration Practices

In areas of the City where infiltration practices are prohibited in order to protect groundwater, filtration practices may still be installed. These features filter and release runoff to the municipal sewer network, overland drainage network, or directly to a receiver such as a watercourse or wetland, at a prescribed rate and volume (i.e., stormwater management design criteria). A portion of the runoff from these facilities is evapotranspired, and these features also delay the peak flow. At the City's discretion, and with the City's explicit approval, these filtration practices may be used:

- Flexible liners; and/or
- Hardened closed-bottom structures (eg. plastic or concrete tanks, vaults, or chambers).

It is recommended that the City initiate a pilot study to test the use of gated or closable inlets to allow for facilities to infiltrate during summer months, but act as filtration facilities when salt is applied within the catchment during the winter.

6 Infiltration Plan for Municipal Roads

Road segments often bisect multiple land uses and as such require their own infiltration policy. The City of Guelph road classification system is based on people movement and includes the classifications identified in **Table 6.1**.

Table 6.1: Municipal Road Classification and Characteristics

Road Classification Characteristics	Road Classification		
	Arterial	Collector	Local
ROW Width	26–36 m	23–26 m	17–20 m
Number of Lanes	2–6 lanes	2–4 lanes	2 lanes
Traffic Volume	Moderate to Large	Low to Moderate	Low
Vehicle Speed	Medium	Moderate	Low
Transit	High Service Level	Transit Service	Transit Service
On-Street Parking Provisions	May be permitted to achieve urban design objectives	Permitted where parking needs identified	Permitted where appropriate

Sodium and chloride are emerging threats and as such, have not yet been mapped as an ICA. The City of Guelph is therefore taking a conservative approach to protect groundwater resources throughout the City, as described in **Sections 6.1 to 6.3**.

In areas of the City where infiltration practices are prohibited in order to protect groundwater, filtration practices may still be installed. These features filter and release runoff to the municipal sewer network, overland drainage network, or directly to a receiver such as a watercourse or wetland, at a prescribed rate and volume (i.e., stormwater management design criteria). A portion of the runoff from these facilities is evapotranspired, and these features also delay the peak flow. For example, soil cells, typically installed with street trees, may be installed as filtration-only systems where infiltration is otherwise prohibited. At the City's discretion, these filtration practices may use:

- Flexible liners; or
- Hardened closed-bottom structures (eg. plastic or concrete tanks, vaults, or chambers).

These roads may alternatively be treated using conventional stormwater management controls such as ponds, wetlands and hybrid facilities as well as hydrodynamic separators (OGS units) and/or membrane or media filtration units (e.g. Jellyfish filters, StormFilters, etc.). **Table 6.2** summarizes the respective policy recommendations for the various road classifications and outlines the potential LID controls that are acceptable for implementation, while **Figure 6.1** illustrates the WHPA Vulnerability Ratings applicable to the table.

It is recommended that the City initiate a pilot study to test the use of gated or closable inlets to allow for facilities to infiltrate during summer months, but act as filtration facilities when salt is applied within the catchment during the winter.

6.1 Arterial Roads

No arterial roads are to be conveyed or treated using infiltration-based practices, regardless of where they are located in the City.

6.2 Collector Roads

Runoff from collector roads is not to be conveyed or treated using infiltration-based practices inside WHPA with Vulnerability Rating equal to, or greater than, 8.

Inside WHPA with Vulnerability Rating from 2-6, runoff may only be treated or conveyed using infiltration-based practices on a case-by-case basis, if the following criteria are met:

1. Risk of impairing groundwater quality is minimal:
 - a. The road catchment area contains no high-risk activities, as listed in **Table 5.1**³ and discussed in **Section 5.1**; and
 - b. If a hydrogeological study can show no impact to groundwater (e.g. ultimate receiver of infiltrated runoff is a surface water body), infiltration facilities may be considered on a case-by-case basis provided Criteria #2 and #3, below, are met.
2. Where required to achieve wetland water balance / site water balance and protect hydrologic and ecological functions of the natural heritage system and water resource system, infiltration of collector road runoff may be permitted subject to no risk of impairing groundwater quality specified in item 1 above, and benefit-cost analysis provided per item 3 below. The City must approve the investigation that determined no risk of impairing groundwater quality; and
3. A cost-benefit analysis is required to compare infiltration practices using LID BMPs with alternative conventional approaches.

Outside of a WHPA, it is permissible for runoff from collector roads to be conveyed or treated by infiltration-based practices, if the road catchment area contains no high-risk activities, as listed in **Table 5.1**³ and discussed in **Section 5.1**.

³ While salt is recognized as a Prescribed Drinking Water Threat, it is being managed through restriction of infiltration practices to low-risk areas of the City and through the use of City and Private Salt Management Plans. Salt can therefore be applied within the catchment per the City's Salt Management Plan.

6.3 Local Roads

Local roads have less intensive winter deicer application (90 per cent sand / 10 per cent salt mix) as a result of lower usage and slower posted speed limits (City of Guelph, 2017). Infiltration opportunities are therefore more extensive along local roads, as the risk to groundwater is less.

