

**PRELIMINARY SERVICING AND  
STORMWATER MANAGEMENT REPORT**

**SILVER CREEK AT CRAIGLEITH**

**TERRASAN CORPORATION**

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## 1.0 INTRODUCTION

Terrasan Corporation retained C.F. Crozier and Associates to prepare a Preliminary Servicing and Stormwater Management Report in support of the proposed Silver Creek at Craigleith development. Crozier was also retained to prepare a Traffic Impact Study in support of the development and that report is provided under separate cover.

The subject property is located on the north side of Highway 26, between Blue Mountain Drive and Long Point Road in the Town of the Blue Mountains, County of Grey. The property is part of Registered Plan 529, formerly Township of Collingwood, County of Grey. The property is divided by Brophy's Lane in the centre with 16.0 Ha of land on the west side and 9.8 Ha of land on the east side. The site location plan is provided in Figure 1.

The lands that makeup the Silver Creek development have a variety of existing uses under the Town of The Blue Mountains Official Plan (OP). Generally, the lands on the west side of the property between Brophy's Lane and Blue Mountain Drive are designated RR-50 (Recreational Residential), WH (Wetland Hazard) and H (Hazard). A portion of the west lands along the frontage are designated HC (Highway Commercial). The current designations were approved through Official Plan Amendment (OPA) 4. Prior to OPA 4 the land use designation was a combination of RR-50 and Institutional. At the time of approving the OPA, the proponent of the former Easter Seals property proposed a draft plan of subdivision consisting of approximately 82 residential dwelling units and a proposed future institutional/residential block.

The Silver Creek lands east of Brophy's Lane are currently designated a combination of Residential Infilling (RI), HC, H and WH under Town of The Blue Mountains OP.

The Zoning By-law of the former Township of Collingwood, By-law No. 83-40 governs this property. The current zoning for the west lands include I (Institutional) to reflect the former Easter Seals Camp and R3 for an existing residence on Highway 26. The current Craigleith General Store adjacent to Highway 26 is zoned C2-52 (Highway Commercial).

The subject lands east of Brophy's Lane are zoned C2-53, C2-47, (Highway Commercial), D (Development) and DD (Deferred Development). An existing single family home on Brophy's Lane was purchased and added to the Silver Creek concept and it is zoned RERa (Rural Estate Residential). The remainder of the Silver Creek lands east of Brophy's Lane are zoned H (Hazard) to reflect the existing drainage ditch.

The proponent is proposing to redesignate the entire site as a mixed use development consisting of a combination of residential, commercial, recreational, institutional, open space and environmental protection areas that once fully developed will result in the creation of a sustainable, compact and complete community. The proponent is applying to increase the residential density on the former Easter Seals lands from 82 units to 151 units and to alter the permitted uses in the HC designation for the remainder of the lands. In addition, the Official Plan boundaries will be refined to reflect site specific wetland mapping and site uses.

An associated zoning by-law amendment will be necessary to address such matters as, permitted use regulations, density, building height, setbacks, parking, etc.

All design work within our report is based on the concept plan dated April 16, 2008 prepared by Stanford Downey Architects.

## 2.0 WATER SERVICING

### 2.1 BACKGROUND

The subject property is located within the Craigleith Service Area as identified in the Combined Environmental Assessment Master Plan for Craigleith, Castle Glen and Osler Service Area (Comprehensive ESR), May 2006. The property is surrounded by an existing municipal water system and serviced by the Craigleith water supply and distribution system. According to the *record drawings* provide by the Town of The Blue Mountains a 150mm water main is located on Blue Mountain Road to the west, Brophy's Lane to the north and Long Point Road to the east. A 200mm dia. watermain is located on the south side of Highway 26 south of the development as illustrated in Figure 2. As part of this report Crozier investigated whether adequate domestic and fire flows are available in the municipal system to support the Silver Creek application.

The water supply for the Craigleith area is provided from the water intake and treatment plant in Thornbury and through a connection to the Town of Collingwood system just south of the Silver Creek at Craigleith development. The water reservoir at Hidden Valley Road and several pressure reducing valves (PRV) and booster pumping stations maintain an adequate supply and system pressure throughout the Craigleith Service Area.

### 2.2 EXISTING SYSTEM SUPPLY

To evaluate the capacity of the existing water system to provide domestic and fire flows, Crozier commissioned hydrant flow tests on three area fire hydrants. Hydrant Test 1 was taken on a fire hydrant within the Town of Collingwood (Collus) water system at the intersection of Silver Creek Drive and Osler Bluff Road. The hydrant tested is connected to a dead end 150mm dia. section of pipe. We note however that there is a 200mm dia. watermain on Silver Creek Drive at Osler Bluff Road through Forest Drive and is expected to produce greater flows through the larger diameter pipe. The waterline on Forest Drive connects to the Town of The Blue Mountains water system further south on Osler Bluff Road and therefore, the current system does not provide a direct feed north to the subject area.

The Comprehensive ESR noted that there will be a future connection from the Collingwood system to the Craigleith system by way of approximately 650m of 300mm dia. watermain extended north on Osler Bluff Road. This connection was recommended in the ESR.

The second hydrant flow test was conducted on a fire hydrant at the intersection of Osler Bluff Road and Highway 26. The third test was taken on a fire hydrant at the intersection of Hope Street and Highway 26. Tests 2 and 3 were taken on the Town of The Blue Mountains water system and are applicable to the Silver Creek development. The results of the three tests are provided in Table 1 with the measured flows, measured residual pressures and extrapolated water flow at the minimum pressure of 138 Kpa (20 psi).

**TABLE 1: RESIDUAL WATER SYSTEM FLOWS**

Test	Location	Measured <sup>1</sup> Pressure psi	Available Flows	
			Measured <sup>1</sup> L/s	Extrapolated <sup>2</sup> L/s
1	Silver Creek Drive at Osler Bluff (Collus)	25	73	79
2	Osler Bluff Road at Hwy 26 (TOBM)	24	52	54
3	Hope St. at Hwy 26 (TOBM)	25	67	71

1. Refer to Vipond test results, Appendix A
2. Flow predicted at 138 kpa (20 psi) based on pressure/flow relationship

### 2.3 WATER DEMAND

The water system demand has been separated into the largely residential lands on the west and the mixed use commercial/institutional on the centre and east lands.

The requirements for water supply for domestic uses and fire protection are outlined in the Town of The Blue Mountains Engineering Standards under Section 4.5 (Water Supply System). The average daily demand is 450 L/capita/day with a maximum day factor of 2.0 and a peak hour factor of 4.5.

