Regional Municipality of Peel

ALBION / VAUGHAN ROAD AND KING STREET INTERSECTION IMPROVEMENTS, TOWN OF CALEDON

DRAFT DRAINAGE AND SWM REPORT
Schedule 'B' Class EA

B000709

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REVIEW AND SUBMISSION REGISTER			
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1. Introduction

As part of the widening and intersection improvements of Albion/Vaughan Road and King Street Class EA project, CIMA+ has been retained by the Regional Municipality of Peel to complete a stormwater assessment for within the study area which is shown on Figure 1 - Study Area. The purpose of the Stormwater Management (SWM) Report is to document the SWM plan to mitigate impacts from the Baseline Road Extension. Based on available background information, applicable design criteria, existing drainage conditions, the Stormwater Management Report will essentially provide an assessment of proposed conditions for the preferred roadway improvements, evaluate and recommend a drainage plan for water quality and quantity including the latest low impact development practices for storm water management.

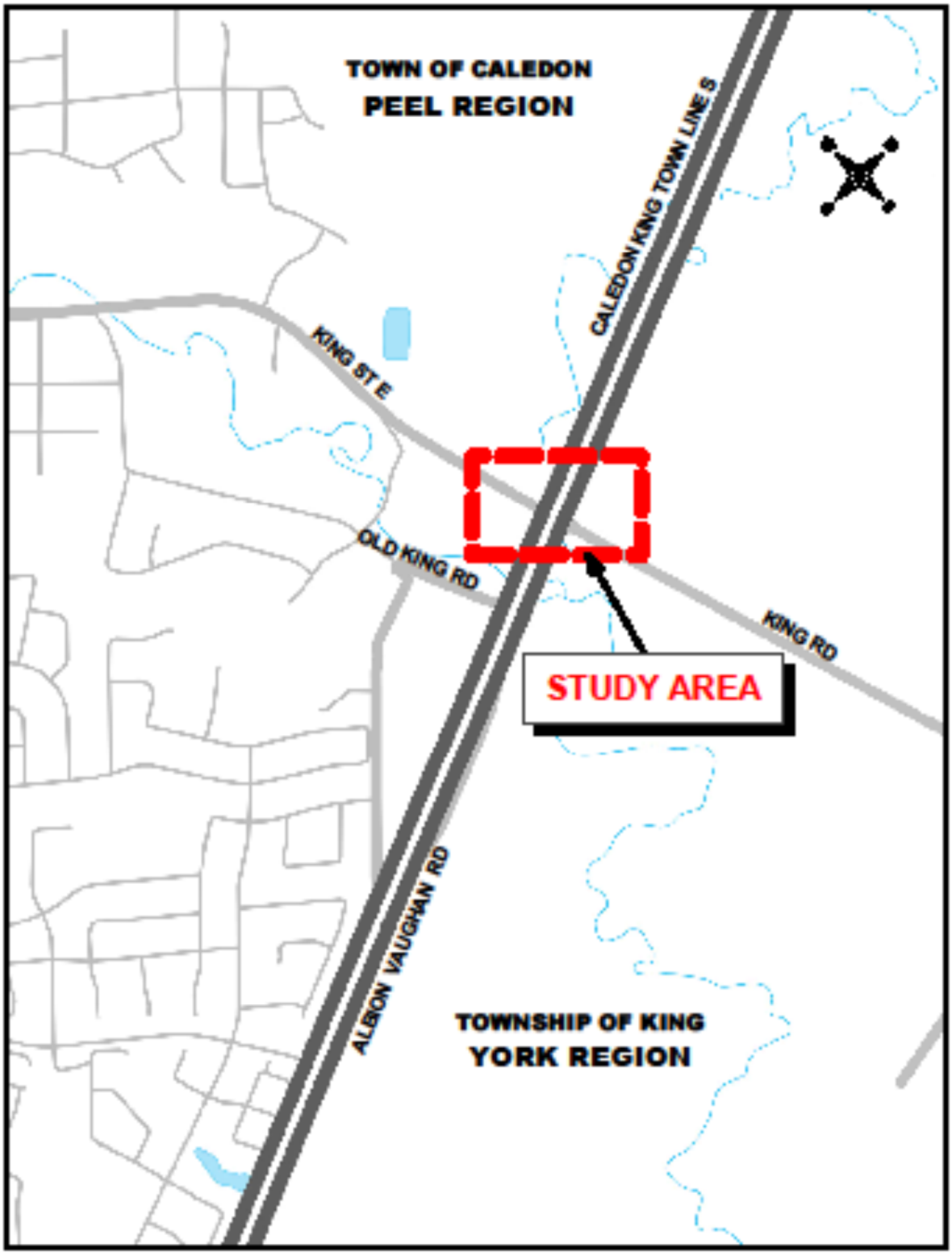
2. Background

The study area is located at the intersection of Albion Vaughan Road and King Road, which is in close proximity to the confluence of Cold Creek and Humber River Main Branch, within the upper portion of the Humber River watershed. Stormwater drainage from the intersection drains to the Humber River watershed, within the jurisdiction of the Toronto and Region Conservation Authority (TRCA). A majority of the study area is located within TRCA's floodplain and regulation limits.

The following background drawings, studies and guidance documents were obtained as part of the SWM Study:

- King Street – Humber Lea Rd. To Albion Vaughan Road – 09-4090 – Storm Sewer Design Sheets;
- King Street – Humber Lea Rd. To Albion Vaughan Road – 09-4090 – Drainage Area Plan;
- Region of Peel GIS data including 2015 Aerial Images, contours, stormsewers, catchbasins, and drainage features;
- Stormwater Management Criteria, TRCA August 2012;
- Hydrology Study: - Humber River Watershed Hydrology Update (Aquafor Beech Ltd, Nov. 2002);
- Humber River Hydrology Update, Civica, June 2015;
- Guidelines for the Preparation of Stormwater Management Reports in Support of Municipal Class Environmental Assessments; and
- MOE's Stormwater Management Planning and Design Manual, March 2003.

