



STORMWATER MANAGEMENT GUIDE

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1.0 Preface and Definitions

The CGS has prepared this Stormwater Management Design Guide to provide guidance to City staff, the development community, and their consultants regarding the stormwater management (SWM) and Erosion / Sediment Control requirements for our community. This guidance considers the critical goals of stormwater management to protect and improve our health, safety, property, economy, environment and climate change resiliency. Climate change has added new challenges that need to be addressed through stormwater management, the guidance in this guide will help to mitigate and adapt to possible impacts of our changing climate.

The City is currently working on watershed studies for all watersheds within the CGS. As these studies are completed this Guide will be updated to include area specific requirements for each watershed.

This guide is not intended to be a comprehensive stormwater management planning and design manual like the SWM manual published by the Ministry of the Environment (MOE, 2003), Draft Low Impact Development Stormwater Management Guidance Manual (MOE, 2022) or similar documents. Detailed planning and design guidance can be found in those documents. The guidance in this document is focused on key issues that must be considered to properly implement SWM within the CGS, follow the requirements of the City's Consolidate Linear Infrastructure ECA for stormwater infrastructure, and to provide clarity where ambiguity may exist. It should result in the following benefits:

- enhanced protection of the natural environment and improved resiliency to climate change;
- designs that better reflect natural hydrology;
- application of uniform and consistent SWM standards;
- reduced need for re-submissions due to inadequate information;
- streamlined review process and improved client service; and
- further Source Water Protection, Conservation Sudbury, or other Provincial/Federal Acts.

For the purposes of this guide refer to the following definitions:

90th percentile rainfall event: This event for the Greater Sudbury area is the 28mm rainfall event.

CGS: Means the City of Greater Sudbury

Control: Stormwater volumes generated from the geographically specific 90th percentile rainfall event, on an annual average basis, from all surfaces on the entire site are targeted for control. Control is in the following hierarchical order, with each step exhausted before proceeding to the next:

- 1) retention (infiltration, reuse, or evapotranspiration),
- 2) LID filtration, and
- 3) conventional Stormwater management. (may be considered only once the MEP has been attained for Steps 1 and 2 for retention and filtration.

Design Criteria: means the design criteria set out in the Ministry's publication "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under ECA", (as amended from time to time), and the CGS Supplemental Design Criteria for Sanitary Sewers, Storm Sewer and Forcemains to the Ministry's publication "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under ECA".

ECA: means Environmental Compliance Approval as defined in the OWRA.

ESC: means erosion and sediment control.

Facility: means the entire operation located on the property where the Sewage Works or equipment is located.

Form SW1: means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Storm Sewers/Ditches/Culverts as obtained directly from the Ministry or from the Ministry's website.

Form SW2: means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Stormwater Management Facilities as obtained directly from the Ministry or from the Ministry's website.

Geotechnical/Soils Report: A report that indicates the water table elevation and/or bedrock, and analyses soil composition to determine its infiltration rate, structural stability and ability to accommodate development.

Intensification: Development of a property or site which results in a net increase in density, floor area or units but does not significantly alter the site layout or increase the impervious area.

Interim Stormwater Management Report: A report that presents the data, methods, procedures, and predicted results associated with the design of drainage works and erosion protection measures during site alteration. The report shall be prepared by a Professional Engineer Licensed in Ontario and provide details on the techniques used to control storm runoff to allowable runoff rates, the method and volume of stormwater storage and the techniques used to address sediment and erosion control.

LID: means "low impact development" 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.

Low Risk Site: A small, non-industrial use or site which does not perform vehicle repair works, or site that does not contain fuel or material storage that may pose a risk to downstream lake or river water quality.

Lot Grading Professional – An Engineer, Architect, Land Surveyor, Landscape Architect and /or company providing these services. The Lot Grading Professional must be approved by the City and have a valid Certificate of Authorization to practice in their profession in the province of Ontario and valid professional liability insurance (i.e., errors and omissions insurance). Other individuals/companies meeting the above criteria/conditions may also qualify as a Lot Grading Professional.

Maximum Extent Possible (MEP): maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices, given the Site Constraints.

MTD means manufactured treatment device.

Municipal Drain: has the same meaning as drainage works as defined in section 1 of the Drainage Act R.S.O. 1990, c. D.17.

Municipal Drainage Engineer's Report: means a report signed by a drainage Engineer employed or contracted by a municipality and approved in writing by municipal council or equivalent.

Must/ Shall: Where must or shall are used, the design detail is considered mandatory and must be satisfied.

Natural Environment: has the same meaning as defined in section 1 of the Environmental Protection Act.

OGS: means Oil and Grit Separator(s).

Owner: for the purposes of this Approval means the CGS, and includes its successors and assigns.

OWRA: means the Ontario Water Resources Act, R.S.O. 1990, c. O.40.

Pre-treatment: A facility installed upstream of a stormwater facility that provides a basic level of protection (60% TSS removal). Examples of acceptable pre-treatment include: hydrodynamic separators, enhanced swales, grass filter strips, storage tank filtration, or other equivalent pre-treatment systems that are shown to provide, at minimum, a basic level of protection (60% TSS removal).

Pre-development: is defined as follows for the various development conditions:

- The current condition present in the field at the project onset, or the last approved condition, or the condition as of 2006, whichever obtains the lowest runoff coefficients.
- For CGS capital works projects, the pre-development impervious condition shall correspond to the current conditions present at the project onset.

Qualified Person (QP): means persons who have obtained the relevant education and training and have demonstrated experience and expertise in the areas relating to the approved works to be completed.

Recharge: the infiltration and movement of surface water into the soil, past the vegetation root zone, to the zone of saturation, or water table.

Redevelopment: The creation of new units, uses or lots on previously developed land which significantly alters the site layout. It may involve the partial or full demolition of a building and/or structure, parking lot reconfiguration, or the assembly of lands for development.

Regional Storm Event: Timmins Storm as defined in MTO Drainage Manual, Design Chart 1.04, as amended from time to time.

Retrofit: as follows

- 1) a modification to the management of the existing infrastructure, or
- 2) changes to major and minor storm water systems, or
- 3) adding stormwater infrastructure, on an existing site undergoing intensification, or
- 4) adding stormwater infrastructure in an existing area on a municipal right-of-way, municipal block, or easement. It does not include conversion of a rural cross-section into an urban cross-section.

Site: the entire property under development, redevelopment, intensification, including all subdivision, capital works projects, site plans, site alterations, etc.

Site Constraints: May include, but are not limited to:

1. Shallow bedrock [1], areas of blasted bedrock [2];
2. High groundwater [1] or areas where increased infiltration will result in elevated groundwater levels which can be shown through an appropriate area specific study to impact critical utilities or property (e.g., susceptible to flooding);
3. Swelling clays [3] or unstable sub-soils;

4. Contaminated soils (e.g., brownfields);
5. High Risk Site Activities including spill prone areas;
6. Prohibitions and or restrictions per the approved Source Protection Plans and where impacts to private drinking water wells and/or Vulnerable Domestic Well Supply Areas cannot be appropriately mitigated;
7. Flood risk prone areas or structures and/or areas of high inflow and infiltration (I/I) where wastewater systems (storm and sanitary) have been shown through technical studies to be sensitive to groundwater conditions that contribute to extraneous flow rates that cause property flooding / Sewer back-ups;
8. For existing municipal rights-of-way infrastructure (e.g., roads, sidewalks, utility corridor, Sewers, LID, and trails) where reconstruction is proposed and where surface and subsurface areas are not available based on a site-specific assessment completed by a QP;
9. For developments within partially separated wastewater systems where reconstruction is proposed and where, based on a site-specific assessment completed by a QP, can be shown to:
 - a. Increase private property flood risk liabilities that cannot be mitigated through design;
 - b. Impact pumping and treatment cost that cannot be mitigated through design; or
 - c. Increase risks of structural collapse of Sewer and ground systems due to infiltration and the loss of pipe and/or pavement support that cannot be mitigated through design.
10. Surface water dominated or dependent features including but not limited to marshes and/or riparian forest wetlands which derive all or a majority of their water from surface water, including streams, runoff, and overbank flooding. Surface water dominated or dependent features which are identified through approved site specific hydrologic or hydrogeologic studies, and/or Environmental Impact Statements (EIS) may be considered for a reduced volume control target. Pre-consultation with the MECP and local agencies is encouraged;
11. Existing urban areas where risk to water distribution systems has been identified through assessments to meet applicable drinking water requirements, including Procedures F-6 and F-6-1, and substantiated by a QP through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
12. Existing urban areas where risk to life, human health, property, or infrastructure has been identified and substantiated by a QP through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
13. Water reuse feasibility study has been completed to determine non-potable reuse of Stormwater for onsite or shared use;
14. Economic considerations set by infrastructure feasibility and prioritization studies undertaken at either the local/site or municipal/system level [4].

Footnotes:

1. May limit infiltration capabilities if bedrock and groundwater is within 1m of the proposed Facility invert per Table 3.4.1 of the LID Stormwater Planning and Design Guide (2010, V1.0 or most recent by TRCA/CVC). Detailed assessment or studies are required to demonstrate infiltration effects and results may permit relaxation of the minimum 1m offset.
2. Where blasting is more localized, this constraint may not be an issue elsewhere on the property. While infiltration-based practices may be limited in blasted rock areas, other forms of LID, such as filtration, evapotranspiration, etc., are still viable options that should be pursued.

3. Swelling clays are clay soils that is prone to large volume changes (swelling and shrinking) that are directly related to changes in water content.
4. Infrastructure feasibility and prioritization studies should comprehensively assess Stormwater site opportunities and constraints to improve cost effectiveness, environmental performance, and overall benefit to the receivers and the community. The studies include assessing and prioritizing municipal infrastructure for upgrades in a prudent and economically feasible manner.

Should: Where should is used, the design detail is considered to be a best practice and the owner must make a reasonable attempt to satisfy the design detail.

Storm Sewer: means Sewers that collect and transmit, but not exfiltrate or lose by design, Stormwater resulting from precipitation and snowmelt.

Stormwater: means rainwater runoff, water runoff from roofs, snowmelt, and surface runoff.

Stormwater Management Facility(ies): means a Facility for the treatment, retention, infiltration, or control of Stormwater.

Stormwater Management Planning and Design Manual: means the Ministry document titled "Stormwater Management Planning and Design Manual", 2003 (as amended from time to time).

Stormwater Management Report: A report that presents the data, methods, procedures and predicted results associated with the design of drainage works and erosion protection measures related to a development. The report shall be prepared by a Professional Engineer licensed in the province of Ontario and provide details on the techniques used to control storm runoff to allowable runoff rates, the method and volume of stormwater storage and the techniques used to address water quality requirements. The report must also detail how the proposed stormwater management plan addresses the requirements of this Guide and where applicable the City's ECA.