The proposed uses at Silver Creek would produce an average daily demand (ADD) of 7 to 12 L/s and the maximum day demand (MDD) of 10 to 15 L/s. These demands are well within the measured available flows in the system.

The minimum fire flow requirements as listed in the TOBM Engineering Standards are as follows:

**TABLE 2: MINIMUM FIRE FLOW**

Site Use	Fire Flow Requirements	
	Minimum L/s	Preferred L/s
Residential Single Family	57	76
Institutional/Convenience Commercial	91	114
Industrial/Commercial	136	152
Downtown Commercial	136	189

All flows based on maintaining a minimum residual pressure of 138 kpa (20psi)

The Town of The Blue Mountains also considers the fire flow calculations endorsed by the Fire Underwriters Survey (FUS). The FUS calculations take into account building materials, building sizes, building separations, occupancy, etc. In addition, the Ministry of the Environment (MOE) requires the minimum fire flow to be 38 L/s plus the maximum day demand; however they note that the decision to set fire flow requirements rests with the local municipality.

## **West Lands**

Using the FUS calculations the estimated fire flow demands for the residential portion (West Lands) range from 50 L/s to over 100 L/s. The range of fire flow is subject to the building configuration, fire walls between adjoining structures, separation distances and building sizes. In the case of the lowest requirement, the minimum requirement of the TOBM would govern (57 L/s). The actual fire flow will be subject to the detailed site plan / draft plan applications.

The local hydrant at Hope Street tested at 71 L/s which is in excess of the minimum demand of 57 L/s. When accounting for withdrawals by users and pipe losses, the supply will still exceed the demand. The capacity of the existing watermain network in the area is marginal however domestic flows and fire protection can be met for the proposed West Lands through restrictions on building materials, sizes and separation distances. Otherwise improvements to the municipal system as described in Section 2.4 will be required.

## **East Lands**

The uses on the East Lands range from a supermarket, seniors complex, commercial and institutional uses. The fire demands of these uses according to TOBM standards, per Table 2, are in excess of the measured available flows in the municipal system. Consequently, water system improvements will be required.

## **2.4 DESIGN RECOMMENDATIONS**

There a number of solutions that will provide adequate fire protection for the proposed site uses. The Comprehensive ESR completed in May 2006 outlines the recommended servicing strategy to service the Silver Creek property and surrounding lands.

### **Option 1: Connect to the Collingwood Water Distribution System and Upgrade the Town of The Blue Mountains System**

One solution to provide suitable fire and domestic flows for the subject property would be a connection from the Collus watermain on Osler Bluff Road to the TOBM system through a 300mm dia watermain. The combination of the measured residual water flows in the TOBM system at Osler Bluff Road (54 L/s) and the Collus system at Silver Creek Drive (79 L/s) should equate to an available fire flow at the subject site in excess of 135 L/s. This flow would approach the minimum fire flow requirements of the Town of The Blue Mountains for commercial uses.

A further recommendation in the ESR is to increase the capacity of the Happy Valley water storage reservoir from 5,000 m<sup>3</sup> to 11,500 m<sup>3</sup>. This project was originally scheduled for completion in 2006 however this project is pending until the Town has an opportunity to optimize the location and size of the reservoir.

Finally there are number of local system improvements that would improve flows near the subject site. These include replacing existing undersized watermain with larger pipe, increasing the flow capabilities of the Town's Pressure Reducing Valve (PRV) at the Craigleith Road and Grey Road 19 intersection and the PRV at the Monterra Road and Blue Mountain Road intersection.

Each of these solutions would improve the water supply in the Silver Creek at Craigleith area and perhaps provide full fire protection and domestic flows. These improvements will have to be modeled along with the municipal water system network.

### Option 2: On-site Reservoir and/or Booster Station

In the event the above recommendations are not completed or are not sufficient, the subject development can be serviced by way of a on-site reservoir and/or booster station. The reservoir would be located within a municipal block and would ultimately be assumed by the municipality. The reservoir would be sized for this development according to MOE guidelines, using the MOE formula:

Storage = A+B+C, where

- A = fire storage according to population
- B = equalization storage
- C = emergency storage

The total estimated storage for the Silver Creek development would be as high as 2400 m<sup>3</sup> (500,000 lgal) if no improvements were carried out to the local municipal system as recommended in the Comprehensive ESR. If some of the recommended projects in the ESR are carried out and the area is still deficient then a smaller, on-site reservoir and/or booster station would be required. Water would be stored in a grade level reservoir and pumped to provide fire protection or held in an above ground reservoir.

Figure 2 shows the connection of the proposed watermain to the existing system. Currently there is an existing 150mm dia. watermain crossing Highway 26 at Blue Mountain Drive. This will be a primary feed for the residential (west) portion of the development along with a new connection, bored and jacked under Highway 26 at Hope Street.

A new watermain will be constructed on the internal road system from the existing watermains on Brophy's Lane and Long Point Road. All watermains will be built to municipal standards and operated by the Town of The Blue Mountains.

## **3.0 SANITARY SERVICING**

### **3.1 BACKGROUND**

The sanitary servicing for the area falls within the Craigleith Service Area as identified under the Town of The Blue Mountains Comprehensive (ESR). The Craigleith Waste Water Treatment Plant is located north and east of the Silver Creek site at the intersection of Brophy's Lane and Long Point Road.

The Environmental Services Department of the Town of The Blue Mountains produces annual reports on the operation of the Town water and waste water system. We reviewed the most recent report entitled *Town of The Blue Mountains, Water and Waste Water Capacity Assessment, 2006 Year End Report* to assess the capacity available to support the Silver Creek at Craigleith development.

### **3.2 EXISTING SEWER SYSTEM AND CAPACITY**

The Silver Creek site will be drained via gravity sewers internal to the property and connect to the existing sanitary sewer located on the south side of Highway 26. This sewer was installed in 1984 and conveys sanitary flows from the Craigleith area westward to the Craigleith Sewage Pumping Station (SPS) located at the intersection of Highway 26 and Lake Shore Road. During the installation of the sanitary sewer, leads were extended north beneath Highway 26 to Blue Mountain Road and Brophy's Lane. The existing gravity sewer on Highway 26 across the frontage of the development is a 300mm dia. PVC pipe which increases to a 750mm dia. sewer near the Craigleith Sewage Pump Station (SPS).

The Craigleith Waste Water Treatment Plant (WWTP) was expanded in 2003 to provide average daily capacity of 8,133 m<sup>3</sup>/day and peak flow of 19,640 m<sup>3</sup>/day. This was the second stage of a multi stage expansion.

