CITY OF BARRIE

Infiltration Low Impact Development Screening Process

Note to Reader: This document has been provided to outline a decision making framework for determining the suitability of an infiltration LID feature in relation to Drinking Water Source Protection considerations. Other factors that determine the suitability of an infiltration LID project including but not limited to cost estimates, life-cycle planning, property acquisition, and other policies and standards are beyond the scope of this document. The document will serve as an excellent starting point for undertaking your project. However, pre-consultation with the LID working group is strongly recommended to determine scope constraints in relation to Source Water Protection. Professional judgement will need to be used to determine overall project feasibility.

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1.0 Introduction

Stormwater management is a highly evolving field. In the 1970's urban stormwater management was practiced to capture increasing runoff and for flood management. In the 1990's it became standard to use stormwater management as a means to help improve water quality. At this time, large centralized detention facilities dedicated to help improve water quality of stormwater returning to lakes and streams, also referred to as end-of-pipe control, became predominant and are still largely used today.

However, these conventional methods do not address the changes to the hydrologic cycle experienced in an urbanized watershed. It fails to address the increase in stormwater volume and runoff rates which leads to erosion and stream degradation, and does little to treat certain contaminants of concern. Low-impact development (LID) practices have received increasing attention as these strategies attempt to capture the runoff and mimic the natural hydrologic cycle.

There are two primary categories of LIDs. The first promotes the infiltration of stormwater close to the source. These infiltration type LIDs are preferred when hydrogeological and physical conditions are optimal and allow for their emplacement. The second capture and slowly release the water to the surface water system through the process of storage and filtration. Filtration and storage type LIDs are to be considered when conditions do not permit infiltration LIDs to be implemented. Therefore many municipalities in Ontario are now looking to make greater use of LIDs, including the City of Barrie, as a need for better solutions to stormwater management are increasingly required.

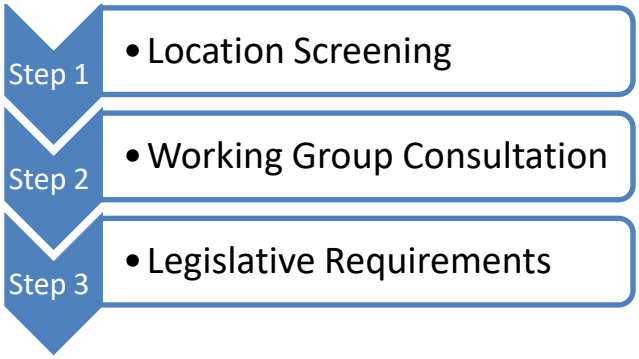
The Lake Simcoe Protection Plan (LSPP) has established policies for stormwater management that encourages municipalities within the Lake Simcoe watershed to implement a hierarchy of source, lot-level, conveyance and end-of-pipe controls to meet adequate stormwater treatment. The Lake Simcoe Region Conservation Authority (LSRCA) has also published guidelines for stormwater management that require a significant portion of runoff from an event be captured and infiltrated, retained, treated on-site.

However, there is concern that implementing infiltration LIDs, especially along road right of ways, will lead to contamination of groundwater resources. Of particular concern is the risk of sodium and chloride contamination, as a result of winter maintenance practices. When road salt is applied to roads, parking lots, sidewalks and other surfaces it dissolves easily in water and the resulting ions remain in solution and can enter the groundwater system. Currently there is no viable option to remove these ions from solution. As the City has Issues Contributing Areas relating to drinking water sources for sodium and chloride, a forward thinking approach on how and where infiltration type LIDs should be permitted is necessary to adequately manage some of the associated potential risks.

This document will focus on offering guidance for the implementation of infiltration type LIDs within the City with a focus on Source Water Protection vulnerable areas. It will be updated from time to time as the science and understanding of LIDs evolves.

2.0 Proposed Approach

The proposed approach for implementing infiltration LID features follows a three step approach.



The first step is a location suitability screening that considers drinking water vulnerable areas and the general water quality characteristics of the stormwater to be infiltrated. If based on these two factors the infiltration facility is deemed permitted the project can immediately proceed to the third step of the process. However, if it has been deemed permitted with conditions it will require to go through the second step of the screening process. During the second screening the application or project must meet additional requirements set by the Infiltration LID Working Group. Finally the third step of the process ensures that all other legislative requirement, including federal and provincial requirements as well as City of Barrie policies and standards are met. In all cases where infiltration LIDs are not appropriate given conditions, consideration should be given to filtration and storage type LIDs.