Stormwater Treatment Train: means a series of Stormwater Management Facilities designed to meet Stormwater management objectives for a given area, and can consist of a combination of MTDs, LIDs and end-of-pipe controls.

STEP: means Sustainable Technologies Evaluation Program which is a multi-agency initiative developed to support broader implementation of sustainable technologies and practices within a Canadian context.**SWM:** means stormwater management.

TRCA: means the Toronto Region Conservation Authority.

2.0 Stormwater Management

This Guide Applies to all Building and Site Alteration Permits, Site Plans, Subdivisions and Capital Works Projects, except where noted otherwise.

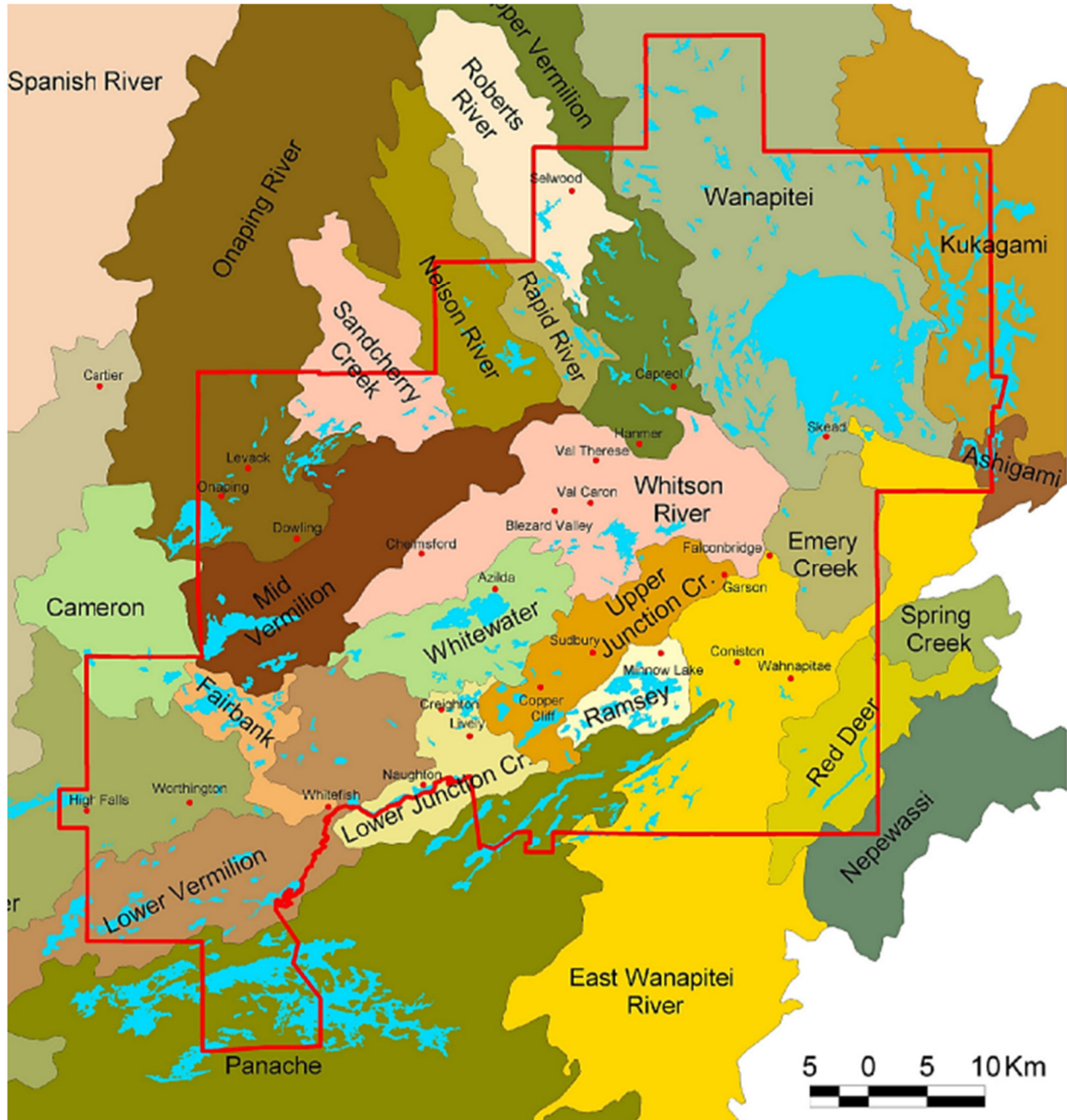
Stormwater Management Controls must be in conformance with the Current Ministry of the Environment Guidelines and Design Criteria, CGS Consolidated Linear Infrastructure ECA for Municipal Stormwater Management Systems, CGS watershed studies, Conservation Sudbury (Nickel District Conservation Authority) requirements, Source Water Protection Plans, and any other applicable Provincial or Federal Acts or Regulations. In addition, and to help guide applicants and city staff the following design requirements and report information must be provided.

2.1 General requirements:

- 1) New storm sewers or ditches can be constructed but not operated until the stormwater Management Facilities required to service the new storm sewers or ditches are in operation.
- 2) Storm water management facilities must be constructed and in operation prior to construction of any impervious surfaces.
- 3) Additional guidance documents related to storm water management can be found in the reference section of this guide.

2.2 Watershed study requirements:

- 1) Refer to Appendix A for Specific requirements related to each watershed within the CGS.
- 2) For additional information on watersheds within the CGS refer to the City's website



2.3 Hierarchy of Controls, Treatment Train and Exemptions

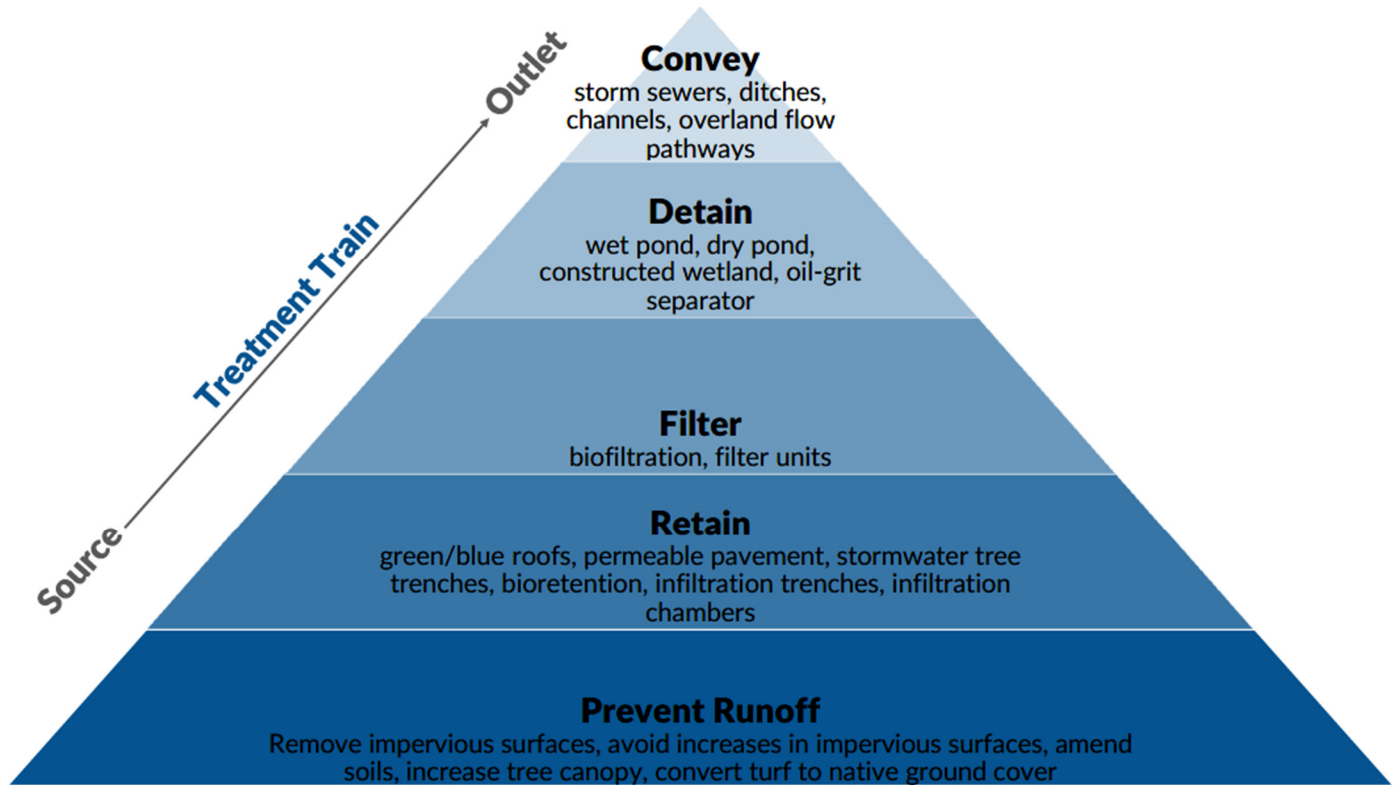


Image taken from the November 24, 2022, Municipal Stormwater Management Discussion Group presentation held in Brampton regarding "CLI ECA Implementation Across Municipal Departments"

- 1) Storm water management (SWM) requirements must be addressed through a "treatment train" approach as follows:
 - 1) Lot level control: to be applied on all Site Plans, and front yards or communal areas of Subdivisions where maintenance access can be easily provided. Some examples are as follows:
 - Rainwater Harvesting
 - Green Roofs
 - Roof Downspout Disconnection
 - Soakaways, Infiltration Trenches and Infiltration Chambers
 - Bioretention
 - Permeable Pavement
 - Perforated Pipe Systems
 - 2) Conveyance control: to be applied on all developments. Some examples are as follows:
 - Bioretention
 - Bioswales/Green Gutters/Tree Trenches

- Permeable Pavement
 - Perforated Pipe Systems
 - Soakaway Pits, Infiltration Trenches, and Infiltration Chambers
- 3) End of pipe control: to be applied only when lot level controls or conveyance controls cannot be utilized to the MEP.
- Wet Ponds
 - Constructed Wetlands
 - Hybrid Wet Pond/Wetland System
 - Dry Ponds
 - Centralized infiltration facility
 - Oil Grit interceptors
- 2) Within the above treatment train the following priorities must be utilized to the MEP.
- 1) Control Hierarchy Priority 1 (Retention) – LID retention technologies which utilize the mechanisms of infiltration, evapotranspiration and or re-use to recharge shallow and/or deep groundwater; return collected rainwater to the atmosphere and/or re-use collected rainwater for internal or external uses respectively. The target volume is controlled and not later discharged to the municipal sewer networks (except for internal water re-use activities) or surface waters and does not therefore become runoff.
- 2) Control Hierarchy Priority 2 (LID Volume Capture and Release) – LID filtration technologies which utilize filtration to filter runoff using LIDs with sufficient filter media. The controlled volume is filtered and released to the municipal sewer networks or surface waters at a reduced rate and volume (a portion of LID Volume Capture and Release may be infiltrated or evapotranspired).
- 3) Control Hierarchy Priority 3 (Other Volume Detention and Release) – Other stormwater technologies which utilize filtration, hydrodynamic separation and or sedimentation (i.e. end-of-pipe facilities) to detain and treat runoff using an appropriate filter media per industry standard verification protocols; separate contaminants from runoff; and/or facilitate the sedimentation and removal of contaminants respectively. The controlled volume is treated and released to the municipal sewer networks or surface waters at a reduced rate.
- 3) Subject to the City's Discretion, sites exempt from on-site Storm Water Management controls are as follows:
- 1) Minor building activities (i.e., new construction on properties with 4 or less residential units or equivalent development type, minor building additions, new decks, new sheds, etc.)
 - 2) Areas where the specific sub-watershed has adequate SWM control.
 - 3) Capital works projects that do not urbanize or change the road cross section/width. Or where active transportation is introduced.

