CIVICA
Water Management Solutions

Environmental Compliance Approval Regulations

10 Key Insights Into The New Systemwide Stormwater ECA Regulations

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Stormwater System - Key Takeaways

The new Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) process governed by the Ministry of Environment, Conservation and Parks (MECP) affects all municipalities in Ontario and must be understood by municipal staff and their stakeholders in order to be effectively followed. This article is the final article of a three-part series that was created to promote awareness of the new regulations and provide insights that will ideally help municipalities be proactive, identify risks, and set up programs to manage costs and optimize their systems. With a shift from individual ECA's for single (or set) of infrastructure to the new CLI-ECA regulations, a renewed focus on the performance of stormwater systems as a whole will be crucial for municipalities that want to be proactive in their management of these valuable systems.

5 Key Insights specific to stormwater systems have been identified and are presented below:

Insight 1 | Inspection and Monitoring are Key to Asset Operation and Maintenance

Upon doing a simple word search, the words "inspect", and "monitor" come up over 45 times combined in the stormwater CLI-ECA template document, highlighting the importance of these two activities. Regular inspection of stormwater assets enables municipalities to perform condition assessments – a systematic approach that can flag areas of minor or major concern and allows for prioritization of remedial works. This systematic approach also enables the municipality to assess the performance of stormwater assets against their original design and prescribed level of service. Stormwater system monitoring is vital to assess system capacity, both under existing and future scenarios (e.g., population growth, climate change, etc.). This information can be used to prioritize potential increased maintenance needs (e.g., pond cleanout) or planning needs (e.g., system upgrades to accommodate increased flows due to larger, more intense storms). This also give the municipality a chance to assess the potential to increase catchment areas and/or squeeze more use out of the existing system (i.e., infra-stretching).

Examples of Stormwater Asset Condition Assessments

Zoom Camera and CCTV Inspection of Culverts and Pipes

Maintenance Hole Condition Inspections Using 360-Degree Cameras

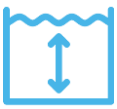
LID Facility Condition Inspections

Outfall Surveys And Condition Inspections

Storm Pond Sediment Surveys

SWM Facility Inspections

Examples of Stormwater System Monitoring



Pond Depth Monitoring

LID Performance Monitoring

Rainfall Monitoring

Pond Sediment Removal Efficiency Monitoring

Storm Pipe and Culvert Flow Monitoring

Nutrient Monitoring In Watercourses

Natural Channel Flow and Water Quality Monitoring

CIVICA INFRASTRUCTURE | Drainage Capacity Management

Insight 2 | Assessment Studies Are Key to optimizing Service Levels, O&M, and Capital Planning (e.g., master plans, system-wide modelling, watershed and subwatershed plans, etc.)

For a more holistic and deep-dive into asset performance, beyond an asset management plan, municipalities can use master planning, system-wide modelling, and smaller watershed/subwatershed studies. These studies achieve a higher level of detail about system performance, identify capacity constraints, and usually incorporate growth and climate change scenarios.

These studies will empower municipalities to generate operation and maintenance programs for 5-10+ years, and plan for system upgrades based on growth needs and impacts of changing climate. Master planning also incorporates stakeholder feedback, such as conservation authorities, public utilities, etc., which fosters a more holistic and diverse set of recommendations. Public consultation is also a requirement and provides local residents to have a say in the future of stormwater infrastructure in their community and be involved in the planning, design and implementation process.

Insight 3 | Importance of Rainfall Data Collection and Analysis

Accurate and reliable rainfall data is a key input in assessing the performance of stormwater infrastructure. A rain gauge network is used most often by municipalities to measure rainfall across space and time; however, rainfall variability can be significant even at small scales. Accurate monitoring of rainfall is a key component of the CLI-ECA regulations, as inspections of assets may be required after significant flooding events, and wet weather sampling needs to be considered for SWM facilities. Climate change and the predicted increase in the frequency and magnitude of rainfall events are likely in Ontario according to the province:

"The occurrence of extreme precipitation events in general is increasing. The frequency and intensity of these extreme events are changing, and infrastructure of all kinds is becoming subject to conditions for which it was not designed. This includes stormwater and wastewater infrastructure which may become overwhelmed, impacting water quality, water quantity and the ecosystem (MOECC, 2016)."

Therefore, accurate monitoring of rainfall is critical to assessing the performance of existing stormwater infrastructure and planning system requirements into the future.

Tips and Tricks for Rainfall Monitoring

Rain gauge network coverage

Always have multiple rain gauges, ideally placed in a grid and with a coverage of 1 rain gauge per 2-4 km^2

Sharing between jurisdictions/agencies

In order to achieve the rain gauge density above, municipalities should leverage other stakeholders that use rainfall data for various purposes (i.e. neighboring municipalities, conservation authorities, provincial/federal government, etc.). Software platforms are available that can be used to upload, store, view and perform various rainfall analyses and agreements between stakeholders are encouraged to share this important data.

Tools and techniques (DRMT, GARR, etc.)

Even with a well-thought-out and well-placed rain gauge network, high variability of storm cells in Ontario and susceptibility of rain gauges to fail or clog poses challenges to accurate and reliable rainfall data. Providentially, there are tools and techniques available that enable municipalities to fill in gaps where there are no rain gauges and/or where gauges have failed:

- The Distributed Rainfall Modeling Technique (DRMT) can be an important tool to accurately assess rainfall between rain gauges using interpolation. This technique can create a virtual hyetograph for a specific area that may have had a high impact from a particular rain event.
- Gauge adjusted radar rainfall (GARR) is another key technique for assessing rainfall in areas where rain gauges are not present by using both radar and rain gauge data. This technique uses captured rainfall data to calibrate radar images of cloud density to create a “rain grid” that can be applied wherever radar imagery is available. The grids can be as small as 1km x 1km or used to generate a catchment-specific rainfall amounts.