Figure 1: Study Area Plan



3. Existing Site Conditions Characterization

This section describes the existing conditions drainage and SWM within the study area that will be impacted by the intersection improvements. The drainage characteristics of the site depend on many things, including the topography, local land use and the type of native soil.

3.1 Tributary Areas, Outlets and Drainage Patterns

Topography of the study area is defined by the valley / channel of the Humber River, and the confluence with Cold Creek Tributary. Existing overland drainage generally drains to a low point / sag at the intersection. The catchment areas and outlets are described below and depicted in Figure 2:

Catchment 1: King Street East from Sneath Road to Caledon King Townline Road, and Caledon King Townline Road to Cold Creek Bridge to the North is an urban cross-section with curb and gutter, catch basins, and storm sewers. The majority of the flows from King Street East are treated by an existing Oil Grit Separator on the NW corner of the intersection, prior to outletting to Cold Creek via a 675mm stormsewer on the NE corner of the intersection.

Catchment 2: Albion Vaughan Road from King Street East to Old King Road is an urban cross-section with curb and gutter, catch basins and storm sewers discharging to an outlet on the SE corner of the intersection via a 450mm stormsewer. The flows outlet to a 1.0m wide enhanced swale prior to discharging to Cold Creek.

Catchment 3: King Road from Albion Vaughan Road to 400m East of the intersection is a semi-rural cross-section with CB's and DI's on the north side of the road outletting to a grass ditch on the South Side of the road outletting to Cold Creek.

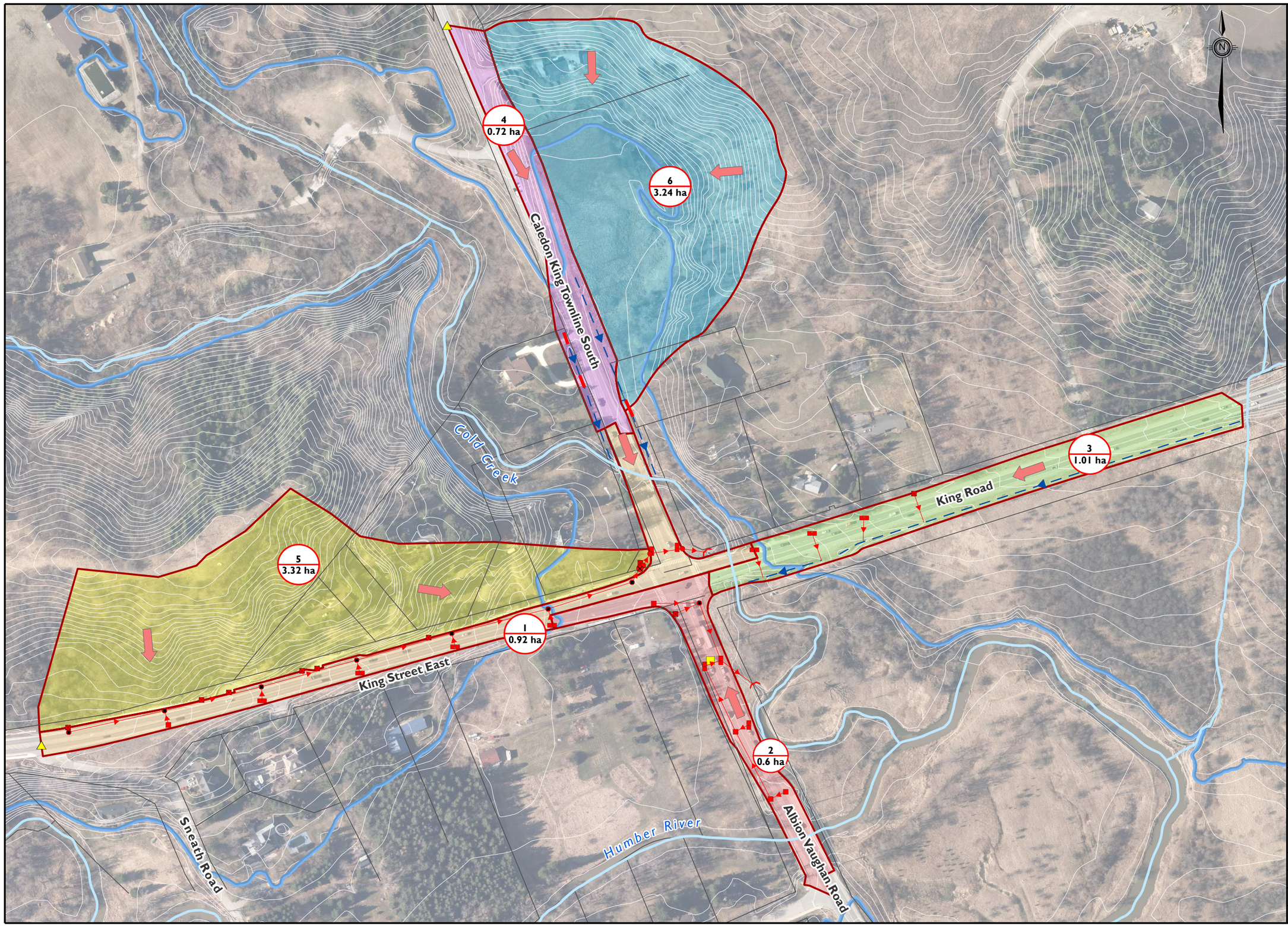
Catchment 4: Caledon King Townline Road North of Cold Creek is a rural cross-section with grass ditching on both sides of the roads draining South to Cold Creek.