2.4 Water Balance

- 1) Refer to Appendix A for Specific requirements related to each watershed within the CGS.
- 2) Where site specific requirements are not identified in Appendix A then a Water Balance should be completed for the development to:
 - a) Control the recharge to meet annual Pre-development Conditions on the site, or
 - b) Control the runoff from the 90th percentile rainfall event.
- 3) For Retrofit Scenarios, control must be completed to the Maximum Extent Possible based on environmental site feasibility studies or address local needs

2.5 Additional Quality Control Design Details

- 1) Refer to Appendix A for Specific requirements related to each watershed within the CGS.
- 2) Where site specific requirements are not identified in Appendix A, onsite Quality Control is required for the entire site, including pre-development impervious areas that flow through the development or are located downstream of the development within the same property.
- 3) Quality control facilities must be sized to capture and treat the minimum 90th percentile rainfall event without bypass.
- 4) Infiltration or filtration of the 90th percentile rainfall event is required to be met on all sites. Where it has been shown that infiltration or filtration has been achieved to the Maximum Extent Possible then detention and release methods of quality control may be used for the remainder and must meet the following requirements:
 - a) Achieve a minimum TSS, oils and floatables removal rate of 80% (enhanced) protection, on annual basis, unless stated otherwise in the Watershed Study.
 - b) Subject to the City's discretion, 70% (normal) protection, on an annual basis, is required to be achieved for all Low-Risk Intensification or Retrofit developments, developed prior to 2006, where no expansion to the impervious areas is proposed, unless stated otherwise in the Watershed Study.
 - c) Pre-treatment must be provided prior to discharge into SWM quality control facilities. Pre-treatment devices can include grass filter strips, gravel diaphragms, enhanced swale, Oil/Grit Separators, etc.
- 5) LID practices must be based on established methods and must refer to supporting documents. A list of reference guides is included in section 3.1 of this guide.
- 6) For Retrofit scenarios Quality Control must:
 - a) Improve the level of water quality control currently provided on site, and
 - b) Be designed as per the TSS removal rates indicated above, or
 - c) if criteria for Suspended Solids cannot be met, works are designed as a multi-year retrofit project, in accordance with a rehabilitation study or similar area-wide Stormwater study, such that the completed treatment train will achieve the 'Development "criteria for Suspended Solids or local needs within ten years; or

- d) if constraints identified in b) or c), then control as per Maximum Extent Possible based on environmental site feasibility studies.

2.6 Manufactured Treatment Devices (MTD)

- 1) Any new sedimentation MTD that is used for Quality Control as per section 2.5 above shall meet the following requirements:
 - a) Tested in accordance with the TRCA protocol Procedure for Laboratory Testing of OGSs and testing data verified in accordance with the ISO 14034 Environmental Technology Verification (ETV) protocol. The suspended solids removal claimed for the sedimentation MTD in achieving the water quality criteria and the sizing methodology used to determine the appropriate sedimentation MTD dimensions for the particular size, shall be based on the verified removal efficiency for all particle size fractions comprising the particle size distribution specified within the testing protocol or a particle size distribution approved by the Director.
 - b) The Sudbury Airport Rainfall Gauge must be used for sizing the sedimentation MTD using the rainfall intensity corresponding to the 90th percentile rainfall event;
 - c) When two or more sedimentation MTD are installed in series, no additional sediment removal credit shall be applied beyond the sediment removal credit of the most effective device in the series.
 - d) The units must be installed in an off-line configuration if the unit had an effluent concentration greater than 25 mg/L at any of the surface loading rates conducted during the sediment scour and resuspension test as part of the ISO 14034 verification.
- 2) Any new filtration MTD that is part of the Alteration shall meet the following requirements:
 - a) Field tested and verified in accordance with a minimum of one of the following protocols:
 - Washington State Technology Assessment Protocol - Ecology (TAPE) General Use Level Designation (GULD); and
 - Has ISO 14034 ETV verification to satisfy ETV Canada requirements.
 - b) Another testing and verification method, where the Director has communicated acceptability in writing.
 - c) The Sudbury Airport Rainfall Gauge must be used for sizing the sedimentation MTD using the rainfall intensity corresponding to the 90th percentile rainfall event
 - d) The Suspended Solid removal rate determined for the tested full scale, commercially available filtration MTD, or single full-scale commercially available cartridge or filtration module, may be applied to other model sizes of that filtration MTD provided that appropriate scaling principles are applied. Scaling the tested filtration MTD or single full-scale commercially available cartridge or filtration module, to determine other model sizes and performance without completing additional testing is acceptable provided that:
 - Depth of media, composition of media, and gradation of media remain constant.
 - The ratio of the maximum treatment flow rate to effective filtration treatment area (filter surface area) is the same or less than the tested filtration MTD;

- The ratio of effective sedimentation treatment area to effective filtration treatment area is the same or greater than the tested filtration MTD; and
- The ratio of wet volume to effective filtration treatment area is the same or greater than the tested filtration MTD.

2.7 Phosphorus Loading

- 1) Refer to Appendix A for Specific requirements related to each watershed.
- 2) Refer to Appendix B for further information on phosphorus budgets and calculating phosphorus loads.

2.8 Winter Salt

- 1) Due to winter salting practices, SWM wet ponds can become stratified and the coolest water that is released from the bottom also has the highest salt concentration. To minimize potential salt concentrations and provide some thermal mitigation (Section 2.10), it is recommended that submerged outlets be provided, located approximately at the midpoint of the permanent pool depth, and a minimum of 0.6m from the bottom of the facility, and 1.0m below the surface of the permanent pool. A multiple outflow configuration that blends flow from the top and bottom of the permanent pool between the depths noted above is preferred.
- 2) SWM and Infiltration facilities must be designed in accordance with any required Source Water Protection Plan to reduce the use of salt on the site.
- 3) In general, the design of roads and parking lots is to be done in such a manner that the need for excess salt use is minimized.

2.9 Mosquitos and Pests

- 1) Stormwater management facilities should be designed with the following considerations with regards to mosquitos and pests:
 - Retention ponds should avoid water depths less than 1m and should limit vegetation and debris in the water.
 - Fountains or aerators should be provided.
 - Wetlands should be designed to encourage birds, dragonflies, and spider habitat, and should be stocked with fish.
 - Infiltration and filtration facilities should be designed to drain within 24 to 72 hrs.

2.10 Thermal Heating

- 1) To reduce Thermal Heating the following should be considered:
 - Eliminate Permanent Pools in storm water management facilities by utilizing infiltration or filtration measures to the maximum extent possible. Otherwise, the following should be considered:

- Minimum length to width ratio of 5:1 to minimize large open areas of water or filtration media;
 - Appropriate orientation and perimeter planting to maximize shade coverage throughout the facility while maintaining the viability of plants which may require full sun for optimum growth; and
 - Multi-draw or blended outlets with cooling trenches that account for both temperature and salt (Section 2.8). For example, designing the bottom draw to be located approximately at the midpoint of the permanent pool depth, a minimum of 0.6m from the bottom of the facility and 1.0m below the surface and blending the top and bottom draws to dilute the salt and maintain some thermal mitigation.
- Maximize tree cover over parking lots and Ponds.
 - Provide green roofs and/or high albedo roofs and pavement surfaces.
- 2) Refer to section 4.4 of the 2003 SWM MOE guide for additional design guidance to reduce thermal heating.

2.11 Additional Quantity Control Design Details

- 1) Refer to Appendix A for Specific requirements related to each watershed within the CGS.
- 2) Where site specific requirements are not identified in Appendix A on-site quantity control is required to be provided, unless determined otherwise by the City's Drainage Engineer based on watershed studies, subdivision agreements or local knowledge in the absence of watershed studies.
- 3) As a minimum Post to Pre-development controls must be provided for the 2, 5, 10, 25, 50 and 100-year rainfall events, except where noted otherwise in Appendix A - Water Shed Study Requirements.
- 4) On developments greater than 1Ha, for the purposes of flood assessment, quantity control design, and design of major overland flow conveyance systems, the design peak flow shall be the largest of those generated by the 100-year design storm or the Regional Storm Event.
- 5) For the 100-year storm, the stormwater flows resulting from two storm distributions should be calculated and compared: the 6-hour Chicago storm distribution (typically critical for fast-draining urban watersheds) and the 24-hour AES storm distribution (critical for slower-draining larger rural watersheds).
- 6) Major overland flow routes must be identified. Maximum ponding should not exceed 300mm in parking lots and roadways and should not exceed 600mm in landscaped areas.
- 7) In cases where there are sanitary maintenance holes located in close proximity to the overland flow route, an analysis must be completed to verify that the sanitary maintenance holes are located outside the flood level for the 25-year rainfall event;
 - If the overland flow will submerge the maintenance hole. Watertight design, including water-tight covers, shall be specified for submerged sanitary maintenance holes, and
 - Where more than one consecutive sanitary maintenance hole requires sealing due to exposure to overland flow, appropriate ventilation shall be provided.
- 8) In the absence of erosion assessment studies for the watershed detain, at minimum, the runoff volume generated from the 90th percentile rainfall event over 24 to 48 hours.