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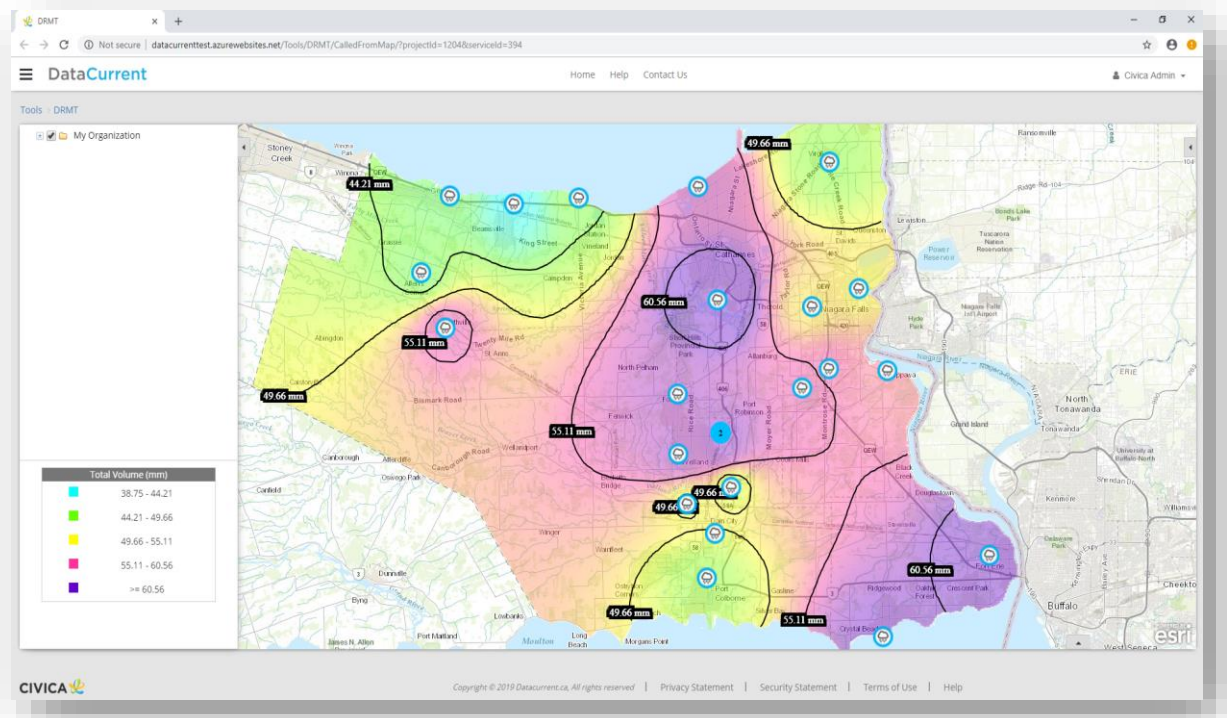

DataCurrent - Rainfall Prediction and Analysis Tool

Insight 4 | Both Water Quantity and Water Quality are Important to Monitor and Understand

Many assessment studies, including watershed/subwatershed plans, source protection plans, stormwater master plans, etc. define the criteria for stormwater quantity control for new developments. Where these studies are not available, stormwater quantity is ideally controlled to meet pre-development conditions on the property to control runoff from the 90th percentile storm event. However, water quality parameters should also be carefully considered, including:

Erosion and sediment control are also critical to consider for any new development or retrofit situations.

For new development areas - characterization of the water quality to be protected, including identification of stormwater contaminants (e.g., suspended solids, nutrients, bacteria, water temperature) for potential impact on the natural environment is crucial to consider and control as necessary.

For retrofit locations – improving water quality control (specifically for suspended solids) above and beyond the current conditions as well as meeting the new development criteria (or as part of a multi-year rehabilitation effort that will achieve those criteria).

In order to reduce urban stormwater runoff impacts, the MECP has adopted legislation or practices to remove up to 80% of the total suspended solids (TSS) present in urban stormwater. In many urban areas throughout Ontario, this legislation has led to implementation of different types of stormwater management facilities (SWMFs), to reduce stormwater runoff pollutant loads. Innovations in monitoring/sampling technologies and incorporation of weather forecast data can increase effectiveness for sampling infrastructure such stormwater management ponds. Manual grab sampling and using state-of-the-art autosamplers may be necessary for some projects but can require significant resource investments that may not be necessary for many SWMF monitoring applications.

An Innovative, Low-Cost Autosampler

Insight 5 | The Use of Green Infrastructure, Including Low Impact Development (LID), Can be an Effective Stormwater Management Strategy

Areas undergoing new development have stricter stormwater management criteria than older urbanized areas and LIDs are often used in a treatment-train approach to improve runoff quantity and quality. LID measures can be implemented in areas where runoff is controlled or uncontrolled, to provide additional stormwater quantity and quality controls. Existing developed areas within municipalities may release stormwater completely uncontrolled into neighbouring watercourses and streams.

These areas present unique opportunities for innovative LID measures to be implemented to increase quality and quantity control, as well as promote infiltration and groundwater recharge. LIDs can be integrated into community features and improve the aesthetics of the overall communities they are in. These opportunities would depend on available space, development type and soil and groundwater conditions. However, there are some challenges with green infrastructure/LIDs, including: high maintenance costs, higher design complexity, and questions regarding cost-benefit vs traditional “grey” infrastructure. Within older areas in a municipality, the success of green infrastructure such as infiltration/bio-retention facilities and LID measures are highly dependent on the availability of land in the area. Green infrastructure and LIDs should definitely be explored where opportunities exist.

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