According to the 2006 Year End Report the WWTP capacity (8,133 m<sup>3</sup>/day) can accommodate 10,549 equivalent residential units. As of the end of 2006, there were 4,932 allocated units and 2,037 reserved units for a total of 7,239 units committed at the plant. "Therefore there are no restrictions at the treatment plant and 3,310 units of plant capacity are available for reservation". The capacity in the Craigleith SPS and forcemain is 10,541 m<sup>3</sup>/day and 12,182 m<sup>3</sup>/day respectively which are in excess of the WWTP capacity.

### **3.3 PROPOSED SANITARY SEWER EXTENSION**

The proposed development can be entirely serviced by gravity sewer. Figure 3 illustrates the proposed and existing sanitary sewer invert elevations.

#### **West Lands**

The western property (formerly Easter Seals Camp) will be serviced by connecting to the existing sanitary manhole 60 at Blue Mountain Road. The residential units and clubhouse will be serviced by a 200mm dia. (minimum) gravity PVC sewer. The sewer within the public road network will be transferred to the municipality. The private condominiums will be connected with a similar 200mm dia. sanitary sewer connecting to the municipal system.

#### **East Lands**

Sanitary flows from the centre portion of the development around Brophy's Lane will be collected in a gravity sewer system and connect to an existing 200mm dia. sanitary sewer pipe stub on the north side of Highway 26 in the Brophy's Lane road allowance. This collection system will largely serve the seniors building, supermarket, single family homes and various commercial uses.

Sanitary flows from the balance of the East Lands of the site will be collected in a gravity sewer and connected to the existing sewer on the south side of Highway 26. This will require a new sewer to be bored and jacked under Highway 26. This will service the proposed institutional building and adjacent commercial uses.

#### 4.0 ROAD NETWORK

The impact the proposed development will have on the boundary road network has been analyzed and described in the Traffic Impact Study prepared by our office and submitted under separate cover. It is important to note that the MTO encourages consolidating and closing entrances onto Highway 26 to facilitate free flow traffic movement. With that objective, the concept plan shows the realignment of the entrance of Blue Mountain Drive to opposite Hope Street, the closure of three commercial entrances and the restriction of vehicle movements to Brophy's Lane with the introduction of a right in/out entrance.

The proposed concept plan incorporates a variety of ownership tenure such that a portion of the road network will be municipally owned and some will be private. As shown on Figure 4, the northern extension of Hope Street to connect to Blue Mountain Drive will be municipally owned. This will allow a public connection for the existing residents on Blue Mountains Drive. The major link road through the west residential lands will be municipally owned, whereas the remaining roads are private.

Brophy's Lane will be re-routed from Highway 26 and connect to Long Point Road. This connection will be a municipal road. Traffic movements eastward onto Highway 26 will be improved from the current intersection at Brophy's Lane through the proposed traffic control lights at Long Point Road.

A right in / out access of Brophy's Lane to the highway will be provided and built to municipal standards. Finally the proposed roundabout will greatly assist traffic flow through the area and become an aesthetic amenity for the local community. While roundabouts are a relatively new feature on the Canadian landscape, the roundabout will be built according to accepted design criteria, similar to roundabouts found in Durham Region, Waterloo Region and Ancaster.

The municipal roads will be built according to the Town of The Blue Mountains Engineering Standards and the Manual of Geometric Design Guidelines. The realignment of Blue Mountain Drive and Brophy's Lane through the subject lands will consist of a 20m road allowance constructed to a fully serviced urban cross section complete with mountable and / or barrier curb and gutter and a 8.5m asphalt platform. The private condominium road will consist of a 7.2m asphalt platform complete with mountable curb and gutter contained within a 10m common element block.

## 5.0 STORMWATER MANAGEMENT & SITE DRAINAGE

The management of stormwater and site drainage for the proposed development is consistent with the policies and standards of the various agencies including the Town of the Blue Mountains, Grey Sauble Conservation Authority (GSCA), and Ministry of the Environment (MOE).

The stormwater management criteria that will be implemented for the development includes the following:

- Water Quantity Control
  - Applies to lands not discharging directly to Georgian Bay.
- Water Quality Control
  - “Enhanced Protection” given Georgian Bay and Watercourse #1 as the ultimate receivers.
- Development Standard
  - Urban cross section complete with curb & gutter;
  - Lot grading at 2% optimum; and,
  - Minor and major drainage system to convey frequent and infrequent rainfall/runoff events, respectively.

Given the proximity of the subject property to Georgian Bay, water quantity controls are not required for the majority of the subject property. This is further discussed in detail in Section 5.2.

### 5.1 EXISTING DRAINAGE CONDITIONS

The subject lands are characterized by low-lying areas with poorly defined drainage features and overall imperfect drainage characteristics. The lack of defined drainage features is primarily a result of the recessional beach ridges which exist across the property and are commonly found in the general area on lands adjacent to the Georgian Bay shoreline. The recessional beach ridges and imperfect drainage in these areas have promoted a series of Provincially Significant Wetlands (PSW) across the property, which are configured in a linear fashion over portions of the property. The PSW's have been delineated by Gartner Lee Limited (2004 and 2007) and the Ministry of Natural Resources (2006). The Gartner Lee delineations were completed based on field data and are reflected on Figure 5 (Existing Conditions Drainage Plan).

The subject lands are covered by light to heavy coniferous forest, with the exception of the grassed areas and buildings within the former Easter Seals Camp. Additionally, a series of existing buildings front onto Highway 26 including the Craigeleith General Store, the Blue Mountain Inn, and the Alhorn Restaurant. Frontage onto the Georgian Bay shoreline is limited to approximately 350 metres along the north limit of the former Easter Seals Camp site.

The entire subject lands are underlain by Granby sand soils, which are classified as Hydrologic Soil Group 'B' according to the Soils Survey of Grey County (1953). As detailed geotechnical and hydrogeological investigations have not yet been completed, details on the stratigraphy of the site soils and seasonal groundwater levels have yet to be fully examined. We understand that detailed geotechnical and hydrogeological investigations will be completed during the next phase of the project.

Preliminary desktop hydrogeological work completed by Gartner Lee Limited suggests that the PSW's are supported by the sandy soils overlying bedrock contact which slopes towards the south away from Georgian Bay. As a result, the regional groundwater system cannot outlet to Georgian Bay due to the "bathtub effect" which causes standing water and generally wet areas in the sandy depressions (bounded by the recessional beach ridges) areas across the site. The reader is directed to GLL for further details regarding the sub-surface conditions and preliminary description of the local groundwater system.