Catchment 5: The external drainage area is predominantly undeveloped with low-density residential properties draining to the King Street East stormsewer system as described in Catchment 1.

Catchment 6: The external drainage area is predominantly undeveloped draining to the Caledon King Townline Road ditch system as described in Catchment 4.

3.2 Land Use and Soils Conditions

Land use in the study area generally consist of low-density residential development, and undeveloped valley lands. The soil within the study area consist primarily of bottom land, and clay loam which is classified as hydrologic soil group C. In terms of drainage this type of soil is considered to have a moderate to poor drainage capability, meaning very little rainfall in the open areas will soak into the ground, leaving most of the water as runoff. Refer to Figure 3 for the existing soils conditions.



LEGEND

EXISTING STORM INFRASTRUCTURE

- CATCH BASIN
- CATCH BASIN MAINT. HOLE
- DOUBLE CATCH BASIN
- DITCH INLET
- MAINT. HOLE
- OIL-GRIT SEPARATOR
- OUTFALL
- SEWER
- CULVERT
- EXISTING DITCH

EXISTING CATCHMENT AREAS

- 1
- 2
- 3
- 4
- 5
- 6
- 2 / 0.6 ha — CATCHMENT ID / CATCHMENT AREA (HA)

OTHER FEATURES

- HIGH POINT
- LOW POINT
- WATERCOURSE
- PROPERTY PARCEL
- FLOODPLAIN LIMITS
- OVERLAND FLOW DIRECTION

CLIENT

Region of Peel
Working for you

PROJECT NAME:

PEEL - KING VAUGHAN ENVIRONMENTAL ASSESSMENT

SHEET TITLE:

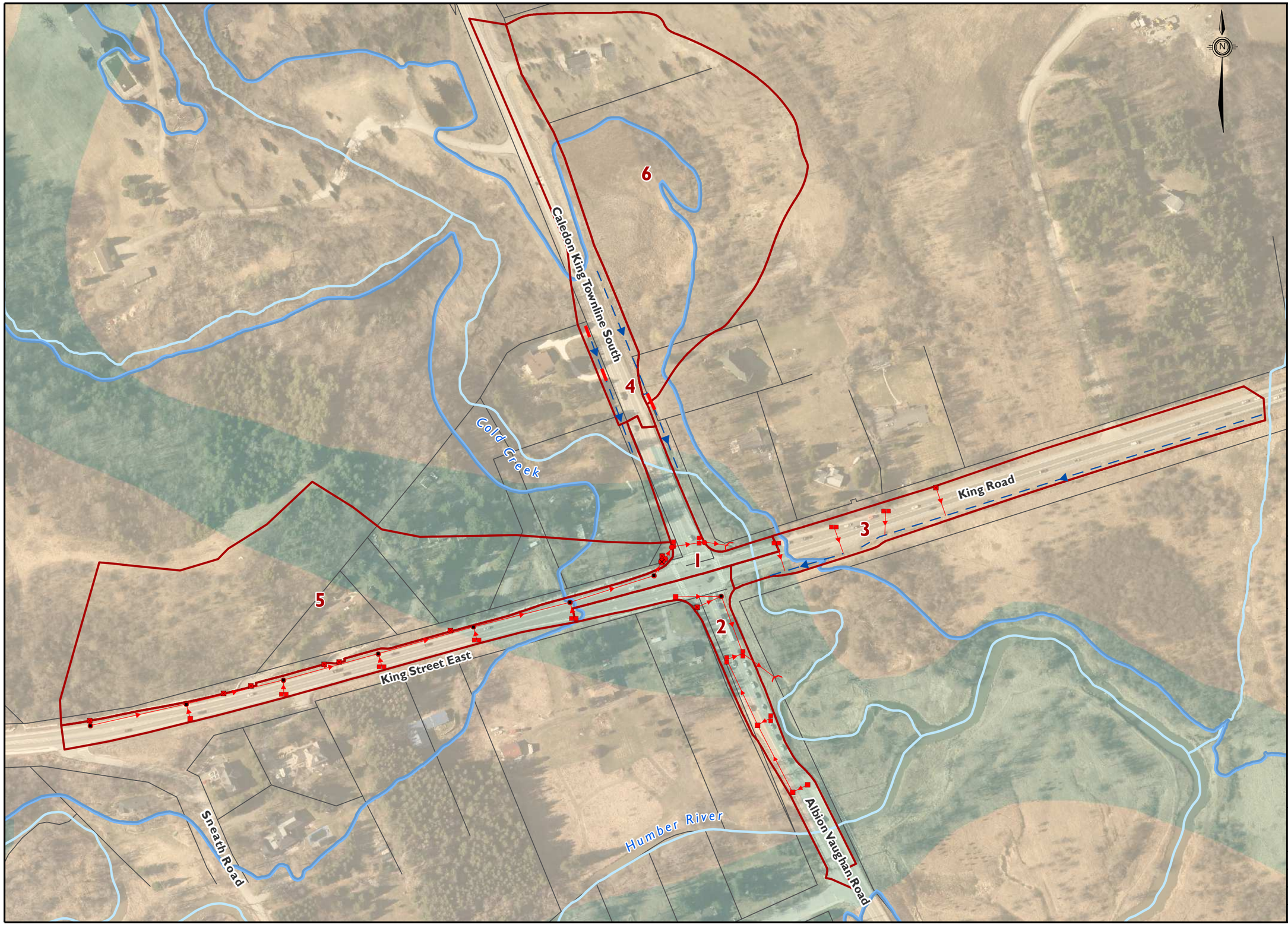
DRAINAGE MOSAIC EXISTING CONDITIONS

SCALE:

