Great Lakes and St. Lawrence Cities Initiative

MUNICIPAL ADAPTATION AND RESILIENCE:
INTEGRATING WATERSHED AND STORMWATER

The Challenge

Increasingly, Great Lakes and St. Lawrence municipalities are experiencing effects symptomatic of climate change. More frequent and intense storms, severe flooding, drought and even tornadoes threaten public safety as well as public and private property and infrastructure around the region. Additionally, stormwater and flooding can have an adverse effect on our freshwater resources, polluting our lakes and rivers with surface contaminants. As we begin to face more uncertainty around the climate and weather, municipalities need to consider these future climate effects in order to ensure that they continue to protect their citizens, infrastructure and property, and our freshwater resources.

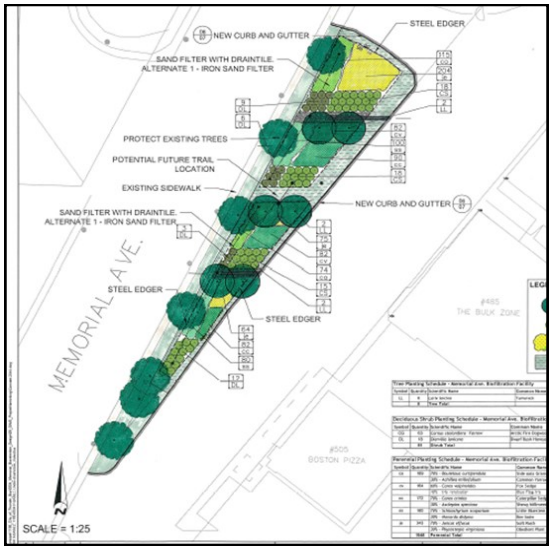
Background

The Municipal Adaptation and Resilience – Integrating Stormwater and Watershed Management project, funded through generous support from the RBC Blue Water Project, aims to help municipalities better manage stormwater and mitigate flooding to address climate change impacts. These pilot projects seek to provide lessons for other communities on how knowledge and management of the broader watershed can support more effective stormwater management and flood mitigation within a municipality while simultaneously reducing contaminants entering the Great Lakes. The project supported demonstration projects in two Great Lakes cities: Thunder Bay, Ontario and Hamilton, Ontario.

The Pilot Projects

Thunder Bay – Memorial Avenue Low Impact Development

The City of Thunder Bay is leading the design and construction of a Low Impact Development (LID) biofiltration facility for stormwater on Memorial Avenue, a major image route corridor. The intent of this LID is to improve parking lot drainage, mitigate potential flooding, and help remove water contaminants from the drainage area. The City is also taking the opportunity to beautify this site through tree and shrub planting and increased pedestrian connections.



Memorial Avenue LID Design Plan

Thunder Bay's urban areas, especially along this section of the Memorial Avenue corridor, exhibit a large presence of chloride (de-icing salt), ammonia and other nutrients, and heavy metals such as aluminum in local runoff. Mitigation of impacts from these contaminants, including the impacts of urban flooding, have been a focal point for environmental programs in the community in recent years and are reflected in aims set out in the City's Sustainability Plan, draft Climate Adaptation Strategy, and draft Stormwater Master Plan.

After soil testing and review, it was determined that the Memorial Avenue LID site was best suited for a biofiltration approach. Biofiltration areas, a sand filter and pre-treatment runnels were used on the site. The design also included a pedestrian connection from Memorial Avenue to the parking lot, with this connection ultimately becoming part of the TransCanada Trail Network. The project team will carry out an educational campaign focusing on the benefits of LIDs in improving the quality of stormwater runoff and mitigating urban flooding. The campaign will include public presentations, public plantings, site tours, and the use of social media. The facility is expected to be completed and online by June 30, 2015. Ongoing monitoring will take place to ensure project goals and performance are achieved.

The Cities Initiative and project partners would like to thank the RBC Blue Water Project for its

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The Pilot Projects

Hamilton—Spencer Creek Vulnerability Assessment: There has been increased public awareness of damage caused by extreme weather events in Ontario, as a result of a number of frequently occurring major storms. The pilot project in Hamilton has focused on undertaking a more in-depth analysis of the relationship of future climate temperature, precipitation and hydrology/hydraulic characteristics to potential effects on 12 bridges and four environmental features in the Spencer Creek Watershed. This pilot project received funding support from the RBC Blue Water Project, the City of Hamilton, Hamilton Conservation Authority, and MITACs.

Several climate models were reviewed and the projected values from each were developed for existing conditions (1960 – 2010) and three future time periods. The approach is to look for longer term data trends rather than absolutes. Once climate projected values were examined for trends, these global/regional scale results were downscaled to convert daily to hourly data for use in the hydrologic/hydraulic models. A series of IDF curves were generated for a number of different climate models using the hydrologic/hydraulic models. Results suggest that the current time series flows may occur at a much more frequent interval under future climate conditions. The importance of this is that these more frequent flows and critical flows dictate erosion vulnerability.

Spencer Creek in Hamilton, Ontario

Future climate changes include potential increases in mean annual temperature, maximum temperatures and growing degree days, while the number of cold days will decrease. In addition, the models predict potential increases in total annual precipitation, more days with substantial rainfall and more long duration events. All of these potential changes may affect the form and function of the environmental features in the watershed. The effect of these changes on environmental features may be lower wetland water levels, resulting in shifts in wetland species, more habitat for invasive species and less water storage and discharge functions; for coldwater streams, these changes could mean loss of brook trout habitat and for forest habitats, vernal pools that support amphibian reproduction may be lost and drying of the forest may lead to shifts in vegetation and loss of rare species.

Potential effects on infrastructure may include increased unpredictability in managing reservoir functions, loss of channel stability and increasing erosion vulnerability, increased frequency of flood events, loss of bridge conveyance and potential structural damages.

The last task in the project is to review how adaptation measures, such as changes to environmental policy/restoration planning, acceptable risk levels, environmental/infrastructure monitoring, emergency response, design guidelines and operation and maintenance, may improve the ability of the City and the Conservation Authority in managing/protecting their infrastructure and environmental features. Results of the pilot study may help guide additional studies within the City of Hamilton and Conservation Authority and will be subject for further refinements and consultations with the concerned parties according to the municipal planning processes.

The Great Lakes and St. Lawrence Cities Initiative is a binational coalition of mayors and other local officials that works to advance the protection and restoration of the Great Lakes and the St. Lawrence River.

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For more information on these projects and the Cities Initiative Municipal Adaptation and Resiliency Program, please visit:

http://glslcities.org/initiatives/municipal-climate-adaptation/