Elm Drive:
Function Meets Design

Canadian Consulting Engineering Awards 2013

The MUNICIPAL INFRASTRUCTURE Group Ltd.

CVC
CREDIT VALLEY CONSERVATION

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project description

The Elm Drive West project involved retrofitting a length of existing right-of-way (ROW) in the City of Mississauga to incorporate stormwater treatment within the ROW. The stakeholders involved in this project included The City of Mississauga, the Credit Valley Conservation (CVC) and the Peel District School Board. The retrofit was aimed at addressing stormwater management and treatment of road runoff by implementing a combination of Low Impact Development bioretention and infiltration technologies. In addition the retrofit was designed with the objective of enhancing public awareness by creating a landscape recognizable as a 'green/sustainable' street.

For the proposed ROW retrofit, The Municipal Infrastructure Group (TMIG) and Schollen & Company developed an innovative design that would direct the road runoff across permeable pavers and into bioretention planters, prior to being discharged to standard stormwater infrastructure. The proposed LID measures will enhance water quality and improve the water quantity control. The project included preparation of a conceptual design which was then evaluated based on cost and effectiveness in providing appropriate stormwater treatment. TMIG was retained to undertake hydrologic analyses to establish a stormwater management strategy; to complete the detailed design; and to provide construction administration services.

objectives, solutions & achievements

Increases in the frequency of severe rainfall events have resulted in flooding within the Cooksville Creek watershed, which has raised much concern over the state of current stormwater management infrastructure. Therefore, the required road reconstruction of Elm Drive in south Mississauga presented a unique opportunity to implement unconventional stormwater management technologies. The CVC and City of Mississauga enlisted in the services of The Municipal Infrastructure Group and Schollen & Company to design innovative stormwater management technologies, which would help reduce stormwater runoff and flooding risks, and improve the quality of the road runoff.

Instead of following standard practice and converting Elm Drive into a conventional curb and gutter street, the innovative design directed the road runoff to bioretention planters and permeable pavers. Stormwater runoff from Elm Drive is directed across the permeable pavers and into the bioretention planters, both of which filter and store the stormwater runoff before it enters into Cooksville Creek and, ultimately, Lake Ontario. The proposed retrofit of Elm Drive was designed to provide 80% total suspended solids (TSS) removal; reduce the existing release rate by 37% during the 2-year storm event to 13% during the 100-year storm event; and reduce the runoff volume from the site by 29% during the 2-year storm event to 8% during the 100-year storm event.

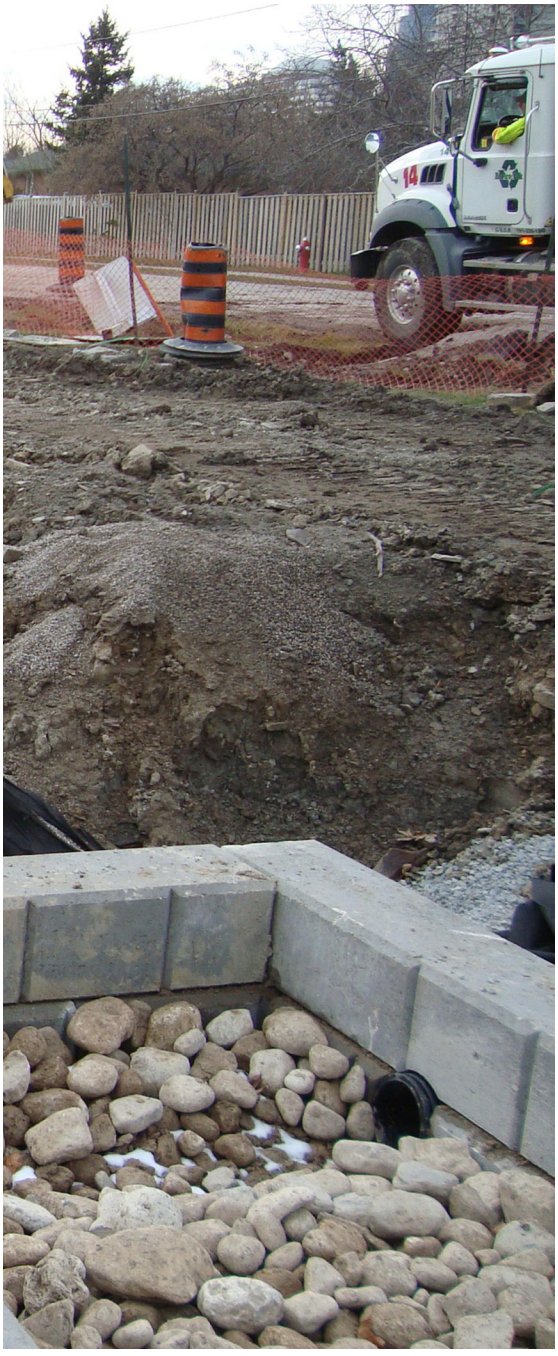
The effectiveness of the bioretention planters and permeable pavement have been monitored to determine improvements to water quality and volume reduction of the stormwater in comparison to conventional curb and gutter design. These monitoring initiatives, undertaken by the CVC, have proven a considerable reduction in run-off due to the introduction of these stormwater management techniques, proving the efficiency and effectiveness of the design.

