Annual Performance Report 2025

City of Kingston Municipal Stormwater Management System
Environmental Compliance Approval: 018-S701

April 30, 2026

This document complies with the Accessibility for Ontarians with Disabilities Act.

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1.0 System Description

The Municipal Stormwater Management (SWM) System serving the City of Kingston catchment area is a separate stormwater system (i.e., not intended to convey sanitary or combined sewage) located within the Lake Ontario, Great Cataraqui River, Gananoque River, and St. Lawrence River watersheds.

The Municipal SWM System consists of low impact development features, storm inlets, storm sewers, maintenance holes, outlets, watercourses, culverts, stormwater management facilities, manufactured treatment devices, and subsurface storage facilities.

The entire Municipal SWM System is owned and operated by the City of Kingston and connects to three (3) neighbouring Municipal SWM Systems: Loyalist Township to the west, South Frontenac Township to the north and The Township of Leeds and the Thousand Islands to the east.

Questions about the report should be directed to:

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2.0 Monitoring Program

2.1 Program Partners

The City of Kingston has yet to develop a system-wide Monitoring Plan for the City of Kingston's Municipal SWM System, as the Ministry of the Environment, Conservation and Parks (MECP) has yet to finalize its forthcoming monitoring plan guidance document. The City's Monitoring Plan will be developed and implemented for the Municipal SWM System within 24 months of the date of the publication of the Ministry's monitoring guidance, as per the terms of our Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) Agreement with the MECP.

In 2022, the City reached out to the Cataraqui Region Conservation Authority (CRCA) to offer them an opportunity to develop the Monitoring Plan for the Municipal SWM System with the understanding that the City would implement the plan using its own staff resources. A proposal was received from the CRCA in January 2023 but has been left in draft and put on hold pending the MECP's publication of the final monitoring plan guidance document. It is the City's intent to prepare its own independent Monitoring Plan separate from neighbouring Municipal Stormwater Management Systems located within the same watershed areas.

Currently, the City is carrying out monitoring of SWM Facilities in accordance with the individual Environmental Compliance Approvals issued prior to the finalization of the City's CLI ECA Agreement.

The City of Kingston maintains a CLI ECA Stormwater webpage that provides information on permit applications, including application requirements, checklists, guidance, fees, and City contact information. The webpage also identifies when direct submission to the MECP is required and provides information on Environmental Activity and Sector Registry (EASR) registration. In addition, it includes links to applicable design standards and guidelines, the technical review process, standard CLI ECA subdivision agreement clauses, previous Annual Performance Reports, watershed mapping, publicly available stormwater asset data, relevant Ontario regulations, and the City's CLI ECA Agreement. The City intends to post the Stormwater Monitoring Plan on this webpage once it has been finalized and approved by the MECP.

2.2 Monitoring Details

- **Number of Monitoring Stations**: Five (grab sampling at stormwater management facilities)
- **Monitoring Level**: In accordance with original Environmental Compliance Approval requirements for each facility

- **Key Receivers Monitored**: None
- **Accredited Laboratory**: Caduceon Environmental Laboratories

2.3 Monitoring Data Summary

Table 1: Monitoring Results (Oil & Grease)

Station	Sample Type[1]	Parameter	Units	Total Count[2]	Wet Weather Samples	Min (mg/L)	Max (mg/L)	Mean (mg/L)
SWM-33	Grab	Oil & Grease	mg/L	72	6	0.7	7.9	2.6
OGS-43	Grab	Oil & Grease	mg/L	72	6	0.7	4.0	3.2
OGS-44	Grab	Oil & Grease	mg/L	72	6	0.7	2.8	1.7

Table 2: Monitoring Results (Total Suspended Solids)

Station	Sample Type[1]	Parameter	Units	Total Count[2]	Wet Weather Samples	Min (mg/L)	Max (mg/L)	Mean (mg/L)
SWM-34	Grab	TSS	mg/L	26	2	13	13	13
SWM-42	Grab	TSS	mg/L	24	3	5	32	14

Table 3: Non-Measured Conditions

Station	Dry Weather Flow	Snow Melt
All Stations	Not Monitored	Not Monitored

[1] Sample types may include grab, automatic, continuous, composite or field measurements.
[2] Total count across all years for this sampling type.

3.0 Monitoring Results and Performance Assessment

3.1 Monitored Catchment Areas

- **SWM-33, OGS-43 and OGS-44**: Catchment area of approximately 84 hectares consisting of the following land uses: General Industrial, Business Park Industrial, Waste Management Area, Residential, Estate Residential, Environmental Protection Area, Open Space, Arterial Commercial, Regional Commercial, and Institutional. Overall imperviousness would be characterized as having an average runoff coefficient of 0.75. Potential sources of pollutants include: Industrial Activities (heavy metals, chemicals, solvents, and particulate matter through emissions, spills, and waste disposal), Urban Runoff (sediment, oil, grease, heavy metals, pesticides, herbicides, fertilizers, animal waste, trash, and debris), Construction Activities (dust, sediment, debris, and chemicals), Urban Agriculture (pesticides, fertilizers, and animal waste), Commercial and Institutional Facilities (waste generation, chemical use, and transportation), Atmospheric Deposition (airborne particulates), Residential Areas (pesticides, herbicides, and fertilizers), and Waste Management Areas (chemicals, oils, solvents, leachate, sediment, nutrients, heavy metals, petroleum hydrocarbons).

- **SWM-34**: Catchment area of approximately 62 hectares consisting of the following land uses: Residential, Environmental Protection Area, Open Space, and Arterial Commercial. Overall imperviousness would be characterized as having an average runoff coefficient of 0.50. Potential sources of pollutants include: Urban Runoff (sediment, oil, grease, heavy metals, pesticides, herbicides, fertilizers, animal waste, trash, and debris), Construction Activities (dust, sediment, debris, and chemicals), Urban Agriculture (pesticides, fertilizers, and animal waste), Commercial Facilities (waste generation, chemical use, and transportation), Atmospheric Deposition (airborne particulates), and Residential Areas (pesticides, herbicides, and fertilizers).

- **SWM-42**: Catchment area of approximately 28 hectares consisting of the following land uses: Residential, Open Space, Arterial Commercial, Business Commercial, and Neighbourhood Commercial. Overall imperviousness would be characterized as having an average runoff coefficient of 0.50. Potential sources of pollutants include: Urban Runoff (sediment, oil, grease, heavy metals, pesticides, herbicides, fertilizers, animal waste, trash, and debris), Construction Activities (dust, sediment, debris, and chemicals), Urban Agriculture (pesticides, fertilizers, and animal waste), Commercial Facilities (waste generation, chemical use, and transportation), Atmospheric Deposition (airborne particulates), and Residential Areas (pesticides, herbicides, and fertilizers).

3.2 Supporting Information

Summary of monitoring issues:

- Most of the wet weather events that occur during the year do not meet the minimum threshold of 15 mm of rain stipulated in the ECAs for SWM-33 and SWM-42 and therefore opportunities for water sampling are limited. Opportunities are further reduced when the 24-hour period after the rainfall event occurs on a weekend and unionized staff are not available to undertake sampling.

- Stormwater management pond SWM-42 is located downstream of a new residential subdivision which has been an active construction zone for the past few years and sediment-laden runoff has been flowing into the pond spiking the total suspended solids concentration in the pond water. While orders to cease discharging sediment-laden water to the pond have been coordinated through our Planning Services department on a case-by-case basis when observed (the City's Sewer Use By-Law stipulates a maximum allowable total suspended solids concentration of 15 mg/L can be discharged to municipal storm sewers), such incidents continue to occur in between enforcement and follow up inspection visits. In addition, the subdivision agreement for this development does not include any clauses for enforcing a pond cleanout at the conclusion of construction.

Comparison of monitoring results to provincial water quality objectives (PWQO):

- Stormwater management ponds SWM-34 and SWM-42 recorded small amounts of total suspended solids (TSS); however, the Ontario Ministry of the Environment, Conservation and Parks (MECP) has not established a specific PWQO for TSS.

- Oil grit-separators OGS-43 and OGS-44 recorded trace amounts of oil and grease inside of the structures, but no sludge or sheen that exceed the PWQO which state that "oil or petrochemicals should not be present in concentrations that can be detected as a visible film, sheen, or discolouration on the surface". No oil or sheen was observed in the effluent from these structures, which are located upstream of regional stormwater pond SWM-33.

- All other parameters were within PWQO limits or do not have PWQO limits.

3.3 System Performance Assessment

Based on the City's current monitoring approach (i.e., monitoring of SWM Facilities in accordance with the individual Environmental Compliance Approvals issued prior to the finalization of the City's CLI ECA Agreement), the municipal stormwater system seems to be functioning well. There are no exceedances of the Provincial Water Quality Objectives (see summary of monitoring results table above) and any elevated levels of total suspended solids resulting from nearby construction activities are able to be enforced through the City's Sewer Use By-Law and, going forward, through newly developed CLI ECA clauses in our subdivision agreements.

3.4 Watershed Water Quality Assessment

As described in Section 2.0, the City's current Monitoring Program consists of monitoring SWM Facilities in accordance with the individual Environmental Compliance Approvals issued prior to the finalization of the City's CLI ECA Agreement, and in this regard the municipal stormwater system seems to be functioning well (see overall performance analysis above). A comprehensive Monitoring Plan for the Municipal SWM System is pending the MECP's publication of the final monitoring plan guidance document.

4.0 Environmental Trends

For the five-year period from January 2021 to December 2025:

Based on the City's current monitoring approach (i.e., monitoring of SWM Facilities in accordance with the individual Environmental Compliance Approvals issued prior to the finalization of the City's CLI ECA Agreement), the municipal stormwater system seems to be functioning well. There are no exceedances of the Provincial Water Quality Objectives (see summary of monitoring results in Section 2.3 tables above) and any elevated levels of total suspended solids resulting from nearby construction activities are able to be enforced through the City's Sewer Use By-Law. There do not appear to be any clear environmental trends for any of the parameters analyzed at the monitored SWM Facilities.

5.0 Operation and Maintenance

5.1 Operational Issues and Corrective Actions

Below is a summary of operating problems encountered and corrective actions taken:

- Most of the wet weather events that occur during the year do not meet the minimum threshold of 15 mm of rain stipulated in the ECAs for SWM-33 and SWM-42 and therefore opportunities for water sampling at SWM Ponds are limited. Opportunities are further reduced when the 24-hour period after the rainfall event occurs on a weekend and unionized staff are not available to undertake sampling. Staff will take additional samples following less significant wet weather events throughout the year to avoid missing sampling opportunities all together.

- Stormwater management ponds SWM-34 recorded small amounts of total suspended solids (TSS).

- Stormwater management pond SWM-42 is located downstream of a new residential subdivision which has been an active construction zone for the past few years and sediment-laden runoff has been flowing into the pond spiking the total suspended solids concentration in the pond water. While orders to cease discharging sediment-laden water to the pond have been coordinated through our Planning Services department on a case-by-case basis when observed (the City's Sewer Use By-Law stipulates a maximum allowable total suspended solids concentration of 15 mg/L can be discharged to municipal storm sewers), such incidents continue to occur in between enforcement and follow up inspection visits. In addition, the subdivision agreement for this development does not include any clauses for enforcing a pond cleanout at the conclusion of construction. However, going forward, newly developed CLI ECA clauses in our subdivision agreements will require developers to clean out stormwater management ponds prior to the Municipality issuing a Preliminary Certificate of Approval of the Works (PCAW) in instances where the accumulation of sediment exceeds the expected sediment accumulation as compared to the pond design elevations since the commencement of operation (i.e., excess sediment in the SWM Pond). To prove sediment accumulation is within expected tolerance, the Owner's Engineer must provide calculations and cite sources within a stamped certification letter following completion of a bathymetric survey.

- Oil grit-separators OGS-43 and OGS-44 recorded trace amounts of oil and grease inside of the structures, but no sludge or sheen that exceed the PWQO which state that "oil or petrochemicals should not be present in concentrations that can be detected as a visible film, sheen, or discolouration on the surface". No oil or sheen was observed in the effluent from these structures, which are

located upstream of regional stormwater pond SWM-33.

- Phragmites and wild parsnip were observed at the beginning of several SWM Pond inspections. The inspector followed procedure by concluding the inspection immediately due to health and safety concerns, requesting removal of the vegetation by the City's Public Works crews (in accordance with their own safe work standard operating procedures) and resuming/completing the inspection once it was safe to do so.

- Uploading photos to the Inspection Record in the City's Asset Management Database (Cartegraph) in low service areas has resulted in photos not being fully uploaded. This has been resolved by uploading photos via Wi-Fi instead.

5.2 Inspections, Maintenance and Repairs

The frequency of inspection varies based on each component of the storm sewer system:

- Inlets are inspected once every four years at a minimum as part of the inlet inspection program managed by Public Works.

- Inlets are cleaned out once every four years at a minimum as part of the inlet maintenance program managed by Public Works.

- Inlets that include inlet filters or insert devices are inspected every two years at a minimum as part of the inspection program managed by Public Works or more frequently if in an area of high potential loading.

- Maintenance hole structures and storm sewer mains are inspected once every ten years at a minimum as part of the annual CCTV inspection program managed by Engineering Services.

- Outlets are inspected once every four years at a minimum as part of the outlet inspection program managed by Engineering Services.

- Maintenance hole structures, storm sewer mains, and outlets are cleaned out once every ten years at a minimum as part of the annual CCTV inspection program managed by Engineering Services.

- Roadside ditches and swales are monitored routinely or in response to public complaints as part of the operations program managed by Public Works; higher frequency inspections may be required based on sediment accumulation rates, trash or debris accumulation or wildlife activity.

- Culverts are monitored routinely or in response to public complaints as part of the operations program managed by Public Works; higher frequency inspections may be required based on sediment accumulation rates, trash or debris accumulation or wildlife activity.

- Visual inspections of all stormwater management (SWM) ponds are completed every year by Engineering Services. Inspections are completed between May and October when the weather is favourable.

- All SWM Ponds are inspected after storm events greater than the 5-year return period.

- SWM Pond inspections are completed immediately after a fuel or chemical spill in coordination with the City's Environment Group.

- SWM Pond clean outs were prioritized based on the results of bathymetric surveys completed in 2024. Higher frequency clean outs may be required at specific locations based on sediment accumulation rates.

- OGS units are inspected every six months for the first year to determine the oil and/or sediment accumulation rates as part of the operations program managed by Public Works.

- OGS units are inspected annually after the first year and with sediment accumulation rates continuing to be monitored as part of the operations program managed by Public Works.

- OGS units are inspected after each major storm event (>25 mm) as part of the operations program managed by Public Works.

- OGS unit inspections are completed immediately after an oil, fuel, or chemical spill in coordination with the City's Environment Group.

- OGS units are cleaned out once the sediment depth reaches 15% of the storage capacity, or at least once per year, whichever comes first, as part of the operations program managed by Public Works.

A summary of deficiencies and follow up maintenance/works are provided below:

- As per the City's CCTV program, all inspected storm sewers and structures were hydraulically cleaned by the Contractor to remove dirt, grease, sand, and other foreign and objectionable debris before inspection. The Contractor transported and disposed of all waste material associated with flushing, cleaning, or blockage removal to an approved disposal site in accordance with current Ministry of

Environment, Conservation and Parks (MECP) waste disposal requirements.

- Like-for-like culvert replacements were completed in various locations throughout the City in 2025 as part of the operations program managed by Public Works where pipes had reached the end of their service life.

- Removal of liquid waste/oil was coordinated for a few OGS units with disposal at a licensed disposal facility, the remaining OGS units were cleaned out using Public Works vacuum truck.

- Several outlets required cleaning out while others were unable to be located (buried). In a few locations modest maintenance work was required such as debris/object or sediment removal, erosion repair measures, minor concrete repairs, vegetation management, grate repair, and/or illegal dumping. Public Works was assigned a work order in OpenGov EAM (the City's asset management system) with individual tasks to locate and/or clean out each outlet location that required maintenance.

- Most stormwater management ponds required some form of modest maintenance such as debris/object or sediment removal, erosion repair measures, minor concrete repairs, phragmites or wild parsnip management, landscape maintenance, fence and gate repair, dislodged structure lid resetting, missing orifice plate replacement, and/or illegal dumping removal. Public Works was assigned a work order in OpenGov EAM (the City's asset management system) with individual tasks to rectify each pond location that required maintenance.

5.3 Equipment Calibration and Maintenance

Calibration of monitoring equipment is completed once per year before inspections commence. Equipment undergoes maintenance and/or replacement as required. Monitoring equipment includes an infrared thermometer (temperature). Total suspended solids are sampled for analysis at an accredited laboratory.

6.0 Complaints

6.1 Complaints and Actions Taken

The City of Kingston launched its Customer Relationship Management (CRM) system in June 2018. The system allows for a more holistic approach to customer service by providing increased access to online services via self-serve options, open access to current and accurate information for the public and staff, a mechanism for soliciting and collecting feedback through feedback surveys, and a centralized place for tracking customer information and interactions with the city. The CRM system allows staff to document, maintain, and share information across departments with the goal of providing seamless customer service through the entire lifecycle of a service request.

Summary of complaints and response actions taken:

- **Complaint Type 1 – Stormwater System Maintenance Issues**

  Includes issues such as sediment or debris accumulation in ditches, clogged catch basin grates, and culvert joint failures.

  Response and Corrective Action:

  - Addressed through the City's routine Operations and Maintenance Program administered by Public Works
  - Physical maintenance activities completed as required to restore system function
  - Related complaints tracked in the City's CRM system
  - Associated asset maintenance activities tracked in OpenGov EAM (City's asset management system)

- **Complaint Type 2 – Capital Project Inquiries**

  Includes inquiries regarding the status, scope, or timing of upcoming or ongoing capital projects.

  Response and Corrective Action:

  - Responded to directly via email and tracked in the City's CRM system
  - Members of the public directed to the City's Projects and Construction Map for project information and updates

- The Project and Construction Map is an online, geo-enabled tool that provides public access to capital project information including scope, schedule, and project contact details

- **Complaint Type 3 – Private Property Drainage Concerns**

  Includes concerns related to drainage impacts on private property, such as ponding due to changes in neighbour property regrading.

  Response and Corrective Action:

  - Where City infrastructure is identified as the source, issues are addressed through the City's Operations and Maintenance Program
  - Where issues are determined to be private in nature, the City facilitates communication between property owners and provides general guidance and resources
  - Complaints tracked in the City's CRM system
  - Any required City asset maintenance tracked in OpenGov EAM (City's asset management system)

7.0 System Alterations

A total of five pre-authorized alterations were completed during the reporting period, consisting of four storm sewer, ditch or culvert works and one stormwater management facility. No third pipe systems, previously approved works, or Schedule C works were undertaken. No alterations were identified as posing a significant drinking water threat.

7.1 Significant Alterations

- **Storm Sewers, Ditches and Culverts**

  Four works were completed under this category, including:

  - Three subdivision developments involving storm sewer, ditch, and culvert infrastructure
  - One capital infrastructure project associated with road and sewer reconstruction

- **Stormwater Management Facilities**

  - One new stormwater management pond was constructed to service a subdivision development

- **Previously Approved Works**

  - None undertaken during the reporting period

No alterations were identified as posing a significant drinking water threat.

8.0 Spills and Abnormal Discharges

8.1 Spills and Discharges Summary

- No spills or abnormal discharge events occurred during the reporting period.

9.0 Performance Improvement Actions

9.1 Actions Undertaken in the Reporting Year

Performance improvement actions were identified through inspections and monitoring activities and are being addressed through the City's Operations and Maintenance Program.

- **Issue 1 – Oil Grit Separator (OGS) Maintenance**

  Description:

  Liquid waste (oil) was identified in several OGS units. In addition, multiple units required routine maintenance to remove accumulated sediment.

  Corrective Action:

  - Liquid waste removal has been coordinated for select OGS units, with disposal at a licensed facility
  - Remaining OGS units were cleaned using Public Works vacuum truck operations in fall 2025

  Target Completion:

  - Sediment removal completed in fall 2025
  - Liquid waste removal scheduled for summer 2026

- **Issue 2 – Outlet Maintenance**

  Description:

  Several outlets required maintenance, including debris and sediment removal, erosion repairs, minor concrete repairs, vegetation management, grate repairs, and removal of illegally dumped materials.

  Corrective Action:

  - Work orders were issued through OpenGov EAM (City's asset management system)
  - Maintenance tasks assigned to Public Works to address each identified outlet location

Target Completion:

- Scheduled for completion as part of the Public Works 2026 Operations Plan

- **Issue 3 – Stormwater Management Pond Maintenance**

  Description:

  Most stormwater management ponds required maintenance, including debris and sediment removal, erosion repairs, minor concrete repairs, invasive species management (e.g., phragmites, wild parsnip), landscape maintenance, fence and gate repairs, structure lid resetting, orifice plate replacement, and removal of illegally dumped materials.

  Corrective Action:

  - Work orders were issued through OpenGov EAM (City's asset management system)
  - Maintenance tasks assigned to Public Works for each identified pond location

  Target Completion:

  - Scheduled for completion as part of the Public Works 2026 Operations Plan

9.2 Status on Previous Year Actions

The following provides a status update on performance improvement actions identified in the previous reporting year.

- **Issue 1 – Oil Grit Separator (OGS) Maintenance**

  Description:

  Liquid waste (oil) was identified in several OGS units. In addition, multiple units required routine maintenance to remove accumulated sediment.

  Corrective Action:

  - Liquid waste removal was coordinated for four OGS units, with disposal at a licensed facility
  - Sixteen OGS units were cleaned using Public Works vacuum truck

operations in fall 2024

Status:

- Sediment removal completed in fall 2024 as part of the Public Works Operations Plan
- Liquid waste removal is scheduled for completion in summer 2026

- **Issue 2 – Outlet Maintenance**

  Description:

  Several outlets required maintenance, including debris and sediment removal, erosion repairs, minor concrete repairs, vegetation management, grate repairs, and removal of illegally dumped materials.

  Corrective Action:

  - Work orders were issued through OpenGov EAM (City's asset management system)
  - Maintenance tasks were assigned to Public Works to address each identified outlet location

  Status:

  - Maintenance activities were completed as part of the Public Works 2025 Operations Plan

- **Issue 3 – Stormwater Management Pond Maintenance**

  Description:

  Most stormwater management ponds required maintenance, including debris and sediment removal, erosion repairs, minor concrete repairs, invasive species management (e.g., phragmites, wild parsnip), landscape maintenance, fence and gate repairs, structure lid resetting, orifice plate replacement, and removal of illegally dumped materials.

  Corrective Action:

  - Work orders were issued through OpenGov EAM (City's asset management system)
  - Maintenance tasks were assigned to Public Works for each identified

pond location

Status:

- Maintenance activities were completed as part of the Public Works 2025 Operations Plan

10.0 Supplementary Information

10.1 Combined Sewer Separation

The City of Kingston, in partnership with Utilities Kingston, has been working to separate all combined sewers in the city as it is the preferred method for overflow reduction, in accordance with our most recent wastewater master plans. Since 2008, the City has been separating sewers at a rate of about 3% per year, in coordination with full road reconstruction projects. In 2023, City Council endorsed a 20-year separation plan to eliminate all combined sewers remaining in the City. The City's sewer separation map shows the progress since 2001.

10.2 Operation and Maintenance Manual

The City of Kingston completed an Operation and Maintenance (O&M) Manual for all municipal stormwater infrastructure within the Authorized System in May 2024. A copy of the manual is provided in Appendix A. The City's Stormwater O&M Manual includes, or references, but is not necessarily limited to, the following information:

- Procedures for the routine operation of all municipal stormwater infrastructure
- Inspection programs, including the frequency of inspection, and the methods or tests employed to detect when maintenance is necessary
- Maintenance and repair programs
- 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
- Procedures for routine physical inspection and calibration of monitoring equipment or components in accordance with the Monitoring Plan
- Emergency Response, Spill Reporting and Contingency Plans/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
- Procedures for receiving, responding, and recording public complaints, including recording any follow-up actions taken
- As-built drawings or record drawings for all municipal stormwater infrastructure constructed after 2010 and where available, for stormwater works constructed before 2010

10.3 Drinking Water Threat Assessment

The City of Kingston will prepare its next Significant Drinking Water Threat Assessment (SDWTA) Report for proposed alterations for the Authorized System by May 31, 2026. The City will make any necessary updates to the report at least once every 12 months. Any components, equipment, or sewage works added to the report will remain included for the operational life of the works.