Existing conditions drainage delineations across the subject lands were taken from the Craigleith Camperdown Subwatershed Study (GSCA, 1993). The subject lands lie within the limits of four subwatersheds per GSCA, namely:

- Subwatershed 1
- Subwatershed 4
- Subwatershed 5
- Subwatershed 6

According to the GSCA (1993) delineations, a portion of the former Easter Seals Camp is located between Subwatersheds 5 and 6 and drains directly to Georgian Bay via sheet flow. Consequently, this portion of the property is not included in any of the above-noted subwatersheds. Figure 5 illustrates the overall subwatershed divides across the subject lands.

For the purposes of evaluating existing drainage conditions across the property, the portion of the subject lands located between Blue Mountain Road and Brophy's Lane are referred to herein as the "West Lands". The West Lands include the former Easter Seals Camp and the Craigleith General Store. The remaining lands located between Brophy's Lane and Long Point Road are referred to as the "East Lands", which includes the Blue Mountain Inn and the Alphorn Restaurant. A detailed description of the drainage patterns are described below on a subwatershed basis, consistent with GSCA (1993).

Various sources of topographic information are available for the subject lands and surrounding area. The Ontario Base Maps (OBM) were originally used by GSCA (1993) to delineate the overall subwatershed throughout the Municipality. This mapping source includes 5 metre contours and provides the best overall representation of the regional topography. Topographic information from various site specific topographic surveys are also available across limited portions of the subject lands. These surveys provided detailed elevation information across limited areas such that the overall drainage patterns could not be refined. Based on field reconnaissance conducted by Crozier and review of all available topographic mapping, it was determined that the OBM maps utilized by GSCA (1993) provided the best representation of local topography for use in this preliminary study. Consequently, the OBM maps and GSCA (1993) delineations of local subwatersheds were utilized herein.

### **West Lands**

Drainage from the West Lands contributes to four separate outlets and is included in three subwatersheds as originally delineated by GSCA (1993). The outlet locations and subwatershed delineations across the property are illustrated on Figure 5, and a detailed description of the existing drainage conditions is provided below according to the identified outlets.

### Outlet #1 - Highway 26 (Existing 600mm Culvert at Blue Mountain Drive)

According to GSCA (1993), approximately 2.7 ha (Catchment EX-1) of the southwest portion of the West Lands are within Subwatershed 6 which drains a total of 500 ha extending from the Escarpment to Georgian Bay. Drainage from Subwatershed 6 reaches Georgian Bay via Watercourse 6 which flows north beneath Highway 26 and discharges to Georgian Bay approximately 300 m west of the subject lands.

The 2.7 ha portion of the West Lands which lies within Subwatershed 6 consists of light forest, open field and existing buildings and parking area from within the former Easter Seals Camp. Discharge from the site enters the existing Highway 26 roadside ditch primarily by way of sheet flow, with the exception of a series of poorly drained depressions located adjacent to Highway 26. The roadside ditch conveys drainage to the west and passes beneath Blue Mountain Drive via a 600 mm CSP culvert before reaching Watercourse 6 approximately 300 metres to the west.

As reflected in Figure 5, there are no roadside ditches along Blue Mountain Drive adjacent to the site. Runoff from a portion of the Blue Mountain Drive ROW drains by way of sheet flow to the existing roadside ditch along Highway 26, similar to the internal lands contributing to Outlet #1.

### Outlet #2 – Georgian Bay (Sheet Flow)

According to the GSCA (1993) subwatershed delineations, a 4.2 ha portion of the West Lands drains directly to Georgian Bay by way of sheet flow. This area was not identified as being part of the above-noted subwatersheds, however this report identifies this area as EX-2 which discharges to Georgian Bay via Outlet #2. It includes open grassed areas and several buildings from the former Easter Seals Camp and approximately 350 metres of the Georgian Bay shoreline.

A portion of the lands within EX-2 consist of various poorly drained depressions, similar to the lands in EX-1. The depressed areas are a result of the natural topographic characteristics of the area, as well as the fill pads associated with the construction of the various Easter Seals Camp buildings. Runoff from the area north of the buildings discharges to Georgian Bay by way of sheet flow, whereas runoff from the area to the south of the buildings is intercepted by the poorly drained depressions before flowing overland to Georgian Bay.

### Outlet #3 – Georgian Bay (Via Cut-off Ditch)

Approximately 3.8 ha (Catchment EX-3) of the central portion of the West Lands lies within Subwatershed 5 and drains directly to Georgian Bay. Subwatershed 5 extends north from Highway 26 to Georgian Bay, and includes a portion of the west spur of Brophy's Lane.

As illustrated on Figure 5, the southern portion of EX-3 includes a series of PSW's, recessional beach ridges and associated poorly drained depressions. These areas are ultimately drained by way of an existing ditch which passes along the northeast property limit, adjacent to the west terminus of Brophy's Lane, and discharges to Georgian Bay at the northeast corner of the West Lands (Outlet #3). A portion of the drainage from Brophy's Lane enters the aforementioned outlet ditch and the remainder enters Georgian Bay by way of sheet flow.

During field reconnaissance conducted by Crozier, a series of poorly drained depressions were also noted surrounding the existing residences and in the ROW along Brophy's Lane. This is likely due to the local subsurface conditions described above, and the lack of adequate roadside ditches with positive drainage outlets.

#### Outlet #4 – Brophy's Lane (Existing 400mm Culvert)

The remaining 5.2 ha portion of the West Lands (Catchment EX-4) are located within Subwatershed 4 according to the GSCA (1993). These lands primarily consist of heavily forested PSW's, recessional beach ridges and poorly drained depressions, with the exception of the lands fronting Highway 26 which includes the Craigleith General Store.

Drainage from the Highway 26 corridor enters the existing roadside ditch and does not contribute to Subwatershed 4. The lands surrounding the Craigleith General Store are generally low-lying and contribute runoff northward to the forested areas noted above. Runoff from the forested areas disperses through the PSW's and into the poorly drained depressions, ultimately reaching the roadside ditch along the west side of Brophy's Lane in an undefined fashion. This roadside ditch passes beneath Brophy's Lane at the northeast corner of the property via a 400 mm dia. CSP culvert (Outlet #4). During field reconnaissance completed by Crozier, a series of ponded areas were noted throughout EX-4 and immediately upstream of the existing cross culvert.