- 9) Orifice controls must be located in control structure below the frost line and must not be located at exposed inlets or outlets. Minimum orifice sizes must not be less than those specified under 2003 SWM MOE guide and pond inlets and outlets must not be less than 450mm.
- 10) SWM ponds;
 - must not utilize submerged inlets. Inlets inverts must be at or above 5-year peak storm water level if attainable. Outlets must contain submerged outlets with obverts located 150mm below the maximum expected ice depth. Refer to section 4.3.1 and table 4.2 of the 2003 SWM MOE guide for maximum expected ice depth calculations.
 - Must include an overflow outlet in the control maintenance hole with an elevation below the level of the overflow weir outside the structure. The overflow elevation must be just above the 100-year storm or Regional (whichever is greater) The overflow structure can be an inverted internal drop structure, cast in place wall, etc.

2.12 Conservation Sudbury and Development within and around Flood Plains and Wetlands

Under Regulation 156/06- Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, Conservation Sudbury regulates development within a series of Natural Hazards and features including flood hazards, erosion hazards areas of unstable soil and wetlands. Furthermore, Regulation 156/06 prohibits the alteration to existing watercourses and interference to wetlands. It is the landowner's responsibility to identify all hazard features on the subject property. Additional guidance on identifying relevant hazards and features can be found in Conservation Sudbury's Reference Manual- Determination of Regulation Limits, January 2006.

- 1) The boundary of all hazards and features, including lakes, watercourses, wetlands, flood hazards, erosion hazards are to be accurately reflected on the plans as determined by qualified professionals.
- 2) Generally, stormwater infrastructure including pipes, ponds, ditches, swales, etc. will not be permitted within any hazard feature regulated by Conservation Sudbury. Under those exceptional circumstances where site conditions are limiting, some stormwater infrastructure may be permitted within a hazard feature subject to technical review and approval of Conservation Sudbury. Development of stormwater infrastructure within and adjacent to hazard features, within the Regulated Area, will require a permit from Conservation Sudbury under Section 28 of the Conservation Authorities Act.
- 3) Where stormwater infrastructure outlets directly to a regulated feature the design should aim to maintain outlets at or above the elevation of the Regulatory storm event to avoid water backup into the SWM facilities and allow the free discharge of water from the facilities during the Regulatory storm event.
- 4) Refer to the Wetland guidelines from Conservation Sudbury for guidance related to development within and adjacent to wetlands. <https://conservationsudbury.ca/en/wetland-guidelines.html>
- 5) Generally, sub-watershed boundaries (as defined in Section 2.2 of this Guide or as otherwise advised by Conservation Sudbury) must not be changed. Any modification to sub-watershed boundaries as part of a development proposal is subject to review through Conservation Sudbury.
- 6) In those circumstances where development is permitted within wetland, wetland features must be appropriately reflected in pre-development models.

2.13 Interim (Phased) Stormwater Management

- 1) Any site alteration or phased project greater than 1ha must either;
 - install the final stormwater management facility for the development ahead of construction as part of the initial phase of development, while ensuring sediments produced during construction will not negatively impact future performance of the facility, or
 - provide and implement an Interim (phased) Stormwater Management Report.

2.14 Modeling Requirements

- 1) For the purposes of determining the Pre-development allowable peak flow for developments less than 1 hectare, the site must be modeled using the Rational Method/IDF Curves utilizing the following parameters. If alternate modeling methods are used to determine the allowable peak flow rate, the lower peak flow of the two methods will determine the allowable peak flow permitted for the development. Alternate modeling should utilize well established methods from the MTO design manual.
- 2) Depending on modeling methodology, provide calculations as follows:

- Runoff Coefficients

Surface	Runoff Coefficient
Pavement	0.95
Gravel	0.7
Roofs	0.95
Lawns	0.3
Dense Landscaping	0.2
Woodland	0.1
Lakes and Wetlands	0.05
Bare Rock (other values should be interpolated)	
30% tree cover	0.75
50% tree cover	0.55
70% tree cover	0.40

For return periods of more than 10 years, increase the runoff coefficients above by 10%- 25 year, 20% - 50 year, 25% - 100 year

- IDF Curve

$$i=a/(t+b)^c,$$

where, i = rainfall intensity (mm/hr), and t = rainfall duration (minutes)

Return Intervals (Years)	a	b	c
Yearly/90 th percentile	28mm		
2	429.375	4.250	0.7325
5	600.938	4.000	0.7325
10	726.563	3.938	0.7400
25	847.030	3.938	0.7400
50	986.250	3.750	0.7375
100	1092.988	3.656	0.7350

Note: from section 6.1 of the CGS 2006 Stormwater Background Study.

- Time of concentration.
 - Time of concentration must be analyzed separately for the pre and post development condition and must be based on the flow path, slope, and surface type from the most remote part of the site to the ultimate outlet for the site.
 - Time of concentration should be based on established methods and should include the time of flow in sewers.
 - Minimum time of concentration to be used is 10 minutes.
- 3) Documentation identifying overall approach and methodology for hydrologic and hydraulic analysis.

2.15 Exemptions for small sites

Subject to the City's discretion, a small site is any development with impervious surface areas (excluding the building) less than 0.085Ha (approx. 25 parking/queuing spaces) and building net floor area less than 500sq.m and does not include developments where drainage within the site flows through or from an adjacent private property.

- 1) Where small Low Risk Sites are proposed (except sites where stormwater management is subject to review by other regulatory agencies) stormwater quality and quantity control requirements can be achieved without the need for a Stormwater Management Report by utilizing the following:
 1. Enhanced grass swales, designed by a Lot Grading Professional, meeting the following requirements.
 - a) Located along, or providing the equivalent length of, the proposed/existing parking and drive aisles.
 - b) Maximum 25m wide contributing flow path across the adjacent impervious surface, with a maximum cross slope of 3% to ensure sheet flow conditions, directed to the enhanced swale.
 - c) Trapezoidal swale cross section with a minimum bottom width of 1.0m.

- d) 3:1 maximum side slopes with a minimum swale depth of 0.3m.
 - e) Minimum 0.5m wide grass filter strip/rounding between the top of swale and the pre-treatment device.
 - f) Pre-treatment, along the length of the parking area at the top of swale.
 - g) Maximum swale slope of 1%.
 - h) Lined with a minimum of 300mm topsoil and grass.
 - i) Set back a minimum of 4m from all buildings.
2. Grass filter strip, designed by a Lot Grading Professional, meeting the following requirements.
- a) Located along the length of the proposed/existing parking and drive aisles.
 - b) Maximum 25m wide contributing flow path across the adjacent impervious surface, with a maximum cross slope of 3% to ensure sheet flow conditions, directed to the filter strip.
 - c) Minimum filter strip width of 5m.
 - d) Maximum filter strip slope of 1%.
 - e) Pre-treatment along the length of the parking area.
 - f) Lined with a minimum of 300mm topsoil and grass.
3. Permeable Pavement or Pavers, designed by a Professional Engineer.
4. In addition to the above, Best Management Practices should be incorporated as follows:
- a) Sheet flow of stormwater from parking lots to swales or landscape strips to convey flow instead of storm sewers.
 - b) Include trees, dense vegetation and other significant rainwater reducing landscaping throughout the site.
 - c) Where sod is provided, topsoil should be well screened and tilled to a minimum 300mm deep.
 - d) Amend topsoil with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.
 - e) Reduce grades throughout the site to below 3%.
 - f) Direct roof leaders to landscaped areas away from the buildings.
- 2) Sites that are not part of a subdivision or consent approval, with proposed impervious surface areas (excluding the building) less than 0.020Ha (approximately 6 parking spaces) may be exempt from stormwater management requirements. However, some sites may still require stormwater management control under applicable provincial acts/regulations or where known drainage issues exist.
- 3) Cash in lieu of onsite quality and quantity controls may be considered for small existing developments where it is impractical to provide stormwater management on site or where the City has or will design and build infrastructure that accounts for the development; however stormwater best management practices should be incorporated into the lot design by a lot grading professional to the maximum extent possible. Unless otherwise stated in

another bylaw the contribution amount will be based on the following (These amounts are from 2023 and are subject to change, as necessary, to account for inflation):

1. In Lieu of onsite Quality Controls the cost of (\$18/m²) will be used for the proposed paved surface area.
2. In lieu of onsite Quantity Controls the following contribution equation will be used based on the increase in impervious areas.
 - Residential = \$1,000 up to the first 560sq.m and \$2.00/sq.m after that.
 - ICI = \$2,000 up to the first 560sq.m and \$4.00/sq.m after that.

2.16 Facility Maintenance Period Requirements

- 1) Unless otherwise specified in Subdivision Agreement, all Municipal SWM facilities will be subject to a minimum developer maintenance period of 2-years. Throughout the Maintenance Period the performance of the facility must be maintained in accordance with the approved Operations and Maintenance manual prepared and sealed by the proponents Engineer.
- 2) Prior to the end of the 2-year developer maintenance period, but not sooner than 1 month before, the SWM facility and any catch basins, maintenance access chambers, ditch inlets, OGS systems or sumps must be cleaned of all accumulated debris to the facilities original design intent; or an assessment provided by a Professional Engineer, indicating that the life expectancy of the facility will not be impacted.
- 3) All storm sewers and culverts are to be flushed and inspected (CCTV) before 2-year maintenance period lapses but no sooner than 1 months before the maintenance period lapses.
- 4) Private SWM facilities approved through site plan control that discharge to the municipally maintained stormwater system will require ongoing maintenance, with an annual maintenance report provided to the City. A logbook of the maintenance records must be kept on site.
- 5) Refer to Section 2.20.3 for additional Operation and maintenance requirements related to the City's ECA.

2.17 Infiltration/Filtration Guidelines

- 1) Infiltration should not be considered for contributing catchment areas with activities that have a high risk of potential contamination (i.e., fuel sales or storage, auto repair, etc.)
- 2) Infiltration of runoff from landscaped or rooftop areas is encouraged. Infiltration of runoff from parking lots, roads and sidewalks should incorporate pre-treatment to ensure longevity of the system.
- 3) Sites located within well head protection areas should limit infiltration of stormwater from parking lots, roads, sidewalks, or other surfaces subjected to winter maintenance activities including snow storage. Where infiltration of these area within well head protection areas is permitted, pretreatment must be provided (e.g., OGS units, Bioswales, etc.).
- 4) Where infiltration is being proposed the Stormwater Management Report must be accompanied by a Geotechnical Report indicating the seasonally high ground water level and soil infiltration rate at each soil stratification.

- 5) Where infiltration/filtration facilities are proposed adjacent to a Municipal Road allowance or where the overall site slopes towards the road allowance a provision for minimizing infiltration into the road allowance must be provided.
- 6) Infiltration/Filtration facilities should include the following design considerations to ensure the quality objectives are met:
 - Located greater than 1.0m above seasonally high groundwater or bedrock.
 - Located outside snow storage areas.
 - Filter media greater than 750mm in depth
 - Filter media phosphorus index values <30ppm (www.omafra.gov.on.ca)
 - Filter media comprised of a mixture of sand, fines, and organic matter.
 - Filter surface covered with mulch and vegetation
 - Pre-treatment systems
 - Multiple treatment cells
 - Monitoring wells
- 7) Factors of Safety must be incorporated into the design infiltration rate to ensure longevity of the facility. The field measured infiltration rate should be divided by the applicable factor of safety indicated below to achieve the design infiltration rate for the proposed facility.