25 12.5 0 25 50 75

meters
1:2,500

PROJECT No: B000709		CLIENT FILE No: ---
DRAFTER: S. ELLIOTT	DESIGNER ---	DRAWING No: --
APPROVER R. CRESSMAN	APPROVER ---	
DATE: 2/14/2018		SHEET No: 1 of 1



LEGEND

EXISTING STORM INFRASTRUCTURE

- CATCH BASIN
- CATCH BASIN MAINT. HOLE
- DOUBLE CATCH BASIN
- DITCH INLET
- MAINT. HOLE
- OIL-GRIT SEPARATOR
- OUTFALL
- SEWER
- CULVERT
- EXISTING DITCH

SOIL SURVEY COMPLEX (LIO)

- BOTTOM LAND
- KING CLAY LOAM

OTHER FEATURES

- WATERCOURSE
- PROPERTY PARCEL
- FLOODPLAIN LIMITS
- EXISTING CATCHMENT AREAS
- 2 CATCHMENT AREA ID

CLIENT

Region of Peel
Working for you

PROJECT NAME:

PEEL - KING VAUGHAN ENVIRONMENTAL ASSESSMENT

SHEET TITLE:

SOIL MAP
EXISTING CONDITIONS

SCALE:

25 12.5 0 25 50 75

meters
1:2,500

PROJECT No: B000709		CLIENT FILE No: ---
DRAFTER: S. ELLIOTT	DESIGNER ---	DRAWING No: --
APPROVER R. CRESSMAN	APPROVER ---	
DATE: 10/19/2017		SHEET No: 1 of 1

3.3 Existing Bridge Structures

There are 3 major watercourse bridge crossings within the study area, as shown in Figure 4 below, and as characterised in the following table:

Table 1: Summary of Existing Watercourse Bridge Crossing Structures

Description	Picture
Structure 1: Albion / Vaughan Road (Peel Regional Road 14) Bridge over Humber River, is a 3 span (12.1m-20.2m-12.1m) pre-stressed concrete girder bridge, original constructed in 2004. The structure is located approximately 200m south of King Road. No erosion/scour to note. There is a pedestrian trail on the south side including staircase walkway on the west side of the structure.	
Structure 2: King Road Bridge (York Regional Road 11) over Cold Creek (Structure ID 37-78), is a 12.9m single span arch concrete bridge, constructed is unknown. The structure is located approximately 25m east of Caledon Townline Road. A water survey of Canada (WSC) monitoring gauge is located at the upstream end of King Road Bridge. The spillway/intake is on the upstream side of the bridge, and the shelter is on the south side of King on the east bank.	
Structure 3: Caledon King Townline Road Bridge over Cold Creek (Structure ID 37-77), is a 8.4m single span arch concrete bridge, original constructed in 1982, and rehabilitated in 2004. The Structure is located approximately 90m north of King Road. There is an erosion/scour hole along the south abutment (0.3m to 0.5m deep). No damage or uncutting of the footing was observed.	

Figure 4: Watercourse Crossings

4. Stormwater Objectives

The following section provides an overview of stormwater management objectives and design criteria for the study area, with reference to the MOECC's SWM Planning and Design Manual (2003), and TRCA SWM Guidelines (2012):

- No quantity control is required in this portion of the Humber River Watershed as per the TRCA's Stormwater Management Criteria, August 2012. (See Appendix A for Table E.1 summarizing the quantity control release rates for Humber River)
- All watercourses within TRCA's jurisdiction are classified as requiring an Enhanced level of water quality protection, equivalent to 80% TSS removal on an annual basis as per MOECC's stormwater design manual.
- The minimum erosion control requirement for TRCA's entire jurisdiction is retention of the first 5mm of every rainfall event, for the area of widening.

The stormwater objectives are expected to be met through a treatment train approach comprising of traditional drainage conveyance methods, conventional stormwater management measures and Low Impact Development (LID) features, where feasible.

5. Proposed Conditions

The Transportation and Traffic Study Report completed by CIMA as part of the EA study identified a number of alternatives to reduce traffic impacts for the 2031 traffic scenario. The following provides an overview of the intersection improvement alternatives developed for the EA and an assessment of the proposed impacts associated with the preferred alternative: Four Lane Widening.

5.1 Bolton Residential Expansion Study (BRES) Option 6

The BRES Option 6 intersection improvements include the addition of a right turn lane for eastbound traffic. The proposed improvements will not require any bridge lengthening. A retaining wall will be constructed to mitigate any impacts to the encroachment of fill adjacent to Cold Creek.

5.2 Double Left Turn (Westbound)

The double left turn intersection improvements include the addition of a right turn lane for eastbound traffic plus the addition of a left turn lane for westbound traffic. This will require two westbound and southbound receiving lanes, construction of a retaining wall, and lengthening of King Road Bridge (Structure 2).

5.3 Four Lane Widening

The Four Lane Widening intersection improvements include the addition of a NBL through-right lane, conversion of SBL right turn lane to southbound through right lane, addition of a westbound through-right lane, and converting existing EBL right turn lane to eastbound through right lane. Each direction will have 1 left turn lane, 1 through lane, 1 through – right lane, and 2 receiving lanes.

The Four Lane Widening alternative will require construction of a retaining wall, lengthening of King Road Bridge (Structure 2) and lengthening of Caledon King Townline Road Bridge (Structure 3).