Upon request, the City will make a copy of the report available to the Ministry of the Environment, Conservation and Parks or Source Protection Authority staff.

The SDWTA Report will include, but is not limited to:

- 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
- An outline of how the Owner assesses the proposed alterations to identify drinking water threats under the CWA
- A list of components, equipment, or Sewage Works that are being altered and have been identified as a Significant Drinking Water Threat for any proposed alteration
- 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, such as those included in the Standard Operating Policy for Sewage Works

10.4 SWM Pond Warning Signage

The City of Kingston completed installation of warning signage at all stormwater management ponds in April 2025. The engineering detail drawing and specifications for the signage are provided in Appendix D of the Stormwater Operation and Maintenance Manual (Appendix A). The signs include the following information:

- Identification that the site contains a Stormwater Management Facility
- Identification of potential hazards and limitations of water use, as applicable
- Identification of the purpose of the Facility
- ECA approval number
- Owner's contact information

10.5 Storm Sewershed Asset Inventory

The City of Kingston submitted an inventory with classification of all storm sewersheds to the Ministry in August 2024. Within 12 months of submission, the documents referenced in the City's ECA Agreement Number 018-S701 were updated to identify the storm sewersheds associated with each outlet and their corresponding level of stormwater management.

The levels of stormwater management are defined as follows:

- Level A – Stormwater receives treatment for water quality and quantity prior to discharge to the environment
- Level B – Stormwater receives treatment for water quality but no water quantity prior to discharge to the environment
- Level C – Stormwater receives no treatment for water quality prior to discharge to the environment

10.6 Monitoring Plan

The City of Kingston will develop and implement a Monitoring Plan for the municipal stormwater system (Authorized System) within 24 months of the publication of the Ministry's monitoring guidance (pending). The Monitoring Plan will be peer-reviewed by a third-party Qualified Person (QP), independent of its development, to confirm its accuracy.

The City will ensure that the Monitoring Plan is updated, as required, within 12 months of any alteration to the Authorized System, or more frequently as specified in the Plan. The City shall, on request and without charge, provide a copy of the Monitoring Plan and associated monitoring data to members of the public.

The Monitoring Plan shall include, but is not limited to:

- Procedures to verify that the operational performance of the Authorized System is as designed or planned
- Procedures to assess the environmental impact of the Municipal Stormwater Management System
- Procedures for any corrective action that may be required to address any performance deficiencies or environmental impacts
- Identification of the Sewage Works to be monitored, including outlets and any works that provide quality and/or quantity control

- Identification of the key receivers to be monitored within the Owner's municipal boundaries and the monitoring locations
- 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)
- Characterization of water quality and quantity conditions and identification of water users to be protected
- Identification of water quality and quantity goals, as it relates to stormwater management
- Identification of locations of rainfall gauges to be used
- 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
- Details respecting a monitoring program for the works and the receivers
- 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
- 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
- Consideration of adaptive management practices (e.g., evidence-based decision making)

10.7 Subdivision Agreement Clauses

The City of Kingston's Engineering Services and Planning Services departments have coordinated the development of standard CLI ECA clauses for Subdivision Agreements to ensure that inspection, maintenance, operations, record-keeping and reporting requirements under the City's ECA Agreement Number 018-S701 are fulfilled by Developers and provided to the City in Annual Performance Reports, during the period in which Developers are responsible for the operation and maintenance of municipal stormwater infrastructure (i.e., prior to municipal assumption). The City's standard CLI ECA Subdivision Agreement clauses are provided in Appendix C of the Stormwater Operation and Maintenance Manual (Appendix A).

The Subdivision Agreement also contains separate provisions related to securities administered under the City's financial assurance framework. These provisions are distinct from the CLI ECA compliance clauses described above. The securities-related provisions establish the conditions for release of the CLI ECA SWM Security at defined milestones, linked in part to the submission of Annual Performance Reports and other required deliverables to the satisfaction of the City. The securities-related clauses are generally as follows:

- Prior to commencing operation of the Stormwater Management Facility, the Developer shall submit a digital copy of the current Operation and Maintenance Manual for each Stormwater Management Facility to the Municipality, to the satisfaction of the Municipal Engineer

- After the submission and acceptance of each Annual Performance Report between issuance of Preliminary Certificate of Approval of Underground Services (PCAUS) and issuance of the Preliminary Certificate of the Works (PCAW) the CLI ECA SWM Security can be reduced

- The Developer shall submit a digital copy of the final Operation and Maintenance Manual for each Stormwater Management Facility to the Municipality at issuance of PCAW, to the satisfaction of the Municipal Engineer, at which point the Developer may request that the CLI ECA SWM Security be reduced

- Prior to the Municipality issuing PCAW for the Stormwater Management (SWM) Pond, the Developer shall complete a bathymetric survey of the pond and provide a letter stamped by the Developer's Engineer certifying that the accumulation of sediment is acceptable (i.e., within the tolerance of expected sediment accumulation) as compared to the pond design elevations since the commencement of operation (i.e., no excess sediment in the SWM Pond). The Developer's Engineer must provide calculations and cite sources within the certification letter (e.g., expected sediment accumulation rate/volume). Should excess settlement and/or debris be present it shall be removed from the SWM Pond by completing at least one (1) pond clean out. At this point, or should no excess sediment or debris be present, and provided that the Owner has provided as-built drawings for the SWM Pond, the Developer may request that the CLI ECA SWM Security be reduced

- Following the Municipality issuing PCAW, the Developer must submit all outstanding monitoring records for each Stormwater Management Facility constructed for the purpose of stormwater treatment to the satisfaction of the Municipal Engineer, at which point the Developer may request that the CLI ECA SWM Security be reduced

- The CLI ECA SWM Security shall be fully released only when the final Annual

Performance Report and any other outstanding deliverables (e.g., monitoring records) have been provided to the Municipality, to the satisfaction of the Municipal Engineer to facilitate the Municipality issuing the Final Certificate of Approval of the Works

10.8 CLI ECA SWM Webpage

The City maintains a CLI ECA Stormwater Management (SWM) webpage that provides consolidated information on the City's CLI ECA SWM program, including permitting requirements, application procedures, technical review process and supporting guidance materials.

The webpage includes information on:

- CLI ECA SWM permit requirements and applicability
- Pre-application guidance and submission requirements
- Application forms, checklists, and fees
- Technical review and approval process
- Design standards and guidelines
- Ontario regulatory references
- Standard CLI ECA SWM clauses for Subdivision Agreements
- Stormwater Annual Performance Reports
- Watershed mapping and stormwater asset data

The City also provides contact information for technical inquiries and application support. The webpage will continue to be updated as additional program guidance and resources become available.

11.0 Public Access

11.1 Report Availability

The City's Annual Performance Reports are made publicly available through the City's CLI ECA Stormwater Management (SWM) webpage.

The webpage also provides access to related stormwater information and resources, including the City's Core Asset Management Plan, watershed mapping (including Kingston and Cataraqui Region Conservation Authority maps), standard CLI ECA Subdivision Agreement clauses, and an inventory of municipal stormwater infrastructure assets available through Open Data Kingston.

Once finalized and as required, the City's Monitoring Plan will also be posted on this webpage.

- City's CLI ECA SWM Webpage
- Open Data Kingston - Storm Assets

Appendix A

Stormwater Operation and Maintenance Manual

Stormwater Operation and Maintenance Manual

City of Kingston Municipal Stormwater Management System
Environmental Compliance Approval: 018-S701

May 21, 2024

Revision Summary

Revision No.	Revision Title	Date of Release
0	Stormwater Operation and Maintenance Manual	May 21, 2024

This document has been formatted in accordance with the requirements of the Accessibility for Ontarians with Disabilities Act.

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Appendices

1.0 Introduction

This Stormwater Operation and Maintenance (O&M) Manual has been prepared to fulfill the requirements identified in Section 3.2, Schedule E of the Environmental Compliance Approval for the Municipal Stormwater Management System of the Corporation of the City of Kingston (ECA No. 018-S701). The City of Kingston is both the Owner and the Operating Authority of the stormwater management system referenced in this document.

The scope of this O&M Manual includes all components of the authorized municipal stormwater management system. Stormwater infrastructure located on City property or within municipal right-of-way that is part of a municipal drain is subject to the Drainage Act and is therefore not included in the authorized system and is not covered by the procedures identified in this manual.

The objectives of this manual are to provide detailed documentation of the following items as they related to the authorized system:

- Procedures necessary for routine operation.
- Inspection programs and methods employed to detect when maintenance is necessary.
- Maintenance and repair programs required to ensure on-going performance.
- Operational and maintenance requirements to protect sources of drinking water.
- Procedures for routine physical inspection and calibration of monitoring equipment or components.
- Emergency Response, Spill Reporting and Contingency Plans.
- Procedures for dealing with equipment breakdowns, potential spills, and any other abnormal situations.
- Procedures for receiving, responding to, and recording public concerns.
- As-built and record drawings.

2.0 Definitions

For the purpose of this manual, the following definitions apply:

- "**Authorized System**" means the Sewage Works comprising the Municipal Stormwater Management System authorized under the CLI ECA.
- "**CCTV**" means closed-circuit television.
- "**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

- "**Constructed Wetland**" means an engineered stormwater management facility with a shallow (< 1 m) permanent pool designed in accordance with Section 4.6.3 of the Stormwater Management Planning and Design Manual.
- "**Culvert**" means a structure or pipe carrying a stream or open drain under a road or railroad.
- "**CVC**" means Credit Valley Conservation.
- "**CWA**" means the Clean Water Act, R.S.O. 2006, c.22.
- "**Drainage Act**" means the Drainage Act R.S.O. 1990, c. D.17.
- "**Dry Pond**" means an engineered stormwater management facility with no permanent pool of water as designed in accordance with Section 4.6.5 of the Stormwater Management Planning and Design Manual.
- "**ECA**" means Environmental Compliance Approval.
- "**EPA**" means the Environmental Protection Act, R.S.O. 1990, c. E. 19 (EPA).
- "**ErMS**" means the City of Kingston environmental risk management system.
- "**Filtration LID**" means LIDs whose primary function is to filter runoff to improve water quality.
- "**Filtration MTD**" means proprietary stormwater treatment devices that improve water quality by using low permeability membranes to filter suspended sediments out of stormwater runoff.
- "**Hybrid Pond**" means an engineered stormwater management facility with both a wet pond and a constructed wetland element connected in series and designed in accordance with Section 4.6.4 of the Stormwater Management Planning and Design Manual.
- "**Inlet Filter**" means a permanent pre-treatment device that is inserted into a storm catch basin or curb inlet to prevent litter, sediment and other debris from entering the stormwater system. Inlet filters include a wide range of proprietary products including the Enviropod LittaTrap™.
- "**Infiltration Chambers**" means infiltration trenches or soakaways that include a wide range of proprietary manufactured modular structures installed underground, typically under parking or landscaped areas that create large void spaces for temporary storage of stormwater runoff and allow it to infiltrate into the underlying native soil.
- "**Infiltration Trenches**" means rectangular trenches lined with geotextile fabric and filled with clean granular stone or other void forming material that receive runoff from surface drainage or sewer systems and allow it to infiltrate into the native soil.

- "**Inlet**" means a structure that accept stormwater runoff including ditch inlets, catch basins and open pipe inlets.
- "**LID**" means "low impact development" as defined in the Stormwater Management and Low Impact Development Planning and Design Manual.
- "**Maintenance Hole**" means a structure providing access to an underground confined space and connected storm sewer pipes.
- "**Major Storm Event**" means greater than 25 mm of rain within a 24-hour period.
- "**MECP**" means the Province of Ontario Ministry of the Environment, Conservation and Parks.
- "**MOE**" means the Province of Ontario Ministry of the Environment, now called MECP.
- "**Monitoring Plan**" means the monitoring plan to be prepared and maintained by the City of Kingston under condition 4.1 in Schedule E of the CLI ECA.
- "**MTD**" means manufactured treatment device.
- "**MTO**" means the Province of Ontario Ministry of Transportation.
- "**Municipal Drain**" has the same meaning as defined in Section 1 of the Drainage Act R.S.O. 1990, c. D.17.
- "**Natural Environment**" has the same meaning as Section 1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19.
- "**OGS**" means Oil and Grit Separator(s).
- "**Outlet**" means the discharge location of a storm sewer system or culvert to a surface drainage feature or to the natural environment.
- "**Operating Authority**" means the person, entity, or assignee that is given responsibility by the Owner for the operation, management, maintenance, or alteration of the Authorized System, or a portion of the Authorized System.
- "**OWRA**" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40.
- "**Perforated Pipe Systems**" means pipes installed with perforations in gently sloping granular stone beds that are lined with geotextile fabric.
- "**Pre-Treatment System**" means secondary stormwater treatment features or devices that are designed to remove sediment prior to discharge into the primary treatment system.
- "**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 work required to be carried out.

- "**Retention LID**" means LID whose primary function is to reduce runoff volume and to improve water quality through infiltration and evaporation.
- "**Rip-Rap Material**" means loose stone or rocky material that is placed to protect soil from scour and erosion.
- "**Sedimentation MTD**" means a proprietary stormwater treatment device that improves water quality by using mechanisms that settle out sediment from stormwater.
- "**Sewage Works**" has the same meaning as defined in Section 1 of the OWRA.
- "**Sewer**" has the same meaning as defined in section 1 of O. Reg. 525/98 under the OWRA.
- "**Soakaways**" are rectangular or circular excavations lined with geotextile fabric and filled with clean granular stone or other void forming material that receive runoff from a perforated pipe inlet and allow it to infiltrate into the native soil.
- "**SOP**" means standard operating procedure.
- "**Spills Action Centre**" (SAC) is the 24-hour contact centre operated by the Ministry of the Environment, Conservation and Parks for reporting spills.
- "**Storm Sewer**" means Sewers that collect and transmit, but not exfiltrate or lose by design, Stormwater resulting from precipitation and snowmelt.
- "**Storm Sewer System**" means all infrastructure associated with the collection and conveyance of stormwater within an underground conduit. The storm sewer system includes inlets, pipes, maintenance hole structures and outlets, but does not include culverts.
- "**Stormwater**" means rainwater runoff, water runoff from roofs, snowmelt, and surface runoff.
- "**Stormwater Collection System**" means the components of the authorized system whose primary function is to collect stormwater and convey it to treatment facilities or the natural environment.
- "**Stormwater Management Facility**" means a facility for the treatment, retention, infiltration, or control of Stormwater.
- "**Super Pipe System**" means an oversized storm sewer(s) designed with a downstream flow restriction through a smaller diameter pipe or orifice to provide subsurface storage and reduce peak flow rates.
- "**Surface Drainage Feature**" means a component of the authorized system, whose primary function is above ground conveyance of stormwater, which primarily consists of ditches and swales.
- "**SWM**" refers to Stormwater Management.

- "**TRCA**" means the Toronto Region Conservation Authority.
- "**Treatment Facility**" means a stormwater management feature that is designed to improve water quality through sediment removal.
- "**Underground Chamber System**" has the same definition as Infiltration Chamber System.
- "**Underground Storage Facility**" means a stormwater management facility whose primary function is to detain stormwater runoff and release it slowly over time, thereby reducing peak flow rates to the receiving drainage system. Underground storage facilities may include super pipe systems, storage vaults and underground storage chamber systems.
- "**Storage Vault**" means rigid underground chamber systems that do not require granular or earth material for structure support.
- "**Wet Pond**" means an engineered stormwater management facility with a deep (> 1 m) permanent pool designed in accordance with Section 4.6.2 of the Stormwater Management Planning and Design Manual.
- "**Wet Stormwater Management Pond**" means an engineered stormwater management facility designed to provide water quality treatment through settling of suspended sediments within a permanent pool and includes wet ponds, hybrid ponds and constructed wetlands.

3.0 Reference Documents

The following documents have been referenced in the preparation of this manual and may be referred to throughout:

3.1 City of Kingston Reference Documents

- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Site Plan Control Guidelines (December 2009)
- Subdivision Development Guidelines & Technical Standards (January 2014)
- Corporate Spills Management Plan (2024)
- Stormwater Monitoring Plan – IN PROGESS

3.2 Conservation Authority Reference Documents

- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)

- Cataraqui Source Protection Plan (November 2014)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Inspection and Maintenance Guide for Stormwater Management Ponds and Constructed Wetlands (TRCA, 2018)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)

3.3 Provincial Reference Documents

- Drainage Management Manual (MTO, 1997)
- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Design Guidelines for Sewage Works (MOE, 2008)
- Highway Drainage Design Standards (MTO, 2008)
- Gravity Pipe Design Guidelines (MTO, 2014)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Culvert Inspection Guide for Culverts less than 3000 mm (MTO, September 2022)
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (MECP, May 31, 2023)

3.4 Additional Reference Documents

- National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP), Lateral Assessment Certification Program (LACP) and Manhole Assessment Certification Program (MACP), Condition Grading System.
- CAN/CSA-W202: Erosion and Sediment Control Inspection and Monitoring Standard (CSA Group, 2018)
- CSA W208-20: Erosion and Sediment Control Installation and Maintenance (CSA Group, 2020)

4.0 Operation, Inspection and Maintenance Procedures

The following sections describe the operation, inspection and maintenance requirements for all components of the authorized system and have been categorized based on Tables B2 and B3 of the CLI ECA.

For subdivision developments, prior to assumption by the City of Kingston, operation, inspection, and maintenance activities are the responsibility of the developer. As such, the City of Kingston has developed standard subdivision agreement clauses to ensure the developer is meeting the requirements of the CLI ECA for future stormwater works to be added to the authorized system. These standard clauses are provided for reference in **Appendix C**.

4.1 Stormwater Collection System

The stormwater collection system includes the components of the authorized system whose primary function is to collect stormwater and convey it to treatment facilities or the natural environment. The following sections describe the operation, inspection and maintenance requirements for these features.

4.1.1 Storm Sewer System

The storm sewer system includes all infrastructure associated with the collection and conveyance of stormwater within an underground conduit including inlets, pipes, maintenance hole structures and outlets.

In general, there are no operational procedures required for the storm sewer system as all components are designed to operate via gravity and do not rely on valves or gates that require adjustment.

Inspections shall be completed in accordance with the City of Kingston's most current SOPs. A recent version of **SWM411 SOP - Inspection Procedures for Storm Sewer Systems** is provided in **Appendix A**. The City of Kingston's Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Maintenance of the storm sewer system is crucial to prevent flooding, erosion and other issues associated with stormwater runoff. Below is a summary of anticipated maintenance items required for each component of the storm sewer system.

Inlets will require regular maintenance to ensure that stormwater runoff is directed into the storm sewer system. The anticipated maintenance items are summarized below:

- Inlet filters shall be cleaned out every 2 years, as part of inspections, or when 75% of the maximum trash capture volume is reached.

- Catch basin sumps shall be cleaned out once every 4 years.
- Debris such as leaves, branches, trash, and sediment shall be removed from grates as required based on inspection results or in response to public complaints.
- Damaged grates and inlet filters shall be realigned or replaced as required.
- Deteriorated concrete and cracks within catch basin structures shall be repaired or replaced.
- Full replacement of the structure may be required depending on the severity of the damage.

Storm sewer pipes will require periodic maintenance and repairs as identified during CCTV inspections. The anticipated maintenance items are summarized below:

- Flushing of storm sewer pipes shall be completed as part of the CCTV inspection program.
- Leaking joints shall be resealed to prevent infiltration of groundwater or exfiltration to the surrounding soils.
- Deteriorated concrete and cracks shall be repaired or replaced.
- Pipes shall be replaced in the event of severe damage or collapse.

Maintenance holes are an integral part of the storm sewer system, providing access points for maintenance and inspection. Over time, maintenance holes may require maintenance and various repairs to address issues such as sediment removal, structural damage, infiltration, or other problems. The anticipated maintenance items are summarized below:

- Flushing of maintenance holes shall be completed as part of the CCTV inspection program.
- Maintenance holes with sumps (not benched) shall be cleaned out once every 10 years as part of the CCTV inspection program.
- Damaged frames and covers shall be realigned or replaced.
- Deteriorated concrete and cracks shall be repaired or replaced.
- Leaking joints shall be resealed to prevent infiltration of groundwater or exfiltration to the surrounding soils.
- Damaged or corroding ladder rungs and safety platforms shall be replaced. Corrosion protection coatings may be required where stormwater runoff has high chloride concentrations.

- Full replacement of the structure may be required depending on the severity of the damage.

Outlets will require regular maintenance to ensure that obstructions do not cause backup within the storm sewer system. This is particularly important in areas that have high wildlife activity such as ponds, lakes and wetlands. The anticipated maintenance items are summarized below:

- Debris such as leaves, branches, trash and sediment that is obstructing the outlet shall be removed as required based on inspections or in response to public complaints.
- Installation of outlet grates may be required in locations that have a history of animal activity obstructing the outlet.
- Management of wildlife will be completed in accordance with guidance provided by the Ministry of Natural Resources and Forestry.
- Outlet bypass systems may also be considered if the site conditions are suitable.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.1.2 Surface Drainage Features

Surface drainage features include all components of the authorized system, whose primary function is above ground conveyance of stormwater. These features include ditches and swales.

In general, there are no operational procedures required for surface drainage features as all components are designed to operate via gravity and do not rely on valves or gates that require adjustment.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM412 SOP - Inspection Procedures for Surface Drainage Features** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Ditches and swales require routine maintenance to prevent flooding problems and to ensure adequate conveyance. This is particularly important in areas with erosive soils, dense vegetation and shallow slopes. The anticipated maintenance items are summarized below:

- Debris such as leaves, branches, trash, and sediment, that is obstructing flow, shall be removed as required based on inspections or in response to public complaints.
- Sediment shall be removed from locations with permanent rock check dams when sediment reaches half of the height of the dam.
- Vegetation shall be trimmed within surface drainage features to ensure conveyance. In locations where swales are relied upon for water quality control, grass vegetation shall be cut to a minimum height of 65 mm.
- Areas of bank erosion or slumping shall be repaired. Placement of temporary or permanent turf reinforcement mats may be required.
- Placement or replacement of rip-rap material may be required at locations with high flow velocities to prevent scouring.
- Regrading of ditches and swales may be required in areas where stormwater is pooling.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.1.3 Culverts

Culverts are located throughout the authorized system to convey stormwater from one side of a roadway or driveway to the other.

In general, there are no operational procedures required for culverts as they are designed to operate via gravity.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM413 SOP - Inspection Procedures for Culverts** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Culverts will require periodic maintenance and repairs as identified during routine monitoring. The anticipated maintenance items are summarized below:

- Debris such as leaves, branches, trash, and sediment, that is obstructing flow, shall be removed as required based on inspections or in response to public complaints.

- Flushing of culverts is not typically required to complete visual inspections and therefore is not recommended as a preventative maintenance activity. If inspections indicate significant sediment build up or debris that is restricting flow, flushing may be required.
- Deteriorated concrete and cracks within the pipe, headwall or wingwalls shall be repaired or replaced.
- Leaking joints shall be resealed to prevent infiltration of groundwater or exfiltration to the surrounding soils.
- Full replacement of the culvert may be required depending on the severity of the damage.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.2 Low Impact Development (LID) Retention Facilities

LID Retention facilities are stormwater management facilities whose primary function is to reduce runoff volume and improve water quality through infiltration and evaporation. These include surface infiltration facilities, underground infiltration facilities, permeable pavement, perforated pipes, and green roofs.

4.2.1 Infiltration Basins

Infiltration basins are surface stormwater management facilities located in areas with highly permeable soils. Infiltration basins typically include a grass or granular base and require pre-treatment measures to limit sediment accumulation within the facility.

