TRAFALGAR ENGINEERING

FUNCTIONAL SERVICING REPORT

Water, Sanitary, and Stormwater Management

CONDOMINIUM TOWNHOUSE AND COMMERCIAL DEVELOPMENT

16114 AIRPORT ROAD
TOWN OF CALEDON
OPA 17-02/RZ 17-09

OUR FILE: 1599

PREPARED FOR SHACCA CALEDON HOLDINGS INC.

SEPTEMBER 28, 2020

(905) 338-3366 #1-481 Morden Road, Oakville, ON, L6K 3W6 www.trafalgareng.com

REVISION HISTORY

DATE	REVISION	SUBMISSION
March 15, 2017		Issued for Rezoning Application
February 6, 2018	2	Revised per TRCA Comments (not submitted)
October 29, 2019	3	Reissued for Rezoning Application
September 28, 2020	4	Reissued for Rezoning Application

TABLE OF CONTENTS

APPENDICES

Appendix 'A' - Topographic Survey
- Site Plan

Appendix 'B' - Grading Plan (G1)
- Servicing Plan (S1)
- Erosion and Sedimentation Control Plan (E1)

Appendix 'C' - Estimated Domestic Water Demand
- *Fire Hydrant Flow Test*
- Estimated Sanitary Flow

Appendix 'D' - TRCA SWM Requirements (email)
- Pre-Development Drainage Area Plan (Figure 1)
- Post-Development Drainage Area Plan (Figure 2)
- Storm Sewer Design Sheet
- HydroCAD Output
- Oil/Grit Separation Sizing
- *CB Shield detail and sizing chart*

Appendix 'E' - Caledon East Wetland Complex Catchment Basin
- Caledon East Wetland Complex Roll #21240500010570000000
- Pre-Development Model Sub-catchment Areas (Figure 3)
- Post-Development Model Sub-catchment Areas (Figure 4)
- Model Parameters
- Interpreted Groundwater Flow (R.J. Burnside)
- EPA SWMM Model Input File

Appendix 'F' *- Table 2: Criteria used to evaluate the probability and magnitude of hydrological change, TRCA Wetland Water Balance Risk Evaluation*
- Table 3: Criteria used to evaluate the sensitivity of the wetland to hydrological change, TRCA Wetland Water Balance Risk Evaluation
- Figure 3: Wetland Risk Evaluation Decision Tree
- Figure 4: Ecological Land Classification (Dillon Consulting)
- Table 6: Ecological Land Classification (Dillon Consulting)
- Appendix 2: List of Wetland Community Types within Toronto and Region Conservation Authority Jurisdiction by Hydrological Sensitivity
- Water Balance, Tables G-1 to G-4 (R.J. Burnside)

Appendix 'G' *- Email correspondence with TRCA re: grading*
- Email correspondence with Region of Peel re: Airport Road drainage
- Email correspondence with TRCA re: model requirements

1.0 INTRODUCTION

1.1 Scope of Functional Servicing Report

This report has been prepared in support of the Rezoning Application made by Shacca Caledon Holdings Inc. (the client) for the site located at 16114 Airport Road (the Subject Lands) in the Town of Caledon. The report examines the availability of municipal services (storm, sanitary and water) to support the proposed development, and provides preliminary servicing details and outlines storm water management requirements. The information provided in this report is preliminary, and detailed engineering designs and drawings will need to be undertaken as part of the site plan design and prior to submission for building permits.

This report has been prepared for the exclusive use of Shacca Caledon Holdings Inc. and cannot be used by other parties without the prior written approval of Trafalgar Engineering Ltd. Revisions to the body of this report are indicated in italics.

1.2 Site Location and Description

The site is located on the north-west corner of the intersection of Airport Road and Walker Road in the Town of Caledon. The site is approximately 4.08 ha and currently occupied by a two-storey designated heritage home known as Allison's Grove. The site is bounded by Airport Road to the east, a condominium townhouse development to the north, wetland to the west, and Walker Road West to the south. Approximately one third of the southern frontage is interrupted by two residential lots: numbers 5 and 7 Walker Road West.

A copy of the topographic survey has been included in Appendix 'A' for reference.

1.3 Proposed Development

The client proposes to divide the subject lands into two development parcels; a breakdown of the proposal is as follows: a residential condominium of approximately 0.944 ha, a commercial lot of approximately 0.557 ha, an Airport Road widening of approximately 0.067 ha, and the remaining 2.514 ha of wetland, compensation area, and associated buffer to remain in its natural condition beyond the limits of the development. The heritage home sits along Airport Road approximately half-way along the site frontage and is to remain.

The townhouse condominium consists of five blocks of between six and eight units each for a total of 32 units. Access to the residential condominium is proposed via condominium road from Airport Road, approximately 170 m north of Walker Road. The *L-shaped* condominium road runs west from Airport Road *and bends south* dividing the residential and commercial components; on-street parking is proposed along the east side of the *south leg*.

The commercial component of the development consists of the heritage home converted to commercial space, as well as a large commercial building to its south. Two entrances are proposed to the commercial re-development: one from Airport Road approximately 95 m north of Walker Road, and one from Walker Road approximately 55 m west of Airport Road. A copy of the site plan is included in Appendix 'A'.

1.4 Grading Requirements and Restrictions

The grading of the site is widely constricted due to the bounding conditions around the site and the large elevation difference from north to south. Grades along the northerly property line are approximately five metres higher than those along the southerly limit, giving a general down gradient of 2.6% in a north-south direction. The site falls off generally at a gradient of 10% east to west from a central mound at the north end of the site; the grade difference is proposed to be made up by daylighting through the mount at a mild slope to match the existing grade along the west limit. TRCA has reviewed the cross-sections proposed (shown on the Grading Plan, G1) and finds the approach acceptable *(refer to email correspondence provided in Appendix 'G')*. A retaining wall is proposed along the northern limit to allow the townhouse units to sit at a reasonable height relative to the fronting condominium road, while preserving the existing elevations at the rear lot line; the wall along the north limit ranges from approximately *0.89* m to *2.5* m high.

The commercial development is graded to be generally compatible with the condominium road grading to the west, the existing heritage house to the north, and with consideration to a 2.0% boulevard along both Walker and Airport Roads; a lane widening and urbanization of Airport Road has been anticipated in the preliminary grading.

The preliminary grading design has attempted to contain drainage from the development, however local portions of the existing heritage frontage will continue to sheet flow to Airport Road. A copy of the preliminary grading plan is included in Appendix 'B' for reference.

2.0 MUNICIPAL WATER AND WASTEWATER

Development of the subject lands will require that municipal services are designed in conformance with the Ontario Building Code, current Region of Peel standards, and current Town of Caledon standards for condominium developments. A servicing plan showing the proposed water, sanitary, and storm servicing is included in Appendix 'B'.

2.1 Water

There are two existing watermains along Airport Road adjacent to the development: an existing 400 mm PVC watermain running along the west side of Airport Road (constructed in 2014), and a

300 mm PVC watermain running along the east side of Airport Road (constructed in 1984). There is a 300 mm watermain located on the north side of Walker Road West.

The proposal includes a 150 mm watermain connected at one end to the 300 mm watermain on Airport Road and the 150 mm watermain on Walker Road West at the other to service the condominium development. A 150 mm fire and 50 mm domestic connection is proposed to service the commercial development. Fire and domestic sizing for the commercial development should be confirmed by a mechanical consultant prior to building permit approval. The heritage house is currently connected to the 300 mm watermain, and that connection will remain in service.

Water usage for each service has been estimated using the Region's design criteria and is provided below. Refer to supporting calculations provided in Appendix 'C' for further detail.

	Commercial Service	**Residential Service**	
Average Daily Demand	5	20	(L/min)
Maximum Hourly Demand	16	60	(L/min)
Maximum Daily Demand	8	40	(L/min)
Estimated Fire Demand (FUS 1999)	8000	9000	(L/min)
Maximum Daily Plus Fire Demand	8008	9040	(L/min)

A flow test was undertaken (September 29, 2020) on the 300 mm diameter watermain located on Walker Road West and the 300 mm diameter watermain Airport Road. The results of the flow tests are included in Appendix 'C' and are summarized below:

Walker Road West	
Static Pressure;	*94 psig*
Flow 1,424 usgpm (90 L/s)	*residual 90 psig*
Flow 2,600 usgpm (164 L/s)	*residual 85 psig*
Theoretical Flow 6,882 usgpm (434 L/s)	*residual 20 psig*
Airport Road (300 mm)	
Static Pressure;	*88 psig*
Flow 1,384 usgpm (87 L/s)	*residual 86 psig*
Flow 2,556 usgpm (161 L/s)	*residual 82 psig*
Theoretical Flow 9,290 usgpm (586 L/s)	*residual 20 psig*

2.2 Wastewater

There are existing 250 mm PVC sanitary sewers on both Airport Road and Walker Road West. The Airport Road sewer will serve as the connection point for the commercial development, while the condominium townhouse development connects to the Walker Road West sewer.

The 250 mm PVC sanitary on Airport Road drains southerly beginning just north of the subject lands. The sewer was constructed to collect drainage from the adjacent townhouse development to the north; the sewer runs along the east side of Airport Road alongside the 300 mm watermain.

It does not appear as though the existing heritage house has a connection to the sanitary sewer; we therefore recommend that any existing sewage system be located and removed subject to approval, and replaced with a 150 mm sanitary connection to Airport Road complete with property line inspection maintenance hole. It is proposed that the commercial development be provided with a separate 150 mm sanitary connection and inspection maintenance hole south of the new connection to the heritage house.

Due to the site grading constraints, the proposed townhouse development will need to be serviced by a 200 mm connection to Walker Road West via an easement over the proposed commercial development. It is not practical to work against the gradient of the site to connect at a higher point along Airport Road. The existing sanitary sewer on Walker Road West drains in an easterly direction just south of the centreline of the roadway. The sanitary flows have been estimated using the Region's criteria and are summarized below. Refer to the calculations provided in Appendix 'C' for further detail.

	Commercial Service	**Residential Service**	
Average Daily Dry Weather Flow	13.0	13.0	(L/s)
Peak Daily Flow (Incl. Infiltration)	13.7	15.3	(L/s)

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

3.1 Existing Condition

The pre-development condition of the site is mostly pervious; the impervious areas of the site consist of the existing heritage house and gravel driveway. The stormwater management quantity control requirements for the site are to use unit flow rates for the Humber Watershed (Sub-basin #6, Equation B), refer to the attached email correspondence from TRCA in Appendix 'D'. Because the unit flow rates determine the allowable discharge for the development, pre-development conditions (including pre-development flow) are not examined in-depth.

3.2 Proposed Condition

Due to grading constraints around the existing heritage building, a small portion of the commercial area drains back into the residential area; the drainage areas are adjusted accordingly and illustrated on Figure 1, Drainage Area Plan, in Appendix 'D'. The drainage areas are used to determine the

allowable discharge for each component of the development. TRCA requires site discharge for each component (Residential and Commercial) to be limited to a rate determined using Equation B for Humber Watershed sub-basin #6. A table summarizing the allowable discharge rates for the following equation is provided below:

TABLE 1 – ALLOWABLE RELEASE RATES

Return Period	Equation B (Sub-basin 6)	Residential Allowable (Drainage Area=0.977)	Commercial Allowable (Drainage Area=0.523)
100-year	Q = 15.199–0.751 x ln(A)	Q = 15 L/s	Q = 8 L/s
50-year	Q = 12.692–0.623 x ln(A)	Q = 12 L/s	Q = 7 L/s
25-year	Q = 10.488–0.522 x ln(A)	Q = 10 L/s	Q = 6 L/s
10-year	Q = 7.707–0.382 x ln(A)	Q = 8 L/s	Q = 4 L/s
5-year	Q = 5.755–0.283 x ln(A)	Q = 6 L/s	Q = 3 L/s
2-year	Q = 3.288–0.159 x ln(A)	Q = 3 L/s	Q = 2 L/s

The storage required to attenuate the flow to each allowable discharge rate is determined using HydroCAD and the TRCA 6- and 12-hour AES storm distributions. Due to potential blockage or clogging, a *control device with an opening* smaller than 75 mm is not recommended. The model is run with a 75 mm *control device* to determine estimated storage usage and release rates; the maximum quantity determined using the 6- and 12-hour distributions is used. The *control device* is to be located downstream of the storage units. Storage is proposed in the form of underground modular cellular storage (ACO StormBrixx or approved equal) lined with *waterproofing to provide a level of protection against road salt and other potential contaminants*; some surface ponding is anticipated in the lower frequency return storms. Approximately *429* m^3 of storage is provided for the residential component *(see also section 3.3 below)*, and approximately 189 m^3 is provided for the commercial component. Both systems are located within the proposed commercial parking lot; a servicing easement is required for the residential system.

Tables below summarize the storage and discharge for the residential and commercial components for both the 6- and 12-hour AES distributions. Table 4 below provides a summary of the required storage (maximal usage) while Table 5 provides a summary of the allowable and calculated overall discharge rates.

Refer to Tables 2 and 3 for estimated Residential and Commercial storage usage and discharge with 75 mm *control device*.

TABLE 2 – RESIDENTIAL COMPONENT
FLOW AND STORAGE SUMMARY
(with 75 mm Orifice)

		6-hr TRCA AES		12-hr TRCA AES	
Return Period	Allowable Flow (L/s)	Calculated Discharge (L/s)	Storage Used (m^3)	Calculated Discharge (L/s)	Storage Used (m^3)
100-yr	15	*10.5*	*309.3*	*10.5*	*312.9*
50-yr	12	*9.5*	*261.5*	*9.6*	*265.9*
25-yr	10	*8.5*	*215.0*	*8.7*	*221.9*
10-yr	8	*7.1*	*157.1*	*7.3*	*165.5*
5-yr	6	*5.8*	*114.9*	*6.1*	*124.5*
2-yr	3	*3.5*	*62.6*	*4.1*	*72.7*

TABLE 3 – COMMERCIAL COMPONENT
FLOW AND STORAGE SUMMARY
(with 75 mm Orifice)

		6-hr TRCA AES		12-hr TRCA AES	
Return Period	Allowable Flow (L/s)	Calculated Discharge (L/s)	Storage Used (m^3)	Calculated Discharge (L/s)	Storage Used (m^3)
100-yr	8	8.6	180.7	8.6	178.7
50-yr	7	7.3	157.2	7.4	156.5
25-yr	6	6.3	134.1	6.4	135.6
10-yr	4	4.9	105.3	5.1	108.6
5-yr	3	3.6	84.5	3.9	89.3
2-yr	2	1.0	59.6	2.0	66.3

TABLE 4 – OVERALL STORAGE REQUIREMENT (in m^3)

Return Period	Residential	Commercial
100-yr	*312.9*	180.7
50-yr	*265.9*	157.2
25-yr	*221.9*	135.6
10-yr	*165.5*	108.6
5-yr	*124.5*	89.3
2-yr	*72.7*	66.3

TABLE 5 – OVERALL DISCHARGE REQUIREMENT (in L/s)

Return Period	Allowable	6-hr TRCA AES Calculated	12-hr TRCA AES Calculated
100-yr	23	*18.8*	*18.7*
50-yr	19	*16.9*	*16.9*
25-yr	16	*14.9*	*15.1*
10-yr	12	*12.0*	*12.4*
5-yr	9	*9.4*	*10.1*
2-yr	5	*4.5*	*6.1*

3.3 Drainage to Airport Road

Approximately 1.27 ha of the development area drains toward Airport Road in the existing condition. In order to satisfy Region of Peel concerns over drainage to the Airport Road storm sewer, the existing and proposed conditions are modelled using a 24-hour Chicago storm distribution based on the Town of Caledon IDF curves. The results of the model are presented in Table 6 below. It must be noted that the 24-hour Chicago storm has a different rainfall distribution and peak intensity that the TRCA 6- and 12-hour AES storms required for water quantity control. This information is only provided for a comparison of existing and proposed flow to the Airport Road storm sewer.

TABLE 6 – 24H CHICAGO STORM
FLOW TO AIRPORT ROAD (L/s)

Return Period	*Existing*	*Proposed*
100-yr	*122.5*	*122.2*
50-yr	*96.9*	*65.3*
25-yr	*75.9*	*26.6*
10-yr	*50.5*	*19.2*
5-yr	*34.2*	*15.8*
2-yr	*15.5*	*10.7*

To attenuate flow to the existing level, approximately 425 m^3 of storage is required for the residential component; storage requirements for the commercial component are unchanged from the values determined in the previous section. This represents approximately 50 m^3 more than is required to meet the quantity control requirements using the TRCA AES distributions. Refer to email correspondence with Region of Peel staff in Appendix 'G' for further discussion on drainage to Airport Road.

3.4 Minor Storm System

Storm drainage is to be collected by a series of inlets and conveyed to the underground storage for both the residential and commercial developments. Both the residential and commercial storm systems are sized to capture and convey the 100-year Town of Caledon storm. A Stormceptor oil/grit separator is proposed upstream of the modular storage units to reduce the sediment settling within the storage units. Drainage is controlled by way of control structures complete with 75 mm *control device* at the downstream end of the storage units; inspection maintenance holes are provided on each storm service at the property line. The proposed storm outlet for the *development* is a *250* mm connection to a catch basin manhole at the south-east corner of the site.

3.5 Major Storm System

In the event of an extreme rainfall event or failure of the storm sewer system, emergency overland flow for the residential development is directed to Walker Road West by way of a driveway connection through the commercial component. The condominium road will serve as the primary conduit for overland flow, directing flow south.

The commercial development has been graded to limit ponding in the parking area to 0.25 m. The overland flow for the commercial development is north to south via the parking lot to Walker Road West.

3.6 Water Quality

Treatment to provide MECP "Enhanced" level of protection (80% long- term removal of suspended solids) is required. A treatment train approach is proposed consisting of CB Shields (see Appendix 'D' for detail) installed in paved areas and Stormceptor EFO units. Stormceptor EFO units are proposed upstream of the underground storage units for both the residential and commercial components. This is to help minimize the settlement of sediment in the modules. Both units are sized *using CA ETV protocol.* A Stormceptor *EFO6* is proposed for the residential development, and a Stormceptor *EFO4* is proposed for the commercial development. Sizing calculations are included in Appendix 'D'. It should be noted that exaggerated impervious areas were used in the sizing of the units.

The NJDEP Stormwater BMP Manual provides a simplified equation for the TSS removal rate for two BMP's in a series:

$$R = A + B - [(A \times B) / 100]$$
$$= 50\% + 60\% - [(50\% \times 60\%) / 100]$$
$$= 110\% - 30\%$$
$$= 80\%$$

Where:
R = Total TSS Removal Rate
A = TSS Removal Rate of the First or Upstream BMP (CB Shield)
B = TSS Removal Rate of the Second or Downstream BMP (EFO unit)

3.7 Erosion and Sediment Control

Typical sediment and erosion control measures will be required during construction. These include silt fencing, mud mat, and check dams with provisions for re-vegetating the site as soon as construction is completed. Although more detailed information will be provided at the detailed

design stage, it is recognized that special care must be taken to protect the wetland from sediment laden runoff and erosion potential.

3.8 Feature Based Water Balance

The subject lands are bounded to the west by a small portion of the bottom end of the Provincially Significant Caledon East Wetlands Complex. The wetlands catchment basin is illustrated in Appendix 'E', along with a highlighted portion of the subject lands that is to be redirected to Airport Road as a result of development. The overall catchment area for the wetland complex is approximately 506.7 ha; the area to be redirected away from the wetland as a result of the proposed development is approximately *0.23* ha, representing roughly 0.045% of the total catchment area for the wetland. Because of the proximity of the proposed development to the adjacent wetland (named Wetland #2, refer to Appendix 'E'), Toronto and Region Conservation Authority requires a Feature Based Water Balance analysis to be undertaken to assess the potential impact as a result of development of the subject lands.

3.8.1 Wetland Water Balance Risk Evaluation

The TRCA Wetland Water Balance Risk Evaluation document was reviewed, and a risk evaluation has been undertaken to establish a risk assignment relating to the development proposal. Tables 2 *and 3, and Figure 3 of the risk evaluation document outline the criteria for evaluation and risk assignments for developments within wetland catchments—these tables and figure are provided in Appendix 'F' for reference. A summary of our assessment is provided below.*

3.8.1.1 Magnitude of Hydrological Change

There is no proposed change to impervious cover within the catchment. The development proposal results in a decrease in catchment size of approximately 0.23 ha; the overall catchment area for the wetland is approximately 506.7 ha. The proposed reduction results in a 0.045% change in catchment area. As a conservative measure the catchment area located solely within the property boundary of the development lands (approximately 2.74 ha) was also reviewed—the reduction in catchment area is approximately 8.4%. The remaining criteria are unapplicable as groundwater is not tributary to the wetland. The resulting magnitude of hydrological change is Low based on Table 2 of the evaluation document.

3.8.1.2 Sensitivity of Wetland

Based on a review of Figure 4 and Table 6 of the Environmental Impact Study prepared by Dillon Consulting (see Appendix 'F'), and a comparison of their Ecological Land Classifications (ELCs) against Appendix 2 of the risk evaluation document, some of the ELCs fall under the High degree

of sensitivity; the resulting sensitivity of the wetland is High. The remaining criteria are not reviewed as the sensitivity is already determined to be High based on ELC.

3.8.1.3 Risk Assignment

Referring to Figure 3: "Wetland Risk Evaluation Decision Tree" provided in the risk evaluation document, a Low magnitude of hydrological change and High sensitivity of wetland falls within the Low Risk assignment; accordingly, monitoring is not required, a non-continuous hydrological model is required with output at monthly or higher resolution, and a mitigation plan to maintain water balance is required. As indicated in the Hydrogeological Impact Assessment prepared by R.J. Burnside, monitoring is recommended as site due diligence; refer to section 8.4 of the Hydrogeological Impact Assessment for further detail. The Hydrogeological Impact Assessment also discusses water balance mitigation in section 7.7. Mitigation on water balance is also discussed in section 3.9 of this report.

At the initial request of TRCA, a continuous hydrological model was prepared by this office and is presented in the following section (see requirements by email in Appendix 'G'). As part of the Hydrogeological Impact Assessment prepared by R.J. Burnside in support of the development, a non-continuous hydrological model based on the Thornthwaite approach was prepared to assess impacts on the local groundwater conditions. The R.J. Burnside analysis complements the findings of continuous model below. Tables G-1 to G-4 from the R.J. Burnside report are provided in Appendix 'F' for reference.

3.8.2. Hydrologic Model and Parameters

An analysis of the existing and proposed conditions is undertaken using a continuous hydrologic model of both cases, comparing the pre- and post-development evaporation, infiltration, and runoff for the areas that are tributary to the wetland. The same rainfall and temperature data, time steps, analysis duration, and soil parameters are used in both cases. Refer to Figures 3 and 4 in Appendix 'E' for the pre- and post-development drainage area boundary delineation referenced in this text.

A continuous hydrologic model using EPA SWMM is setup using estimated parameters. One hour rainfall data for the period 23/05/1986–01/11/2007 measured at Toronto Buttonville Airport was provided by TRCA to be used in the model. Daily temperature data for the same period was also provided by TRCA and is used by the model to estimate evaporation using the Hargreaves method. Further detail on model parameters and subcatchment definition is provided below.

3.8.2.1. Data Limitations

It is noted that the total volume of rainfall provided in the hourly data (9,471 mm) does not equal the total volume of rainfall provided in the daily record (15,283 mm). The hourly rainfall data includes a number of erroneous (flagged as missing) readings; when cross-checked against the daily rainfall records, it is noted that the missing readings correspond to days with higher rainfall totals. Additionally, it should be noted that there are no rainfall events recorded for the months of December–March. Notwithstanding the foregoing *and in consideration of the "Low Risk" assignment to the wetland,* we believe the impact is insignificant

3.8.2.2. Infiltration

The Green-Ampt infiltration method is selected based on the availability of known soil parameters. The hydraulic conductivity for the soil was calculated by R.J. Burnside based on in-situ testing at two monitoring wells; an average hydraulic conductivity between the two monitoring wells of 4.3×10^{-4} cm/s is converted to 15.5 mm/hr and used for the simulation. Other required parameters for the Green-Ampt method are Suction Head and Initial Deficit, both of which are obtained from published tables and interpolated based on the hydraulic conductivity. The parameters used in the model are discussed in further detail in Appendix 'E'.

It is worthy to note that the prevailing interpreted groundwater flow direction is north to south; most of the infiltration volume estimated for the development area is not tributary to the wetland. Refer to the "Interpreted Groundwater Flow" figure prepared by R.J. Burnside included in Appendix 'E'. Accordingly, there is no discussion of any net change in infiltration volume in the results.

3.8.2.3. Subcatchment Areas

Two subcatchment areas have been delineated and modelled to determine the existing evaporation, infiltration, and runoff that drains to the wetland. The two subcatchment areas are identified as "Buffer" and "Dev-Area", and are illustrated on the attached subcatchment area plans (Figures 3 and 4, Appendix 'E'). The development area ("Dev-Area") is delineated to the east based on the contours provided on the topographic survey prepared by David B. Searles (Appendix 'A'). It is bounded to the north and south by the property boundaries, and to the west by the development limit. The topography of this area is more steeply sloped than the adjacent Buffer subcatchment area. The Buffer area is bounded to the east by the development limit, to the north and south by the property boundaries, and to the west by the surveyed "drip line". The Buffer area is beyond the limits of the development, and will remain unchanged. The development area subcatchment drains to the Buffer subcatchment in the existing condition, but will drain toward Airport Road upon development. The Buffer subcatchment outlets to the wetland in both

cases. A summary of the parameters used to define the subcatchments as well as the model input file is provided in Appendix 'E'.

3.8.3. Results

A simulation is performed with the development area outlet directed to the Buffer in order to evaluate the existing condition, and again with the development area disconnected—representing the post development condition. The results indicate a net reduction in total runoff of approximately 2 mm from the Buffer to the wetland over the entire simulation period (approximately 0.1 mm/year). The net change in runoff is negligible, and it can be concluded that there is no significant impact to the wetland as a result of redirecting the development area toward Airport Road.

Pre- and post-development weekly hydrographs are not provided; the absence of any meaningful runoff in both conditions makes a graphical representation of these values impractical. In the pre-development condition, there are a total of three runoff events over the entire simulation period from the Buffer area to the wetland ranging between 0.002 and 0.019 m^3/s; there are also three runoff events in the post-development condition ranging between 0.002 and 0.019 m^3/s. Pre- and post-development simulation results over the entire period are tabulated below.

PRE-DEVELOPMENT SIMULATION RESULTS (1986–2007)

Subcatchment Name	Total Precipitation (mm)	Total Evaporation (mm)	Total Infiltration (mm)	Total Runoff (mm)	Peak Runoff (m^3/s)
Dev-Area	9471.10	0.96	9466.88	4.36	0.01
Buffer	9471.10	0.99	9468.39	3.83	0.02

POST-DEVELOPMENT SIMULATION RESULTS (1986–2007)

Subcatchment Name	Total Precipitation (mm)	Total Evaporation (mm)	Total Infiltration (mm)	Total Runoff (mm)	Peak Runoff (m^3/s)
Buffer	9471.10	0.98	9467.62	3.05	0.01

NET CHANGE (1986–2007)

Subcatchment Name	Total Precipitation (mm)	Total Evaporation (mm)	Total Infiltration (mm)	Total Runoff (mm)	Peak Runoff (m^3/s)
Buffer	0.00	-0.01	-0.77	-0.78	-0.01

3.8.4. Summary

The results of continuous hydrologic modelling over the period of 1986–2007 indicate that there is no significant impact to the wetland as a result of redirecting flow from the development area away from the wetland; there is an insignificant net change in total runoff volume to the wetland (in the order of 0.04 mm/year). Rainfall over the simulation period is mostly infiltrated; the prevailing interpreted groundwater flow direction—as determined by R.J. Burnside—is north to south. It is therefore concluded that infiltrated rainfall is not tributary to the wetland.

3.9 LOW IMPACT DEVELOPMENT

The site is in an area with predominantly sandy soils, which are candidates for infiltration LIDs including vegetated swales and rainwater leader (downspout) disconnection. Roof drainage from the townhouses (residential component) and the heritage building (commercial component) is to be directed to pervious areas at grade to provide additional opportunity for infiltration. Side and rear yard swales provide an opportunity for infiltration along the travel path prior to collection at catch basin inlets. Calculations provided by R.J. Burnside as part of their Hydrogeological Impact Assessment quantify estimated infiltration volumes in the order of 1,100 m^3 per year; refer to Table G-4 in Appendix 'F' for reference.

4.0 CONCLUSION

The servicing requirements as discussed in this report are summarized below in support of the proposed rezoning application.

1. Water servicing for both domestic and fire purposes will be from the existing 300 mm watermain on Airport Road and the 300 mm watermain on Walker Road West for the residential component. The commercial component is to be serviced from the 300 mm watermain on Airport Road. A 150 mm diameter main will be per Region standards to provide service to the proposed townhouse units. A 150 mm fire and 50 mm domestic service is proposed for the commercial component.

2. The commercial sanitary drainage will be directed to the existing 250 mm sanitary sewer along Airport Road by way of 150 mm service laterals.

3. The residential sanitary drainage will be directed to the existing 250 mm sanitary sewer on Walker Road West by way of 200 mm sanitary sewer via an easement over the proposed commercial development.

4. Storm drainage is to be controlled as closely as possible to the 2-100 year unit flow rates for sub-basin #6 determined using equation B provided by TRCA for the Humber River watershed; a 75 mm minimum diameter *control device* is proposed. A total of *312.9* m^3 of storage is required for the residential development *based on TRCA AES 12-hr storm distribution, and 425 m^3 is required for Region of Peel criteria to Airport Road*; 180.7 m^3 of storage is required for the commercial development. Storage is underground in *waterproofed* modular cellular storage. Approximately *429* m^3 is provided for the residential component and 189 m^3 for the commercial component.

5. There is no significant impact to the adjacent wetland as a result of redirecting flow from a small portion of the wetland catchment area toward Airport Road.

PREPARED BY TRAFALGAR ENGINEERING LTD.

J.T. Nelson, P.Eng.
Manager—Design Services

Appendix ‘A’

Topographic Survey

Site Plan

SURVEYOR'S REAL PROPERTY REPORT
PART 1, PLAN OF
PART OF LOT 4, CONCESSION 6
EAST OF HURONTARIO STREET
(GEOGRAPHIC TOWNSHIP OF CALEDON, COUNTY OF PEEL)

TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

SCALE 1: 500

10 5 0 5 10 20 30 40 50 metres

David B. Searles Surveying Ltd.
ONTARIO LAND SURVEYORS

METRIC

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

LEGEND

■	DENOTES MONUMENT FOUND
□	DENOTES MONUMENT SET
IB	DENOTES IRON BAR
SIB	DENOTES STANDARD IRON BAR
WIT	DENOTES WITNESS
769	DENOTES I.L. THOMPSON O.L.S.
1184	DENOTES E. BIASON O.L.S.
1514	DENOTES M.J. TERRY, O.L.S.
1606	DENOTES L. BIASON, O.L.S.
M&P	DENOTES MACKAY & PETERS, O.L.S.
M	DENOTES MEASURED
P1	DENOTES PLAN 43R-20293
P2	DENOTES PLAN 43R-21686
P3	DENOTES REGISTERED PLAN 43M-1481
P4	DENOTES PLAN 43R-28552
ANC	DENOTES ANCHOR
BB	DENOTES BELL BOX
BC	DENOTES BACK OF CURB
BF	DENOTES BOARD FENCE
CB	DENOTES CATCH BASIN
CCUT	DENOTES CURB CUT
CLF	DENOTES CHAIN LINK FENCE
CPAD	DENOTES CONCRETE PAD
CSP	DENOTES CULVERT (STEEL PIPE)
CSW	DENOTES CONCRETE SIDE WALK
CUL	DENOTES CULVERT
EG	DENOTES EDGE OF GRAVEL
EP	DENOTES EDGE OF PAVEMENT
FF	DENOTES FINISHED FLOOR
FH	DENOTES FIRE HYDRANT
GD	DENOTES GRAVEL DRIVEWAY
GM	DENOTES GAS METER
GLM	DENOTES GAS LINE MARKER
HM	DENOTES HYDRO METER
HLINE	DENOTES HEDGE LINE
LS	DENOTES LIGHT STANDARD
MW	DENOTES MONITORING WELL
MHC(SAN)	DENOTES MAINTENANCE HOLE COVER (SANITARY)
MHC(STM)	DENOTES MAINTENANCE HOLE COVER (STORM)
MHC(W)	DENOTES MAINTENANCE HOLE COVER (WATER)
PWF	DENOTES PCOT AND WIRE FENCE
SP	DENOTES SIGN POST
WP(B)	DENOTES WOODEN POLE (BELL)
WP(H)	DENOTES WOODEN POLE (HYDRO)
WV	DENOTES WATER VALVE
ø	DENOTES DIAMETER
TOS	DENOTES TOP OF SLOPE
BOS	DENOTES BOTTOM OF SLOPE
DL	DENOTES DITCH LINE
OHW	DENOTES OVERHEAD WIRES
	DENOTES CONIFEROUS TREE
	DENOTES DECIDUOUS TREE
	DENOTES TREE LINE
TC	DENOTES TOP CASING
TP	DENOTES TOP PIPE
TW	DENOTES TEST WELL

BEARING NOTE

BEARINGS SHOWN HEREON ARE GRID AND ARE REFERRED TO THE NORTHEAST LIMIT OF PART 1 AS SHOWN ON PLAN 43R-20293, HAVING A BEARING OF N45°06'55"W.

BEARINGS ON PLAN 43R-20293 (P1), 43R-21686 (P2), 43M-1481 (P3), 43R-28552 (P4), HAVE BEEN ROTATED 0°43'45" COUNTERCLOCKWISE TO MAKE COMPARISONS.

DISTANCE NOTE

DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.99966073.

BENCH MARK NOTE

ELEVATIONS ARE REFERRED TO THE TOWN OF CALEDON BENCHMARK No. 25, BEING ON THE NORTH FACE AT THE WEST CORNER OF A TWO STOREY BLOCK BUILDING #16301 LOCATED ON THE EAST SIDE OF AIRPORT ROAD, APPROXIMATELY 0.32km NORTH OF NORTHERLY LIMIT OF CALEDON EAST, HAVING AN ELEVATION OF 310.640 METRES

NOTE

PROPERTY LIMITS ARE NOT FENCED UNLESS OTHERWISE NOTED ON THE FACE OF THE PLAN.

CAUTION

LOCATIONS OF ALL UTILITIES ARE APPROXIMATE. ALL UTILITIES SHOULD BE CONTACTED PRIOR TO ANY DIGGING OR CONSTRUCTION.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE *SURVEYS ACT*, THE *SURVEYORS ACT*, AND THE REGULATIONS MADE UNDER THEM.

2. THE SURVEY WAS COMPLETED ON THE 22nd DAY OF SEPTEMBER, 2016.

PRELIMINARY

DATE

ALISTER SANKEY
ONTARIO LAND SURVEYOR

THIS PLAN WAS PREPARED FOR
SHACCA CALEDON HOLDINGS INC.
c/o GLEN SCHNARR & ASSOCIATES INC.

DAVID B. SEARLES SURVEYING LTD. IS NOT RESPONSIBLE FOR USE BY OTHER PARTIES

PART 2

THIS PLAN MUST BE READ IN CONJUNCTION WITH SURVEY REPORT DATED JULY 21st, 2016

David B. Searles Surveying Ltd.
ONTARIO LAND SURVEYORS
4255 Sherwoodtowne Blvd, Suite 206, Mississauga, Ont. L4Z 1Y5
Tel: (905) 273-6840 Fax: (905) 896-4410
Email: info@dbsearles.ca

Calculator	Draftsperson
KR	PG
Editor	Plan Index No.
ADS	E-17

Calculation File	Drawing File	File No.
104-16CALC.DWG	104-0-16.DWG	104-0-16

GENERAL NOTES

1. Builder and Surveyor to confirm difference between FFL and USF before proceeding with excavation. Report discrepancies to the Architect.
2. Surveyor is to comply with current subdivision zoning regarding setbacks in laying out the work. Any discrepancies are to be reported to the Architect and the builder immediately.
3. The builder shall comply with all current standards for Local Municipal Subdivision Lot Drainage and Grading as they relate to max. & min. slopes for yards, swales & drives and clearances to street furniture and services for driveways.
4. The builder shall check and verify all given grade elevations and drainage prior to commencement of construction. Builder shall verify location of existing and proposed utilities prior to commencement of construction.
5. Footings to bear on natural undisturbed soil and be a min. of 1.22m below finished grade. Underside of footings shown are taken from architectural plans and may not represent actual footing level.
6. All dimensions and grade elevations are shown in metres.
7. Unless otherwise indicated, finished floor level is 0.40m above Specified House Grade at entry points to house and provision of 2 risers at entries must be made to gain entry into house. Maintain top of foundation wall min. 0.15m above finished grade.
8. Unprotected openings (windows/doors) must be min 1.2m from lot lines. Builder to verify location of all windows relative to lot line to maintain min. setback for unprotected openings.
9. These General Notes apply to all drawings for Siting & Grading including siting on individual sheets.
10. Footing adjacent to R.L.C.B. least to be extended to undisturbed ground and verified by soil consultant.

NOTES:
ACCESSIBLE PARKING SPACES SHALL COMPLY WITH SCHEDULE K OF BY-LAW 2015-058.

THE ENTRANCES TO THE RETAIL / COMMERCIAL BUILDINGS ARE TO BE BARRIER FREE WITH EITHER POWER DOOR OPERATORS OR SLIDING DOOR FEATURES AS PER THE ONTARIO BUILDING CODE.

KEY PLAN NTS

LEGEND:

DEVELOPMENT CONCEPT PLAN
SHACCA CALEDON HOLDINGS INC.

16114 AIRPORT ROAD
PART 1, PLAN OF PART OF LOT 4, CONCESSION 6, E.H.S.
TOWN OF CALEDON, REGION OF PEEL

Development Statistics - Total Site

Wetland / Woodlot	1.832ha (4.53ac)
Compensation Area:	0.1844ha (0.46ac)
Compensation Area Buffer:	0.469ha (1.16ac)
Potential Park:	0.1037ha (0.26ac)
Net Residential Area*:	0.842ha (2.08ac)
Commercial Area:	0.555ha (1.37ac)
Road Widening & 0.3m Reserve:	0.10ha (0.25ac)
Gross Site Area:	**4.09ha (10.11ac)**
Net Site Area*:	**1.50ha (3.71ac)**

Development Statistics - 6.1m Condo Townhouse Residential

Total Units:	32 Units
Net Residential Density:	32 Units / 0.842ha = 38.0UPH
Total Visitor Parking:	9 Spaces (0.28 per unit)
Total Landscaped / Snow Storage:	361m² (4,28%)
Total Hard Surface (HS) Area:	1,836m²
Total Snow Storage % of HS Area:	19.7%
Total Parkland Dedication required:	0.042ha (5%)
Total Parkland Dedication provided:	0.1037ha (12%)
Building Coverage:	35.7%

Development Statistics - Retail Commercial (Buildings A & B)

Total GFA:	1,222.56m² (13,160ft²)
Building Coverage:	17.8%
Total Landscaped / Snow Storage:	620m²
Total Hard Surface (HS) Area:	2,560m²
Total Snow Storage % of HS Area:	24.0%
Total Parking Required:	62 Spaces *(1 space per 20m²)*
Total Parking Provided:	59 Spaces
Total Barrier Free Parking Required:	3 *(2 Type 'A' ; 1 Type 'B')*
Total Barrier Free Parking Provided:	4 *(2 Type 'A' ; 2 Type 'B')*
Delivery Spaces Required:	1
Delivery Spaces Provided:	1

Notes:
- Net Site Area only includes: Net Residential Area, Commercial & Potential Park
- ^ Net Residential Area includes 4.5m Residential Buffers
- Typical Parking Space: 2.75m x 6.0m
- Typical Type 'A' Barrier Free Space: 3.4m x 6.0m
- Typical Type 'B' Barrier Free Space: 2.75m x 6.0m
- Typical Barrier Free Aisle: 1.5m x 6.0m
- Typical Delivery Space: 3.5m x 9.0m
- Wetland / Woodlot constraint information provided by Dillon Consulting
- Denotes pedestrian circulation

TOWNHOUSE UNIT BREAKDOWN

MODEL	UNITS NUMBER	HIEGHT (STORIES)	UNIT GFA (SF)	TOTAL GFA (SF)
TOWNHOUSE				
TYPE 1				
CORNER	2	2	1616	3232
INTERIOR	12	2	1688	20256
INTERIOR	10	2	1650	16500
END	8	2	1700	13600
TOTAL	32			53588 ft²
				4978.32 m²

DENSITY: 32 UNITS / 0.842 Ha = 38.0 UpHA

FLOOR SPACE INDEX (FSI): Gross floor area 4978.32 m² / Gross site area 8399.99 m² = 0.592

ROAD WIDTH: 7.0 m

CL ROAD RADIUS: 13.0 m

TOTAL VISITOR PARKING: 9 Spaces (0.28 per unit)

COMMERCIAL STATISTICS

SITE AREA	5555.00 m²	
COVERAGE	1000.00 m²	18.0%
PARKING, WALKWAY	2472.00 m²	44.5%
LANDSCAPE	2083.00 m²	37.5%
COMMERCIAL G.F.A.	1222.59 m²	

Total Parking Required: 62 Spaces (1 space per 20m²)
Total Parking Provided: 59 Spaces
Total Barrier Free Parking Required: 3 (2 Type 'A' ; 1 Type 'B')
Total Barrier Free Parking Provided: 4 (2 Type 'A' ; 2 Type 'B')
Delivery Spaces Required: 1
Delivery Spaces Provided: 1

11.16.20	FP	UPDATED & ISSUED PER CITY SPA COMMENTS
10.25.19	FP	UPDATED & ISSUED FOR CITY SUBMISSION
09.24.19	FP	UPDATED COMMERCIAL BLOCK & ADJUSTED STATISTICS
09.13.19	FP	UPDATED GFA FOR CORNER MODEL & ADJUSTED STATISTICS
09.18.19	FP	REV. SITE PER NEW DRAFT PLAN
04.07.17	FP	ADDED MATRIX, LOT NUMBERS UPDATED STATISTICS
03.01.17	CZ	Added RETAIL/COMMERCIAL
02.22.17	CZ	UPDATED BUILDING FOOTPRINTS & STATS
02.01.17	CZ	PRELIMINARY SITE PLAN
Date	Ref.	Description

Revisions

Drawn	CZ
Date	01/27/17
Checked	
Approved	
Printed	07.18.19
CAD File	161338-SP5.DWG

The Architect has not been retained to carry out general review of the work and assumes no responsibility for the failure of the contractor or sub-contractors to carry out the work in accordance with the Contract Documents, are to be reported to the Architect

Single pages of documents are not to be read independently of all pages of the Contract Documents.

