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Memorandum

To	Don Kudo, P.Eng (Town of Halton Hills)	Page	1
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Subject	**Southwest Georgetown** **Proposed Tributary A Realignment Performance Specifications**		
From	Claire Wittnebel E.I.T, Ray Tufgar P.Eng		
Date	March 24, 2017	Project Number	60297831

In order to identify the requirements for the stream corridor within the southwest corner of the Vision Georgetown lands for the purposes of the Secondary Plan, The Town of Halton Hills retained AECOM to develop performance specifications for a natural flow channel and floodplain along Tributary A to Trafalgar Road. This memo outlines the storage capacity of the existing channels, for the purposes of tailoring the new channel to meet the stated criteria, as well as outlining the considerations for channel corridor widths, flood depth management, channel widths, and natural heritage protection.

Tributary A consists of five tributaries, designated A2, A3, A4, A5, and AM (reaches 1 to 7). Floodplain storage is to be managed as per Conservation Halton policies for each of the drainage elements that are identified as being retained as open watercourses through the headwater classification analysis. This includes tributary A4, where the floodplain storage is to be preserved to the 50 hectare drainage limit. Through the headwater classification analysis, it was determined that tributary A3 does not need to be retained as an open drainage element and, as such, floodplain storage does not need to be considered. Conveyance and existing floodplain storage is replicated on an incremental basis for all regulated features. The sub-watershed study recommendations in **Section 6.3** provide for the enhancement and realignment of AM, A2, and A5. This could potentially create a new channel parallel to Trafalgar Road, connecting to A5, and modifying the channel along A5 and the middle portion of AM. A potential channel alignment is shown in **Figure V1**, attached.

The final location of the valley lands in the southwest area of the study area on the lands described as Part of Lots 11 and 12 Concession 8 and referred to as Sixteen Mile Creek Tributary A will be refined through a supplemental study to this sub-watershed study. The performance specifications have been developed to allow for the management of the floodline shown on **Figure V1** by either containing within the channels or within other storage options as deemed appropriate. The supplemental study will demonstrate compliance of the future design with the following performance specifications developed through consultation with Conservation Halton:

- Channel corridor widths are to be minimally sized on the basis of:
    - Final Meander Belt Width + Valley Height x Stable Inclination (to include minimum 0.3 m freeboard above regulatory storm) + Regulated Allowance (15 m from greatest hazard)

- Channel corridors will be sized with regard for habitat linkage requirements as per the sub-watershed study recommendation.
- Sizing of channel corridors will consider adaptation needs resulting from the changing climate.

- Existing and proposed conditions hydraulic analysis is required to demonstrate (noting that it is proposed by the Town and supported by Conservation Halton that further refinement of the existing conditions hydrology will be completed that extends downstream beyond the study area and includes additional calibration and verification based on long term flow monitoring):
    - Corridor sizing maintains the existing floodplain storage through incrementally balanced cut and fill (0.3 m increments), to prevent increases in flood duration, erosive velocities, and flood depths. The incremental analysis may be performed utilizing grading and design software tools such as AutoCAD, or through hydraulic tools such as HEC RAS, based on a storm by storm analysis (provided that flood elevations associated with progressive standard storm return periods are less than 0.30 m apart). Where there are greater differences in corresponding flood levels (i.e. > 0.3 m), intermediary flows are to be modelled, to demonstrate maintenance of floodplain storage on an incremental basis.
    - Proposed floodplain alterations do not result in increases in flood elevation or velocities that negatively impact the potential flood susceptibility of existing buildings, or reduce potential for safe access and egress on any existing road or driveway. 'No' increase is defined as any increase in predicted water levels greater than 0.01 m (1 cm). Increases of 0.01 m or less are accepted as a modelling irregularity. Floodplain alterations that have off-property impacts that do not increase the level of risk to existing buildings or access routes, may be permitted by Conservation Halton where the affected property owner knowingly accepts the proposed floodplain increase and the impacts that will have on their current and future uses of the property. Changes in velocities and elevations are not to increase erosion potential, or increase flood risk over the full range of anticipated flow conditions from low flows to the Regulatory event.
- Given the extensive reservoir storage function occurring at the confluence of A5-1 and AM-6, alterations to reaches A5-1 and/or AM-5 to AM-7 will require hydrologic evaluation to ensure the potential channel corridor design will not result in routing modifications that significantly increase potential downstream flood risk, i.e. there is to be no significant increase in regulatory flows off-property or affecting any non-participating landowner.
- The proposed corridor must generally maintain the natural valley and channel length of the existing feature to be replicated.
- Proposed alterations must allow for continuation of natural channel processes, and not result in increased aggradation or erosion. The design is to achieve a channel morphology consistent with anticipated drainage, gradient, and sediment transport regimes, while meeting management and habitat objectives that demonstrates a smooth and stable transition to unaltered up and downstream reaches.
- A package is to be submitted for approval by agencies that contains:
    - Conceptual drawings (plan and elevation drawings showing planform, profile and typical treatments, as well as cross sectional drawings will be required to ensure that the corridor size will allow for an appropriate natural channel configuration; and