6.3.1 Urban Cross Section

No runoff from local roads with urban cross-sections (i.e., curb and gutter) is permitted inside WHPA with Vulnerability Rating of 10.

Inside WHPA with Vulnerability Rating of 8, runoff may only be treated or conveyed using infiltration-based practices on a case-by-case basis, if the following criteria are met:

1. Risk of impairing groundwater quality is minimal:
 - a. The road catchment area contains no high-risk activities, as listed in **Table 5.1**³ and discussed in **Section 5.1**; and
 - b. If a hydrogeological study can show no impact to groundwater (e.g. ultimate receiver of infiltrated runoff is a surface water body), infiltration facilities may be considered on a case-by-case basis provided Criteria #2 and #3, below, are met.
2. Where required to achieve wetland water balance / site water balance and protect hydrologic and ecological functions of the natural heritage system and water resource system, infiltration of rural road runoff may be permitted subject to no risk of impairing groundwater quality specified in item 1 above, and benefit-cost analysis provided per item 3 below. The City must approve the investigation that determined no risk of impairing groundwater quality; and
3. A cost-benefit analysis is required to compare infiltration practices using LID BMPs with alternative conventional approaches.

In WHPA Vulnerability Ratings of 2-6 and outside of WHPAs, it is permissible for runoff from collector roads to be conveyed or treated by infiltration-based practices, if the road catchment area contains no high-risk activities, as listed in **Table 5.1**³ and discussed in **Section 5.1**.

6.3.2 Rural Cross-Section

Local roads with rural cross-sections follow the same criteria as described above for local roads with urban cross-sections, with the exception of roads within WHPA Vulnerability Rating of 10. In this case, local roads with existing rural-cross-sections already contribute to pollutant loading (though significantly less than collector and arterial roads per unit length) and it is unlikely that directing runoff from existing grassed ditches to infiltration practices will exacerbate the issue or increase the threat, provided:

- a) The proposed infiltration facility footprint is no larger than the existing ditch footprint;
or
- b) The proposed annual infiltration volume is not increased as compared to the existing condition (ditch) annual infiltration volume based on the characterization of the limiting in-situ native soils (i.e. infiltration rate(s) per the LID Stormwater Planning and Design Guide (<https://wiki.sustainabletechnologies.ca/wiki>)).

In addition, the following criteria will be considered when determining whether infiltration will be accepted:

- Where required to achieve wetland water balance / site water balance and protect hydrologic and ecological functions of the natural heritage system and water resource system; and
- Upon completion of a cost-benefit analysis to compare infiltration practices using LID BMPs with alternative conventional approaches.

Table 6.2: Recommended Road Classification Based Infiltration Policy and Acceptable Practices

Road Classification		Arterial	Collector	Local	
Cross-Section		Urban & Rural Cross Section	Urban & Rural Cross Section	Urban Cross Section (i.e. Curb and Gutter)	Rural Cross Section (i.e. Ditched)
Inside WHPAs with Vulnerability Scores equal to 10	Recommended Policy	Not to be conveyed or treated using infiltration-based practices	Not to be conveyed or treated using infiltration-based practices	Not to be conveyed or treated using infiltration-based practices	Permissible to be conveyed or treated using infiltration-based practices provided condition 6.3.2a or 6.3.2b can be met and no High-risk Site Activities (Table 5.1) are within catchment
	Acceptable Practices	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales
Inside WHPAs with Vulnerability Scores equal to 8	Recommended Policy	Not to be conveyed or treated using infiltration-based practices	Not to be conveyed or treated using infiltration-based practices	Permissible to be conveyed or treated using infiltration-based practices on case-by-case basis if no High-risk Site Activities (Table 5.1) are within catchment	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment
	Acceptable Practices	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Lined LID Facilities; Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales
Inside WHPAs with Vulnerability Scores from 2 through 6	Recommended Policy	Not to be conveyed or treated using infiltration-based practices	Permissible to be conveyed or treated using infiltration-based practices conditions 6.2a–c can be met	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment
	Acceptable Practices	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units; Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales
Outside WHPAs	Recommended Policy	Not to be conveyed or treated using infiltration-based practices	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment	Permissible to be conveyed or treated using infiltration-based practices if no High-risk Site Activities (Table 5.1) are within catchment
	Acceptable Practices	Lined LID Facilities; Convey to downstream SWM facility or Hydrodynamic separators (OGS units) and or membrane filtration units	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales	Bioretention (Dry Swales/ Bioswale, Boulevard units & Bump-outs), Perforated Pipes, Permeable Pavements & Enhanced Swales



7 Conclusions and Recommendations

Through a review of the applicable local policies, a comprehensive infiltration policy was developed. It is recommended that the City adopt the policies summarized in **Sections 4** through **5.3**.

As part of the SWM-MP, a list of acceptable LID practices will be identified during upcoming reporting. These LID practices must still be designed and implemented per the appropriate design guidelines and the City's Infiltration Policy.

The Infiltration Policy will be applied during subsequent phases of the SWM-MP when determining stormwater management retrofit opportunities. These opportunities will be screened against the Infiltration Policy to ensure compliance.

8 References

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