Factor of Safety = 2	Factor of Safety = 3
Permeameter or percolation test on site	Grain size analyses or other infiltration testing,
Loamy or sandy soil	Clayey soil
No nearby sensitive receptors	Sensitive receptors in near proximity e.g., buildings, foundations or vulnerable natural heritage features.

Source: https://wiki.sustainabletechnologies.ca/wiki/Design_infiltration_rate

2.18 Report Details

At a minimum the following information must be included in the Stormwater Management Report prepared and sealed by a Professional Engineer Licensed in the Province of Ontario with a valid Certificate of Authorization:

- ☐ location map of the subject property;
- ☐ property description;
- ☐ post and pre-development, internal and external drainage area plans indicating all flood and fill lines, overland flow routes, all upstream lands and diversion of any drainage routes, and modeling parameters used (i.e., run-off coefficients, areas, CN values, % imperviousness, etc.);

- schematic layout of existing and proposed storm sewer networks, including maintenance access chambers and catch basin descriptions coordinated with the Site Servicing Plan;
- schematic layout of the sub watershed showing the main watercourse, tributaries and trunk sewers;
- for more hydraulically complex sites provide a routing model schematic for minor and major systems illustrating catchment routing, ID, area, imperviousness/coefficient, SWM facilities, channels, sewers and outlets;
- provide descriptions of pre-development and post-development conditions including at minimum general ground cover, drainage patterns, existing/post development inlet and outlet locations in and from the site, respective storm release rates (pre and post development);
- plans detailing storage facility locations, its separation from bedrock and/or seasonally high groundwater table where applicable, volumes and their representative water elevation at peaks for all storms modeled, control structures details, invert elevations, , and inlet / outlet locations including overflow structures where applicable;
- any supporting calculations, reports, and drawings, such as:
 - General Requirements and Assumptions
 - Calculation, and/or model input/output printout, where applicable, for pre and post development surface run-off.
 - Calculation and summary table of run-off coefficients, areas, % imperviousness, and times of concentration.
 - Calculation and/or model input/output printout, where applicable, of allowable release rate and required on site storage.
 - Methods of run-off attenuation and on-site storage.
 - Stage-Storage-Discharge table for each SWM facility clearly indicating stage at which individual control outlets begin.
 - Design information on control outlets and emergency overflow structures such as weirs.
 - Measures to maintain or improve water quality.
 - Measures to minimize impact of run-off downstream, including erosion, flooding etc.
 - Proposed roof control device locations, type, control release rates and corresponding storage volumes for flat roof portions; including a letter from the consultant designing the building confirming that the drains will be installed and will function as described in the Stormwater Management Report/site servicing drawings, and that the building will be designed to withstand the additional loads.
 - Infiltration rates, including appropriate factors of safety.
 - Water balance requirements, where applicable.
 - Flow and storage summary tables which reference the associated drainage area, catchment ID, outlet(s) and differentiate between controlled and uncontrolled areas.
 - Identify and show seasonal high groundwater levels in report and on drawings where infiltration facilities are proposed.
 - A table summarizing required storage, provided storage and associated elevation and flow for the permanent pool, and 2 through 100-year return period and/or regional rainfall events for each facility.
 - Quantity Control Section

- Runoff coefficient or imperviousness calculations.
- Analysis using appropriate storm distributions.
- Pre-development peak flow (m³/s).
- Post-development uncontrolled peak flow (m³/s).
- Post-development controlled peak flow (m³/s).
- SWM facility type.
- Stage – storage – discharge table.
- Outlet design and calculations.
- Total storage required (m³).
- Total storage provided (m³).
- Table to compare provided versus required and predevelopment outlet rates.
- Overland flow conveyance and design.
- External drainage conveyance (100 year and regional).
- Quality Control Section
 - Level of Protection.
 - Table showing permanent water requirements and provided.
 - Extended detention calculation, volume and release time.
 - 28mm Water Quality storm model and/or calculations.
 - Drainage area to facility in hectares.
 - Percentage Impervious.
 - Pre-treatment devices and forebays.
 - Forebay average flow rate at peak during water quality storm.
 - Forebay design calculations as per The Ministry of the Environment design manual.
 - Monitoring devices.
 - Filter media type, depth, porosity, etc.
 - Sizing information for OGS system(s).
- calculation of surface run-off;
- ponding/water elevations corresponding to the required level of controls;
- calculation of run-off coefficients, % imperviousness, and times of concentration;
- calculation of permissible release rate and required on site storage;
- methods of run-off attenuation and on site storage;
- measures to maintain or improve water quality;
- measures to minimize impact of run-off downstream, including erosion, flooding etc;
- proposed roof control device locations, type, control release rates and corresponding storage volumes for flat roof portions;
- in-situ percolation rates.
- Maintenance Protocol for the proposed stormwater management (SWM) facility, provided on a separate letter head and sealed by a Professional Engineer; The Maintenance Protocol must outline the following as a minimum:
 - Indicate the types of maintenance required for the site and for each SWM facility and outline the maintenance procedure.
 - Indicate the periods that maintenance is required for the site and for each SWM facility,

- Indicate the lifespan of the SWM facility and the periods at which review, and monitoring of the system are required to ensure that the required level of treatment is being maintained.
- Detail the monitoring requirements
- Indicate the qualifications required to provide the maintenance/review/monitoring of the SWM facility.
- Detail and provide required Health and Safety protocols to perform maintenance or monitoring
- spill prevention and contingency plan, covering information requirements as per O.Reg 224/07 where applicable, provided on a separate letter head and sealed by a Professional Engineer;
- geotechnical reports and hydro-geological studies where applicable.

2.19 Construction Erosion and Sediment Control

- 1) Manage construction erosion and sediment control through development and implementation of an ESC plan. The ESC plan shall:
 - Have regard to Canadian Standards Association (CSA) W202 Erosion and Sediment Control Inspection and Monitoring Standard (as amended); OR
 - Have regard to Erosion and Sediment Control Guideline for Urban Construction 2019 by TRCA (as amended).
 - Be prepared by a QP for sites with drainage areas greater than 5 ha or if specified by the Owner for a drainage area lower than 5 ha.
- 2) Installation and maintenance of the ESC measures specified in the ESC plan shall have regard to CSA W208:20 Erosion and Sediment Control Installation and Maintenance (as amended).
- 3) Inspections of ESC measures are to be conducted at a frequency specified per the ESC plan, for dry weather periods (active and inactive construction phases), after Significant Storm Events and Significant Snowmelt Events, and after any extreme weather events. Inspections and maintenance of the temporary ESC measures shall continue until they are no longer required.
- 4) For sites with drainage areas greater than 5 ha, a QP shall inspect the construction ESC measures, as specified in the ESC plan.

2.20 ECA requirements (Refer to Appendix D for Process Flow Charts)

- 1) Modification or Expansion of the City's ECA with the Ministry (Form SW1 and SW2)

(effective June 2022, unless efforts to undertake the alteration, such as tendering or commencement of construction of the Sewage Works have occurred in which case July 2023)

- 1) The Alterations authorized under the City's ECA are limited to Sewage Works comprising the Authorized System which does not include municipally or Privately Owned Stormwater Works:

- On industrial, commercial, or institutional land;
 - That are operated as waste disposal sites defined under the EPA, and snow dump/melt facilities; or
 - That propose to collect, store, treat, or discharge stormwater containing substances or pollutants (other than Total Suspended Solids, or oil and grease) detrimental to the environment or human health.
- 2) A Record of Future Alteration form SW1 must be completed for all alterations, additions, modifications, replacements or extension to storm sewers, ditches, or culverts, except where the storm sewers ditches or culverts:
- Pass under or through a body of surface water, unless trenchless construction methods are used or the local Conservation Authority has authorized an alternate construction method;
 - Has a nominal diameter greater than 2.4m, or equivalent sizing;
 - Is a combined sewer;
 - Is a concrete channel;
 - Is designed to, at any time, transmit, store, or control sanitary sewage.
 - Converts rural road cross section, ditches to curb, gutter, and storm sewers if the stormwater volume and /or peak flow is increased and no water quality treatment is planned or demonstrated to be achieved, in accordance with this guide to offset the increase in stormwater.
 - Results in new discharges or increased discharges to a Municipal Drain without written approval by the Owner and a signed Municipal Drainage Engineer's Report in accordance with the Drainage Act;
 - Establishes a new outlet with direct discharge into the Natural Environment without monitoring in accordance with this Guide. Private outlets that discharge to the environment and not to a municipally owned and maintained storm outlet requires their own ECA;
 - Increases stormwater flow of an existing storm sewer or ditch without achieving water quality criteria set out in this guide, unless the existing downstream Municipal stormwater management system has sufficient residual transmission and treatment capacity to accommodate the additional stormwater;
 - Increases local hydraulic capacity of an existing storm sewer or ditch to accommodate new stormwater flows unless the existing downstream; unless the existing downstream Municipal stormwater management system has sufficient residual transmission and treatment capacity to accommodate the additional stormwater.
- 3) A Record of Future Alteration form SW2 must be completed for all alterations, additions, modifications, replacements, or extension to storm water management facilities, accept where:
- the stormwater management facility is a regional end-of-pipe flood control Facility;
 - the Alteration will result in new or increased discharges to a Municipal Drain without written approval by the Owner and a signed Municipal Drainage Engineer's Report in accordance with the Drainage Act R.S.O. 1990, c.D.17;

- a new outlet is established that discharges directly into the Natural Environment without treatment and monitoring in accordance with this Guide. Monitoring is only completed on Municipally owned and maintained storm outlets. Private outlets that discharge directly to the environment require their own ECA;
- The Alteration will service a drainage area greater than 65 ha;
- The alteration will result in conversion of an existing Stormwater Management Facility into another type of Stormwater Management Facility.
- Exemptions are made under section 53(6) of the OWRA or by O.Reg 525/98;
- It constitutes maintenance or repair of the Authorized System.