5.4 Hydrology and Hydraulic Assessment

A detailed hydraulic assessment, documented under separate cover, was completed to evaluate the impact of lengthening the King Road Bridge to a total length of 22.0m (3.5m lengthening on the south side and 1.5m lengthening on the north side), and lengthening the Caledon King Townline Road Bridge to a total length of 20.5m (3.0m lengthening on the east side). It was determined that the hydraulic impact for the Four Lane Widening alternative will have negligible impacts on water levels and velocities when compared to existing conditions.

The lengthening on the north side of King Road Bridge will have impacts on the Water Survey of Canada (WSC) stream gauge and will require consultation with the National Hydrological Service during future design stages.

5.5 Stormwater Management Assessment

The proposed drainage conditions for the future intersection improvements will result in some localized increases in roadway imperviousness at the intersection. The following table summarizes the increase in impervious area for each section within the study area based on airphoto interpretation, survey data and proposed four lane widening intersection improvements as shown in Figure 5.

Table 2: Summary of Impacts for Four Lane Widening Alternative

Catchment	Area (ha)	% Impervious		Increase in Impervious	Impervious Area (ha)	
		Existing	Future	(%)	Existing	Future
Catchment #1	0.92	82.7%	88.2%	5.5%	0.76	0.81
Catchment #2	0.60	84.1%	99.4%	15.3%	0.50	0.60
Catchment #3	1.01	51.9%	59.2%	7.3%	0.52	0.60
Catchment #4	0.72	30.5%	33.0%	2.5%	0.22	0.24
Total	**3.25**	**61.8%**	**69.0%**	**7.2%**	**2.01**	**2.24**

Overall, there is less than 10% increase in the impervious area for the entire study area under ultimate conditions. Catchment #2 can expect to see the greatest increases, with approximate 15% increase in impervious area, while Catchment #4 will have the smallest increases at 2.5%.

There are no major changes to the drainage patterns as part of the future improvements. However, stormsewers may be impacted by the widening and will require modifications including re-locating catchbasin inlets and extension of sewer leads.

The proposed strategy for managing the impacted study area will be to enhance the water quality treatment of Catchment #2. In the interim and ultimate intersection configurations, this catchment will be impacted the most (greater than 10% increase) and therefore efforts should focus on this catchment. An oil grit separator could be installed before the enhanced swale to provide a treatment train approach to achieve 80% TSS removal for Catchment #2. A Hydroworks HydroStorm 8 or equivalent OGS unit will provide the necessary level of quality control to outlet Catchment #2 to the enhanced swale. The existing enhanced swale, at the outlet, could be enlarged or lengthened in order to capture the 5mm event for the area of widening, a total of 11.5m^3 of runoff, which would require an extra 2.5m wide, 23m long swale.

No water quality control will be implemented for the remaining catchments given the minor increases. The existing best management practices, including, oil-grit separator and roadside ditches, will be sufficient to mitigate the proposed widening.

No quantity controls will be required, as per TRCA guidelines for Humber River, Table E.1 Quantity Control Release Rates can be found in Appendix A.

LEGEND

- NEW ROAD SURFACE WITH 4 LANE WIDENING
- EXISTING BRIDGE STRUCTURE
- PROPOSED BRIDGE WIDENING
- PROPOSED RETAINING WALL
- EXISTING CATCHMENT
- 2 CATCHMENT AREA ID

PROPOSED STORM INFRASTRUCTURE

- CATCH BASIN
- DOUBLE CATCH BASIN
- DITCH INLET
- MAINT. HOLE
- OIL-GRIT SEPARATOR
- OUTFALL
- SEWER
- SWALE

EXISTING STORM INFRASTRUCTURE

- CATCH BASIN
- CATCH BASIN MAINT. HOLE
- DOUBLE CATCH BASIN
- DITCH INLET
- MAINT. HOLE
- OIL-GRIT SEPARATOR
- OUTFALL
- SEWER
- CULVERT
- EXISTING DITCH

OTHER FEATURES

- WATERCOURSE
- PROPERTY PARCEL
- FLOODPLAIN LIMITS

CLIENT

Region of Peel
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PROJECT NAME:

PEEL - KING VAUGHAN ENVIRONMENTAL ASSESSMENT

SHEET TITLE:

DRAINAGE MOSAIC PROPOSED INFRASTRUCTURE

SUB TITLE:

FOUR LANE WIDENING

SCALE:

10 5 0 10 20 30 40 50
meters
1:1,500

PROJECT No: B000709		CLIENT FILE No: ---
DRAFTER: S. ELLIOTT	DESIGNER ---	DRAWING No: --
APPROVER R. CRESSMAN	APPROVER ---	
DATE: 6/1/2018		SHEET No: 1 of 1