Infiltration basins require some operational considerations to ensure long term performance. In particular, accumulation of sediment can cause compaction, which can seal the bottom and reduce the ability of the soil to allow infiltration. The anticipated operational items are summarized below:

- Trucks and heavy equipment shall be directed away from the base to prevent compaction.
- Grass cutting on the embankments shall be completed based on aesthetics. Grass clippings shall be bagged or directed up-hill away from the facility. Grass cutting shall also be conducted as required for outfall channels and emergency overflow weirs to ensure they are free of obstructions.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM421 SOP - Inspection Procedures for Infiltration Basins** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Infiltration basins require regular maintenance to ensure proper function. The anticipated maintenance items are summarized below:

- Pre-treatment devices such as sedimentation MTDs, filter strips and swales should be cleaned out regularly, based on inspections.
- Flushing of inlet and outlet pipes shall be completed, as required based on inspections.
- Placement or replacement of rip-rap material at outlets into the facility may be required at locations with high flow velocities to prevent scouring.
- Areas of bank erosion or slumping shall be repaired. Periodic re-seeding may be required in areas of exposed banks. Placement of temporary or permanent turf reinforcement mats, or other forms of erosion protection may also be required if continual bank erosion is occurring.
- Infiltration basins with granular bases should include a geotextile layer approximately 100 mm below the surface. Removal of accumulated sediment and replacement of the geotextile will be required when sediment is visible from the surface or when the storage volume capacity is reduced by 15%. The surface granular material can be washed and replaced.
- Sediment shall be removed from infiltration basins with grassed bases when the depth of accumulation near the inlet reaches 150 mm or when the storage volume capacity is reduced by 15%, to prevent migration to the remainder of the feature and reduction to infiltration rates.
- Installation of a rip-rap material check dam ring around the inlet may also be required to keep sediment contained.
- Tilling the base may be required to maintain the infiltration potential of the soil if drawdown extends beyond 48 hours.
- Planting of deep-rooted legumes in an infiltration basin may be beneficial in maintaining the porosity and infiltration potential of the soil. However, consideration must be given to the anticipated growing conditions in the basin (frequency and depth of inundation).

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal

legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.2.2 Infiltration Trenches, Chambers and Soakaways

Infiltration trenches, chambers and soakaways are stormwater management facilities that capture and infiltrate runoff within an underground system. Infiltration trenches and soakaways are similarly constructed as rectangular excavations, lined with geotextile and filled with clean granular stone. A perforated pipe is sometimes used to distribute flow through the system. Infiltration chambers are a variation of the infiltration trench concept but include proprietary manufactured modular structures installed within the excavation to create larger void spaces and allow for easier maintenance. Infiltration chambers can also include a detention storage component to reduce peak flow rates to the receiving drainage system.

These underground infiltration systems do not require any special operational considerations. However, pre-treatment activities, such as oil-grit separators and inlet filters, are very important to ensure long term performance as sediment can be difficult to remove.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM422 SOP - Inspection Procedures for Infiltration Trenches, Chambers and Soakaways** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Maintenance of infiltration trenches and soakaways is generally focused on ensuring that the pre-treatment is operational and adequate. The anticipated maintenance items are summarized below:

- Flushing of pipes in an infiltration trench is generally not feasible since there are typically several pervious pipes within the trench and cleanout locations would have to be provided at both the inlet and outlet of each pipe length.
- A plastic mesh or wire mesh filter should be placed near the ground surface just below the overflow pipe so that overflows will occur if the filter becomes plugged. Frequent overflows during small summer storms are a signal that maintenance is required. The filter should be cleaned once a year in the fall (after the leaves have fallen off the trees).
- Other than maintaining pre-treatment measures, the only feasible maintenance for infiltration trenches and soakaways is re-construction.

Maintenance of infiltration chambers has more flexibility than trenches or soakaways as the chambers are typically connected with an isolator row that detains the majority of sediment. The anticipated maintenance items are summarized below:

- Repair damage to inlet structures (i.e. patching broken concrete, sunken pavement, etc.).
- Repair or replace any damaged or missing inlet structure components (i.e. catch basin cover, grates, etc.).
- Pre-treatment systems should be cleaned of sediment, trash, and debris bi-annually, or when sediment accumulation has reduced the capacity of the pre-treatment system is 50% or less (i.e. the pre-treatment system is 50% full, or greater).
- Remove sediment from the isolator row when accumulation reaches 80 mm or more. Confined space training may be required for sediment removal, and operations should only be completed by properly trained individuals. City health and safety protocols should be followed. Sediment should be flushed and shoveled to the nearest access port and removed using hydro-vac services. A hydro-vac contractor should be retained if the services are not available through City operations.
- If a monitoring well is present, repair or replace any broken riser pipes and/or well caps. Remove any accumulated sediment or debris from well casing.
- Remove obstructions from overflow outlet structure as required to maintain conveyance capacity.
- Flush sub-drains with water on a regular basis to remove any sediment accumulation. Sub-drains should be flushed or cleaned when one third (33%) of the pipe has been blocked.
- Clean out the control structure when sediment accumulates to 100 mm, or when stormwater flow into or out of the control structure is blocked.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.2.3 Permeable Pavement

Permeable pavements are an alternative to traditional impervious pavement that allows stormwater to drain through them into a stone reservoir. They are primarily designed to reduce runoff volume by infiltrating stormwater into the underlying soils. There are several types of permeable pavement including interlocking concrete pavers, plastic or grid systems, pervious concrete, and porous asphalt.

At the time of this manual, the City of Kingston does not have any permeable pavements included in the authorized system. For any future permeable pavements, the design engineer should review the recommended procedures identified below and confirm that they are appropriate. If not, these procedures should be updated, prior to the proposed feature being put into service.

Permeable pavement systems require more operational considerations than typical pavement. In particular, prevention of clogging within the stone reservoir, filler, and underdrain is essential to ensure long term performance. The anticipated operational items are summarized below:

- Trucks and other heavy vehicles shall be prevented from tracking or spilling dirt onto the pavement which can grind dirt into the porous surface. As such, appropriate signage shall be posted in these areas to direct heavy vehicles away from permeable pavement areas.
- Construction and hazardous material carriers shall be prohibited from entering a permeable pavement area to prevent potential groundwater contamination.
- Sealing coats should never be applied to permeable pavements.
- Impervious area contributing to permeable pavement shall be swept regularly and kept clear of litter and debris.
- Flows from landscaped areas should be diverted away from permeable pavement areas until well stabilized with vegetation.
- Paver and grid systems that have been planted with grass shall be mowed regularly, and the clippings should be removed. Watering and fertilizer shall be applied as necessary to ensure healthy vegetation.
- Sand shall not be spread on permeable pavement as it can quickly lead to clogging.
- De-icers should be used in moderate amounts and only when needed. Studies have shown that permeable pavements require approximately 75% less salt than conventional pavement over the course of a typical winter season.
- Snow removal shall be completed like other paved areas. However, snow piles and snowmelt water shall not be directed to permeable pavement systems.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM423 SOP - Inspection Procedures for Permeable Pavement** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Permeable pavement systems also require regular maintenance to ensure proper function. The anticipated maintenance items are summarized below:

- Surface sweeping of the permeable pavement shall be completed at least once a year with a commercial vacuum sweeping unit to mitigate sediment accumulation and ensure continued porosity. Do not use high water pressure or compressed air systems.
- Inlet structure and drainage pipes within or draining to the subsurface bedding shall be cleaned out as required, based on inspection results.
- Isolated potholes can be patched with standard patching mixes for porous asphalt or pervious concrete. However, once the structural integrity of the pavement has been compromised or stormwater can no longer drain into the aggregate base full replacement will be required.
- Uneven pavers shall be repaired by pulling up the pavers, redistributing the bedding layer, and then placing the pavers back. New filler stone will need to be swept into the replaced pavers.
- Weeding shall be completed while weeds are small to limit damage to the pavement and loss of filler material between pavers.

4.2.4 Perforated Pipe

Perforated pipe systems are similar to long infiltration trenches or linear soakaway pits and consist of perforated pipes installed in gently sloping granular stone beds that are lined with geotextile fabric. They are primarily designed as conveyance systems, but also provide a runoff volume benefit through exfiltration into the surrounding soils.

At the time of this manual, the City of Kingston does not have any perforated pipe systems included in the authorized system. For any future perforated pipe systems, the design engineer should review the recommended procedures identified below and confirm that they are appropriate. If not, these procedures should be updated prior to the proposed feature being put into service.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM424 SOP - Inspection Procedures for Perforated Pipe Systems** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Perforated pipe systems require periodic maintenance and repairs as identified during inspections. The anticipated maintenance items are summarized below:

- Debris and accumulated sediment should be removed from pre-treatment devices such as leaf screens, sedimentation MTDs, vegetated filter strips and grass swales.
- Flushing of the perforated pipe system should be completed when the time to fully drain the system exceeds 72 hours.
- Removal and replacement of the granular material and geotextile liner may be required if slow drainage persists.

4.2.5 Green Roof

Green roofs consist of a thin layer of vegetation and growing medium installed on top of a conventional flat or sloped roof. Green roofs reduce runoff volume and improve water quality by storing rainwater in the growing medium and ponding areas and conveying excess stormwater to the building drainage system.

At the time of this manual, the City of Kingston does not have any green roofs included in the authorized system. For any future green roofs, the design engineer should review the recommended procedures identified below and confirm that they are appropriate. If not, these procedures should be updated, prior to the proposed feature being put into service.

Green roof systems require the greatest amount of maintenance within the first 2 years as plants are becoming established. As such, a warranty should be included in the construction contract to ensure dense coverage becomes established, prior to assumption by the City.

Regular operation of green roofs include irrigation, where watering should be done based on actual soil moisture conditions, rather than on fixed intervals. Green roof plants are designed to be drought tolerant. As such, high soil moisture from unnecessary watering will reduce the runoff reduction benefits of the green roof. In addition, electronic leak detection systems are recommended and must be installed prior to the green roof.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM425 SOP - Inspection Procedures for Green Roof Systems** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Green roofs will require ongoing maintenance at least twice per year and should include:

- Weeding to remove seeding of trees and shrubs. Green roofs are not typically designed for the weight of these plants, and the roots can damage the water proofing.
- Debris and dead vegetation removal should include periodic removal of bird feces and ensure that the overflow conveyance system is clear of obstructions.

4.3 Low Impact Development (LID) Filtration Facilities

LID filtration facilities are stormwater management facilities whose primary function is to filter runoff to improve water quality. These facilities are primarily used in areas with site constraints that do not allow for significant groundwater infiltration.

At the time of this manual, the City of Kingston does not have any low impact development filtration facilities included in the authorized system. As such the procedures identified below are typical requirements for common types of LID filtration facilities. These procedures should be updated based on recommendations of the design engineer for any future LID filtration facilities, prior to being put into service.

4.3.1 Bioretention Facilities and Rain Gardens

Bioretention facilities and rain gardens are vegetated areas which include an underlying filter bed that is comprised of sand, fines and organic material, referred to as a biofilter. This biofilter layer provides filtration of stormwater runoff and can be utilized without an underdrain (for full infiltration) or with an underdrain where site conditions do not support infiltration.

Bioretention facilities require regular watering for the first 2 years of operation until vegetation is established. As such, a warranty should be included in the construction contract to ensure vegetation is established, prior to assumption by the City.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM431 SOP - Inspection Procedures for Bioretention Facilities and Rain Gardens** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

For bioretention facilities, the anticipated maintenance items are summarized below:

- Remove trash and debris from pre-treatment devices, the bioretention area surface, and inlet and outlets at least twice annually.
- Trim trees and shrubs.
- Replace dead vegetation and remove invasive growth.
- Repair eroded or sparsely vegetated areas.

- Remove accumulated sediment on the bioretention area surface when dry and exceeds 25 mm depth.
- If gullies are observed along the surface, regrading and revegetating may be required.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.3.2 Enhanced Grassed Swales

Enhanced grassed swales are vegetated open channels designed to convey, treat, and attenuate stormwater runoff. In order for these features to provide water quality treatment, the key design objective is to maintain a low flow velocity at a shallow depth during frequent storm events. As such, the channel geometry includes a wide base, tall grasses and sometimes check dams to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil.

Operational procedures associated with enhanced grassed swales are similar to conventional ditches and swales; however, vegetation shall be maintained at a minimum height of 100 mm.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM432 SOP - Inspection Procedures for Enhanced Grassed Swales** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Enhanced grassed swales require periodic maintenance to ensure adequate conveyance and filtration. The anticipated maintenance items are summarized below:

- Regular watering may be required during the first 2 years while vegetation is becoming established.
- Mow grass to maintain a height of 100 mm.
- Remove trash and debris from pre-treatment devices, the swale surface, and inlet and outlet structures.
- Replace eroded or sparsely vegetated areas.
- Remove accumulated sediment on the swale surface when dry and exceeds 25 mm depth.

- If gullies are observed along the swale, regrading and revegetating may be required.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.4 Wet Stormwater Management Ponds

Wet stormwater management ponds are stormwater management facilities which provide water quality treatment through settling of suspended sediments within a permanent pool. Wet stormwater management ponds typically include a forebay to contain the majority of sediment near the inlet to reduce the sediment removal costs. Wet stormwater management ponds are primarily used for end-of-pipe water quality treatment; however, they often contain a detention storage component to reduce peak flow rates to the receiving drainage system. Wet Stormwater Management Ponds include Wet Ponds, Constructed Wetlands and Hybrid Ponds.

Public safety is particularly important around wet stormwater management ponds due to the depth of the permanent pool, steep sloping of the embankments and the rapid changes in water level during rainfall events. As such, warning signs shall be posted at highly visible locations for all stormwater management ponds. The City of Kingston Stormwater Management Pond Warning Sign is provided in **Appendix D**.

Wet stormwater management ponds require some operational considerations to ensure long term performance. The anticipated operational items are summarized below:

- Trucks and heavy equipment shall take special care when performing maintenance activities in and near wet stormwater management ponds that have impermeable liners. This is to ensure the liner does not become punctured, creating a potential for drawdown of the permanent pool or the release of contaminants into the groundwater system.
- Facilities with aerator pumps and fountains should ensure they are maintained and winterized in accordance with manufacturer recommendations. Pumps and fountains should also be re-installed in the spring of every year, where required in accordance with the engineering design, to limit algae growth.
- Grass cutting on the embankments shall be completed based on aesthetics. Grass clippings shall be bagged or directed up-hill away from the facility. Grass cutting shall also be conducted as required for outfall channels and emergency overflow weirs to ensure they are free of obstructions.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM440 SOP - Inspection Procedures for Stormwater Management Ponds** (applicable to both wet and dry stormwater management facilities) is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Wet stormwater management ponds will require routine maintenance typically every few years, if not annually. These routine maintenance items are summarized below:

- Debris such as leaves, branches, trash, and sediment that is obstructing inlets and outlets shall be removed as required based on inspections or in response to public complaints.
- Areas of bank erosion or slumping shall be repaired. Periodic re-seeding may be required in areas of exposed banks. Placement of temporary or permanent turf reinforcement mats, or other forms of erosion protection may also be required if continual bank erosion is occurring.
- Weed removal shall be completed to manage invasive species that may compromise the intended function of the planting strategy. Weed removal shall be completed by hand to prevent destruction of surrounding vegetation. The use of herbicides and insecticides shall be prohibited, and the use of fertilizers shall be minimized.
- Vegetation in the aquatic and shoreline fringe zones will require periodic replanting or enhancement during the first 2 years of operation; however, minimal replanting is anticipated after this period unless damage is caused by other maintenance activities.

Wet stormwater management ponds will also require non-routine maintenance, as identified during inspections. The anticipated non-routine maintenance items are summarized below:

- Placement or replacement of rip-rap material at outlets into the facility may be required at locations with high flow velocities to prevent scouring.
- Installation of aerators or fountains may be required if excessive algae growth is observed and causing odours.
- Flushing of inlet and outlet pipes shall be completed, as required based on inspections.
- Sediment removal shall be completed when the annual removal efficiency of the facilities is 5% less than the original target removal efficiency. See Section 6.4.1 of the Stormwater Management Planning and Design Manual for further details.

- Sediment removal from forebays shall be completed when the forebay permanent pool volume is reduced by 40% of the original design. This shall be completed even if the annual removal efficiency is still within 5% of the original target removal efficiency.

Sediment removal from wet stormwater management facilities requires careful planning, construction staging, permitting and approvals from municipal, provincial, and potentially federal agencies, as well as environmental protections. City staff shall consult the most current version of the Inspection and Maintenance Guide for Stormwater Management Ponds and Constructed Wetlands prior to initiating a sediment removal program for wet stormwater management facilities.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.5 Dry Stormwater Management Ponds

Dry stormwater management ponds are stormwater management facilities which do not provide water quality treatment but contain a detention storage component to reduce peak flow rates to the receiving drainage system.

Public safety is important around dry stormwater management ponds due to the steep sloping of the embankments and the rapid changes in water level during rainfall events. As such, warning signs shall be posted at highly visible locations for all stormwater management ponds. The City of Kingston Stormwater Management Pond Warning Sign is provided in **Appendix D**.

Dry stormwater management ponds require minimal operational considerations to ensure long term performance. Grass cutting on the embankments shall be completed based on aesthetics. Grass clippings shall be bagged or directed up-hill away from the facility. Grass cutting shall also be conducted as required for outfall channels and emergency overflow weirs to ensure they are free of obstructions.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM450 SOP - Inspection Procedures for Stormwater Management Ponds** (applicable to both wet and dry stormwater management facilities) is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Dry stormwater management ponds will require routine maintenance typically every few years, if not annually. These routine maintenance items are summarized below:

- Debris such as leaves, branches, trash, and sediment that is obstructing inlets and outlets shall be removed as required based on inspections or in response to public complaints.
- Areas of bank erosion or slumping shall be repaired. Periodic re-seeding may be required in areas of exposed banks. Placement of temporary or permanent turf reinforcement mats, or other forms of erosion protection may also be required if continual bank erosion is occurring.
- Flushing of inlet and outlet pipes shall be completed, as required based on inspections.
- Placement or replacement of rip-rap material at outlets into the facility may be required at locations with high flow velocities to prevent scouring.
- Weed removal shall be completed to manage invasive species that may compromise the intended function of the planting strategy. Weed removal shall be completed by hand to prevent destruction of surrounding vegetation. The use of herbicides and insecticides shall be prohibited, and the use of fertilizers shall be minimized.

Dry stormwater management ponds will also require non-routine maintenance, as identified during inspections. The anticipated non-routine maintenance items are summarized below:

- Placement or replacement of rip-rap material at outlets into the facility may be required at locations with high flow velocities to prevent scouring.
- Flushing of inlet and outlet pipes shall be completed, as required based on inspections.
- Sediment removal shall be completed when the available storage volume is less than the required volume, as determined in the original design documents.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.6 Underground Storage Facilities

Underground storage facilities are stormwater management facilities whose primary function is to detain stormwater runoff and release it slowly over time, thereby reducing peak flow rates to the receiving drainage system. Underground storage facilities may include super pipe systems, storage vaults and underground storage chamber systems.

At the time of this manual, the City of Kingston does not have any storage facilities included in the authorized system. As such the procedures identified below are typical requirements for common types of storage facilities. These procedures should be updated based on recommendations of the design engineer for any storage facilities prior to being put into service.

4.6.1 Super Pipes

Super pipes are oversized storm sewers designed with a downstream flow restriction through a smaller diameter pipe or orifice to provide subsurface storage and reduce peak flow rates.

In general, there are no operational procedures required for super pipes as all components are design to operate via gravity and do not rely on valves or gates that require adjustment.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM461 SOP - Inspection Procedures for Super Pipe Systems** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Super pipe systems wills require periodic maintenance. The anticipated maintenance items are summarized below:

- Repair damage to inlet structures (i.e. patching broken concrete, sunken pavement, etc.).
- Repair or replace any damaged or missing inlet structure components (i.e. cover, grates, etc.).
- Pre-treatment systems should be cleaned of sediment, trash, and debris annually, or when sediment accumulation has reduced the capacity of the pretreatment system to 50% or less (i.e. the pretreatment system is 50% full, or greater).
- Remove sediment from the super pipe when accumulation reaches 80 mm or more. Confined space training may be required for sediment removal and operations should only be completed by properly trained individuals. City health and safety protocols should be followed. Sediment should be flushed and removed. A hydro-vac subcontractor may be required for flushing and sediment removal. A hydro-vac contractor should be retained if the services are not available through City operations.

- Remove obstructions from overflow outlet structure as required to maintain conveyance capacity.
- Clean out the control structure when sediment accumulates to 100 mm, or when stormwater flow into or out of the control structure is blocked.
- Repair or replace any damaged or missing outlet structure components (i.e. catch basin cover, grates, etc.).
- Repair or replace any damaged pipe sections.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.6.2 Vaults and Underground Storage Chamber Systems

Vaults and underground storage chamber systems are very similar to infiltration chambers; however, their primarily function is detention of stormwater with a controlled outlet structure to reduce peak flow rates to the receiving drainage system. In some cases, these systems also include an infiltration layer or an impermeable liner to prevent groundwater interference.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM462 SOP - Inspection Procedures for Vaults and Underground Storage Chambers** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Maintenance of vaults and underground storage chambers is similar to infiltration chambers as they are typically connected with an isolator row that detains the majority of sediment. The anticipated maintenance items are summarized below:

- Repair damage to inlet structures (i.e. patching broken concrete, sunken pavement, etc.).
- Repair or replace any damaged or missing inlet structure components (i.e. catch basin cover, grates, etc.).
- Pre-treatment systems should be cleaned of sediment, trash, and debris bi-annually, or when sediment accumulation has reduced the capacity of the pre-treatment system is 50% or less (i.e. the pre-treatment system is 50% full, or greater).

- Remove sediment from the isolator row when accumulation reaches 80 mm or more. Confined space training may be required for sediment removal, and operations should only be completed by properly trained individuals. City health and safety protocols should be followed. Sediment should be flushed and shoveled to the nearest access port and removed using hydro-vac services. A hydro-vac contractor should be retained if the services are not available through City operations.
- If a monitoring well is present, repair or replace any broken riser pipes and/or well caps. Remove any accumulated sediment or debris from well casing.
- Remove obstructions from overflow outlet structure as required to maintain conveyance capacity.
- Flush sub-drains with water on a regular basis to remove any sediment accumulation. Sub-drains should be flushed or cleaned when one third (33%) of the pipe has been blocked.
- Clean out the control structure when sediment accumulates to 100 mm, or when stormwater flow into or out of the control structure is blocked.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.7 Filtration Manufactured Treatment Devices

Filtration MTDs are proprietary stormwater treatment facilities that improve water quality by using low permeability membranes to filter suspended sediments out of stormwater runoff.

At the time of this manual, the City of Kingston does not have any filtration MTDs included in the authorized system. As such the procedures identified below are typical requirements for common types of filtration MTDs. These procedures should be updated based on recommendations of the design engineer for any future filtration MTDs, prior to being put into service.

Filtration MTDs do not require any special operational consideration; however, higher sediment loading will require more frequent maintenance. As such, impervious areas contributing to filtration MTDs shall be swept regularly and kept clear of litter and debris and flows from landscaped areas should be diverted away from filtration MTDs, particularly during construction, until well stabilized with vegetation.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM470 SOP - Inspection Procedures for Filtration Manufactured Treatment Devices** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Filtration MTDs will require periodic maintenance. The anticipated maintenance items are summarized below:

- Filter cartridges must be rinsed and re-installed at least once per year or more frequently based on inspection results. Do not use a high-pressure sprayer or focused stream of water to rinse the filter cartridges.
- Damaged or missing cartridge deck components must be repaired or replaced immediately.
- A licensed waste management company should remove oil and sediment and dispose of it according to current regulations.
- If a chemical spill has been captured, do not attempt maintenance. Immediately follow the procedures outlined in Section 4 of the Corporate Spills Management Plan.
- Refer to the manufacturer recommendations for specific maintenance procedures.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.8 Sedimentation Manufactured Treatment Devices

Sedimentation MTDs are proprietary stormwater treatment facilities that improve water quality by using mechanisms that settle out sediment from stormwater.