The following section of the report will go over the three step approach. Figure 1 shows a process map of the approach.

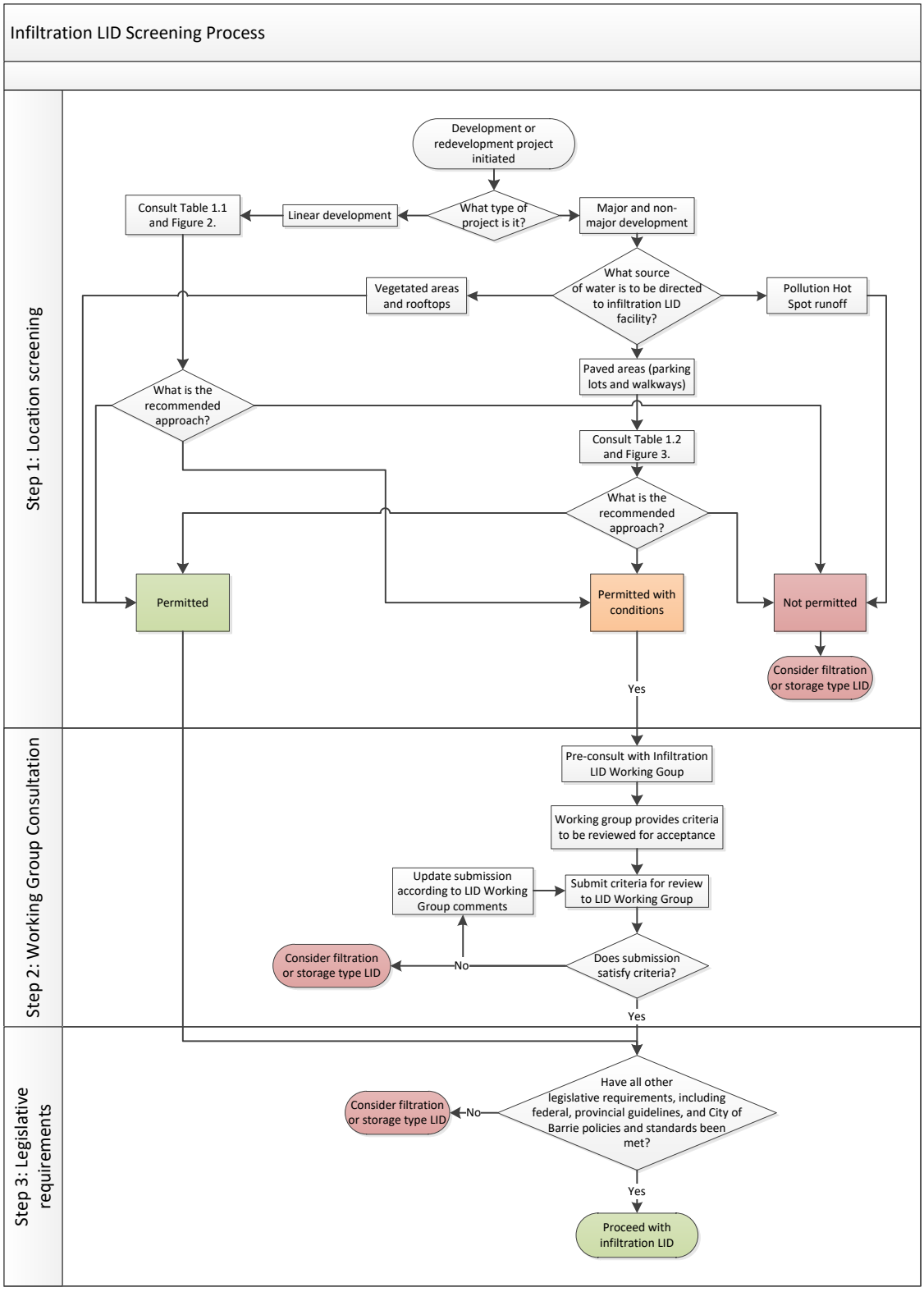


Figure 1. Process map for the screening of infiltration LID features to be implemented based on location suitability.