APPENDIX A

Humber River SWM Quantity Control Release Rates

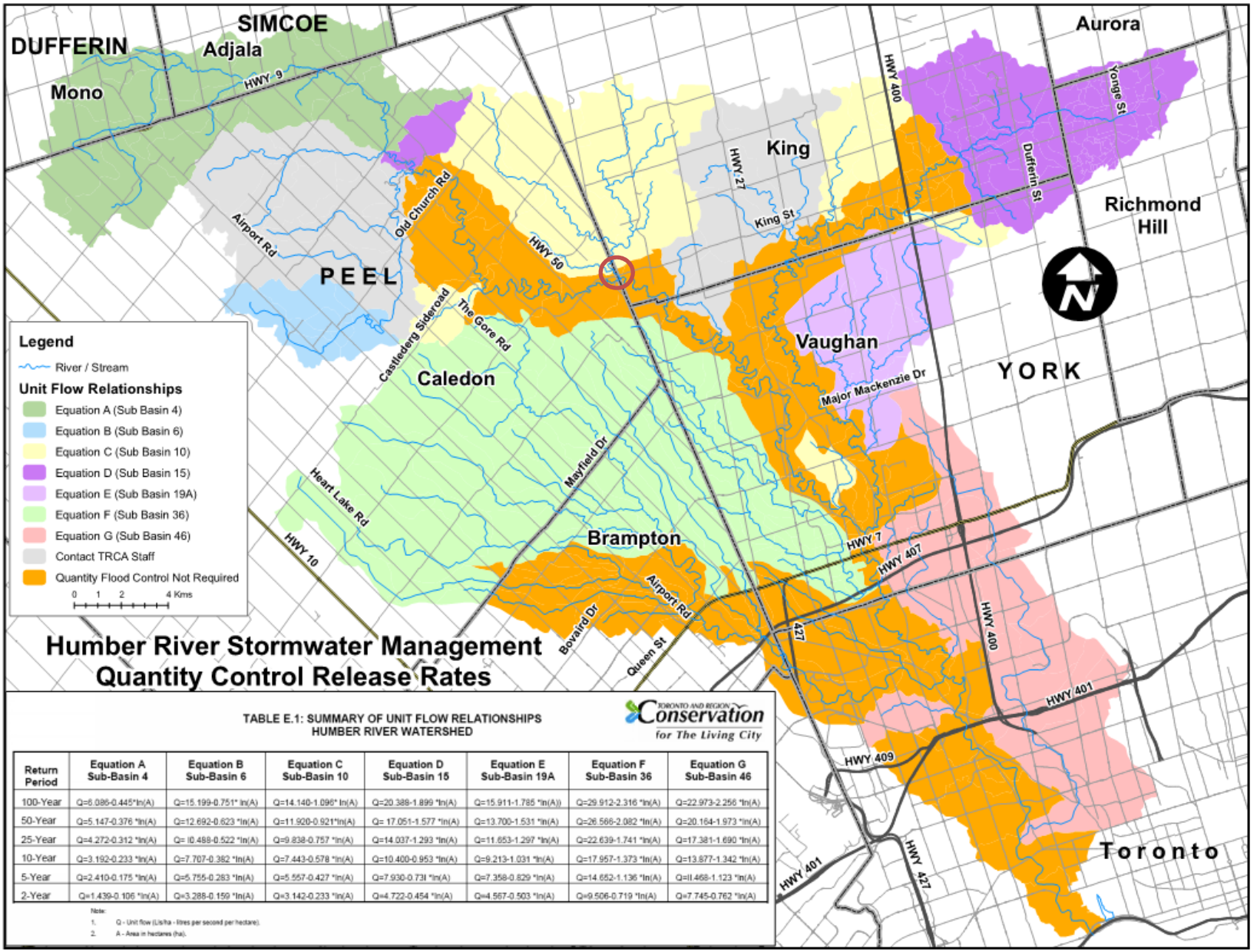


TABLE E.1: SUMMARY OF UNIT FLOW RELATIONSHIPS
HUMBER RIVER WATERSHED

Conservation for The Living City

Return Period	Equation A Sub-Basin 4	Equation B Sub-Basin 6	Equation C Sub-Basin 10	Equation D Sub-Basin 15	Equation E Sub-Basin 19A	Equation F Sub-Basin 36	Equation G Sub-Basin 46
100-Year	Q=6.086-0.445*ln(A)	Q=15.199-0.751* ln(A)	Q=14.140-1.096* ln(A)	Q=20.388-1.899 *ln(A)	Q=15.911-1.785 *ln(A))	Q=29.912-2.316 *ln(A)	Q=22.973-2.256 *ln(A)
50-Year	Q=5.147-0.376 *ln(A)	Q=12.692-0.623 *ln(A)	Q=11.920-0.921*ln(A)	Q= 17.051-1.577 *ln(A)	Q=13.700-1.531 *ln(A)	Q=26.566-2.082 *ln(A)	Q=20.164-1.973 *ln(A)
25-Year	Q=4.272-0.312 *ln(A)	Q= I0.488-0.522 *ln(A)	Q=9.838-0.757 *ln(A)	Q=14.037-1.293 *ln(A)	Q=11.653-1.297 *ln(A)	Q=22.639-1.741 *ln(A)	Q=17.381-1.690 *ln(A)
10-Year	Q=3.192-0.233 *ln(A)	Q=7.707-0.382 *ln(A)	Q=7.443-0.578 *ln(A)	Q=10.400-0.953 *ln(A)	Q=9.213-1.031 *ln(A)	Q=17.957-1.373 *ln(A)	Q=13.877-1.342 *ln(A)
5-Year	Q=2.410-0.175 *ln(A)	Q=5.755-0.283 *ln(A)	Q=5.557-0.427 *ln(A)	Q=7.930-0.73I *ln(A)	Q=7.358-0.829 *ln(A)	Q=14.652-1.136 *ln(A)	Q=II.468-1.123 *ln(A)
2-Year	Q=1.439-0.106 *ln(A)	Q=3.288-0.159 *ln(A)	Q=3.142-0.233 *ln(A)	Q=4.722-0.454 *ln(A)	Q=4.567-0.503 *ln(A)	Q=9.506-0.719 *ln(A)	Q=7.745-0.762 *ln(A)

Note:
1. Q - Unit flow (L/s/ha - litres per second per hectare).
2. A - Area in hectares (ha).