The contractor shall verify all dimensions on the Contract Documents. Any discrepancies

prior to the commencement of the work.

Under no circumstances shall the Contractor or sub-contractors proceed in uncertainty.

Do not scale drawings.

architects inc.
70 Sitton Road, Unit #21,
Woodbridge, Ontario, L4L 8B9
(905) 265-2688

SP

Shacca Caledon Holdings

PROPOSED CONDOMINIUM TOWNHOUSE DEVELOPMENT

16114 AIRPORT ROAD
TOWN OF CALEDON
ONTARIO

16114 AIRPORT ROAD
PART OF LOT 4, CONCESSION 6, E.H.S.
BEING PART 1 ON 43R-20293
EXCEPT PARTS 1&2 ON 43R-21686
AND PART LOT 4, CONCESSION 6, E.H.S.
BEING PART 1 ON 43R-21686
TOWN OF CALEDON, REGION OF PEEL

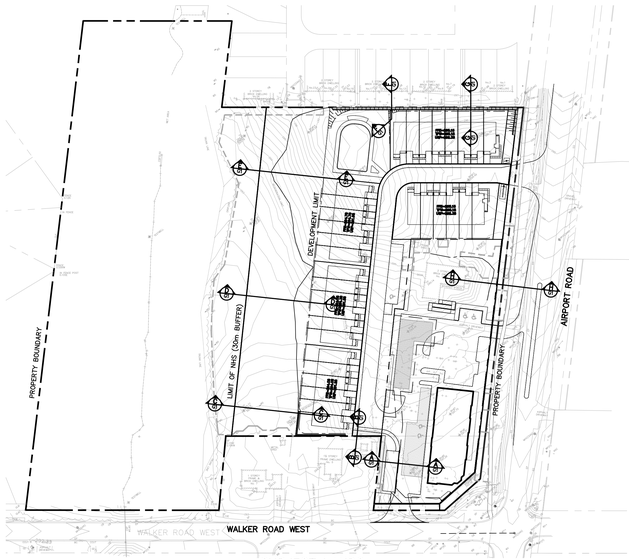
Sheet Title	SITEPLAN
Scales	1:500
Sheet Number	16-1338-SP1

Appendix ‘B’

Grading Plan (G1)

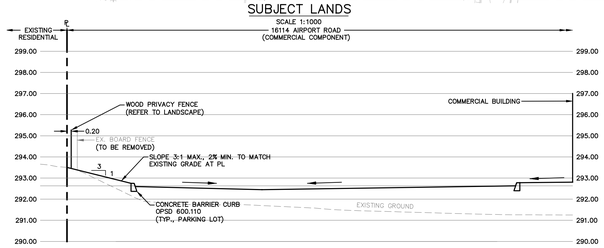
Servicing Plan (S1)

Erosion and Sediment Control Plan (E1)



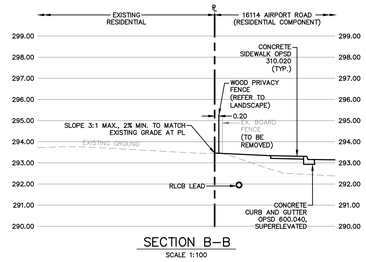
SUBJECT LANDS

SCALE 1:1000



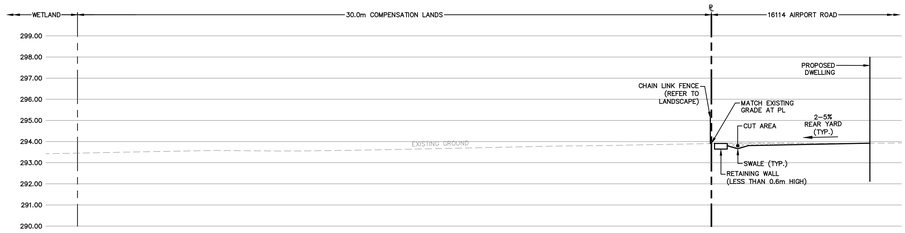
SECTION A–A

SCALE 1:100



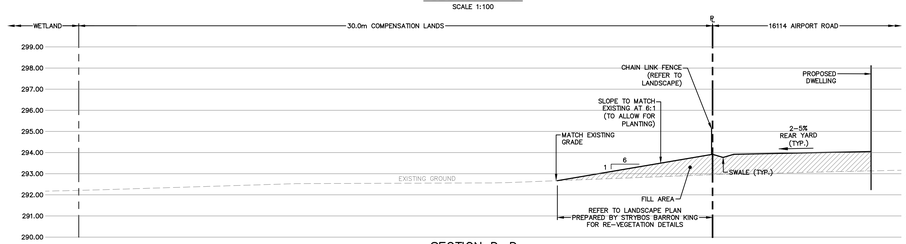
SECTION B–B

SCALE 1:100



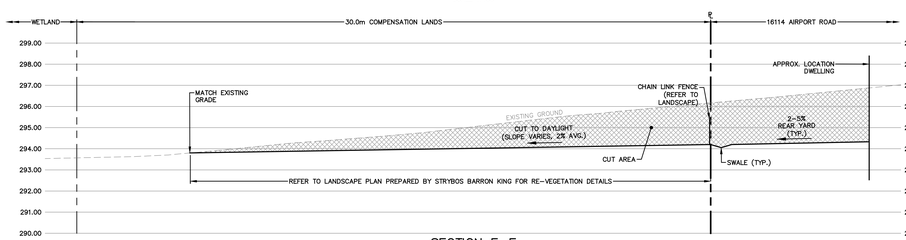
SECTION C–C

SCALE 1:100



SECTION D–D

SCALE 1:100



SECTION E–E

SCALE 1:100

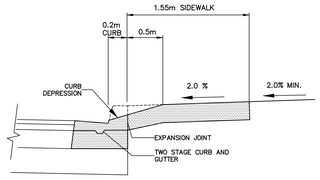
CATCH BASIN TABLE					
CB	INV	TOP	OPSD	COVER	COMMENTS
RESIDENTIAL DEVELOPMENT					
1	292.10	293.47	705.010	STD.503	BEEHIVE STYLE TOP
2	291.80	293.25	705.010	STD.503	BEEHIVE STYLE TOP
3	292.20	293.65	705.010	STD.503	BEEHIVE STYLE TOP
4	292.60	294.05	705.010	STD.503	BEEHIVE STYLE TOP
5	292.65	294.10	705.010	STD.503	BEEHIVE STYLE TOP
6	292.99	294.44	705.010	STD.503	BEEHIVE STYLE TOP
7	292.93	293.98	705.010	STD.503	BEEHIVE STYLE TOP
8	292.87	294.32	705.010	400.010	BEEHIVE STYLE TOP
9	292.90	294.35	705.010	400.010	EQUIPPED WITH CB SHIELD
10	292.60	294.05	705.010	400.010	EQUIPPED WITH CB SHIELD
11	292.60	294.05	705.010	400.010	EQUIPPED WITH CB SHIELD
12	292.20	293.65	705.010	400.010	EQUIPPED WITH CB SHIELD
13	292.16	293.61	705.010	400.010	EQUIPPED WITH CB SHIELD
14	291.84	293.29	705.010	400.010	EQUIPPED WITH CB SHIELD
15	291.81	293.26	705.010	400.010	EQUIPPED WITH CB SHIELD
16	291.55	293.00	705.010	400.010	EQUIPPED WITH CB SHIELD
17	291.58	293.03	705.010	400.010	EQUIPPED WITH CB SHIELD
COMMERCIAL DEVELOPMENT					
18	291.34	292.36	705.010	400.010	EQUIPPED WITH CB SHIELD
19	291.66	292.56	705.010	400.010	EQUIPPED WITH CB SHIELD
20	291.67	292.57	705.010	400.010	EQUIPPED WITH CB SHIELD
21	291.55	292.70	705.010	STD.503	BEEHIVE STYLE TOP

GENERAL GRADING NOTES

1. ALL DOWNSPOUTS TO SPLASH AT GRADE c/w CONCRETE SPLASH PAD
2. ALL LOTS TO HAVE MIN 200mm TOPSOIL
3. ALL YARDS SHALL HAVE A MIN. SLOPE OF 2.0%
4. ALL REAR YARDS SHALL HAVE A SLOPE BETWEEN 2.0% AND 5.0% WITHIN 5.0m OF THE REAR FACE OF DWELLING.
5. MAX. SLOPE IS 3 HORIZONTAL TO 1 VERTICAL (3:1).
6. MIN. DRIVEWAY SLOPE IS 2.0%, MAX. SLOPE IS 7.0%
7. DECKS AND LANDINGS LESS THAN 1.0M HIGH SHALL HAVE 100MM LAYER OF 19MM CLEAR STONE DIRECTLY UNDER DECK.
8. WHEN THE SEPARATION BETWEEN ADJACENT DWELLINGS IS 1.2m OR LESS THE AREA SHALL BE COVERED WITH 100mm DEEP 19mm CLEAR STONE.
9. ALL SWALES SHALL BE 150mm DEEP MIN. WITH A GRADE OF 2.0% MIN. UNLESS OTHERWISE NOTED.
10. RETAINING WALL EXCEEDING 1.0m IN HEIGHT SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER.
11. SEE GEOTECHNICAL REPORT PREPARED BY TERRAPROBE DATED JANUARY 30, 2017 FOR SOIL INFORMATION AND FOUNDATION REQUIREMENTS.

GENERAL NOTES

1. ALL ROADS, STORM SEWERS AND OTHER MISCELLANEOUS ITEMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TOWN OF CALEDON REQUIREMENTS. SANITARY SEWERS AND WATERMAINS SHALL BE IN ACCORDANCE WITH THE REGION OF PEEL REQUIREMENTS. IN ABSENCE OF LOCAL STANDARDS, ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS SHALL BE USED, AS MODIFIED BY THE LOCAL MUNICIPALITY.
2. ONTARIO PROVINCIAL STANDARD DRAWINGS (O.P.S.D.) ARE TO BE USED WHEN INDICATED (EXAMPLE: O.P.S.D. 600.04) TOWN OF CALEDON STANDARDS ARE USED FOR ROADS, STORM SEWERS AND MISCELLANEOUS WHEN INDICATED. THE REGION OF PEEL STANDARDS ARE USED ON WATERMAINS AND SANITARY SEWERS AS INDICATED.
3. ALL INFORMATION SHOWN ON THE ENGINEERING DRAWINGS REGARDING THE SIZE AND LOCATION OF EXISTING UTILITIES AND/OR SERVICES HAS NOT BEEN VERIFIED IN THE FIELD. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION AND LOCATION OF SAID UTILITIES AND PROTECTING AND MAINTAINING UTILITIES DURING CONSTRUCTION.
4. THE CONTRACTOR SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER.
5. HOARDING OR SNOW FENCE SHALL BE ERECTED PRIOR TO ANY GRADING OR CONSTRUCTION AND SHALL REMAIN IN PLACE AND IN GOOD REPAIR THROUGHOUT THE CONSTRUCTION AND GRADING PHASE AND REMOVED ONLY AS DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL NOT DAMAGE TREES OUTSIDE AREAS INDICATED TO BE CLEARED AND GRUBBED.
7. TRAFFIC DETOURS AND SIGNAGE TO BE APPROVED BY TOWN OF CALEDON AND REGION OF PEEL. MAINTAIN ONE LANE OPEN TO TRAFFIC AT ALL TIMES.

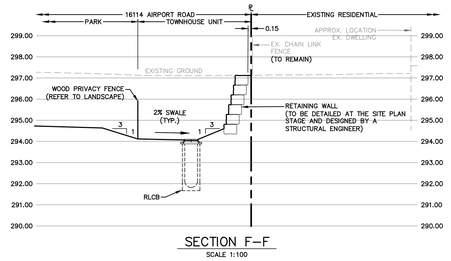


CURB AND SIDEWALK AT HOUSE DRIVEWAY

TO BE READ IN CONJUNCTION WITH OPSD 310.020 AND OPSD 600.070

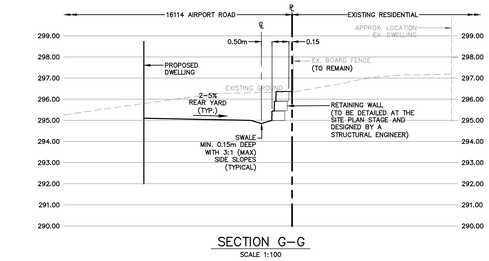
GRADING DETAIL

SCALE 1:400



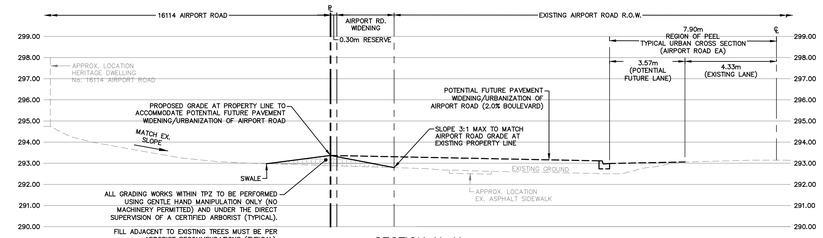
SECTION F–F

SCALE 1:100



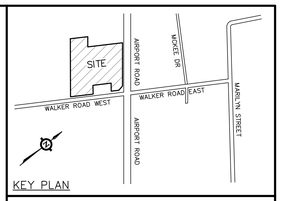
SECTION G–G

SCALE 1:100



SECTION H–H

SCALE 1:100



KEY PLAN

LEGEND

- EXISTING ELEVATION
- 202.00 PROPOSED ELEVATION
- PROPOSED SWALE DIRECTION
- PROPOSED DRAINAGE DIRECTION
- PROPERTY LINE
- PROPOSED SLOPE
- PROPOSED SWALE HIGH POINT
- PROPOSED CATCHBASIN
- PROPOSED DOUBLE CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- EISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED OVERLAND FLOW DIRECTION
- PROPOSED CHAIN LINK FENCE
- PROPOSED WOOD PRIVACY FENCE
- PROPOSED WOOD ACOUSTIC FENCE
- PROPOSED DECORATIVE METAL FENCE
- TREE PROTECTION FENCE (REFER TO LANDSCAPE)

NO.	DATE	BY/DRAWN	REVISIONS
3	13/10/2020	JN	RE-ISSUED FOR REZONING APPLICATION
2	29/10/2019	JN	RE-ISSUED FOR REZONING APPLICATION
1	15/03/2017	JN/ZG	ISSUED FOR REZONING APPLICATION

CAD FILE: 1599S.dwg | PLOT SCALE: 1:1 | PLOT DATE: Oct. 13, 2020

BENCHMARK

ELEVATIONS ARE REFERRED TO THE TOWN OF CALEDON BENCHMARK No. 25 HAVING AN ELEVATION OF 310.64 METRES

SURVEY CREDIT

TOPOGRAPHIC INFORMATION SHOWN HEREON IS OBTAINED FROM THE TOPOGRAPHIC SURVEY (104-O-16.DWG) PREPARED BY DAVID B. SEARLES SURVEYING LTD. DATED 22 SEPTEMBER 2016.

J.T. NELSON 100160289 13/10/2020 PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

DESIGNED BY

APPROVED BY

CONSULTANT

TRAFALGAR ENGINEERING
#1-481 MORDEN ROAD, OAKVILLE, ON, L6K 3W6
www.trafalgareng.com

PROJECT TITLE

RESIDENTIAL CONDOMINIUM AND RETAIL DEVELPOMENT
SHACCA CALEDON HOLDINGS

LOCATION

16114 AIRPORT ROAD
TOWN OF CALEDON

DRAWING TITLE

PRELIMINARY GRADING PLAN

SCALE: AS NOTED	DESIGN BY: JN	PROJECT No.	1599
DRAWN BY: JN	CHECKED BY: JN	PLAN No.	G1
DATE: 2019/09/04	SHEET 1 OF 1		

FILENAME: C:\Users\jnielsen\Trafalgar Engineering Ltd\Production - Active Projects\1599 Shacca\Drawings\DWG\1599S.dwg
PLOTDATE: Oct. 13, 2020 - 11:53am

SANITARY SEWER DESIGN TABLE

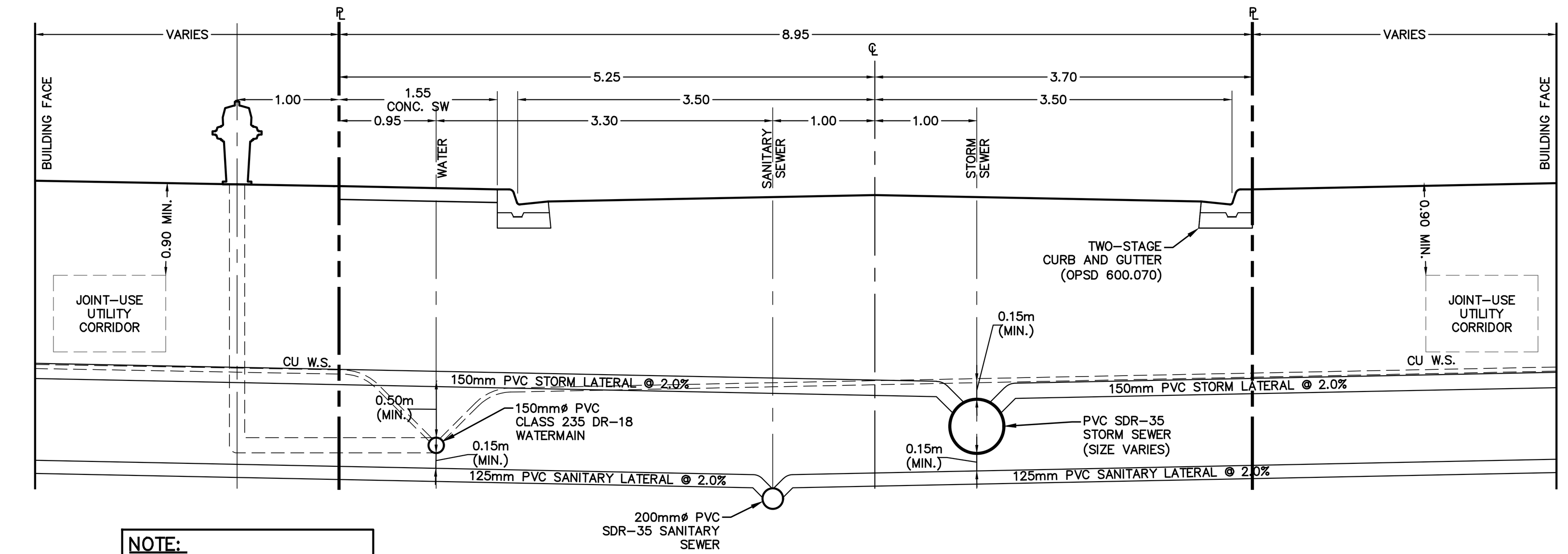
MH	N	NE	E	SE	S	SW	W	NW	TOP	DIA	OPSD	COVER	COMMENTS
RESIDENTIAL DEVELOPMENT													
1A	288.49		288.23				288.25			1200	701.010	401.010	
2A	288.69				288.66					1200	701.010	401.010	
3A					289.05		289.15		292.82	1200	701.010	401.010	
4A	289.41		289.31						293.14	1200	701.010	401.010	
5A	289.69				289.66				294.37	1200	701.010	401.010	
6A		290.69			290.59				294.22	1200	701.010	401.010	
7A			290.89			290.79			294.31	1200	701.010	401.010	
8A							291.31		294.61	1200	701.010	401.010	
COMMERCIAL DEVELOPMENT													
9A	290.33				290.31		290.43		292.66	1200	701.010	401.010	
10A			290.71					290.81	293.06	1200	701.010	401.010	
11A	290.15				290.13		290.52		292.25	1200	701.010	401.010	
12A			290.80			290.90			292.69	1200	701.010	401.010	

CATCH BASIN TABLE

CB	INV	TOP	OPSD	COVER	COMMENTS
RESIDENTIAL DEVELOPMENT					
1	292.10	293.47	705.010	STD.503	BEEHIVE STYLE TOP
2	291.80	293.25	705.010	STD.503	BEEHIVE STYLE TOP
3	292.20	293.65	705.010	STD.503	BEEHIVE STYLE TOP
4	292.60	294.05	705.010	STD.503	BEEHIVE STYLE TOP
5	292.65	294.10	705.010	STD.503	BEEHIVE STYLE TOP
6	292.99	294.44	705.010	STD.503	BEEHIVE STYLE TOP
7	292.93	293.98	705.010	STD.503	BEEHIVE STYLE TOP
8	292.87	294.32	705.010	400.010	BEEHIVE STYLE TOP
9	292.90	294.35	705.010	400.010	EQUIPPED WITH CB SHIELD
10	292.60	294.05	705.010	400.010	EQUIPPED WITH CB SHIELD
11	292.60	294.05	705.010	400.010	EQUIPPED WITH CB SHIELD
12	292.20	293.65	705.010	400.010	EQUIPPED WITH CB SHIELD
13	292.16	293.61	705.010	400.010	EQUIPPED WITH CB SHIELD
14	291.84	293.29	705.010	400.010	EQUIPPED WITH CB SHIELD
15	291.81	293.26	705.010	400.010	EQUIPPED WITH CB SHIELD
16	291.55	293.00	705.010	400.010	EQUIPPED WITH CB SHIELD
17	291.58	293.03	705.010	400.010	EQUIPPED WITH CB SHIELD
COMMERCIAL DEVELOPMENT					
18	291.34	292.36	705.010	400.010	EQUIPPED WITH CB SHIELD
19	291.66	292.56	705.010	400.010	EQUIPPED WITH CB SHIELD
20	291.67	292.57	705.010	400.010	EQUIPPED WITH CB SHIELD
21	291.55	292.70	705.010	STD.503	BEEHIVE STYLE TOP

STORM SEWER DESIGN TABLE

MH	N	NE	E	SE	S	SW	W	NW	TOP	DIA	OPSD	COVER	COMMENTS
RESIDENTIAL DEVELOPMENT													
1					290.44			290.46	291.64	1200	701.010	400.010	REPLACE EX. CB
2					290.57		290.66		292.22	1200	701.010	401.010	
3				290.74				290.79	292.34	1200	701.010	401.010	
4	290.88		290.83						292.45	1200	701.010	401.010	
5	291.08			291.03					292.67	1200	701.010	401.010	
6	290.86				291.16				292.66	1200	701.010	401.010	CONTROL MH
7			291.25				291.27		293.61			401.010	STORMCEPTOR EF06
8	291.41		291.31						293.47	1500	701.011	401.010	
9			291.79		291.74				293.29	1200	701.010	401.010	
10		291.95	291.83						294.16	1200	701.010	401.010	
11	292.30		292.17		292.00		292.30		294.25	1500	701.011	401.010	
12			292.27			292.22			294.31	1200	701.010	401.010	
13	292.62						292.49		294.63	1200	701.010	401.010	
COMMERCIAL DEVELOPMENT													
14					290.57		290.61		292.24	1200	701.010	401.010	
15	290.74				290.69				292.52	1200	701.010	400.020	
16	290.78		290.76						292.54	1200	701.010	401.010	CONTROL MH
17	290.91				290.83		290.91		292.65	1200	701.010	401.010	STORMCEPTOR EF04
18	291.04		290.94		291.04				292.59	1200	701.010	401.010	
19		291.04			291.01				292.63	1200	701.010	401.010	
20	291.30				291.17				292.87	1200	701.010	401.010	
21	290.54			290.52				290.54	292.27	1500	701.011	401.010	



NOTE:
REFER TO TOWN OF CALEDON
STANDARD DRAWING 223

PRIVATE ROAD TYPICAL SECTION
1:40

GENERAL NOTES

1. CONSTRUCTION FOR THIS PROJECT TO COMPLY WITH THE MOST CURRENT VERSION OF THE DEVELOPMENT STANDARDS, POLICIES AND GUIDELINES, PREPARED BY THE TOWN OF CALEDON INFRASTRUCTURE DEPARTMENT AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.

2. ALL PROPOSED CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.

3. A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO COMMENCING CONSTRUCTION WITHIN THE MUNICIPAL RIGHT OF WAY THE CONTRACTOR MUST CONTACT THE FOLLOWING: THE TOWN OF CALEDON PUBLIC WORKS AND ENGINEERING DEPARTMENT 905-584-2272, THE REGION OF PEEL, ENBRIDGE CONSUMERS GAS, HYDRO ONE, BELL CANADA, ROGERS CABLE, FIRE AND EMERGENCY SERVICES

4. ALL DRAINAGE TO BE SELF-CONTAINED AND DISCHARGED TO A LOCATION APPROVED BY THE PUBLIC WORKS AND ENGINEERING DEPARTMENT AND CONSERVATION AUTHORITY PRIOR TO THE ISSUANCE OF A BUILDING PERMIT.

5. SEDIMENT CONTROL DEVICES ARE TO BE INSTALLED PRIOR TO ANY CONSTRUCTION ON THE SITE AND SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD TO THE SATISFACTION OF THE TOWN AND THE APPLICABLE CONSERVATION AUTHORITY.

6. A MINIMUM OF 1.2M CLEARANCE IS TO BE PROVIDED FROM THE LIMITS OF ALL SIDEWALKS AND DRIVEWAYS TO EXISTING UTILITY STRUCTURES WITHIN THE MUNICIPAL RIGHT OF WAY. IF THIS CLEARANCE IS NOT MAINTAINED THEY SHALL BE RELOCATED AT THE APPLICANT'S EXPENSE.

7. STREET CURBS ARE TO BE CONTINUOUS THROUGH THE PROPOSED ENTRANCE.

8. MUNICIPAL SIDEWALKS SHALL BE CONTINUOUS THROUGH ALL ENTRANCES TO THE SITE AND THE CURB SHALL BE TAPERED BACK 600MM. SIDEWALKS SHALL BE COMPLETELY REMOVED AND REPLACED WITH A 180MM MINIMUM CONCRETE THICKNESS, 30MPA AND 5 TO 7% AIR ENTRAINMENT AT ALL PROPOSED INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL ENTRANCES.

9. ANY CHANGES TO GRADES OR SERVICING FROM THE ORIGINAL APPROVED SITE PLAN MUST BE SUBMITTED BY THE ENGINEER TO THE TOWN FOR APPROVAL PRIOR TO CONSTRUCTION.

10. ALL BOULEVARDS TO BE RESTORED WITH 150MM MINIMUM OF TOPSOIL AND SOD TO THE SATISFACTION OF THE TOWN OF CALEDON PUBLIC WORKS AND ENGINEERING DEPARTMENT.

11. THE MINIMUM PAVEMENT DESIGN FOR THE ASPHALT DRIVEWAY APRON WITHIN THE MUNICIPAL ROAD ALLOWANCE SHALL BE AS FOLLOWS: 40MM HL3 ASPHALT 50MM HL8 ASPHALT 150MM GRANULAR 'A' 300MM GRANULAR 'B' THE CONSULTANT SHOULD REVIEW THE ABOVE WITH RESPECT TO THE EXPECTED USAGE.

12. ALL DIMENSIONS AND ELEVATIONS TO BE VERIFIED PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES FOUND PRIOR TO OR DURING CONSTRUCTION SHALL BE CLARIFIED WITH THE ENGINEER.

13. THE LOCATION OF ALL EXISTING UTILITIES AND SERVICES TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

14. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANT'S PLANS. ANY DISCREPANCIES SHALL BE CLARIFIED PRIOR TO CONSTRUCTION. INFORMATION RELATED TO DIMENSIONS FOR PRIVATE ROAD, PARKING AND SETBACKS SHALL BE TAKEN FROM THE SITE PLAN PREPARED BY the ARCHITECT.

15. ALL SERVICES AND APPURTENANCE MATERIAL AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL, ONTARIO PLUMBING CODE AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.

16. O.P.S.D. REFERS TO ONTARIO PROVINCIAL STANDARD DRAWING.

17. ALL REMOVED OR DAMAGED CURBS, SIDEWALK AND SOD RESULTING FROM SERVICE INSTALLATION SHALL BE REINSTATED BY SERVICING CONTRACTOR TO THE TOWN OF CALEDON STANDARDS.

18. ALL SEWER TRENCH BACKFILL WITHIN SITE SHALL BE NATIVE MATERIAL FREE OF ORGANIC MATERIAL AND COMPACTED TO 95% SPMDD OR AS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER.

WATERMAINS

1. ALL MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT PEEL PUBLIC WORKS STANDARDS AND SPECIFICATIONS.

2. WATERMAIN AND / OR WATER SERVICE MATERIALS 100mm (4") AND LARGER MUST BE AWWA C-900-16 POLYVINYL CHLORIDE (PVC) DR18 INSTALLED WITH A 12 GAUGE TWH SOLID COPPER LIGHT COLOURED PLASTIC COATED TRACER WIRE BROUGHT TO THE SURFACE AT EACH VALVE BOX. SIZE 50mm (2") AND SMALLER MUST BE COPPER TYPE "K" SOFT COPPER TUBING.

3. WATERMAINS AND / OR WATER SERVICES ARE TO HAVE A MINIMUM COVER OF 1.7m (5'6") WITH A MINIMUM HORIZONTAL SPACING OF 1.2m (4") FROM THEMSELVES AND ALL OTHER UTILITIES.

4. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED WITH AT LEAST A 50mm (2") OUTLET ON 100mm (4") AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. THEY MUST ALSO BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100mm (4") DIAMETER MINIMUM ON A HYDRANT.

5. ALL CURB STOPS TO BE 3.0m (10') OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.

6. HYDRANT AND VALVE SET TO REGION STANDARD 1-6-1. DIMENSION A AND B, 0.7m (2") AND 0.9m (3") AND TO HAVE PUMPER NOZZLE.

7. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON THE APPROVED SITE PLAN. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.

8. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.30m (12") OVER / 0.50m (20") UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.

9. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEMS.

10. ALL LIVE TAPPING AND OPERATION OF REGION OF WATER VALVES SHALL BE ARRANGED THROUGH THE REGIONAL INSPECTOR ASSIGNED OR BY CONTACTING THE OPERATIONS AND MAINTENCE DIVISION.

11. ALL PROPOSED WATER PIPING MUST BE ISOLATED THROUGH A TEMPORARY CONNECTION THAT SHALL INCLUDE AN APPROPRIATE CROSS-CONNECTION CONTROL DEVICE, CONSISTANT WITH THE DEGREE OF HAZARD, FOR BACKFLOW PREVENTION OF THE ACTIVE DISTRIBUTION SYSTEM, CONFORMING TO REGION OF PEEL STANDARDS 1-7-7 OR 1-7-8.

SANITARY SEWERS

1. ALL SANITARY SEWER BEDDING AS PER STD. 2-3-1.

2. MAINLINE SANITARY SEWER PIPE SIZE SHALL BE MINIMUM 250mm IN DIAMETER INSTALLED AT THE APPROVED DESIGN GRADE. PIPE CLASS AND APPURTENANCES AS PER REGION'S SPECIFICATIONS.

3. ALL SEWERS CONSTRUCTED WITH GRADES 0.5% OR LESS SHALL BE APPROVED BY THE ENGINEER AND THE AGENCY PROJECT MANAGER OR DESIGNATE AND BE INSTALLED WITH LASER AND CHECKED PRIOR TO BACKFILL.

4. MINIMUM SANITARY SEWER PIPE SLOPE FOR LAST LEG SHALL BE 1% AND DESIRABLE SLOPE 2%.

5. ALL MANHOLES SHALL BE AS PER REGION STD. DWG. 2-5-1, 2-5-2, AND 2-5-3, WITH BENCHING AS PER STD 2-5-20. SEE NOTE 9.c. FOR IN-FLOW AND INFILTRATION.

6. FRAME AND COVERS SHALL BE AS PER REGION STD. DWG. 2-6-1.

7. MANHOLE STEPS SHALL BE AS PER REGION STD. DWG. 2-6-11.

8. MANHOLES DEEPER THAN 5.0m MUST BE EQUIPPED WITH SAFETY PLATFORMS, AS PER STD 2-6-13, 2-6-14, AND 2-6-15

9. SANITARY SERVICE LATERALS SHALL BE MINIMUM 150mm DIAMETER.

   a. SANITARY SERVICE SHALL BE LOWER THAN AND TO THE RIGHT OF THE STORM SERVICE AT THE PROPERTY LINE WHEN FACING THE LOT FROM THE STREET.

   b. CONNECTIONS TO SEWERS SHALL BE MADE WITH MANUFACTURED TEES OR WYES WHERE APPLICABLE AND SHALL BE COLOUR CODED AS NON-WHITE, AS PER STD. DWG. 2-4-1, 2-4-2, AND 2-4-3.

   c. ANY SANITARY CONNECTION OR STRUCTURE LEADING TO IN-FLOW AND INFILTRATION WILL HAVE TO BE ADDRESSED AND WILL BE ENFORCED IN THE FIELD BY A REGION OF PEEL INSPECTOR.

STORM SEWERS

1. ALL STORM SEWERS 450mm DIAMETER AND LESS SHALL BE PVC DR-35 SEWER PIPE & FITTINGS IN ACCORDANCE WITH CSA B 182.2 WITH BEDDING PER O.P.S.D. 802.010. STORM SEWER 525mm DIA. AND LARGER SHALL BE REINFORCED CONCRETE PIPE 65-D, CSA A257.2 COMPLETE WITH BEDDING PER OPSD 802.030 (UNLESS OTHERWISE NOTED).

2. SINGLE CATCHBASINS SHALL BE IN ACCORDANCE WITH O.P.S.D. 705.01 WITH 250mm DIAMETER (UNLESS OTHERWISE SHOWN) PVC LEAD AT 1.0% MIN. DOUBLE CATCHBASIN SHALL BE IN ACCORDANCE WITH O.P.S.D. 705.02 WITH 300mm DIAMETER (UNLESS OTHERWISE SHOWN) PVC LEAD AT 1.0% MIN. FRAME AND COVER PER O.P.S.D. 400.02 (UNLESS OTHERWISE SHOWN). ALL CB LEADS TO HAVE A MINIMUM COVER OF 1.2m AND A MAXIMUM COVER OF 1.8m BELOW TOP OF COVER (UNLESS OTHERWISE SHOWN) SINGLE CATCHBASINS SPECIFIED TO HAVE 'NO SUMP' SHALL BE IN ACCORDANCE WITH CITY OF MISSISSAUGA STD 2114.01.

3. STORM CONNECTIONS SHALL BE 150mm DIAMETER, WHITE COLOUR ONLY PVC PIPE SDR-28 AT A MIN. GRADE OF 2.0% PER CITY STD. 2115.05.

4. MINIMUM CLEARANCE SHALL BE 150mm OR AS REQUIRED FOR BEDDING WHICHEVER IS GREATER.

5. CATCHBASINS AT ROAD SIDES SHALL HAVE 270 R GEOTEXTILE MATERIAL PLACED BETWEEN FRAME AND COVER TO CONTROL SEDIMENT. MAINTENANCE OF THE GEOTEXTILE SHALL BE ROUTINELY DONE TO ENSURE ADEQUATE DRAINAGE.

6. STORM PIPE WITH LESS THAN 1.2m COVER TO BE PROVIDED WITH INSULATION IN ACCORDANCE WITH OBC SECTION 7.3.5.4. APPENDIX A.

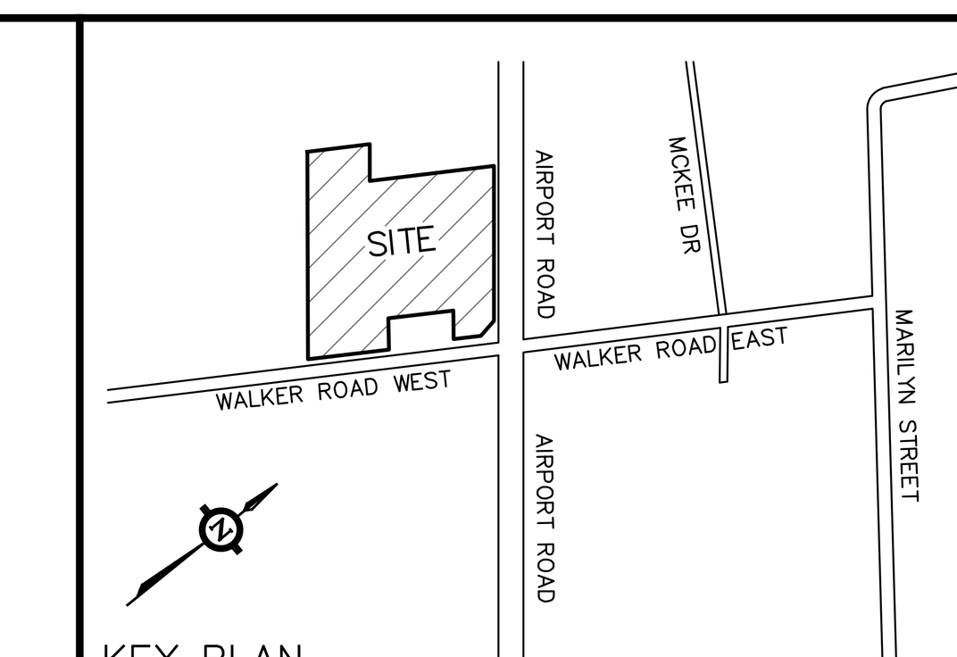
ADDITIONAL NOTES

1. LOCATION OF ALL EXISTING UTILITIES IN THE FIELD TO BE ESTABLISHED BY THE CONTRACTOR.

2. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING OF ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE AREA OF THEIR WORK, WHETHER SHOWN ON THE PLANS OR NOT, AND FOR ALL REPAIRS AND CONSEQUENCES RESULTING FROM DAMAGE TO SAME.

3. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE TO GIVE 72 HOURS WRITTEN NOTICE TO THE UTILITIES PRIOR TO CROSSING SUCH UTILITIES, FOR THE PURPOSE OF INSPECTION BY THE CONCERNED UTILITY. THIS INSPECTION WILL BE FOR THE DURATION OF THE CONSTRUCTION, WITH THE CONTRACTOR RESPONSIBLE FOR ALL COSTS ARISING FROM SUCH INSPECTION.

FILENAME: C:\Users\jnelson\Trafalgar Engineering Ltd\Production - Active Projects\1599 Shacca\Drawings\DWG\1599S.dwg
PLOTDATE: Oct 13, 2020 - 11:55am



KEY PLAN

LEGEND

- PROPOSED CATCHBASIN
- PROPOSED DOUBLE CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPERTY LINE
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED FIRE HYDRANT
- PROPOSED VALVE & BOX
- PROPOSED CHECK VALVE IN CHAMBER
- PROPOSED WATERMAIN
- PROPOSED PLUG
- EXISTING CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- EISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE

NO.	DATE	BY/DRAWN	REVISIONS
3	13/10/2020	JN	RE-ISSUED FOR REZONING APPLICATION
2	29/10/2019	JN	RE-ISSUED FOR REZONING APPLICATION
1	15/03/2017	JN/ZG	ISSUED FOR REZONING APPLICATION

CAD FILE: 1599S.dwg | PLOT SCALE: 1:1 | PLOT DATE: Oct 13, 2020

BENCHMARK

ELEVATIONS ARE REFERRED TO THE TOWN OF CALEDON BENCHMARK No. 25 HAVING AN ELEVATION OF 310.64 METRES

SURVEY CREDIT

TOPOGRAPHIC INFORMATION SHOWN HEREON IS OBTAINED FROM THE TOPOGRAPHIC SURVEY (104-0-16.DWG) PREPARED BY DAVID B. SEARLES SURVEYING LTD. DATED 22 SEPTEMBER 2016.

LICENSED PROFESSIONAL ENGINEER
J. T. NELSON
100199369
13/10/2020
PROVINCE OF ONTARIO

DESIGNED BY

APPROVED BY

CONSULTANT

TRAFALGAR ENGINEERING
#1-481 MORDEN ROAD, OAKVILLE, ON, L6K 3W6
www.trafalgareng.com

PROJECT TITLE

RESIDENTIAL CONDOMINIUM AND RETAIL DEVELPOMENT
SHACCA CALEDON HOLDINGS

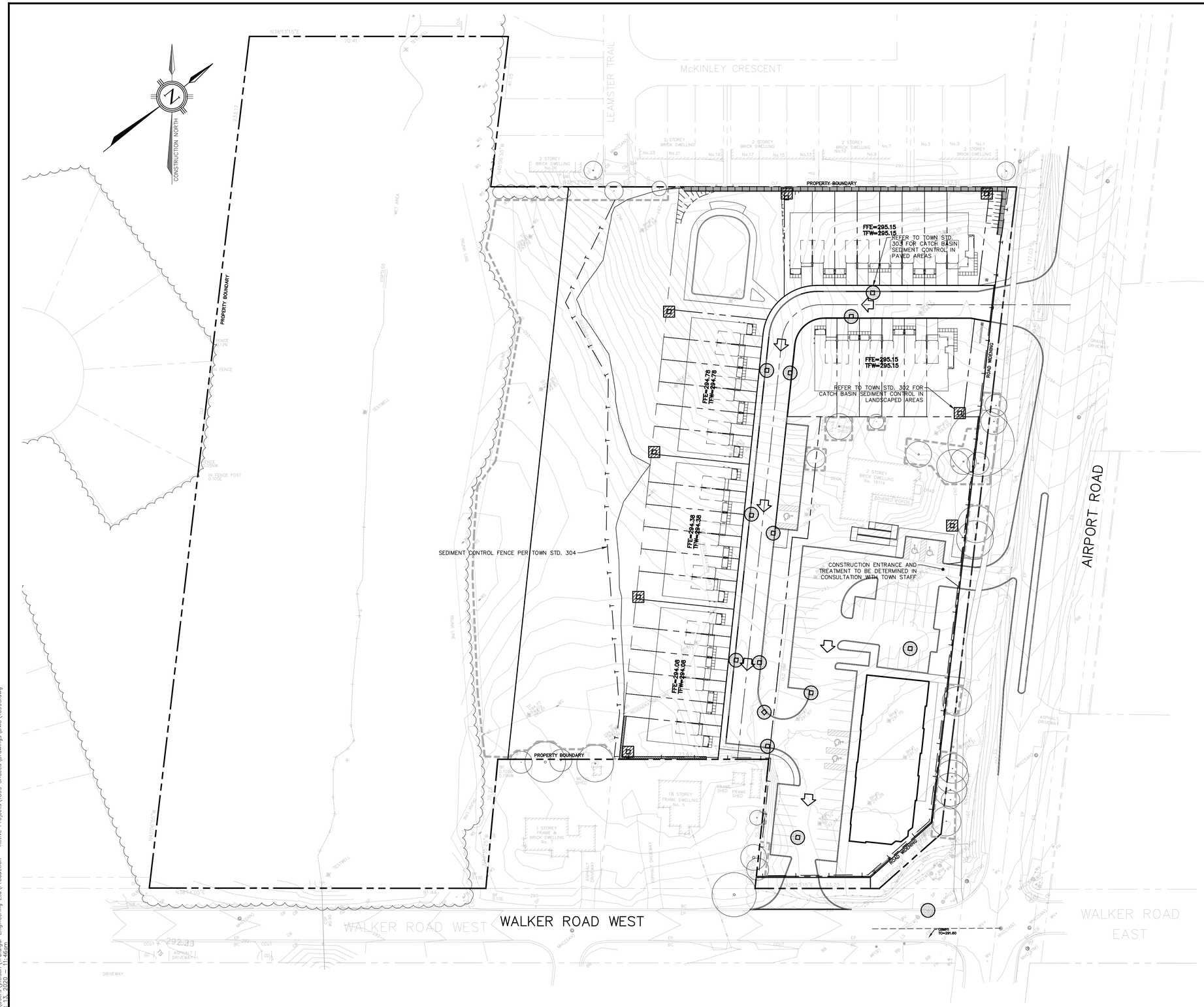
LOCATION

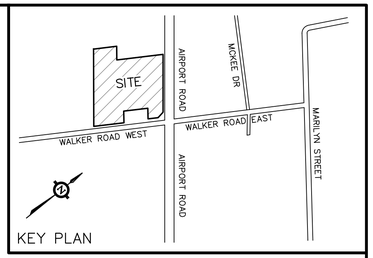
16114 AIRPORT ROAD
TOWN OF CALEDON

DRAWING TITLE

PRELIMINARY SERVICING PLAN

SCALE	1:400	DESIGN BY	JN	PROJECT No.	1599
DRAWN BY	JN	CHECKED BY	JN	PLAN No.	S1
DATE	2019/09/04	SHEET	1 OF 1		





LEGEND

- SEDIMENT CONTROL CB IN PAVED AREAS
- SEDIMENT CONTROL CB IN LANDSCAPED AREA
- PROPERTY LINE
- PROPOSED SLOPE
- PROPOSED CATCHBASIN
- PROPOSED DOUBLE CATCHBASIN
- EXISTING CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- PROPOSED OVERLAND FLOW DIRECTION
- SEDIMENT CONTROL FENCE

NO.	DATE	BY/DRAWN	REVISIONS
3	13/10/2020	JN	RE-ISSUED FOR REZONING APPLICATION
2	29/10/2019	JN	RE-ISSUED FOR REZONING APPLICATION
1	15/03/2017	JN/ZG	ISSUED FOR REZONING APPLICATION

CAD FILE: 1599S.dwg | PLOT SCALE: 1:1 | PLOT DATE: 13/10/20

BENCHMARK

ELEVATIONS ARE REFERRED TO THE TOWN OF CALEDON BENCHMARK No. 25 HAVING AN ELEVATION OF 310.64 METRES

SURVEY CREDIT

TOPOGRAPHIC INFORMATION SHOWN HEREON IS OBTAINED FROM THE TOPOGRAPHIC SURVEY (104-0-16.DWG) PREPARED BY DAVID B. SEARLES SURVEYING LTD. DATED 22 SEPTEMBER 2016.

