

**APPENDIX U**

**Hydraulic and Geomorphology  
Assessment**



## MEMO

**TO:** Peter Yu, P.Eng., PMP, Project Manager, WSP



**FROM:** Peter Hayes, P.Geo., Senior Geoscientist, WSP

**SUBJECT:** SW Agincourt Transportation Connections Class EA – Erosion Rate Fluvial Geomorphology Assessment

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As requested, this memo summarizes the erosion rate fluvial geomorphology assessment for the Highland Creek watercourse crossing the Canadian Pacific (CP) Rail corridor, in Scarborough, Ontario. The site location is shown on attached **Figures 1 to 9**.

## APPROACH

WSP's approach for the desktop fluvial geomorphology assessment was as follows:

- Obtaining historical aerials;
- Adding watercourse alignments on historical aerials;
- Assessing historical aerials, including a composite figure; and
- Complete a 100-year erosion rate assessment.

## SITE SETTING

The study area is located in the Highland Creek watershed, which is in the eastern section of the City of Toronto. Within the study area, the West Highland Creek flows to the southeast and discharges into the Lake Ontario drainage basin. An engineered floodplain flanks West Highland Creek within the study area.

The hydrologic regime has changed over the years due to channelization of the meandered headwater in order to permit new residential and industrial development and increase the total surface water flow. Also the loss of forest cover resulted in a lower water table, which caused many of the tributaries of the Highland Creek to disappear and result in an increase in runoff and erosion from the land (The Toronto and Region Conservation Authority, 1999).

## HISTORICAL AERIAL IMAGES

As a part of the fluvial geomorphology assessment WSP retrieved aerial imagery of the site approximately once every decade, as far back as available (1947, 1957, 1967, 1975, 1983, 1992, 2005, and 2021). The individual historical aerial images are provided on **Figures 1 to 8**. WSP approximated the watercourse channel for each historical aerial and compiled the approximated watercourse channels onto one figure to highlight the historical variations of the watercourse over the past 74 years, **Figure 9**. Watercourse alignments have various colours for individual historical aerial watercourse alignments such that each can be easily identified on the composite figure (**Figure 9**).

## ASSESSMENT

### AERIAL IMAGES - 1947 AND 1957

In 1947 and 1957 the area was rural and predominantly agricultural, but urbanization was present to the north and expanding. The watercourse south of Shepard Ave E was natural with meanders. The watercourse north of Shepard Ave E had been straightened.

### AERIAL IMAGES - 1967 AND 1975

In 1967 and 1975 urbanization continued with most of the area having been developed by 1975. By 1967 the watercourse had been straightened south of Shepard Ave E and by 1975 the watercourse was straightened south of the Canadian Pacific (CP) Rail corridor.

### AERIAL IMAGES - 1983, 1992, 2005, 2021

In 1983, 1992, 2005 and 2021 the area was urban. By 1983 the watercourse was straightened further along the entire site area with an engineered floodplain flanks.

### AERIAL IMAGES – OVERALL

Based on the historical aerials the area was rural with a natural channel historically and has since been developed into an urban area with a straightened watercourse channel and an engineered floodplain flanks.

WSP approximated the watercourse channel for each historical aerial photograph and compiled the approximated watercourse channels onto one figure to highlight the historical variations of the watercourse over the 74 year timeframe, 1947 to 2021 (**Figure 9**). As noted previously watercourse alignments have various colours for individual historical aerial watercourse alignments such that each can be easily identified on the composite figure (**Figure 9**).

Based on **Figure 9** it is interpreted that this watercourse channel has generally followed the same alignment pre 1983 with some minor shifts. Since 1983 the watercourse was straightened with an engineered floodplain flanks.

### 100-YEAR EROSION RATE

The TRCA (2015) *Crossing Guidelines for Valley and Corridors (Appendix 2.A)* describes a method for estimation of lateral 100-year erosion rates. This method is for a proposed

crossing and involves measurements at two meanders upstream and downstream of the crossing.

Generally, watercourse alignments for each historical aerial image are overlaid onto one figure to show the differences, **Figure 9**. Meander wavelengths and meander amplitudes are then marked-up for each of the assessed meanders. Finally, meander extension and meander translation values are measured for each meander as applicable.

Based on the TRCA (2015) *“the 100-year migration rate of the watercourse channel in the vicinity of the crossing are assumed equal to the migration rate of the bend immediately upstream of the crossing, or the average rate of the four bends measured in the analysis, whichever is greater”*.

As the watercourse has been straightened with an engineered floodplain flanks, no meanders are present in the site vicinity of the site and a 100-year erosion rate cannot be determined.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the fluvial geomorphology assessment the following conclusions and recommendations were determined:

- 1 Based on the historical aerials, the area has been progressively urbanized.
- 2 Based on the historical aerials, the watercourse channel has been fully straightened with engineered floodplain flanks.
- 3 Based on the TRCA (2015) *Crossing Guidelines for Valley and Corridors (Appendix 2.A)* a 100-year erosion rate cannot be calculated for this study area.
- 4 The watercourse channel has not changed since it was highly modify pre-1983. It is not anticipated to change given the hardened construction of the engineered channel.

## REFERENCES

- The Toronto and Region Conservation Authority, 199. State of the Watershed Report: Highland Creek Watershed. URL: [https://reportcard.trca.ca/app/uploads/2018/03/Highland-Creek-State-of-the-Watershed-Report\\_1999.pdf](https://reportcard.trca.ca/app/uploads/2018/03/Highland-Creek-State-of-the-Watershed-Report_1999.pdf)
- Toronto and Region Conservation Authority, 2015. Crossing Guidelines for Valley and Corridors.

## ATTACHMENTS:

Figures 1 to 8: Individual Historical Aerials  
Figure 9: Composite Historical Watercourse