Sedimentation MTDs do not require any special operational consideration. Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM480 SOP - Inspection Procedures for Sedimentation Manufactured Treatment Devices** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

Sedimentation MTDs will require periodic maintenance. The anticipated maintenance items are summarized below:

- Repair or replace broken maintenance holes or inlet grates, as required.
- Repair ground surface damage, if present.
- A licensed waste management company should remove oil and sediment and dispose of it according to current regulations.
- At the time of maintenance, inspect the internal storm sewer system and remove accumulated sediment to ensure proper maintenance of the entire drainage system.
- Refer to the manufacturer recommendations for specific maintenance procedures.

Disclaimer: Sediment removal and materials handling shall be completed by a qualified person, with the required permits and approvals, in accordance with City of Kingston procedures and policies and in accordance with applicable provincial and federal legislation. All handling of on-site and excess soil shall be in accordance with O. Reg. 406/19.

4.9 Stormwater Pump Stations

Stormwater pumping stations are facilities that contain equipment to store stormwater runoff within a collecting chamber and pump it through a forcemain to another location where conveyance can continue by gravity.

At the time of this manual, the City of Kingston does not have any stormwater pumping stations included in the authorized system. As such, the Utilities Kingston Operation and Maintenance Manual for sanitary pumping stations should be referenced for general operation, inspection and maintenance procedures.

Inspections shall be in accordance with the City of Kingston's most current SOPs. A recent version of **SWM490 SOP - Inspection Procedures for Stormwater Pumping Stations** is provided in **Appendix A**. The City of Kingston Engineering Department is responsible for keeping the SOPs within this manual up to date. Contact City of Kingston Engineering Department staff for the current version of any SOP.

For any future stormwater pumping stations, this manual should be updated based on the recommendations of the design engineer, prior to being put into service.

5.0 Monitoring Equipment

Regular inspections and calibration of monitoring equipment is essential to ensure that accurate and reliable data is collected and recorded in accordance with the City of Kingston Stormwater Management System Monitoring Plan.

At the time of this manual, the Monitoring Plan has not yet been completed. As such, the following are general procedures for the routine physical inspection and calibration of monitoring equipment or components that are anticipated to be included in the final Monitoring Plan. Once the Monitoring Plan is completed, this manual should be updated based on the specific equipment and components required.

The Monitoring Plan will include separate equipment for two types of monitoring referred to as receiver monitoring and performance monitoring of stormwater management infrastructure. Receiver monitoring is focused on collecting data on stream water quality and quantity and analyzing how it changes over time. Performance monitoring focuses on site level or sewershed scale monitoring to evaluate the performance of LIDs, stormwater management ponds and MTDs. While the focus of these two types of monitoring is different, the equipment used is similar. As such, the general monitoring equipment required and associated inspection and calibration procedures are summarized below.

5.1 General Monitoring Equipment

General monitoring equipment such as cameras, tape measures, shovels, pickaxes, grab sample poles and hip/chest waders shall be visually inspected before each use. Equipment shall be cleaned at the end of each day and stored in a protected location.

5.2 Water Level Gauge / Level Logger

Water level gauges and level loggers shall be visually inspected as part of each site visit to ensure the equipment has not been damaged or tampered with and is adequately protected. When downloading data from level loggers, the data should be reviewed as soon as possible to ensure the gauge is providing accurate results. Also, the battery level should be checked or charged to ensure it is sufficient for continuous data collection until the next site visit. If the gauges or housings appear to have moved or shifted, a topographic survey should be completed to ensure the base elevation is consistent with the original installed elevation. If not, the collected data will need to be reviewed and potentially adjusted to the new datum.

5.3 Flow Meter

Flow meters shall be visually inspected before each use to ensure the equipment has not been damaged. Calibration frequency shall be based on manufacturer’s recommendations. At the end of each day of use, flow meters shall be rinsed of any accumulated sediment and stored in a protected location.

5.4 Water Quality Sample Meter and Turbidity Sensors

Water quality sample meters and turbidity sensors shall be visually inspected before each use to ensure the equipment has not been damaged. Calibration frequency shall

be based on manufacturer's recommendations. At the end of each day of use, equipment shall be rinsed with distilled water and stored in accordance with manufacturer's recommendations.

5.5 Data Collector

Proprietary data collectors associated with sampling shall be visually inspected before each use to ensure the equipment has not been damaged. Calibration frequency shall be based on manufacturer's recommendations. Non-proprietary data collectors, such as phones or tablets, shall be visually inspected before each use and confirmed that the required software programs are installed, and the necessary network data is available.

5.6 Water and Soil Sample Container

Water and soil sample containers shall be visually inspected prior to use to ensure no cracks or leaks.

6.0 Emergency Response

The City of Kingston administers a Corporate Spills Management Plan with primary objectives to:

- Ensure continuous improvement of spills management and prevention practices.
- Identify the roles/responsibilities of City of Kingston personnel as they relate to spill response.
- Identify the resources available (equipment, personnel, and other agencies) to provide spill response.
- Develop and implement spill response procedures to be used by City of Kingston personnel.
- Identify internal and external reporting requirements and establish standardized spill reporting procedures.
- Identify training requirements for City of Kingston employees.
- Ensure proper investigation and documentation of spill incidents.

Spill reporting, record keeping, and standard operation procedures are actively maintained through the City of Kingston's Environmental Risk Management System (ErMS) which was created to assist all staff in maintaining and improving the City's environmental performance while minimizing risks when it comes to regulations, laws, and financial impacts of their work.

Standard operating procedures related to environmental spills provided as listed below:

- First responders to environmental spills shall follow the **Initial Spill Response Checklist for the First Responder** standard operation procedure.
- On-scene coordinators for environmental spills shall follow the **On-scene Coordinator Spill Response** standard operation procedure.

Recent versions of these SOPs are provided in **Appendix B**; however, inspection staff should always use the live version available on the ErMS page.

Public complaints that are received through the Customer Relationship Management System (described in **Section 7.0)** that are related to environmental spills will also be logged in the ErMS system to ensure consistent record keeping and reporting to the Spills Action Centre.

7.0 Public Complaints

The City of Kingston actively uses a Customer Relationship Management (CRM) system in which citizens can submit inquiries or bring concerns and complaints to the City's attention. The CRM portal is accessible through the City's website, and after creating an account, users can direct their inquiries or concerns to appropriate City departments and request follow-up communication or action from City staff. The CRM system is designed to compile information on customer concerns and complaints across different communication channels including website, phone, social media, and in-person (i.e., front counter) services. The CRM system provides City staff access to more detailed information to ensure consistent service on customer concerns and complaints over time and captures detailed analytics to track service levels and to continue the City's goal of providing a high level of responsive service to the public.

All public inquiries and complaints regarding municipal stormwater infrastructure, and operation, inspection and maintenance programs will be logged in the CRM system, including follow up communications and actions taken. If concerns or complaints are received outside of the CRM system, City staff will upload a summary of the issue and its resolution to the CRM system to ensure an appropriate record is maintained. CRM system logs will be made available to the Ministry upon request.

8.0 As-Built and Record Drawings

All available as-built and record drawings for the approved system are stored in the City of Kingston's Cartegraph Asset Management System (Cartegraph). Cartegraph is a GIS integrated asset management system that helps City staff plan, operate, inspect, and manage their infrastructure. Log-in credentials have been provided to the Ministry for read-only access to the authorized system, which also includes access to as-built and record drawings for each component of the authorized system.

New as-built and record drawings shall be uploaded to Cartegraph upon the completion of construction or commencement of operation for all establishment, alteration, extension, replacement or enlargement works associated with the authorized system.

9.0 Conclusion

This Stormwater Operation and Maintenance Manual has been prepared to fulfill the requirements identified in Section 3.2, Schedule E of the Environmental Compliance Approval for the Municipal Stormwater Management System of the Corporation of the City of Kingston (ECA No. 018-S701).

The procedures for the operation and maintenance of each component of the authorized system are described in detail, and the standard operating procedures for inspections are provided in **Appendix A**.

Emergency response procedures are provided in the City of Kingston's Spills Management Plan and maintained through the Environmental Risk Management System portal.

Public complaints are be managed by the City of Kingston's Customer Relationship Management System, which provides an online portal for receiving, responding to, and recording inquiries and concerns.

As-built and record drawings are provided in the City of Kingston's Cartegraph Asset Management System.

In accordance with the CLI ECA, the City is required to update this manual to include the procedures necessary for the operation, inspection, and maintenance of any Sewage Works within the authorized system that are established, altered, extended, replaced, or enlarged, prior to placing into service those Sewage Works. As such, this document is not static and is to be updated on a regular basis to ensure that necessary procedures are in place for the operation, inspection and maintenance of all components of the authorized system.

10.0 Statement of Limitations

This Stormwater Operation and Maintenance Manual has been prepared by the City of Kingston to address the requirements of Section 3.2, Schedule E of the Environmental Compliance Approval for the Municipal Stormwater Management System of the Corporation of the City of Kingston (ECA No. 018-S701).

The procedures discussed in this manual are based on available background documentation and discussions with applicable agencies at the time of preparation. The procedures discussed are not exhaustive and do not supersede any other provincial or federal legislative requirements.

The manual is intended to demonstrate the means whereby the stormwater components of the authorized system are to be operated, inspected, and maintained, while also documenting the procedures for emergency response and public complaints.

Any use which a third party makes of this manual other than a Stormwater Operation and Maintenance Manual for the City of Kingston authorized system is the responsibility of such third parties. The City of Kingston accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or action taken based on using this report for purposes other than a Stormwater Operation and Maintenance Manual for the City of Kingston authorized system.

Appendix A

Stormwater Inspection Standard Operation Procedures

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM411**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **5**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR STORM SEWER SYSTEMS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned storm sewer systems, which includes inlets, pipes, maintenance hole structures and outlets but excludes culverts.

Scope

This procedure applies to any City staff that undertake storm sewer system inspections.

Frequency

The frequency of inspection varies based on each component of the storm sewer system:

- Inlets that include inlet filters or insert devices shall be inspected every 2 years at a minimum as part of the inspection program managed by Public Works or more frequently if in an area of high potential loading.
- Inlets shall be inspected once every 4 years at a minimum as part of the inlet inspection program managed by Public Works.
- Inlets shall be cleaned out once every four 4 years at a minimum as part of the inlet maintenance program managed by Public Works.
- Maintenance hole structures and storm sewer mains shall be inspected once every 10 years at a minimum as part of the annual CCTV inspection program managed by Engineering Services.
- Outlets shall be inspected once every 4 years at a minimum as part of the outlet inspection program managed by Engineering Services.
- Maintenance hole structures, storm sewer mains, and outlets shall be cleaned out once every 10 years at a minimum as part of the annual CCTV inspection program managed by Engineering Services.

Department Owner

Engineering Services

Definitions

"**CCTV**" means Closed Circuit Television.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**Inlet**" means a structure that accepts stormwater runoff including ditch inlets, catch basins and open pipe inlets.

"**Outlet**" means the discharge location of a storm sewer system to a surface drainage feature or to the natural environment.

"**PPE**" means Personal Protective Equipment.

"**SOP**" means Standard Operating Procedure.

Equipment

Inlets and Outlets

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Notebook
- Pen/Pencil
- Tape Measure
- Shovel
- Pickaxe
- Vacuum Truck

Maintenance Hole Structures and Storm Sewer Mains

- Required equipment to be determined by the CCTV contractor.

Procedure

Inlets and Outlets

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.

2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspectors shall confirm the CartegraphOne Application is installed on the Phone or Tablet.
    a. CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    b. Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a full inspection using the Cartegraph Inlet/Outlet Inspection form, making special note of any deficiencies observed and recording the depth of sediment.
9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall inspect the inlet filter, if applicable, for damage and accumulated debris. Inspector shall coordinate repair of damage and/or removal of all debris from within the inlet filter by Public Works following the inspection.
11. Inspector shall coordinate removal of all accumulated sediment from inlet sumps by Public Works.
12. Inspector shall coordinate removal of all accumulated sediment at outlets by Public Works if restricting flow within the upstream pipe or sediment depth exceeds 100 mm.
13. Inspector shall assign a structure and operation score on a scale of “1” (very poor) to “5” (excellent) for the inspected Outlet within the Cartegraph Inspection Report.
14. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Maintenance Hole Structures and Storm Sewer Mains

1. Flushing and CCTV inspection activities for Maintenance Hole Structures and Storm Sewer Mains are to be completed by a licensed contractor in accordance with National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) and Manhole Assessment Certification Program (MACP), Condition Grading System.

2. All pipes are to be flushed and accumulated sediment removed from maintenance hole structures prior to inspection.
3. CCTV videos and inspections reports are to be prepared by the contractor and submitted to the Senior Stormwater Technologist in Engineering Services who will review and upload final approved documents to Cartegraph.
4. Engineering Services will coordinate updating of condition ratings for maintenance hole structures and storm sewer mains in Cartegraph.
5. Engineering Services to identify and prioritize any deficiencies to be rectified and schedule maintenance activities as necessary.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for inlets and outlets.
- CCTV inspection reports of maintenance hole structures and storm sewer mains shall be uploaded to Cartegraph and condition ratings shall be assigned to each component.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Outlets can be difficult to locate via the Cartegraph App. The most recent imagery layer is recommended to be turned on to locate the end of pipe via visible surface features (e.g., trees, waterbodies, structures).
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Drainage Management Manual (MTO, 1997)
- Stormwater Management Planning and Design Manual (MOE, March 2003)
- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Design Guidelines for Sewage Works (MOE, 2008)
- Highway Drainage Design Standards (MTO, 2008)
- Stormwater Management Criteria Document (TRCA, 2012)
- Gravity Pipe Design Guidelines (MTO, 2014)

- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Guidelines for Stormwater Management (CRCA, 2021)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (MECP, May 31, 2023)
- National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) and Manhole Assessment Certification Program (MACP), Condition Grading System
- Stormwater Monitoring Plan – IN PROGESS

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspections of City-owned ditches and swales. Note that inspection procedures for enhanced grasses swales are provided under a separate SOP.

Scope

This procedure applies to any City staff that undertake road ditch and swale inspections.

Frequency

- Roadside ditches and swales shall be monitored routinely or in response to public complaints as part of the operations program managed by Public Works.
- Higher frequency inspections may be required based on sediment accumulation rates, trash or debris accumulation or wildlife activity.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Notebook
- Pen/Pencil
- Tape Measure
- Shovel

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspectors shall confirm the CartegraphOne Application is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Ditch/Swale Inspection form recording the following information as a minimum:
    - Vegetation condition.
    - Trash and debris.
    - Signs of erosion.
    - Depth of sediment at inlets, outlets and culvert crossings.
    - Signs of oil and chemical spills.
    - Ponded water.
9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in ditches/swales by Public Works if restricting flow or sediment depth exceeds 100 mm.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for ditches and swales.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Drainage Management Manual (MTO, 1997)
- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Highway Drainage Design Standards (MTO, 2008)
- Site Plan Control Guidelines (December 2009)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Subdivision Development Guidelines & Technical Standards (January 2014)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- CAN/CSA-W202: Erosion and Sediment Control Inspection and Monitoring Standard (CSA Group, 2018)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- CSA W208-20: Erosion and Sediment Control Installation and Maintenance (CSA Group, 2020)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)

- Corporate Spills Management Plan (2024)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspections of City-owned culverts.

Scope

This procedure applies to any City staff that undertake culvert inspections.

Frequency

- Culverts shall be monitored routinely or in response to public complaints as part of the operations program managed by Public Works.
- Higher frequency inspections may be required based on sediment accumulation rates, trash or debris accumulation or wildlife activity.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Notebook
- Pen/Pencil
- Tape Measure

- Shovel

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate traffic protection plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Culvert Inspection form recording the following information as a minimum:
    - Trash and debris.
    - Signs of erosion on embankments.
    - Condition of headwalls and wingwalls.
    - Condition of joints and barrel.
    - Signs of oil and chemical spills.
    - Ponded water.
    - Depth of sediment at inlet and outlet.
9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in culverts by Public Works or via a private contractor if restricting flow or sediment depth exceeds 100 mm.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.

12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for culverts.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Drainage Management Manual (MTO, 1997)
- Stormwater Management Planning and Design Manual (MOE, March 2003)
- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Highway Drainage Design Standards (MTO, 2008)
- Site Plan Control Guidelines (December 2009)
- Subdivision Development Guidelines & Technical Standards (January 2014)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- CAN/CSA-W202: Erosion and Sediment Control Inspection and Monitoring Standard (CSA Group, 2018)
- CSA W208-20: Erosion and Sediment Control Installation and Maintenance (CSA Group, 2020)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)

- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Culvert Inspection Guide for Culverts less than 3000 mm (MTO, September 2022)
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (MECP, May 31, 2023)
- National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP), Lateral Assessment Certification Program (LACP) and Manhole Assessment Certification Program (MACP), Condition Grading System.
- Corporate Spills Management Plan (2024)
- Stormwater Monitoring Plan – IN PROGESS

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM421**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR INFILTRATION BASINS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspections of City-owned infiltration basins.

As the City does not currently have any infiltration basins included in the CLI ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future infiltration basins, prior to being put into service.

Scope

This procedure applies to any City staff that undertake infiltration basin inspections.

Frequency

- Inspect infiltration basins every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect infiltration basins annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of infiltration basins immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)

- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Infiltration Basin Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the surface infiltration basin. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to stormwater runoff and the basin.
    - Inspect the surface infiltration basin for obstructions, damage and erosion. Record any observations. Make note of any trash or debris accumulation.
    - Inspect the surface infiltration basin for sediment accumulation. Measure and record the depth of sediment accumulation if present.
    - Inspect the area for standing water upstream of the surface infiltration basin. Standing water may indicate that the surface infiltration basin is blocked or is not functioning properly.

- Inspect the vegetation in the surface infiltration basin. Note the amount of plant cover, any bare areas and the plant condition.
- Inspect the surface infiltration basin for evidence of erosion (e.g., rills). The presence of rills may indicate that the facility needs repair or re-grading.
- Inspect the outlet of the surface infiltration basin for obstructions or damage.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in infiltration basins.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for infiltration basins.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)

- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned infiltration trenches, chambers and soakaways.

Scope

This procedure applies to any City staff that undertake infiltration trench, chamber and soakaway inspections.

Frequency

- Inspect infiltration trenches, chambers or soakaways every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect infiltration trenches, chambers or soakaways annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of infiltration trenches, chambers or soakaways immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone

- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
5. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
6. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
7. Inspector must complete a visual inspection using the Cartegraph Infiltration Trench, Chamber or Soakaway Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the infiltration trench, chamber or soakaway. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to the runoff and the facility.
    - Inspect the infiltration trench, chamber or soakaways for obstructions, damage and erosion. Record any observations. Make note of any trash or debris accumulation.
    - Inspect the infiltration trench, chamber or soakaways for sediment accumulation. Measure and record the depth of sediment if present.
    - Inspect monitoring well, if applicable to the infiltration trench, chamber or soakaway design. Check that well caps are present, secure and free from damage.

- Inspect monitoring well standpipe for damage or cracks and record any damage if observed. Measure and record the water level. Measure the level of sediment in the standpipe, if present.
- Inspect the sub-drain, if applicable to the infiltration trench, chamber or soakaway. Measure and record any sediment accumulation. If a flow restrictor is present within the sub-drain, inspect it for damage and sediment accumulation.
- Inspect the outlet of the infiltration trench, chamber or soakaway for obstructions or damage.

8. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
9. Inspector shall coordinate removal of all accumulated sediment in infiltration trenches, chambers or soakaways.
10. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
11. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for infiltration trench, chamber or soakaway.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)

- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM423**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR PERMEABLE PAVEMENT**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned permeable pavement.

As the City does not currently have any permeable pavement systems included in the CLI ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future permeable pavement systems, prior to being put into service.

Scope

This procedure applies to any City staff that undertake permeable pavement inspections.

Frequency

- Inspect permeable pavement every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect permeable pavement annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of permeable pavement immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)

- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Tape Measure

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Permeable Pavement Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the permeable pavement. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to stormwater runoff and the permeable pavement.
    - Inspect the permeable pavement for obstructions, damage, heaving or sinking ground, rutting, open joints and erosion. Record any observations. Make note of any trash or debris accumulation.
    - Inspect the permeable pavement for standing water. Standing water may indicate that the permeable pavement is blocked or is not functioning properly.
    - Inspect the vegetation on the permeable pavement. Note the amount of vegetation cover, any bare areas and its condition.
    - Inspect the sub-drain, if applicable to the design of the permeable pavement. Measure and record sediment accumulation, blockages and/or any root intrusion

observed. If a flow restrictor is present within the sub-drain, inspect it for damage and sediment accumulation.

- Inspect the monitoring well, if applicable to the permeable pavement design. Check that well caps are present, secure and free from damage. Inspect monitoring well standpipe for damage or cracks and record all observations. Measure and record the water level and sediment within the standpipe if present.
- Inspect the overflow outlet structure of the permeable pavement for obstructions or damage.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in permeable pavement.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for permeable pavement.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)

- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM424**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR PERFORATED PIPE SYSTEMS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned permeable pavement.

As the City does not currently have any perforated pipe systems included in the CLI ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future permeable pipe systems, prior to being put into service.

Scope

This procedure applies to any City staff that undertake perforated pipe system inspections.

Frequency

- Inspect perforated pipe systems every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect perforated pipe systems annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of perforated pipe systems immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)

- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Perforated Pipe Inspection form recording the following information as a minimum:
    - Inspect the perforated pipe for sediment accumulation, obstructions or structural damage (e.g., collapse, root intrusion, etc.). Measure and record any sediment accumulation and/or the type of obstruction.
    - Inspect the flow restrictor, if present, within the perforated pipe for structural damage and sediment accumulation.
    - Inspect the area for standing water upstream of the perforated pipe facility. Standing water may indicate that the perforated pavement is blocked or not functioning properly.
9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.

10. Inspector shall coordinate removal of all accumulated sediment in perforated pipe systems.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for perforated pipe systems.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Stormwater Monitoring Plan – IN PROGESS

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM425**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR GREEN ROOFS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned green roofs.

As the City does not currently have any green roofs included in the CLI ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future green roofs, prior to being put into service.

Scope

This procedure applies to any City staff that undertake green roof inspections.

Frequency

- Inspect green roofs every 6 months for the first year as part of the operations program managed by Public Works.
- Inspect green roofs annually after the first year as part of the operations program managed by Public Works.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph

- Tape Measure
- Shovel

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall gather all required equipment and ensure it is in good and working order.
4. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
5. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
6. Inspector shall wear PPE at all times.
7. Inspector must complete a visual inspection using the Cartegraph Culvert Green Roof Inspection form recording the following information as a minimum:
    - Inspect the perimeter of the green roof and verify that there is space between the perimeter of the green roof and the main roof perimeter. Record any areas of vegetation, debris or other blockages that may act as a fire hazard. Wind breaks, if present, should be inspected for damage (e.g., cracks, erosion, etc.).
    - Inspect the green roof for obstructions, damage and erosion. Record any observations. Make note of any trash or debris accumulation.
    - Inspect the green roof for the presence of standing water. Standing water may indicate that the green roof is blocked or is not functioning correctly.
    - Inspect the vegetation in the green roof. Note the amount of plant cover, any bare areas and the plant condition.
    - Inspect the irrigation system for signs of damage or leaks.
    - Inspect any visible or exposed sections of the protective layers under the green roof (e.g., waterproof membrane) for damage. Record any observed damage (e.g., rips, tears, etc.).

- Inspect the overflow outlet structure of the green roof for obstructions or damage.

8. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
9. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
10. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for green roofs.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Stormwater Monitoring Plan – IN PROGESS

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM431**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR BIORETENTION FACILITIES AND RAIN GARDENS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned bioretention facilities and rain gardens.

Scope

This procedure applies to any City staff that undertake bioretention facility and rain garden inspections.