LICENSED PROFESSIONAL ENGINEER
J. T. NELSON
100193389
13/10/2020
PROVINCE OF ONTARIO

DESIGNED BY | APPROVED BY

TRAFALGAR ENGINEERING LTD.
481 MORDEN ROAD OAKVILLE, ONTARIO L6K 3W6
TEL: (905) 338-3366 FAX: (905) 338-7734
tel@trafalgareng.com

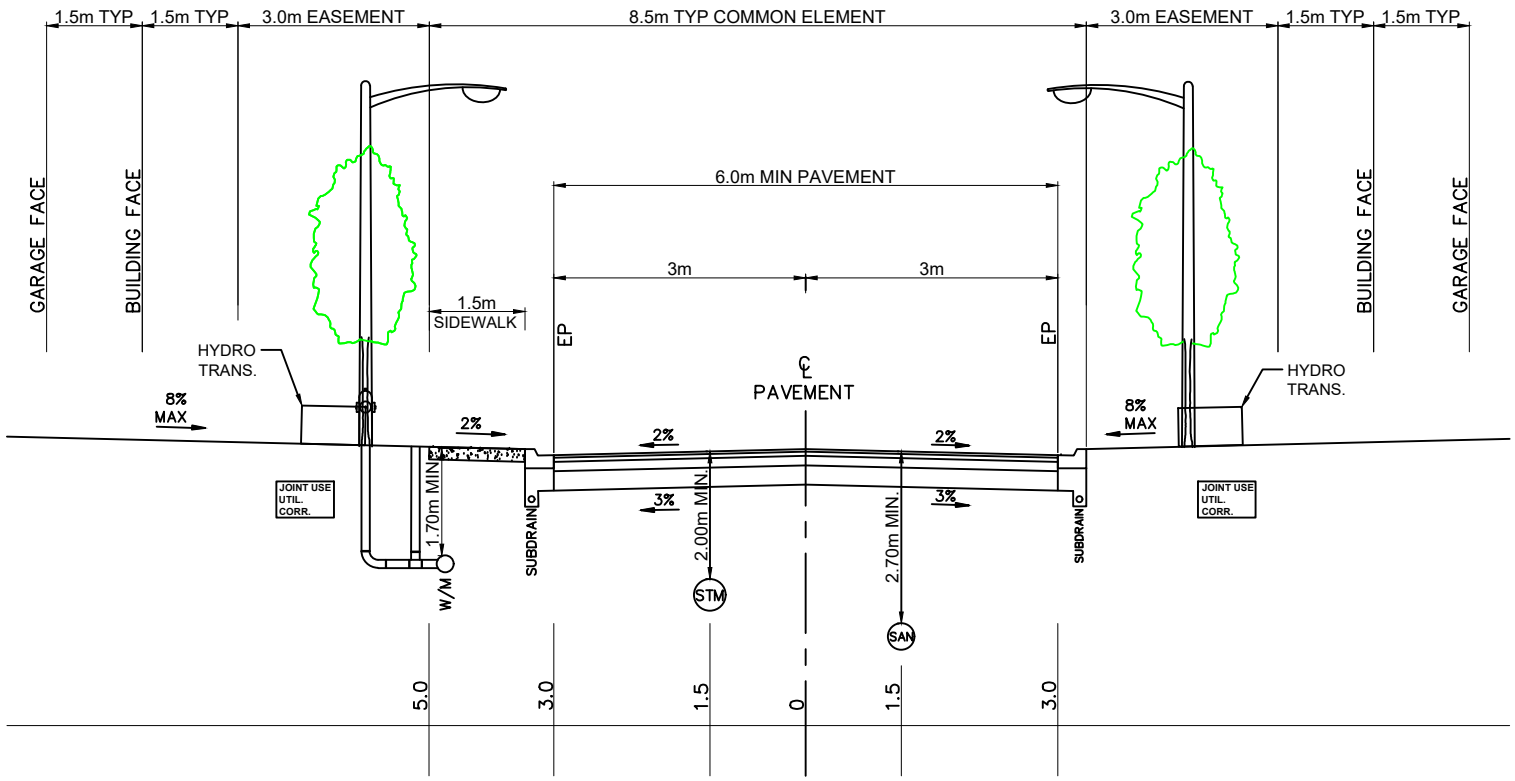
PROJECT TITLE
RESIDENTIAL CONDOMINIUM AND RETAIL DEVELOPMENT
SHACCA CALEDON HOLDINGS

LOCATION
16114 AIRPORT ROAD
TOWN OF CALEDON

DRAWING TITLE
EROSION AND SEDIMENTATION CONTROL PLAN

SCALE 1:500	DESIGN BY JN/SP	PROJECT No. 1599	
DRAWN BY JN/ZG	CHECKED BY SP	PLAN No. E1	
DATE 15/11/2016	SHEET 1 OF 1		

FILENAME: C:\Users\jnelson\Trafalgar Engineering Ltd\Production - Active Projects\1599 Shacca\Drawings\DWG\1599S.dwg
PLOTDATE: Oct 13, 2020 - 11:46am



NOTES

1. WATERMAIN TO HAVE MINIMUM COVER OF 1.7m.
2. UTILITY CORRIDOR TO HAVE A MINIMUM COVER OF 0.9m.
3. TREES TO BE PLACED IN LOCATIONS PER APPROVED LANDSCAPE PLAN.
4. THE FOLLOWING IS A MINIMUM ROAD BASE AND WILL REQUIRE A SOILS REPORT VERIFICATION
   - 40 mm HL3
   - 65 mm HL8
   - 150 mm GRANULAR "A"
   - 300 mm GRANULAR "B"
6. THE BOULEVARDS REQUIRE A MINIMUM OF 300mm OF TOPSOIL AND NURSERY SOD.
8. FULL LENGTH MINIMUM 100 MM DIA.SUB-DRAINS C/W FILTERCLOTH SHALL BE INSTALLED,
9. SUB-GRADE SHALL BE COMPACTED TO A MINIMUM 95% OF S.P.D. AT OPTIMUM MOISTURE CONTENT.
10. WHERE POSSIBLE MANHOLE LIDS TO BE LOCATED OUT OF TIRE LANE OF TRAFFIC.
11. LONG DIMENSION OF TRANSFORMER TO BE PARALLEL TO STREETLINE.

TOWN OF CALEDON

PRIVATE ROAD CROSS SECTION COMMON ELEMENT CONDOMINIUM ROAD

NO.	REVISION	APR'D	DATE

APR'D:

DATE: MAY 19

DRAWN: J.M.

SCALE: N.T.S.

STANDARD No. 223

Appendix ‘C’

Estimated Domestic Water Demand

Fire Hydrant Flow Test

Estimated Sanitary Flow

TRAFALGAR ENGINEERING LTD.

ESTIMATED DOMESTIC WATER DEMAND

Project: Shacca Caledon
Desc: Third submission Rezoning

Project No.: 1599
Prepared By: JN
Checked By: SP

	Occupancy Data					Peaking Factors			Demand Flow		
Land Use / Occupancy Type	Units	Population Density (pers/unit)	Eq. Population (cap.)	Per Cap. Demand (L/cap. Day)	Average Daily Demand (L/min)	Min. Hour	Peak Hour	Max. Daily	Min. Hour Demand (L/min)	Max. Hour Demand (L/min)	Max. Daily Demand (L/min)
Proposed Townhouse Condominium	32	3.2	102	280	20	1.00	3.00	2.00	20	60	40
									0	0	0
									0	0	0
									0	0	0
TOTAL			**102**		**20**				**20**	**60**	**40**

Fire Flow
Using Fire Underwriters Survery Methodology:

Average Daily Demand: **20 (L/min)**
Minimum Hourly Demand: **20 (L/min)**
Maximum Hourly Demand: **60 (L/min)**
Maximum Daily Demand: **40 (L/min)**
Max. Daily Plus Fire: **9040 (L/min)**

1. **An estimate of the fire flow is given by the formula** $F = 220C\sqrt{A}$

Where:
F = The required fire flow in litres per minute
C = Coefficient related to the type of construction
A = The total floor area in square metres (including all storeys but excluding basements at least 50% below grade)

Type of Construction: Ordinary — Coefficient: 1.00 — Total Floor Area: 1200 (m^2)

F = 8000 (L/min)

Adequately Protected Vertical Openings: No

Area Note: For fire resistive buildings, consider the two largest adjoining floors plus 50% of the remaining floors up to eight, when openings are inadequately protected. For adequately protected vertical openings consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors

2. **Adjust the value in No. 1 for occupancy surcharge/reduction**

Occupancy Contents: Limited Combustible — Factor: -15%

F = 6800 (L/min)

3. **Adjust the value in No. 2 for sprinkler**

NFPA 13 Sprinkler:	No	Reduction:	0%
Standard Water Supply:	Yes	Reduction:	0%
Fully Supervised:	No	Reduction:	0%

Total Reduction: **0%**
Sprinkler Reduction: **0 (L/min)**

4. Adjust the value in No. 2 for exposure

	Separation (m)	Charge
North	45	0%
East	3	20%
South	18	15%
West	N/A	

Total Charge: **35%**
Exposure Charge: **2380 (L/min)**

5. **Estimated Fire Flow is value in No. 2 less *Sprinkler Reduction* plus *Exposure Charge*, rounded to the nearest 1000**

F = 9000 (L/min)

TRAFALGAR ENGINEERING LTD.

ESTIMATED DOMESTIC WATER DEMAND

Project: Shacca Caledon
Desc: Third submission Rezoning

Project No.: 1599
Prepared By: JN
Checked By: SP

	Occupancy Data					Peaking Factors			Demand Flow		
Land Use / Occupancy Type	Site Area (ha)	Population Density (pers/ha)	Eq. Population (cap.)	Per Cap. Demand (L/cap. Day)	Average Daily Demand (L/min)	Min. Hour	Peak Hour	Max. Daily	Min. Hour Demand (L/min)	Max. Hour Demand (L/min)	Max. Daily Demand (L/min)
Proposed Commercial Development	0.557	50	28	280	5	1.00	3.00	1.40	5	16	8
									0	0	0
									0	0	0
									0	0	0
TOTAL			**28**		**5**				**5**	**16**	**8**

Fire Flow
Using Fire Underwriters Survery Methodology:

Average Daily Demand: **5 (L/min)**
Minimum Hourly Demand: **5 (L/min)**
Maximum Hourly Demand: **16 (L/min)**
Maximum Daily Demand: **8 (L/min)**
Max. Daily Plus Fire: **8008 (L/min)**

1. **An estimate of the fire flow is given by the formula** $F = 220C\sqrt{A}$

Where:
F = The required fire flow in litres per minute
C = Coefficient related to the type of construction
A = The total floor area in square metres (including all storeys but excluding basements at least 50% below grade)

Type of Construction: Ordinary — Coefficient: 1.00 — Total Floor Area: 905 (m^2)

F = 7000 (L/min)

Adequately Protected Vertical Openings: No

Area Note: For fire resistive buildings, consider the two largest adjoining floors plus 50% of the remaining floors up to eight, when openings are inadequately protected. For adequately protected vertical openings consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors

2. **Adjust the value in No. 1 for occupancy surcharge/reduction**

Occupancy Contents: Combustible — Factor: 0%

F = 7000 (L/min)

3. **Adjust the value in No. 2 for sprinkler**

NFPA 13 Sprinkler:	No	Reduction:	0%
Standard Water Supply:	Yes	Reduction:	0%
Fully Supervised:	No	Reduction:	0%
		Total Reduction:	**0%**
		Sprinkler Reduction:	**0 (L/min)**

4. **Adjust the value in No. 2 for exposure**

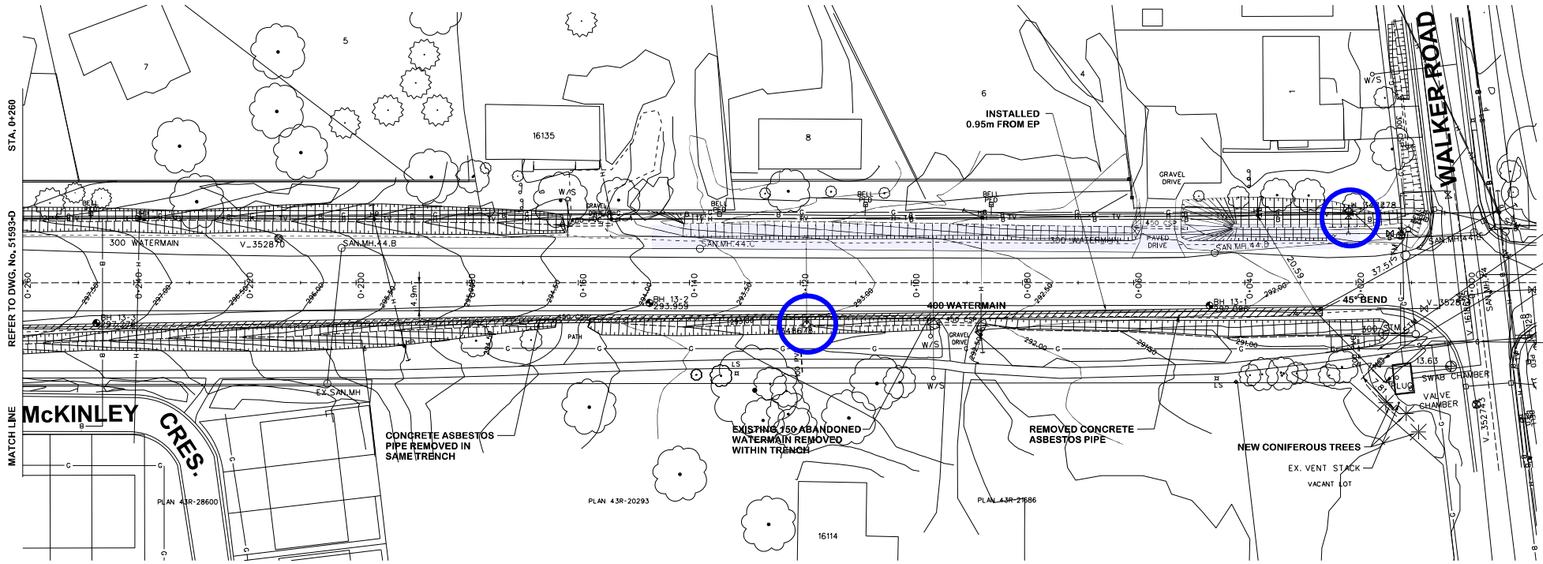
	Separation (m)	Charge
North	35	5%
East	N/A	
South	N/A	
West	35	5%
Total Charge:		**10%**
Exposure Charge:		**700 (L/min)**

5. **Estimated Fire Flow is value in No. 2 less *Sprinkler Reduction* plus *Exposure Charge*, rounded to the nearest 1000**

F = 8000 (L/min)

DISCLAIMER

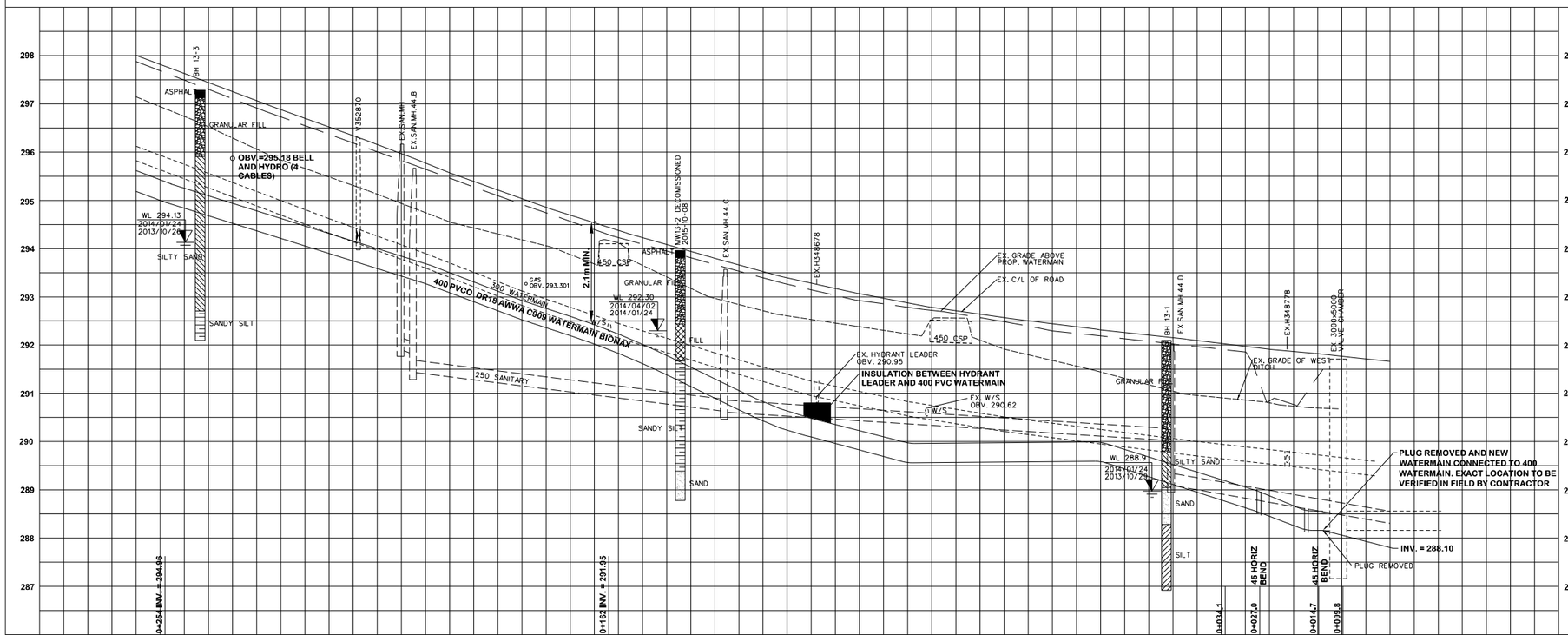
These records are based upon available and unverified information and may prove inaccurate.
The Region of Peel disclaims any responsibility should these records be relied upon to the detriment of any person.



APPROXIMATE LOCATION	ITEM	MAKE AND MODEL	REGION ID#
STA 0+015.5 WEST SIDE OF AIRPORT ROAD	SWABBING CHAMBER	1200mm DIA SWABBING CHAMBER - MUNRO	
STA 0+016.5 WEST SIDE OF AIRPORT ROAD IN DITCH - DIRECT BURIED	GATE VALVE	(12"/300mm) R/W VALVE MECHANICAL JOINT ENDS - CLOW VALVE COMPANY MODEL #2640	

400 WATERMAIN IS BIONAX PIPE IPEX - AIRPORT ROAD PROJECT. CONTRACT 2014-054T

AIRPORT ROAD (REGIONAL ROAD 7)



295.13	294.66	294.02	293.27	292.52	291.83	290.90	290.17	289.56	289.76	289.63	289.43	288.79		BOT.EL. OF WM.
298.00	297.26	296.52	295.77	295.04	294.38	293.80	293.28	292.87	292.57	292.31	292.09	291.87	291.66	EX. ROAD ELEV.
0+260	0+240	0+220	0+200	0+180	0+160	0+140	0+120	0+100	0+080	0+060	0+040	0+020	0+000	ROAD CHAINAGE

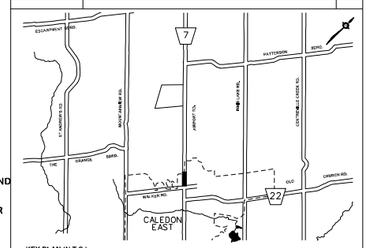
Consultant Ref# 13052

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS	JUL 24, 2013	MB	GAS MAINS	OCT 10, 2013	MB
STORM SEWERS	JUL 24, 2013	MB	BELL U/G CABLE	NOV 4, 2013	MB
WATERMAINS	SEPT 20, 2013	MB	HYDRO U/G CABLE	NOV 4, 2013	MB
TRANSIT			HYDRO ONE	NOV 4, 2013	MB
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES	OCT 16, 2013	MB

REVISIONS

DATE	DETAILS	INIT.
MAY 23, 2014	ISSUED FOR TENDER	MNB
JUNE 27, 2014	ISSUED FOR CONSTRUCTION	MNB
APR 1, 2015	AS RECORDED	MNB



NOTE:

1. FOR GENERAL NOTES, DETAILS AND LEGEND SEE DWG. 51591-D
2. STATION 0+333 TO 1+275 AND 1+377 TO 1+609 IS WITHIN THE TRCA REGULATORY LIMIT.
3. FOR NOTES AND DETAILS REGARDING EROSION AND SEDIMENT CONTROL SEE DWG 51591-D AND 51599-D.
4. LOCATION OF BOREHOLES ARE APPROXIMATE, REFER TO GEOTECHNICAL INFORMATION PROVIDED BY SPL.

TOPOGRAPHIC INFORMATION

EXISTING TOPOGRAPHIC INFORMATION WAS OBTAINED FROM FIELD SURVEY BY GAMSBY AND MANNEROW IN JULY 2013.

THIS DRAWING TO BE USED FOR WATERMAIN CONSTRUCTION ONLY

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted
All Water And Sanitary Service Locations Are Approximate And Must Be Located Accurately In The Field
All Horizontal And Vertical Bends Are In Degrees
All Pipes Size In mm
25C Existing Water Service, Size In mm
WS20 Proposed Water Service, Size In mm
B.M. No. 25 Elev. 310.640
On the North face at the West corner of a two storey block building No. 16301 located on the East side of Airport Road approx. 0.32Km North of Northerly limit of Caledon East
B.M. No. 29 Elev. 386.922
On the East face at the South Corner of a Two storey red brick house No. 17358 Located on the South West corner of Airport Road and Escarpment Sidecad
The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only, To Be Verified In Field By Contractor. Geotechnical And Groundwater Level Information Is Shown For Information Purposes Only. Information Is Derived From Various Sources And Should Not Be Relied Upon.

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE
1m 0 1 2 3m VERTICAL SCALE

Gamsby and Mannerow ENGINEERS

Region of Peel
Working for you

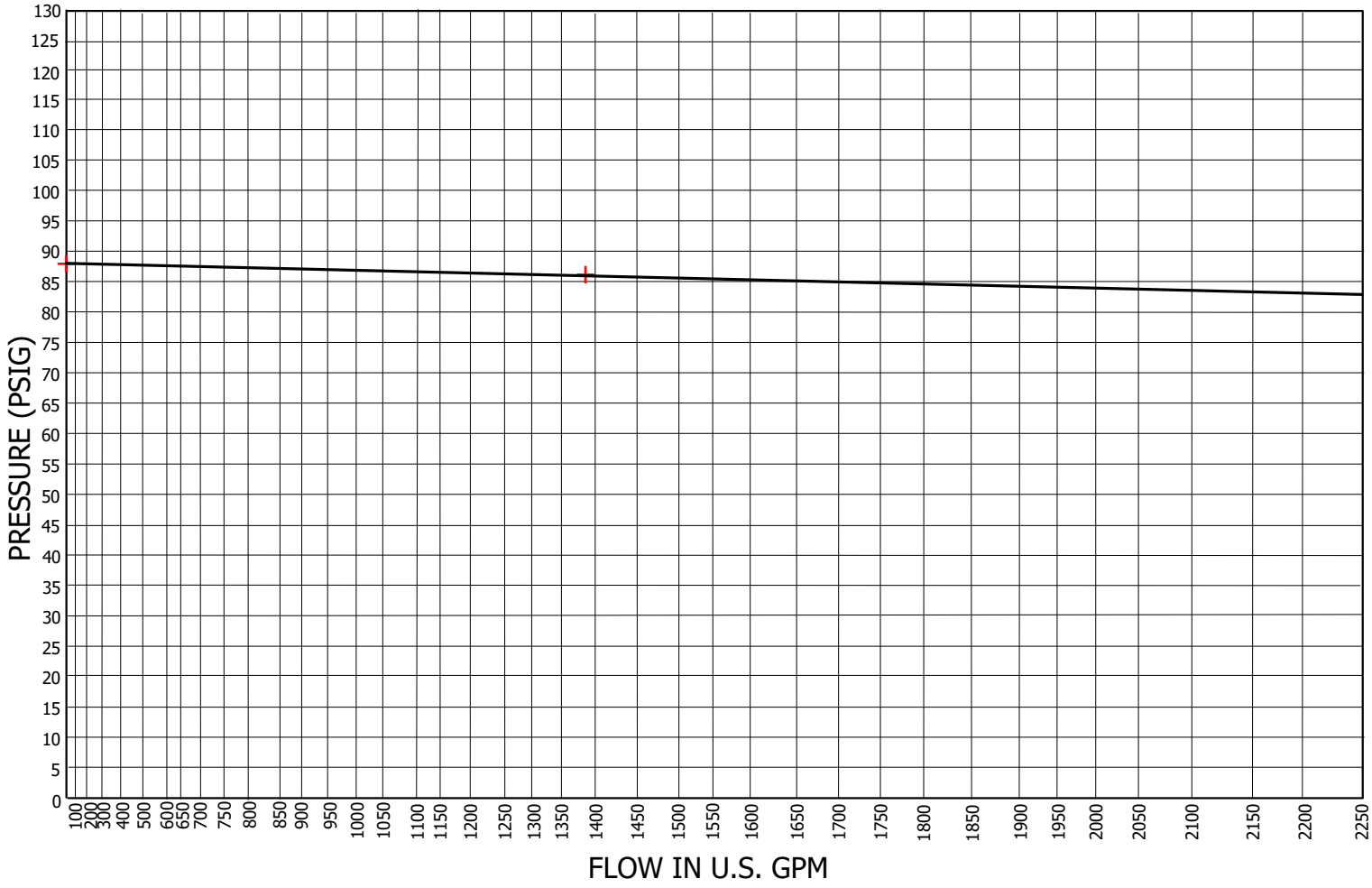
AIRPORT ROAD

(FROM WALKER ROAD TO CALEDON EAST RESERVOIR)

PROP. 400mm WATERMAIN

STA. 0+000.00 TO STA. 0+260.00

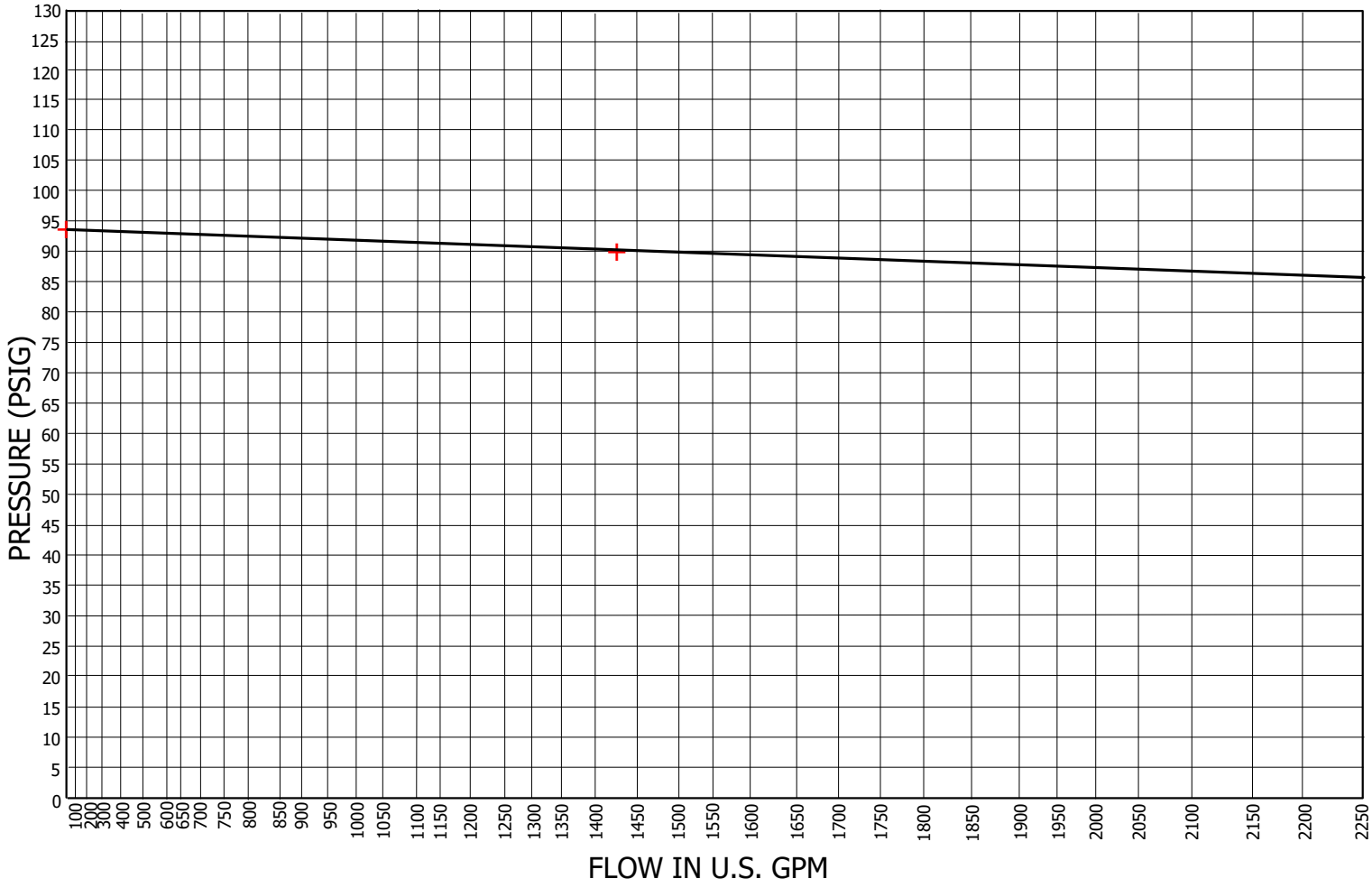
CAD Area	Area	C-48/C-49	Project No. 13-1191
Checked by M.N.B.	Drawn by M.J.B.		
Date SEPTEMBER 2013	Sheet 02 of 14		Plan No. 51592-D



# of Ports	PORT DIA. (in/mm)	PITOT (psig)	FLOW (usgpm)	RESIDUAL (psig)
1	2.50/63	68	1384	86
2	2.50/63	58/58	2556	82
THEORETICAL FLOW @ 20psi			9290	

General Data	
Test Date	29 September 2020
Test Time	10:00am
Pipe Dia.	16"
Static	88

Site Information	
Site or Developer Name	Trafalgar Engineering/Shacca Caledon
Site Address/Municipality	16114 Airport Road, Caledon East
Location of Test Hydrant	Front of 16114 Airport Road
Location of Base Hydrant	Airport Road, 1st South of Leamster Trail
Technician's Comments	No conversion factor used for flow calculation based on round and flush internal nozzle
	configuration. Flow testing has been conducted in accrodance with NFPA 291 guidelines
	wherever possible. Refer to attached report for further information.
	Verified By: Mark Schmidt



# of Ports	PORT DIA. (in/mm)	PITOT (psig)	FLOW (usgpm)	RESIDUAL (psig)
1	2.50/63	72	1424	90
2	2.50/63	60/60	2600	85
THEORETICAL FLOW @ 20psi			6882	

General Data	
Test Date	29 September 2020
Test Time	10:30am
Pipe Dia.	12"
Static	94

Site Information	
Site or Developer Name	Trafalgar Engineering/Shacca Caledon
Site Address/Municipality	16114 Airport Road, Caledon East
Location of Test Hydrant	Near 7 Walker Road West
Location of Base Hydrant	Walker Road West @ Putney Road
Technician's Comments	No conversion factor used for flow calculation based on round and flush internal nozzle
	configuration. Flow testing has been conducted in accrodance with NFPA 291 guidelines
	wherever possible. Refer to attached report for further information.
	Verified By: Mark Schmidt

TRAFALGAR ENGINEERING LTD.

ESTIMATED SANITARY FLOW

Project: Shacca Caledon
Desc: Third submission Rezoning

Project No.: 1599
Prepared By: JN
Checked By: SP

Residential

Land Use / Occupancy Type	Unit Count	Population Density (pers/unit)	Eq. Population (cap.)	Per Cap. Demand (L/cap. Day)	Average Daily Dry Weather Flow (L/s)
Proposed Townhouse Condominium	32	3.2	102	302.8	13.0
*SEE PEEL STD. 2-5-2					
TOTAL			**102**		**13.0**

Industrial / Commercial / Institutional

Land Use / Occupancy Type	GFA	Population Density (pers/ha)	Eq. Population (cap.)	Per Cap. Demand (L/Ha. Day)	Average Daily Dry Weather Flow (L/s)
					0.0
					0.0
TOTAL			**0**		**0.0**

Residential Peaking Factor:	1.00	*PEAKING IS INCLUDED IN REGION FLOW (STD 2-5-2)
ICI Peaking Factor:	4.50	
Include ICI Peaking?	No	
Site Area:	0.94	(ha)
Infiltration Allowance:	0.20	(L/s ha)
Manhole Allowance	2.24	(L/s)
Residential Average Flow:	15.3	(L/s)
ICI Average Flow:	0.0	(L/s)
Groundwater Discharge:	0.0	(L/s)
Total Average Flow:	**15.3**	**(L/s)**
Residential Peak Flow:	15.3	(L/s)
ICI Peak Flow:	0.0	(L/s)
Groundwater Discharge:	0.0	(L/s)
Total Peak Flow:	**15.3**	**(L/s)**

TRAFALGAR ENGINEERING LTD.

ESTIMATED SANITARY FLOW

Project: Shacca Caledon
Desc: Third submission Rezoning

Project No.: 1599
Prepared By: JN
Checked By: SP

Residential

Land Use / Occupancy Type	Site Area (ha)	Population Density (pers/ha)	Eq. Population (cap.)	Per Cap. Demand (L/cap. Day)	Average Daily Dry Weather Flow (L/s)
Proposed Commercial Development	0.557	50	28	*	13.0
*SEE PEEL STD. 2-5-2					
TOTAL			**28**		**13.0**

Industrial / Commercial / Institutional

Land Use / Occupancy Type	GFA	Population Density (pers/ha)	Eq. Population (cap.)	Per Cap. Demand (L/Ha. Day)	Average Daily Dry Weather Flow (L/s)
					0.0
					0.0
TOTAL			**0**		**0.0**

Residential Peaking Factor:	1.00	*PEAKING IS INCLUDED IN REGION FLOW (STD 2-5-2)
ICI Peaking Factor:	4.50	
Include ICI Peaking?	No	
Site Area:	0.56	(ha)
Infiltration Allowance:	0.20	(L/s ha)
Manhole Allowance	1.12	(L/s)
Residential Average Flow:	13.7	(L/s)
ICI Average Flow:	0.0	(L/s)
Groundwater Discharge:	0.0	(L/s)
Total Average Flow:	**13.7**	**(L/s)**
Residential Peak Flow:	13.7	(L/s)
ICI Peak Flow:	0.0	(L/s)
Groundwater Discharge:	0.0	(L/s)
Total Peak Flow:	**13.7**	**(L/s)**

Appendix ‘D’

TRCA SWM Requirements (Email)

Pre-Development Drainage Area Plan (Figure 1)

Post-Development Drainage Area Plan (Figure 2)

Storm Sewer Design Sheet

HydroCAD Output

Oil/Grit Separator Sizing

CB Shield detail and sizing chart

James Nelson

From: Anant Patel <APatel@trca.on.ca>
Sent: June-22-16 10:16 AM
To: Stephen Potter
Subject: 16114 Airport Road, Caledon

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Steve,

As discussed this morning, please see below TRCA's Stormwater Management requirements.

The stormwater management requirements for the proposed development at 16114 Airport Road, Caledon is:

- **Quantity Control:** TRCA's quantity control criteria for the site is that post development peak flows to be controlled to pre-development peak flows for 2 - 100 year storms. The pre-development peak flows for 2 - 100 year storms should be established based on the unit flow rates for Sub-basin # 6 (Equation B) and typically with drainage areas under existing conditions. The unit flow relationships for the Humber River Watershed are provided in the TRCA Stormwater Management Criteria document which can be found in the following link: http://www.trca.on.ca/dotAsset/26183.pdf. Please use 6 hr AES and 12 hr AES to estimate storage requirements for the post-development flows to achieve the targets and then select the option that require greater storage requirements.

- **Quality Control:** Level 1/Enhanced protection such that 80% TSS removal is achieved.

- **Erosion Control:** due to the size of the site, an erosion assessment is required to identify the necessary controls required to mitigate any potential downstream erosion issues. However, the minimum control required is to detain runoff from a 25 mm storm for at least 48 hours.

- **Water Balance:** As the site is located on the Oak Ridges Moraine, post-development infiltration should be maintained to pre-development infiltration by implementing mitigation measures to aid in the infiltration.

- **Feature Based Water Balance Analysis:** Given that the Ministry of Natural Resources and Forestry (MNRF) has identified the wetland to the rear of the property as a Provincially Significant Wetland (PSW, a feature based water balance will be required in support of the application. Scoping of the FBWB will depend on the conceptual alterations to the wetland catchment area as well as the sensitivity of the wetland complex. Please refer the applicant to Appendix: D of he SWM Criteria Document for further guidance.

TRCA staff recommend that you also refer to TRCA Low Impact Development Stormwater Management Planning & Design Guide, which can be found in the following link: https://trca.ca/wp-content/uploads/2016/04/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf.

Should you have any further questions, please do not hesitate to contact me.