innovation

Low Impact Development (LID) technologies are a relatively new concept in Ontario; therefore the Elm Drive retrofit was developed as a "Green Street" pilot project to test the stormwater management properties of the proposed LID design. TMIG developed a methodology for modeling the potential infiltration capacity of both permeable pavers and the bioretention planters. The success of the Elm Drive design shows how these LID features can be incorporated within existing ROWs to provide increased water quality and volume reduction for road runoff. The success of this project will assist in these technologies being incorporated in other areas throughout Mississauga, and potentially other municipalities within Ontario.

naturally clean water

complexity



The Elm Drive retrofit pilot project involved a non-standard road design, as well as the implementation of bioretention planters within a small space. The partnership with the Peel District School Board allowed the City of Mississauga to construct and maintain stormwater infrastructure within private property, however the design still needed to fit in a relatively small space, and work around the numerous existing utility lines.

The restrictions on space and having to deal with existing infrastructure proved to be a challenge, however that challenge led to a more innovative design. Having to incorporate the proposed LID measures into a small space proved to be a difficult yet manageable task.

The model developed for the Elm Drive retrofit was unique and had to incorporate the water quality and infiltration capabilities of both the permeable pavers and the bioretention planters. The model accurately predicted the volume reductions that have been observed since the implementation of the proposed design. As such, the CVC is now using this modeling to develop a modeling standard for future LID projects.

social and economic benefits

The section of Elm Drive that was retrofitted was directly in front of an Adult Education Centre, and in the same neighbourhood as an elementary school, making it a busy area for both foot and vehicular traffic. The retrofit included the construction of lay-by areas, constructed of permeable pavers, that provided convenient pick-up and drop-off locations. In addition, the design included the design of a sidewalk that passes beside the newly constructed bioretention planters, offering walkers a safe and aesthetically pleasing walkway along Elm Drive.

The Elm Drive retrofit was completed as part of the City's planned roadway rehabilitation work; as such a portion of the funds used to finance the project would have been used to upgrade the road. The cost of constructing the bioretention planters was slightly more expensive than traditional methods; however the hope is that the long term maintenance costs of the planters will be less. As, this was a pilot project it will take a few years of monitoring to determine the actual long term maintenance costs for the bioretention system.

environmental impact

The bioretention planters were placed in a landscaped area at the front of the school, which consisted of grass and a few sparse trees, some of which were dying. The bioretention planters were filled with an array of plants and flowers, which serve a dual purpose. Not only do the plants and flowers aid in the filtration of road run-off, but they enhance the landscape with a variety of vegetation that was designed to thrive in the roadside environment.