Frequency

- Inspect bioretention facilities and rain gardens every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect bioretention facilities and rain gardens annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of bioretention facilities and rain gardens immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone

- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Bioretention Facility or Rain Garden Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the bioretention facility or rain garden. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to stormwater runoff and the facility.
    - Inspect bioretention facility or rain garden for obstructions, damage, displacement or erosion. Record all observations. Make note of any trash or debris accumulation.
    - Inspect the side slopes of the bioretention facility or rain garden for signs of erosion or damage. Measure and record any areas requiring repair.
    - Inspect the filter bed for standing water. Standing water may indicate that the bioretention facility or rain garden is blocked or not functioning correctly.

- Inspect the bioretention facility or rain garden for sediment accumulation. Measure and record the depth of sediment accumulation if present.
- Inspect the vegetation in the bioretention facility or rain garden. Note the amount of plant cover, any bare areas and the plant condition.
- Inspect the sub-drain, if applicable to the bioretention facility or rain garden. Measure and record sediment accumulation, and/or any root intrusion observed. If a flow restrictor is present within the sub-drain, inspect it for damage and sediment accumulation.
- Inspect monitoring well, if applicable to the bioretention facility or rain garden. Check that well caps are present, secure and free from damage. Inspect monitoring well standpipe for damage or cracks and record any damage if observed. Measure and record the water level. Measure the level of sediment in the standpipe, if present.
- Inspect the outlet of the bioretention facility or rain garden for obstructions or damage.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in the bioretention facilities or rain gardens.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered in Cartegraph by City staff for bioretention facilities and rain gardens.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Corporate Spills Management Plan (2024)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM432**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR ENHANCED GRASSED SWALES**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned enhanced grassed swales.

Scope

This procedure applies to any City staff that undertake enhanced grass swale inspections.

Frequency

- Inspect enhanced grass swales every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect enhanced grass swales annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of enhanced grass swales immediately after an oil, fuel or chemical spill with the City's Environment Group.
- Enhanced grass swales shall be cleaned out once the sediment depth reaches 15% of the storage capacity, or at least once per year, whichever comes first as part of the operations program managed by Public Works.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone

- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Enhanced Grassed Swale Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the enhanced swale. Note any potentially contaminating activities (i.e. leaking chemical containers, spills, etc.) that may act as a source of pollution to stormwater runoff and the swale.
    - Inspect enhanced swale for obstructions, damage, displacement or erosion. Record all observations. Make note of any trash or debris accumulation.
    - Inspect the side slopes of the enhanced swale for signs of erosion or damage. Measure and record any areas requiring repair.
    - Inspect the filter bed for standing water. Standing water may indicate that the enhanced swale is blocked or not functioning correctly.
    - Inspect the enhanced swale for sediment accumulation. Measure and record the depth of sediment accumulation if present.
    - Inspect the check dams, if present at the site, for damage.

- Inspect the vegetation in the enhanced swale. Note the amount of plant cover, any bare areas and the plant condition.
- Inspect the outlet structure of the enhanced swale or obstructions or damage.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in enhanced grass swales.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered in Cartegraph by City staff for enhanced grass swales.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual, (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)

- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Corporate Spills Management Plan (2024)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM440 & SWM450**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **16**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR STORMWATER MANAGEMENT PONDS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned stormwater management ponds. For the purpose of this SOP stormwater management ponds include wet ponds, wetlands, hybrid pond and dry ponds.

Note that monitoring and sampling procedures are provided in a separate SOP titled Monitoring and Sampling Procedures for Stormwater Management Ponds (pending).

Scope

This procedure applies to any City staff that undertake stormwater management pond inspections.

Frequency

- Visual inspections of all stormwater management ponds shall be completed every year by the Senior Stormwater Technologist in Engineering Services. Inspections shall be completed between May and October when the weather is favourable.
- Inspect all stormwater management ponds after storm events greater than the 5-year return period.
- Coordinate inspection of stormwater management ponds immediately after a fuel or chemical spill with the City's Environment Group.
- Pond cleanouts will be prioritized based on the results of regular bathymetric surveys for all stormwater management ponds. Higher frequency cleanouts may be required at specific locations based on sediment accumulation rates.

Department Owner

Engineering Services

Definitions

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**Constructed Wetland**" means Engineered stormwater management facility with a shallow (< 1 m) permanent pool.

"**Dry Pond**" means Engineered stormwater management facility without a permanent pool.

"**Hybrid Pond**" means Engineered stormwater management facility with both a wet pond and a constructed wetland element connected in series.

"**PPE**" means Personal Protective Equipment.

"**SOP**" means Standard Operating Procedure.

"**Wet Pond**" means Engineered stormwater management facility with a deep (> 1 m) permanent pool.

Equipment

Visual Inspections

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Notebook
- Pen/Pencil
- Tape Measure
- Shovel
- Pickaxe
- Business Cards

Sediment Volume Surveys

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera
- Tape Measure
- Shovel
- Survey Grade GPS Unit
- Rowboat or Canoe

- Life Jackets
- Marine Safety Kit
- Hip or Chest Waders

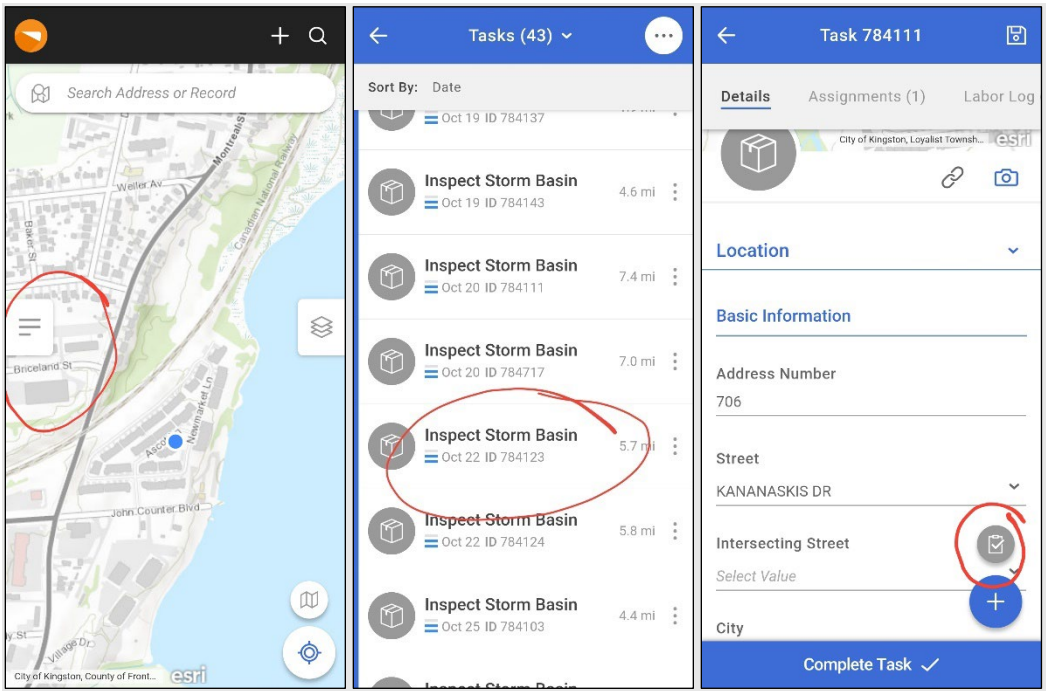
Procedure

Pre-Inspection

1. Senior Stormwater Technologist shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, catchment area maps, maintenance history and as-built drawings.
2. Senior Stormwater Technologist shall create and assign a work order in Cartegraph to track stormwater management (SWM) pond inspection progress.
3. Senior Stormwater Technologist shall review pertinent sections of the Departmental Health & Safety Manual.
4. Senior Stormwater Technologist shall gather all required equipment and ensure it is in good and working order.
5. Senior Stormwater Technologist shall confirm the Cartegraph One Application is installed on the Phone or Tablet.
    a. CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    b. Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Senior Stormwater Technologist shall notify the Supervising Engineer of their proposed SWM pond inspections work plans each day before leaving the office.
7. Senior Stormwater Technologist shall book the Engineering Services Floater Vehicle (Vehicle ID 21963) in advance of the planned inspection date. Due to the high demand during the summer months the vehicle should be booked at least one (1) week in advance.
8. Senior Stormwater Technologist must wear PPE at all times.
9. Senior Stormwater Technologist must complete a full SWM pond inspection using the Cartegraph SWM pond inspection form, making special notes and taking at least one (1) photo of any deficiencies observed.
    a. To start a new inspection, follow the steps below:
        1) Click the three dash lines on the left to go to assigned tasks.

2) Select ‘Sort By’. Choose either ‘Proximity’ or ‘Priority’. Select the SWM Pond (Storm Basin) Task.
3) Select the Inspection Form icon (clipboard).
4) Pre-populate form with previous years inspection. This can be done by opening last year's inspection on a computer and manually inputting the same scoring for each category through the CartegraphOne App. This can also be completed with Inlet and Outlet Data.
5) Record the date of the last rainfall event and the amount of precipitation. This task can be completed using the Kingston Historic Climate Climate data. Kingston Historic Climate data can be found from Environment Canada: https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

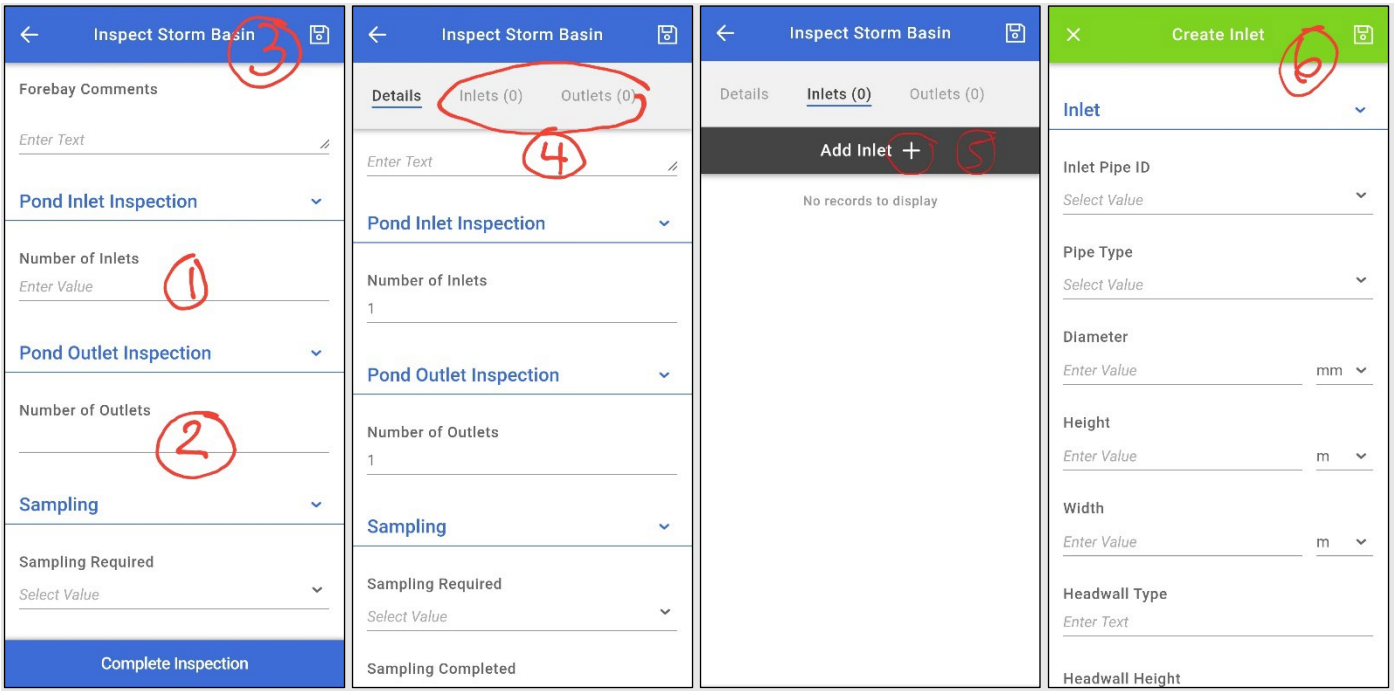
1 **2** **3**



b. To display inlets and outlets follow the steps below:

1) Assign the number of inlets
2) Assign the number of outlets
3) Save the whole inspection SWM Pond Inspection Form.

4) Go back into the SWM Pond Inspection Form. New inlet and outlet tabs will appear. Select a tab.
5) Add the inlet/outlet.
6) The green form is the inlet/outlet inspection form. Complete the form and click save. It is OK if the inlet or outlet does not have an ID, do not create a new ID.
7) Repeat for each inlet/outlet.
8) Save the SWM Pond Inspection Form.



Field Inspection

1. Take photos of all inspected items and upload them to the Cartegraph inspection form. Do not upload to the main SWM Pond Record in Cartegraph.
2. Once the inspection is complete and the form is saved, click the three dots on the side in the CartegraphOne application and select ‘Complete Task’.
3. If the SWM pond or portions of the SWM pond are found to be unsafe for inspection (e.g., presence of wild parsnip or hogweed) they are not to be inspected.
    a. Senior Stormwater Technologist shall report unsafe conditions immediately to the Supervising Engineer and arrange for the SWM pond to be made safe as soon as possible by coordinating with Public Works.

b. If only interim measures can be implemented to make the SWM pond safe for a short duration, the Supervising Engineer will make arrangements for a permanent solution to rectify the situation as soon as possible.

c. Senior Stormwater Technologist shall complete a follow up inspection once the SWM pond has been made safe.

d. The inspection report must include a record of the unsafe conditions, steps that were taken to rectify the situation, and any future planned work.

4. Senior Stormwater Technologist and Supervising Engineer shall review all inspection reports and coordinate the rectification of all deficiencies following completion of the SWM pond inspections, instructions for inspection summary documents located in “Post Inspection” Section. The City Departments listed below should be notified of deficiencies under their respective responsibilities to take appropriate corrective action:
    - **Public Works Services**: Debris/object or sediment removal, erosion repair measures, minor concrete repairs, landscape maintenance.
    - **Environmental Engineering**: Any foul odours, potential spills, algae concerns.
    - **By-Law Enforcement**: Any illegal dumping, removal of SWM pond vegetation or fencing.
    - **Planning Services**: SWM ponds not yet assumed by the City.
5. Senior Stormwater Technologist to ensure all photos and SWM pond inspections have been uploaded to Cartegraph.

Post-Inspection

1. Once all SWM Pond inspections have been completed, a document is created by exporting the compiled data into a colour coded excel sheet which summarizes each year’s inspections. This is created by following the instructions found within the “Creating an Inspection Report for a Single SWM Pond” document attached.

Sediment Surveys

1. Surveyors shall review pertinent sections of the Departmental Health & Safety Manual, particularly, sections related to working in and around water.
2. Surveyors shall gather all required equipment and ensure it is in good and working order.
3. Surveyors shall confirm the CartegraphOne Application is installed on the Phone or Tablet.
4. Surveyors shall notify the Construction Supervisor of their proposed SWM pond survey work plans each day before leaving the office.

5. Survey must be completed in pairs and surveyors must wear PPE at all times.
6. Confirm survey vertical datum using benchmarks from the as-built drawings.
7. Check invert elevations of all inlet and outlet structures as well as the emergency overflow weir.
8. Check the permanent pool elevation in both the forebay(s) and main cells(s)
9. Complete a bathymetric survey of the forebay(s) and main cell(s) using a 5 m x 5 m grid starting at 0.30 m above the permanent pool to the base of the pond.
10. Take photos of all inspected items and upload them to Cartegraph.
11. Engineering / GIS Technologist in Engineering Services to upload survey data to AutoCAD software and compare pond bottom surface to as-built drawings to estimate accumulated sediment.
12. Refer to Stormwater Operation and Maintenance Manual to determine when a sediment cleanout is required.

Reporting or Auditing Requirements

- All inspection data and photos are to be uploaded into Cartegraph by City staff for SWM ponds.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Inspection and Maintenance Guide for Stormwater Management Ponds and Constructed Wetlands (TRCA, 2018)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)

- Guidelines for Stormwater Management (CRCA, 2021)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022
- Corporate Spills Management Plan (2024)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

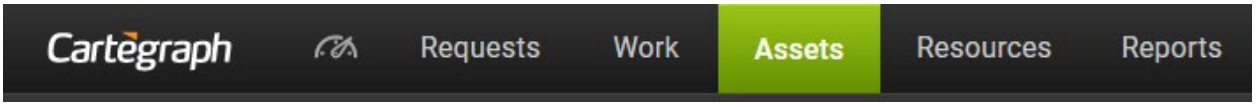
SWM POND INSPECTION REPORT INSTRUCTIONS

Creating an Inspection Report for a Single SWM Pond

- *includes all previous inspections

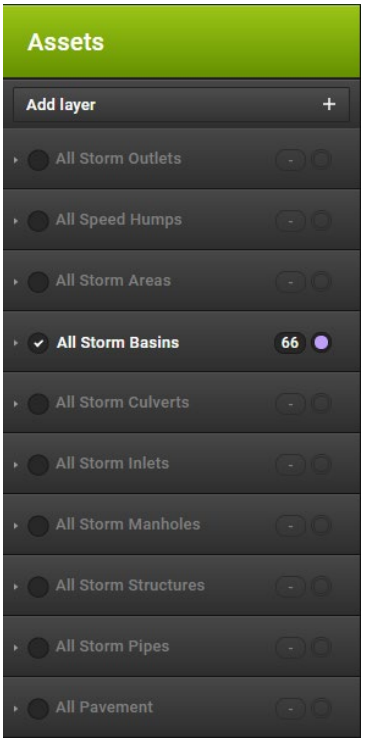
Step 1:

Open Cartegraph and Navigate to the “Assets” Tab



Step 2:

Under the Assets column on the left turn on the “All Storm Basins” Layer. Turn off all other layers

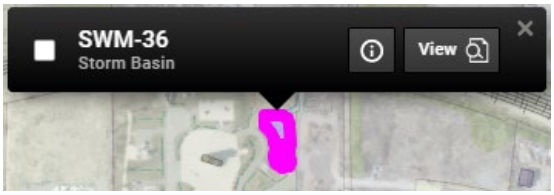


Step 3:

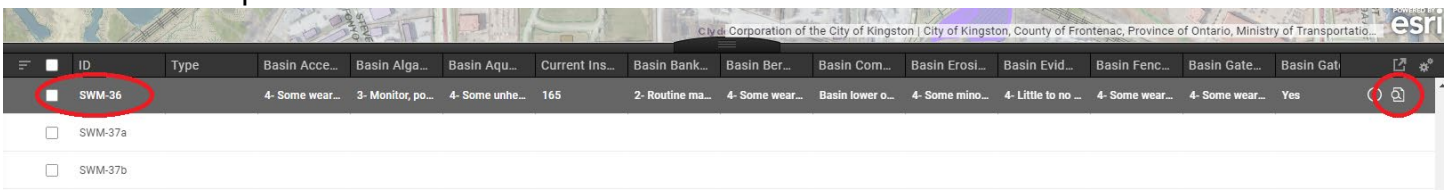
Once the “All Storm Basins” layer loads, bring up the asset information for the SWM Pond by either:

- Selecting the pond on the map and clicking “View”

SWM POND INSPECTION REPORT INSTRUCTIONS

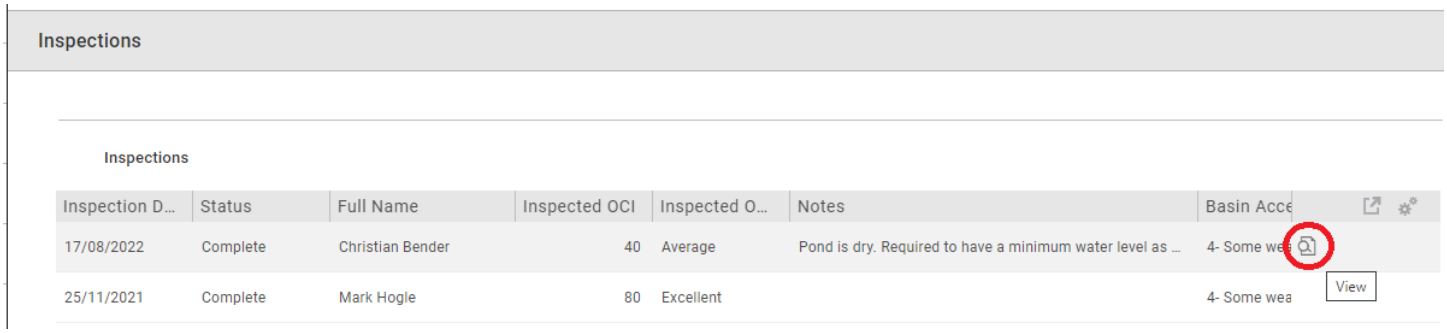


- Navigating the Pond list on the bottom of the page and clicking the pond in question either on the ID or “View” Button. NOTE: Clicking the anywhere else in the row highlights the pond on the map



Step 4:

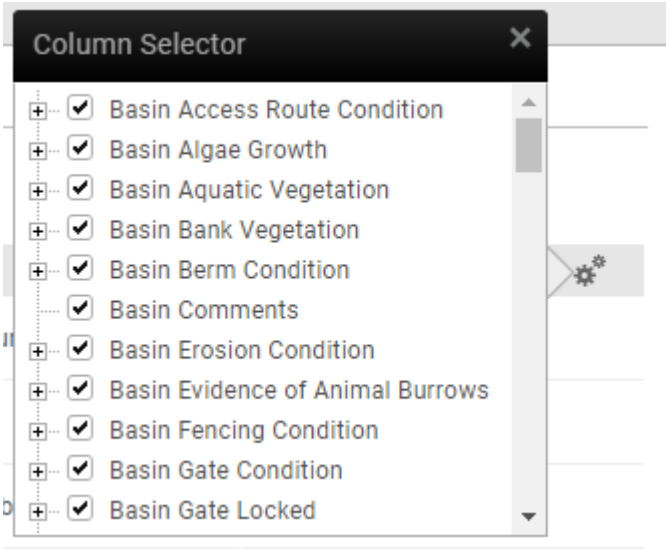
Once the asset information for the pond is open, scroll down to the “Inspections” heading. From here you can view any of the past completed inspections or make a report. To view the report, select the “View” button (Shown red below).



Step 5:

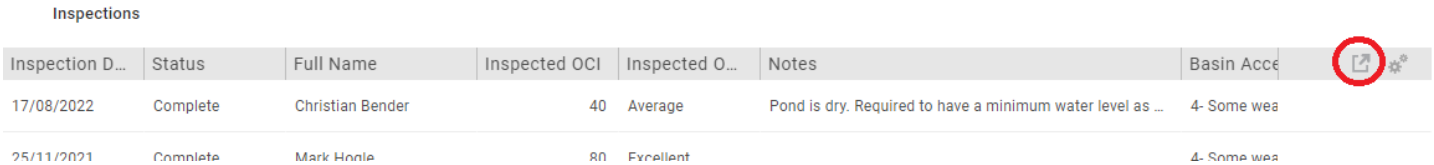
Select the “Column Selector” button (two gears) on the top right corner of the inspections box. Check off all the boxes shown in the menu (You do not need to select any of the sub-categories) and then click anywhere outside the box. Note this will change the look of the currently shown table and may take some time to load.

SWM POND INSPECTION REPORT INSTRUCTIONS



Step 6:

Select the “Export” button. This will save the report to your downloads folder in excel document titled “InspectionsExport.csv”



Step 7:

Open the newly created excel document. This will show all current and previous inspections completed on the selected SWM Pond. To highlight cells based on their rating refer to the “Creating Rules” section below.

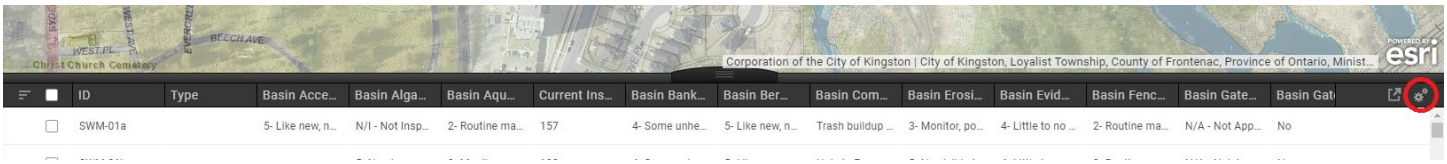
Creating a Report for All Current SWM Ponds Inspections

Step 1:

Repeat Steps 1 and 2 above.