Thank you,
Anant

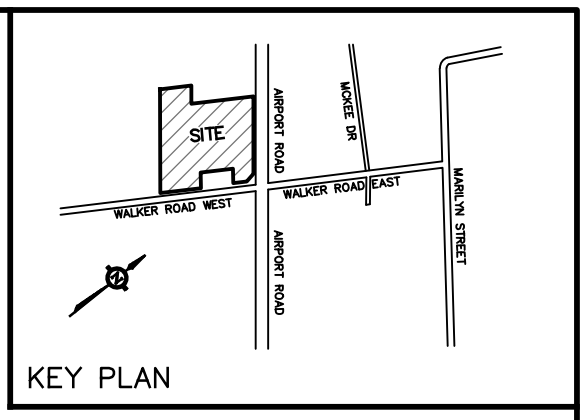
Anant Patel, Acting Planner II | Planning and Development |
Toronto and Region Conservation Authority|
P: 416.661.6600 x5618 | F: 416.661.6898 | apatel@trca.on.ca | www.trca.on.ca |
Head Office location & courier address: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 |

LEGEND

PROPOSED OVERLAND FLOW DIRECTION

PROPOSED DRAINAGE AREA

0.195 / 0.25 — DRAINAGE AREA (ha) / IMPERVIOUSNESS



KEY PLAN

TRIBUTARY TO AIRPORT RD

IMPERVIOUS AREA:	0.034 ha
TOTAL AREA:	1.272 ha
% IMPERVIOUS:	2%
RUNOFF COEFFICIENT:	C=0.27
Q2:	81 L/s
Q100:	232 L/s

TRIBUTARY TO WETLAND

IMPERVIOUS AREA:	0.000 ha
TOTAL AREA:	0.229 ha
% IMPERVIOUS:	0%

0.229 / 0.00

1.272 / 0.02

DEVELOPMENT AREA

AIRPORT ROAD

WALKER ROAD WEST

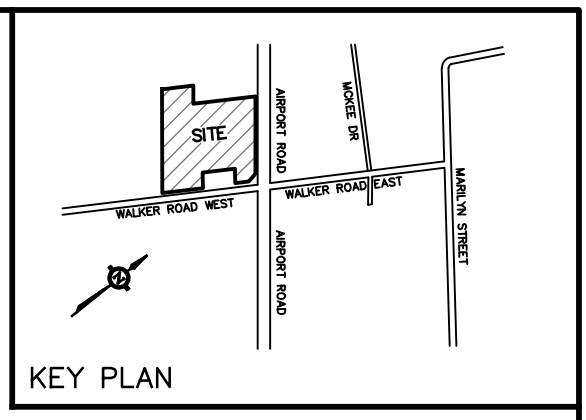
PROJECT TITLE	16114 AIRPORT ROAD TOWN OF CALEDON	TRAFALGAR ENGINEERING LTD. TEL: (905) 338-3366 FAX: (905) 338-7734 tel@trafalgareng.com	
DRAWING TITLE	PRE-DEVELOPMENT DRAINAGE AREA PLAN	DESIGN BY: JN/SP; DRAWN BY: JN; SCALE: 1:1; DATE: 06/03/2017	DRAWING No. FIGURE 1
		CAD FILE: 1599S.DWG; PLOT SCALE: 1:1	PLOT DATE: 06/02/2018

LEGEND

PROPOSED OVERLAND FLOW DIRECTION

PROPOSED DRAINAGE AREA

0.195 / 0.25 — DRAINAGE AREA (ha) / IMPERVIOUSNESS



KEY PLAN

IMPERVIOUSNESS:

RESIDENTIAL COMPONENT

IMPERVIOUS AREA:	0.591 ha
TOTAL AREA:	0.966 ha
% IMPERVIOUS:	61%

RESIDENTIAL COMPONENT (UNCONTROLLED)

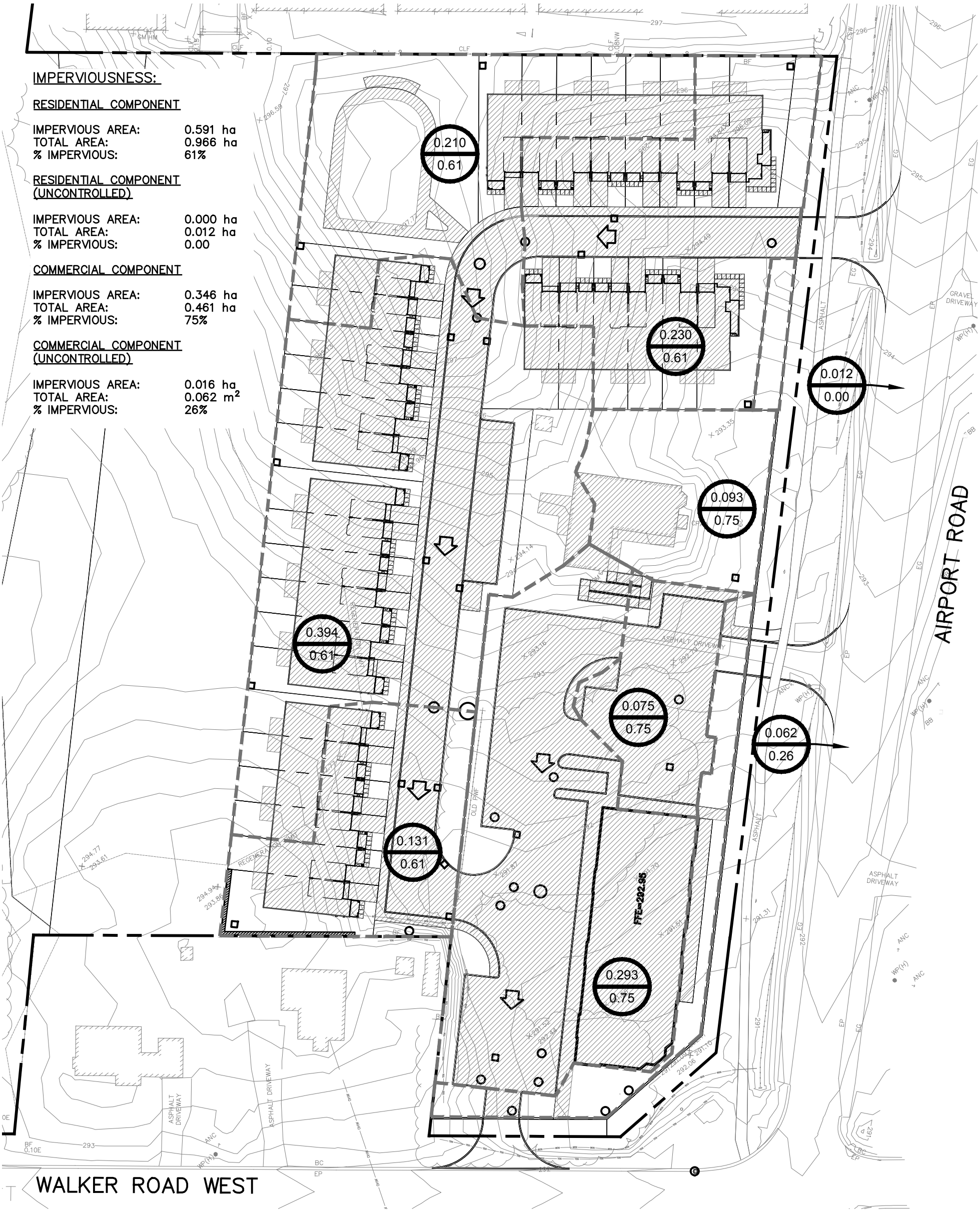
IMPERVIOUS AREA:	0.000 ha
TOTAL AREA:	0.012 ha
% IMPERVIOUS:	0.00

COMMERCIAL COMPONENT

IMPERVIOUS AREA:	0.346 ha
TOTAL AREA:	0.461 ha
% IMPERVIOUS:	75%

COMMERCIAL COMPONENT (UNCONTROLLED)

IMPERVIOUS AREA:	0.016 ha
TOTAL AREA:	0.062 m^2
% IMPERVIOUS:	26%



PROJECT TITLE	16114 AIRPORT ROAD TOWN OF CALEDON
DRAWING TITLE	POST-DEVELOPMENT DRAINAGE AREA PLAN

TRAFALGAR ENGINEERING LTD.
TEL: (905) 338-3366 FAX: (905) 338-7734
tel@trafalgareng.com

DESIGN BY	JN/SP	SCALE	1:1	DRAWING No. FIGURE 2
DRAWN BY	JN	DATE	06/03/2017	
CAD FILE:	1599S.DWG	PLOT SCALE:	1:1	PLOT DATE: 06/02/2018

TRAFALGAR ENGINEERING LTD.
Consulting Engineers

Project Name : 16114 Airport Road
Project No. : 1599
Date : 06-Sep-19

STORM SEWER DESIGN SHEET

100-year Storm
Town of Caledon

Intensity = $A / (T_d + B)^C$

A= 4688
B= 17
C= 0.96

Area No.	LOCATION	FROM MH	TO MH	DRAINAGE AREA Area (ha)	Runoff Coeff. ('c')	A x R (ha x 'c')	Accum. A x R (ha x 'c')	RUNOFF T of C (min)	Intensity (mm/hr)	Expected Flow (m^3/s)	PROPOSED SEWER Length (m)	Gradient (%)	Pipe Size (mm)	Manning's Coeff. (n)	Capacity (m^3/s)	Velocity (m/s)	Time of Flow (min)	Fraction Full (%)
	Residential Development																	
1		13	12	0.230	0.76	0.176	0.176	10.00	198.10	0.097	43.50	0.50	375	0.013	0.130	1.14	0.64	75
		12	11				0.176	10.64	193.71	0.095	9.00	0.50	375	0.013	0.130	1.14	0.13	73
2		11	10	0.210	0.76	0.160	0.336	10.77	192.83	0.180	9.50	0.50	450	0.013	0.211	1.28	0.12	85
3		10	8	0.394	0.76	0.301	0.637	10.89	192.01	0.340	69.00	0.60	525	0.013	0.348	1.56	0.74	97
4		9	8	0.131	0.76	0.100	0.100	10.00	198.10	0.055	39.50	0.50	300	0.013	0.072	0.98	0.67	77
		8	7				0.736	11.63	187.26	0.383	4.50	1.00	525	0.013	0.450	2.01	0.04	85
		7	STOR				0.736	11.67	187.02	0.383	3.00	1.00	525	0.013	0.450	2.01	0.02	85
		STOR	6				0.736	11.69	186.87	0.382	1.50	2.00	525	0.013	0.636	2.85	0.01	60
		6	5							0.011	15.50	0.50	200	0.013	0.024	0.75	0.35	45
		5	4							0.011	31.00	0.50	200	0.013	0.024	0.75	0.69	45
		4	3							0.011	7.50	0.50	200	0.013	0.024	0.75	0.17	45
		3	2							0.011	16.50	0.50	200	0.013	0.024	0.75	0.37	45
		2	1							0.019	19.00	0.50	250	0.013	0.044	0.87	0.36	43
		1											250					
	Commercial Development																	
5		CB8	20	0.093	0.94	0.087	0.087	10.00	198.10	0.048	43.00	1.00	250	0.013	0.062	1.23	0.58	77
6		20	19	0.075	0.94	0.070	0.158	10.58	194.07	0.085	26.00	0.50	375	0.013	0.130	1.14	0.38	66
		19	17				0.158	10.96	191.53	0.084	20.50	0.50	375	0.013	0.130	1.14	0.30	65
7		18	17	0.293	0.94	0.274	0.274	10.00	198.10	0.151	5.00	0.50	450	0.013	0.211	1.28	0.06	72
		17	STORC				0.432	11.27	189.58	0.227	1.00	2.00	450	0.013	0.422	2.57	0.01	54
		STORC	16				0.432	11.27	189.54	0.227	1.50	2.00	450	0.013	0.422	2.57	0.01	54
		16	15							0.007	5.00	0.50	200	0.013	0.024	0.75	0.11	29
		15	14							0.007	16.00	0.50	200	0.013	0.024	0.75	0.36	29
		14	1							0.007	7.50	0.50	250	0.013	0.044	0.87	0.14	16

Note: Composite runoff coefficient is based on impervious area using C=0.25 for pervious and C=0.9 for impervious areas. The resultant composite runoff coefficient has a 1.25 factor applied for the 100-year storm.

TRAFALGAR ENGINEERING LTD.
Consulting Engineers

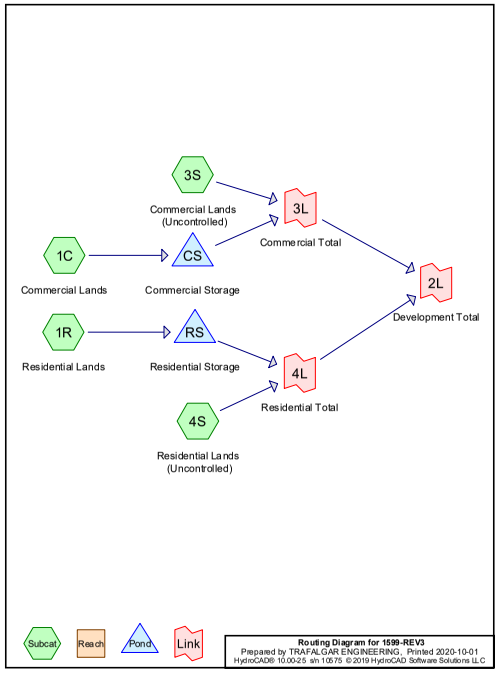
Project Name : 16114 Airport Road
Project No. : 1599
Date : 06-Sep-19

HYDRAULIC GRADE LINE

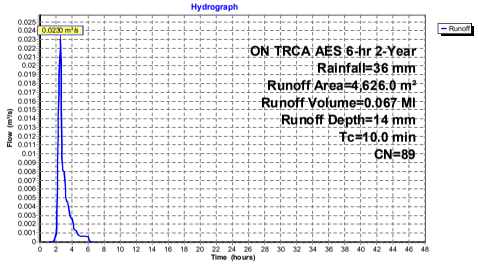
100-year Storm
Town of Caledon

A= 4688
B= 17
C= 0.96

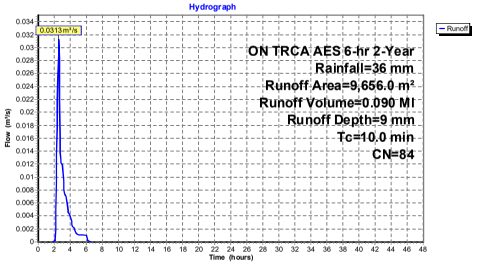
Area No.	LOCATION	FROM MH	TO MH	DRAINAGE AREA: Area (ha)	Runoff Coeff. ('c')	A x R (ha x 'c')	Accum. A x R (ha x 'c')	Expected Flow (m^3/s)	GEOMETRY: S_f Friction Slope (m/m)	A Cross-Sectional Area	V Velocity (m/s)	LOSSES: H_f Friction Loss (m)	Defl. Angle (deg)	Approx. Loss Coeff.	MH Loss (m)	HYDRAULIC GRADIENT: D/S OBV. (m)	D/S INV. (m)	Inv. Drop (m)	Obv. Drop (m)	U/S H.G.L. (m)	U/S INV. (m)	U/S OBV. (m)
	Residential Developme																					
1		13	12	0.230	0.76	0.176	0.176	0.097	0.003	0.0773	1.25	0.13	45	0.75	0.06	292.64	292.27	0.050	0.050	292.80	292.49	292.86
		12	11				0.176	0.095	0.003	0.0760	1.24	0.03	45	1.35	0.11	292.55	292.17	0.175	0.100	292.61	292.22	292.59
2		11	10	0.210	0.76	0.160	0.336	0.180	0.004	0.1244	1.45	0.04	5	0.15	0.02	292.40	291.95	0.125	0.050	292.48	292.00	292.45
3		10	8	0.394	0.76	0.301	0.637	0.340	0.006	0.1921	1.77	0.43	90	1.35	0.21	291.94	291.41	0.100	0.100	292.42	291.83	292.35
		9	8	0.131	0.76	0.100	0.100	0.055	0.003	0.0503	1.09	0.13	90	1.35	0.08	291.84	291.54	0.225	0.000	291.92	291.74	292.04
		8	7				0.736	0.383	0.008	0.1693	2.26	0.04	0	0.15	0.04	291.79	291.27	0.020	0.020	291.68	291.31	291.84
		7	STOR				0.736	0.383	0.008	0.1693	2.26	0.02	0	0.15	0.04	291.74	291.22	0.325	0.325	291.60	291.25	291.77
		STOR	6				0.736	0.382	0.008	0.1275	3.00	0.01	10	0.15	0.07	291.39	290.86	-0.295	0.030	291.26	290.89	291.42
		6	5					0.011	0.001	0.0149	0.74	0.02	10	0.15	0.00	291.28	291.08	0.050	0.050	291.18	291.16	291.36
		5	4					0.011	0.001	0.0149	0.74	0.04	45	0.75	0.02	291.08	290.88	0.050	0.050	291.01	291.03	291.23
		4	3					0.011	0.001	0.0149	0.74	0.01	45	0.75	0.02	290.99	290.79	0.050	0.050	290.89	290.83	291.03
		3	2					0.011	0.001	0.0149	0.74	0.02	45	0.75	0.02	290.86	290.66	0.100	0.050	290.77	290.74	290.94
		2	1					0.019	0.001	0.0227	0.84	0.02	45	0.75	0.03	290.71	290.46	0.020	0.020	290.60	290.56	290.81
		1							0.000	0.0000		0.00					290.44				290.44	290.69
	Commercial Development																					
5		CB8	20	0.093	0.94	0.087	0.087	0.048	0.007	0.0355	1.35	0.28	45	0.75	0.07	291.55	291.30	0.125	0.000	291.79	291.73	291.98
6		20	19	0.075	0.94	0.070	0.158	0.085	0.002	0.0692	1.23	0.06	45	0.75	0.06	291.42	291.04	0.030	0.030	291.34	291.17	291.55
		19	17				0.158	0.084	0.002	0.0692	1.21	0.05	0	0.15	0.01	291.28	290.91	0.075	0.000	291.16	291.01	291.39
		18	17	0.293	0.94	0.274	0.274	0.151	0.003	0.1075	1.40	0.01	90	1.00	0.10	291.36	290.91	0.080	0.080	291.27	290.94	291.39
		17	STORC				0.432	0.227	0.006	0.0856	2.66	0.01	0	0.15	0.05	291.26	290.81	0.000	0.000	291.10	290.83	291.28
		STORC	16				0.432	0.227	0.006	0.0856	2.66	0.01	0	0.15	0.05	291.23	290.78	0.020	0.270	291.04	290.81	291.26
		16	15					0.007	0.000	0.0106	0.66	0.00	90	1.00	0.02	290.94	290.74	0.050	0.050	290.81	290.76	290.96
		15	14					0.007	0.000	0.0106	0.66	0.01	45	0.75	0.02	290.81	290.61	0.050	0.000	290.68	290.69	290.89
		14	1					0.007	0.000	0.0107	0.65	0.00	45	0.75	0.02	290.69	290.52			290.58	290.56	290.81



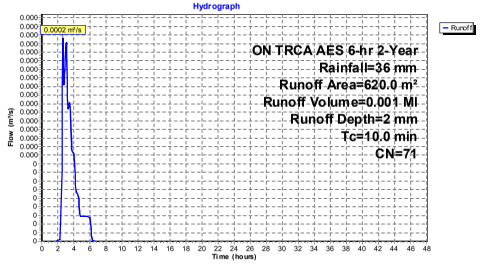
Subcatchment 1C: Commercial Lands



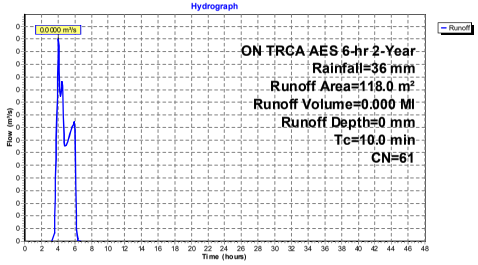
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



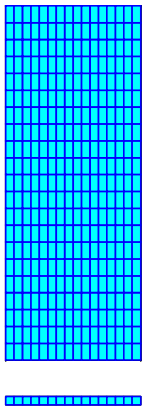
Pond CS: Commercial Storage - Chamber Wizard Field A

ChamberModel = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



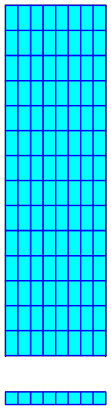
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

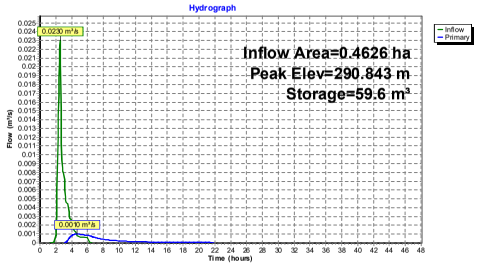
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



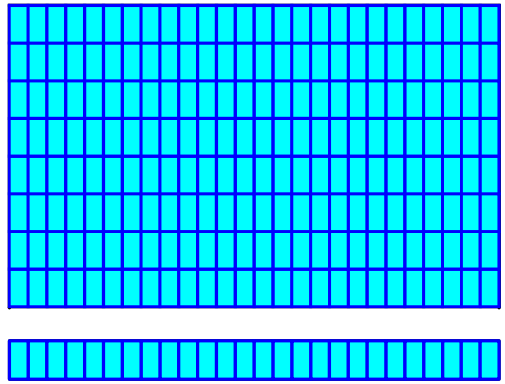
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



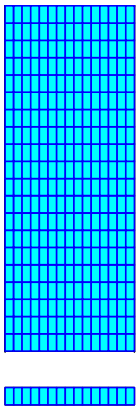
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

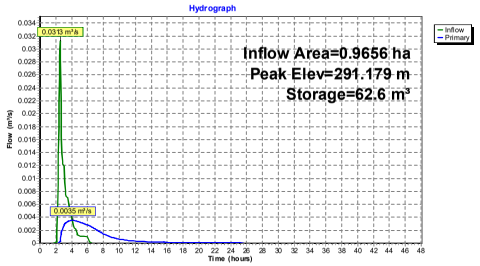
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

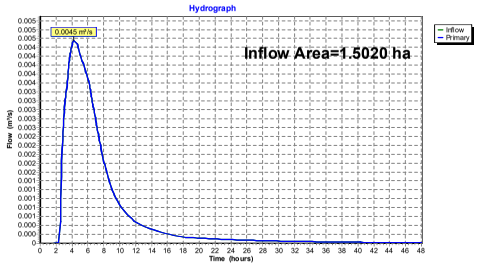
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



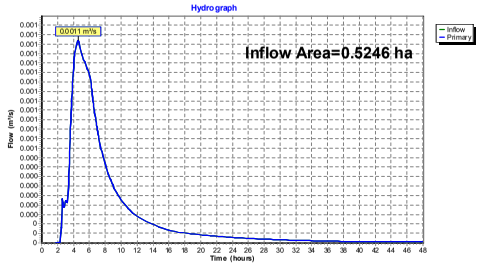
Pond RS: Residential Storage



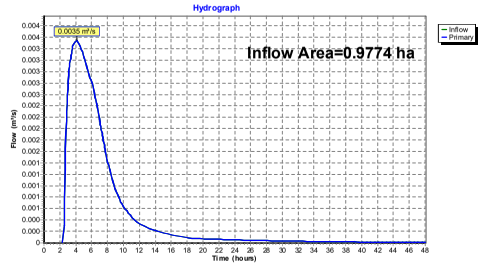
Link 2L: Development Total



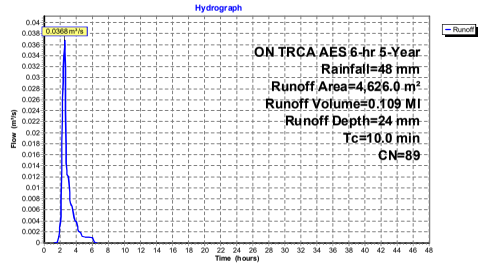
Link 3L: Commercial Total



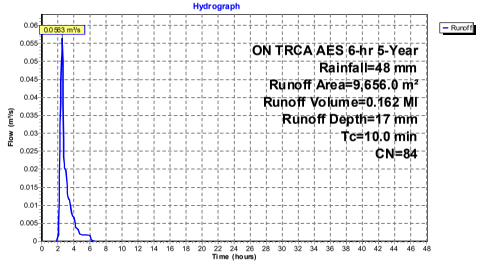
Link 4L: Residential Total



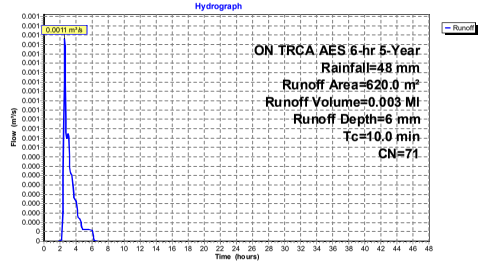
Subcatchment 1C: Commercial Lands



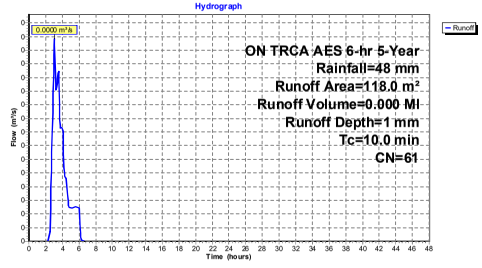
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



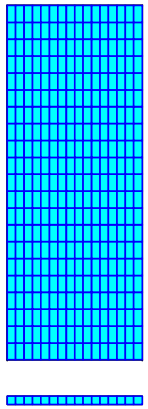
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



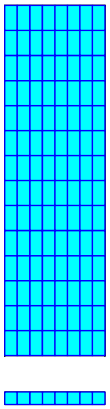
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

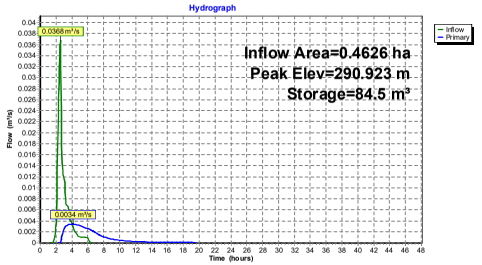
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



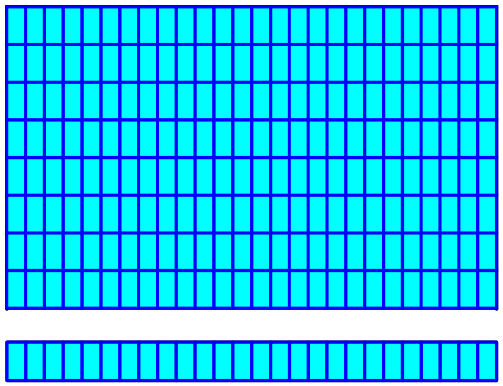
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



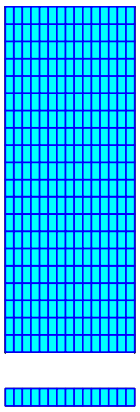
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

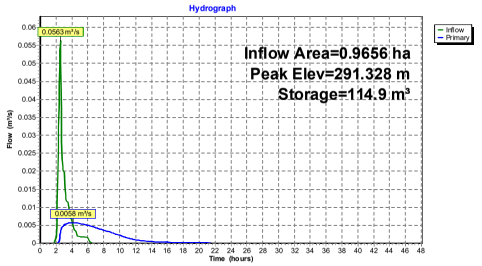
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

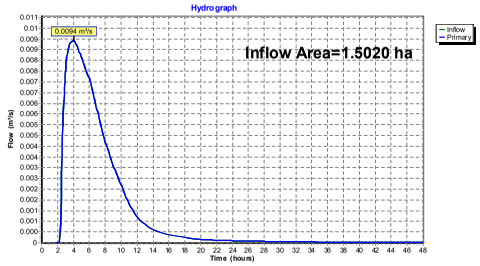
Chamber Storage = 253.26 m³ = 0.253 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



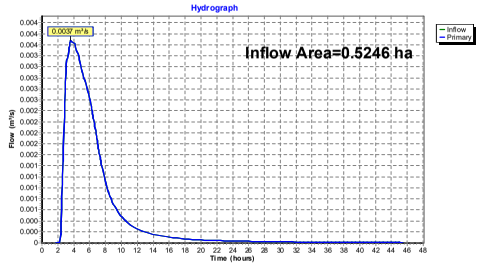
Pond RS: Residential Storage



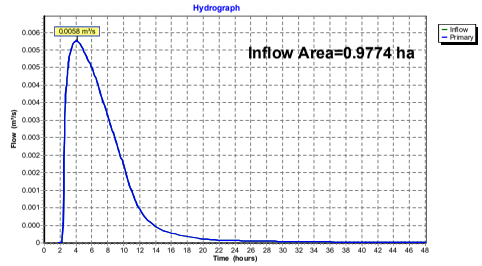
Link 2L: Development Total



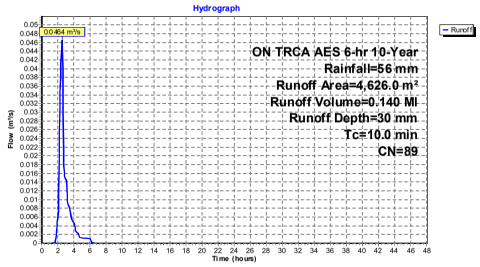
Link 3L: Commercial Total



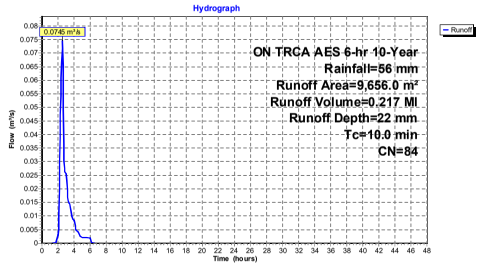
Link 4L: Residential Total



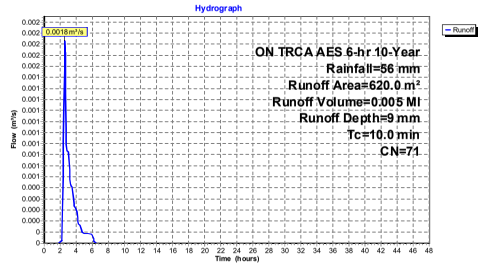
Subcatchment 1C: Commercial Lands



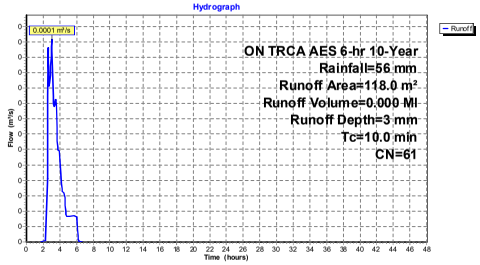
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



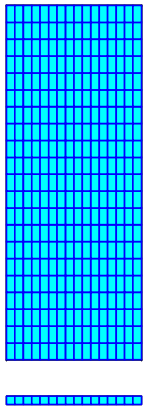
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



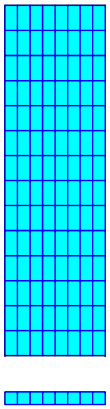
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

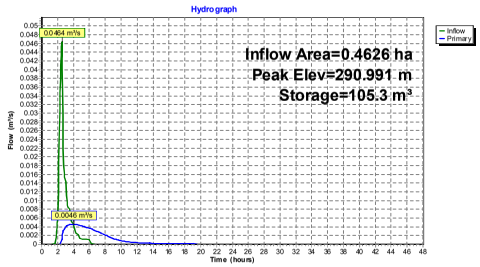
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



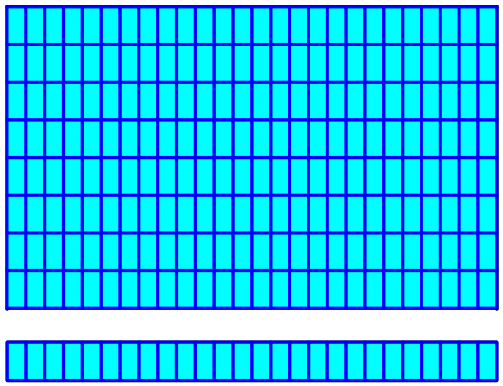
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



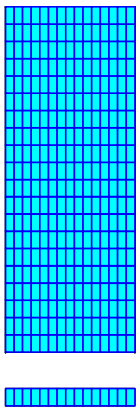
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

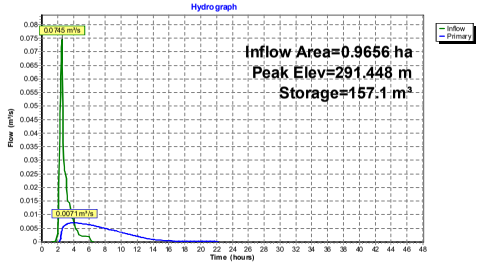
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

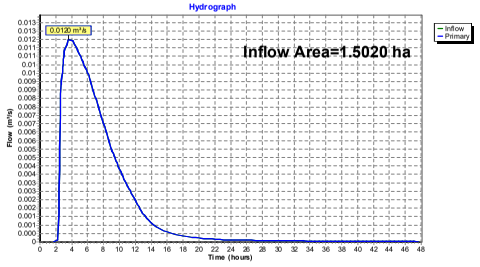
Chamber Storage = 253.26 m³ = 0.253 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



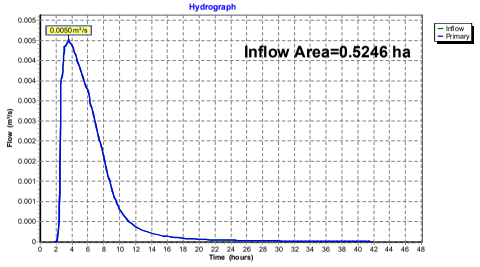
Pond RS: Residential Storage



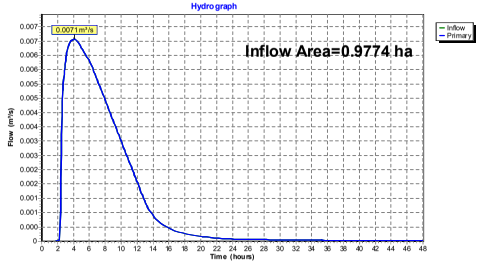
Link 2L: Development Total



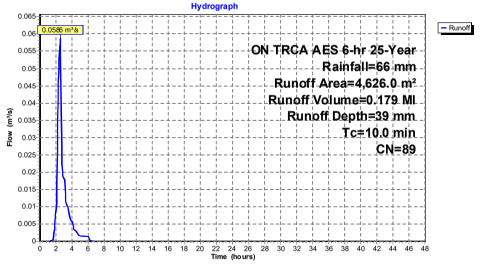
Link 3L: Commercial Total



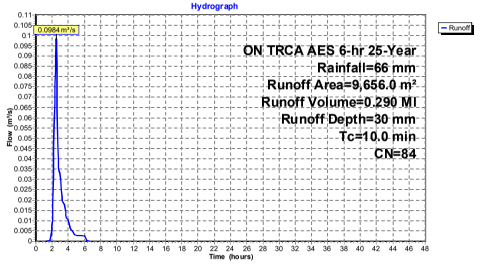
Link 4L: Residential Total



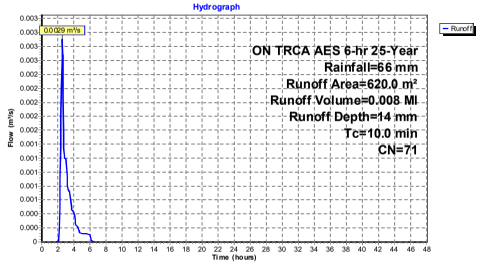
Subcatchment 1C: Commercial Lands



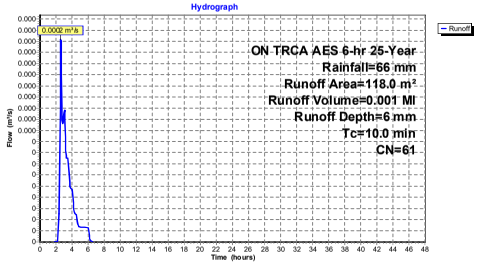
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



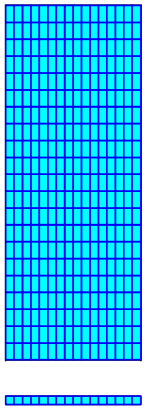
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



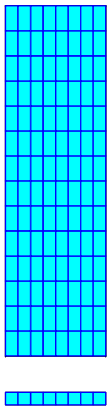
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

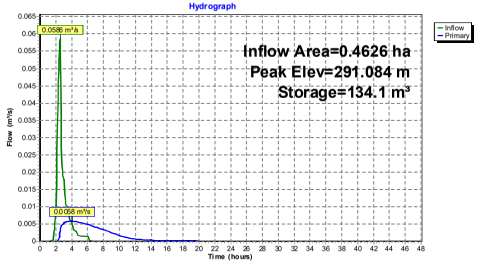
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



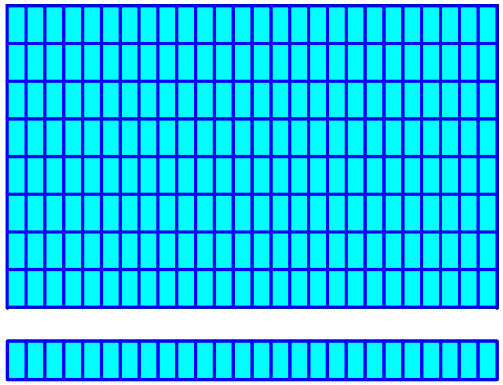
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



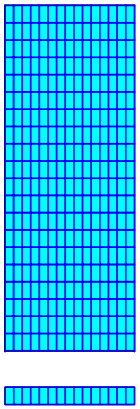
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

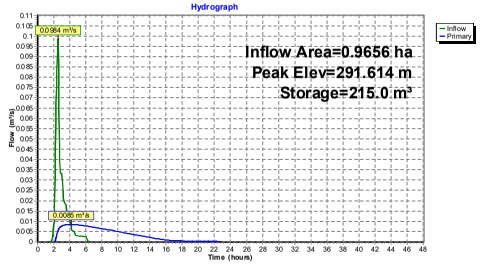
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

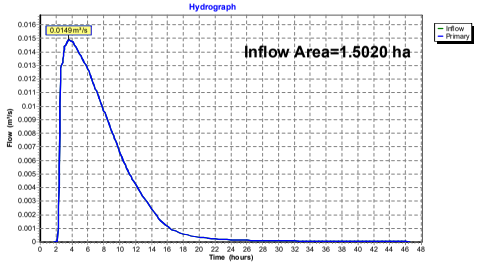
Chamber Storage = 253.26 m³ = 0.253 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



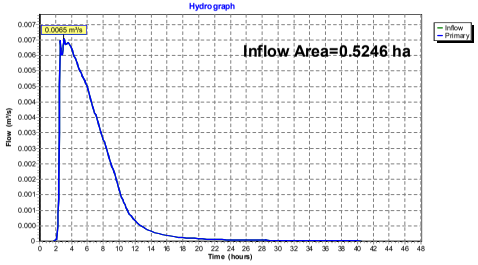
Pond RS: Residential Storage



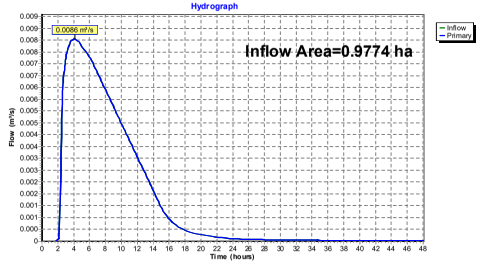
Link 2L: Development Total



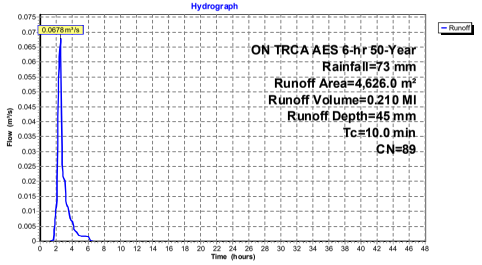
Link 3L: Commercial Total



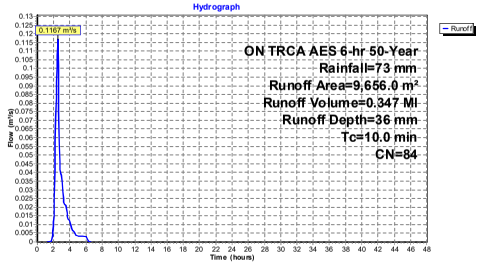
Link 4L: Residential Total



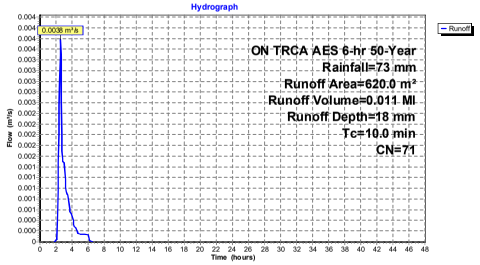
Subcatchment 1C: Commercial Lands



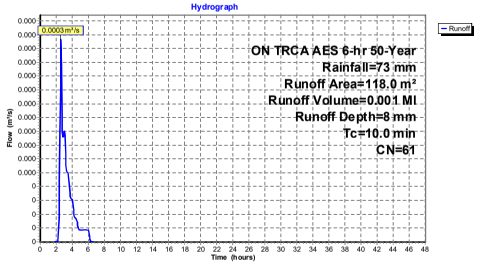
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



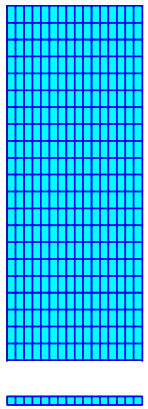
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



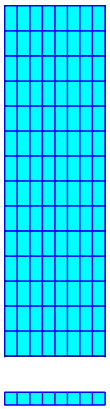
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

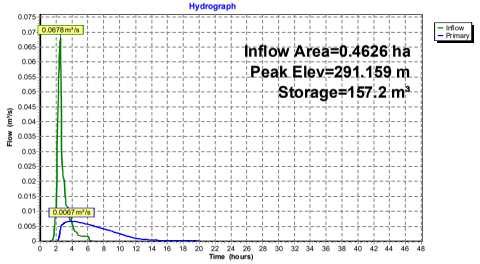
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



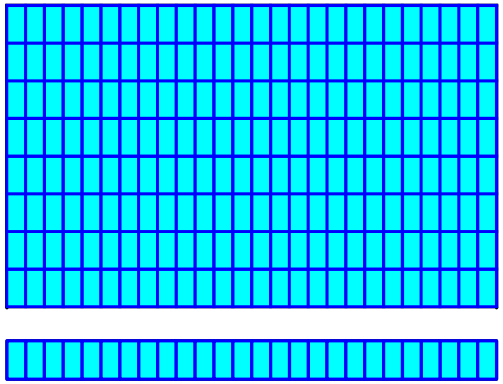
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



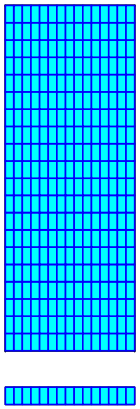
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

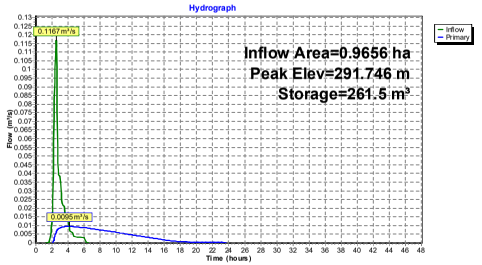
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

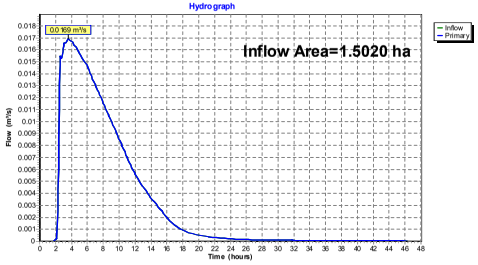
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