B000709

APPENDIX B

OGS Unit Sizing

Hydroworks Sizing Summary

04-16-2019

Recommended Size: HS 8

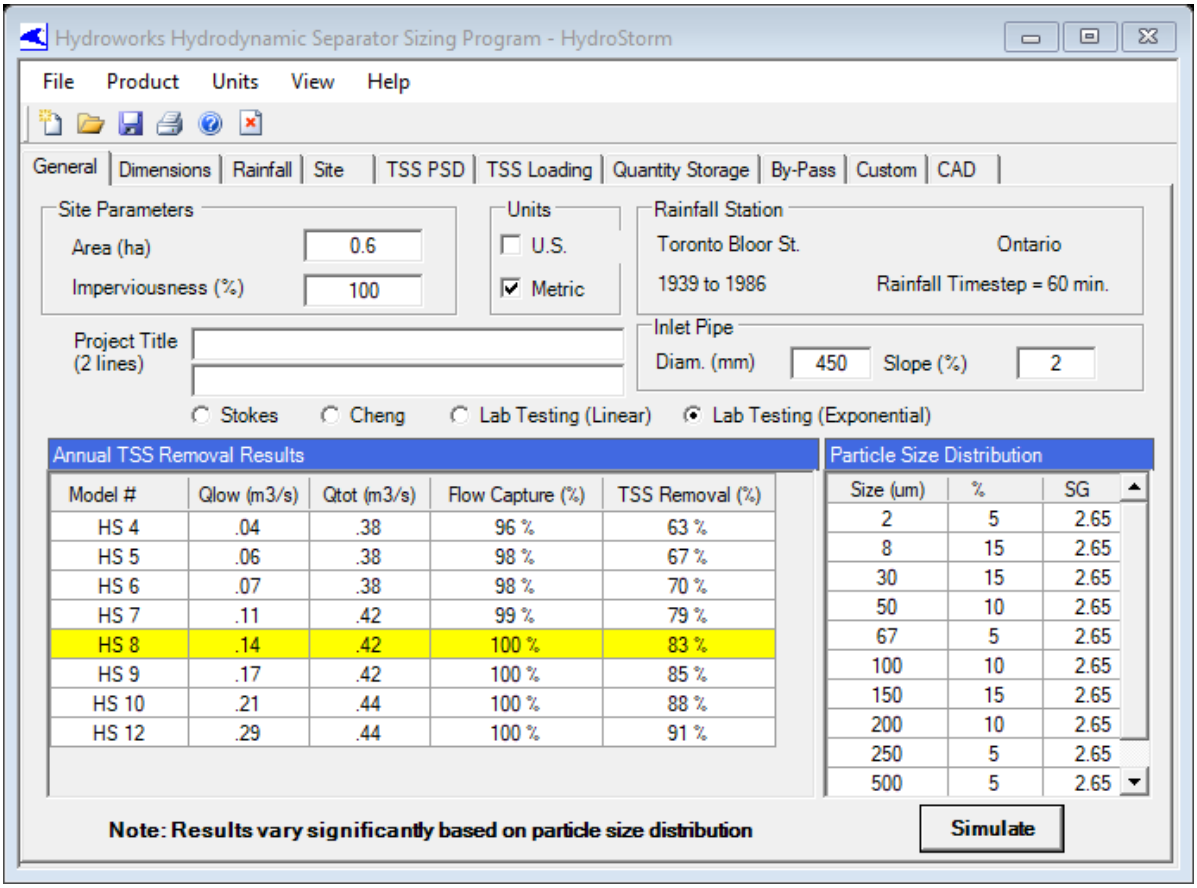
A HydroStorm HS 8 is recommended to provide 80 % annual TSS removal based on a drainage area of 0.6 (ha) with an imperviousness of 100 % and Toronto Bloor St., Ontario rainfall for the NJDEP particle size distribution.

The recommended HydroStorm HS 8 treats 100 %of the annual runoff and provides 83 % annual TSS removal for the Toronto Bloor St. rainfall records and NJDEP particle size distribution.

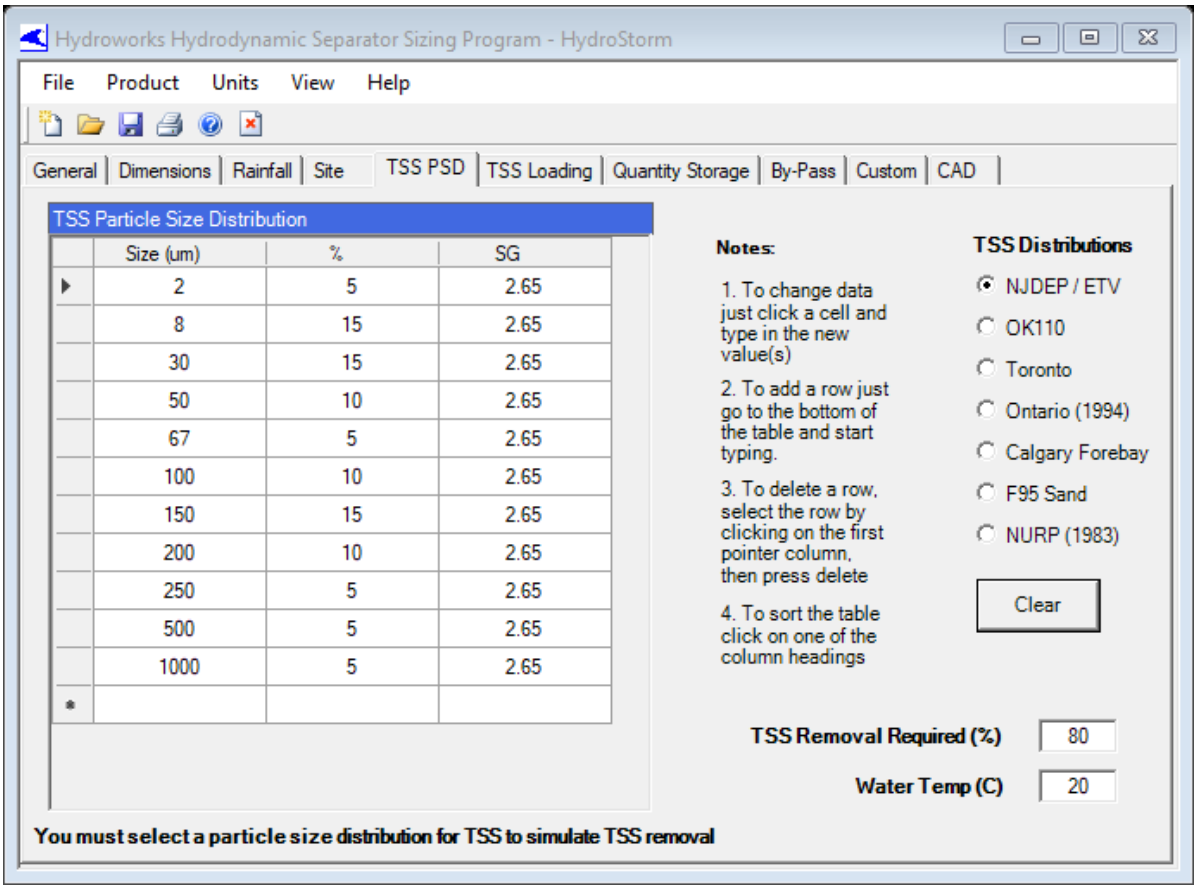
This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

