5113 Brock Road, Claremont

Functional Servicing and Stormwater Management Report

July 2021

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SUBMISSION HISTORY

Submission	Date	In Connection With	Distributed To
1st	July 2021	Zoning By-Law Amendment, Draft Plan Approval	City of Pickering, Durham Region, TRCA, Claremont Developments Inc.

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Claremont Developments Inc. to prepare a Functional Servicing and Stormwater Management Report for a proposed development within the Hamlet of Claremont (Part of Lots 17 and 18, Concession 9 Lots 47 and 48 Registered Plan no.12), City of Pickering, Region of Durham.

1.1 Purpose of the Functional Servicing Report

The Functional Servicing and Stormwater Management Report (FSSR) has been prepared in connection with the Zoning By-law Amendment and Draft Plan of Subdivision for the proposed development. The proposed Draft Plan of Subdivision is provided in **Appendix A**. This report serves to update functional servicing and stormwater management in respect of the proposed zoning and subdivision of 5113 Brock Road, as fully described in the Planning Opinion Report by Malone Given Parsons, dated July 2021.

The proposed development consists of the following land uses:

- Single detached residential lots,
- Existing residential,
- Park,
- Open space blocks and buffers,
- Noise attenuation,
- Stormwater management ponds,
- Road widening,
- Lands to be conveyed to adjacent existing lots, and
- Local roads.

The purpose of this report is to demonstrate that the proposed development can be graded and serviced in accordance with the City of Pickering, Durham Region, Toronto and Region Conservation Authority (TRCA), the Ministry of Environment, Conservation and Parks (MECP), and Ministry of Natural Resources and Forestry (MNRF) design criteria.

1.2 Study Area

The study area is approximately 38.18 ha in size and it is located north of Central Street, between Brock Road (Claremont Bypass) and Old Brock Road in the Hamlet of Claremont, City of Pickering, Regional Municipality of Durham, as shown on the site location plan (**Figure 1.1**). The study area is bounded by existing residential houses to the west and south, and woodlot and residential areas to the north.

The subject lands are comprised of agricultural land, open space areas, and an existing house. The site is located within the East Duffins Creek subwatershed. Mitchell Creek, a tributary to the East Duffins Creek, is located west of Old Brock Road. Mitchell Creek is Redside Dace Occupied Habitat south of the CP Railway. A tributary of East Duffins Creek is located northeast of the site, crossing Brock Road.

1.3 Background Servicing Information

In preparation of the site servicing and SWM strategies, the following design guidelines and standards were used:

- Ministry of Natural Resources and Forestry Guidance for Development Activities in Redside Dace Protected Habitat (March 2016);
- Credit Valley Conservation and Toronto and Regional Conservation Authority Low Impact Development Stormwater Planning and Design Guide (November 2010);
- Development Control Design Standards and Stormwater Management Design Guidelines, City of Pickering (2013);
- Stormwater Management Criteria, Toronto and Region Conservation Authority (TRCA) (April 2012, Version 10); and
- Ministry of Environment (MOE) Stormwater Management Planning and Design Manual (March 2003).

2.0 STORMWATER MANAGEMENT

2.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the design guidelines and standards listed in **Section 1.3.** The stormwater runoff criteria are summarized below in **Table 2.1.**

Table 2.1 – Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Control proposed release rates to allowable release rates during the 2 through 100 year storm events, as specified by TRCA. Return period peak flows are to be based on the 1 hour AES, 4 hour Chicago, and 12 hour AES storms.
Quality Control	Enhanced quality protection as per Ministry of the Environment 2003 Stormwater Management Planning and Design Manual (i.e., 80% TSS Removal).
Erosion Control	Retention of 5mm of rainfall on-site. Attenuation of the 25 mm rainfall runoff for a minimum of 48 hours.
Water Budget	Where feasible, incorporate measures to minimize impacts on the water balance into the development design.

2.1.1 Allowable Release Rates

The allowable release rates for the site have been established based on revised release rates for Duffins Creek watershed in the community of Claremont, provided by TRCA during consultation in May 2014. The subject development falls within three catchments of the Duffins Creek, namely Catchments 47, 49 and 51 (refer to **Appendix B** for supporting documentation).

The allowable release rates are summarized in **Table 2.2**.

Table 2.2 - Allowable Release Rates

Return Period Storm	Release Rate (m^3/s)		
	Duffins Creek Watershed Catchment 47	Duffins Creek Watershed Catchment 49	Duffins Creek Watershed Catchment 51
2 Year	0.002	0.003	0.003
5 Year	0.004	-	0.005
10 Year	0.005	-	0.006
25 Year	0.006	-	0.008
50 Year	0.007	-	0.010
100 Year	0.008	0.006	0.011

2.2 Existing Drainage

As illustrated in the existing storm drainage plan (**Figure 2.1),** the 38.18 ha site drains in four general directions. The drainage boundaries were determined using detailed survey completed by Rady-Pentek and Edward Surveying Ltd. in December 2018.

Drainage from Catchment 101 (5.42 ha) drains north, through Catchment 111 (10.79 ha) to a portion of the existing Glen Major Provincially Significant Wetland (PSW) Complex (ELC unit SWC1 – White Cedar Mineral Coniferous Swamp) that drains easterly to a culvert under Brock Road and continues off site in a relatively defined channel to a 1.5 ha online pond approximately 250 m east of Brock Road. This watercourse appears to flow through various ponds and wetlands downstream of the online pond before converging with East Duffins Creek. Drainage from Catchment 103 (0.87 ha) sheet drains north to the existing wetland complex (ELC unit MAM2 – Mineral Meadow Marsh) (Catchment 110, 1.39 ha) then via the SWC1 wetland to Brock Road. The total existing drainage area contributing to the SWC1 wetland is 18.47 ha. The total existing drainage area contributing to the MAM2 wetland is 2.26 ha. Drainage from Catchment 107 (0.75 ha) flows east to a ditch flowing in a northerly direction on Brock Road and joins with the flows from the SWC1 wetland to the tributary of East Duffins Creek. This drainage flowing northeast of the subject lands discharges to Catchment 51 of the Duffins Creek watershed.