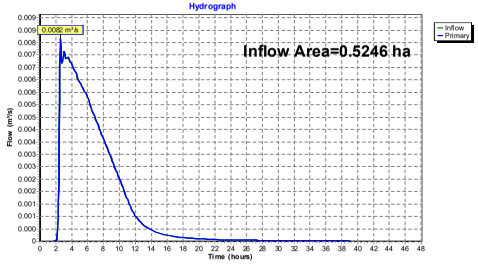
Pond RS: Residential Storage



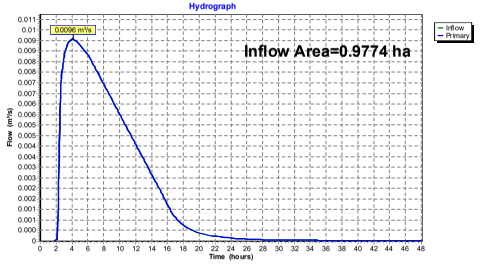
Link 2L: Development Total



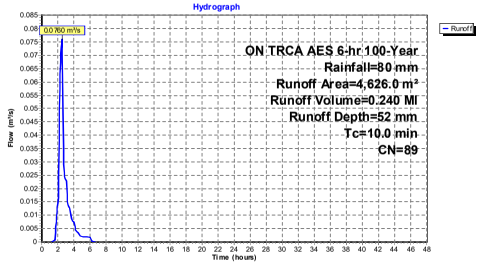
Link 3L: Commercial Total



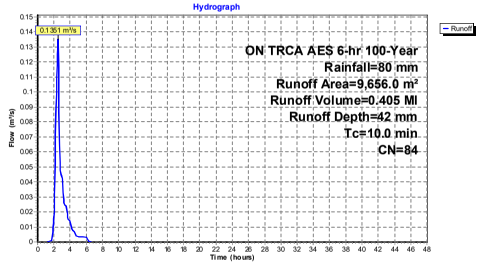
Link 4L: Residential Total



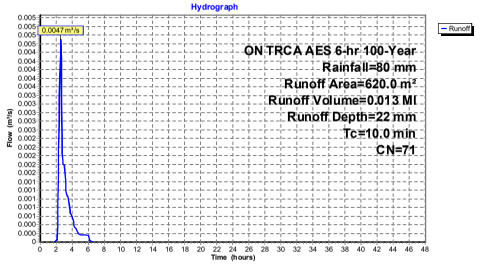
Subcatchment 1C: Commercial Lands



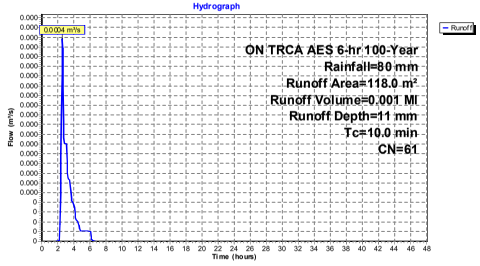
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



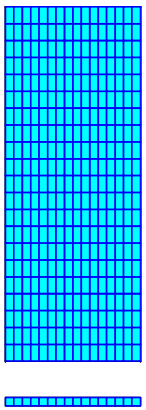
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



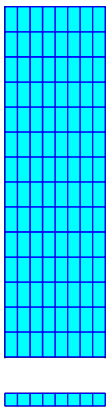
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

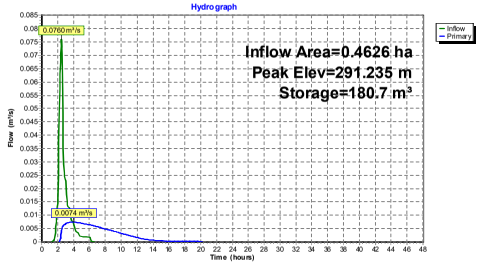
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



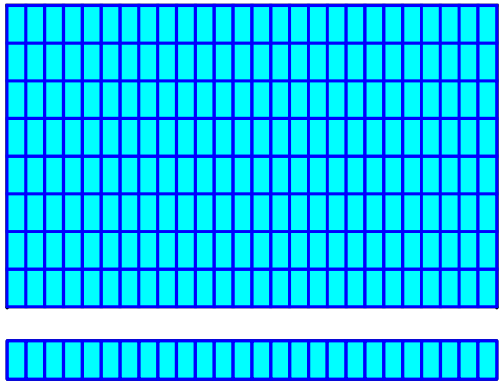
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



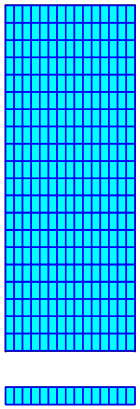
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

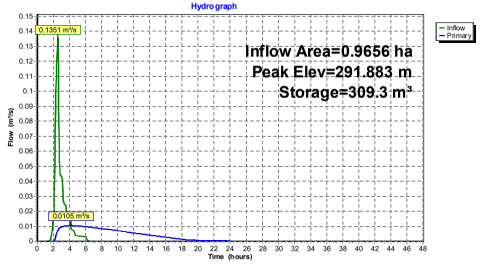
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

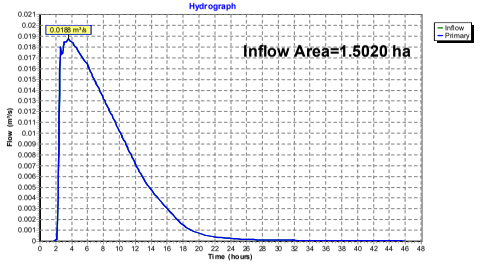
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



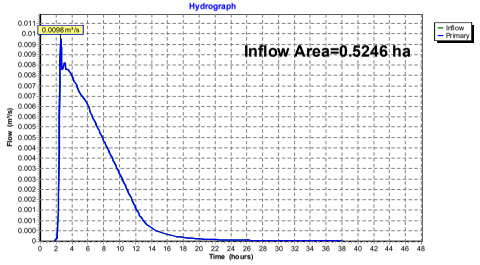
Pond RS: Residential Storage



Link 2L: Development Total

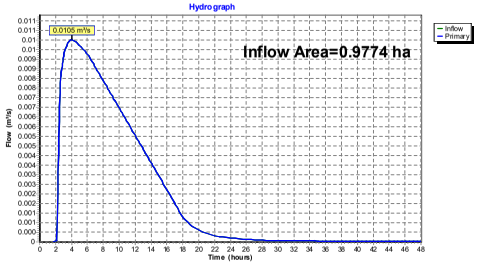


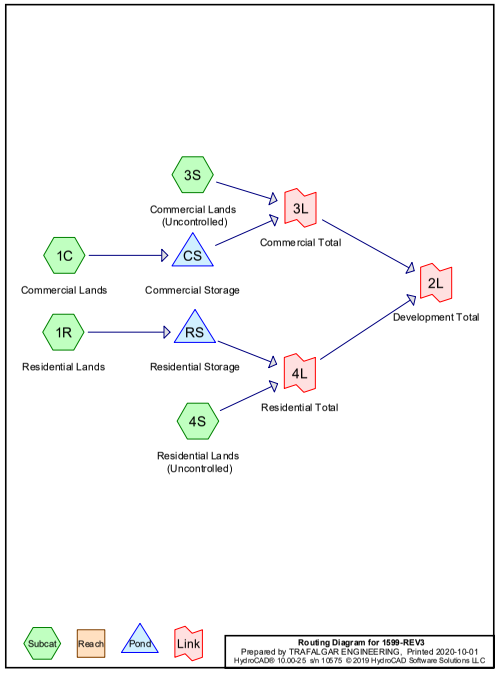
Link 3L: Commercial Total



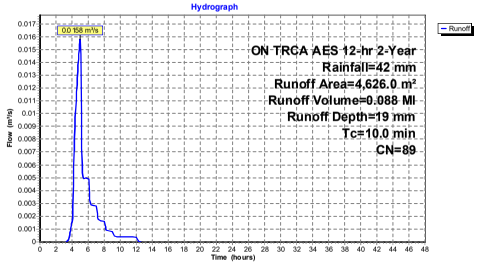
Link 4L: Residential Total

Hydrograph

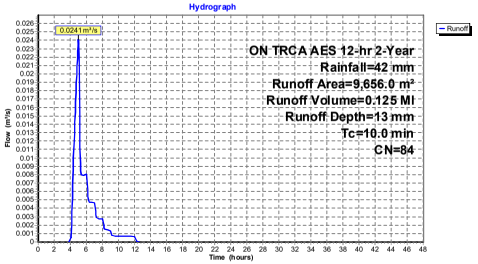




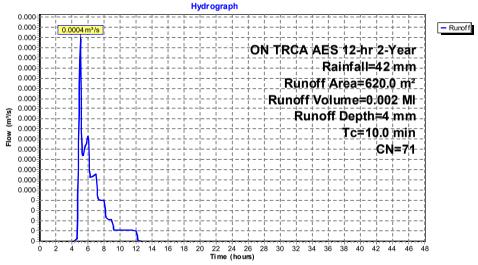
Subcatchment 1C: Commercial Lands



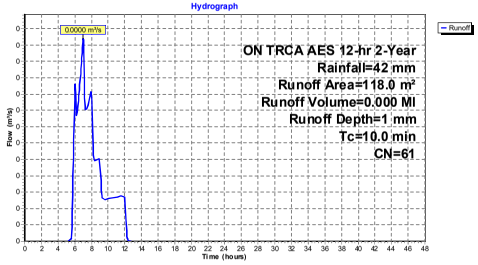
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



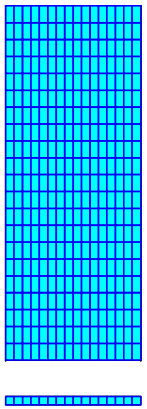
Pond CS: Commercial Storage - Chamber Wizard Field A

ChamberModel = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



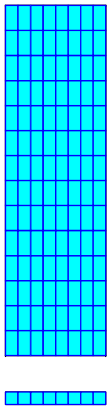
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

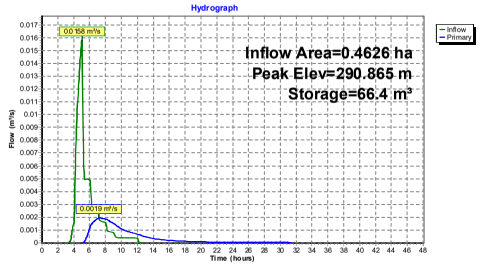
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



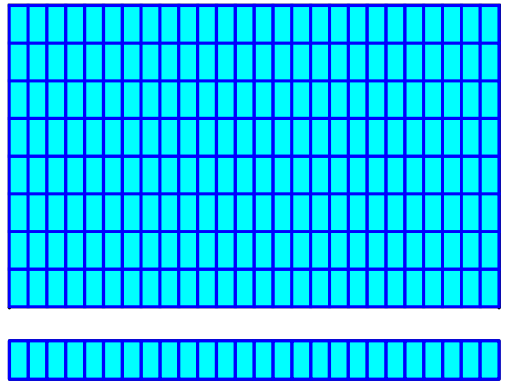
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



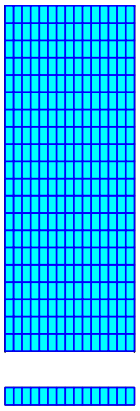
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

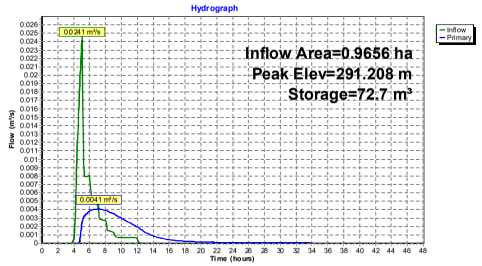
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

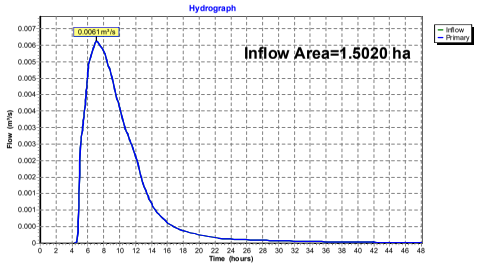
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



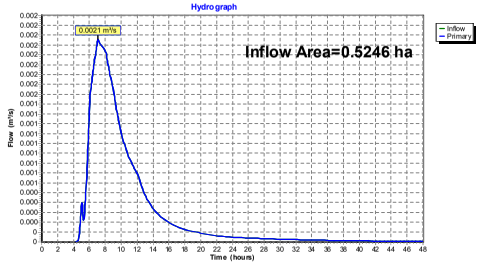
Pond RS: Residential Storage



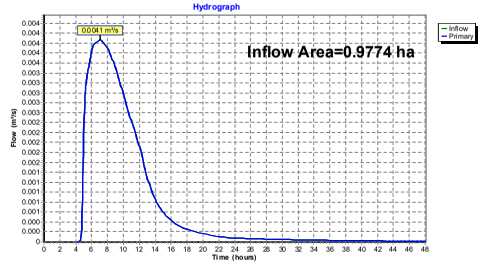
Link 2L: Development Total



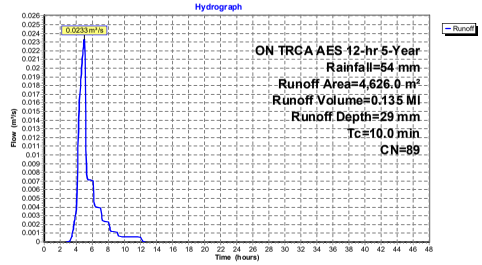
Link 3L: Commercial Total



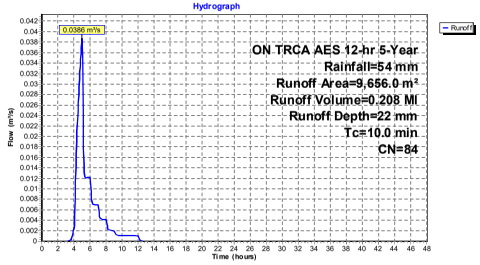
Link 4L: Residential Total



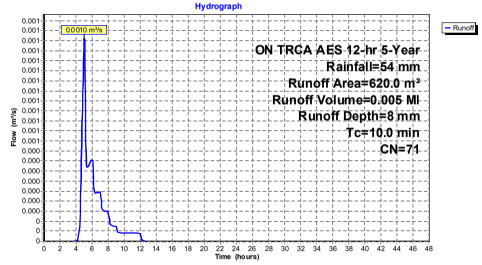
Subcatchment 1C: Commercial Lands



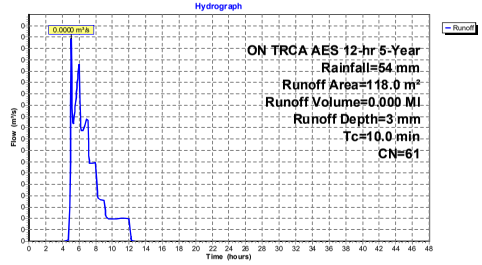
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



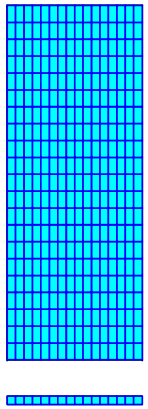
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



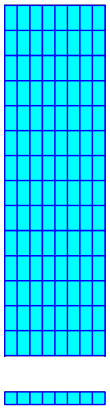
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

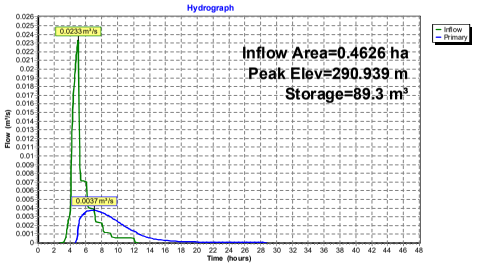
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



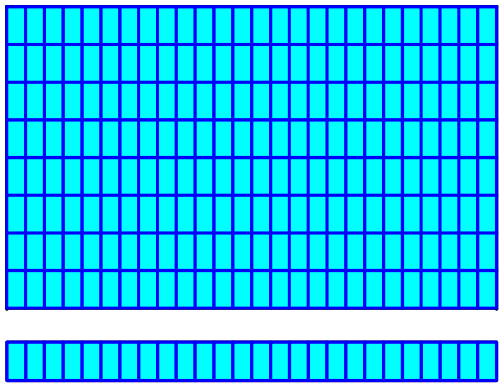
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



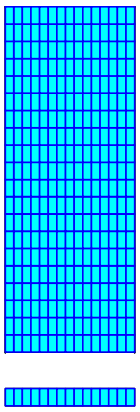
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

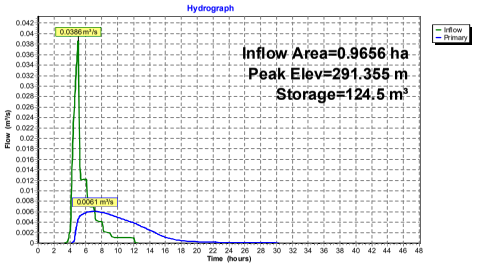
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

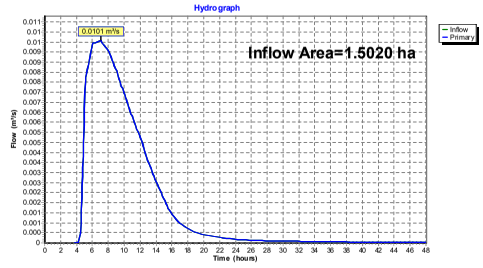
Chamber Storage = 253.26 m³ = 0.253 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



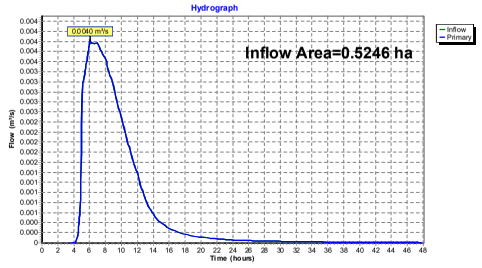
Pond RS: Residential Storage



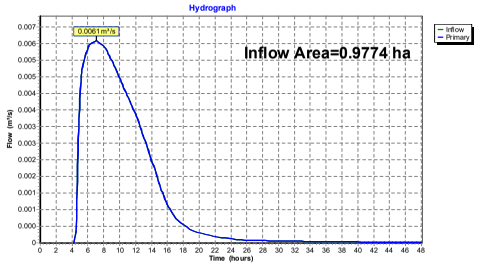
Link 2L: Development Total



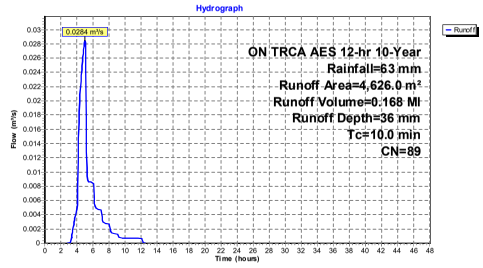
Link 3L: Commercial Total



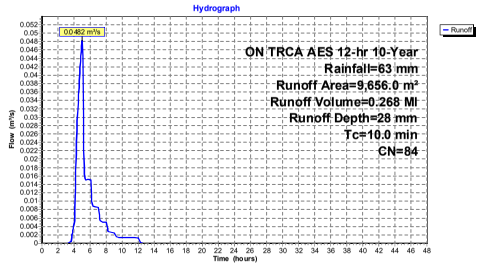
Link 4L: Residential Total



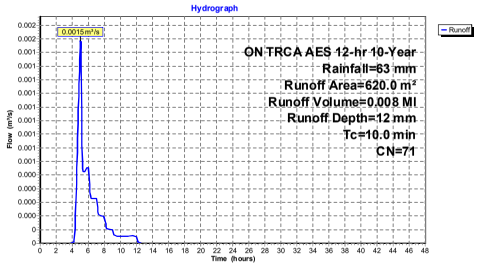
Subcatchment 1C: Commercial Lands



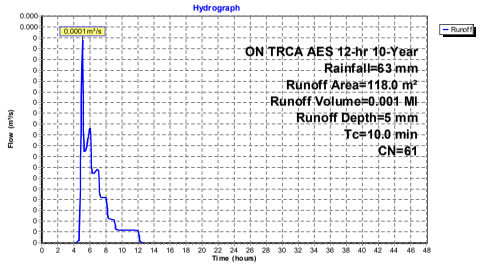
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



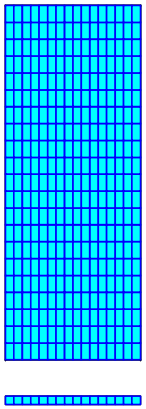
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



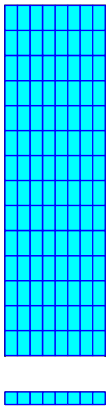
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

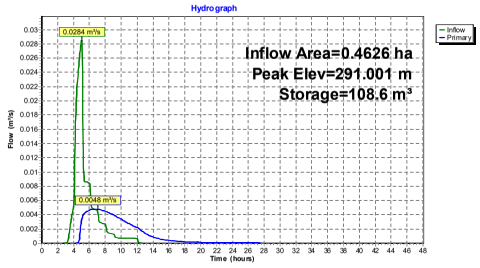
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



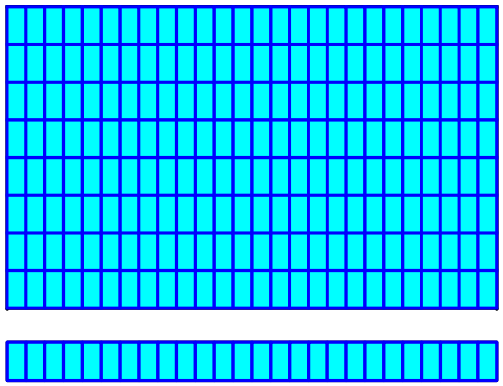
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



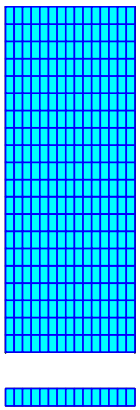
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

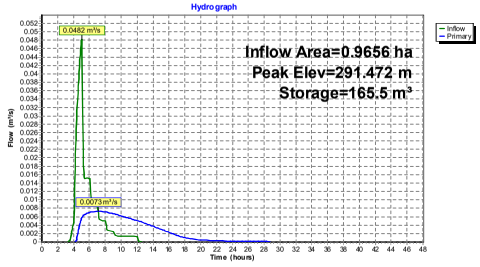
300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

Chamber Storage = 253.26 m³ = 0.253 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



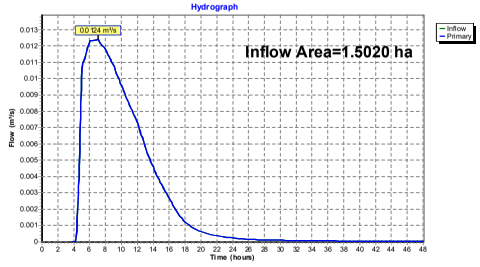
Pond RS: Residential Storage

Hydrograph



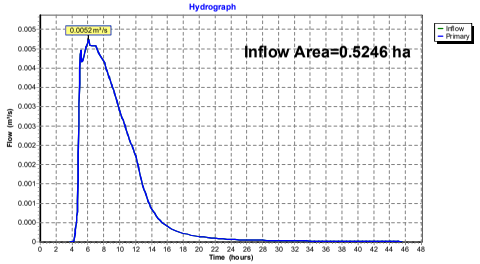
Link 2L: Development Total

Hydrograph



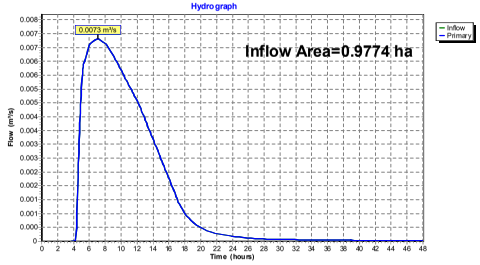
Link 3L: Commercial Total

Hydrograph



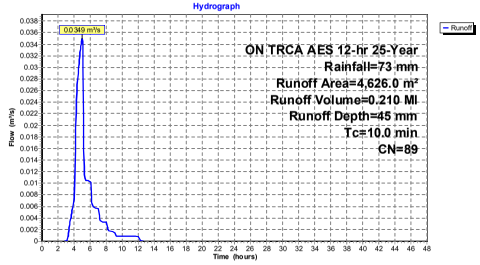
Link 4L: Residential Total

Hydrograph



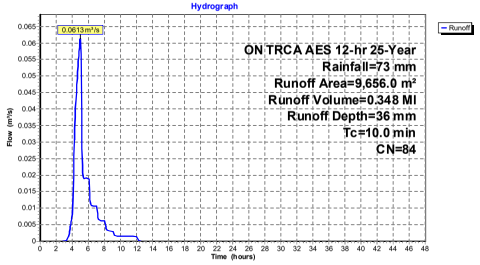
Subcatchment 1C: Commercial Lands

Hydrograph

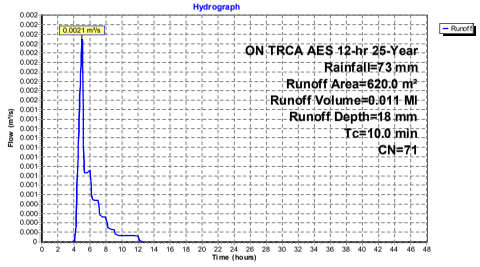


Subcatchment 1R: Residential Lands

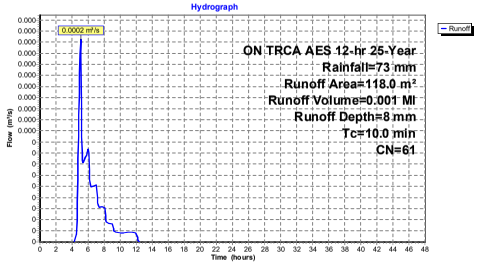
Hydrograph



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



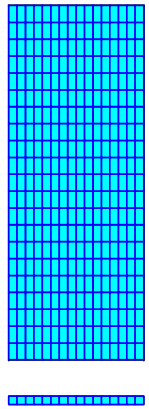
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



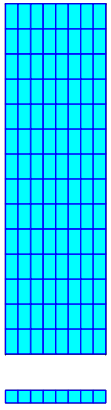
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

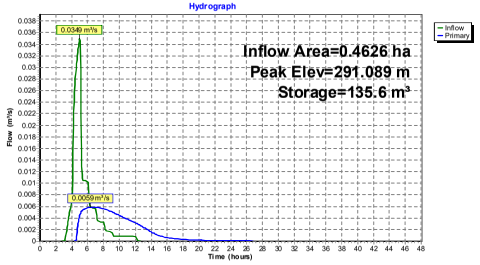
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



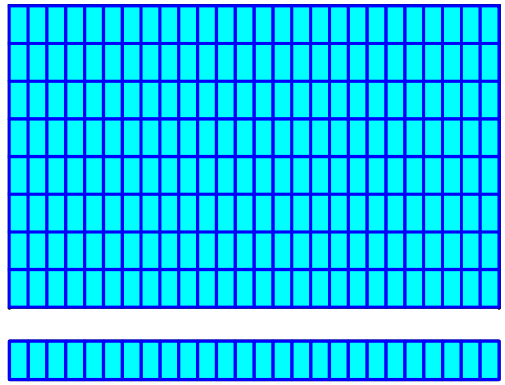
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



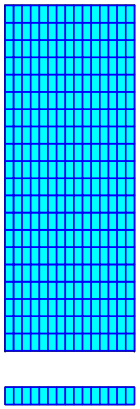
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

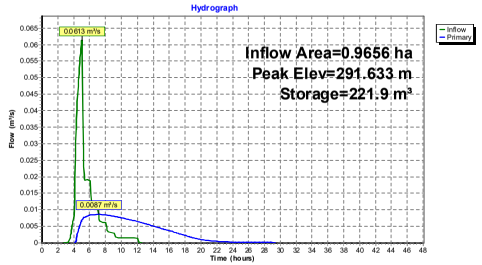
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

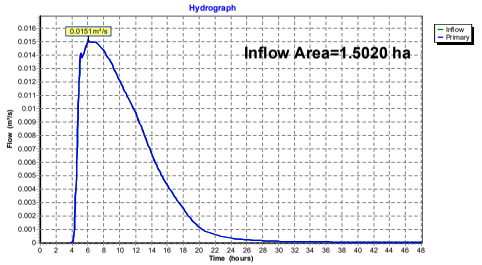
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



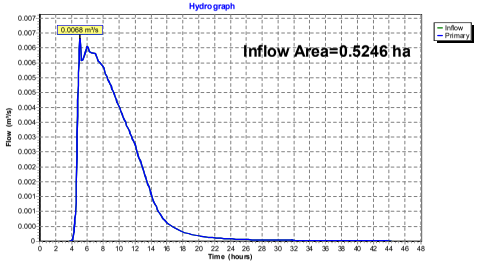
Pond RS: Residential Storage



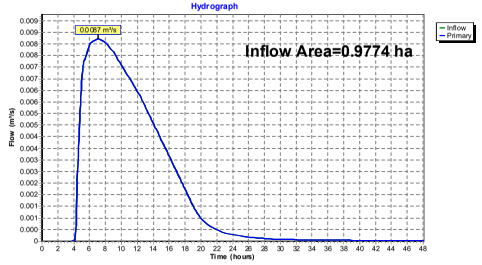
Link 2L: Development Total



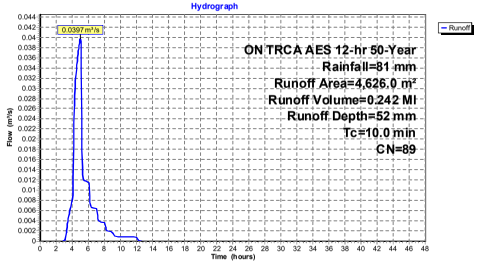
Link 3L: Commercial Total



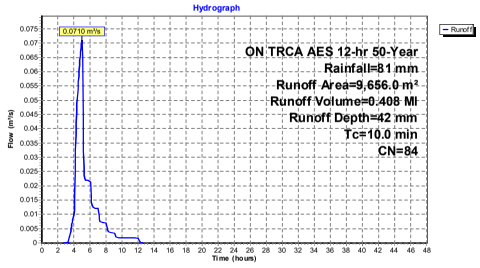
Link 4L: Residential Total



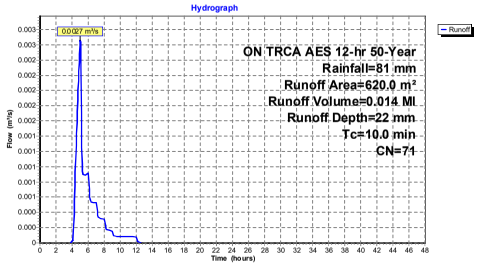
Subcatchment 1C: Commercial Lands



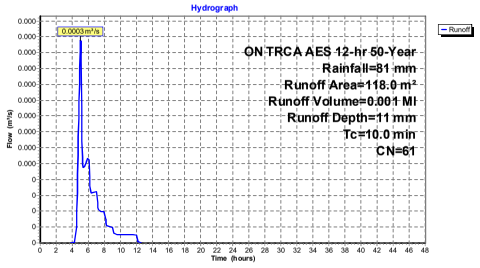
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



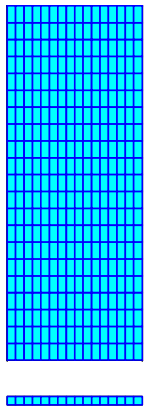
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



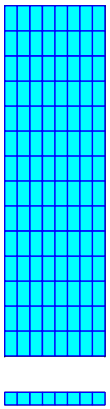
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

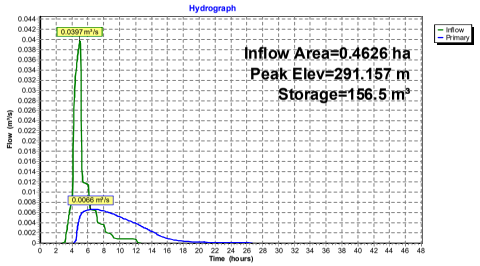
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



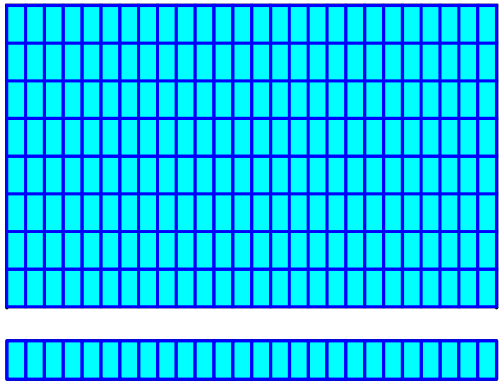
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



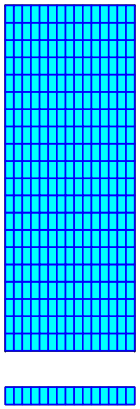
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

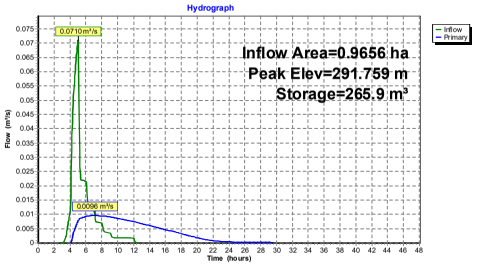
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

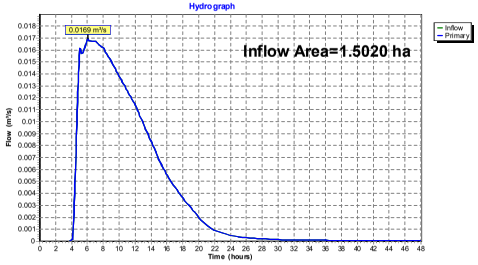
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



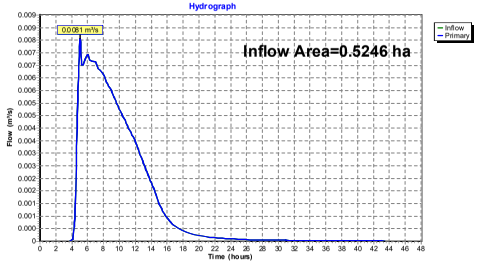
Pond RS: Residential Storage



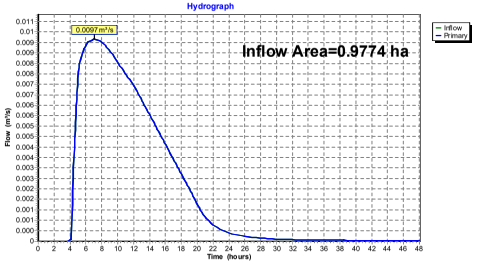
Link 2L: Development Total



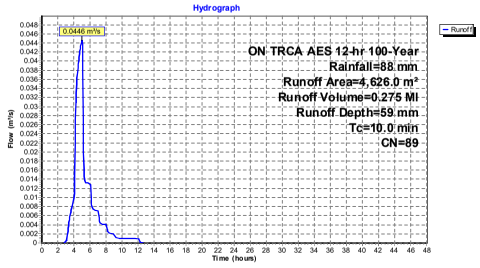
Link 3L: Commercial Total



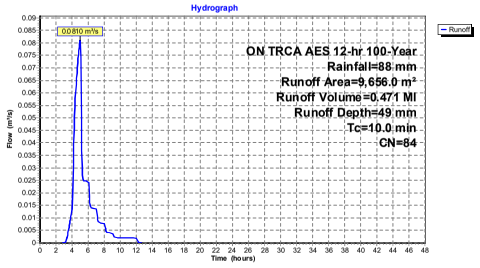
Link 4L: Residential Total



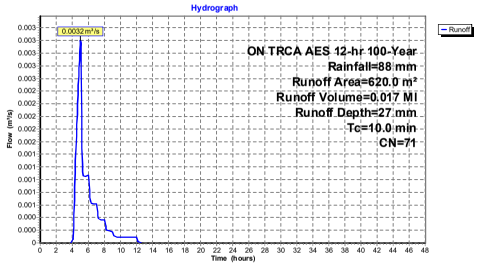
Subcatchment 1C: Commercial Lands



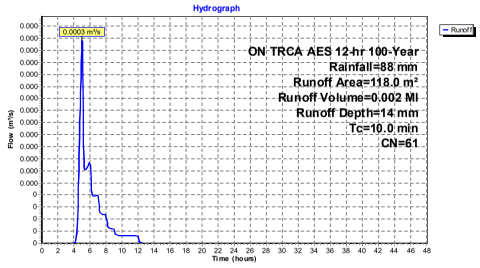
Subcatchment 1R: Residential Lands



Subcatchment 3S: Commercial Lands (Uncontrolled)



Subcatchment 4S: Residential Lands (Uncontrolled)



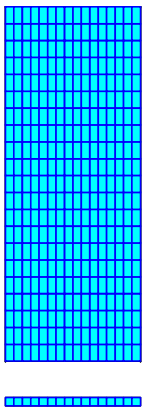
Pond CS: Commercial Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

21 Chambers/Row x 1.21 m Long = 25.30 m Row Length
16 Rows x 603 mm Wide = 9.64 m Base Width
612 mm Chamber Height = 0.61 m Field Height

336 Chambers x 0.42 m³ = 141.83 m³ Chamber Storage
336 Chambers x 0.44 m³ = 149.29 m³ Displacement

Chamber Storage = 141.83 m³ = 0.142 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 25.30 m x 9.64 m x 0.61 m



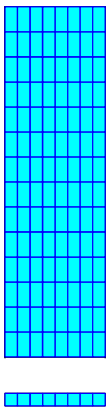
Pond CS: Commercial Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 1 (ACO StormBrixx®)
Inside= 603 mmW x 612 mmH => 0.350 m² x 1.21 mL = 0.42 m³
Outside= 603 mmW x 612 mmH => 0.369 m² x 1.21 mL = 0.44 m³

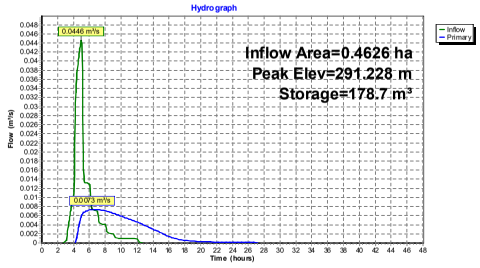
14 Chambers/Row x 1.21 m Long = 16.87 m Row Length
8 Rows x 603 mm Wide = 4.82 m Base Width
612 mm Chamber Height = 0.61 m Field Height

112 Chambers x 0.42 m³ = 47.28 m³ Chamber Storage
112 Chambers x 0.44 m³ = 49.76 m³ Displacement

Chamber Storage = 47.28 m³ = 0.047 Ml
Overall Storage Efficiency = 95.0%
Overall System Size = 16.87 m x 4.82 m x 0.61 m



Pond CS: Commercial Storage



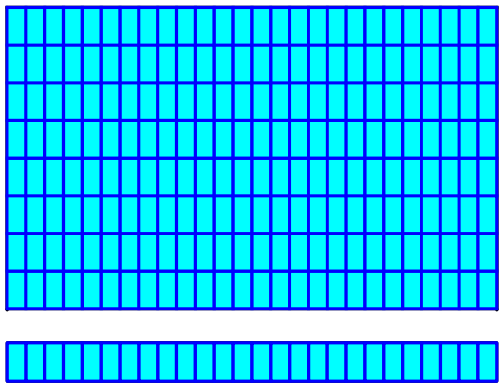
Pond RS: Residential Storage - Chamber Wizard Field A

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

8 Chambers/Row x 1.21 m Long = 9.64 m Row Length
26 Rows x 603 mm Wide = 15.66 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

208 Chambers x 0.84 m³ = 175.60 m³ Chamber Storage
208 Chambers x 0.89 m³ = 184.84 m³ Displacement

Chamber Storage = 175.60 m³ = 0.176 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 9.64 m x 15.66 m x 1.22 m



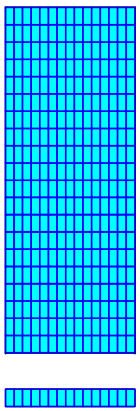
Pond RS: Residential Storage - Chamber Wizard Field B

Chamber Model = ACO StormBrixx 2 (ACO StormBrixx®)
Inside= 603 mmW x 1,224 mmH => 0.701 m² x 1.21 mL = 0.84 m³
Outside= 603 mmW x 1,224 mmH => 0.737 m² x 1.21 mL = 0.89 m³

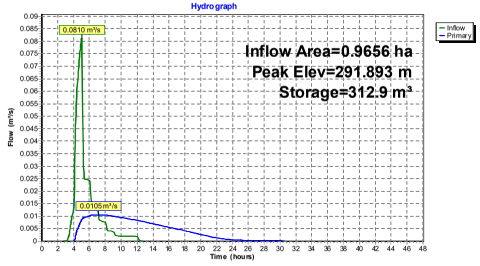
20 Chambers/Row x 1.21 m Long = 24.10 m Row Length
15 Rows x 603 mm Wide = 9.04 m Base Width
1,224 mm Chamber Height = 1.22 m Field Height

300 Chambers x 0.84 m³ = 253.26 m³ Chamber Storage
300 Chambers x 0.89 m³ = 266.59 m³ Displacement

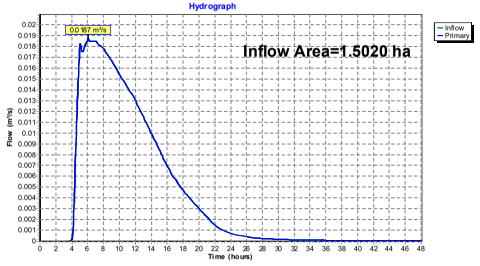
Chamber Storage = 253.26 m³ = 0.253 MI
Overall Storage Efficiency = 95.0%
Overall System Size = 24.10 m x 9.04 m x 1.22 m



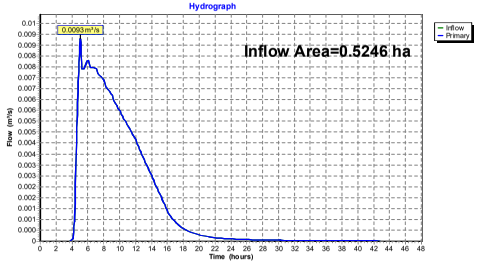
Pond RS: Residential Storage



Link 2L: Development Total

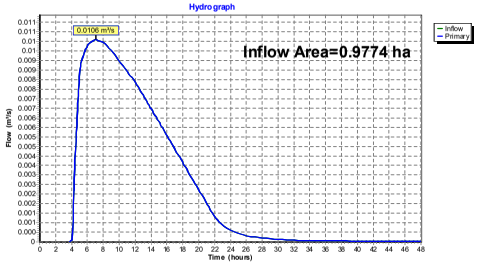


Link 3L: Commercial Total



Link 4L: Residential Total

Hydrograph



Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/30/2020

Province:	Ontario
City:	Caledon
Nearest Rainfall Station:	TORONTO CENTRAL
NCDC Rainfall Station Id:	0100
Years of Rainfall Data:	18

Site Name:	Commercial
Drainage Area (ha):	0.46
% Imperviousness:	85.00

Runoff Coefficient 'c': 0.81

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	5.85
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	16114 Airport Road
Project Number:	1599
Designer Name:	James Nelson
Designer Company:	Trafalgar Engineering Ltd
Designer Email:	jnelson@trafalgareng.com
Designer Phone:	905-338-3366
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	63
EFO6	67
EFO8	69
EFO10	70
EFO12	70