Step 1: Location Screening

The current screening document is to be used when a development or redevelopment project is initiated and infiltration LIDs are being considered for stormwater management. The first step of the screening process is designed to screen areas where infiltration LIDs would be suitable based on Source Water Protection vulnerable area, and the general water quality characteristics of the stormwater to be infiltrated in the LID facility.

To complete this task we must first determine what type of project is being proposed: a linear development or a major or non-major development. The type of project going forward will affect the first step of the process and the recommendation for implementing infiltration type LIDs.

Requirements from the first step of the screening process will fall within one of the following categories. Stormwater is:

1. Infiltration based practices are **permitted**
2. Infiltration based practices are **permitted with conditions**
3. Infiltration based practices are **not permitted**

The practices that are deemed permitted with conditions will continue to the second step of the screening process, where the Infiltration LID Working Group will outline additional criteria to be satisfied. When stormwater is not permitted to be conveyed or treated using infiltration based practices, filtration or storage type features should be considered.

2.1.1 Recommendations for Linear Development

Given the nature of stormwater originating from roadways, the viability of implementing infiltration type LIDs in road right of ways for linear developments are considered separately from other projects. Recommendations for linear developments have been made according to the road classification of the existing or proposed roadway.

The road classifications that are being considered for the purposes of this document are either arterial and collector roadways or local roadways:

Arterial or Collector Roadways: Arterial and collector roadways are the most heavily used roadways and receive a priority level of service in terms of winter maintenance. As such they receive the highest load of road salt. The requirements for arterial and collector roadways, which can be consulted in Table 1.1, are conservative given the general water quality characteristics of runoff from these roadways.

Local Roadways: Local roadways are those that have lower volumes of traffic and for the most part have a lower level of service than arterial and collector roadways. Lesser amounts of road salt are used as de-icing material along local roads and as a result, the requirements for LIDs along local roads (see Table 1.1) are less restrictive than those for arterial and collector roadways.

Table 1.1 outlines the detailed requirements for implementing infiltration type LIDs according to road classification. To help visualize the recommended approach for implementing infiltration type LIDs along linear developments, Figure 2 was created by overlaying vulnerable areas and Official Plan roadway classification. When determining what the recommendation is for the implementation of an infiltration type LID the table and map should be consulted simultaneously.

Table 1.1 City of Barrie requirements for the implementation of infiltration type LIDs for linear developments based on Source Water Protection Vulnerable Area and road classification

Road Classification	Vulnerable Area	Requirement
Arterial & Collector	***Issues Contributing Area***	Infiltration based practices not permitted
	Wellhead Protection Area A and B	
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	Infiltration based practices are permitted with conditions
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	
Local	***Issues Contributing Area***	Infiltration based practices are permitted with conditions
	Wellhead Protection Area A and B	Infiltration based practices are not permitted
	Wellhead Protection Area C and D	Infiltration based practices are permitted
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	Infiltration based practices are permitted with conditions
	Highly Vulnerable Aquifers	Infiltration based practices are permitted
	Not Vulnerable	