Another roadside ditch exists along the east side of Brophy's Lane (↓, north-south) which drains a portion of the existing gravel road and several residences. Both roadside ditches connect downstream of the above-noted culvert and convey runoff to the downstream portion of Subwatershed 4 which consists of PSW's and poorly drained depressions to the northeast (off-site). Crozier staff noted ponded areas throughout the downstream portion of Subwatershed 4, to the south of the existing residences along Brophy's Lane (↔, east-west).

In total, the West Lands contribute drainage to four primary outlets, referred to as Outlet #1, #2, #3, and #4. The East Lands consist of the balance of the site which drains to three additional outlets referred to as Outlet #5, #6, and #7, as described in detail below.

#### East Lands

Drainage from the East Lands contributes to three separate outlets and is included in two subwatersheds as originally delineated by GSCA (1993). A detailed description of the existing drainage conditions is provided below according to the identified outlets.

#### Outlet #5 – Brophy's Lane (Existing 450mm Culvert @ Bend)

According to the GSCA (1993), approximately 7.7 ha (Catchment EX-5) of the East Lands contributes to Subwatershed 4 in a manner similar to EX-4. The 7.7 ha portion of the East Lands extends from Highway 26 to the north property limit adjacent to the 90-degree bend along Brophy's Lane. With the exception of an existing residence on Brophy's Lane, Blue Mountain Inn and Alphorn Restaurant fronting Highway 26, EX-5 consists of PSW's, recessional beach ridges and poorly drained depressions, similar to that of EX-4.

Runoff from EX-5, including the existing buildings and parking areas, flows north via sheet flow into the heavily forested areas which consist of the PSW's, recessional beach ridges and poorly drained depressions. The runoff that is not captured in the depressed areas ultimately reaches the roadside ditch along the west side of Brophy's Lane (↓, north of the first 90-degree bend) or the Eastern Drain at Brophy's Lane. The roadside ditch combines with runoff from the balance of Subwatershed 4 and passes beneath Brophy's Lane at a second 90-degree bend approximately 200 metres north of the East Lands. Downstream of Brophy's Lane, the trapezoidal rip-rap ditch flows north between two residences before discharging to Georgian Bay. The remainder of the

drainage reaching Brophy's Lane at the first 90-degree bend is collected by the Eastern Drain which passes north across Brophy's Lane via an 850mm x 1100mm CSPA (Outlet #6).

#### Outlet #6 – Brophy's Lane (Eastern Drain at Existing Arch Culvert)

As illustrated on Figure 5, the Eastern Drain bisects the East Lands as it flows north from Highway 26 to Brophy's Lane adjacent to the Alhorn Restaurant. It was constructed in the 1980's during the construction of the Craigleith Wastewater Treatment Plant. It is a trapezoidal rip-rap ditch with a bottom width and depth each of approximately 1.5 metres. Although it is illustrated as being located along the east limit of Subwatershed 4 (GSCA, 1993), the Eastern Drain primarily provides a drainage outlet for external lands south of Highway 26 which includes the existing residences along Timmons Street and surrounding areas. Based on field reconnaissance, it is estimated that approximately 3 ha of external lands south of Highway 26 contribute to the Eastern Drain.

Drainage from internal lands adjacent to the Eastern Drain generally flows north towards the low-lying forested areas and disperses in an undefined manner before reaching Brophy's Lane at multiple locations described above. The portion of the internal area EX-5 which is not captured by the roadside ditch enters the Eastern Drain upstream of Brophy's Lane and passes beneath the road via an 850mm x 1100mm CSPA culvert (Outlet #6).

Immediately downstream of Brophy's Lane, the Eastern Drain passes into Subwatershed 2B (off-site) and flows east along the south limit of the Craigleith WWTP. Drainage from the upstream portion of Subwatershed 2B is also collected in a ditch and passes beneath Brophy's Lane via a 375 mm CSP culvert before combining with the Eastern Drain. The Eastern Drain then continues to flow east before it turns north around the WWTP and passes along the west limit of Long Point Road as a roadside ditch. The Eastern Drain ultimately discharges to Georgian Bay approximately 450 m north of the intersection of Long Point Road and Brophy's Lane.

The external lands which lie to the south of Brophy's Lane within Subwatershed 2B consist of heavily forested areas that are subject to imperfect drainage. Field reconnaissance conducted by Crozier found a series of undrained depressions which supports the imperfect drainage characterization of these lands. A large ponded area was noted at the upstream side of the existing 375 mm CSP cross culvert, in addition to a series of local ponded areas surrounding the existing residences along the south side of Brophy's Lane. A significant amount of debris present at the upstream end of the culvert may be exacerbating the extent of ponding in the area.

#### Outlet #7 – Long Point Road (Watercourse #1 at Existing Twin Arch Culverts)

According to GSCA (1993), approximately 2.1 ha (EX-6) of the east portion of the East Lands were identified as contributing to Watercourse #1. These lands primarily consist of light to heavy forested areas including a series of poorly drained depressions causing imperfect drainage conditions. Runoff from these areas that is not captured in the depressed areas would flow overland to Watercourse #1 or flow north towards Subwatershed 2B, however the exact drainage divide is only approximate due to the generally flat topography and coarse topographic information (ie. 5-m contours). Drainage from the Highway 26 corridor is intercepted in the roadside ditches along the highway and conveyed directly to the Eastern Drain and Watercourse #1.

Watercourse #1 is identified by GSCA (1993) as having a drainage area of approximately 400 hectares extending from the tablelands of the Escarpment to Georgian Bay. It enters the subject lands at the southeast property limit via a 3660mm x 1520mm concrete box culvert beneath Highway 26. Downstream of Highway 26, the watercourse traverses the east limit of the property

along the west side of Long Point Road before it makes a 90-degree bend east beneath the road via a pair of 1490mm x 920mm CSPA culverts. Watercourse #1 then passes through several open fields and forested areas before discharging to Georgian Bay approximately 850 m downstream of Long Point Road in the Town of Collingwood.

## 5.2 PROPOSED DRAINAGE CONDITIONS

The storm drainage and grading of the proposed development will address several fundamental issues:

1. Manage the internal stormwater by safely conveying peak flows to suitable outlets and provide the necessary water quality controls as specified in this section.
2. Manage external drainage entering the site by providing safe conveyance across the subject development and discharge to suitable outlets.
3. Ensure that drainage from all public roadways is conveyed to public facilities. Drainage from private lands can be conveyed to public or private facilities.