4) All designs must;

- Be prepared by a licensed Engineer;
- satisfy or exceed the minimum requirements specified in the Ministries Design Criteria, and as updated in the CGS Supplemental Design Criteria;
- Be planned, designed, and built to be consistent with the Ministries publication "Stormwater Management Planning and Design Guidance Manual" (as amended from time to time);
- Be planned, designed, and built to be consistent with Guidelines set out in this document.
- Include an outlet or an emergency overflow for the Sewage Works, with the verification of the location, route and capacity of the receiving major system to accommodate overflows:
- Include design considerations to protect sources of drinking water, including those set out in the Standard Operating Policy for Sewage Works and any applicable local Source Protection Plan policies:
- Not result in adverse effects or a deterioration on the approved effluent quality or quantity of downstream Stormwater Management Facilities which results in not being able to achieve the overall Stormwater performance criteria.
- Have regard to the 2012 TRCA Stormwater Management Criteria document, Appendix E, for outlets, and any such outlet must not:
 - Increase discharge or create a new point source discharge to privately owned land unless there is express written consent of the owner (s) of such private lands(s);
 - Result in adverse effects.

5) Any Alteration to LID or end of pipe Stormwater management Facilities shall be inspected before operation of the alteration to confirm construction as per specifications (including depth, as applicable).

2) Direct Submission to the MECP

- 1) Where alterations, additions, modifications, replacements, or extension of the sewage works or storm water management facilities do not fall under the City's Consolidated

Linear Infrastructure ECA or are not exempt from an ECA then a direct submission to the MECP is required.

- 2) The statement of municipality is not required for proposed sewage works related to industrial developments (which includes automobile repair and fueling stations) or if the applicant is the municipality within whose jurisdiction the sewage works that are the subject of the application are or are to be located.
- 3) Operation and Maintenance Protocol
 - 1) Operation and Maintenance Protocol of the Sewage Works must be created in accordance with Schedule E, section 3.2, to the CGS ECA Agreement with the Ministry which can be found in Appendix C of this Guide.

3.0 References

- 1997 MTO Drainage Management Manual.
- 2003 MOE Stormwater Management Planning and Design Guide.
- 2006 CGS Stormwater Background Study.
- 2008 Design Guidelines for Sewage Works.
- 2011 Ontario Water Resources Act
- 2012 CGS Engineering Design Manual.
- 2014 CGS Source Protection Area Plan
- 2016 CGS Site Plan Control Guide.
- 2016 LSRCA Technical Guidelines for Stormwater Management Submissions.
- 2016 Ontario Regulation 332/12 Building Code.
- 2022 MECP DRAFT Low Impact Development Stormwater Management Guidance Manual.

4.0 Low Impact Development reference guides

- STEP resource library (<https://sustainabletechnologies.ca/resource-library/>)
- TRCA and CVC Low Impact Development Stormwater Management Planning and Design Guide (http://sustainabletechnologies.ca/wp/wp-content/uploads/2013/01/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf)
- CVC Grey to Green Road retrofits (<https://cvc.ca/wp-content/uploads/2015/01/Grey-to-Green-ROW-Road-Right-Of-Way.pdf>)
- New Jersey Stormwater Best Management Practices (http://www.njstormwater.org/bmp_manual2.htm)

APPENDIX A

WATERSHED SPECIFIC REQUIREMENTS

DRAFT CGS Stormwater Management Design Guide
Last updated: April 18, 2023

WATER SHED	QUALITY	QUANTITY	WATER BALANCE & EROSION PROTECTION	PHOSPHORUS
RAMSEY LAKE	<ul style="list-style-type: none">Enhanced Quality	<ul style="list-style-type: none">Allowable flow rate must be reduced to 80% or the pre-development flow rate	<ul style="list-style-type: none">No additional requirements	<ul style="list-style-type: none">No additional requirements
JUNCTION CREEK	<ul style="list-style-type: none">Enhanced Quality	<ul style="list-style-type: none">Developments upstream of the downtown box culvert must reduce the allowable flow rate to 85% of the pre-development flow rate.	<ul style="list-style-type: none">Capture and retain the runoff from the 25mm event for a minimum of 24hrs on site to reduce downstream erosion.	<ul style="list-style-type: none">Undertake a phosphorus budget as outlined in Appendix B.

APPENDIX B
PHOSPHORUS LOADING

Phosphorus Loading

Phosphorus loads (kg / ha / year) are to be calculated based on the catchment area, the land use, level of control of the SWM facility where it exists, and the average load. Typical phosphorus reductions for various types of BMP's are as follows:

- Constructed Wetlands – 77%;
- Dry Detention Ponds – 10%;
- Perforated Pipe Infiltration / Exfiltration System – 87%;
- Sand or Media Filters – 45%;
- Infiltration Trenches – 60%;
- Sorbtive Media Interceptors – 79%;
- Vegetated Filter Strips / Stream Buffers – 65%; and
- Wet Detention Ponds – 63%.

These reduction estimates are based on data contained in the MOE's Lake Simcoe Phosphorus Loading Development Tool (2012). Subsequent versions of this tool should be used to obtain the latest MOE accepted removal rates.

Alternate BMP's or removal rates will be considered provided that the removal rates have been verified based on the results of acceptable third party field studies.

Phosphorus removal rates for oil / grit separators are assumed to be zero ("0") unless satisfactory field studies have been completed for the specific unit.

Loadings for existing and proposed land use can be based upon data contained within the MOE's Lake Simcoe Phosphorus Loading Development Tool (2012 or most recent version). Other methods can be used, subject to the approval of the CGS.

APPENDIX C

DRAFT OPERATION AND MAINTENANCE PROTOCOL OF THE SEWAGE WORKS SCHEDULE E, TO THE CGS ECA AGREEMENT WITH THE MINISTRY

Schedule E: Operating Conditions

System Owner	Greater Sudbury, City of
ECA Number	016-S701
System Name	Greater Sudbury Stormwater System
ECA Issue Date	\${MONTH} \${DAY}, \${YEAR}

1.0 General Operations

- 1.1 The Owner shall ensure that, at all times, the Sewage Works comprising the Authorized System and the related equipment and Appurtenances used to achieve compliance with this Approval are properly operated and maintained.
- 1.2 Prescribed Persons and Operating Authorities shall ensure that, at all times, the Sewage Works under their care and control and the related equipment and Appurtenances used to achieve compliance with this Approval are properly operated and maintained.
- 1.3 In conditions 1.1 and 1.2 “properly operated and maintained” includes effective performance, adequate funding, adequate operator staffing and training, including training in applicable procedures and other requirements of this Approval and the EPA, OWRA, CWA, and regulations, adequate laboratory services, process controls and alarms and the use of process chemicals and other substances used in the Authorized System.
- 1.4 The Owner shall ensure that Sewage Works are operated with the objective that the effluent from the Sewage Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam, or discoloration on the receiving waters, and shall evaluate the need for maintenance if the objective is not being met.
- 1.5 The Owner shall ensure that any Storm Sewers or ditches authorized under Schedule D of this approval are not placed into operation until the associated Stormwater Management Facilities to provide treatment are constructed and operated.

2.0 Duties of Owners and Operating Authorities

- 2.1 The Owner, Prescribed Persons, and any Operating Authority shall ensure the following:
 - 2.1.1 At all times that the Sewage Works within the Authorized System are in service, the Sewage Works are:

-
- a) Operated in accordance with the requirements under the EPA and OWRA, and
 - b) Maintained in a state of good repair.
 - 2.1.2 The Authorized System is operated by persons that are familiar with the requirements of this Approval.
 - 2.1.3 All sampling, testing, monitoring, and reporting requirements under the EPA and this Approval that relate to the Authorized System are complied with.
 - 2.1.4 All necessary steps are taken to ensure that operations of the Sewage Works and any associated physical structures do not constitute a safety or health hazard to the general public.
 - 2.1.5 Where a Stormwater Management Facility ceases to function as a Stormwater Management Facility, whether by intent, accident, or otherwise (e.g., a CSO or an SSO), a workplan shall be developed that includes local community notification, plans for rehabilitating the Stormwater Management Facility to proper function in a reasonable time, identification of actions that will be taken to prevent reoccurrences, and timelines for implementing the workplan.
 - 2.1.6 That operations and maintenance activities are undertaken at the frequency and in conformance with the procedures set out in the O&M Manual.
 - a) A Prescribed Person or Operating Authority shall only undertake operations and maintenance activities where they have been delegated the authority to undertake such activities by the Owner or the Owner has expressly approved the activity(ies).
 - 2.2 For clarity, the requirements outlined in the above conditions 2.1 for Prescribed Persons and any Operating Authority only apply to Sewage Works within the Authorized System where they are responsible for the operation.
 - 2.3 The Owner, Prescribed Persons, and Operating Authority shall take all reasonable steps to minimize and ameliorate any Adverse Effect on the Natural Environment or impairment of the quality of water of any waters resulting from the operation of the Authorized System, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

3.0 Operations and Maintenance

3.1 Inspection

- 3.1.1 The Owner shall ensure that all Sewage Works within the Authorized System are inspected at the frequency and in accordance with procedures set out in their O&M Manual.
- 3.1.2 The owner shall ensure that:
- a) Any Stormwater Management Facilities, pumping stations, and any outlets that discharge to a receiver, are inspected at least once before December 31, 2026, if these have not been inspected since January 1, 2018 and thereafter as required by the O&M Manual; and
 - b) Any Stormwater Management Facilities, pumping stations, and any outlets that discharge to a receiver, established, or replaced within the Authorized System after the date of issuance of this Approval, are inspected within one year of being placed into service and thereafter as required by the O&M Manual.
- 3.1.3 The Owner shall clean and maintain Sewage Works within the Authorized System to ensure the Sewage Works perform as designed.
- 3.1.4 The Owner shall inspect the Stormwater Management Facilities in the Authorized System after significant flooding events as defined in, and in accordance with procedures documented in, the O&M Manual.
- 3.1.5 The Owner shall maintain records of the results of the inspections required in condition 3.1.1, 3.1.2 and 3.1.4 and any cleaning and maintenance operations undertaken, and shall make available the records for inspection by the Ministry upon request. The records shall include the following:
- a) Asset ID and name of the Sewage Works;
 - b) Date and results of each inspection, maintenance, or cleaning;
 - c) Name of person who conducted the inspection, maintenance, or the name of the inspecting official, where applicable, and
 - d) As applicable to the type of works, observations resulting from the inspection including, at a minimum:

- i Hydraulic operation of the works (e.g., length of occurrence since the last rainfall event, evidence or occurrence of overflows).
- ii Condition of vegetation in and around the works.
- iii Occurrence of obstructions at the inlet and outlet of the works.
- iv Evidence of spills and/or oil/grease contamination.
- v Presence of trash build-up, and
- vi Measurements of other parameters as required in the Monitoring Plan.