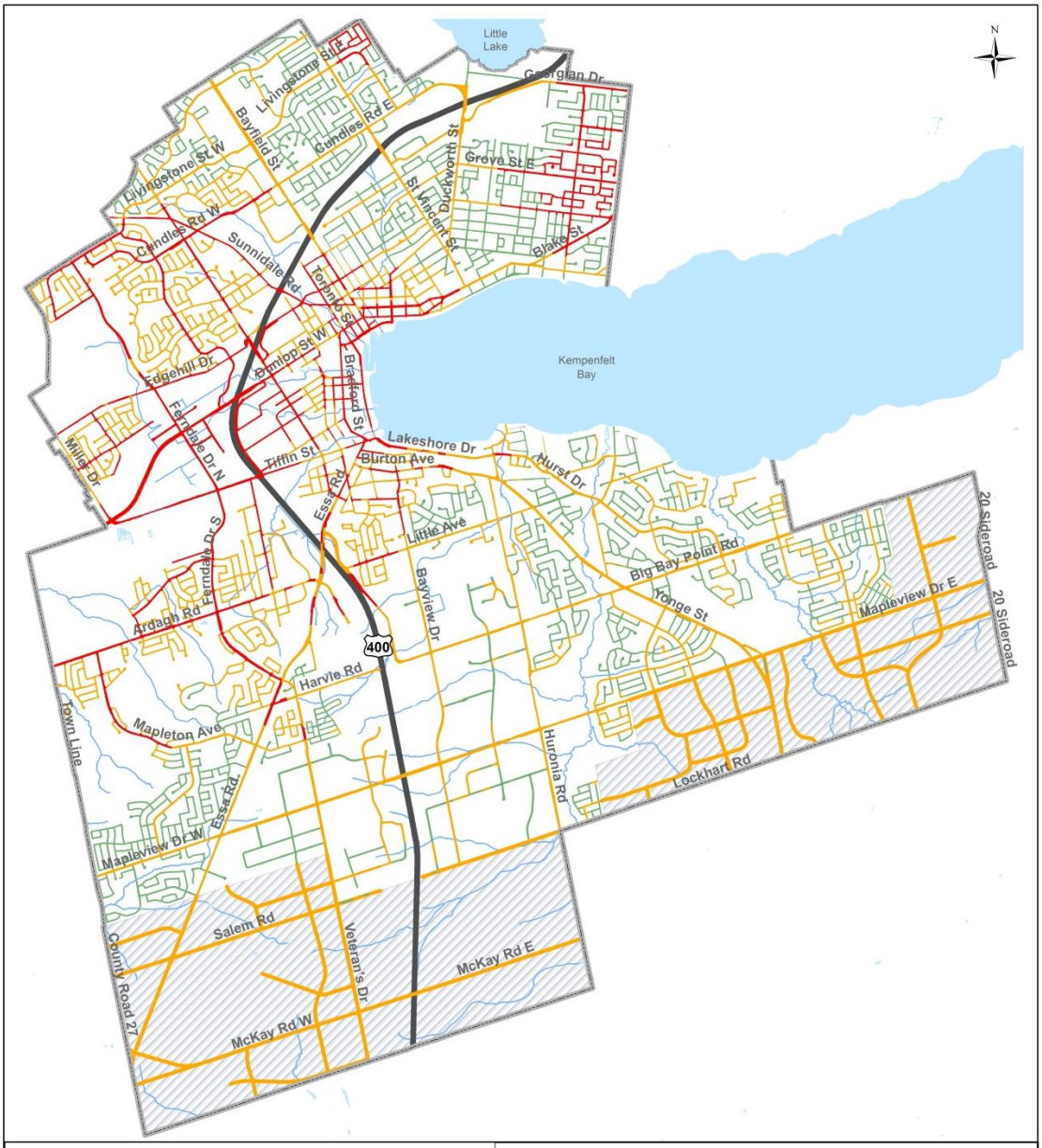


Figure 2. Screening map showing infiltration LID requirements for linear development

2.1.2 Recommendations for Major and Non-Major Development

The recommended approach for the implementation of infiltration type LIDs for major and non-major developments are to be based firstly on the source of the stormwater to be directed into the infiltration LID facility. The four sources of runoff considered in this document include vegetated areas, rooftop runoff, paved areas, including parking lots and walkways, and pollution hot spot runoff (e.g. a gas station). Secondly, considerations are given to the proposed land use activities of the project property for certain sources of runoff (paved areas).

Vegetated and rooftop runoff: As vegetated and rooftop runoff are a relatively clean source of runoff, these sources are permitted to be conveyed or treated using infiltration based practices regardless of the land use activities proposed for the project site.

Pollution hot spot runoff: Pollution hot spot runoff is never permitted to be conveyed or treated using infiltration based practices given the high potential for soil and groundwater contamination.

Paved area runoff: The water quality characteristics of runoff from paved areas, including parking lots and walkways, ranges widely depending on the land use activities of the project site. Of particular concern to Source Water Protection is the fact that land-use will have a significant influence on the amount of road salt that is applied on these paved surfaces. As such runoff from paved areas, given its location within a Source Water Protection vulnerable area, will be assigned a recommendation similar to those for linear projects. To consult the requirements based on land-use activities see Table 1.2. Figure 3 can be used to help visualize the requirements for implementing infiltration type LIDs that are receiving paved area runoff within major and non-major developments. Figure 3 was created by overlaying vulnerable areas and Official Plan zoning designations.

Figure 3 should be consulted with caution noting that if the proposed end land use of the site is not the current land use as it exists in the Official Plan, Table 1.2 must be consulted to determine the appropriate recommendation.