As explained in Section 4.0, the development will be constructed to an urban standard complete with a 20.0 m public road and a series of 10.0 m private condominium roads. The minor drainage system will consist of storm sewers with a minimum 5-year return capacity and the major system which will consist of the road network and channels that will be designed to provide an overland flow route. The realignment of both Blue Mountain Drive and Brophy's Lane will include reconstruction to a full 20.0 m municipal standard with curb and gutter and storm sewers, in addition to the upgrade of Long Point Road from Highway 26 to the Watercourse #1 crossing.

Refer to Figure 6 for the Post-Development Conditions Drainage Plan. The proposed drainage system will utilize the pre-development outlets where feasible as described below.

### West Lands

The development across the West Lands will primarily be concentrated on the former Easter Seals Camp site and will consist of 151 residential units, tennis courts, parking areas, clubhouse and a stormwater management facility. Based on the current concept plan, 16 lots and a clubhouse will have frontage onto the Georgian Bay shoreline. As explained in Section 4.0 and illustrated on Figure 4, the residential areas will be serviced by both public and private roads complete with an urban section. Drainage from these lands will be conveyed via storm sewers and overland flow routes within the road allowance to a proposed stormwater management facility, as illustrated in Figure 6.

With the exception of the rear lots of the lakefront units, the entire development across the West Lands will drain to the proposed stormwater management facility. Runoff from the improved Blue Mountain Road corridor and extension of the Brophy's Lane cul-de-sac will also drain to the facility, which will be a linear stormwater wetland with water quality control capability, consistent with industry standard stormwater management practices. Water quantity (ie. peak flow) control is not necessary due to the direct outlet to Georgian Bay. The stormwater management facility will extend from the East Lands and will discharge into Georgian Bay via a constructed outfall as a suitable outlet does not currently exist. For analysis purposes, the outfall of the facility will be located at Outlet #2. Sheet flow drainage from the rear lots of the lakefront units are also considered to discharge to Georgian Bay at Outlet #2. Ownership of the SWM facility will be retained by the Municipality since both private and publicly owned lands will be draining to the facility.

Overall, the drainage area contributing to Outlet #1 (600 mm CSP culvert at Blue Mountain Drive) is reduced when compared to existing conditions. This is due to the redirection of drainage from the majority of the development lands to the proposed stormwater management facility. Additionally, drainage from the Highway 26 corridor will remain independent from the internal drainage network and continue to discharge to Watercourse #6 approximately 300 m west of the site.

Drainage from the PSW areas within the West Lands will remain unchanged as a result of the development. The heavily forested and poorly drained areas will continue to utilize the existing culvert under Brophy's Lane (400 mm CSP) as Outlet #3.

Preliminary stormwater management design information and modeling analysis for the entire development is provided in Section 5.3.

### **East Lands**

The development plans for the East Lands consist of a series of commercial blocks, an institutional block and eight single family residential lots. These development blocks will be located on and accessed from the east-west realignment of Brophy's Lane to Long Point Road. As described in Section 4.0, access onto Brophy's Lane will be provided off of Long Point Road and a right in/out access off of Highway 26.

The proposed stormwater management facility will provide the most suitable outlet for the development due to the direct outlet to Georgian Bay. Consequently, portions of the development within the East Lands, specifically catchment PR-6, will utilize the stormwater management facility to the extent possible subject to site grading constraints. Based on preliminary grading exercises completed, several commercial blocks located adjacent to Highway 26 could successfully drain to the proposed SWM facility via overland flow routes (road & ditch) and storm sewers. Additionally, the front portions of the residential units and the majority of the Brophy's Lane realignment could drain to the proposed SWM facility. The redirection of runoff from areas of imperfect drainage characteristics will be implemented where feasible in order to improve existing drainage conditions. Drainage from the Highway 26 corridor would remain independent from the internal drainage and continue to discharge directly to the Eastern Drain and Watercourse #1.

Based on site grading constraints, the commercial blocks adjacent to the Eastern Drain and Watercourse #1 will be directed to their respective outlets, Outlet #6 and Outlet #7. For commercial blocks less than 5 ha, typical stormwater management practices include rooftop, parking lot and sub-surface storage for water quantity control, and end-of-pipe treatment (ie. oil/grit separator) for water quality control. This is the case for the two above-noted commercial blocks. Since Georgian Bay is not the direct receiver of runoff from these blocks, water quantity (ie. peak flow) control will be required in addition to water quality controls.

Drainage from the commercial block adjacent to the Eastern Drain is contained within Catchment PR-8, and the other block is contained within Catchment PR-9, each having an area of less than 5 ha. PR-8 consists of 1.3 ha of commercial development, whereas PR-9 consists of 1.4 ha of commercial development and public road. Drainage from each catchment will be controlled through the above-noted treatment methods prior to discharge to their respective outlets. PR-8 will discharge directly to the Eastern Drain whereas PR-9 will discharge directly to Watercourse #1. The direct discharge of treated runoff to the suitable outlets noted above will reduce the volume of runoff which currently enters the poorly drained depressed areas. Overall, the proposed stormwater management measures will improve the local drainage conditions.

The proposed realignment of Brophy's Lane (public) to Long Point Road will require a crossing of Watercourse #1. As this watercourse is identified by GSCA (1993) as a "cold water fishery", a suitable crossing configuration will have to be designed such as an open-bottom culvert, subject to approval of the Municipality and GSCA. This will be completed upon detailed design. Additionally, the commercial development within PR-9 will respect a 30 metre vegetated buffer to Watercourse #1.

Catchment PR-7 consists of the portion of the East Lands between the Brophy's Lane realignment and Eastern Drain that will remain undeveloped. These lands will continue to drain to the northeast towards Brophy's Lane, however the overall contributing area from the subject lands will be reduced. By doing so, the imperfect drainage conditions within the heavily forested areas will not be exacerbated.

### **5.3 STORMWATER QUANTITY CONTROL REQUIREMENTS**

The majority of the subject lands do not require stormwater quantity control due to the direct outlet to Georgian Bay via the proposed stormwater management facility. As such, quantity controls are only required on the East Lands at Outlets #6 and #7 where post-development runoff is conveyed to the Eastern Drain and Watercourse #1, respectively, before reaching Georgian Bay.

The preliminary stormwater management modeling used to support the quantity control analysis and sizing of detention storage volumes is described below. The quantity control analysis was conducted based on a "runoff volume" approach instead of a post-to-pre "peak flow" control approach. The purpose of the "runoff volume" approach is based on providing a conservative estimate of stormwater quantity storage required at this preliminary juncture by detaining the excess runoff volume generated from the development lands when compared to existing conditions. This is to ensure that there is sufficient storage available on-site in advance of completing detailed design which will include more detailed modeling based on "post-to-pre" peak flow control. Typically, the "peak flow" control approach yields reduced storage volume requirements when compared to the "runoff volume" approach.