3.2 Operations & Maintenance (O&M) Manual

3.2.1 The Owner shall prepare and implement an operations and maintenance manual for Sewage Works within the Authorized System on or before June 17, 2023, that includes or references, but is not necessarily limited to, the following information:

- a) Procedures for the routine operation of the Sewage Works;
- b) Inspection programs, including the frequency of inspection, and the methods or tests employed to detect when maintenance is necessary, including:
 - i Presence of algae and/or invasive species impairing the Works (e.g., phragmites, goldfish);
 - ii Measurements of sediment depth, manual water levels (staff gauge) and/or visual observations, as appropriate to the Stormwater Management Facilities.
- c) Maintenance and repair programs, including:
 - i The frequency of maintenance and repair for the Sewage Works;
 - ii Stormwater pond sediment cleanout, dewatering, and management;
 - iii Excavation, modification, replacement of LID soil/media/aggregate/geotextile, such as bioretention cells, green roof, permeable pavement; and

-
- iv The frequency of maintenance for any other Stormwater Management Facilities identified in Schedule B that collect sediment.
 - d) Operational and maintenance requirements to protect sources of drinking water, such as those included in the Standard Operating Policy for Sewage Works, and any applicable local Source Protection Plan policies;
 - e) Procedures for routine physical inspection and calibration of monitoring equipment or components in accordance with the Monitoring Plan;
 - f) Emergency Response, Spill Reporting and Contingency Plans and Procedures for dealing with equipment breakdowns, potential spills, and any other abnormal situations, including notification to the Spills Action Centre, the Medical Officer of Health, and the District Manager, as applicable;
 - g) Procedures for receiving, responding, and recording public complaints, including recording any follow-up actions taken; and
 - h) As-built drawings or record drawings of the Sewage Works for stormwater works constructed on or after January 1, 2010 and where available for stormwater works constructed prior to January 1, 2010.
- 3.2.2 The Owner shall review and update the O&M Manual and ensure that access to a copy is readily available for each Stormwater Management Facility for the operational life of the works.
- 3.2.3 The Owner shall provide a copy of the O&M Manual to Ministry staff, upon request.
- 3.2.4 The Owner shall revise the O&M Manual to include procedures necessary for the operation and maintenance of any Sewage Works within the Authorized System that are established, altered, extended, replaced, or enlarged after the date of issuance of this approval prior to placing into service those Sewage Works.
- 3.2.5 For greater certainty, the O&M Manual may be a single document or a collection of documents that, when considered together, apply to all parts of the Authorized System.
- 3.3 On or before June 17, 2025, the Owner shall establish signage to notify the public at any Stormwater Management Facility identified in Schedule B that

is a wet pond, dry pond, hybrid Facility, or engineered wetland. The signage shall include the following minimum information:

- 3.3.1 Identification that the site contains a Stormwater Management Facility;
 - 3.3.2 Identification of potential hazards and limitations of water use, as applicable;
 - 3.3.3 Identification of the purpose of the Facility;
 - 3.3.4 ECA approval number and/or asset ID; and
 - 3.3.5 Owner's contact information.
- 3.4 Prior to any maintenance of Sewage Works comprising the Authorized System, the Owner shall ensure that all applicable permits or authorizations have been obtained from Federal or Provincial agencies having legislative mandates relating to species at risk or water resources.

4.0 Monitoring Plan

- 4.1 On or before June 17, 2024 or within twenty-four (24) months of the date of the publication of the Ministry's monitoring guidance, whichever is later, the Owner shall develop and implement a monitoring plan for the Authorized System. The monitoring plan shall be:
- 4.1.1 Signed and approved by management with the authority delegated by the Owner to do so;
 - 4.1.2 Peer-reviewed by a third-party Qualified Person (QP), external to the development of the Monitoring Plan, to verify the adequacy of the Monitoring Plan in complying with conditions 4.4 and 4.5 of Schedule E. The results of the peer review shall include:
 - a) Written confirmation from the QP that they have the experience and qualifications to carry out the work; and
 - b) Written confirmation from the QP of the adequacy of the Monitoring Plan.
- 4.2 The Owner, or a QP designated by the Owner, may jointly develop the Monitoring Plan in partnership with Owner(s) of other Municipal Stormwater Management Systems as long as the Municipal Stormwater Management Systems are within the same watershed.
- 4.3 The Owner shall ensure the Monitoring Plan is implemented and any resulting monitoring data is recorded in an electronic database.

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- 4.4 The Monitoring Plan shall include:
- 4.4.1 Procedures to verify that the operational performance of the Authorized System is as designed/planned;
 - 4.4.2 Procedures to assess the environmental impact of the Municipal Stormwater Management System; and
 - 4.4.3 Procedures for any corrective action that may be required to address any performance deficiencies or environmental impacts identified from above conditions 4.4.1 or 4.4.2.
- 4.5 The Monitoring Plan shall also include, but not be limited to:
- 4.5.1 Identification of the Sewage Works to be monitored, including outlets and any works that provide quality and/or quantity control;
 - 4.5.2 Identification of the key receivers to be monitored within the Owner's municipal boundaries and the monitoring locations;
 - 4.5.3 Consideration of relevant municipal land use and environmental planning documents (e.g., Stormwater Management Master Plan, Class Environmental Assessment Project, asset management plan, subwatershed studies, and planned development);
 - 4.5.4 Characterization of water quality and quantity conditions and identification of water users to be protected, based on conditions 4.5.2 and 4.5.3;
 - 4.5.5 Identification of water quality and quantity goals, as it relates to Stormwater management, using the information collected in condition 4.5.4;
 - 4.5.6 Identification of locations of rainfall gauges to be used;
 - 4.5.7 Identification of inspections, measurements, sampling, analysis and/or other monitoring activities that were used as the basis for or will inform future updates to the procedures identified in condition 4.4.
 - 4.5.8 Details respecting a monitoring program for the works and the receivers, that includes, at a minimum:
 - a) Hydrological, chemical, physical, and biological parameters, as appropriate, in alignment with the goals;

- b) Ensures water level of the Stormwater Measurement Facilities, excluding MTDs, are measured at regular intervals with a water level gauge;
 - c) Monitoring methodology, including the frequency and protocols for sampling, analysis, and recording, with consideration of dry and wet weather events and timing of sampling during wet weather events.
 - d) Ensures that the time of all samples or measurements are recorded.
- 4.5.9 An implementation plan for the monitoring program that identifies timelines and, if the monitoring occurs on a rotational basis, provides a description of the rotational schedule and associated works.
- 4.5.10 Includes a summary of all monitoring data along with an interpretation of the data and any conclusion drawn from the data evaluation about the need for future modifications to the Authorized System or system operations, and
- 4.5.11 Consideration of adaptive management practices (e.g., evidence-based decision making).
- 4.6 The Owner shall ensure that the Monitoring Plan is updated where necessary within twelve (12) months of any Alteration to the Authorized System, or more frequently as required by the Monitoring Plan.
- 4.7 The Owner shall, on request and without charge, provide a copy of the Monitoring Plan and any resulting monitoring data to members of the public.

5.0 Reporting

- 5.1 The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.
- 5.2 The Owner shall prepare an annual performance report for the Authorized System that:
- 5.2.1 Is submitted to the Director on or before April 30th of each year and covers the period from January 1st to December 31st of the preceding calendar year.
 - a) For clarity, the first report shall cover the period of January 1, 2023 to December 31st, 2023 and be submitted to the Director on or before April 30th, 2024.

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- 5.2.2 Includes a summary of all monitoring data along with an interpretation of the data and an overview of the condition and operational performance of the Authorized System and any Adverse Effects on the Natural Environment;
 - 5.2.3 Includes a summary and interpretation of environmental trends based on all monitoring information and data for the previous five (5) years;
 - 5.2.4 Includes a summary of any operating problems encountered and corrective actions taken;
 - 5.2.5 Includes a summary of all inspections, maintenance, and repairs carried out on any major structure, equipment, apparatus, mechanism, or thing forming part of the Authorized System;
 - 5.2.6 Includes a summary of the calibration and maintenance carried out on all monitoring equipment;
 - 5.2.7 Includes a summary of any complaints related to the Sewage Works received during the reporting period and any steps taken to address the complaints;
 - 5.2.8 Includes a summary of all Alterations to the Authorized System within the reporting period that are authorized by this Approval including a list of Alterations that pose a Significant Drinking Water Threat;
 - 5.2.9 Includes a summary of all spills or abnormal discharge events;
 - 5.2.10 Includes a summary of actions taken, including timelines, to improve or correct performance of any aspect of the Authorized System; and
 - 5.2.11 Includes a summary of the status of actions for the previous reporting year.
- 5.3 The report described in condition 5.2 shall be:
- 5.3.1 Made available, on request and without charge, to members of the public who are served by the Authorized System; and
 - 5.3.2 Made available, by June 1st of the same reporting year, to members of the public without charge by publishing the report on the Internet, if the Owner maintains a website on the Internet.

6.0 Record Keeping

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- 6.1 The Owner shall retain for a minimum of ten (10) years from the date of their creation:
 - 6.1.1 All records, reports and information required by this Approval and related to or resulting from Alterations to the Authorized System, and
 - 6.1.2 All records, report and information related to the operation, maintenance and monitoring activities required by this Approval.
 - 6.2 The Owner shall update, within twelve (12) months of any Alteration to the Authorized System being placed into service, any drawings maintained for the Municipal Stormwater Management System to reflect the Alteration of the Sewage Works, where applicable.

7.0 Review of this Approval

- 7.1 No later than the date specified in Condition 1 of Schedule A of this Approval, the Owner shall submit to the Director an application to have the Approval reviewed. The application shall, at minimum:
 - 7.1.1 Include an updated description of the Sewage Works within the Authorized System, including any Alterations to the Sewage Works that were made since the Approval was last issued; and
 - 7.1.2 Be submitted in the manner specified by Director and include any other information requested by the Director.

8.0 Source Water Protection

- 8.1 The Owner shall ensure that any Alteration in the Authorized System is designed, constructed, and operated in such a way as to be protective of sources of drinking water in Vulnerable Areas as identified in the Source Protection Plan, if available.
- 8.2 The Owner shall prepare a "Significant Drinking Water Threat Assessment Report for Proposed Alterations" for the Authorized System on or before June 17, 2023 that includes, but is not necessarily limited to:
 - 8.2.1 An outline of the circumstances under which proposed Alterations could pose a Significant Drinking Water Threat based on the Director's Technical Rules established under the CWA.
 - 8.2.2 An outline of how the Owner assesses the proposed Alterations to identify drinking water threats under the CWA.

- 8.2.3 For any proposed Alteration a list of components, equipment, or Sewage Works that are being altered and have been identified as a Significant Drinking Water Threat.
- 8.2.4 A summary of design considerations and other measures that have been put into place to mitigate risks resulting from construction or operation of the components, equipment, or Sewage Works identified in condition 8.2.3, such as those included in the Standard Operating Policy for Sewage Works.
- 8.3 The Owner shall make any necessary updates to the report required in condition 8.2 at least once every twelve (12) months.
- 8.4 Any components, equipment, or Sewage Works added to the report required in condition 8.2 shall be included in the report for the operational life of the Sewage Works.
- 8.5 Upon request, the Owner shall make a copy of the report required in condition 8.2 available to the Ministry or Source Protection Authority staff.