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 63

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

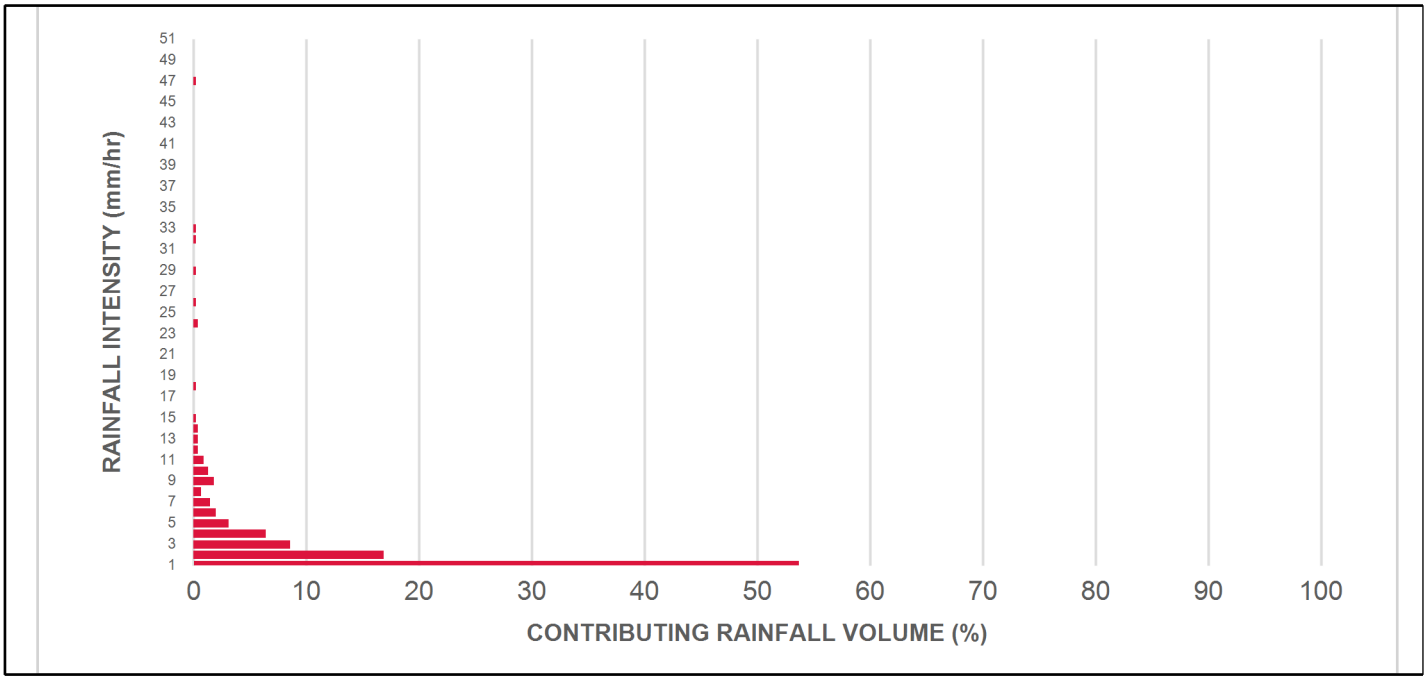
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	53.7	53.7	1.04	62.0	52.0	69	36.9	36.9
2	16.9	70.6	2.07	124.0	104.0	62	10.5	47.5
3	8.6	79.2	3.11	186.0	155.0	58	5.0	52.5
4	6.4	85.6	4.14	249.0	207.0	54	3.5	55.9
5	3.1	88.7	5.18	311.0	259.0	53	1.6	57.6
6	2.0	90.7	6.21	373.0	311.0	51	1.0	58.6
7	1.5	92.2	7.25	435.0	363.0	49	0.7	59.3
8	0.7	92.9	8.29	497.0	414.0	48	0.3	59.7
9	1.8	94.7	9.32	559.0	466.0	46	0.8	60.5
10	1.3	96.0	10.36	621.0	518.0	45	0.6	61.1
11	0.9	96.9	11.39	684.0	570.0	43	0.4	61.5
12	0.4	97.3	12.43	746.0	621.0	42	0.2	61.6
13	0.4	97.7	13.47	808.0	673.0	42	0.2	61.8
14	0.4	98.1	14.50	870.0	725.0	41	0.2	62.0
15	0.2	98.3	15.54	932.0	777.0	41	0.1	62.0
16	0.0	98.3	16.57	994.0	829.0	41	0.0	62.0
17	0.0	98.3	17.61	1057.0	880.0	41	0.0	62.0
18	0.2	98.5	18.64	1119.0	932.0	40	0.1	62.1
19	0.0	98.5	19.68	1181.0	984.0	40	0.0	62.1
20	0.0	98.5	20.72	1243.0	1036.0	40	0.0	62.1
21	0.0	98.5	21.75	1305.0	1088.0	39	0.0	62.1
22	0.0	98.5	22.79	1367.0	1139.0	38	0.0	62.1
23	0.0	98.5	23.82	1429.0	1191.0	37	0.0	62.1
24	0.4	98.9	24.86	1492.0	1243.0	36	0.1	62.3
25	0.0	98.9	25.90	1554.0	1295.0	36	0.0	62.3

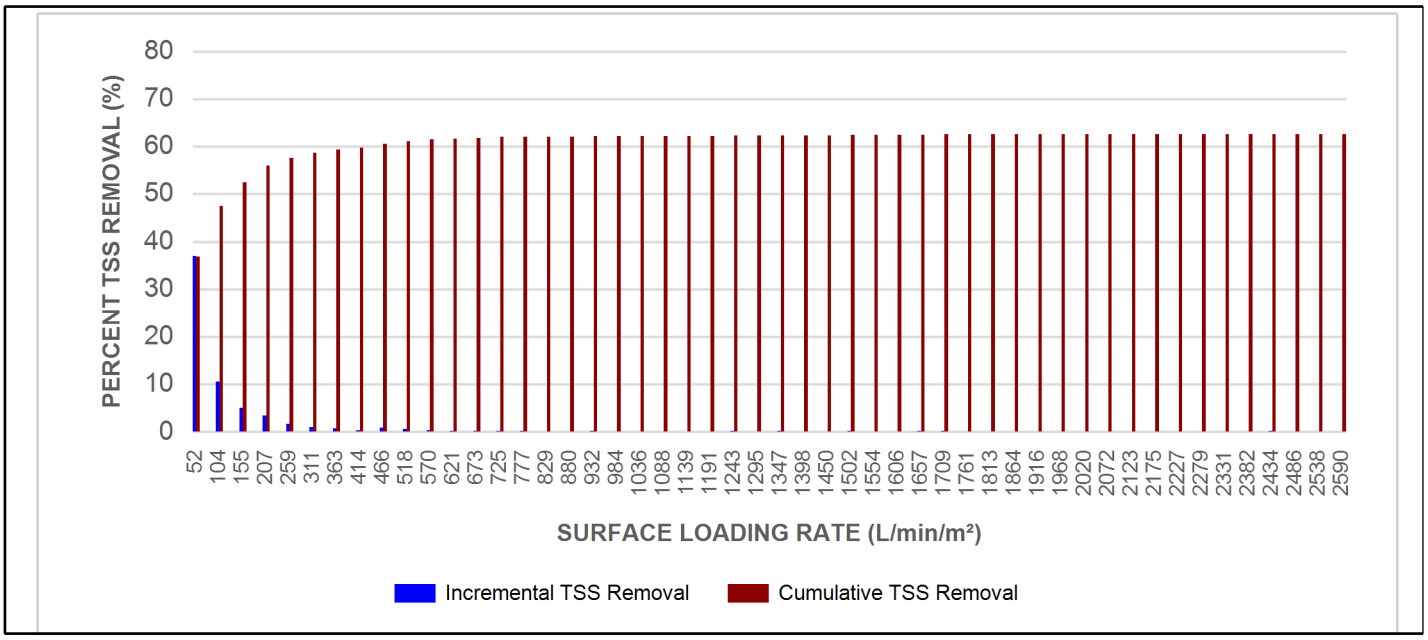
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.2	99.1	26.93	1616.0	1347.0	35	0.1	62.3
27	0.0	99.1	27.97	1678.0	1398.0	34	0.0	62.3
28	0.0	99.1	29.00	1740.0	1450.0	33	0.0	62.3
29	0.2	99.3	30.04	1802.0	1502.0	32	0.1	62.4
30	0.0	99.3	31.07	1864.0	1554.0	31	0.0	62.4
31	0.0	99.3	32.11	1927.0	1606.0	30	0.0	62.4
32	0.2	99.5	33.15	1989.0	1657.0	29	0.1	62.4
33	0.2	99.7	34.18	2051.0	1709.0	28	0.1	62.5
34	0.0	99.7	35.22	2113.0	1761.0	27	0.0	62.5
35	0.0	99.7	36.25	2175.0	1813.0	26	0.0	62.5
36	0.0	99.7	37.29	2237.0	1864.0	26	0.0	62.5
37	0.0	99.7	38.33	2300.0	1916.0	25	0.0	62.5
38	0.0	99.7	39.36	2362.0	1968.0	24	0.0	62.5
39	0.0	99.7	40.40	2424.0	2020.0	24	0.0	62.5
40	0.0	99.7	41.43	2486.0	2072.0	23	0.0	62.5
41	0.0	99.7	42.47	2548.0	2123.0	22	0.0	62.5
42	0.0	99.7	43.50	2610.0	2175.0	22	0.0	62.5
43	0.0	99.7	44.54	2672.0	2227.0	21	0.0	62.5
44	0.0	99.7	45.58	2735.0	2279.0	21	0.0	62.5
45	0.0	99.7	46.61	2797.0	2331.0	20	0.0	62.5
46	0.0	99.7	47.65	2859.0	2382.0	20	0.0	62.5
47	0.2	99.9	48.68	2921.0	2434.0	20	0.0	62.5
48	0.0	99.9	49.72	2983.0	2486.0	19	0.0	62.5
49	0.0	99.9	50.76	3045.0	2538.0	19	0.0	62.5
50	0.0	99.9	51.79	3107.0	2590.0	18	0.0	62.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**63 %**

imbrium

RAINFALL DATA FROM TORONTO CENTRAL RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



imbrium

Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

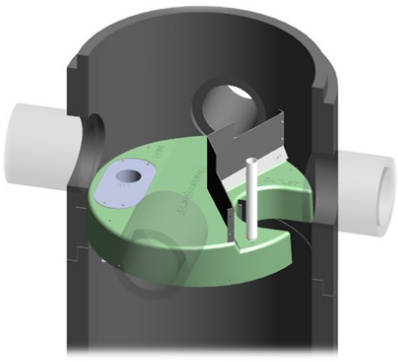
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

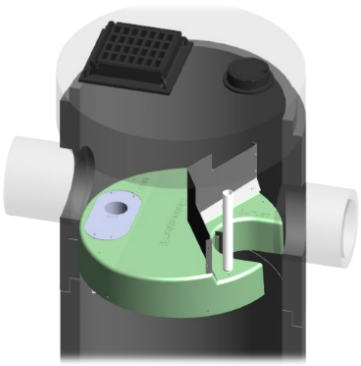
DESIGN FLEXIBILITY

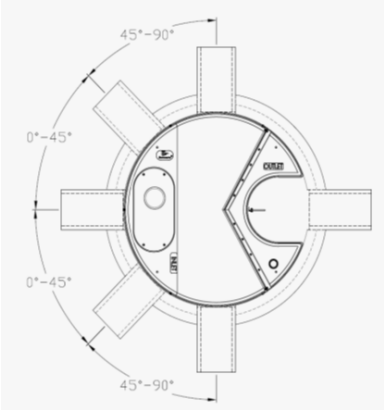
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff,**Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL
1	70	660	46	1320	48	1980	35
30	70	690	46	1350	48	2010	34

imbrium

60	67	720	45	1380	49	2040	34
90	63	750	45	1410	49	2070	33
120	61	780	45	1440	48	2100	33
150	58	810	45	1470	47	2130	32
180	56	840	45	1500	46	2160	32
210	54	870	45	1530	45	2190	31
240	53	900	45	1560	44	2220	31
270	52	930	44	1590	43	2250	30
300	51	960	44	1620	42	2280	30
330	50	990	44	1650	42	2310	30
360	49	1020	44	1680	41	2340	29
390	48	1050	45	1710	40	2370	29
420	48	1080	45	1740	39	2400	29
450	48	1110	45	1770	39	2430	28
480	47	1140	46	1800	38	2460	28
510	47	1170	46	1830	37	2490	28
540	47	1200	47	1860	37	2520	27
570	46	1230	47	1890	36	2550	27
600	46	1260	47	1920	36	2580	27
630	46	1290	48	1950	35		

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR' (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m2 to 2600 L/min/m2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/30/2020

Province:	Ontario
City:	Caledon
Nearest Rainfall Station:	TORONTO CENTRAL
NCDC Rainfall Station Id:	0100
Years of Rainfall Data:	18

Site Name:	Residential

Drainage Area (ha):	0.97
% Imperviousness:	70.00

Runoff Coefficient 'c': 0.72

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	10.97
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	16114 Airport Road
Project Number:	1599
Designer Name:	James Nelson
Designer Company:	Trafalgar Engineering Ltd
Designer Email:	jnelson@trafalgareng.com
Designer Phone:	905-338-3366
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	56
EFO6	64
EFO8	67
EFO10	68
EFO12	69

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 64

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

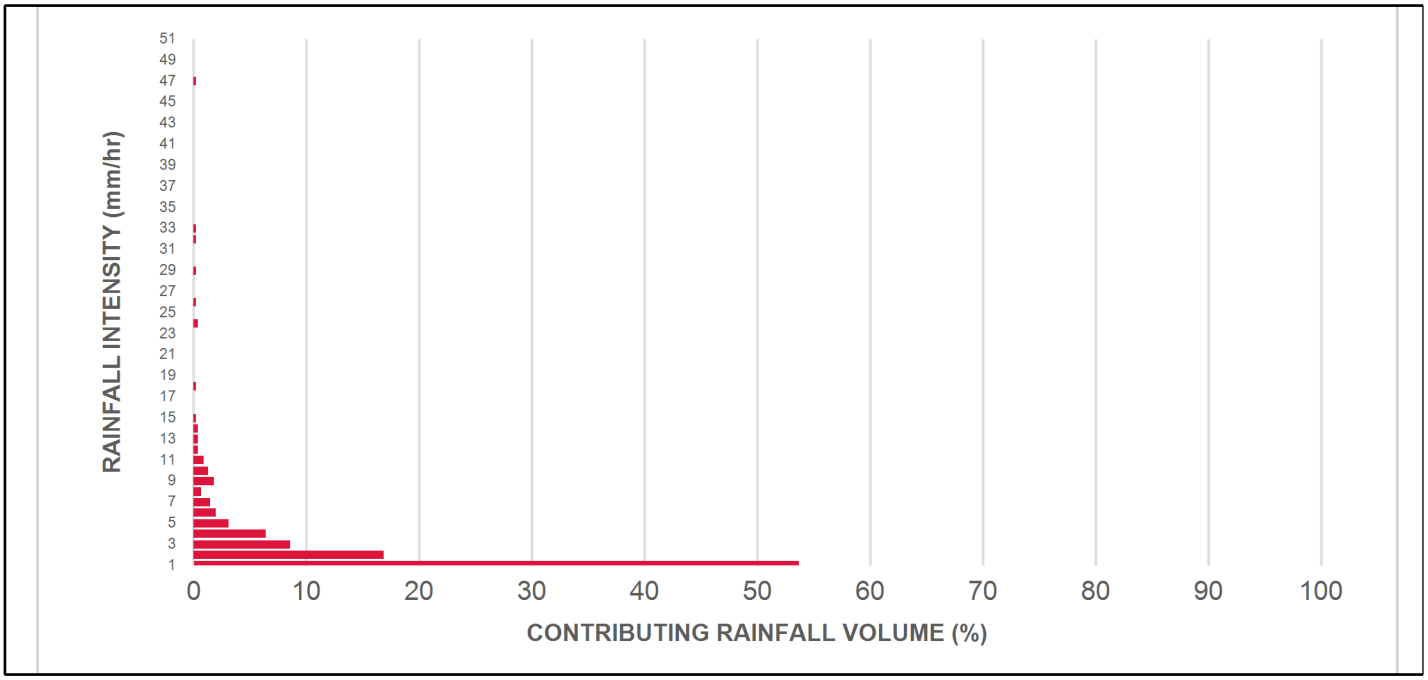
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

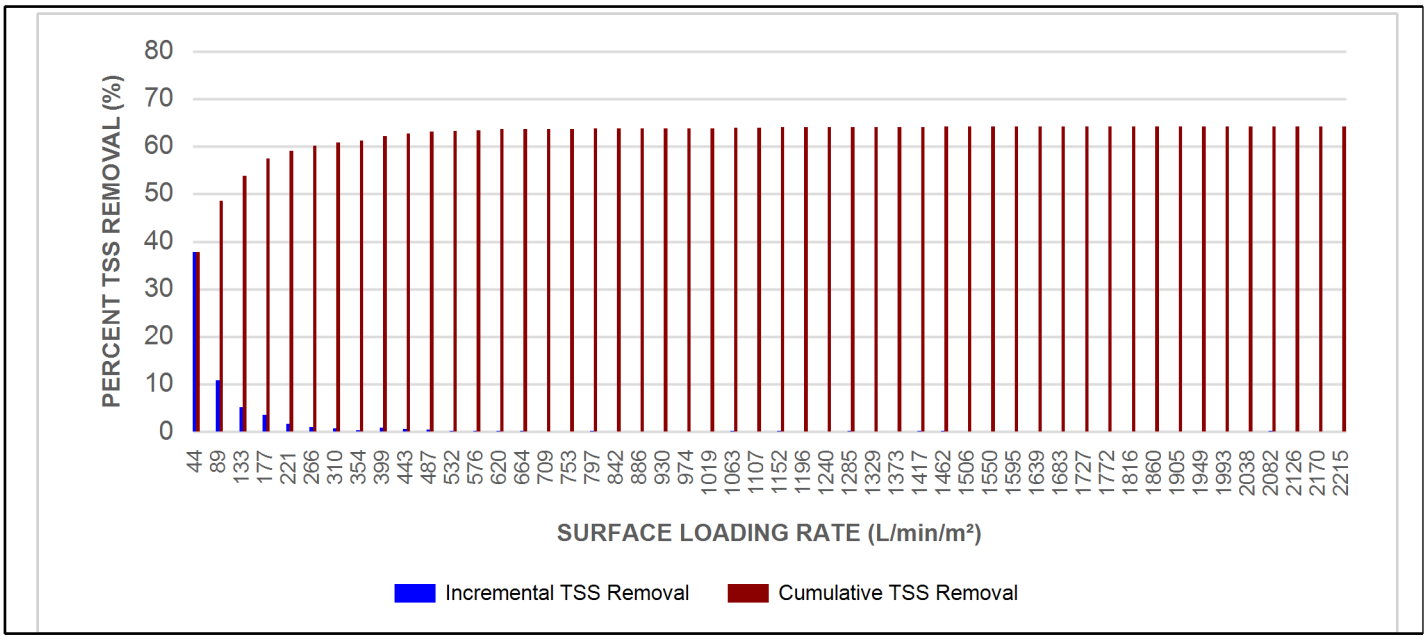
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	53.7	53.7	1.94	116.0	44.0	70	37.8	37.8
2	16.9	70.6	3.88	233.0	89.0	64	10.8	48.6
3	8.6	79.2	5.82	349.0	133.0	60	5.1	53.8
4	6.4	85.6	7.77	466.0	177.0	57	3.6	57.4
5	3.1	88.7	9.71	582.0	221.0	53	1.7	59.0
6	2.0	90.7	11.65	699.0	266.0	52	1.0	60.1
7	1.5	92.2	13.59	815.0	310.0	51	0.8	60.8
8	0.7	92.9	15.53	932.0	354.0	50	0.3	61.2
9	1.8	94.7	17.47	1048.0	399.0	48	0.9	62.1
10	1.3	96.0	19.42	1165.0	443.0	47	0.6	62.7
11	0.9	96.9	21.36	1281.0	487.0	46	0.4	63.1
12	0.4	97.3	23.30	1398.0	532.0	44	0.2	63.3
13	0.4	97.7	25.24	1514.0	576.0	43	0.2	63.4
14	0.4	98.1	27.18	1631.0	620.0	42	0.2	63.6
15	0.2	98.3	29.12	1747.0	664.0	42	0.1	63.7
16	0.0	98.3	31.06	1864.0	709.0	42	0.0	63.7
17	0.0	98.3	33.01	1980.0	753.0	41	0.0	63.7
18	0.2	98.5	34.95	2097.0	797.0	41	0.1	63.8
19	0.0	98.5	36.89	2213.0	842.0	41	0.0	63.8
20	0.0	98.5	38.83	2330.0	886.0	41	0.0	63.8
21	0.0	98.5	40.77	2446.0	930.0	40	0.0	63.8
22	0.0	98.5	42.71	2563.0	974.0	40	0.0	63.8
23	0.0	98.5	44.66	2679.0	1019.0	40	0.0	63.8
24	0.4	98.9	46.60	2796.0	1063.0	39	0.2	63.9
25	0.0	98.9	48.54	2912.0	1107.0	39	0.0	63.9

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.2	99.1	50.48	3029.0	1152.0	38	0.1	64.0
27	0.0	99.1	52.42	3145.0	1196.0	37	0.0	64.0
28	0.0	99.1	54.36	3262.0	1240.0	36	0.0	64.0
29	0.2	99.3	56.31	3378.0	1285.0	36	0.1	64.1
30	0.0	99.3	58.25	3495.0	1329.0	35	0.0	64.1
31	0.0	99.3	60.19	3611.0	1373.0	34	0.0	64.1
32	0.2	99.5	62.13	3728.0	1417.0	34	0.1	64.1
33	0.2	99.7	64.07	3844.0	1462.0	33	0.1	64.2
34	0.0	99.7	66.01	3961.0	1506.0	32	0.0	64.2
35	0.0	99.7	67.95	4077.0	1550.0	31	0.0	64.2
36	0.0	99.7	69.90	4194.0	1595.0	30	0.0	64.2
37	0.0	99.7	71.84	4310.0	1639.0	29	0.0	64.2
38	0.0	99.7	73.78	4427.0	1683.0	28	0.0	64.2
39	0.0	99.7	75.72	4543.0	1727.0	28	0.0	64.2
40	0.0	99.7	77.66	4660.0	1772.0	27	0.0	64.2
41	0.0	99.7	79.60	4776.0	1816.0	26	0.0	64.2
42	0.0	99.7	81.55	4893.0	1860.0	26	0.0	64.2
43	0.0	99.7	83.49	5009.0	1905.0	25	0.0	64.2
44	0.0	99.7	85.43	5126.0	1949.0	25	0.0	64.2
45	0.0	99.7	87.37	5242.0	1993.0	24	0.0	64.2
46	0.0	99.7	89.31	5359.0	2038.0	23	0.0	64.2
47	0.2	99.9	91.25	5475.0	2082.0	23	0.0	64.2
48	0.0	99.9	93.19	5592.0	2126.0	22	0.0	64.2
49	0.0	99.9	95.14	5708.0	2170.0	22	0.0	64.2
50	0.0	99.9	97.08	5825.0	2215.0	22	0.0	64.2
Estimated Net Annual Sediment (TSS) Load Reduction =								**64 %**

RAINFALL DATA FROM TORONTO CENTRAL RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

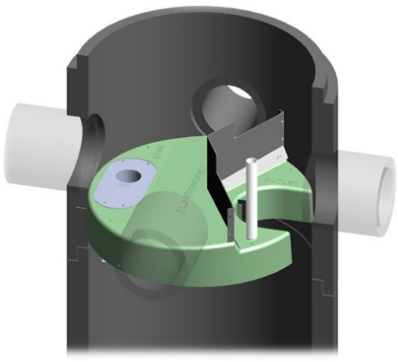
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

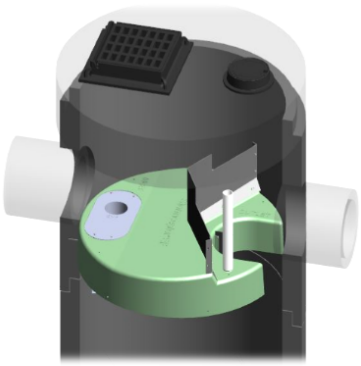
DESIGN FLEXIBILITY

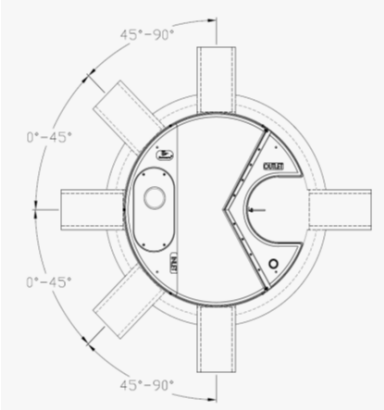
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff,**Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL	SLR (L/min/m^2)	TSS % REMOVAL
1	70	660	46	1320	48	1980	35
30	70	690	46	1350	48	2010	34

imbrium

60	67	720	45	1380	49	2040	34
90	63	750	45	1410	49	2070	33
120	61	780	45	1440	48	2100	33
150	58	810	45	1470	47	2130	32
180	56	840	45	1500	46	2160	32
210	54	870	45	1530	45	2190	31
240	53	900	45	1560	44	2220	31
270	52	930	44	1590	43	2250	30
300	51	960	44	1620	42	2280	30
330	50	990	44	1650	42	2310	30
360	49	1020	44	1680	41	2340	29
390	48	1050	45	1710	40	2370	29
420	48	1080	45	1740	39	2400	29
450	48	1110	45	1770	39	2430	28
480	47	1140	46	1800	38	2460	28
510	47	1170	46	1830	37	2490	28
540	47	1200	47	1860	37	2520	27
570	46	1230	47	1890	36	2550	27
600	46	1260	47	1920	36	2580	27
630	46	1290	48	1950	35		

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR' (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m2 to 2600 L/min/m2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Average Annual Sediment Removal Rates (%) using a CB Shield (based on ETV Sediment - 1 to 1000 micron Particle Size Distribution)

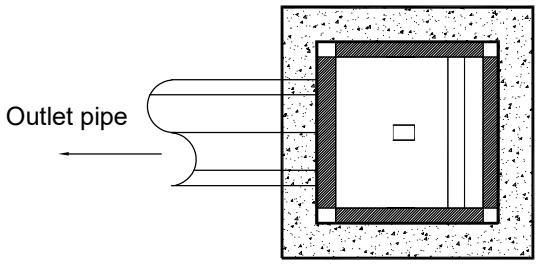
Area to CB (ha)	Imperviousness[1] (%)					
	20%	35%	50%	65%	80%	100%
0.02	57%	57%	57%	57%	56%	56%
0.05	56%	56%	56%	55%	55%	54%
0.10	56%	55%	54%	53%	52%	51%
0.20	54%	53%	51%	49%	48%	46%
0.30	53%	50%	48%	46%	45%	43%
0.40	51%	48%	46%	44%	42%	40%
0.50	50%	47%	44%	42%	40%	38%
0.60	49%	45%	43%	40%	39%	36%

Notes:

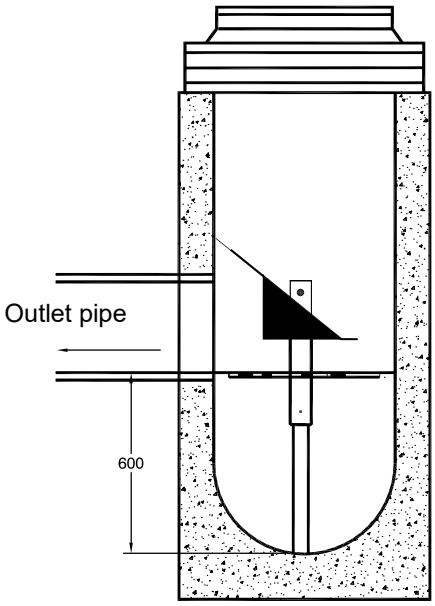
1. Runoff Coefficient 'C' is approximately equal to 0.05 + 0.9*Impervious Fraction.
2. Above chart is based on long term continuous hydrologic analysis of Toronto, Ontario (Bloor St) rainfall data.
3. Assumes 0.6 m sump in CB and that maintenance is performed (i.e. CB cleaning) when required by sediment/pollutant build-up or otherwise.
4. See accompanying chart for suggested maintenance scheduling - AND - get CB Shield Inc. to monitor it for you in field.
5. Sediment/Pollutant removal rates based on third party certified laboratory testing using ETV sediment (PSD analysis available on request).
6. See additional discussion regarding scour protection from CB Shield during more infrequent runoff events.

Notes

1. CB Shield can be installed at any time. In a non frozen condition.
2. The frame and cover should be well aligned with the catchbasin for proper installation
3. The catchbasin sump must be clean before installation
4. The grate should be at the same level as the standing water in the sump.
5. Pipes must be cut flush with inside walls



Top view



Profile view

CB Shield (600mm Sump)

Appendix ‘E’

Caledon East Wetland Complex Catchment Basin

Caledon East Wetland Complex Roll #21240500010570000000

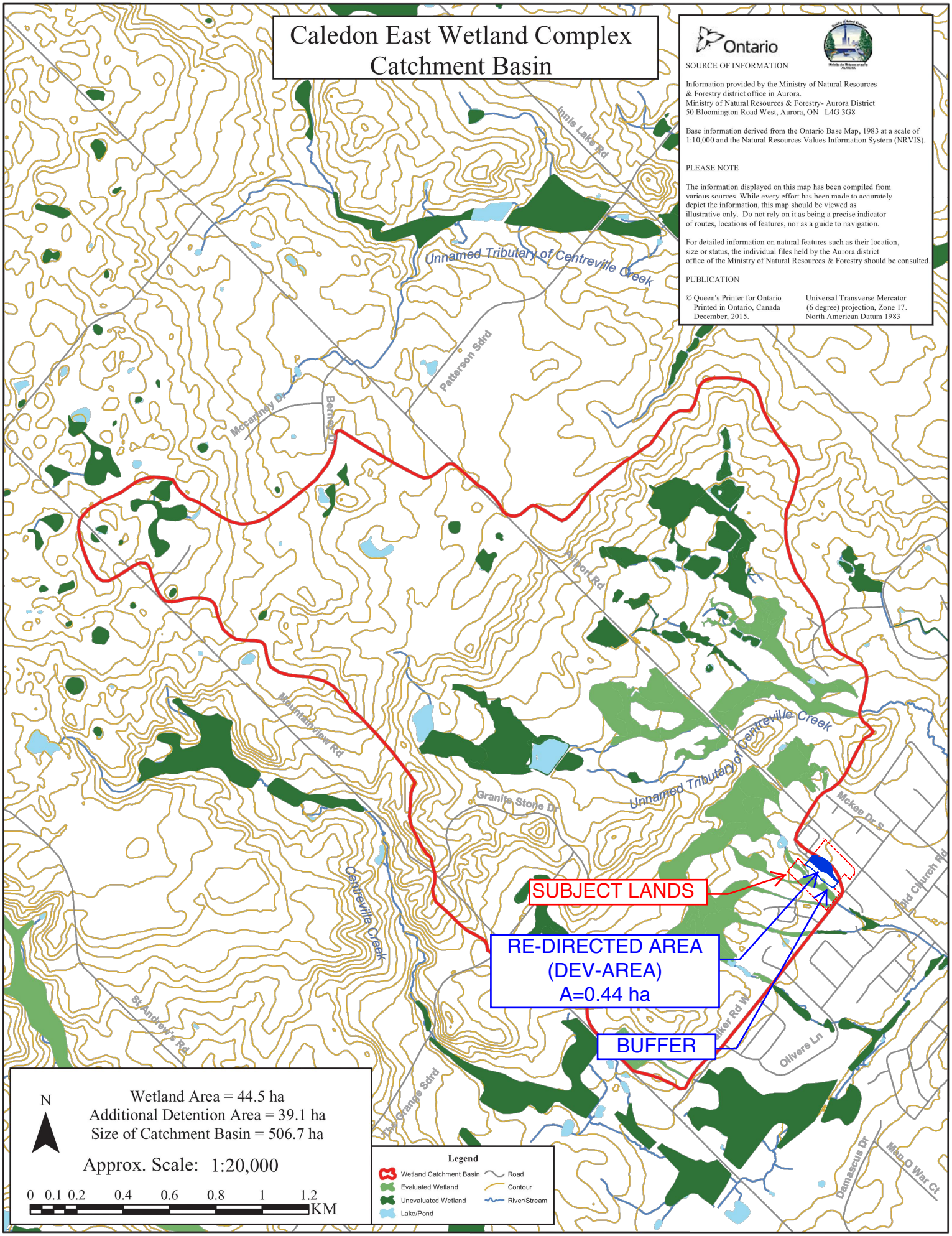
Pre-Development Model Subcatchment Areas (Figure 3)

Post-Development Model Subcatchment Areas (Figure 4)

Model Parameters

Interpreted Groundwater Flow (R.J. Burnside)

EPA SWMM Model Input File


Caledon East Wetland Complex
Catchment Basin
Ontario
SOURCE OF INFORMATION
Information provided by the Ministry of Natural Resources
& Forestry district office in Aurora.
Ministry of Natural Resources & Forestry- Aurora District
50 Bloomington Road West, Aurora, ON L4G 3G8
Base information derived from the Ontario Base Map, 1983 at a scale of 1:10,000 and the Natural Resources Values Information System (NRVIS).
PLEASE NOTE
The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
For detailed information on natural features such as their location, size or status, the individual files held by the Aurora district office of the Ministry of Natural Resources & Forestry should be consulted.
PUBLICATION
© Queen's Printer for Ontario
Printed in Ontario, Canada
December, 2015.
Universal Transverse Mercator
(6 degree) projection, Zone 17.
North American Datum 1983
Innis Lake Rd
Unnamed Tributary of Centreville Creek
Patterson Sdrd
McCartney Dr
Bethesda Dr
Airport Rd
Mountainview Rd
Granite Stone Dr
Centreville Creek
Unnamed Tributary of Centreville Creek
Mckee Dr S
Old Church Rd
SUBJECT LANDS
RE-DIRECTED AREA
(DEV-AREA)
A=0.44 ha
BUFFER
Walker Rd W
Olivers Ln
St Andrew's Rd
The Grange Sdrd
Damascus Dr
Main O War Ct
N
Wetland Area = 44.5 ha
Additional Detention Area = 39.1 ha
Size of Catchment Basin = 506.7 ha
Approx. Scale: 1:20,000
0 0.1 0.2 0.4 0.6 0.8 1 1.2
KM
Legend
Wetland Catchment Basin
Evaluated Wetland
Unevaluated Wetland
Lake/Pond
Road
Contour
River/Stream

Ontario

Scale 1:1,500 (approx.)

0 25 50 100 150 200 M

FILE ID:2015-78-ST

Legend

- Watercourse
- MNRF Evaluated Wetland
- Subject Lands
- Parcel Fabric
- c S17 Wetland Vegetation Community

PUBLICATION

Cartography by Aurora District Geomatics.

Universal Transverse Mercator (6 degree) projection, Zone 17. North American Datum 1983

SOURCE OF INFORMATION

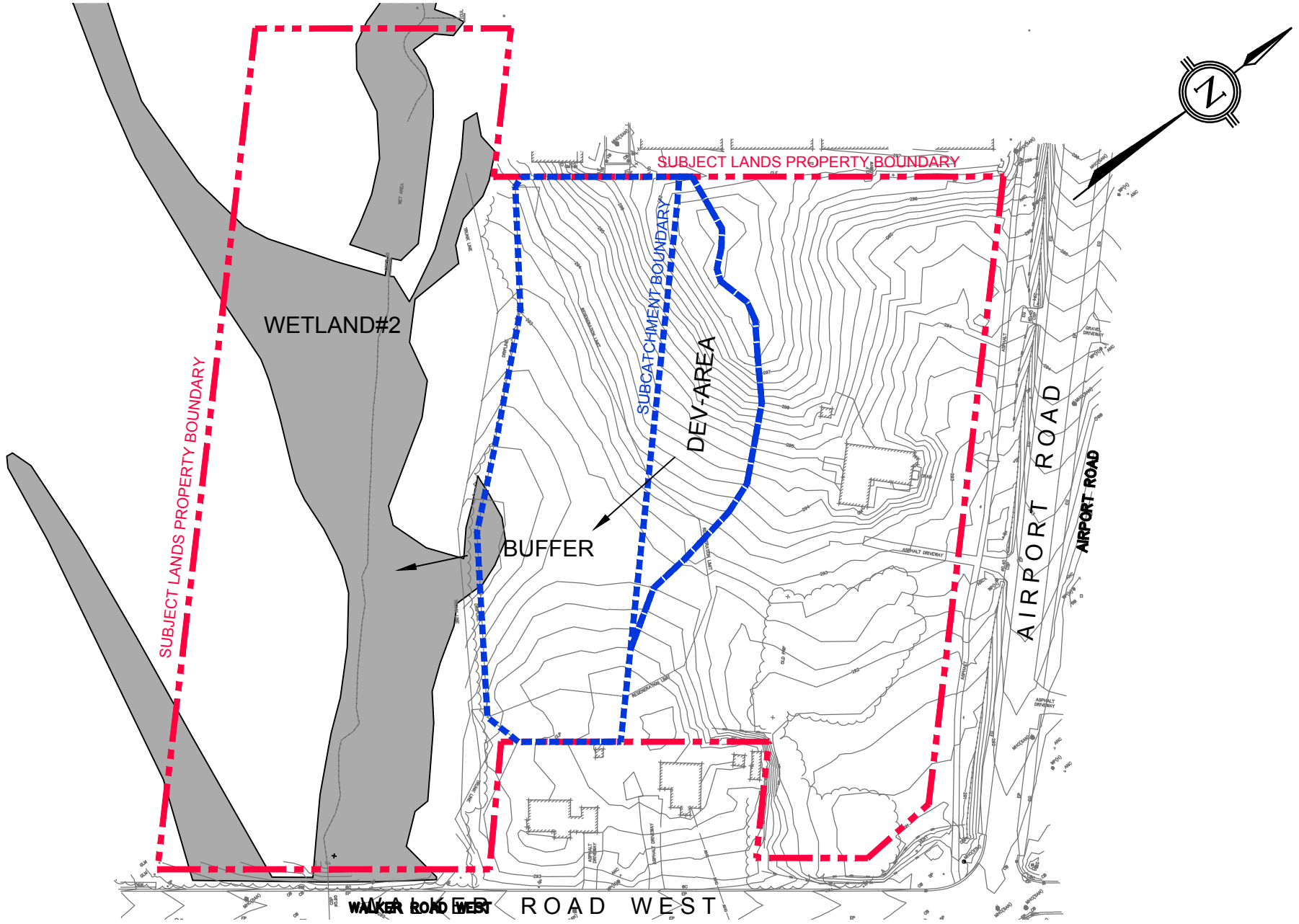
Information provided by the Ministry of Natural Resources & Forestry district office in Aurora.
Ministry of Natural Resources & Forestry- Aurora District 50 Bloomington Road West, Aurora, ON L4G 3G8

Base information derived from the Ontario Base Map, 1983 at a scale of 1:10,000 and the Natural Resources Values Information System (NRVIS).

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

For detailed information on natural features such as their location, size or status, the individual files held by the Aurora district office of the Ministry of Natural Resources & Forestry should be consulted.



PROJECT TITLE

16114 AIRPORT ROAD

TOWN OF CALEDON

TRAFALGAR ENGINEERING LTD.

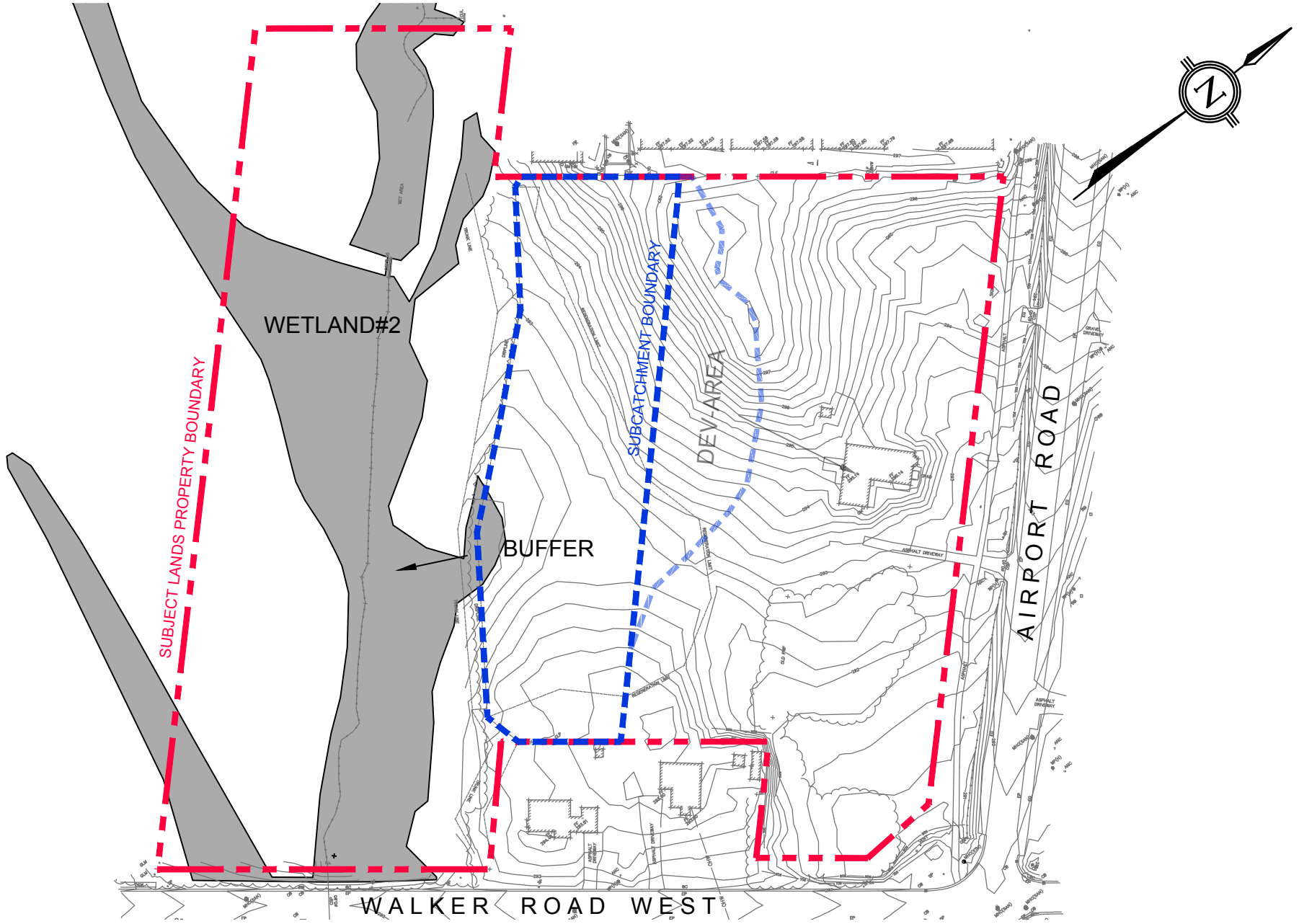
TEL: (905) 338-3366 FAX: (905) 338-7734

tel@trafalgareng.com

DRAWING TITLE

PRE-DEVELOPMENT SUBCATCHMENT AREA PLAN

DESIGN BY	JN	SCALE	1:1500	FIGURE No.	FIGURE 3
DRAWN BY	SP	CAD FILE	1599-FIG2-3.DWG	DATE	08/02/2018



PROJECT TITLE

16114 AIRPORT ROAD
TOWN OF CALEDON

TRAFALGAR ENGINEERING LTD.
TEL: (905) 338-3366 FAX: (905) 338-7734
tel@trafalgareng.com

DRAWING TITLE
POST-DEVELOPMENT SUBCATCHMENT AREA PLAN

DESIGN BY	JN	SCALE	1:1500	FIGURE No.	FIGURE 3
DRAWN BY	SP	CAD FILE	1599-FIG2-3.DWG	DATE	08/02/2018

Model Parameters

E.1 Groundwater

Groundwater modelling is not a part of the simulation.