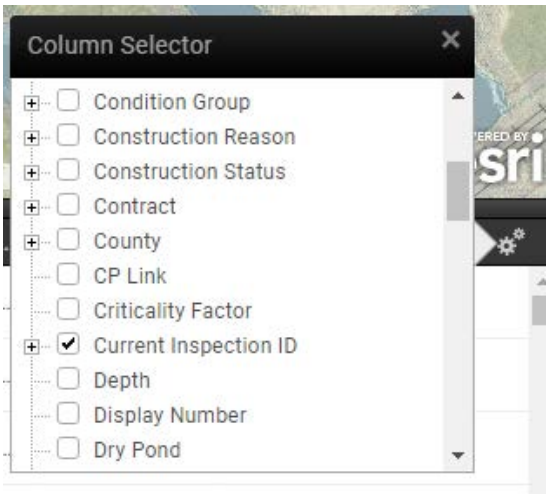
Step 3:

On the Asset page with only the “All Storm Basins” layer turned on, select the “Column Selector” button (two gears).



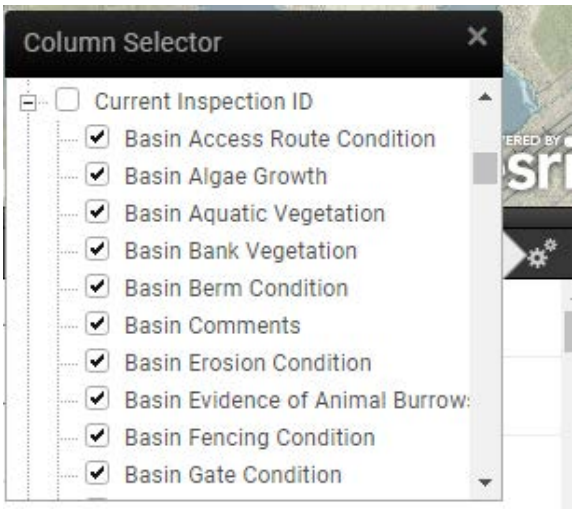
SWM POND INSPECTION REPORT INSTRUCTIONS

Scroll to the “Current Inspection ID” row, check the box, and expand the row by selecting the ⊞ button



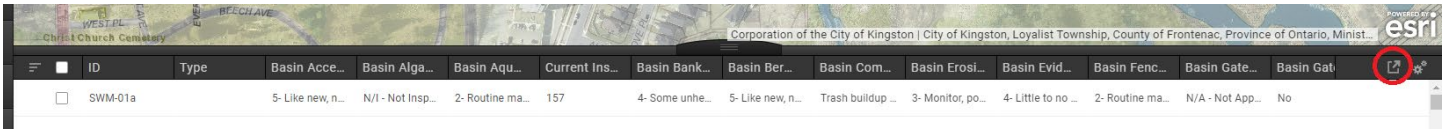
Step 4:

Check all boxes in the “Current Inspection ID” sub-category. Once this is done, click anywhere outside the menu. Note this will change the look of the currently shown table and may take some time to load.



Step 5:

Select the “Export” button. This will save the report to your downloads folder in an excel document titled “StormBasinsExport”



SWM POND INSPECTION REPORT INSTRUCTIONS

Step 6:

Open the newly created excel document. This will show the inspection results of all SWM Ponds completed this year. To highlight cells based on their rating refer to the “Creating Rules” section below.

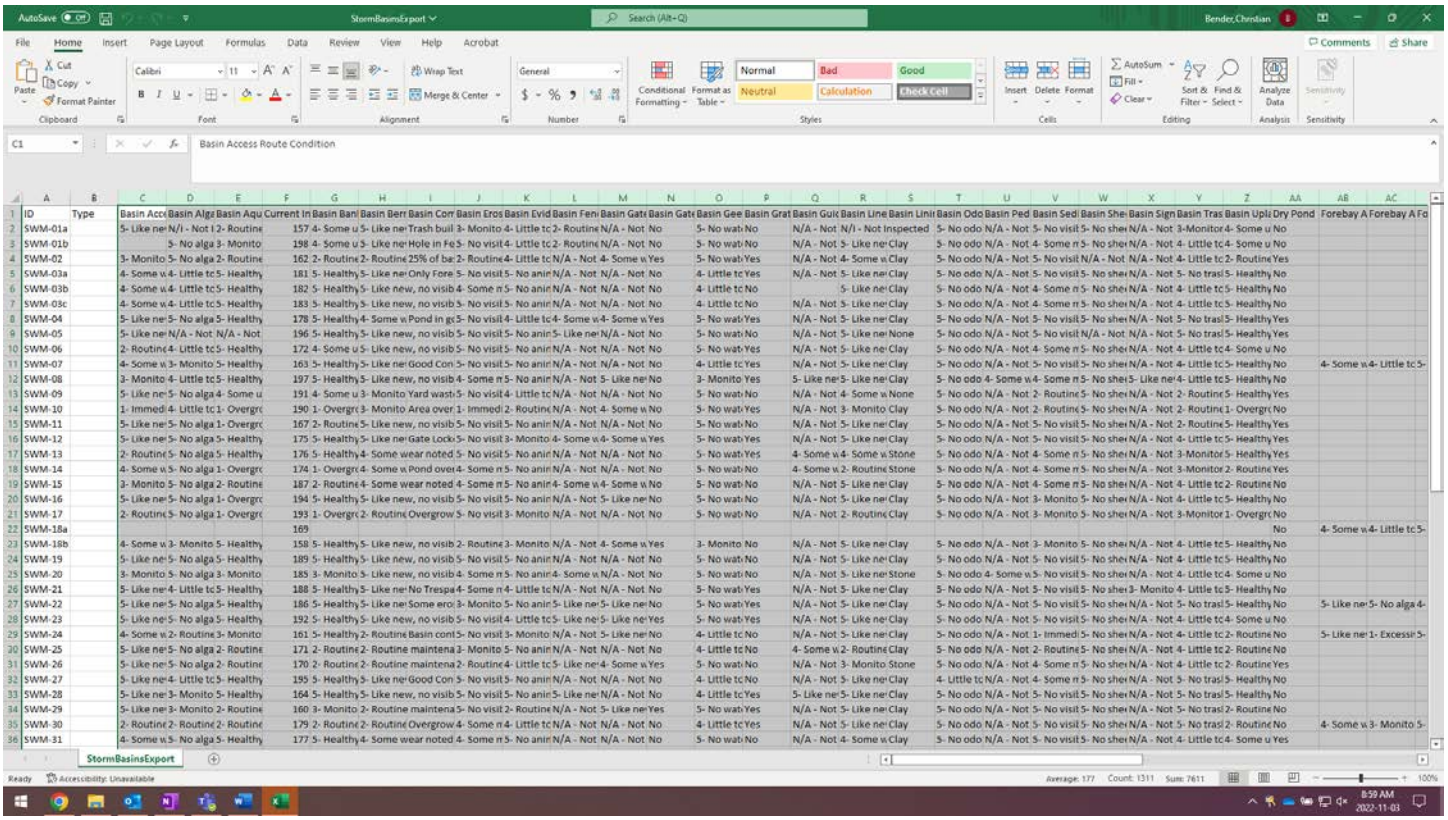
Creating Rules within Excel

Step 1:

Open the excel file containing SWM pond inspection data you wish to add rules to.

Step 2:

Highlight the cells you wish to change colour based on their rating.

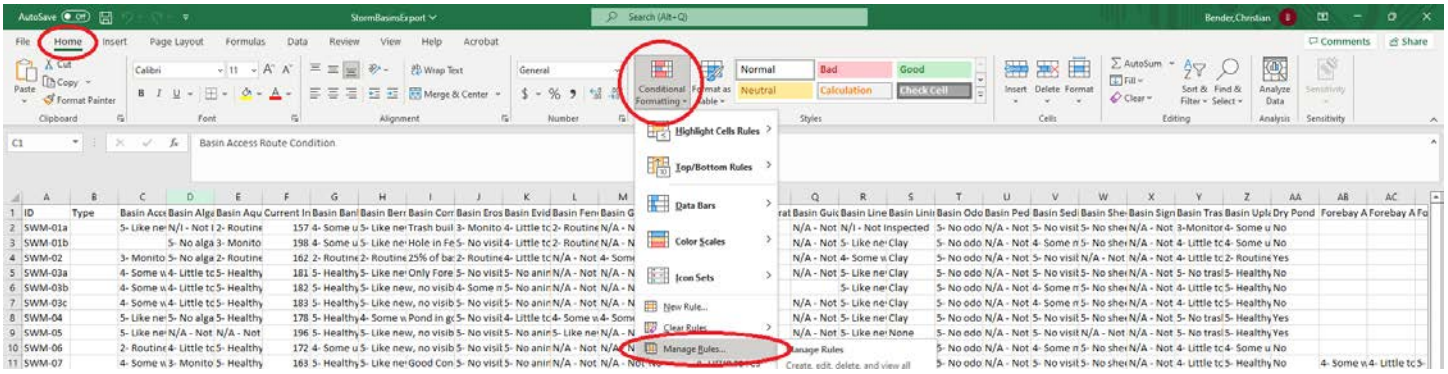


NOTE: For this document I have selected columns C to AY in the “StormBasinsExport” file. This selects all columns that have an inspection rating of 1-5. All cells can be selected in this step however this will change the colour of not applicable cells i.e. ID, Number of Inlets/Outlets.

Step 3:

From the Home ribbon, select “Conditional Formatting” and then “Manage Rules”.

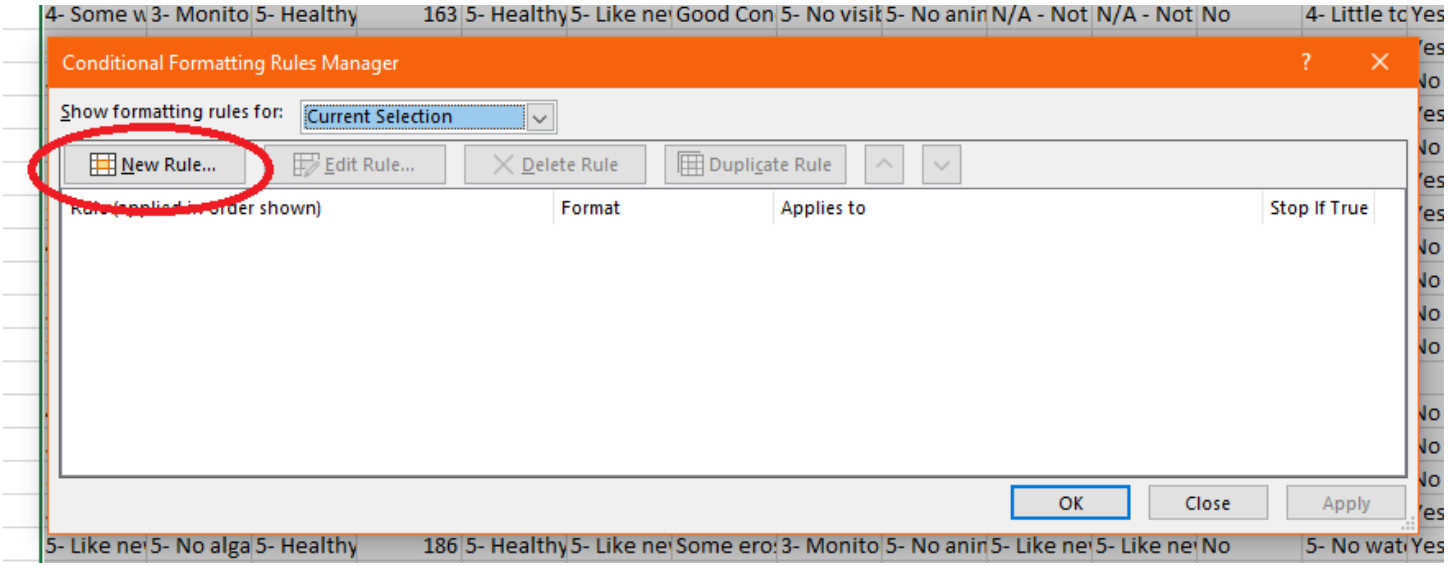
SWM POND INSPECTION REPORT INSTRUCTIONS



Step 4:

In the “Conditional Formatting Rules Manager” window, ensure the dropdown menu for Show formatting rules is showing Current Selection. Entire Workbook can be selected from the dropdown if Step 2 was skipped.

Click the “New Rule” button.

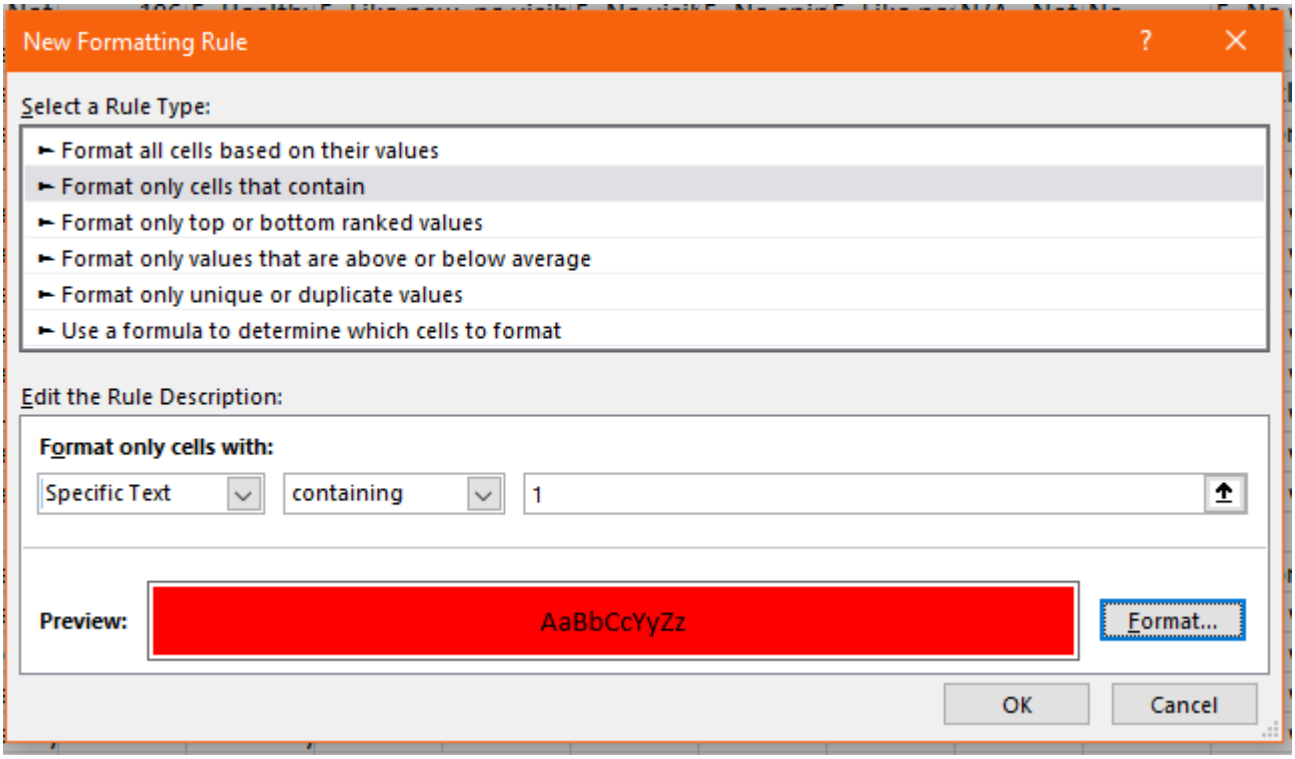


Step 5:

Select “Format only cells that contain” under Select a Rule Type, then select “Specific Text” from the dropdown and enter 1 in the textbox.

Select the Format button, go to the Fill tab and change the fill colour to red

SWM POND INSPECTION REPORT INSTRUCTIONS

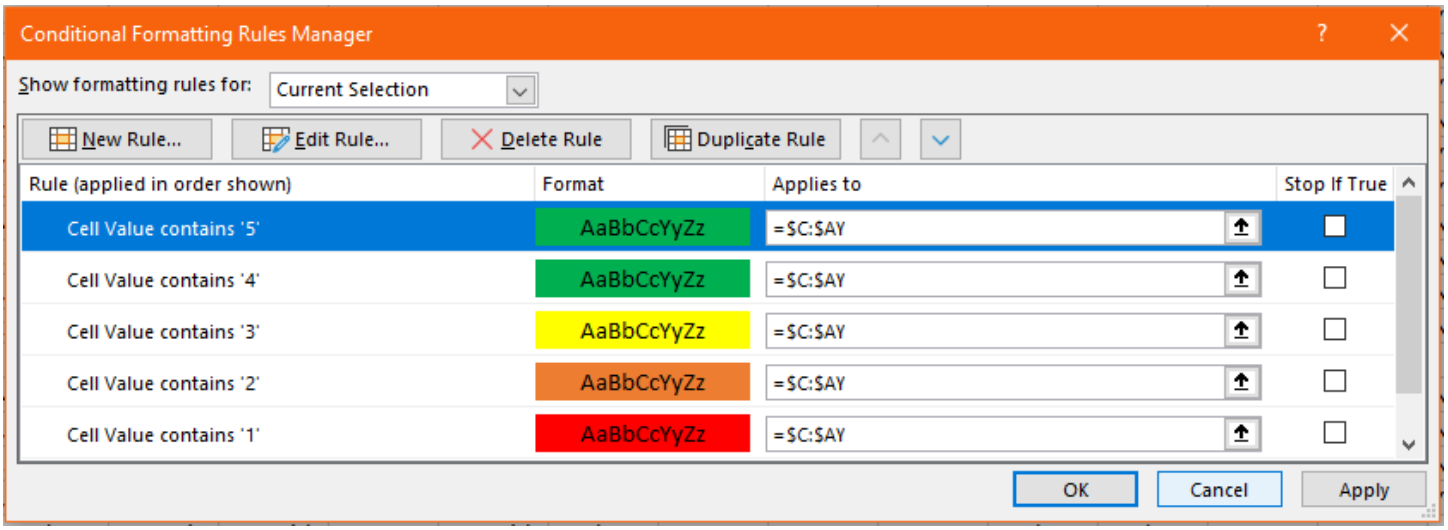


Step 6:

Repeat Step 5 with the following data until you have rules for numbers 1 to 5.

2 – Formatted to be Orange
3 – Formatted to be Yellow
4 – Formatted to be Green
5 – Formatted to be Green

When complete the Rules Manager should look like:



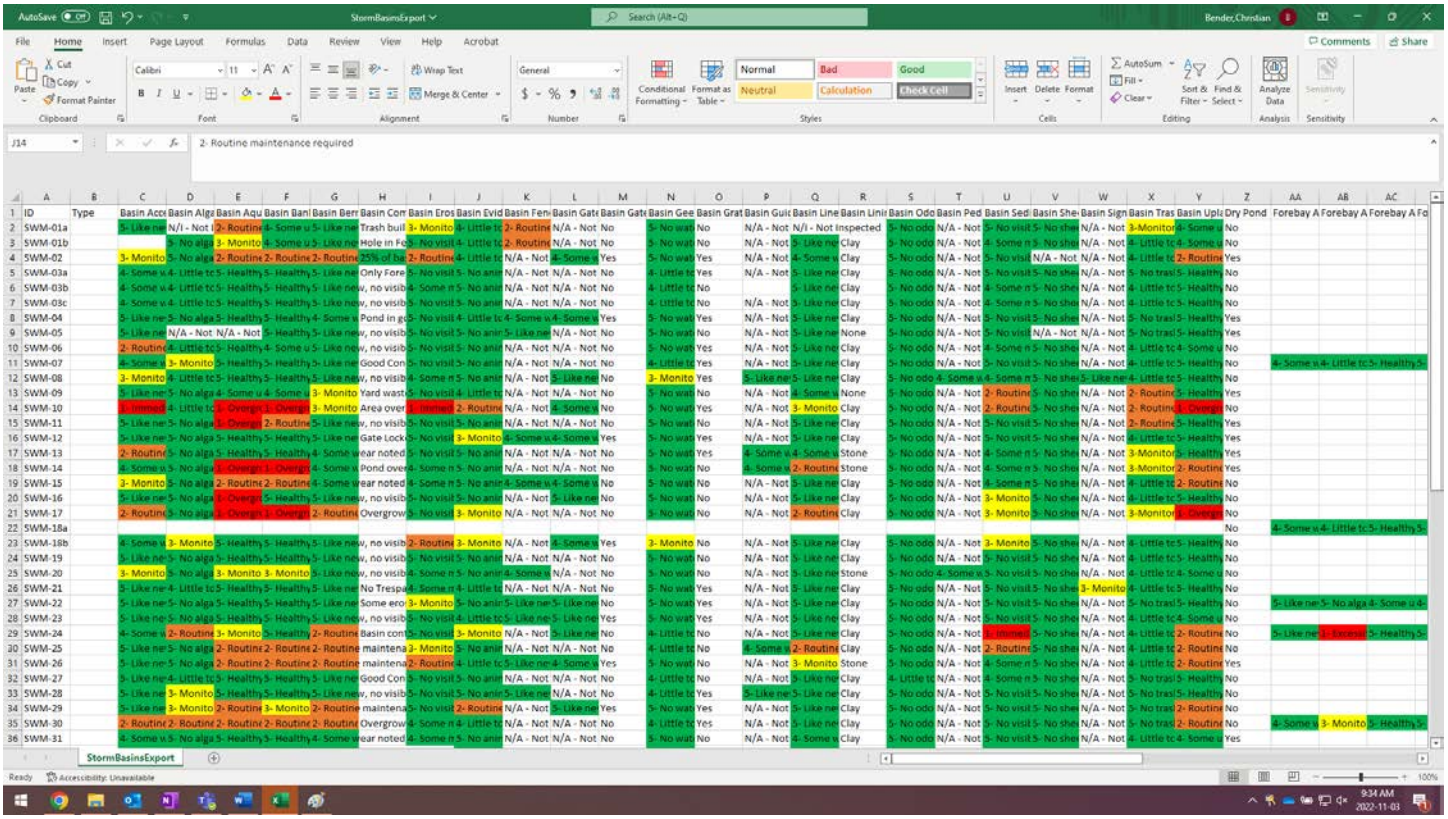
SWM POND INSPECTION REPORT INSTRUCTIONS

Select “Apply” then “OK”

Step 7:

Your worksheet should now highlight all cells based on their inspection rating.

Select “File” and then “Save As”. Change the name of the file to “SWM Pond Inspections – 20xx”, depending on the year, and change the file type to “Excel Workbook (*.xlsx)”. If the file type is not changed the rules will be deleted on closing the document and will need to be re-entered when opening the file again.



	STANDARD OPERATING PROCEDURE			
	Number:	**SWM461**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR SUPER PIPE SYSTEMS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned super pipe systems.

As the City does not currently have any super pipe systems included in the CLI-ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future facilities, prior to being put into service.

Scope

This procedure applies to any City staff that undertake super pipe system inspections.

Frequency

- Inspect super pipe systems every 6 months for the first year to determine the sediment accumulation rate as part of the operations program managed by Public Works.
- Inspect super pipe systems annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspections of super pipe systems immediately after an oil, fuel or chemical spill with the City's Environment Group.
- Super pipe systems shall be cleaned out once the sediment depth reaches 15% of the storage capacity, or at least once per year, whichever comes first as part of the operations program managed by Public Works.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**Super Pipe**" means oversized storm sewer pipes with orifice controls to create pipe storage.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Inspector must complete a visual inspection using the Cartegraph Super Pipe Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the super pipe. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to the runoff and underground infiltration system.
    - Inspect the super pipe for obstructions, damage, or erosion. Record all observations. Make note of any trash or debris accumulation.
    - Inspect the outlet for obstructions or damage.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
11. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for super pipe systems.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual, (MOE, March 2003)
- Gravity Pipe Design Guidelines (MTO, 2014)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Guidelines for Stormwater Management (CRCA, 2021)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (MECP, May 31, 2023)
- Corporate Spills Management Plan (2024)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM462**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR VAULTS AND UNDERGROUND CHAMBERS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned stormwater management vaults and underground chambers.