Table 1.2 Infiltration LID requirements for **paved area** runoff for major and non-major development

Note: This table outlines requirements for paved area runoff only. Runoff from vegetated areas and rooftop are always permitted to be infiltrated, while runoff from pollution hot spot is never permitted.

Land Use	Vulnerable Area	Requirement
Low Density Residential	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are permitted
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	
Commercial & Institutional	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	
	Wellhead Protection Area C and D	Infiltration based practices are permitted with conditions
	Intake Protection Zone-1 and Zone-2	Infiltration based practices are permitted
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	Infiltration based practices are not permitted
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted
Industrial	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	
Mixed Use and High Density Residential	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are permitted with conditions
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	Infiltration based practices are permitted
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	Infiltration based practices are permitted with conditions
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted
Open Spaces and Environmental Protection Areas	***Wellhead Protection Area A and B***	Infiltration based practices are permitted with conditions
	Issues Contributing Area	
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted

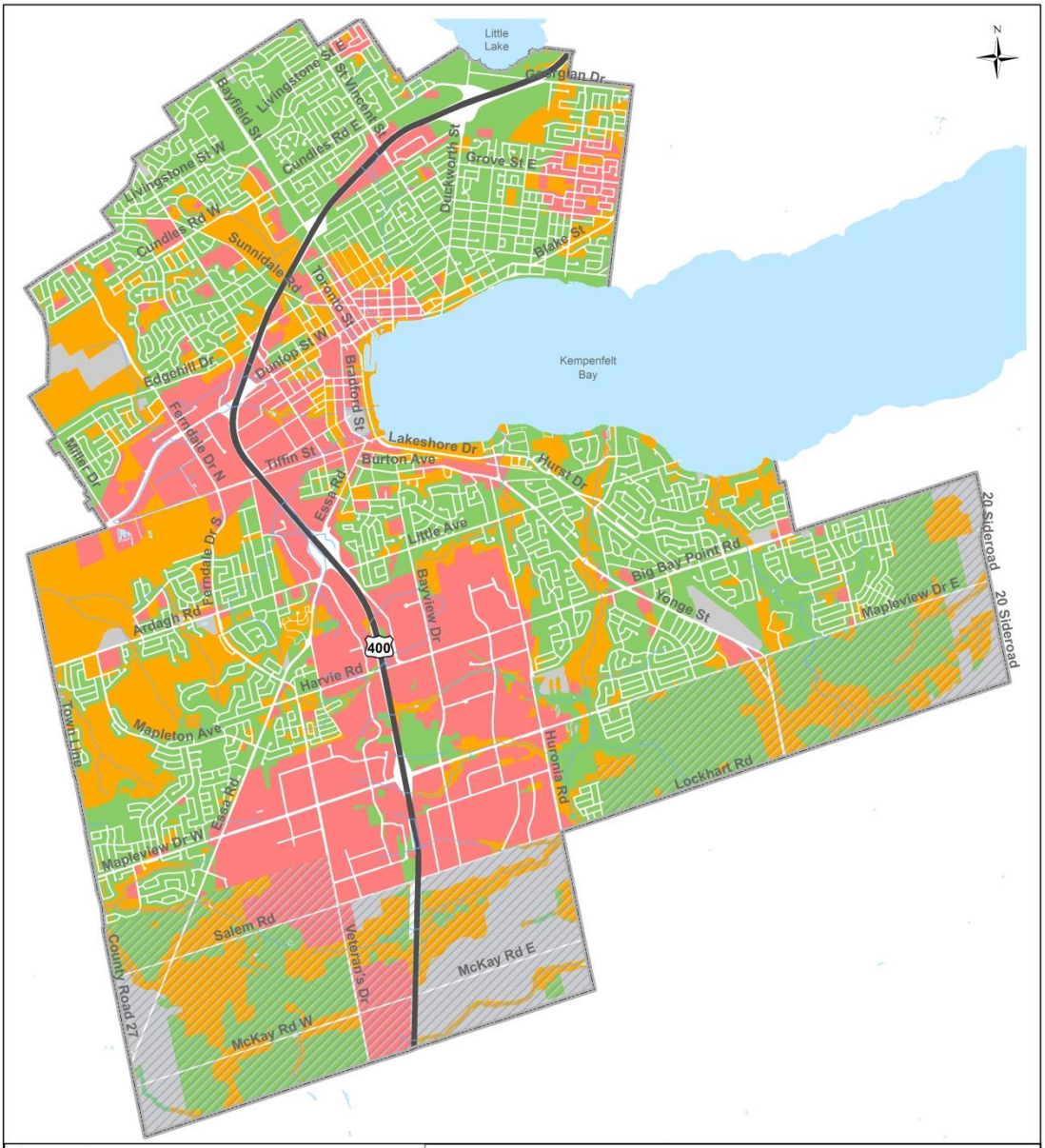


Figure 3. Screening map showing infiltration LID recommendations for paved area runoff for major and non-major development

2.2 Step 2: Additional Considerations

The second step of the screening process only applies to those areas where the source of stormwater has been recommended as permitted to be conveyed or treated using infiltration based practices provided additional requirements are met (permitted with conditions).

A proposal to implement infiltration based LIDs in these areas will be reviewed by the Infiltration LID Working Group. They are only to be considered if it has been demonstrated that the LSRCA stormwater quantity control criteria for peak flow control cannot be met through the infiltration of clean sources only (permitted sources).

2.2.1 Infiltration LID Working Group

The Infiltration LID Working Group is the proposed group that will review and outline additional criteria for going ahead with infiltration LIDs within areas deemed permitted with conditions. The purpose of the group is to review projects and applications to test the process internally until the group is comfortable with some of the associated risks of such features and a clear list of conditions is established.

The LID Working Group should be formed by members from many different departments (ex. Source Water Protection, Infrastructure Planning, Parks Planning, Policy and Standards, Development Services, Design & Construction, Environmental Operations, Roads Operations and Planning Services) to bring a wide range of knowledge to the table. A proposed Terms of Reference for the working group can be found in Appendix A.