#### Existing Conditions Modeling

The runoff volumes were evaluated for each of the aforementioned catchments under existing conditions, even though the quantity control analysis is only required for portions of the East Lands. This is to demonstrate the overall change in responsiveness of the site from existing to proposed conditions. The runoff volumes were generated for the 24-hour 100-year rainfall event based on the rainfall data for basins west of and including Collingwood (MTO District 5). The total rainfall amount for the above-noted event is 108 mm. Land use and soils characteristics were used to determine an appropriate runoff coefficient for each catchment, per Design Chart 1.07 of the MTO Drainage Management Manual (Part 4). Results from the existing conditions runoff volume analysis are summarized in Table 3.

**TABLE 3: SUMMARY OF EXISTING CONDITIONS 100 YEAR RUNOFF VOLUMES**

Catchment ID	Land Use	Area (ha)	Runoff Coefficient	Runoff Volume (mm)
EX-1	Former Easter Seals Camp	2.7	0.17	19
EX-2		4.2	0.17	19
EX-3	Heavy Forest / Former Camp	3.8	0.10	11
EX-4	Heavy Forest / Craigleith General Store	4.8	0.08	9
EX-5	Light to Heavy Forest / Blue Mnt. Inn / Alphorn	7.7	0.14	15
EX-6	Light to Heavy Forest	2.1	0.12	12

Notes: Runoff coefficients reflect 25% increase due to 100-year storm event. Refer to Appendix B for runoff coefficient determination.

As expected, the existing conditions analysis suggests relatively low site responsiveness due to sandy soils and land cover characteristics. An increase in imperviousness as a result of the development will ultimately result in increased runoff volumes which should be mitigated.

#### Post-Development Conditions Modeling

The preliminary storage volume requirements were computed based on detaining the excess runoff generated from the development to existing condition levels. The post-development runoff volumes were computed based on runoff coefficients as done for existing conditions and adjusted by 25% to reflect the 100-year storm event.

Results from the post-development runoff volume analysis are presented in Table 4. As shown, the runoff volumes increase by as much as 4 times the existing conditions volumes. For those catchments which will drain to the proposed SWM facility, the results noted in Table 3 are inconsequential as water quantity controls are not required for these catchments. However, results from the runoff volume analysis for catchments PR-8 and PR-9 were used to determine the preliminary conservative storage volume requirements as water quantity controls will be required from these lands.

**TABLE 4: SUMMARY OF EXISTING AND PROPOSED CONDITIONS 100 YEAR RUNOFF VOLUMES AND WATER QUANTITY STORAGE REQUIREMENTS**

Catchment ID	Land Use	Area (ha)	Post-Development Runoff Coefficient	Runoff Volume (mm)		Excess Runoff (mm)	Storage Required (m <sup>3</sup> )
				Existing Conditions <sup>1</sup>	Proposed Conditions		
PR-1	Residential (Townhomes / Singles)	7.4	0.82	19	88	69	N/A
PR-2	Singles (Rear Lots)	1.3	0.10	19	11	-	N/A
PR-3	SWM Facility	1.4	0.06	11	7	-	N/A
PR-4	Forest (Undeveloped)	1.5	0.10	11	11	0	N/A
PR-5	Forest (Undeveloped)	4.0	0.08	9	9	0	N/A
PR-6	Commercial / Singles	4.1	0.82	15	88	73	N/A
PR-7	Forest / Singles (Rear Lots)	3.9	0.14	15	15	0	N/A
PR-8	Commercial	1.3	0.82	15	88	73	1200
PR-9	Commercial	1.4	0.82	12	88	76	1350

1. Runoff volume corresponds to existing conditions catchment, as noted in Table 3  
Notes: Runoff coefficients reflect 25% increase due to 100-year storm event.  
See appendix B for runoff coefficient determination.

Based on the results in Table 4, the total storage volumes of 1200 m<sup>3</sup> and 1350 m<sup>3</sup> are required within Catchments PR-8 and PR-9, respectively, at this preliminary juncture in order to provide sufficient water quantity control for the subject development. Figure 6 illustrates the areas in each commercial block which will provide rooftop, parking lot and sub-surface storage, and the available storage volumes in each cell. These types of runoff storage methods for water quantity control purposes is industry standard for commercial blocks. As noted, the available storage volumes within each commercial block are in excess of the requirements noted in Table 4, which are conservative at this preliminary stage. It is expected that the actual storage volumes required within catchments PR-8 and PR-9 will be reduced upon detailed design and analysis based on “post-to-pre” peak flow control.

#### 5.4 STORMWATER QUALITY & EROSION CONTROL

It will be necessary to implement stormwater management practices to address the water quality and erosion control requirements of the regulatory agencies. Since the Georgian Bay, Watercourse #1 and the Eastern Drain are the ultimate receivers of drainage from the proposed development, the development will incorporate measures to provide “enhanced protection” per the MOE (2003) guidelines. “Enhanced” water quality protection involves the removal of at least 80% of suspended solids from 90% of the annual runoff volume. Erosion control measures, however, are only required for those areas which will discharge to Watercourse #1 and the Eastern Drain. A detailed description and analysis of the water quality and erosion control elements that will be incorporated into the design of the development is provided below.

##### Linear Stormwater Wetland Facility

The screening of potential stormwater quality control measures for the majority of the subject lands led to the recommendation of an extended detention stormwater wetland. This “end-of-pipe” facility is suitable given the size of the drainage catchment (exceeding 5 ha), the likelihood of high

groundwater levels, and the lack of topographic relief on the site. The linear nature of the SWM facility will allow runoff from a significant portion of the development to be treated for quality purposes, including roadways, parking lots and grassed areas, while minimizing the need for fill placement. Specifically, it will provide water quality treatment for internal catchments PR-1 and PR-6 which will include both residential and commercial blocks across both the West and East Lands.

Based on an estimated imperviousness of 65% for the lands contributing to the SWM facility, the minimum water quality storage requirement for a stormwater wetland is 115 m<sup>3</sup>/ha (MOE, 2003). The minimum water quality volume consists of 75 m<sup>3</sup>/ha permanent pool volume and 40 m<sup>3</sup>/ha extended detention. Therefore, the 12.9 ha drainage area tributary to the SWM facility will require minimum water quality volumes as follows:

- Permanent Pool 975 m<sup>3</sup>
- Extended Detention (Quality Only) 525 m<sup>3</sup>

Since erosion control will not be required as the facility will discharge directly to Georgian Bay, extended detention drawdown of the 25-mm storm event was not considered.