Scope

This procedure applies to any City staff that undertake stormwater vault or underground chamber inspections.

Frequency

- Inspect vaults or chambers every 6 months for the first year to determine the sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect vaults or chambers annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Coordinate inspection of vaults or chambers immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph

- Tape Measure
- Shovel
- Pickaxe

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
5. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
6. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
7. Inspector must complete a visual inspection using the Cartegraph Vaults and Chambers Inspection form recording the following information as a minimum:
    - Inspect the area that drains to the vault or chamber. Note any potentially contaminating activities (e.g., leaking chemical containers, spills, etc.) that may act as a source of pollution to the runoff and the facility.
    - Inspect the vault or chamber for obstructions, damage and erosion. Record any observations. Make note of any trash or debris accumulation.
    - Inspect the vaults or chambers for sediment accumulation. Measure and record the depth of sediment if present.
    - Inspect monitoring well, if applicable to the vault or chamber design. Check that well caps are present, secure and free from damage.
    - Inspect monitoring well standpipe for damage or cracks and record any damage if observed. Measure and record the water level. Measure the level of sediment in the standpipe, if present.

- Inspect the sub-drain, if applicable to the vault or chamber. Measure and record any sediment accumulation. If a flow restrictor is present within the sub-drain, inspect it for damage and sediment accumulation.
- Inspect the outlet of the vault or chamber for obstructions or damage.

8. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
9. Inspector shall coordinate removal of all accumulated sediment in vault or chamber.
10. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
11. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for vaults and chambers.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019)
- Guidelines for Stormwater Management (CRCA, 2021)

- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM470**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR FILTRATION MANUFACTURED TREATMENT DEVICES**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned filtration manufacture treatment devices (MTDs).

As the City does not currently have any filtration MTDs included in the authorized system, the procedures identified below are typical requirements for jellyfish filter units, which are a common type of filtration MTD. These procedures should be updated based on recommendations of the design engineer for any future filtration MTDs, prior to being put into service.

Scope

This procedure applies to any City staff that undertake filtration MTD inspections.

Frequency

- Inspect filtration MTD units every 6 months for the first year to determine the oil and/or sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect filtration MTD units annually after the first year and continue to monitor oil and sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect filtration MTD units after each major storm event (>25 mm) as part of the operations program managed by Public Works.
- Coordinate inspection of filtration MTD units immediately after an oil, fuel or chemical spill with the City's Environment Group.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**MTD**" means Manufactured Treatment Device.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera
- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe or other tool to open maintenance hole covers

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Manufacturer recommendations for the inspection and maintenance of the Jellyfish filter units are attached. Inspection procedures are summarized below.
    - Review pertinent sections of the Departmental Health & Safety Manual.
    - Set up traffic controls as required.

- Inspect the maintenance hole cover or inlet grates for damage. Damage to the surrounding area that may impair the filtration MTD unit should also be noted (e.g., broken or heaving asphalt).
- Inspect the filter device for floating trash, debris, oil sheen, etc.
- Measure oil and sediment depth in several locations to determine the volume of accumulation.
- Measure and record the presence of any free product (e.g., oil) in several locations to determine the volume of accumulation.
- Inspect the filter device for physical damage or broken components.
- During a dry weather inspection, inspect for standing water or sediment on the filter device deck.
- During a wet weather inspection, observe the flow (rate and direction) of the water.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in filtration MTD units.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for filtration MTD units.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)

- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Design Guidelines for Sewage Works (MOE, 2008)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Stormwater Monitoring Plan – IN PROGESS
- MTD unit manufacturing documentation (e.g. owner's manual, maintenance and inspection manual, etc.)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM480**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **4**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR SEDIMENTATION MANUFACTURED TREATMENT DEVICES**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned sedimentation manufactured treatment devices (MTDs). Sedimentation MTDs are also commonly referred to as oil and grit separator (OGS) units.

Scope

This procedure applies to any City staff that undertake OGS unit inspections.

Frequency

- Inspect OGS units every 6 months for the first year to determine the oil and/or sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect OGS units annually after the first year and continue to monitor sediment accumulation rates as part of the operations program managed by Public Works.
- Inspect OGS units after each major storm event (>25 mm) as part of the operations program managed by Public Works.
- Coordinate inspection of OGS units immediately after an oil, fuel or chemical spill with the City's Environment Group.
- OGS units shall be cleaned out once the sediment depth reaches 15% of the storage capacity, or at least once per year, whichever comes first as part of the operations program managed by Public Works.

Department Owner

Engineering Services

Definitions

"**SOP**" means Standard Operating Procedure.

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**OGS**" means Oil and Grit Separator.

"**MTD**" means Manufactured Treatment Device.

"**PPE**" means Personal Protective Equipment.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Tape Measure
- Shovel
- Pickaxe or other tool to open maintenance hole covers

Procedure

1. Inspector shall confirm that all pertinent background data is available in Cartegraph including previous inspection forms, maintenance history and as-built drawings.
2. Inspector shall review pertinent sections of the Departmental Health & Safety Manual.
3. Inspector shall prepare an appropriate Traffic Management Plan.
4. Inspector shall gather all required equipment and ensure it is in good and working order.
5. Inspector shall confirm that the CartegraphOne App is installed on the Phone or Tablet.
    - CartegraphOne download link is https://apps.cityofkingston.ca/OMS
    - Request login credentials from Asset Management Coordinator in Engineering Services if not set up.
6. Inspector shall notify their direct Supervisor/Manager of their proposed inspection work plans each day before leaving the office.
7. Inspector shall wear PPE and follow the Traffic Management Plan at all times.
8. Manufacturer recommendations for the inspection and maintenance of OGS units are attached. Inspection procedures are summarized below:
    - Review pertinent sections of the Departmental Health & Safety Manual.
    - Set up traffic control as required.

- Inspect the maintenance hole cover or inlet grates for damage. Damage to the surrounding area that may impair the OGS unit should also be noted (e.g., broken or heaving asphalt).
- Measure and record the sediment depth in several locations to determine the volume of accumulation.
- Measure and record the presence of any free product (e.g., oil) in several locations to determine the volume of accumulation.
- Inspect the OGS unit for large debris.
- Inspect the OGS unit and weir for damage or broken components.
- During a dry weather inspection, inspect for standing water or sediment.
- During a wet weather inspection, observe the flow (rate and direction) of the water.

9. Inspector shall take photos of all inspected items and upload them to the Cartegraph inspection form.
10. Inspector shall coordinate removal of all accumulated sediment in OGS units.
11. Inspector shall report any significant maintenance items to their direct Supervisor/Manager.
12. Once the inspection is complete and the form is saved, the Inspector shall click the three dots on the side in the CartegraphOne application and select “Complete Task”.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for OGS units.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- Stormwater Management Planning and Design Manual (MOE, March 2003)

- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Design Guidelines for Sewage Works (MOE, 2008)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC/TRCA, 2010)
- Stormwater Management Criteria Document (TRCA, 2012)
- Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (CVC, 2015)
- Low Impact Development Inspection and Maintenance Guide (TRCA, 2016)
- Guidelines for Stormwater Management (CRCA, 2021)
- Draft Low Impact Development Stormwater Management Guidance Manual (MECP, January 2022)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Corporate Spills Management Plan (2024)
- MTD Unit Manufacturer Documentation (e.g. owner's manual, maintenance and inspection manual, etc.)

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

	STANDARD OPERATING PROCEDURE			
	Number:	**SWM490**	Revision:	**0**
	Effective Date:	**May 1, 2024**	Pages:	Page **1** of **3**
	Section:	**ENGINEERING**	Title:	**INSPECTION PROCEDURES FOR STORMWATER PUMPING STATIONS**

Purpose

This Standard Operating Procedure (SOP) outlines the procedures for inspection of City-owned stormwater pumping stations.

As the City does not currently have any stormwater pumping stations included in the CLI ECA authorized system, the procedures identified below are standard requirements. These procedures should be updated based on recommendations of the design engineer for any future stormwater pumping stations, prior to being put into service.

Scope

This procedure applies to any City staff that undertake stormwater pumping station inspections.

Frequency

The frequency of inspection shall be determined by the design engineer.

Department Owner

Engineering Services

Definitions

"**CLI ECA**" means Environmental Compliance Approval Number 018-S701, issued under the MECP Consolidated Linear Infrastructure program.

"**PPE**" means Personal Protective Equipment.

"**SOP**" means Standard Operating Procedure.

Equipment

- Personal Protective Equipment (safety vest, hard hat, work boots)
- Camera/Phone
- Phone or Tablet with access to Cartegraph
- Additional equipment as determined by the design engineer.

Procedure

1. For general inspection procedures reference the Utilities Kingston Operation and Maintenance Manual for sanitary pumping stations.

Reporting or Auditing Requirements

- Inspection forms shall be entered into Cartegraph by City staff for pumping stations.

Known Issues

- Uploading photos to Cartegraph Inspection Record in low service areas results in the photos not fully uploading. This can be solved by uploading photos via Wi-Fi instead.
- Once an inspection record and the task are submitted as “Complete”, no further changes can be made to the record. All fields should be fully completed, and photos uploaded prior to completing the record.

References

- City of Kingston Sewer Use By-Law No. 2008-192 (November 2008)
- Design Guidelines for Sewage Works (MOE, 2008)
- Environmental Compliance Approval for a Municipal Stormwater Management System ECA NO. 018-S701 – City of Kingston (MECP, August 2022)
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (MECP, May 31, 2023)
- Stormwater Monitoring Plan – IN PROGESS

Revision Schedule

This procedure shall be reviewed every 3 years or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision Details	Section Heading

Approved By

Adam M. Hardy, P.Eng., Supervising Engineer, Engineering Services

Appendix B

Spill Management Standard Operation Procedures

	STANDARD OPERATING PROCEDURE			
	Number:	**ENV001**	Revision:	**FINAL – R4**
	Effective Date:	**October 1, 2017**	Pages:	Page **1** of **3**
	Section:	**ENVIRONMENT**	Title:	**INITIAL SPILL RESPONSE CHECKLIST FOR THE FIRST RESPONDER**

Purpose

This Standard Operating Procedure (SOP) outlines the duties and responsibilities of the first responder when a spill occurs.

Scope

This procedure applies to all City staff who may be the first at the site of a spill incident or the first City staff point of contact from an outside agency or member of the public reporting a spill.

Department Owner

Environment Division

Definitions

"Contaminant" means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that causes or may cause an adverse effect (as amended under the Environmental Protection Act, R.S.O. 1990);

"**First Responder**" means any City of Kingston staff that witnesses a spill and/or coordinates the response, containment and/or cleanup of a spill, prior to the arrival of the On-Scene Coordinator.

"**Natural Environment**" means the air, land and water, or any combination or part thereof, of the Province of Ontario (as amended under the Environmental Protection Act, R.S.O. 1990);

"**On-Scene Coordinator**" refers to a member of the Environment Division (or designate), responding to the spill.

"**Spill**" means a direct or indirect discharge or deposit to the sewage works, storm sewer, or natural environment which is abnormal in quantity or quality in light of all the circumstances of the discharge or deposit (as amended under BY-LAW NO. 2008-192);

"**Spills Action Centre (SAC)"** A 24 hour contact centre operated by the Ministry of Environment, Conservation and Parks for reporting spills, information collected is provided to Ministry of the Environment officers for follow up.

Procedure

- Alert nearby persons of any hazard and clear the area.
- Remove all potential sources of ignition and take all reasonable steps to make the area safe.
- Check for potential injuries and attend to any injured persons by arranging for First Aid and/or by calling 9-1-1.

- For a spill to the Natural Environment contact a staff member from the Environment Division below. Use the following call list in chronological order; continue down the list until a staff member is contacted:

  1. **Sarah McCallum** – Environmental Technologist
     Office: 613-546-4291 ext. 1398
     Cell: 613-929-0429

  2. **Jordan Wright** – Environmental Technologist
     Office: 613-546-4291 ext. 1263
     Cell: 613-929-3295

  3. **Devin Matheson** – Environmental Technologist
     Office: 613-546-4291 ext. 1249
     Cell: 613—331-0658

  4. **Brodie Richmond** – Manager, Environment Operations & Programs
     Office: 613-546-4291 ext. 1368
     Cell: 613-532-2452;
     Home: 613-358-2909

  5. **Paul MacLatchy** – Environment Director
     Office: 613-546-4291 ext. 1226
     Cell: 613-532-6720;
     Home: 613-547-9748

- Only after attempting to reach all of the above, contact the Spills Action Centre (SAC) at 1-800-268-6060. When contacting SAC the officer will require the following information, if you are unsure DO NOT guess:

  - your name and phone number
  - name of the company or individual responsible for the spill
  - time and location of the spill
  - type and quantity of material spilled
  - status of the spill, including actions being taken to control the spill

Where the Contaminant is not known or you do not have the chemical specific WHMIS training, confirm the area is evacuated and wait in a safe area for the On-Scene Coordinator – Do Not Proceed.

Where it is safe to do so,

- Eliminate the source of the Spill (turn off a valve, right an overturned container).
- Isolate the Contaminant and prevent/minimize the escape of the Contaminant to the Natural Environment using available materials, equipment and training where applicable – PPE must be used:
    - Block drains including storm and sanitary sewer drains
    - Build berms or containment areas using available materials and equipment
    - Prevent migration of the Contaminant to sensitive areas such as watercourses and sewers.
- A list of the location of spill kits and their contents is provided in Appendix E of the Corporate Spills Plan.

References

- Corporate spill management plan, City of Kingston
- Environmental Protection Act, R.S.O. 1990
- City of Kingston BY-LAW 2008-192

Revision Schedule:

This procedure shall be reviewed every 3 year(s) or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision details	Section Heading
08/19/20	Updated call list	Procedure
05/03/22	Updated call list	Procedure
02/08/23	Updated department name to Environment Division	Definitions
04/20/23	Reorganized call list	Procedure

Approved By:

Brodie Richmond, P.Geo. (Ltd.), C.E.T.
Manager, Environment Operations and Programs

Purpose

This Standard Operating Procedure (SOP) outlines the duties and responsibilities of the On-Scene Coordinator during a spill response.

Scope

This procedure applies to all Environment Division staff (or delegates) who take on the role of On-Scene Coordinator at a spill incident site.

Department Owner

Environment Division

Definitions

"Contaminant" means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that causes or may cause an adverse effect (as amended under the Environmental Protection Act, R.S.O. 1990);

"**First Responder**" means any City of Kingston staff that witnesses a spill and/or coordinates the response, containment and/or cleanup of a spill, prior to the arrival of the On-Scene Coordinator.

"**Natural Environment**" means the air, land and water, or any combination or part thereof, of the Province of Ontario (as amended under the Environmental Protection Act, R.S.O. 1990);

"**On-Scene Coordinator**" refers to a member of the Environment Division (or designate), responding to the spill.

"**Spill**" means a direct or indirect discharge or deposit to the sewage works, storm sewer, or natural environment which is abnormal in quantity or quality in light of all the circumstances of the discharge or deposit (as amended under BY-LAW NO. 2008-192);

"**Spills Action Centre (SAC)"** A 24-hour contact center operated by the Ministry of Environment, Conservation and Parks for reporting spills, information collected is provided to Ministry of the Environment officers for follow up.

Responsibilities

The On-Scene Coordinator is the person in charge of the Spill scene during evaluation and/or clean-up activities following the initial response. Unless otherwise notified by Provincial/Federal

regulatory officials or Emergency Response Units dispatched by Police or Fire, the Environment Division, or delegate shall be the On-Scene Coordinator.

Procedure

1. Locate the First Responder and receive their verbal report of the incident and all steps taken to secure the scene and respond to the Spill.
2. Confirm:
   - All non-essential personnel are cleared from the scene;
   - Injuries have/are being attended to;
   - All potential ignition sources and other safety hazards have been removed.
3. Confirm the nature of the material spilled (class, quality, quantity etc.) and assess whether it is safe to proceed with Spill containment.
4. Determine whether the Contaminant has been released to the Natural Environment. If there has been a release to the Natural Environment, contact the Spills Action Centre (1-800-268-6060). * Refer to section 4 of the Corporate Spills Management Plan for reporting procedures.

WHERE THE CONTAMINANT IS NOT KNOWN OR THERE IS A HEALTH AND SAFETY RISK, CONFIRM THE AREA IS EVACUATED AND CALL EMERGENCY PERSONNEL – DO NOT PROCEED

The Environment Division representative is responsible for assessing the capacity of on-site resources to respond to the Spill. When in doubt, additional resources should be called in to assist. Where the Spill may result in a danger to the health or safety of any person, call 911 for assistance. For access to heavy equipment, the Public Works division can be contacted for assistance. If the Spill is beyond the capability of the resources available to respond in a timely manner, contact a spills service provider. A list of Spill service providers is available in Appendix C of the Corporate Spills Management Plan. The location of Spill kits at various city facilities is provided in Appendix E of the Corporate Spills Management Plan.

WHERE A SPILL CONTRACTOR IS CALLED TO THE SCENE, THE SPILL CONTRACTOR MAY LEAD THE SPILL RESPONSE AT THE DIRECTION OF THE ENVIRONMENT DIVISION REPRESENTATIVE.

WHERE A SPILL CONTRACTOR IS NOT NEEDED, AND ONLY WHERE IT IS SAFE TO PROCEED, the Environment Division representative shall:

5. Eliminate the source of the spill.
6. Isolate the contaminant and prevent the escape of the contaminant to the natural environment – appropriate personal protective equipment (PPE) must be utilized.
7. Secure the site.
8. If applicable, and familiar with MSDS associated with the spilled contaminant, neutralize/clean up the spilled material.
9. Coordinate clean-up activities by qualified and licensed personnel and contractors.
10. Coordinate and confirm that waste materials are collected and transported off-site for proper disposal at a facility licensed to accept the wastes in accordance with all applicable legislation.
11. Coordinate the re-instatement of any lands affected.
12. Document all activities on a City of Kingston spill report form.

When dealing with Provincial or Federal Inspectors and Investigators, refer to the City's policy on Regulatory Inspection and Investigation in Appendix F of the Corporate Spills Management Plan and located on KingNet ErMS on the procedures page.

- Collect any required verification, classification, or leachate samples and submit to an accredited lab for analyses.
- Prepare required verification reports as directed by Provincial or Federal regulators.
- Follow up with Provincial and/or Federal regulators as necessary; and, close the spill file when complete.
- Refer to cost recovery policy in Appendix G of the corporate spills management plan.

References

- Corporate spills management plan, City of Kingston
- Environmental Protection Act, R.S.O. 1990
- City of Kingston BY-LAW 2008-192
- Procedure ENV001 – first responder
- Inspection and Investigation policy, City of Kingston
- Cost recovery policy, City of Kingston

Revision Schedule:

This procedure shall be reviewed every 3 year(s) or earlier if required. Records of revision will be kept in the table below.

Date (MM/DD/YY)	Revision details	Section Heading
08/19/20	Reviewed	
02/08/23	Updated department name to Environment Division	Definitions, Scope

Approved By:

Brodie Richmond, P.Geo. (Ltd.), C.E.T.
Manager, Environment Operations and Programs

Appendix C

Standard Subdivision Agreement Clauses Outlining Developer Responsibilities for Operation, Inspection and Maintenance of Stormwater Infrastructure

Subdivision Agreement Clauses
CLI ECA for Municipal SWM System
ECA Number 018-S701

The following terms are defined for the purposes of this Schedule "I":

"CLI ECA Stormwater Permit" means a project-specific environmental compliance approval agreement between the *Municipality* and the *Owner*, awarded by the *Municipality* through the approval authority granted by the *Ministry* for low-risk *Stormwater Works*.

"Extreme Weather Event" means unexpected, unusual, severe, or unseasonal weather occurrence that goes beyond normal weather patterns and which poses risks to life or property.

"Ministry" means the ministry of the government of Ontario responsible for the *Environmental Protection Act, R.S.O. 1990, c.E.19*, as amended, and *Ontario Water Resources Act, R.S.O. 1990, c. O.40*, as amended, and includes all officials, employees or other persons acting on its behalf.

"Natural Environment" means the air, land and water, or any combination or part thereof, of the City of Kingston.

"Significant Flooding Event" means a wet weather event which results in an overflow of water onto normally dry land.

"Significant Snowmelt Event" means melting of snow at a rate which adversely affects the performance and function of the *Stormwater Management Facility*.

"Significant Storm Event" means a minimum of 25 millimetres of rain in any 24-hour period.

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

"Stormwater Management Facility" means a facility for the treatment, retention, infiltration, or control of *Stormwater*.

"Stormwater Works" means any works for the collection, transmission, treatment and disposal of stormwater or any part of such works.

"Wet Weather Event" means a minimum of 15 mm of rain in the previous 24 hours.

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General

Erosion & Sedimentation Control Measures

The *Owner* shall ensure that temporary erosion and sedimentation control (ESC) measures are installed in advance of, and maintained during, any construction activity. All ESC measures shall be in accordance with the ESC Plan as provided in the Stormwater Management Report/Brief, prepared by the *Owner's Engineer* to the satisfaction of the *Municipal Engineer*.

Inspections of ESC measures are to be conducted at the frequency specified per the ESC plan, and at a minimum:

a) once every two (2) weeks for dry weather periods (active and inactive construction phases);
b) after each *Significant Storm Event*;
c) after each *Significant Snowmelt Event*; and
d) after any *Extreme Weather Event*.

The *Owner* shall address any deficiencies and shall undertake any required maintenance action(s) as soon as practicable once they have been identified. If a deficiency cannot be rectified within 48 hours, the *Owner* shall notify the *Municipal Engineer* as soon as practicable, summarizing the situation, including the reason for the delay in rectification, proposed plan to rectify the deficiency, and expected timeframe for completion.

Temporary ESC measures shall remain in place until they are no longer required (i.e., the site has been stabilized) at which point they should be removed along with any accumulated sediment.

The *Owner* shall maintain records of all inspections and maintenance of temporary ESC measures undertaken and shall provide records with each Annual Performance Report. The records shall include the following at a minimum:

a) the name of each *Stormwater Management Facility*;
b) the name of the person who conducted the inspection and maintenance, or the name of the inspecting official, where applicable; and
c) the date and results of each inspection and maintenance including visual observations, an estimate of the quantity of any materials removed, and any other remedial actions undertaken to maintain the temporary ESC measures.

Operations & Maintenance Manual

The *Owner* shall prepare an Operations & Maintenance Manual to the satisfaction of the *Municipality* prior to the commencement of operation of the *Stormwater Management Facility* that includes, but is not necessarily limited to, the following information:

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a) Operating and maintenance procedures for the routine operation of the *Stormwater Management Facility*;
b) Inspection programs, including the frequency of inspection, for the *Stormwater Management Facility* and the methods or tests employed to detect when maintenance is necessary;
c) Repair and maintenance programs, including the frequency of repair and maintenance for the *Stormwater Management Facility*;
d) Contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the *Municipality*; and
e) Procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

The Owner shall keep the Operations & Maintenance Manual for each *Stormwater Management Facility* current and provide a digital copy of the final manual to Municipality staff as supporting documentation in the application for the *Preliminary Certificate of Approval of the Works* (PCAW).