  - Discusses how the proposed conceptual design replicates form and function (including water balance requirements) and generally meets the management recommendations identified in the Management Strategy;

- All work must be completed by a qualified licensed professional (P.Eng. or P.Geo.) and should be undertaken in accordance with the Stream Corridors Adaptive Management and Design framework.
- Design components such as a riparian reservoir to accommodate flood storage would need to be supported by additional analysis demonstrating no significant negative impacts on natural channel design, channel function as compared to existing conditions and consideration of anticipated impacts up and downstream of the proposed reservoir.
- Concepts must provide sufficient assessment of the impact of channel lowering or justification for the need for channel lowering to demonstrate that the grading changes are necessary and will result in a net system benefit when evaluated holistically. This evaluation will need to consider how the proposed slope changes will impact sediment balance within the impacted reaches and within the downstream system, floodplain storage, vegetation communities and terrestrial habitat features, edge impacts and restoration requirements, water balance, fish passage, and water quality, at a minimum.
- Proposed condition flows should be utilized in the proposed condition floodplain analysis, given that the stormwater management strategy for the study area will alter the locations of flow contributions.
- Proposed channel configuration is based on maintenance of existing conditions within the NHS system (inclusive of the buffer) for all natural features to be retained.

Flooding in the southwest corner at the confluence of Reach A5-1 and Reach AM-6 is complicated by the inundation of a directly adjacent large flat area. This area provides significant riparian storage volumes that are available to attenuate flows from either reach. The attenuation can be modelled and considered in either a fully dynamic model run or more conservatively ignored by the manual addition of hydrographs in the model from each reach at the confluence.

Under the fully dynamic scenario flows can access the available floodplain storage at the confluence both in an upstream to downstream direction and via a backwater, should the timing and volumes of the two arriving hydrographs allow, the storage could be used twice in a single storm event. **Sections 4.6** and **4.7** in the sub-watershed study provide a full description of this model. Under the more conservative scenario the storage volume at the confluence is ignored, and hydrographs from Reach A5-1 and AM-6 upstream of the confluence have been added and inputted immediately downstream of the confluence (node J1887.99). The fully dynamic model will produce lower flow values, and lower storage volumes than the conservative scenario.

Due to the complex nature of this hydraulic function it is anticipated that it will be difficult to replicate the fully dynamic scenario under proposed conditions. Therefore the conservative approach has been adopted in establishing the design storm volume criteria included in **Table V1**. To support the use of a dynamic modelling approach, it must be demonstrated to the satisfaction of the Town and approval agencies that the dynamic conditions can be replicated.

HEC-RAS was utilized to assess the hydraulic properties of the existing channel. **Sections 4.6** and **4.7** in the sub-watershed study provide a full description of this model. It was noted that the difference in water surface elevations between 2-year and 5-year storm events was greater than

30 cm, and so an interim storm between the two flows was analyzed. The same was found for the 100-year storm and the Regional storm, which also had an interim flow assessed.

