



# INFORMATION REPORT

<b>TO:</b>	Chair and Members Public Works Committee
<b>COMMITTEE DATE:</b>	May 30, 2016
<b>SUBJECT/REPORT NO:</b>	Escarpment Crossings – Rock Slope Assessment (PW16048) (City Wide)
<b>WARD(S) AFFECTED:</b>	City Wide
<b>PREPARED BY:</b>	Brian Hughes 905-546-2424, Extension 7875
<b>SUBMITTED BY:</b>	Betty Matthews-Malone, P. Eng. Director, Operations Division Public Works Department
<b>SIGNATURE:</b>	

## Council Direction:

Not applicable.

## Background

The City of Hamilton has a number of roads crossing the escarpment which are either in close proximity to natural slopes or steep rock cuts excavated to create a roadway. In some locations rockfall events are potential risks for traffic.

Rockfalls have occurred regularly in the past. Generally, the rockfalls occurring on the Hamilton roadways are caused by deterioration of the escarpment face. As the rock mass in the escarpment has many horizontal and vertical fissures, it is susceptible to damage from freeze-thaw cycles and root damage from vegetation. In addition, groundwater seepage through the escarpment face causes erosion in the softer material in the make-up of the escarpment.

## Report

The Public Works Operations Division (Operations) administers an annual rock scaling program on the escarpment road crossings within the City. In order to assess the slopes to determine the appropriate maintenance strategy and timing of the work, a study was commissioned using a consulting firm, Golder Associates, who are recognized subject experts in rock assessments. The study was undertaken in 2015.

Golder Associates carried out the following work:

- An inspection of the rock slope locations which included a visual assessment of the exposed rock conditions, identification of potential rockfall hazards and mapping of relevant features of the slopes, such as major jointing, seepage, etc., as well as an assessment of the potential failure modes.

- Rating of the inspected sites with regard to the potential for rockfalls and the associated risk, priority assignment regarding maintenance scaling and provision for recommendations for additional remedial measures as required.

The locations are as follows:

- Fifty Road Mountain Access
- McNeilly Road Mountain Access
- Dewitt Rd
- New Mountain Rd
- Centennial Parkway
- Kenilworth Access
- Sherman Cut
- Sherman Access East and West
- Claremont Access
- Jolly Cut
- James Street Hill
- Queen Street Hill/ Beckett Drive
- Wilson St (Ancaster)
- Old Dundas Rd (Ancaster)
- Hwy 8 (Dundas)
- Sydenham Rd

The rating of each location was done by the consultant based on the information obtained in visual inspections and traffic information provided by the City. The overall rating for each site was based on MAGNITUDE (estimated amount of rock that might come down in a rockfall event); INSTABILITY (estimated frequency of rockfalls); REACH (estimated amount of roadway impacted with rock debris) and CONSEQUENCES (impact to traffic, etc).

A Slope Criticality Rating for each location was developed with this information. These ratings are intended to assist the Operations Division in planning rock scaling and other remedial measures, including the installation of steel mesh on the escarpment face.

It is important to consider that the rankings include factors such as traffic volume and proximity to the roadway which explains why some locations get a higher ranking over another which may appear to have a greater rockfall potential. It is also important to consider that these ratings are based on site observations at the time of the inspections and that due to ongoing weathering of the rock face the conditions can change, resulting in a change in priority rating.

Based on the study recommendations and staff observations the following locations were identified for maintenance priority:

- Queen Street Hill/Beckett Drive
- Sherman Access East & West
- Sherman Cut
- Jolly Cut

- Wilson Street
- New Mountain Rd
- Dewitt Rd

As the study was proceeding in 2015 maintenance work was already underway on the Sherman Cut where scaling and steel mesh was installed. Scaling on Sherman Access East has also been completed as of April 2016. Operations are developing a rock scaling program for summer 2016 & 2017 that will address the remaining priority locations.

#### Study Recommendations and Work Plan

Operations will undertake regular inspections of the escarpment crossing slopes. For most locations assessed in the 2015 study, the routine maintenance recommended involves regular rock scaling (every three to five years or as needed) with associated ditch maintenance. The normal annual budget allocation of \$300,000 for escarpment maintenance generally covers this routine maintenance. Operations will use the study as a guide in determining potential locations for the annual rock scaling program and will also assess areas that have exhibited significant rockfall events each winter.

The level of scaling work achievable within the annual capital program will be monitored by staff and with the regular inspections it will be determined if this funding is sufficient to address the routine maintenance needs over the long term for the escarpment crossings or if an increase is required.

The study also recommended that consideration be given to other remedial measures, including steel mesh and concrete barriers at some locations to provide greater protection to traffic. For locations with near vertical rock faces in close proximity to the roadway the installation of steel mesh is recommended. Steel mesh was installed on the Sherman Cut in 2015 and this will continue on the Sherman Access East this year. Additional locations will be assessed for future years work program and budgets will be increased to reflect these installations.

For permanent barrier installations, such as provided on the Sherman Access West, it is necessary to undertake the necessary planning, engineering design and budgeting. Potential locations will be reviewed with the Engineering Division for consideration in future year's budgets.

For escarpment crossings with extensive remedial recommendations necessary to protect traffic and/ or property at the top of the escarpment discussions are ongoing with Engineering Services and Risk Management. It is anticipated that staff will be undertaking further studies at many of the problem locations to develop appropriate cost effective strategies to address the short and long term escarpment crossing needs.