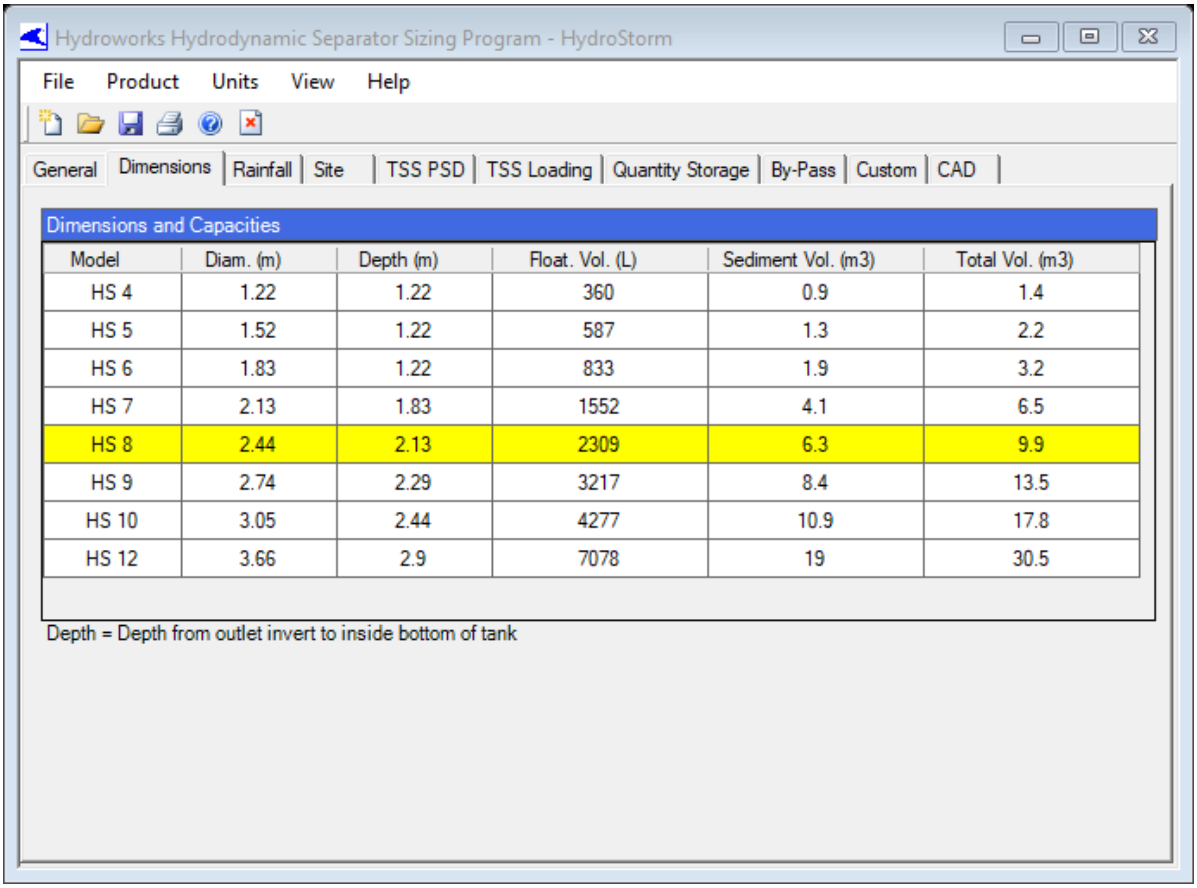
TSS Removal Sizing Summary



TSS Particle Size Distribution



Dimensions And Capacities



Dimensions and Capacities

Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 4	1.22	1.22	360	0.9	1.4
HS 5	1.52	1.22	587	1.3	2.2
HS 6	1.83	1.22	833	1.9	3.2
HS 7	2.13	1.83	1552	4.1	6.5
HS 8	2.44	2.13	2309	6.3	9.9
HS 9	2.74	2.29	3217	8.4	13.5
HS 10	3.05	2.44	4277	10.9	17.8
HS 12	3.66	2.9	7078	19	30.5

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 8 CAD Drawing