Two types of considerations will be addressed by the Infiltration LID Working Group. These include on-going review of site specific conditions on an individual project basis, and working towards establishing overall corporate objectives to deal with associated risks of infiltration features.

2.2.1.1 Corporate Objectives

The Infiltration LID Working Group will work towards some key corporate initiatives aimed at establishing a level of comfort in implementing infiltration LID projects. They include big picture objectives intended to reduce the risk of contamination for all project proposals regardless of location.

1. Establish a **spill response process** for spills within or near LID features
2. Develop a **maintenance and monitoring plan** for LID features
3. Analyze feasibility of having centralized infiltration facilities with **by-pass valve capacity**
4. Implementation of **road salt reduction measures**
    a. Salt Optimization Strategy
    b. Parking Lot Design Guidelines
    c. Risk Management Plans and outreach to local businesses
    d. Smart About Salt
5. Develop Engineering **policy and standards for LIDs**
6. Continued consideration of **new and emerging science and policy directions**

New corporate objectives may be determined and added to this list as new information becomes available. Some of the above mentioned corporate initiatives will be required to be in place for site specific projects to go forward.

2.2.1.2 Site Specific Information

Site specific information will need to be reviewed by the Infiltration LID Working Group prior to allowing infiltration LIDs to be implemented in areas permitted with conditions. This review should be done on an individual project basis until such time the Infiltration LID Working Group determines otherwise. Below is a potential list of information needed to be reviewed by the working group; however this list will continue to be updated as the process is tested.

1. An understanding of the **background water quality** conditions; it is recommended that quarterly water quality sampling occur for a period of 1-2 years prior to implementation
2. An understanding of the **local hydrogeological system**
3. Submission of a site specific **monitoring recommendations** prior to implementation
4. Submission of a **contingency plan** prior to implementation
    a. What happens in case of failure,
    b. Contaminants of concern are found at unacceptable concentrations
5. For paved surfaces and road segments: **design guidelines for effective winter maintenance** are to be employed on-site (as to minimize the amount of road salt needed)
6. Development of a Risk Management Plan relating to winter maintenance for the site (note this is not a Risk Management Plan as required under PartIV of the Clean Water Act, but is to be developed using a similar template and be incorporated as a condition through the site plan agreement)

The Infiltration LID Working Group may request to view additional information that is not included in this list based on the individual project. If the project is working through the EA process, the working group may also request to complete a secondary review at time of detailed design.