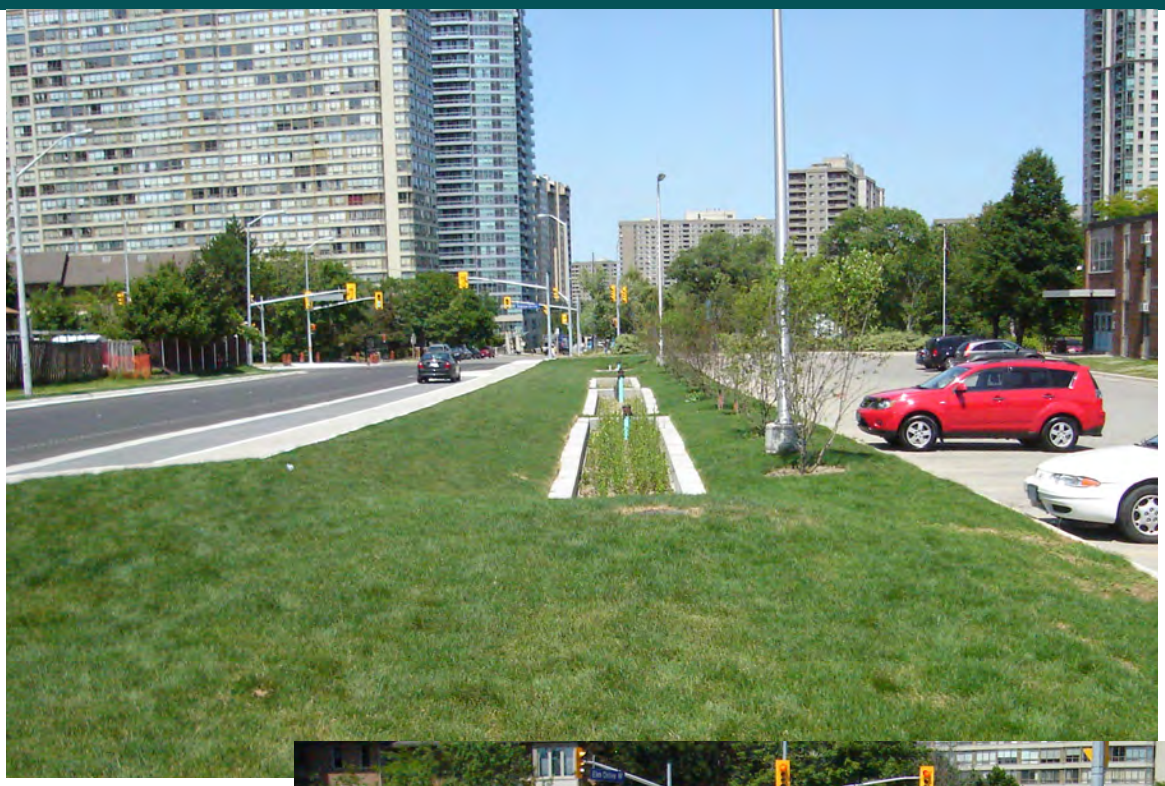
The permeable pavers and bioretention planters also serve a stormwater management purpose, providing both enhanced water quality treatment and volume reduction to the stormwater runoff from the contributing road drainage area. Enhanced water quality treatment removes 80% of the sediment that has been washed off the road surface from the stormwater, resulting in cleaner water being discharged to the storm sewer system and ultimately into Cooksville Creek. The permeable pavers and bioretention planters also retain some of the runoff for infiltration purposes, reducing the volume of water that reaches the downstream system and reducing the potential for flooding.

meeting client's needs

The City of Mississauga, the Credit Valley Conservation (CVC) and the Peel District School Board were all extremely pleased with the finished product. It provided the desired stormwater management functions in an aesthetically pleasing fashion, which addressed the needs of all parties involved. In fact, the CVC and the City of Mississauga have showcased the Elm Drive retrofit project in several of the Low Impact Development (LID) conferences that are put on by the CVC each year.

Photographs

photos



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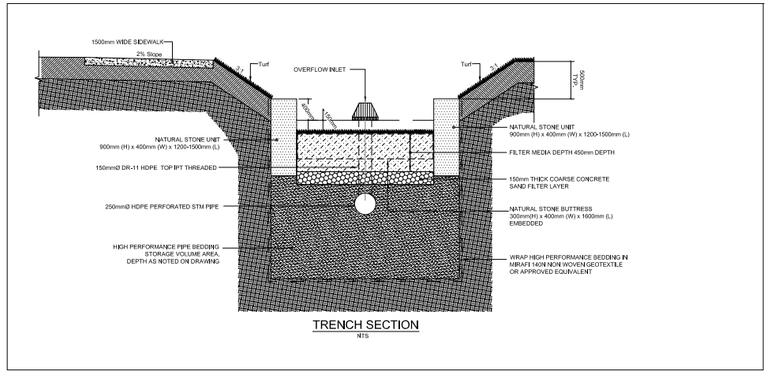

TRENCH SECTION
NTS

Client Letter

Thursday, April 18, 2013

Phil James, P.Eng.
Credit Valley Conservation
1255 Old Derry Road
Mississauga, ON L5N 6R4

Bronwen Parsons
Canadian Consulting Engineer Magazine
60 Valleybrook Drive
Toronto, ON M3B 2S9

Dear Bronwen,

Please accept this letter as a testament to our working relationship with TMIG.

Credit Valley Conservation confirms that the consulting engineering services were provided and sufficiently completed to our satisfaction. The overall objectives were met within the approved timeframe and budget and the project is complete.

Sincerely,

Phil James, P. Eng.
Water Resources Engineer