E.2 Evaporation

Evaporation is calculated by the software using the Hargreaves method. Reference may be made to the EPA SWMM Reference Manual, Volume I: Hydrology section 4.2 for further detail. The evaporation is determined using the temperature data provided by TRCA.

E.3 Infiltration

Parameters used with the Green-Ampt infiltration method are obtained from Tables 4-7 and 4-8 from the EPA SWMM Reference Manual, attached. Parameter values are interpolated in Table 4-7 based on the hydraulic conductivity of the soil. Typical values of maximum moisture deficit (Initial Deficit) are provided in Table 4-8 from the EPA SWMM Reference Manual based on soil type. The Initial Deficit used in the simulation is selected based on approximate soil type (between Sandy Loam and Loamy Sand, by hydraulic conductivity).

E.4 Rainfall and Climate Data

All rainfall and climate data for the simulation period is obtained from TRCA.

E.5 Subcatchment Geometry and Properties

Subcatchment Properties

Subcatchment	Area (ha)	Width (m)	Slope (%)	% Imp.	n, Imp.	n, Per.	Dep. Storage, Imp. (mm)	Dep. Storage, Per. (mm)
DEV-AREA	0.439	105	9	0	0.015	0.035	2	5
BUFFER	0.441	155	4	0	0.015	0.035	2	5

Infiltration Parameters

Subcatchment	Suction Head (mm)	Hydraulic Conductivity (mm/hr)	Initial Deficit (Fraction)
DEV-AREA	98.4	15.5	0.33
BUFFER	98.4	15.5	0.33

Table 4-7 Green-Ampt parameters for different soil classes (Rawls et al., 1983)

(Numbers in parentheses are ± one standard deviation from the parameter value shown.)

Soil Class	Porosity, ϕ	Effective Porosity, ϕ_e*	Wetting Front Suction Head, ψ_s (in)	Saturated Hydraulic Conductivity, K_s (in/hr)
Sand	0.437 (0.374–0.500)	0.417 (0.354–0.480)	1.95 (0.38–9.98)	4.74
Loamy sand	0.437 (0.363–0.506)	0.401 (0.329–0.473)	2.41 (0.53–11.00)	1.18
Sandy loam	0.453 (0.351–0.555)	0.412 (0.283–0.541)	4.33 (1.05–17.90)	0.43
Loam	0.463 (0.375–0.551)	0.434 (0.334–0.534)	3.50 (0.52–23.38)	0.13
Silt loam	0.501 (0.420–0.582)	0.486 (0.394–0.578)	6.57 (1.15–37.56)	0.26
Sandy clay loam	0.398 (0.332–0.464)	0.330 (0.235–0.425)	8.60 (1.74–42.52)	0.06
Clay loam	0.464 (0.409–0.519)	0.309 (0.279–0.501)	8.22 (1.89–35.87)	0.04
Silty clay loam	0.471 (0.418–0.524)	0.432 (0.347–0.517)	10.75 (2.23–51.77)	0.04
Sandy clay	0.430 (0.370–0.490)	0.321 (0.207–0.435)	9.41 (1.61–55.20)	0.02
Silty clay	0.479 (0.425–0.533)	0.423 (0.334–0.512)	11.50 (2.41–54.88)	0.02
Clay	0.475 (0.427–0.523)	0.385 (0.269–0.501)	12.45 (2.52–61.61)	0.01

*Effective porosity is the difference between the porosity ϕ and the residual moisture content ϕ_r that remains after a saturated soil is allowed to drain thoroughly.

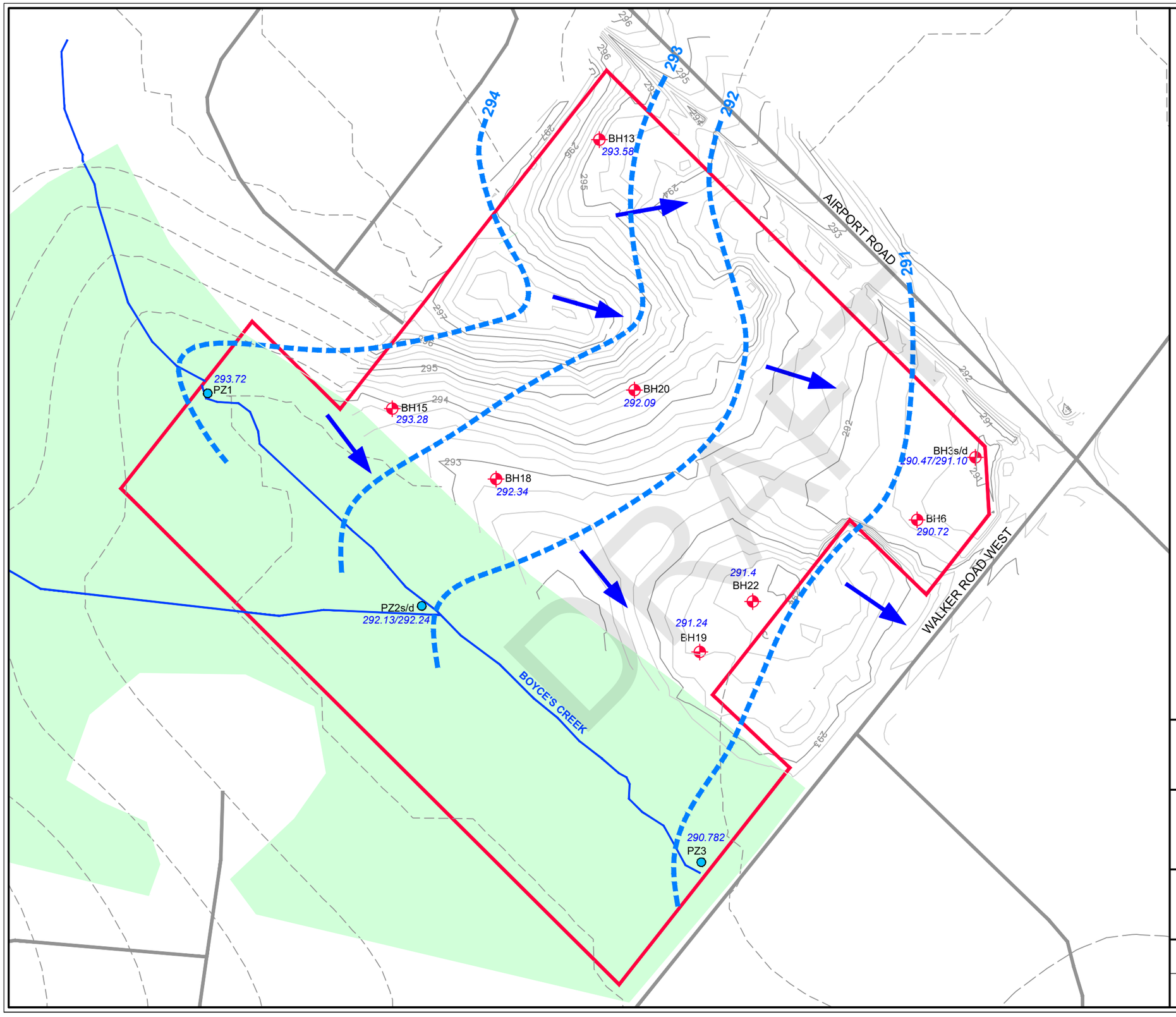
Maximum Moisture Deficit (θ_{dmax})

The maximum moisture deficit, θ_{dmax} is defined as the difference between the moisture content at saturation and at the start of the simulation. Because this parameter is the most sensitive of the three parameters for estimates of runoff from pervious areas (Brakensiek and Onstad, 1977), some care should be taken in determining the best θ_{dmax} value to use. The saturated moisture content is approximately equal to the soil's porosity ϕ (i.e., the fraction of voids), assuming one ignores the 5 - 10% of trapped air that typically exists at saturation. After a saturated soil is allowed to drain thoroughly, the residual moisture content that remains is ϕ_r. The effective porosity ϕ_e is defined as $\phi - \phi_r$ and can be used to represent θ_{dmax} for dry antecedent conditions. Typical values of ϕ_e are included in the Rawls et al. (1983) data set listed in Table 4-7.

Sandy soils tend to have lower porosities than clay soils, but drain to lower moisture contents between storms because the water is not held so strongly in the soil pores. Consequently, values of θ_{dmax} for dry antecedent conditions tend to be higher for sandy soils than for clay soils. Table 4-8, derived from Clapp and Hornberger (1973), is another source of θ_{dmax} values for various soil types.

Table 4-8 Typical values of θ_{dmax} for various soil types.

Soil Texture	Typical θ_{dmax} at Soil Wilting Point
Sand	0.34
Sandy Loam	0.33
Silt Loam	0.32
Loam	0.31
Sandy Clay Loam	0.26
Clay Loam	0.24
Clay	0.21



LEGEND

- SUBJECT LANDS
- WATERCOURSE
- WOODED AREA
- CONTOUR (0.5m intervals - masl)
- CONTOUR (1m intervals)
- MONITORING WELL (TERRAPROBE, 2016)
- DRIVE POINT PIEZOMETER (RJB, 2016)
- INTERPRETED GROUNDWATER CONTOUR (masl)
- 289.45 MEASURED WATER LEVEL (MAY 11 2017)
- INTERPRETED GROUNDWATER FLOW DIRECTION

Sources:
1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.
3. Site contours provided by David B. Searles Surveying Ltd., July 21, 2016.
4. Regional contours created from 2002 Dem file, MNR.

N

0 25 50 75 100
Metres

BURNSIDE

Client / Report

SHACCA CALEDON HOLDINGS INC.
CALEDON EAST, ONTARIO

HYDROGEOLOGICAL IMPACT ASSESSMENT

Figure Title

INTERPRETED GROUNDWATER FLOW

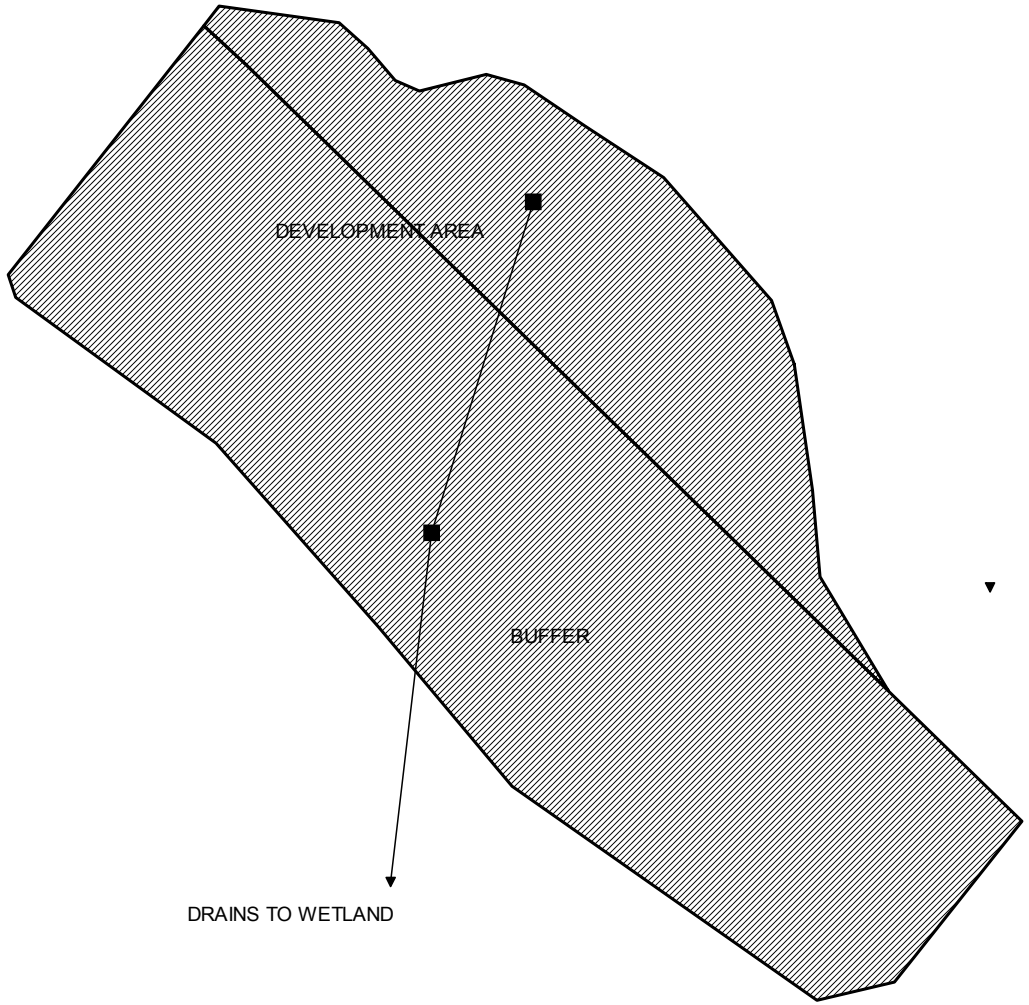
Drawn	Checked	Date	Figure No.
SK	SC	September 2020	8
Scale		Project No.	
1:1,250		300039242	

File Name:Nigel\Shared Work Areas\039242 Shacca \02_Production\ 039242 HG Study Figures 6-7-8.dwg Date Plotted: September 28, 2020 - 9:53 AM

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           05/23/1986
START_TIME           00:00:00
REPORT_START_DATE    05/23/1986
REPORT_START_TIME    00:00:00
END_DATE             11/01/2007
END_TIME             23:59:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         1.14
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
TEMPERATURE
DRY_ONLY         NO

[TEMPERATURE]
;;Data Element     Values
FILE               "test Daily_Temp.dat"
WINDSPEED FILE
SNOWMELT           0 0.5 0.6 295 43.9 19
ADC IMPERVIOUS     1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
ADC PERVIOUS       1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
RG-1             VOLUME    1:00     1.0      FILE       "615HMAK_Hourly_Prec tel.dat" STA01
    MM

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
DEV-AREA         RG-1             DIVERTED         0.220    0        105      9.0      0

BUFFER           RG-1             WETLAND          0.652    0        155      4.0      0
```

```
[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
DEV-AREA         0.015      0.035      2.00       5.00       25         OUTLET
BUFFER           0.015      0.035      2.00       5.00       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DEV-AREA         98.4       15.5       0.33
BUFFER           98.4       15.5       0.33

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
WETLAND          290.39     NORMAL                      NO
DIVERTED         0          FREE                        NO

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 590582.721 4858184.289 590734.609 4858334.328
Units      Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
WETLAND          590642.160         4858207.488
DIVERTED         590724.353         4858247.795

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DEV-AREA         590697.393         4858278.387
DEV-AREA         590694.360         4858287.092
DEV-AREA         590679.505         4858303.962
DEV-AREA         590668.709         4858310.997
DEV-AREA         590660.524         4858316.619
DEV-AREA         590655.233         4858318.041
DEV-AREA         590646.136         4858315.854
DEV-AREA         590642.749         4858317.190
DEV-AREA         590639.059         4858321.668
DEV-AREA         590634.979         4858325.086
DEV-AREA         590618.635         4858327.508
DEV-AREA         590616.446         4858324.728
DEV-AREA         590622.158         4858319.501
DEV-AREA         590710.380         4858233.614
DEV-AREA         590701.028         4858249.127
DEV-AREA         590700.042         4858261.163
BUFFER           590622.158         4858319.501
BUFFER           590616.446         4858324.728
BUFFER           590589.625         4858290.656
BUFFER           590590.753         4858287.498
BUFFER           590618.275         4858267.621
BUFFER           590640.396         4858242.408
BUFFER           590658.866         4858220.399
BUFFER           590700.682         4858191.109
```

```
BUFFER           590711.254         4858193.586
BUFFER           590728.707         4858215.772

[SYMBOLS]
;;Gage            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
RG-1             590590.543         4858320.150

[LABELS]
;;X-Coord          Y-Coord            Label
590614.155         4858204.562        "DRAINS TO WETLAND" "" "Arial" 10 0 0
590626.277         4858298.190        "DEVELOPMENT AREA" "" "Arial" 10 0 0
590658.461         4858242.598        "BUFFER" "" "Arial" 10 0 0
```


DEVELOPMENT AREA
BUFFER
DRAINS TO WETLAND

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 2
Number of nodes 2
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
RG-1	P:\1599 Shacca\Storm Water Management\Water Balance\615HMAK_Hourly_Prec tel.dat		

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
DEV-AREA	0.22	105.00	0.00	9.0000	RG-1	BUFFER
BUFFER	0.65	155.00	0.00	4.0000	RG-1	WETLAND

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
WETLAND	OUTFALL	290.39	0.00	0.0	
DIVERTED	OUTFALL	0.00	0.00	0.0	

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
STA01	05/23/1986	11/01/2007	60 min	6337	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:

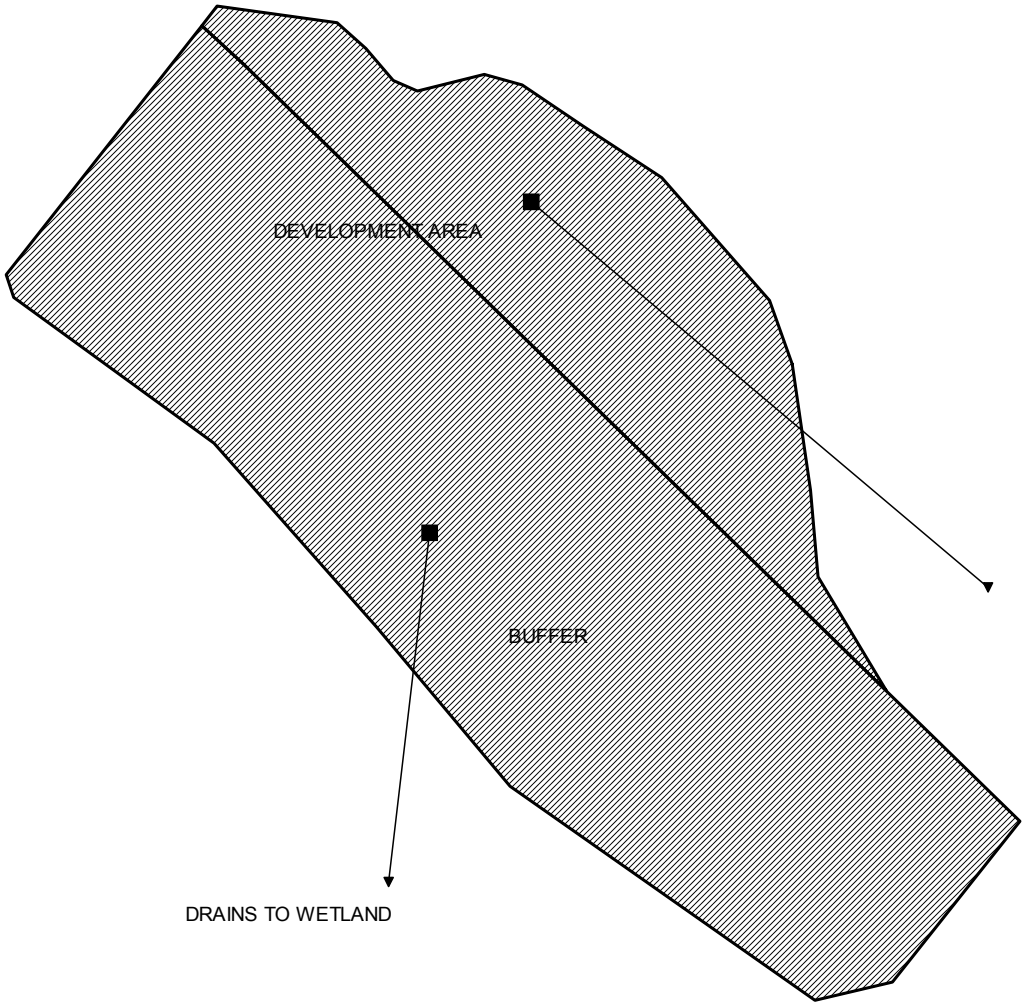
```
  Rainfall/Runoff ..... YES
  RDII ................ NO
  Snowmelt ............ NO
  Groundwater ......... NO
  Flow Routing ........ NO
  Water Quality ....... NO
Infiltration Method ..... GREEN_AMPT
Surcharge Method ........ EXTRAN
Starting Date ........... 05/23/1986 00:00:00
Ending Date ............. 11/01/2007 23:59:00
Antecedent Dry Days ..... 0.0
Report Time Step ........ 01:00:00
Wet Time Step ........... 00:05:00
Dry Time Step ........... 00:05:00
```

****
Control Actions Taken
****

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	8.259	9471.100
Evaporation Loss	0.001	0.983
Infiltration Loss	8.256	9468.008
Surface Runoff	0.002	2.862
Final Storage	0.000	0.000
Continuity Error (%)	-0.008	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.002	0.025
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.002	0.025
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
```
Analysis begun on:  Thu Oct 10 11:44:14 2019
Analysis ended on:  Thu Oct 10 11:44:20 2019
Total elapsed time: 00:00:06
```


DEVELOPMENT AREA
BUFFER
DRAINS TO WETLAND

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 2
Number of nodes 2
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
RG-1	P:\1599 Shacca\Storm Water Management\Water Balance\615HMAK_Hourly_Prec tel.dat		

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
DEV-AREA	0.22	105.00	0.00	9.0000	RG-1	DIVERTED
BUFFER	0.65	155.00	0.00	4.0000	RG-1	WETLAND

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
WETLAND	OUTFALL	290.39	0.00	0.0	
DIVERTED	OUTFALL	0.00	0.00	0.0	

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
STA01	05/23/1986	11/01/2007	60 min	6337	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:

```
  Rainfall/Runoff ..... YES
  RDII ................ NO
  Snowmelt ............ NO
  Groundwater ......... NO
  Flow Routing ........ NO
  Water Quality ....... NO
Infiltration Method ..... GREEN_AMPT
Surcharge Method ........ EXTRAN
Starting Date ........... 05/23/1986 00:00:00
Ending Date ............. 11/01/2007 23:59:00
Antecedent Dry Days ..... 0.0
Report Time Step ........ 01:00:00
Wet Time Step ........... 00:05:00
Dry Time Step ........... 00:05:00
```

****
Control Actions Taken
****

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	8.259	9471.100
Evaporation Loss	0.001	0.972
Infiltration Loss	8.256	9467.434
Surface Runoff	0.003	3.385
Final Storage	0.000	0.000
Continuity Error (%)	-0.007	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.003	0.030
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.003	0.030
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Analysis begun on: Thu Oct 10 11:42:37 2019
Analysis ended on: Thu Oct 10 11:42:43 2019
Total elapsed time: 00:00:06

Appendix ‘F’

Table 2: Criteria used to evaluate the probability and magnitude of hydrological change, TRCA Wetland Water Balance Risk Evaluation

Table 3: Criteria used to evaluate the sensitivity of the wetland to hydrological change, TRCA Wetland Water Balance Risk Evaluation

Figure 3: Wetland Risk Evaluation Decision Tree

Figure 4: Ecological Land Classification (Dillon Consulting)

Table 6: Ecological Land Classification (Dillon Consulting)

Appendix 2: List of Wetland Community Types within Toronto and Region Conservation Authority Jurisdiction by Hydrological Sensitivity

Water Balance, Tables G-1 to G-4 (R.J. Burnside)

Table 2: Criteria used to evaluate the probability and magnitude of hydrological change.

Criteria	High magnitude	Medium magnitude	Low magnitude
Impervious cover Score (*S*) within catchment, as determined using Equation 1	> 25 %	10-25 %	< 10 %
Increase or decrease in catchment size	> 25 %	10-25 %	< 10 %
Water taking or discharge	Dewatering exceeding MOECC EASR limits (> 400,000 L/day) for > 6 months anticipated	Dewatering within MOECC EASR limits (50,000 - 400,000 L/day) for > 6 months anticipated OR Dewatering exceeding MOECC EASR limits (>400,000 L/day) for < 6 months anticipated	Dewatering within MOECC EASR limits (50,000 - 400,000 L/day) for < 6 months anticipated*
Impact to recharge areas*	Impact (e.g. replacement with impervious cover) to >25% of locally significant recharge areas*	Impact (e.g. replacement with impervious cover) to 10-25% of locally significant recharge areas*	Impact (e.g. replacement with impervious cover) to <10% of locally significant recharge areas*

Note: Where there is no proposed alteration to the catchment imperviousness or size and water taking is below MOECC EASR registration requirements (< 50,000 L/day), a feature-based water balance analysis as defined in the TRCA *SWM document* (2012) is not required. See section 1.4 (Applicability).

* Defined in Table 1

Table 3: Criteria used to evaluate the sensitivity of the wetland to hydrological change.

Criteria	High sensitivity	Medium sensitivity	Low sensitivity
Vegetation community type (ELC)*	Presence of a high sensitivity vegetation community	Presence of a medium sensitivity vegetation community	No high or medium sensitivity criteria satisfied
High sensitivity fauna species**	Presence of a high sensitivity species	Presence of a medium sensitivity species	No high or medium sensitivity criteria satisfied
High sensitivity flora species**	Presence of multiple high sensitivity species	Presence of multiple medium sensitivity species OR Presence of one high sensitivity species	No high or medium sensitivity criteria satisfied
Significant Wildlife Habitat	Presence of Significant Wildlife Habitat, as defined by OMNRF (2014), for high sensitivity species**	N/A	No high criteria satisfied
Hydrological classification considering ecology	Isolated/palustrine AND Presence of medium or high sensitivity vegetation communities* OR medium or high sensitivity flora or fauna species**	Isolated/palustrine AND No medium or high sensitivity vegetation communities* AND no medium or high sensitivity flora or fauna species** present	Riverine/lacustrine

* See Appendix 2 for community rankings by hydrological sensitivity
** See Appendix 3 for species rankings by hydrological sensitivity

1

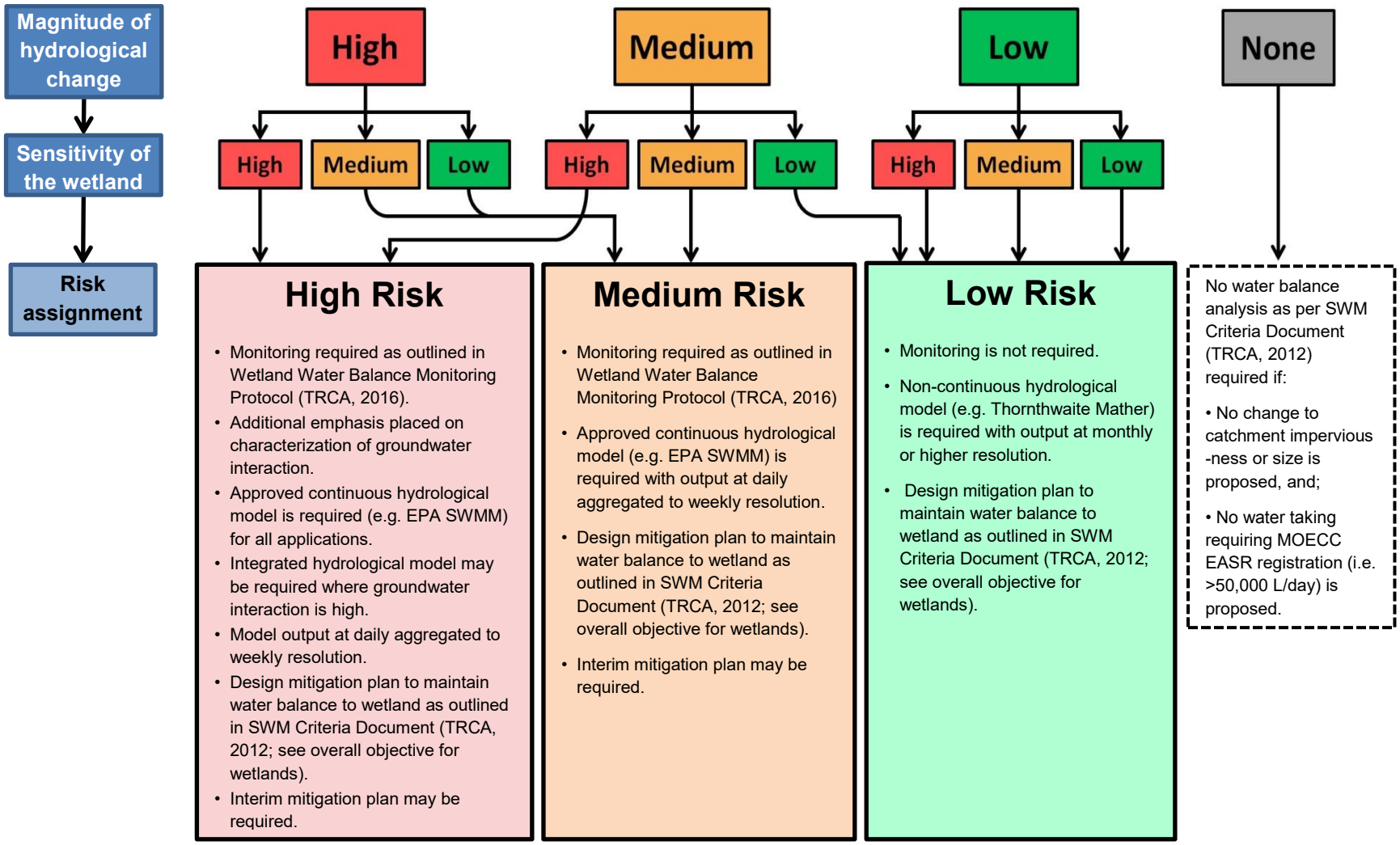
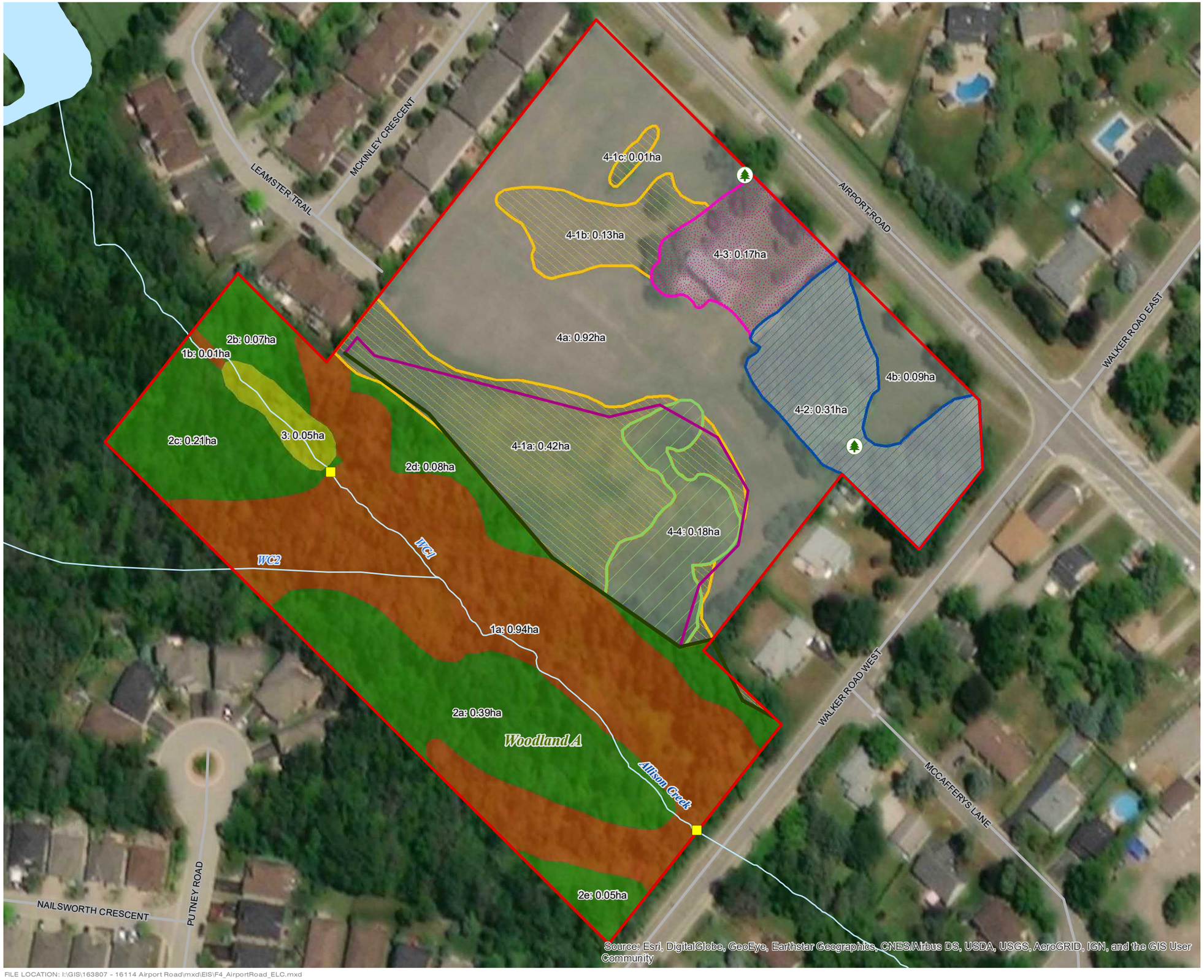


Figure 3: Wetland Risk Evaluation Decision Tree



SHACCA CALEDON HOLDINGS INC.
16114 AIRPORT ROAD
CALEDON, ON

FIGURE 4
ECOLOGICAL LAND CLASSIFICATION

- Study Area/ Property
- Culvert
- Butternut
- Regeneration Area Limit (as staked by TRCA in 2014)
- Dripline (as staked by TRCA in 2016)
- Road
- Watercourse
- Waterbody

Ecological Land Classification

- 1. SWDM4: Mineral Deciduous Swamp Ecosite
- 2. FODM8-1: Fresh-Moist Poplar Deciduous Forest
- 3. MASO3: Mixed Organic Shallow Marsh Ecosite
- 4. CVR_4: Rural Property (approx. 2.23ha)
  - 4-1. MEMM4: Fresh-Moist Mixed Meadow Ecosite
  - 4-2. FODM4-2: Dry-Fresh White Ash - Hardwood Deciduous Forest
  - 4-3. CVR_3: Single Family Residential
  - 4-4. FODM7-9: Fresh - Moist Exotic Lowland Deciduous Forest (Regenerating Woodland Area)

0 5 10 20 Metres

SCALE 1:1,200

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, GOOGLE EARTH

MAP CREATED BY: LK
MAP CHECKED BY: WM
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 16-3807
STATUS: DRAFT
DATE: 2019-07-31

FILE LOCATION: I:\GIS\163807 - 16114 Airport Road\mxd\EIS\F4_AirportRoad_ELC.mxd

Table 6: Ecological Land Classification

ELC Code	Classification	Total Area within Study Area(ha)	Vegetation	Comments	Photo Appendix D
FODM8-1	Fresh - Moist Poplar Deciduous Forest	0.8	The canopy and sub-canopy consists of Trembling Aspen (*Populus tremuloides*) as the dominant species with Paper Birch (*Betula papyrifera*), Scotch Pine (*Pinus sylvestris*), White Spruce (*Picea glauca*), Black Locust, Apple species (*Malus sp*) and American Basswood (*Tilia americana*). Shrub species present include Choke Cherry (*Prunus virginiana*), Riverbank Grape (*Vitis riparia*) and Purple-flowering Raspberry (*Rubus odoratus*). Herbaceous species present consists of Virginia Creeper (*Parthenocissus quinquefolia*), Sensitive Fern (*Onoclea sensibilis*), Cleavers (*Galium aparine*), Ostrich Fern (*Matteuccia struthiopteris*) and Herb-Robert (*Geranium robertianum*).	This community is located on the southern side of the Study Area. This community has an abundance of invasive species and light rubbish dumping. This community also contains slight noise levels with a light amount of disease and death of trees.	1
SWDM4	Mineral Deciduous Swamp	0.95	The canopy and sub-canopy consists of Black Ash (*Fraxinus nigra*), Trembling Aspen, American Elm (*Ulmus americana*), Wild Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*), Eastern White Cedar (*Thuja occidentalis*) and Green Ash (*Fraxinus pennsylvanica*). Shrub species present include Prickly Gooseberry (*Ribes cynosbati*), Common Elderberry (*Sambucus canadensis*), Common Buckthorn (*Rhamnus cathartica*) and Silky Dogwood (*Cornus obliqua*). Herbaceous species present consist of Spotted Jewelweed (*Impatiens capensis*), Sensitive Fern, Tall Boneset (*Eupatorium altissimum*), Bittersweet Nightshade (*Solanum dulcamara*) and Creeping Buttercup (*Ranunculus repens*).	Patches of this community occur in the southern and northern portions of the Study Area. This community has occasional occurrences of invasive species, slight noise levels and moderate evidence of disease and death of trees.	2
MASO3	Mixed Organic Shallow Marsh	0.05	The community contains Broad-leaved Arrowhead (*Sagittaria latifolia*), Rice Cutgrass (*Leersia oryzoides*), Willow species (*Salix sp*), Bitter Dock, American Water-horehound (*Lycopus americanus*) and Bittersweet Nightshade (*Solanum dulcamara*).	A small patch of this community occurs in the western portion of the Study Area.	3
CVR_4	Rural Property	2.23	Mown grass.	This community is located throughout the Study Area.	4.5
	Inclusion: MEMM4 Fresh - Moist Mixed Meadow	*0.42*	Ground cover consisted primarily of Kentucky Bluegrass (*Poa pratensis ssp. Pratens*is), Canada Bluegrass (*Poa compressa*) and Red Fescue (*Festuca rubra ssp. rubra*) with Awnless Brome (*Bromus inermis*), Common Timothy (*Phleum pretense*) and Reed Canary Grass (*Phalaris arundinacea*) associates. Trees found within the understory and ground cover includes Black Walnut (*Juglans nigra*), Trembling Aspen (*Populus tremuloides*), Black Locust and Manitoba Maple. Shrub species observed were Riverbank Grape, Thicket Creeper (*Parthenocissus inserta*), Wild Red Raspberry (*Rubus sachalinensis var. sachalinensis*) and Virginia Virgin's-bower (*Clematis virginiana*).	Patches of this community are located within the central and northwest corner of the Study Area, and are considered inclusions within the residential property. This community has abundant and wide spread occurrences of invasive species.	6
	Inclusion: FODM4-2 Dry - Fresh White Ash Hardwood Deciduous Forest	*0.31*	The canopy and sub-canopy consists of White Ash (*Fraxinus americana*) as the dominant species with Norway Maple (*Acer platanoides*), Black Locust, Eastern White Cedar, Northern Red Oak (*Quercus rubra*) and Tulip Tree (*Liriodendron tulipifera*) associates. A Butternut was also observed within this community. Herbaceous species present consists of White Avens (*Geum canadense*), Tall Buttercup (*Ranunculus acris*), Garlic Mustard (*Alliaria petiolata*), Sensitive Fern, Ostrich Fern, Ground Ivy (*Glechoma hederacea*), Cleavers and Bitter Dock (*Rumex obtusifolius*).	This community is an inclusion located within the northeast corner of the Study Area. This community has occasional but wide spread occurrences of invasive species and light garbage dumping.	7,8
	Inclusion: FODM7-9 Fresh - Moist Exotic Lowland Deciduous Forest (Regenerating Woodland Area)	*0.18*	The canopy and sub-canopy consists of Black Locust, Black Walnut, Red Pine (*Pinus resinosa*), Manitoba Maple, Northern Red Oak, White Ash, Green Ash, Eastern White Cedar, American Elm and Wild Black Cherry. Shrub and herbaceous species present consists of Riverbank Grape, Wild Red Raspberry, Thicket Creeper, Virginia Creeper, Sensitive Fern, Cleavers, Ostrich Fern and Herb-Robert.	Small inclusion of this community occurs within the larger poplar deciduous community. This community is currently regenerating as the area appears to have been previously brushed evidenced by wood chips and occasional stumps throughout.	9,10
	Inclusion: Single Family Residential	*0.17*	The canopy and sub-canopy consists of Paper Birch, European Larch (*Larix decidua*), White Ash, Eastern White Pine (*Pinus strobus*), Norway Spruce (*Picea abies*), Manitoba Maple, Black Walnut (*Juglans cinerea*), Eastern White Cedar and a Butternut was observed. Shrub species present include Tartarian Honeysuckle (*Lonicera tatarica*) and Virginia Creeper. Herbaceous species present include Goldenrod species (*Solidago sp*), Tufted Vetch (*Vicia cracca*) and Wild Strawberry (*Fragaria virginiana*)	This community is located along the north and eastern sides of the Study Area.	11

APPENDIX 2: LIST OF WETLAND COMMUNITY TYPES WITHIN TORONTO AND REGION CONSERVATION AUTHORITY JURISDICTION BY HYDROLOGICAL SENSITIVITY

A list of wetland community types (Ecological Land Classification Ontario) ranked by sensitivity to hydrological change is used to evaluate the wetland sensitivity criteria in Step 3 of the *Risk Evaluation* (Section 2.3). Ranking of communities into different sensitivity categories was done by TRCA ecologists. Note that other CAs adopting this document may wish to modify Appendix 2 and Appendix 3 to suit the ecological communities and conservation priorities in their jurisdictions.

Wetland communities were sorted by L-rank (L1-L5) for the native communities and L+ and L+? for exotic communities. Generally, L1-L2 communities were assigned a high-sensitivity rating due to their stringent habitat needs, L3-L4 communities were assigned a medium sensitivity, and L5 communities were assigned a low sensitivity. Further details about this list and the methodology used to produce it can be provided by TRCA upon request.

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
White Pine - Red Maple - Birch - Leatherleaf Treed Kettle Bog	BOT2-1A	High	Nutrient poor system. Community slow to recover from hydrological changes
Leatherleaf Shrub Kettle Bog	BOS2-1	High	Nutrient poor system. Community slow to recover from hydrological changes
Tamarack - Leatherleaf Treed Kettle Bog	BOT2-1	High	Nutrient poor system. Community slow to recover from hydrological changes
Slender Sedge Open Fen	FEO1-2	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Beaked Sedge Open Fen	FEO1-5	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Willow Shrub Fen	FES1-A	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Tamarack Treed Fen	FET1-1	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Leatherleaf - Forb Shrub Fen	FES1-4	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Low White Cedar Shrub Fen	FES1-9	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Tamarack - White Cedar Treed Fen	FET1-2	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Bog Buckbean - Sedge Open Fen	FEO1-4	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
Willow Shrub Mineral Fen	FES2-A	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
White Cedar - Scots Pine Low Treed Mineral Fen	FET2-B	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
White Cedar Low Treed Mineral Fen	FET2-A	High	Mineral rich community. Groundwater fed. Community slow to recover from hydrological changes
Bluejoint - Switchgrass Tallgrass Meadow Marsh	MAM6-A	High	Community slow to recover from hydrological changes
Nelson's Scouring Rush - Baltic Rush Coastal Fen	MAM4-A	High	Community slow to recover from hydrological changes
Unvegetated Mineral Vernal Pool	MAS2-H	High	Community slow to recover from hydrological changes
Narrow-leaved Sedge Organic Shallow Marsh	MAS3-3	High	Community slow to recover from hydrological changes
Unvegetated Organic Vernal Pool	MAS3-E	High	Community slow to recover from hydrological changes
Calla Lily Organic Shallow Marsh	MAS3-11	High	Community slow to recover from hydrological changes
Narrow-leaved Sedge Organic Meadow Marsh	MAM3-5	High	Community slow to recover from hydrological changes
Swamp Loosestrife Organic Shallow Marsh	MAS3-12	High	Community slow to recover from hydrological changes
Broad-leaved Sedge Organic Shallow Marsh	MAS3-4	High	Community slow to recover from hydrological changes
Bur-reed Organic Shallow Marsh	MAS3-7	High	Community slow to recover from hydrological changes
Horsetail Organic Shallow Marsh	MAS3-B	High	Community slow to recover from hydrological changes
Manna Grass Organic Shallow Marsh	MAS3-C	High	Community slow to recover from hydrological changes
Bluejoint Organic Meadow Marsh	MAM3-1	High	Community slow to recover from hydrological changes
Broad-leaved Sedge Organic Meadow Marsh	MAM3-6	High	Community slow to recover from hydrological changes
Mineral Fen Meadow Marsh	MAM5-1	High	Community slow to recover from hydrological changes
Forb Organic Shallow Marsh	MAS3-10	High	Community slow to recover from hydrological changes
Bulrush Organic Shallow Marsh	MAS3-2	High	Community slow to recover from hydrological changes
Rice Cut-grass Organic Shallow Marsh	MAS3-8	High	Community slow to recover from hydrological changes
Bur-reed Mixed Shallow Aquatic	SAM1-5	High	Community slow to recover from hydrological changes
Crowfoot Mixed Shallow Aquatic	SAM1-C	High	Community slow to recover from hydrological changes
Bladderwort Mixed Shallow Aquatic	SAM1-6	High	Community slow to recover from hydrological changes
Bushy Naiad Submerged Shallow Aquatic	SAS1-B	High	Community tolerant of slight hydrological change

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
Water Lily - Bullhead Lily Mixed Shallow Aquatic	SAM1-A	High	Community slow to recover from hydrological changes
Tamarack - Black Spruce Organic Coniferous Swamp	SWC4-1	High	Community slow to recover from hydrological changes
Tamarack - Balsam Fir - Spruce Organic Coniferous Swamp	SWC4-A	High	Community slow to recover from hydrological changes
Swamp Maple - Conifer Organic Mixed Swamp	SWM5-2	High	Community slow to recover from hydrological changes
Red (Green) Ash - Hemlock Mineral Mixed Swamp	SWMA-A	High	Community slow to recover from hydrological changes
Buttonbush Mineral Thicket Swamp	SWT2-4	High	Community slow to recover from hydrological changes
Mountain Maple Organic Thicket Swamp	SWT3-3	High	Community tolerant of slight hydrological change
Silky Dogwood Organic Thicket Swamp	SWT3-B	High	Community tolerant of slight hydrological change
Tamarack Organic Coniferous Swamp	SWC4-2	High	Community slow to recover from hydrological changes
Buttonbush Organic Thicket Swamp	SWT3-4	High	Community slow to recover from hydrological changes
Spiraea Organic Thicket Swamp	SWT3-A	High	Community slow to recover from hydrological changes
Hemlock Organic Coniferous Swamp	SWCA-A	High	Community slow to recover from hydrological changes
White Birch - Cottonwood Coastal Mineral Deciduous Swamp	SWD4-A	High	Community slow to recover from hydrological changes
Red Maple Organic Deciduous Swamp	SWD6-1	High	Community slow to recover from hydrological changes
Silver Maple Organic Deciduous Swamp	SWD6-2	High	Community slow to recover from hydrological changes
Red Maple - Conifer Organic Mixed Swamp	SWM5-1	High	Community slow to recover from hydrological changes
Poplar - Conifer Organic Mixed Swamp	SWM6-2	High	Community slow to recover from hydrological changes
Winterberry Mineral Thicket Swamp	SWT2-B	High	Community slow to recover from hydrological changes
Winterberry Organic Thicket Swamp	SWT3-7	High	Community slow to recover from hydrological changes
Swamp Maple - Conifer Mineral Mixed Swamp	SWM2-2	High	Community slow to recover from hydrological changes
Hemlock Mineral Coniferous Swamp	SWC2-2	High	Community slow to recover from hydrological changes
Red Maple - Conifer Mineral Mixed Swamp	SWM2-1	High	Community slow to recover from hydrological changes
Yellow Birch Organic Deciduous Swamp	SWD7-2	High	Community slow to recover from hydrological changes
White Cedar - Conifer Organic Coniferous Swamp	SWC3-2	High	Community slow to recover from hydrological changes
Birch - Conifer Organic Mixed Swamp	SWM6-1	High	Community slow to recover from hydrological changes
White Cedar - Hardwood Organic Mixed Swamp	SWM4-1	High	Community slow to recover from hydrological changes
Threesquare Mineral Shallow Marsh	MAS2-6	Medium	Community tolerant of slight hydrological change

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
Sweet Flag Mineral Shallow Marsh	MAS2-F	Medium	Community tolerant of slight hydrological change
Jewelweed Organic Meadow Marsh	MAM3-8	Medium	Community tolerant of slight hydrological change
Narrow-leaved Sedge Mineral Shallow Marsh	MAS2-3	Medium	Community tolerant of slight hydrological change
Horsetail Mineral Shallow Marsh	MAS2-C	Medium	Community tolerant of slight hydrological change
Rush Mineral Meadow Marsh	MAM2-C	Medium	Community tolerant of slight hydrological change
Rice Cut-grass Organic Meadow Marsh	MAM3-3	Medium	Community tolerant of slight hydrological change
Buejoint Mineral Meadow Marsh	MAM2-1	Medium	Community tolerant of slight hydrological change
Narrow-leaved Sedge Mineral Meadow Marsh	MAM2-5	Medium	Community tolerant of slight hydrological change
Broad-leaved Sedge Mineral Meadow Marsh	MAM2-6	Medium	Community tolerant of slight hydrological change
Horsetail Mineral Meadow Marsh	MAM2-7	Medium	Community tolerant of slight hydrological change
Forb Organic Meadow Marsh	MAM3-9	Medium	Community tolerant of slight hydrological change
Broad-leaved Sedge Mineral Shallow Marsh	MAS2-4	Medium	Community tolerant of slight hydrological change
Bur-reed Mineral Shallow Marsh	MAS2-7	Medium	Community tolerant of slight hydrological change
Broad-leaved Cattail Organic Shallow Marsh	MAS3-1A	Medium	Community tolerant of slight hydrological change
Bulrush Mineral Meadow Marsh	MAM2-E	Medium	Community tolerant of slight hydrological change
Rice Cut-grass Mineral Shallow Marsh	MAS2-8	Medium	Community tolerant of slight hydrological change
Manna Grass Mineral Shallow Marsh	MAS2-G	Medium	Community tolerant of slight hydrological change
Bulrush Mineral Shallow Marsh	MAS2-2	Medium	Community tolerant of slight hydrological change
Forb Mineral Shallow Marsh	MAS2-9	Medium	Community tolerant of slight hydrological change
Broad-leaved Cattail Mineral Shallow Marsh	MAS2-1A	Medium	Community tolerant of slight hydrological change
Watercress Mixed Shallow Aquatic	SAM1-3	Medium	Community tolerant of slight hydrological change
Water Milfoil Mixed Shallow Aquatic	SAM1-7	Medium	Community tolerant of slight hydrological change
Water Lily - Bullhead Lily Floating-leaved Shallow Aquatic	SAF1-1	Medium	Community tolerant of slight hydrological change
Wild Celery Submerged Shallow Aquatic	SAS1-5	Medium	Community tolerant of slight hydrological change
Pondweed Mixed Shallow Aquatic	SAM1-4	Medium	Community tolerant of slight hydrological change
Waterweed Submerged Shallow Aquatic	SAS1-2	Medium	Community tolerant of slight hydrological change
Water Milfoil Submerged Shallow Aquatic	SAS1-4	Medium	Community tolerant of slight hydrological change

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
Coon-tail Submerged Shallow Aquatic	SAS1-A	Medium	Community tolerant of slight hydrological change
Duckweed Floating-leaved Shallow Aquatic	SAF1-3	Medium	Community tolerant of slight hydrological change
Duckweed Mixed Shallow Aquatic	SAM1-2	Medium	Community tolerant of slight hydrological change
Pondweed Submerged Shallow Aquatic	SAS1-1	Medium	Community tolerant of slight hydrological change
Stonewort Submerged Shallow Aquatic	SAS1-3	Medium	Community tolerant of slight hydrological change
Spiraea Mineral Thicket Swamp	SWT2-6	Medium	Community tolerant of slight hydrological change
Nannyberry Mineral Thicket Swamp	SWT2-10	Medium	Community tolerant of slight hydrological change
Mountain Maple Mineral Thicket Swamp	SWT2-3	Medium	Community tolerant of slight hydrological change
White Cedar - Conifer Mineral Coniferous Swamp	SWC1-2	Medium	Community tolerant of slight hydrological change
Bur Oak Mineral Deciduous Swamp	SWD1-2	Medium	Community tolerant of slight hydrological change
Red Maple Mineral Deciduous Swamp	SWD3-1	Medium	Community tolerant of slight hydrological change
Willow Organic Deciduous Swamp	SWD7-A	Medium	Community tolerant of slight hydrological change
Birch - Conifer Mineral Mixed Swamp	SWM3-1	Medium	Community tolerant of slight hydrological change
Poplar - Conifer Mineral Mixed Swamp	SWM3-2	Medium	Community tolerant of slight hydrological change
Silky Dogwood Mineral Thicket Swamp	SWT2-8	Medium	Community tolerant of slight hydrological change
Yellow Birch Mineral Deciduous Swamp	SWD4-4	Medium	Community tolerant of slight hydrological change
Black Ash Organic Deciduous Swamp	SWD5-1	Medium	Community tolerant of slight hydrological change
Swamp Maple Organic Deciduous Swamp	SWD6-3	Medium	Community tolerant of slight hydrological change
Alder Organic Thicket Swamp	SWT3-1	Medium	Community tolerant of slight hydrological change
Red-osier Organic Thicket Swamp	SWT3-5	Medium	Community tolerant of slight hydrological change
White Cedar Organic Coniferous Swamp	SWC3-1	Medium	Community tolerant of slight hydrological change
Paper Birch - Poplar Organic Deciduous Swamp	SWD7-1	Medium	Community tolerant of slight hydrological change
Willow Organic Thicket Swamp	SWT3-2	Medium	Community tolerant of slight hydrological change
White Ash Mineral Deciduous Swamp	SWD2-A	Medium	Community tolerant of slight hydrological change
White Cedar Mineral Coniferous Swamp	SWC1-1	Medium	Community tolerant of slight hydrological change
Black Ash Mineral Deciduous Swamp	SWD2-1	Medium	Community tolerant of slight hydrological change
Swamp Maple Mineral Deciduous Swamp	SWD3-3	Medium	Community tolerant of slight hydrological change

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
White Elm Mineral Deciduous Swamp	SWD4-2	Medium	Community tolerant of slight hydrological change
Alder Mineral Thicket Swamp	SWT2-1	Medium	Community tolerant of slight hydrological change
Red (Green) Ash Mineral Deciduous Swamp	SWD2-2	Medium	Community tolerant of slight hydrological change
Silver Maple Mineral Deciduous Swamp	SWD3-2	Medium	Community tolerant of slight hydrological change
Paper Birch - Poplar Mineral Deciduous Swamp	SWD4-3	Medium	Community tolerant of slight hydrological change
Willow Mineral Thicket Swamp	SWT2-2	Medium	Community tolerant of slight hydrological change
White Cedar - Hardwood Mineral Mixed Swamp	SWM1-1	Medium	Community tolerant of slight hydrological change
Fowl Manna Grass Organic Meadow Marsh	MAM3-4	Medium	Maybe sensitive to hydrological change
Fowl Manna Grass Mineral Meadow Marsh	MAM2-4	Medium	Maybe sensitive to hydrological change
Rice Cut-Grass Mineral Meadow Marsh	MAM2-D	Medium	Maybe sensitive to hydrological change
Reed Canary Grass Organic Meadow Marsh	MAM3-2	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Common Reed Organic Meadow Marsh	MAM3-a	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Giant Manna Grass Mineral Shallow Marsh	MAS2-e	Medium	
Narrow-leaved Cattail Organic Shallow Marsh	MAS3-1b	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Common Reed Organic Shallow Marsh	MAS3-9	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Purple Loosestrife Organic Shallow Marsh	MAS3-a	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Reed Canary Grass Organic Shallow Marsh	MAS3-d	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Floating-heart Mixed Shallow Aquatic	SAM1-b	Medium	
Exotic Organic Thicket Swamp	SWT3-c	Medium	Substrate sensitive to change. Organic soils are slow to accumulate
Jewelweed Mineral Meadow Marsh	MAM2-9	Low	Community moderately tolerant of hydrological changes
Forb Mineral Meadow Marsh	MAM2-10	Low	Community moderately tolerant of hydrological changes
Liverwort Floating-leaved Shallow Aquatic	SAF1-A	Low	Community moderately tolerant of hydrological changes
Manitoba Maple Mineral Deciduous Swamp	SWD3-4	Low	Community moderately tolerant of hydrological changes
Willow Mineral Deciduous Swamp	SWD4-1	Low	Community moderately tolerant of hydrological changes

Vegetation Community	ELC Code	Sensitivity	Assumptions/Basis
Red-osier Mineral Thicket Swamp	SWT2-5	Low	Community moderately tolerant of hydrological changes
Red-top Mineral Meadow Marsh	MAM2-3	Low	Community moderately tolerant of hydrological changes
Reed Canary Grass Mineral Meadow Marsh	MAM2-2	Low	
Miscanthus Mineral Meadow Marsh	MAM2-f	Low	
Cool-season Grass Mineral Meadow Marsh	MAM2-g	Low	
Reed Canary Grass Mineral Shallow Marsh	MAS2-d	Low	
European Alder Mineral Deciduous Swamp	SWD4-b	Low	
Exotic Mineral Thicket Swamp	SWT2-a	Low	

WATER BALANCE CALCULATIONS
16114 Airport Road, Caledon East
Shacca Caledon Holdings Inc.

PROJECT No.300039242.0000

TABLE G-1

Pre- and Post-Development Monthly Water Balance Components

Based on Thornthwaite's Soil Moisture Balance Approach with a Soil Moisture Retention of 75 mm (grass/meadow in sandy loam soils)

Precipitation data from Albion Field Centre (1981 - 2010)

Potential Evapotranspiration Calculation	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average Temperature (Degree C)	-7.00	-5.90	-1.40	6.10	12.40	17.30	19.90	19.10	14.30	8.10	2.10	-3.90	**6.8**
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.35	3.96	6.55	8.10	7.61	4.91	2.08	0.27	0.00	**34.8**
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	28.80	60.57	85.87	99.44	95.25	70.33	38.77	9.42	0.00	**488**
Adjusting Factor for U (Latitude 43° 55' N)	0.81	0.82	1.02	1.12	1.26	1.28	1.29	1.2	1.04	0.95	0.81	0.77	
Adjusted Potential Evapotranspiration PET (mm)	0	0	0	32	76	110	128	114	73	37	8	0	**579**
COMPONENTS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	**821**
Potential Evapotranspiration (PET)	0	0	0	32	76	110	128	114	73	37	8	0	**579**
P - PET	60	50	50	35	0	-34	-46	-37	2	31	74	58	**243**
Change in Soil Moisture Storage	0	0	0	0	0	-34	-40	0	2	31	42	0	**0**
Soil Moisture Storage max 75 mm	75	75	75	75	75	40	0	0	2	33	75	75	
Actual Evapotranspiration (AET)	0	0	0	32	76	110	122	77	73	37	8	0	**536**
Soil Moisture Deficit max 75 mm	0	0	0	0	0	35	75	75	73	42	0	0	
Water Surplus - available for infiltration or runoff	60	50	50	35	0	0	0	0	0	0	32	58	**286**
Potential Infiltration (based on MOE metholodogy*; independent of temperature)	36	30	30	21	0	0	0	0	0	0	19	35	**171**
Potential Direct Surface Water Runoff (independent of temperature)	24	20	20	14	0	0	0	0	0	0	13	23	**114**
IMPERVIOUS AREA WATER SURPLUS													
Precipitation (P)	821	mm/year											
Potential Evaporation (PE) from impervious areas (assume 15%)	123	mm/year											
P-PE (surplus available for runoff from impervious areas)	698	mm/year											

Assume January storage is 100% of Soil Moisture Storage
Soil Moisture Storage 75 mm <-- See "Water Holding Capacity" values in Table 3.1, MOE SWMPDM, 2003

*MOE SWM infiltration calculations

topography - hilly land	0.1	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
soils - sandy loam soils	0.4	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
cover - urban lawn/meadow	0.1	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
Infiltration factor	**0.6**	

Latitude of site (or climate station) 43 ° N.

WATER BALANCE CALCULATIONS
16114 Airport Road, Caledon East
Shacca Caledon Holdings Inc.

PROJECT No.300039242.0000

TABLE G-2

Pre- and Post-Development Monthly Water Balance Components

Based on Thornthwaite's Soil Moisture Balance Approach with a Soil Moisture Retention of 300 mm (mature forest in sandy loam soils)

Precipitation data from Albion Field Centre (1981 - 2010)

Potential Evapotranspiration Calculation	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average Temperature (Degree C)	-7.00	-5.90	-1.40	6.10	12.40	17.30	19.90	19.10	14.30	8.10	2.10	-3.90	**6.8**
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.35	3.96	6.55	8.10	7.61	4.91	2.08	0.27	0.00	**34.8**
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	28.80	60.57	85.87	99.44	95.25	70.33	38.77	9.42	0.00	**488**
Adjusting Factor for U (Latitude 43° 55' N)	0.81	0.82	1.02	1.12	1.26	1.28	1.29	1.2	1.04	0.95	0.81	0.77	
Adjusted Potential Evapotranspiration PET (mm)	0	0	0	32	76	110	128	114	73	37	8	0	**579**
COMPONENTS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	**821**
Potential Evapotranspiration (PET)	0	0	0	32	76	110	128	114	73	37	8	0	**579**
P - PET	60	50	50	35	0	-34	-46	-37	2	31	74	58	**243**
Change in Soil Moisture Storage	0	0	0	0	0	-34	-46	-37	2	31	74	11	**0**
Soil Moisture Storage max 300 mm	300	300	300	300	300	265	219	182	184	215	289	300	
Actual Evapotranspiration (AET)	0	0	0	32	76	110	128	114	73	37	8	0	**579**
Soil Moisture Deficit max 300 mm	0	0	0	0	0	35	81	118	116	85	11	0	
Water Surplus - available for infiltration or runoff	60	50	50	35	0	0	0	0	0	0	0	47	**243**
Potential Infiltration (based on MOE metholodogy*; independent of temperature)	54	45	45	31	0	0	0	0	0	0	0	42	**218**
Potential Direct Surface Water Runoff (independent of temperature)	6	5	5	3	0	0	0	0	0	0	0	5	**24**
IMPERVIOUS AREA WATER SURPLUS													
Precipitation (P)	821	mm/year											
Potential Evaporation (PE) from impervious areas (assume 15%)	123	mm/year											
P-PE (surplus available for runoff from impervious areas)	698	mm/year											

Assume January storage is 100% of Soil Moisture Storage

Soil Moisture Storage	300 mm	<-- See "Water Holding Capacity" values in Table 3.1, MOE SWMPDM, 2003
*MOE SWM infiltration calculations		
topography - flat land	0.3	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
soils - sandy loam soils	0.4	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
cover - wooded lands	0.2	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
Infiltration factor	**0.9**	
Latitude of site (or climate station)	43 ° N.	

WATER BALANCE CALCULATIONS
16114 Airport Road, Caldedon East
Shacca Caledon Holdings Inc.

PROJECT No.300039242.0000

BURNSIDE

TABLE G-3

Pre and Post Development Water Balance Calculations (assuming no mitigation measures)

Catchment Area	Approx. Land Area (m^2)	Estimated Impervious Fraction for Land Use***	Estimated Impervious Area (m^2)	Runoff from Impervious Area** (m/a)	Runoff Volume from Impervious Area (m^3/a)	Estimated Pervious Area (m^2)	Runoff from Pervious Area** (m/a)	Runoff Volume from Pervious Area (m^3/a)	Infiltration from Pervious Area*** (m/a)	Infiltration Volume from Pervious Area (m^3/a)	Total Runoff Volume (m^3/a)	Total Infiltration Volume (m^3/a)
Exising Land Use*												
Grass and Meadow	15,216	0.00	0	0.698	0	15,216	0.114	1,739	0.171	2,609	1,739	2,609
Rural Residential	1,692	0.30	508	0.698	354	1,184	0.114	135	0.171	203	490	203
Wooded Lands	23,953	0.00	0	0.698	0	23,953	0.024	581	0.218	5,232	581	5,232
TOTAL PRE-DEVELOPMENT	**40,861**		**508**		**354**	**40,353**		**2,456**		**8,044**	**2,810**	**8,044**
Post-Development Land Use												
Residential	8,420	0.68	5,692	0.698	3,974	2,728	0.114	312	0.171	468	4,286	468
Commercial	5,550	0.68	3,757	0.698	2,623	1,793	0.114	205	0.171	307	2,828	307
Potential Park	1,037	0.00	0	0.698	0	1,037	0.114	119	0.171	178	119	178
Road Widening	1,000	0.00	0	0.698	0	1,000	0.114	114	0.171	171	114	171
Natural Heritage System and Buffer	24,854	0.00	0	0.698	0	24,854	0.024	603	0.218	5,429	603	5,429
TOTAL POST-DEVELOPMENT	**40,861**		**9,449**		**6,597**	**31,412**		**1,353**		**6,554**	**7,950**	**6,554**
									% Change from Pre to Post		283	19
									Effect of development (with no mitigation)		2.8 times increase in runoff	19% reduction in infiltration

* taken from mapping provided by Dillon Consulting

** figures from Tables G-1 and G-2

*** post development figures provided by Trafalgar Engineering

To balance pre- to post-,
the infiltration target (m^3/a)= **1,491** **m^3/a**

WATER BALANCE CALCULATIONS
16114 Airport Road, Caldedon East
Shacca Caledon Holdings Inc.

PROJECT No.300039242.0000

TABLE G-4

Water Balance Mitigation Strategy
Direction of Roof Runoff to Pervious

	Roof Area Directed to Pervious (m^2)	Total Annual Precipitation (m)*	Runoff from Roofs (assuming 15% evaporation) (m^3/a)	% Infiltration over Pervious Area**	Potential Infiltration Volume (m^3/a)
Residential Roofs	2,933	0.821	2048	50%	1,024
Heritage House Roof	236	0.821	165	50%	82
				Total	1,106

* total average annual precipitation from Albion Field Center MOE climate station

** based on estimation in the LID SWM Planning and Design Guide (CVC & TRCA, 2010) for hydrologic groups A & B

Appendix ‘G’

Email correspondence with TRCA re: grading

Email correspondence with Region of Peel re: Airport Road drainage

Email correspondence with TRCA re: model requirements

James Nelson

From: Nicholas Cascone <Nicholas.Cascone@trca.ca>
Sent: July 19, 2019 10:17 AM
To: James Nelson
Cc: Stephen Potter; Bruce McCall-Richmond; mary.nordstrom@caledon.ca; Patrick Pearson
Subject: RE: 16114 Airport Road, Town of Caledon-File: 21T-17005C

Hello James,
Thanks for the detailed email. I had a chance to review the preliminary grading plan with technical staff. In general, we also prefer the grading solution as opposed to a retaining wall as the gentle slope will provide for a more gradual transition to the adjacent natural features. Furthermore, it will not require any future maintenance and allow for restoration to take place.

However, in order to justify grading within the buffer (and ensure the area is appropriately restored), it will be very important to ensure that an excellent planting plan is prepared which includes dense native tree, shrub and groundcover.

In addition to the above, it appears that a 3 metre retaining wall has been proposed along the north side of the site. As part of any future submission, please ensure that engineer stamped design drawings are submitted for the wall.

Please let me know if you have any further questions.

Regards,

Nick Cascone, M.Sc.(Pl)
Planner
Development Planning and Permits | Development and Engineering Services

T: (416) 661-6600 ext. 5927
E: nicholas.cascone@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: James Nelson <jnelson@trafalgareng.com>
Sent: July-17-19 5:21 PM
To: Nicholas Cascone <Nicholas.Cascone@trca.ca>
Cc: Stephen Potter <spotter@trafalgareng.com>; Bruce McCall-Richmond <BruceMR@gsai.ca>; mary.nordstrom@caledon.ca; Patrick Pearson <PatrickP@gsai.ca>
Subject: RE: 16114 Airport Road, Town of Caledon-File: 21T-17005C

Hi Nick,

I hope you're well. Please see attached grading sketches for discussion purposes. Below I'm including a design rationale that will hopefully explain the grading proposal illustrated.

Rationale

The grading design of the development must be compatible with certain boundary conditions; these are the existing condominium development to the north, Airport Road to the east, existing single family dwellings to the south, and the compensation area and associated buffer to the west. Airport Road and the dwellings to the south provide key boundary conditions that control the required condo road grades. The proposed condominium road grade is reasonably flat (0.7% to 1.0%) and generally follows Airport Road in a north to south direction (Airport Road is approximately 2.0% adjacent to the site). The grade of the condo road controls the front yard grade of the units.

While Airport Road provides a relatively consistent downgrade along the easterly boundary, a significant elevation change of approximately 5m occurs along the westerly boundary (the compensation lands). This significant change in elevation is due to the presence of a large mound located roughly in the top-centre of the subject lands. The mound is approximately 5m higher than the wetland to the west and approximately 3m higher than Airport Road to the east. This mound poses a problem from a grading perspective; a small grade change is needed in order to maintain a consistent Finished Floor elevation across a block of townhouses and to facilitate acceptable lot grading.

Two key options exist to address the grading problem along the westerly limit:

Option 1) Grade into the as-of-yet un-restored compensation lands (daylighting). This option provides a gentle slope to transition between the development and the wetland buffer. Sloping away from the development grants a planting opportunity and promotes groundwater infiltration by replacing the existing steep slope (+/-8%-11%) with a gentle slope (+/-2%). This approach maintains the maximum drainage area of the compensation lands (up to the development limit) toward the wetland. Where the development is in a fill condition a 6:1 slope is proposed that would still allow for planting but avoid encroachment into the wetland buffer. This option is preferred (and is illustrated on the attached drawings).

Option 2) Construct a retaining wall along the entire west limit. This option maintains the existing grades at the boundary of the compensation lands, but requires a large retaining wall (up to 2m in height) along the entire boundary. The wall would retain the existing grade on the high side through the north half of the site and retain the proposed grade on the high side through the south half of the site. This option is not preferred and is not illustrated.

If you or your technical staff have any questions, please feel free to phone and discuss.

Please note that I will be out of the office next week (July 22-26) but will have limited access to email if you have any quick questions.

James

From: Nicholas Cascone [mailto:Nicholas.Cascone@trca.ca]
Sent: July-16-19 8:58 AM
To: James Nelson <jnelson@trafalgareng.com>
Cc: Stephen Potter <spotter@trafalgareng.com>; Bruce McCall-Richmond <BruceMR@gsai.ca>
Subject: RE: 16114 Airport Road, Town of Caledon-File: 21T-17005C

Hello James,
No worries – thanks for the email. Please note that I will unlikely be able to get necessary technical staff into a teleconference this week due to busy summer schedules. However, send me the sketches once they have been prepared and I will do my best to get some answers for you as soon as possible. If we need to set up a teleconference to further discuss the matter, I can get availability from technical staff at that time.
Regards,

Nick Cascone, M.Sc.(Pl)
Planner
Development Planning and Permits | Development and Engineering Services

T: (416) 661-6600 ext. 5927
E: nicholas.cascone@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

From: James Nelson <jnelson@trafalgareng.com>
Sent: July-16-19 8:47 AM
To: Nicholas Cascone <Nicholas.Cascone@trca.ca>
Cc: Stephen Potter <spotter@trafalgareng.com>; Bruce McCall-Richmond <BruceMR@gsai.ca>
Subject: 16114 Airport Road, Town of Caledon-File: 21T-17005C

Hi Nick,

I'm sorry I missed your call yesterday.

I'm putting together some sketches for a discussion on grading solutions along the westerly boundary of the condo development. There is significant grade change of nearly 5 metres from north to south and we would like to discuss our options with you and your team.

Would you be available later this week for a conference call? I will send out some sketches/sections in advance of our discussion for you to review.

James

TRAFALGAR ENGINEERING
www.trafalgareng.com/

James Nelson, P.Eng.
Manager – Design Services
#1 - 481 Morden Road
Oakville, Ontario, L6K 3W6
O: (905) 338-3366 ext. 136
E: jnelson@trafalgareng.com

Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments
Date: Monday, October 5, 2020 at 9:49:34 AM Eastern Daylight Time
From: Trent, Elizabeth
To: James Nelson
CC: Bruce McCall-Richmond
Attachments: image001.png

Good morning James,
Please note that orifice pipes will have to be on the private side, besides that I do not have any more comments.
Please submit the revised report to the Region.

Thank you
Elizabeth Trent
647-285-2130

From: James Nelson <jnelson@trafalgareng.com>
Sent: Tuesday, September 29, 2020 1:51 PM
To: Trent, Elizabeth <Elizabeth.Trent@peelregion.ca>
Cc: Bruce McCall-Richmond <BruceMR@gsai.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Hi Elizabeth,

I hope you've been keeping well! In terms of the orifice plate, we are happy to review and discuss alternatives including orifice pipes or other ICDs such as vortex controls at a detailed design stage, if that's acceptable to you. In the meantime, the calculations are based on a minimum sized opening of 75mm to prevent clogging.

In terms of the wye connection, we have replaced it with another MH. See attached drawing.

This is the storm design we intend to resubmit, so any high-level comments you can provide promptly are appreciated. Our servicing options are limited on this site due to the downward gradient of the site to match Airport Road, the depth of the existing storm sewer on Airport Road, and the extensive water servicing in the boulevard at the north-west corner. We also examined the potential to outlet to the existing storm culvert to the west of the site, however we believe the shallow depth makes this prohibitive.

James

From: Trent, Elizabeth <elizabeth.trent@peelregion.ca>
Sent: June 30, 2020 12:05 PM
To: James Nelson <jnelson@trafalgareng.com>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Nelson, the Region reviewed your proposal and they are ok with it with the following changes:

We do not allow orifice plates, the design needs to be redone with a control outlet pipe (a smaller pipe at less or no slope, to naturally restrict the outflow from the site). Orifice plates rust, fall off and are removed, and this is not easy to see or monitor.
The WYE connection is not allowed, connections should be to a manhole.
Please send a short summary of your proposal with a revised drawing.

Thank you
Elizabeth Trent
647-285-2130

From: James Nelson <jnelson@trafalgareng.com>
Sent: Wednesday, June 24, 2020 3:21 PM
To: Trent, Elizabeth <Elizabeth.Trent@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Hi Elizabeth,

I hope you're keeping well! I'm sorry for the delay in responding to you.

I have modelled the pre- and post-development flows to Airport Road using EPA SWMM with a 24-hour Chicago storm distribution based on the Town of Caledon IDF data. The Chicago storm has a higher peak intensity and generates more runoff than the TRCA 6- or 12-hour AES distributions that TRCA requested we use in our report. We need a small increase in the volume of storage (+/- 50 m^3) proposed for the residential component in order match the 100-year pre-development flow to Airport Road—this will be captured in the next submission. Please see below for model results:

24-Hour Chicago Storm	**Flow to Airport Road (L/s)**	
Return	**Pre**	**Post**
2-Year	15.5	10.7
5-Year	34.2	15.8
10-Year	50.5	19.2
25-Year	75.9	26.6
50-Year	96.9	65.3
100-Year	122.5	122.2

Please note that the 24-hour Chicago storm has a different rainfall distribution and peak intensity than the TRCA 6- and 12-hour AES storms presented in the report; as such, the modelled flows presented here are different from--and cannot be directly compared to--those presented in the report. Please let me know if you would like to discuss via telephone.

Stay safe,

James

From: Trent, Elizabeth <elizabeth.trent@peelregion.ca>
Sent: June 17, 2020 2:13 PM
To: James Nelson <jnelson@trafalgareng.com>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

James, please calculate the pre-development flows and send only the basic comparison pre and post.

Thank you
Elizabeth Trent
647-285-2130

From: James Nelson <jnelson@trafalgareng.com>
Sent: Monday, June 15, 2020 10:40 AM
To: Trent, Elizabeth <Elizabeth.Trent@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Good morning Elizabeth,

I certainly understand about delayed responses during these times. I'm working from home and it's definitely not the same as being at the office!

I very much appreciate you reaching out to the manager for further discussion. As requested, please find attached the following:

1. Our second submission (2019) report.
2. Figure 1 showing the existing flow to Airport Road (included in the report but I have extracted it for your convenience).
3. Second submission Grading Plan (G1)
4. Second submission Servicing Plan (S1)

The pre-development flow is summarized on Figure 1. The post-development flows are summarized on page 6 of the report and are based on the TRCA AES storm. I can calculate the pre- and post- based on a different storm distribution if you prefer—let me know.

The post development flow is significantly less than the pre-development.

I hope you're keeping well and that you had a pleasant weekend.

Yours,

James

From: Trent, Elizabeth <elizabeth.trent@peelregion.ca>
Sent: June 10, 2020 8:58 AM
To: James Nelson <jnelson@trafalgareng.com>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

James, sorry for not replying sooner.
I reached out to the Manager of Roads Construction if connection to storm sewer can be considered and he asked some questions. I have SWM report from 2017, do not have the latest digital.
Can you please provide a summary:
the pre area flowing to Airport and the flow rate to Airport for the 5, 10, 25, 50, 100 and Regional storms
post development flows
site plan drawing

Thank you
Elizabeth Trent
647-285-2130

From: James Nelson <jnelson@trafalgareng.com>
Sent: Tuesday, June 2, 2020 2:39 PM
To: Trent, Elizabeth <Elizabeth.Trent@peelregion.ca>
Cc: Prowse, Dylan <dylan.prowse@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

CAUTION: EXTERNAL MAIL. DO NOT CLICK ON LINKS OR OPEN ATTACHMENTS YOU DO NOT TRUST.

Hi Elizabeth,

Are you available for a discussion on the below? I believe it would be beneficial to have a direct chat so that we can go over the design as well as our options.

I hope you're keeping well!

James

From: Trent, Elizabeth <elizabeth.trent@peelregion.ca>
Sent: May 19, 2020 3:04 PM
To: James Nelson <jnelson@trafalgareng.com>
Cc: Prowse, Dylan <dylan.prowse@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

James, my first comment about storm sewer discharging to Airport Rd. was maybe incorrectly worded.
The pre- and post drainage flows apply only to overland flow adjacent to the road (a strip of lawn) as we do not generally allow changes to grading within existing road ROW.
The Region does not allow any storm sewers pipes from private developments to be connected to storm sewer pipes on Regional Roads under any conditions.

"*The site is adjacent to Airport Road which is Regional Road no 7. As per Region's guidelines, storm sewers from subdivisions are not allowed to be connected to the Regional storm sewer system. Airport Road storm sewers were designed to convey run-off from the Right of Way of Airport Road only.* "

The second question applies to undeveloped area to the west.

Thank you
Elizabeth Trent
Ph 905 791 7800 ex 7847

From: James Nelson <jnelson@trafalgareng.com>
Sent: Friday, May 15, 2020 11:16 AM
To: Trent, Elizabeth <Elizabeth.Trent@peelregion.ca>
Cc: Prowse, Dylan <dylan.prowse@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Good morning Elizabeth,

I hope you're keeping well!

I am reviewing the Region's comments for the above subdivision and I have a couple of questions. The first relates to several comments that indicate storm drainage is not acceptable to the Airport Road storm sewer. The first round of comments specified that any existing drainage to Airport Road could be maintained if demonstrated that proposed flow does not exceed existing conditions. The comment is provided below for your reference:

"If external land drains to the Airport Road storm sewer system as per existing conditions, the following applies: post-development flows must be
equal or less than pre-development levels."

We provided a drainage plan (Figure 1) in the second submission report that illustrates the existing drainage area and flow tributary to the Airport Road storm sewer. Flow in the proposed condition is less than the existing. Please confirm that this approach is still acceptable to the Region in keeping with the first submission comments.

My second question is regarding drainage to the provincially significant wetlands:

"We also note that most of the stormwater runoff from the site appears to discharge to a pond located within a Provincially Significant Wetland. We are interested to know if the Ministry of Natural Resources and Forestry (MNRF) and/or Toronto and Region Conservation Authority (TRCA) provided comments or direction regarding any proposed changes to the existing drainage pattern."

The proposed design indicates storm drainage from the development area is directed to the Airport Road storm sewer. Please confirm which pond located within a PSW you are referring to. It is assumed this comment relates to the undeveloped buffer lands that currently sheet drain to the west. Please confirm. The existing drainage pattern for this portion of the site is to remain.

I hope you have a wonderful long weekend! Thank you in advance for your assistance.

Yours,

James

From: Prowse, Dylan <dylan.prowse@peelregion.ca>
Sent: May 15, 2020 10:51 AM
To: James Nelson <jnelson@trafalgareng.com>
Cc: Trent, Elizabeth <elizabeth.trent@peelregion.ca>
Subject: RE: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Hi James,

Thanks for reaching out. Please forward your question to Elizabeth Trent (copied on this reponse).

Best,

Dylan Prowse
Junior Planner
Development Services
Region of Peel
10 Peel Centre Drive Suite A, 6th Floor
T: 905-791-7800 x7921
F: 905-791-7920
C: 416-702-7234

In response to the emergence of the novel coronavirus, the Region of Peel is implementing various measures to protect our customers, employees and workplaces. Development Services will endeavour to maintain the continuity of our business operations, however delays in service may still be experienced. We appreciate your patience during this time.

We have recently updated our website to better serve your needs. For information on Planning and Engineering matters of Regional interest, please visit this link : https://www.peelregion.ca/planning/about/devservices.htm . Let us know how we can serve you better

---

From: James Nelson <jnelson@trafalgareng.com>
Sent: May 14, 2020 8:21 AM
To: Prowse, Dylan <dylan.prowse@peelregion.ca>
Subject: 21T-17005C -- 16114 Airport Road Subdivision -- Region of Peel Comments

Good morning Dylan,

I hope you're keeping safe and well! I am the civil consultant for the above mentioned subdivision and I have a question regarding one of the Development Services – Engineering Stormwater Management comments. Do you know who is on the file or the best person to contact to discuss?

Thanks in advance,

James

TRAFALGAR ENGINEERING

www.trafalgareng.com/

James Nelson, P.Eng.
Manager – Design Services
#1 - 481 Morden Road
Oakville, Ontario, L6K 3W6
O: (905) 338-3366 ext. 136
E: jnelson@trafalgareng.com

James Nelson

From: Dilnesaw Chekol <dchekol@trca.on.ca>
Sent: January 22, 2018 4:34 PM
To: Stephen Potter
Cc: Alejandra Padron (AlejandraP@gsai.ca); apatel@trca.on.ca; James Nelson; Jairo Morelli
Subject: Re: 16114 Airport Road, Caledon East
Attachments: Daily_MET.xlsx; Daily_Temp_PET.xlsx; 615HMAK_Hourly_Prec.csv

Follow Up Flag: Follow up
Flag Status: Completed

Hi Steve,

As discussed, the analysis should assess the impact of proposed land use change on the runoff volume going to the wetland using the attached long-record precipitation and temperature data in a continuos simulation.

Regards,

Dilnesaw A. Chekol, Ph.D, P.Eng | Senior Engineer, Water Resources | Engineering Services | Restoration & Infrastructure Division | **Toronto and Region Conservation Authority for The Living City** | ☎ 416 661-6600 ext. 5746 | 🖷 416-661-6898 | ✉ dchekol@trca.on.ca | www.trca.on.ca | Follow us on Twitter @TRCA_Flood

NEW ADDRESS
Please note that we have moved to a new head office location: Meeting and Courier Address: 101 Exchange Avenue (beside IKEA)| Vaughan, ON | L4K 5R6 |: Mailing Address: 5 Shoreham Drive | Toronto, ON | M3N 1S4 |

From: Stephen Potter <spotter@trafalgareng.com>
To: "dchekol@trca.on.ca" <dchekol@trca.on.ca>
Cc: "Alejandra Padron (AlejandraP@gsai.ca)" <AlejandraP@gsai.ca>, "apatel@trca.on.ca" <apatel@trca.on.ca>, James Nelson <jnelson@trafalgareng.com>
Date: 01/18/2018 02:02 PM
Subject: 16114 Airport Road, Caledon East

Dilnesaw,

Thanks for taking time today to call me about this project and the required featured based water balance.

Per our discussion I would appreciate in you could provide us with rainfall data file (plus other climatic data files) that you want us to use in the continuous simulation of the site.

Thanks for your assistance.

Steve Potter