The proposed stormwater wetland facility will extend a minimum permanent pool elevation of 177.4 m from the outlet at Georgian Bay to the East Lands, which represents a total length of 650 m. The 177.4 m elevation corresponds to the 100 year mean high water level of Georgian Bay. The permanent pool will have an average depth of 0.3 m; therefore the bottom elevation of the wetland facility will be constructed at 177.1 m. An additional 0.3 m of depth above the permanent pool level is provided for extended detention (water quality) storage purposes only. The width of the facility will vary considerably between 4 m and 35 m, as shown on Figure 6, and will be integrated into the development. Although the required permanent pool volume is 975 m<sup>3</sup> per MOE (2003), the preliminary design of the SWM facility reflects an available volume of approximately 1800 m<sup>3</sup>. Similarly, the required volume for extended detention is 525 m<sup>3</sup> per MOE (2003), whereas the preliminary design reflects an available volume of 2500 m<sup>3</sup>.

The final operating levels within the facility and the design of the outlet structure and sediment forebay will be subject to detailed design and further subsurface investigations. Also, the elevations noted above are absolute minimum operating levels based on outlet constraints. Subject to the detailed design of the development, the operating levels within the SWM facility can be raised to suit finished grades.

#### Site Specific Water Quality Controls

Due to site topographic constraints, the commercial blocks located within PR-8 and PR-9 will not drain to the proposed SWM wetland noted above. Consequently, site specific water quality and erosion controls will be required as these blocks cover less than 5 ha, which is the minimum drainage area required for an end-of-pipe stormwater facility.

Typical water quality and erosion controls for the treatment of runoff from areas less than 2 ha includes a treatment train approach using a combination of sand filters, oil/grit separators, bio-swales, filter strips, and infiltration galleries. For example, MOE stormwater quality objectives for internal Catchments PR-8 and PR-9 can each be achieved using a Stormceptor STC 4000. The water quality treatment unit within PR-8 would outlet to a grassed swale before discharging to the Eastern Drain approximately 130 m upstream of the existing culvert at Brophy's Lane. The treatment unit within PR-9 would outlet to a grassed swale within the 30-metre vegetated buffer

along Watercourse #1 before discharging to the watercourse. Details of each treatment unit will be provided at detailed design.

Ownership of the treatment unit within PR-8, which drains to the Eastern Drain, will be retained by the condominium corporation as the entire development block contributing to this outlet consists of private lands. However, ownership of the treatment unit within PR-9 will be retained by the Municipality, as the unit will be located within the future Brophy's Lane public ROW and will accept runoff from both the public ROW and the private commercial block.

## 5.5 EROSION & SEDIMENTATION CONTROL DURING CONSTRUCTION

Erosion and sediment controls will be implemented on-site prior to construction. The controls will consist of a combination of sediment fence (light and heavy duty), rip-rap flow check dams, straw-bale check dams and the SWM wetland operating as a temporary sediment basin.

- Silt Fencing

Silt fence will be installed where required to intercept sheet flow. It should be noted that additional silt fencing may be added during construction based on field decisions by the Engineer and Developer prior to, during and following the earth works.

- Topsoil Stockpiles

It will be necessary to strip topsoil prior to earth moving. Temporary topsoil stockpiles will be located over 50 metres from the PSW designated lands and over 30 metres from site watercourses.

- Interceptor Ditch and Swales

Drainage will be conveyed by a series of interceptor ditch and swales. The drainage swales will be strategically placed on-site to direct runoff to the erosion and sediment controls.

- Dust Suppression

During earthwork activities, the Contractor will ensure that measures for dust suppression are provided as required, such as the application of water or lime.

## 6.0 UTILITIES

In the preparation of this report we contacted area utility companies to confirm the availability to service the proposed developed.

- Rogers Cable confirmed that they have services in the area to support the development.
- Hydro One will require additional substations to service this area. They should be able to supply the complete development at the distribution voltage and all of the system enhancements outside the development will be completed at Hydro One's expense.
- Bell Canada requires additional infrastructure in the area and "would be interested in servicing"
- Union Gas did not respond to our request for information

## 7.0 CONCLUSIONS & RECOMMENDATIONS

Based on the foregoing, we conclude that the proposed Silver Creek at Craigleith development can be adequately serviced.

1. Access to the site will be by way of three public roadway entrances. One will be the realignment of Blue Mountain Drive to align with the existing Hope Street intersection. The new Blue Mountain Drive will form a connection through the West Lands. The existing Brophy's Lane will be redirected eastward to Long Point Road. Right in/out movements can be facilitated through a new entrance and all other traffic movements will be accommodated in upgrades to the Long Point Road intersection.
2. The development will be fully serviced by way of municipal water and sewer. Ownership of the watermain be retained by the Municipality, whereas the sanitary conveyance system will be held under both private and public ownership corresponding to the ownership of the road network.
3. The domestic water supply will be provided by a looped system with connections to the existing watermains on Blue Mountain Drive, Brophy's Lane and Long Point Road. Fire and domestic water supply can be achieved through the existing municipal network and through implementing the recommendations in the Comprehensive ESR.
4. Sanitary sewage conveyance across the site will be provided by gravity sewers and connect to the existing trunk sanitary sewer on the south side of Highway 26. Sewage from the site will ultimately be treated at the Craigleith Waste Water Treatment Plant (WWTP).
5. Utilities including power, gas, telephone and cable services are available as plant is located on the perimeter roads surrounding the subject lands.
6. Georgian Bay and Watercourse #1 are the ultimate receivers of drainage for the site and as such, stormwater management controls will be implemented for the development to treat runoff for water quality purposes for the entire site. This will be provided by way of a stormwater wetland facility with a direct outlet to Georgian Bay. Water quantity controls by way of site specific controls will be required for the portion of the East Lands which will discharge to the Eastern Drain and Watercourse #1.
7. A 30-metre vegetated buffer will be provided adjacent to Watercourse #1 on the East Lands, given the fact that Watercourse #1 is a cold-water fishery. The realignment of Brophy's Lane will cross Watercourse #1 by way of an open-bottom culvert, subject to detailed design and approval of the Municipality and GSCA.

Therefore, we recommend approval of the Planning Applications for the subject lands from the perspective of engineering servicing requirements.

Respectfully Submitted,

**C.F. CROZIER & ASSOCIATES INC.**

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# APPENDIX A

## Hydrant Flow Test

# APPENDIX B

## Stormwater Management Calculations

# LIST OF FIGURES

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