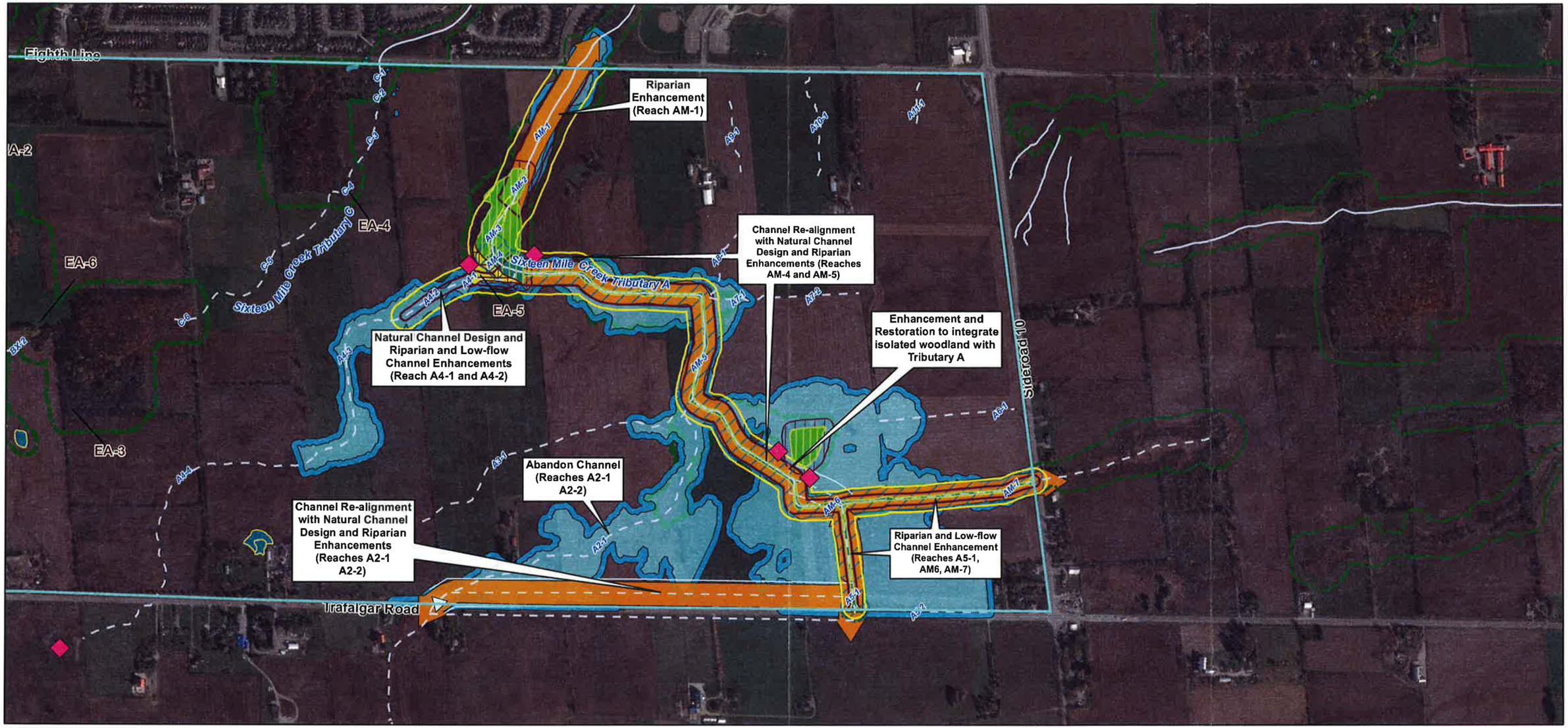
HEC-RAS volume calculations were used to assess the storage of Tributary A. The volume is calculated cumulatively from the cross-section to the end of the reach, so volumes were taken from cross-sections which were within the study area boundaries, not beyond. Additionally, in order to account for possible overlap of volumes at junctions and the distance from the junction to the first cross-section of the new reach, the volume from the last cross-section of the minor tributary (A5 and A4, into AM) was subtracted, and the volume from the last cross-section of the major tributary (Reach AM6 and AM5) was scaled to account for the extended reach length (from the junction to the first cross-section). The reach storage conditions have been summarized in **Table V1**, below.

Table V1: Existing Conditions for Tributary A

Storm Event	A2 Existing Storage	A5 Existing Storage	AM6 Existing Storage	AM5 Existing Storage	AM4 Existing Storage	AM3 Existing Storage	A4 Existing Storage	Total Existing Storage
	(m3)	*(m3)*	*(m3)*	*(m3)*	*(m3)*	*(m3)*	*(m3)*	*(m3)*
1.5 year	1600	840	693	1150	2370	1620	1870	10144
2 year	2120	1110	842	1385	3410	1960	2360	13187
2-5 year Interim	3760	3500	4789	2993	7490	3260	5720	31512
5 year	5580	5080	9762	5025	11000	4400	12870	53718
10 year	8130	10330	23505	9391	14760	6370	22480	94965
25 year	11680	15140	30377	18399	22320	9450	26460	133826
50 year	15170	18200	35890	23826	24420	12940	29640	160087
100 year	18510	22000	43011	31069	27950	15910	32880	191330
100-Regional Interim	25640	25700	49214	36392	34560	21240	35680	228427
Regional Storm	30080	29510	55459	43208	42340	26110	38770	265477

References

AECOM (2016). *Southwest Georgetown Subwatershed Study VISION GEORGETOWN Subwatershed Strategy Report*



Legend

- Study Area
- Erosion Hazard Limit
- Meander Belt
- Cultural Community
- Forest Community
- Wetland Community
- Unclassified Watercourse
- Intermittent Watercourse
- Permanent Watercourse
- Tributary Alignment Options For Enhancement
- Existing Floodline*
- Existing Floodline (15m buffer)*
- Natural Heritage System (ROPA 38)
- Flow Barrier Removal Opportunity
- Infill Restoration Opportunity

NHS - Terrestrial Components - Study Area

- Core
- Supporting
- Local Linkage (60 m)
- Woodland Buffer (10 m minimum)
- Wetland Buffer (25 m minimum)

*Existing conditions floodline not indicative of proposed conditions

SW Georgetown Channel Realignment | **Figure V1**

SW Georgetown IPP RPP

Project 60297831 March 2017

UTM Zone 17 N, NAD 83

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