# Appendix B

# Hydrology and Hydraulics

# Memo

**To:** Curtis Marshall, Town of Halton Hills

**From:** Aaron Farrell/Matt Britton

**Date:** April 7, 2017
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**File:** TP115042

**cc:** Steve Grace, Town of Halton Hills
Steve Burke, Town of Halton Hills

**Re:** **Premier Gateway Scoped Subwatershed Study – Supplemental Comparison of HSP-F Hydrologic Model Calibration and Simulated Peak Flows**

## INTRODUCTION

As requested (ref. e-mail correspondence Marshall-Farrell, March 8, 2017), Amec Foster Wheeler has conducted supplemental analyses to verify whether the 100 year frequency flow generated using the refined and uncalibrated HSP-F hydrologic model would represent the Regulatory flow for the watercourses through the Premier Gateway Lands. These supplemental analyses have been completed as requested by Conservation Halton (ref. e-mail correspondence Howatt-Marshall, February 22, 2017; e-mail correspondence Koshenkov-Farrell, March 28, 2017), and have built upon the information provided in the Technical Memorandum of January 31, 2017 detailing the legacy of development and calibration of the HSP-F hydrologic model for the Sixteen Mile Creek Watershed, as well as the calibration and validation undertaken specifically for the current Scoped Subwatershed Study. The following has been prepared to summarize the results of this assessment.

## 100 YEAR FREQUENCY FLOW ASSESSMENT

As requested by Conservation Halton (ref. e-mail correspondence Koshenkov-Farrell, March 28, 2017), the refined and uncalibrated HSP-F hydrologic model has been used to generate the 100 year frequency flows for the area watercourses. Consistent with the approach applied for the Phase 1 Characterization, the hydrologic model has been executed for a 42 year continuous simulation, and frequency analyses have been completed at key locations based upon the simulated annual maximum peak flows. The Three Parameter Lognormal Distribution has been applied for the frequency analyses based upon the observed fit between the trendline and the sample dataset. The 100 year frequency flows and the Regional Storm peak flows, as generated

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by the refined and uncalibrated HSP-F model, are presented in Table 1, along with the results generated by the refined and calibrated HSP-F hydrologic model.

**Table 1: Simulated Regional Storm Peak Flows and 100 Year Frequency Flows for Uncalibrated and Calibrated HSP-F Hydrologic Models ($m^3/s$)**

| Tributary | Reference Node | Uncalibrated Hydrologic Model | | Calibrated Hydrologic Model | |
|---|---|---|---|---|---|
| | | 100 Year | Regional Storm | 100 Year | Regional Storm |
| Hornby | 2.510 | 20 | 51.1 | 17.4 | 39.4 |
| | 2.520 | 1.7 | 6.51 | 1.7 | 6.51 |
| | 2.540 | 2.1 | 7.93 | 2.0 | 7.93 |
| | 2.670 | 20.9 | 63.3 | 18.1 | 53.1 |
| East Branch | 2.420 | 1.1 | 4.88 | 1.3 | 4.88 |
| | 2.430 | 9.4 | 16 | 9.1 | 8.67 |
| | 2.440 | 5.9 | 8.59 | 5.7 | 3.95 |
| | 2.450 | 15.7 | 26.5 | 14.8 | 19.4 |
| West Branch | 2.480 | 46.9 | 84 | 43.5 | 55.6 |
| Middle Sixteen Mile Creek | 2.660 | 57.6 | 123 | 56.3 | 78.9 |
| | 2.651 | 79.4 | 181 | 71.7 | 124 |

The results in Table 1 indicate that, for all regulated watercourses through the Premier Gateway area, the peak flow for the Regional Storm event exceeds the 100 year frequency flow generated by the refined and uncalibrated hydrologic model. As su
ch, the Regional Storm event represents the Regulatory Event.

The results in Table 1 also indicate that, as anticipated, the calibrated hydrologic model generates lower frequency flows than the uncalibrated hydrologic model. As such, the frequency flows generated by the calibrated hydrologic model are considered to represent the more constraining condition for establishing stormwater management facility sizing criteria for the Premier Gateway area. Further, as indicated in the January 31, 2017 Technical Memorandum, the results indicate that the Regional Storm peak flows generated by the refined and uncalibrated hydrologic model are greater than those generated by the refined and calibrated hydrologic model.

## CONCLUSION AND RECOMMENDATION

As noted,

(i) The results presented above, as well as the results presented in the Technical Memorandum of January 31, 2017 indicate that the peak flows generated by the calibrated and uncalibrated hydrologic model for the Regional Storm event are greater than the 100 year frequency flows generated by each model. Consequently, the Regional Storm event represents the Regulatory Event for both the calibrated and uncalibrated hydrologic models.

(ii) The results presented in the previous Technical Memorandum further indicate that the Regional Storm peak flow generated by the uncalibrated hydrologic model are greater than those generated by the calibrated model, hence the Regional Storm peak flows generated by the uncalibrated hydrologic model represent the more conservative (i.e. higher) flows for generating Regulatory Floodline Mapping for the area watercourses.

(iii) The results in the foregoing assessment have confirmed that the 100 year frequency flows generated by the calibrated HSP-F hydrologic model are lower than those generated by uncalibrated HSP-F hydrologic model. Consequently, the frequency flows generated by the calibrated hydrologic model represent the more conservative (i.e. lower) flows for establishing stormwater management facility sizing criteria for the Premier Gateway area.

Based upon the foregoing, it is recommended that the Regional Storm peak flows generated by the refined and uncalibrated hydrologic model be used to establish floodline mapping for the Premier Gateway area, as suggested by Conservation Halton (ref. e-mail correspondence Howatt-Marshall, February 22, 2017), and that the refined and calibrated hydrologic model be used to establish stormwater management facility design criteria, as recommended in Amec Foster Wheeler's prior correspondence (ref. e-mail correspondence Farrell-Marshall, February 23, 2017).

We trust the foregoing satisfies your current requirements. Feel free to contact our office should you have any questions.

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