2.2.2 Future Guidance

Listed below are a series of documents/initiatives that are currently being completed. The outcome of these will hopefully help address some of the concerns of groundwater contamination (mainly salt loading) through infiltration LID features. Additional considerations for the implementation of LIDs in areas deemed permitted with conditions may be reassessed upon the results from these initiatives.

2.2.2.1 Provincial Stormwater Guidance Document

The Ministry of Environment and Climate Change is currently working on an LID stormwater management guidance document that is expected to specify the ministry's expectation on water balance, outline monitoring and maintenance of LID facilities and provide further guidance on suitability. Currently the document is expected to be released in 2017. Until the release of this document a conservative approach to LID implementation is recommended.

2.2.2.2 LSRCA Parking Lot Design Guidelines

Lake Simcoe Region Conservation Authority (LSRCA) recently initiated a project to develop guidelines for the design of commercial/institutional parking lots for salt reduction. The project is expected to focus on a minimum of three key design features that promote the greatest reduction of road salt application and are most likely to be implemented in the design of future parking lots or the retrofit of existing parking lots. The guidelines are anticipated to be released in February 2017.

2.2.2.3 Research Results from Current LID Practices

Many municipalities have started implementing LID features as pilot projects (ex. permeable pavers in a Bradford West Gwillimbury municipal parking lot, LSRCA parking lot, CVC numerous pilot projects). Analysis and research of long term datasets on the effectiveness of these LID practices would be beneficial in understanding the ability of LIDs in controlling water quantity and effectively treating for water quality.

2.2.2.4 Salt Optimization Strategy

As a requirement under the Clean Water Act (2006), an evaluation of drinking water issues was completed for the City of Barrie drinking water supply system. It was found that concentrations of sodium and chloride for certain municipal supply wells within the central portion of the City are trending to exceed Ontario Drinking Water Quality Standards within the next 50 years. This prompted the outlining of an Issues Contributing Area and as a consequence the development of a Salt Optimization Strategy. The Strategy outlines a series of recommendation that are designed to optimize the use of road salt to help minimize the impacts of application. The outcomes of this Strategy implementation will be analyzed following the each winter maintenance season to measure its success in reducing salt application on municipal roadways.

2.2.2.5 Smart About Salt

It is the intention of the City of Barrie to have the Smart About Salt training sessions brought to Barrie for City staff as well as private contractors. Smart About Salt offers innovative training programs that teach how to effectively balance winter safety and environmental protection.

2.3 Step 3: Legislative Requirements

Whether a proposed infiltration LID facility is permitted or permitted with conditions, based on the location screening completed in step 1, it must meet additional legislative requirements that are beyond the scope of this document.

A project proposing infiltration LIDs must adhere to all federal and provincial requirements as well as requirements set out in the City of Barrie's Storm Drainage and Stormwater Management Policies and Design Guidelines. LID specific policies and standards for the City are currently being developed and reviewed. For those projects deemed permitted with conditions it is recommended to complete steps 2 and 3 concurrently.

3.0 Definitions

High Density Residential: High density residential is a land use category that generally includes three or more unit dwellings, townhouse dwellings and apartment dwellings and is designated by the following zoning codes (RM2, RM2-TH, RA1, RA2) as outlined in the City of Barrie Comprehensive Zoning By-law.

Linear Development: Linear development is defined as a road or highway project that results in full road reconstruction and/or increases in total impervious area. Mill and overlay and other resurfacing activities are not considered linear developments. (Lake Simcoe Region Conservation Authority, 2016)

Low Density Residential: Low density residential is a land use category that generally includes single detached dwellings and two unit dwellings and is designated by the following zoning codes (RH, R1, R2, R3, R4, RM1, RM1-SS) as outlined in the City of Barrie Comprehensive Zoning By-law.

Major Development: Major development means the construction of a building or buildings on a lot with the ground floor area cumulatively equal or greater than 500 m^2, and any other impervious surface. Note single detached residential properties are exempt from the definition. (Ministry of the Environment, 2009)

Non-Major Development: Non-major development is considered to be anything not captured in the definition of major development.

Pollution Hot Spot: Pollution hot spots are areas where certain land uses or activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, service or demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites).

4.0 References

City of Barrie, 2014, The City of Barrie Official Plan.

City of Barrie, 2015, Comprehensive Zoning By-law.