Annual Performance Report

The *Owner* shall prepare and submit an Annual Performance Report to the *Municipality* each year by March 31st following the end of the period being reported upon. The first such report shall cover the commencement of operation of the *Stormwater Management Facility* to December 31st of that year and subsequent reports shall be submitted to cover annual periods following thereafter (January 1st to December 31st). The reports shall contain, but shall not be limited to, the following information:

a) A description of any operating problems encountered and corrective actions taken;
b) A description of all inspection, maintenance, and corrective actions carried out on temporary ESC measures;
c) A summary of all inspection, maintenance, testing and corrective actions carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Stormwater Management Facility*, including an estimate of the quantity of any materials removed from the *Stormwater Management Facility;*
d) Inspection & Maintenance Program records;
e) Monitoring Program records;
f) Measurement of the volume of accumulated sediment removed when undertaking maintenance of the *Stormwater Management Facility*;
g) A summary of any complaints received during the reporting period and any steps taken to address the complaints;
h) A summary of all spill or abnormal discharge events;
i) Current versions of all manuals, plans, records, data, procedures and supporting documentation; and
j) Any other information the *Municipality* requires from time to time.

Emergency Reporting

As it relates to each approved *Stormwater Management Facility*, the *Owner* shall ensure that, upon the occurrence of any spill, bypass or loss of any product, by product, intermediate product, oils, solvents, waste material or any other polluting substance into the environment, such occurrence be immediately reported to the *Municipality*, and the Spills Action Centre for the Ministry (Telephone 1-800-268-6060).

Further, the *Owner* shall, within ten (10) working days of the occurrence, submit a full written report of the occurrence to the *Municipality* describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and the schedule of implementation.

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Stormwater Management Ponds

Inspection & Maintenance Program

The *Owner* shall inspect the *Stormwater Management Facility* at least once a year and after any *Significant Flooding Event* and, if necessary, clean and maintain the *Stormwater Management Facility* to ensure that sediment, debris, and excessive decaying vegetation are removed from the *Stormwater Management Facility* to prevent the excessive build-up and to avoid the reduction of the capacity and/or permeability of the *Stormwater Management Facility*, as applicable. During the first two (2) years of operation the *Stormwater Management Facility* shall be inspected by the *Owner* after each *Significant Storm Event*. The *Owner* shall regularly inspect and clean out the inlet to and outlet from the *Stormwater Management Facility* to ensure that these are not obstructed. In addition, the *Owner* shall ensure that the design minimum liquid retention volume in the pond is maintained at all times and operate the *Stormwater Management Facility* with the objective *Stormwater Management Facility* 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.

The *Owner* shall maintain records of the results of all inspections, cleaning and maintenance operations undertaken, and shall make available the records for inspection by the *Municipality* upon request.

The records shall include the following:

a) The name of the *Stormwater Management Facility*;
b) The date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the *Stormwater Management Facility*;
c) The name of the person who conducted the inspection, maintenance and cleaning, or the name of the inspecting official, where applicable;
d) Observations resulting from the inspection including, at a minimum:
    i. condition of vegetation in and around the *Stormwater Management Facility*;
    ii. occurrence of obstructions at the inlet and outlet of the *Stormwater Management Facility*;
    iii. evidence of spills or oil/grease contamination, and the date of each spill within the site, including follow-up actions / remedial measures undertaken; and presence of trash build-up.
e) Hydraulic operation of the *Stormwater Management Facility* (e.g., length of occurrence since the last rainfall event, evidence or occurrence of overflows);
f) A summary of any operating problems encountered and corrective actions taken;
g) A summary of any complaints related to the *Stormwater Management Facility* received during the reporting period and any steps taken to address the

complaints;

h) A summary of actions taken, including timelines, to improve or correct performance of any aspect of the *Stormwater Management Facility*; and
i) A summary of the status of actions for the previous reporting year.

The *Owner's Engineer* must submit inspection and maintenance records to the *Municipality* each year as part of the Annual Performance Report.

Monitoring Program

The *Owner* shall carry out a monitoring program and evaluate the performance of the *Stormwater Management Facility* commencing at the initial completion of construction of the facility and continuing until the *Preliminary Certificate of Approval of the Works* has been issued, or when agreed upon by the *Owner* and the *Municipal Engineer* during the PCAW process.

The monitoring program must include obtaining grab samples at the outfall from the pipe discharging from the *Stormwater Management Facility* for at least three (3) *Wet Weather Events* per year. Two (2) of the events must occur within the May to September period. Samples must be tested for Total Suspended Solids (mg/L), Phosphorus (ppm), and Temperature (^{o}C) and the results recorded. The *Owner* shall maintain records of the results of all monitoring operations undertaken and shall make available the records for inspection by the *Municipality* upon request.

The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

a) the *Ministry's* Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Stormwater Management Facility (Liquid Waste Streams Only)”, as amended from time to time by more recently published editions;
b) the *Ministry's* publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater” (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;
c) CCME publication “Protocols Manual for Water Quality Sampling in Canada” (2011), ISBN 978-1-896997-7-0, as amended from time to time by more recently published editions; and
d) the publication “Standard Methods for the Examination of Water and Wastewater” (21st edition), as amended from time to time by more recently published editions.

The records shall include the following:

a) the name of the *Stormwater Management Facility*;
b) the name of the person who conducted the monitoring, or the name of the

inspecting official, where applicable;

c) the date and results of each sample taken under the monitoring program (described above);
d) a summary of all monitoring data along with an interpretation of the data and an overview of the condition and operational performance of the infrastructure and any Adverse Effects on the Natural Environment (Adverse Effect as defined in the *Environmental Protection Act, R.S.O. 1990, c. E.19*);
e) a summary and interpretation of environmental trends based on all monitoring information and data for the previous years; and
f) a summary of the calibration and maintenance carried out on all monitoring equipment.

The *Owner's Engineer* must submit monitoring records to the *Municipality* each year as part of the Annual Performance Report.

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As-Built Information

Prior to the *Municipality* issuing the *Preliminary Certificate of Approval of the Works* for the *Stormwater Management Facility*, the *Owner* must complete a bathymetric survey (using GPS/Sonar, surveying and manual checks) that demonstrates the *Stormwater Management Facility* beneath the permanent pool elevation has been constructed in conformance with the approved design to the satisfaction of the *Municipality* and provide a letter stamped by the *Owner's Engineer* certifying that the accumulation of sediment is acceptable (i.e., within the tolerance of expected sediment accumulation) as compared to the pond design elevations since the commencement of operation (i.e., no excess sediment in the *Stormwater Management Facility*). The *Owner's Engineer* must provide calculations and cite sources within the certification letter (e.g., expected sediment accumulation rate/volume). Should excess settlement and/or debris be present it shall be removed from the *Stormwater Management Facility* by completing at least one (1) pond clean out. The surveys must include elevations for the permanent pool water level, forebay water level, bottom of the permanent pool, bottom of the forebay, permanent pool top of sediment, forebay top of sediment, top of pond, inlet location, and outlet location.

As-built drawings for the *Stormwater Management Facility* must also include topographic survey information to verify that as-built conditions conform with the approved design. As-built drawings are to be provided in both a PDF version and an AutoCAD version depicting all as built features. Refer to Section 8.8 of the Municipality of Kingston Subdivision Development Guidelines & Technical Standards for additional as-built drawing specifications and requirements.

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Manufactured Treatment Devices

Inspection & Maintenance Program

The *Owner* shall inspect Manufactured Treatment Devices (e.g., filter units) at least once a year and, if necessary, after any major spills have occurred and clean and maintain the *Stormwater Management Facility* to prevent the excessive build-up of sediments and oil/grease contamination.

The *Owner* shall maintain records of the results of all inspections, cleaning and maintenance operations undertaken, and shall make available the records for inspection by the *Municipality* upon request.

The records shall include the following:

a) the name of the *Stormwater Management Facility*;
b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed;
c) the name of the person who conducted the inspection, maintenance and cleaning, or the name of the inspecting official, where applicable;
d) observations resulting from the inspection including, at a minimum:
    i. occurrence of obstructions at the inlet and outlet of the *Stormwater Management Facility*;
    ii. evidence of spills or oil/grease contamination, and the date of each spill within the site, including follow-up actions / remedial measures undertaken; and
    iii. presence of trash build-up.
e) a summary of any operating problems encountered and corrective actions taken;
f) a summary of any complaints related to the *Stormwater Management Facility* received during the reporting period and any steps taken to address the complaints;
g) a summary of actions taken, including timelines, to improve or correct performance of any aspect of the *Stormwater Management Facility*; and
h) a summary of the status of actions for the previous reporting year.

The *Stormwater Management Facility* can be cleaned using a vacuum pump inserted down the maintenance access ways – no entry into the unit is required for its operation. The *Owner* shall clean the *Stormwater Management Facility* annually, whenever the accumulation reaches 15% of the sediment storage, or after any major spills have

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occurred. Oil levels greater than 25 mm should be removed immediately by a licensed waste management firm, usually to a licensed landfill facility.

The sediment should be tested to determine the disposal options. The *Ministry* publishes sediment disposal guidelines which should be consulted for up-to-date information pertaining to the exact parameters and acceptable levels for the various disposal options. The preferred option is off-site disposal arranged by a licensed waste management firm, usually to a licensed landfill facility.

The *Owner's Engineer* must submit inspection and maintenance records to the *Municipality* each year as part of the Annual Performance Report.

Monitoring Program

The *Owner* shall carry out a monitoring program and evaluate the performance of the manufactured treatment device commencing at the initial completion of construction of the treatment facility until the *Preliminary Certificate of Approval of the Works* has been issued, or when agreed upon by the *Owner* and the *Municipal Engineer* during the PCAW process.

The monitoring program must include obtaining grab samples at the manufactured treatment device once during three (3) representative *Wet Weather Events* in both the autumn and spring seasons (annually six samples per unit). Two (2) of the events must occur within the May to September period. Samples must be tested for oil & grease and the results recorded. The *Owner* shall maintain records of the results of all monitoring operations undertaken and shall make available the records for inspection by the *Municipality* upon request.

The records shall include the following:

a) the name of the *Stormwater Management Facility*;
b) the name of the person who conducted the monitoring, or the name of the inspecting official, where applicable;
c) the date and results of each sample taken under the monitoring program (described above);
d) quantity and frequency of slop oil disposal from the manufactured treatment device, including a copy of the disposal manifest;
e) a summary of all monitoring data along with an interpretation of the data and an overview of the condition and operational performance of the infrastructure and any Adverse Effects on the Natural Environment (Adverse Effect as defined in the *Environmental Protection Act, R.S.O. 1990, c. E.19*);
f) a summary and interpretation of environmental trends based on all monitoring information and data for the previous years; and

g) a summary of the calibration and maintenance carried out on all monitoring equipment.

The *Owner's Engineer* must submit monitoring records to the *Municipality* each year as part of the Annual Performance Report.

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Stormwater Chambers

Inspection & Maintenance Program

The *Owner* shall inspect the *Stormwater Management Facility* at least once a year and after any *Significant Flooding Event* and, if necessary, clean and maintain the *Stormwater Management Facility* to prevent the excessive build-up of sediment and debris to avoid reduction of the capacity and/or permeability of the *Stormwater Management Facility*, as applicable. The *Owner* shall also regularly inspect and clean out the inlet to and outlet from the *Stormwater Management Facility* to ensure that these are not obstructed.

The *Owner* shall maintain records of the results of all inspections, cleaning and maintenance operations undertaken, and shall make available the records for inspection by the *Municipality* upon request.

The records shall include the following:

a) the name of the *Stormwater Management Facility*;
b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the *Stormwater Management Facility*;
c) the name of the person who conducted the inspection, maintenance and cleaning, or the name of the inspecting official, where applicable;
d) observations resulting from the inspection including, at a minimum:
    i. occurrence of obstructions at the inlet and outlet of the *Stormwater Management Facility*;
    i. evidence of spills or oil/grease contamination, and the date of each spill within the site, including follow-up actions / remedial measures undertaken;
    ii. presence of trash build-up.
e) hydraulic operation of the *Stormwater Management Facility* (e.g., length of occurrence since the last rainfall event, evidence or occurrence of overflows);
f) a summary of any operating problems encountered and corrective actions taken;
g) a summary of any complaints related to the *Stormwater Management Facility* received during the reporting period and any steps taken to address the complaints;
h) a summary of actions taken, including timelines, to improve or correct performance of any aspect of the *Stormwater Management Facility*; and
i) a summary of the status of actions for the previous reporting year.

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The sediment should be tested to determine the disposal options. The *Ministry* publishes sediment disposal guidelines which should be consulted for up-to-date information pertaining to the exact parameters and acceptable levels for the various disposal options.

The *Owner's Engineer* must submit inspection and maintenance records to the *Municipality* each year as part of the Annual Performance Report.

Final Clean Out

Prior to the *Municipality* issuing the *Preliminary Certificate of Approval of the Works* for the *Stormwater Management Facility*, the *Municipality* will require certification from the *Owner* that all excess sediment and debris have been cleaned out of the *Stormwater Management Facility*. This certification must be a letter stamped by the *Owner's Engineer* supported with at least one (1) clean out (i.e., flushing and disposal of accumulated sediment) of the *Stormwater Management Facility*.

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Storm Sewers

General Requirements

The *Owner* shall inspect and test all new and replaced storm sewers, maintenance holes, connections and appurtenances shall be inspected and tested to ensure integrity of the installed material for water tightness prior to placing into service. A single testing plan can be used for similar tests on the same project; however, each test shall be recorded separately.

Inspection and testing plans including procedure, equipment, schedule, safety requirements, and emergency response plan shall be submitted to the *Municipality* at least two (2) weeks prior to the inspection or testing. The *Owner* shall not proceed with the inspection or testing until the plans have been accepted by the *Municipality*. Seasonal variation (e.g., spring freshet) on groundwater conditions shall be considered on selecting appropriate testing method.

CCTV Inspections

The *Owner* shall conduct a camera inspection shall be conducted throughout the entire length of the storm sewer system in accordance OPSS.MUNI 409 and supplemental conditions outlined in Appendix 2A of the Municipality of Kingston Subdivision Development Guidelines & Technical Standards. The inspection shall be carried out prior to the application of the final lift of asphalt but not within the first ten (10) months following the completion of base asphalt. All new storm sewers including connections and associated appurtenances shall be inspected to confirm alignment and to ensure that the *Stormwater Management Facility* is free from obstructions, debris, and defects. All storm maintenance holes/access structures shall be inspected for any defects, leaks, debris, and to ensure proper benching.

If the *Municipality* is provided with sufficient justification from the *Owner's Engineer* to determine that a CCTV inspection is not possible, other acceptable inspection methods for storm sewers and structures are included in Section 8.0 of the *Ministry's* "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval", and are summarized below:

a) zoom camera inspections as per OPSS.MUNI 432;
b) sonar inspections as per OPSS.MUNI 435 (under submerged or partially submerged conditions); and
c) laser inspections as per OPSS.MUNI 434.

The *Owner's Engineer* shall speak to any defects with respect to the sewer installations and recommend the method of remedial work, where warranted. The *Owner* shall correct, at the *Owner's* expense, any issues identified in the inspections and the

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respective pipe segments and maintenance holes shall be re-inspected.

Deflection Testing

The *Owner* shall complete a deflection test for all new flexible storm sewers at least thirty (30) calendar days after backfilling but prior to paving. Pipe segments failing the deflection test shall be removed and replaced. Mandrel testing and laser profiling performed in accordance with OPSS.MUNI 438 and OPSS.MUNI 434, respectively, are acceptable tests for pipe deflection testing. Equipment used to perform mandrel tests shall be specifically designed for the pipe material being tested.

The *Owner's Engineer* shall speak to any defects with respect to the sewer installations and recommend the method of remedial work where warranted. The *Owner* shall correct, at the *Owner's* expense, any issues identified in the testing shall be corrected at the *Owner's* expense and the respective pipe segments shall be re-inspected.

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PART C – CLI ECA SWM SECURITY

The Municipality shall retain a security for the CLI ECA SWM deliverables described in Schedule “I”, hereinafter referred to as the “CLI ECA SWM Security” in the amount of One Hundred Thousand Dollars ($100,000.00). The CLI ECA SWM Security may be used by the Municipality to complete any outstanding deliverables described in Schedule “I”. This CLI ECA SWM Security shall not be subject to the general provisions respecting reductions of Security and shall be subject to the following procedure only:

a) the CLI ECA SWM Security in the amount of One Hundred Thousand Dollars ($100,000.00) is additional to the Security for Works and shall be withheld by the Municipality as part of the initial Security reduction for the Subdivision;
b) prior to commencing operation of the Stormwater Management Facility, the Owner shall submit a digital copy of the current Operations & Maintenance Manual for each Stormwater Management Facility to the Municipality, to the satisfaction of the Municipal Engineer in accordance with the requirements described in Schedule “I”;
c) after the submission and acceptance of each Annual Performance Report in accordance with Schedule “I” between issuance of PCAUS and issuance of PCAW the CLI ECA SWM Security can be reduced by an amount of Twenty Thousand Dollars ($20,000). The CLI ECA SWM Security shall not be reduced below Forty Thousand Dollars ($40,000) prior to the issuance of PCAW;
d) the Owner shall submit a digital copy of the final Operations & Maintenance Manual for each Stormwater Management Facility to the Municipality at issuance of PCAW, to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule “I”, at which point the Owner may request that the CLI ECASWM Security be reduced by an amount of Ten Thousand Dollars ($10,000);
e) prior to the Municipality issuing PCAW for the Stormwater Management (SWM)Pond, the Owner shall complete a bathymetric survey of the pond and provide a letter stamped by the Owner’s Engineer certifying that the accumulation of sediment is acceptable (i.e., within the tolerance of expected

sediment accumulation) as compared to the pond design elevations since the commencement of operation (i.e., no excess sediment in the SWM Pond). The Owner's Engineer must provide calculations and cite sources within the certification letter (e.g., expected sediment accumulation rate/volume). Should excess settlement and/or debris be present it shall be removed from the SWM Pond by completing at least one (1) pond clean out. At this point, or should no excess sediment or debris be present, and provided that the Owner has provided as-built drawings for the SWM Pond in accordance with the requirements described in Schedule "I" (including topographic survey information), the Owner may request that the CLI ECA SWM Security be reduced by an amount of Ten Thousand Dollars ($10,000);

f) following the Municipality issuing PCAW, the Owner must submit all outstanding monitoring records for each Stormwater Management Facility constructed for the purpose of stormwater treatment to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule "I", at which point the Owner may request that the CLI ECA SWM Security be reduced by an amount of Ten Thousand Dollars ($10,000);

g) at no time shall the CLI ECA SWM Security be less than Ten Thousand Dollars ($10,000.00) until the final Annual Performance Report and any other outstanding deliverables (e.g., monitoring records) have been provided to the Municipality, to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule "I" to facilitate the Municipality issuing the Final Certificate of Approval of the Works, at which point the CLI ECA SWM Security shall be fully released.

PART C – CLI ECA SWM SECURITY

The Municipality shall retain a security for the CLI ECA SWM deliverables described in Schedule "I", hereinafter referred to as the "CLI ECA SWM Security" in the amount of Fifty Thousand Dollars ($50,000.00). The CLI ECA SWM Security may be used by the Municipality to complete any outstanding deliverables described in Schedule "I". This CLI-ECA SWM Security shall not be subject to the general provisions respecting reductions of Security and shall be subject to the following procedure only:

(a) the CLI ECA SWM Security in the amount of Fifty Thousand Dollars ($50,000.00) is additional to the Security for Works and shall be withheld by the Municipality as part of the initial Security reduction for the Subdivision;

(b) prior to commencing operation of the Stormwater Management Facility, the Owner shall submit a digital copy of the current Operations & Maintenance Manual for each Stormwater Management Facility to the Municipality, to the satisfaction of the Municipal Engineer in accordance with the requirements described in Schedule "I";

(c) after the submission and acceptance of each Annual Performance Report in accordance with Schedule "I" between issuance of PCAUS and issuance of PCAW the CLI ECA SWM Security can be reduced by an amount of Twenty Thousand Dollars ($20,000). The CLI ECA SWM Security shall not be reduced below Thirty Thousand Dollars ($30,000) prior to the issuance of PCAW;

(d) the Owner shall submit a digital copy of the final Operations & Maintenance Manual for each Stormwater Management Facility to the Municipality at issuance of PCAW, to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule "I", at which point the Owner may request that the CLI ECA SWM Security be reduced by an amount of Ten Thousand Dollars ($10,000)

(e) prior to the Municipality issuing PCAW for the Stormwater Chamber, the Owner shall certify that the Stormwater Chamber is free of sediment and debris by providing one cleanout of the system. Once the cleanout is completed to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule

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"I", the Owner may request that the CLI ECA SWM Security be reduced by an amount of Ten Thousand Dollars ($10,000);

(f) at no time shall the CLI ECA SWM Security be less than Ten Thousand Dollars ($10,000.00) until the final Annual Performance Report has been provided to the Municipality, to the satisfaction of the Municipal Engineer, in accordance with the requirements described in Schedule "I" to facilitate the Municipality issuing the Final Certificate of Approval of the Works, at which point the CLI ECA SWM Security shall be fully released.

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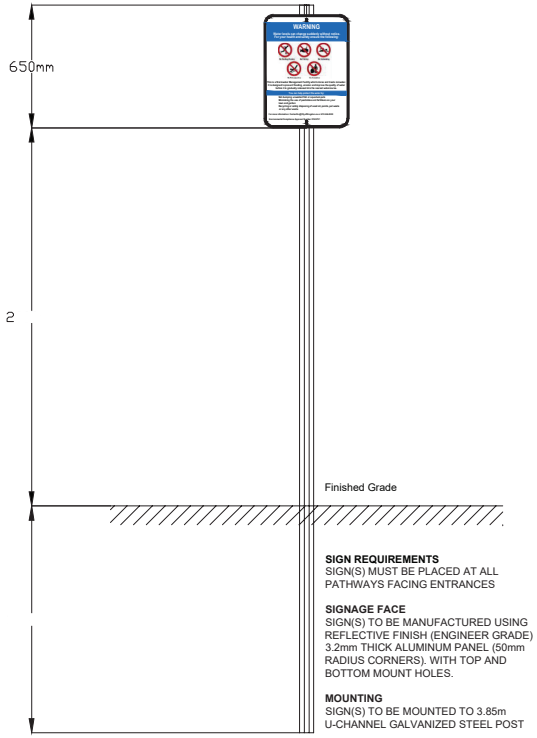
Appendix D

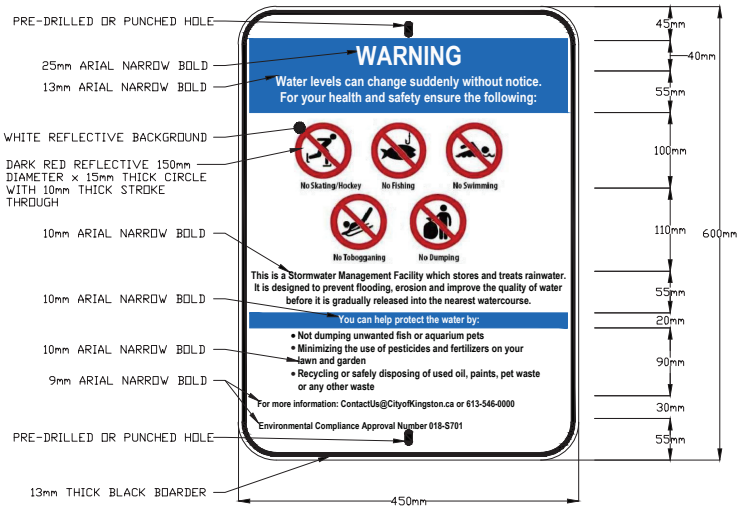
Stormwater Management Pond Warning Signs



SIGN REQUIREMENTS
SIGN(S) MUST BE PLACED AT ALL PATHWAYS FACING ENTRANCES

SIGNAGE FACE
SIGN(S) TO BE MANUFACTURED USING REFLECTIVE FINISH (ENGINEER GRADE) 3.2mm THICK ALUMINUM PANEL (50mm RADIUS CORNERS). WITH TOP AND BOTTOM MOUNT HOLES.

MOUNTING
SIGN(S) TO BE MOUNTED TO 3.85m U-CHANNEL GALVANIZED STEEL POST



CITY OF KINGSTON

ENGINEERING DEPARTMENT

Stormwater Management Facility Warning Sign

April 24 2024

SWM-01