9.0 Storm Sewer Catchment Asset Inventory

- 9.1 The Owner shall prepare and submit to the Director an inventory of the storm sewersheds and classify in accordance with Tables E1 and E2, on or before June 17, 2025. Minimum classification of the level of Stormwater management is as follows:
- 9.1.1 Level A – Stormwater receives treatment for water quality and quantity prior to discharge to the environment;
- 9.1.2 Level B – Stormwater receives treatment for water quality but no water quantity prior to discharge to the environment; and
- 9.1.3 Level C – Stormwater receives no treatment for water quality prior to discharge to the environment.

Table E1. Storm Sewershed and Associated Treatment					
Outlet Asset ID	Sewershed Catchment Area (ha)	Tributary or Receiver	Subwatershed/ Watershed	Stormwater Management Level (A, B or C)	Treatment provided by other municipality (if applicable)

Table E2. Summary of Storm Sewersheds		
Stormwater Management Level	Total Number of Outlets to Environment	Total Sewershed Catchment Area (ha)

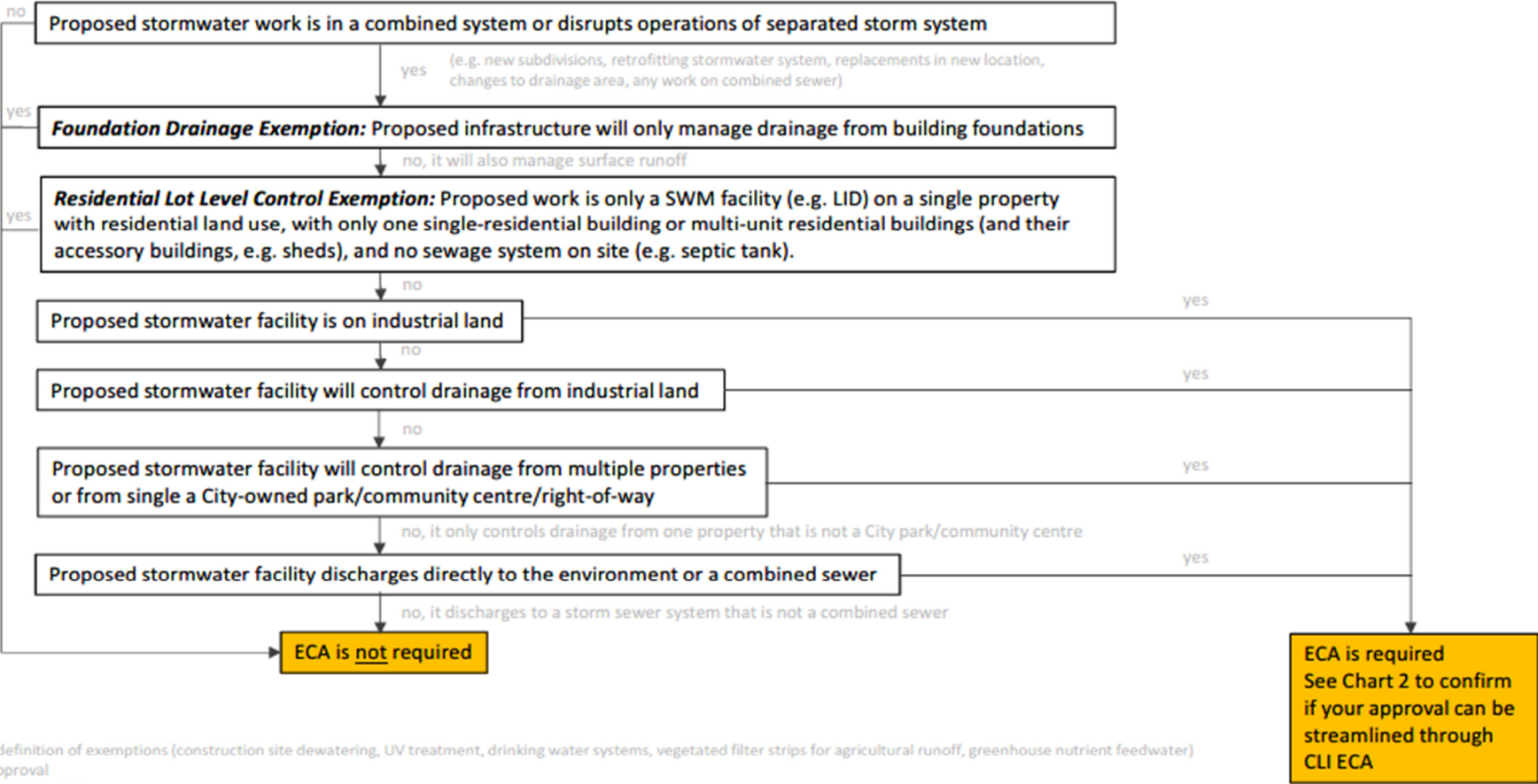
Level A		
Level B		
Level C		

- 9.2 Within 12 (twelve) months of the date that the inventory required in condition 9.1 is submitted to the Director, the document(s) or file(s) referenced in Table B1 of Schedule B of this Approval shall be updated to identify the storm sewersheds for each outlet and their level of Stormwater management.

APPENDIX D
ECA and CLI FLOW CHARTS

Chart 1: Is your project subject to an ECA?

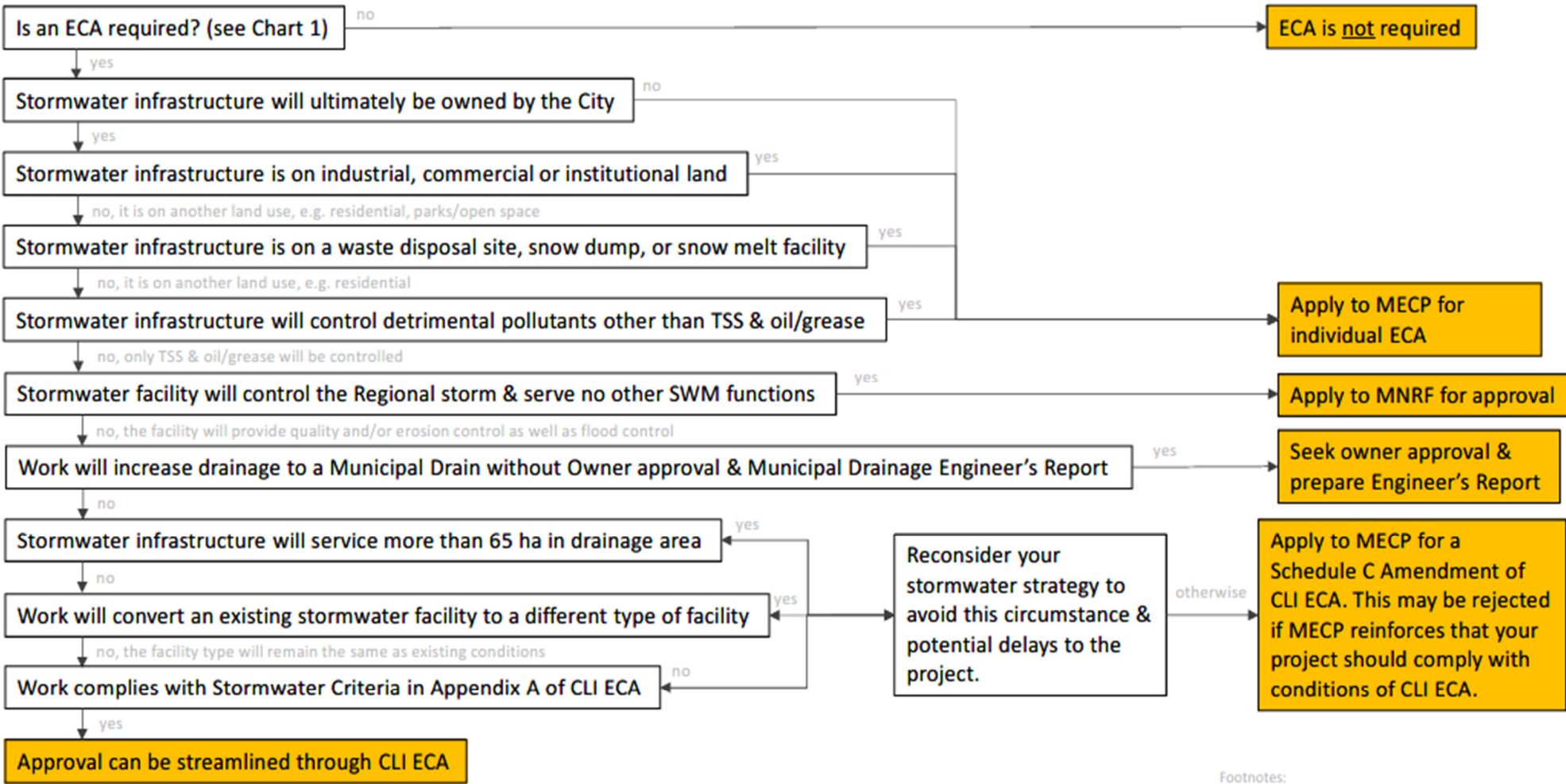
(e.g. road resurfacing with no storm sewer retrofits or impervious changes, service connections, in kind replacement, lining sewers*)



Footnotes:
Refer to O. Reg. 525/98 for complete definition of exemptions (construction site dewatering, UV treatment, drinking water systems, vegetated filter strips for agricultural runoff, greenhouse nutrient feedwater)
“ECA” – Environmental Compliance Approval
“CLI ECA” – Consolidated Linear Infrastructure ECA
“Industrial land” means land used for the production, processing, repair, maintenance or storage of goods or materials, or the processing, storage, transfer or disposal of waste, but does not include land used primarily for the purpose of buying or selling,
 (a) goods or materials other than fuel, or
 (b) services other than vehicle repair services
*where lining the sewer does not disrupt the operation of the sewage works

Image taken from the November 24, 2022, Municipal Stormwater Management Discussion Group presentation held in Brampton regarding “CLI ECA Implementation Across Municipal Departments”

Chart 2. Can your project get streamlined approval through the CLI ECA?



Footnotes:
"CLI ECA" – Consolidated Linear Infrastructure ECA
Refer to approved CLI ECA for full details

Image taken from the November 24, 2022, Municipal Stormwater Management Discussion Group presentation held in Brampton regarding "CLI ECA Implementation Across Municipal Departments"