Credit Valley Conservation & Toronto Region Conservation Authority (CVC & TRCA), 2010, Low Impact Development Stormwater Management Planning and Design Guide.

Lake Simcoe Region Conservation Authority, 2014, Guidance for the Protection and Restoration of Significant Groundwater Recharge Areas (SGRAs) in the Lake Simcoe Watershed.

Lake Simcoe Region Conservation Authority, 2016, LSRCA Technical Guidelines for Stormwater Management Submissions.

Ministry of the Environment, 2009, Lake Simcoe Protection Plan.

South Georgian Bay-Lake Simcoe Source Protection Region, 2015, Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area

Appendix A Proposed Terms of Reference- Infiltration LID Working Group

Proposed Terms of Reference- Infiltration LID Working Group

Purpose of Infiltration LID Working Group Terms of Reference
This document outlines the role of the Infiltration LID Working Group in providing recommendations and decisions on proposed infiltration Low Impact Development (LID) projects regarding drinking water sources. It also presents how the working group will operate, including how and when meetings will take place. Any amendments to these Terms of Reference (TOR) will be done in consultation with the Manager of Infrastructure Planning and working group members.

Working Group Overview
The City of Barrie is looking to make greater use of LIDs, as the need for better solutions to stormwater management are increasingly required. However, there is concern that implementing infiltration LIDs, especially along road right of ways, will lead to contamination of groundwater resources. Of particular concern is the risk of sodium and chloride contamination, as a result of winter maintenance practices.

The Infiltration LID Working Group will focus on offering guidance, working through case studies and participating in corporate initiatives that address drinking water source protection concerns.

Mandate
The Infiltration LID Working Group is an internal working group guided by these Terms of Reference. It provides an opportunity for key stakeholders to discuss and require the implementation of actions to support the successful implementation of infiltration LID projects in the City of Barrie.

The mandate of the working is to provide on-going review of certain infiltration LID projects as outlined in the Infiltration LID Screening Process, and advance the implementation of key corporate initiatives required to establish a level of comfort in implementing infiltration LID projects.

The role of working group membership includes:

- Coming prepared to meetings by reviewing any reports prior to meetings and having comments, questions and concerns previously identified;
- Actively participating and sharing knowledge during discussions on Infiltration LID projects
- Identifying potential Issues and Concerns and how these might be addressed
- Attending all working group meetings whenever possible; and
- Working collaboratively with others on advancing and implementing corporate initiatives aimed at establishing a level of comfort in implementing infiltration LID projects.

Work Plan
It is proposed that the working group will meet in person on a quarterly basis over the life of the working group. Additional meetings may be scheduled to review proposed projects upon request.

Membership
Working group membership will consist of the following groups:

Development Services	Planning Services
Design and Construction	Policy and Standards
Environmental Operations	Road Operations
Infrastructure Planning	Source Water Protection
Parks Planning	Field Coordinator

Term of Membership
Membership in the Infiltration LID Working Group is anticipated to be for a minimum of three years, starting in 2017 and continuing until a level of comfort has been established for implementing Infiltration LID projects in the City of Barrie. After, three years the purpose and role of the working group will be reassessed.

Decision Making
It is envisioned that a consensus-based approach-where members seek general agreement on advice, recommendations and project specific conditions- will be the operating model for the working group. If consensus is not achieved, differing perspectives and viewpoints will be recorded and noted in the working group minutes.

If consensus is not achieved, a vote will occur. Quorum will be required for decision making to occur. To have quorum 2/3rds of the working group members will need to be present.

Meeting Management, Agendas and Reporting
The following procedures will be used in convening meetings of the Infiltration LID Working Group:

- Meetings will be scheduled on a quarterly basis by the chair, and subject to confirmation of working group member availability.
- Meetings will be held on weekdays (mornings or afternoons) for up to two hours. When more discussion time is required, members may consider holding an extended or additional meeting.
- Meeting agendas and any materials will be distributed to working group members one week in advance of each meeting.
- Working group members will be consulted on agenda items for future meetings at the conclusion of each meeting.
- Action items and key points from each working group meeting will be recorded. Meeting highlights will be prepared within 10 business days of each meeting.

Advisors and Experts
The working group may wish to invite or request additional advisors or experts to attend at various points during the term of working group existence. Considerations will be given to each request by the Chair and will be subject to timing, availability and budget considerations.