Drainage from Catchments 100 and 102 (12.82 ha) flows in a westerly direction towards Old Brock Road. Drainage from Catchment 102 (7.62 ha) flows south into an existing ditch on the east side of Old Brock Road, under Old Brock Road via an existing culvert and westerly toward Mitchell Creek. The majority of drainage from Catchment 100 (4.67 ha) flows to the existing ditch on the east side of Old Brock Road, under Old Brock Road via a box culvert and westerly toward Mitchell Creek. The remainder of the drainage from Catchment 100 flows north into the existing ditch on the east side of Old Brock Road, under Old Brock Road via a CSP culvert and westerly toward Mitchell Creek. The westerly drainage discharges to Catchment 49 of the Duffins Creek watershed.

Drainage from Catchment 104 (8.71 ha) flows southerly into existing ditches that drain south along both sides of Franklin Street and enters the existing storm sewer system on Franklin Street via ditch inlet catch basins at Joseph Street. The drainage from this southwestern portion of the site also contributes to Catchment 49 of the Duffins Creek watershed.

Drainage from Catchment 105 (3.10 ha) flows south. Drainage from Catchment 106 (0.87 ha) drains to a ditch on Brock Road and flows south. These two areas, combined with the runoff from external existing lots (Catchment 108, 0.22 ha) and the runoff from Brock Road (Catchment 109, 2.51 ha) drain into an existing roadside wetland (SWD3 – Maple Mineral Deciduous Swamp) in the southeastern portion of the site. This SWD3 wetland has a total drainage area of 6.7 ha. The SWD3 wetland discharges via a culvert under Central Street to an existing roadside ditch on the west side of Brock Road. This drainage continues south for approximately 1.7 km before converging with Mitchell Creek. This southerly drainage discharges to Catchment 47 of the Duffins Creek watershed.

2.2.1 Existing Site Characterization

The soil classifications were identified in the Preliminary Geotechnical Investigation prepared by Golder Associates (July 2021). The report identifies that the soils within the study limits are predominantly clayey silt and sandy silt. These soils were classified as Hydrologic Soil Group C. Land uses identified include agricultural land, open space areas, and an existing house.

2.2.2 Existing Hydrology Model

Hydrologic modelling was undertaken using the Visual OTTHYMO Version 2.2.4 (VO2) software. Under existing conditions, the catchments drain uncontrolled to the three Duffins Creek Watershed catchments, as described in **Section 2.1.1**.

The 1-hour AES and 12-hour AES design storms and the 4-hour Chicago Storm distribution were modelled. A summary of the resulting existing peak flows to the catchments is provided in **Table 2.3**. It is noted that the most conservative (lowest) existing peak flows have been included in **Table 2.3.**

Table 2.3 – Existing Peak Flows to Duffins Creek Watershed Catchments

Return Period Storm	Duffins Creek Watershed Catchment 47 (north of Central St.)	Duffins Creek Watershed Catchment 49	Duffins Creek Watershed Catchment 51
2 Year	0.067	0.178	0.110
5 Year	0.108	0.323	0.185
10 Year	0.139	0.417	0.238
25 Year	0.179	0.542	0.309
50 Year	0.212	0.642	0.365
100 Year	0.245	0.744	0.423

A link to obtain the VO2 hydrology model is provided in **Appendix C**.

2.2.3 Existing External Drainage Concerns

Through discussions with both the City of Pickering staff and local residents, it has been made evident that several areas within the community of Claremont have historically experienced flooding of roads and private properties during significant rainfall events.

One example of this includes Franklin Street, where the existing storm sewer has the capacity to only convey storm runoff from less than a 2 year storm event. Current engineering practices typically require construction of storm sewers that have the capacity to convey runoff from a 5 year storm event, along with municipal roads that can safely convey runoff from the 100 year storm event (the major system) without impacting the adjacent privately owned properties. The Franklin Street right-of-way has essentially no major system capacity, with overland flows spilling over the shallow roll curb directly onto the adjacent lots, including a major system spill along the original drainage path across the northwest corner of Franklin Street and Central Street, causing ponding on the lots and flooding around the existing houses on Franklin and Barclay Streets. Overflows onto the existing lots occur in storms less than the 2 year storm event. Mitigative measures to reduce the occurrence of flooding on Franklin Street are proposed, as described in **Section 2.4** and **Section 2.8** of this report.

2.3 Best Management Practices

In accordance with the Ministry of Environment Stormwater Management Planning and Design Manual (2003), a review of stormwater management (SWM) best management practices (BMPs) was completed using a treatment train approach, which evaluated lot level, conveyance system, and end-of-pipe alternatives.

The following site characteristics were taken into consideration:

- The topography is generally higher in the middle of the site, sloping downward to the site boundaries at approximately 1-5%;
- Based on the Geotechnical investigation, site soils consisted of clayey silt, sandy silt, silt and sand;
- An in-situ percolation test was completed and indicates that the native soils have an infiltration rate ranging from approximately 46 to 111 mm/hr;
- Within the installed site wells, groundwater was observed at depths ranging between approximately 0.4 m to 7.5 m below existing grade;
- The proposed developable residential area is approximately 24.38 ha and consists of 70 lots;
- The proposed lots are large (approximately 0.30 ha) and will include septic beds within the rear yard areas; and
- The site drains west to Old Brock Road, north to an existing woodlot and residential areas, east to Brock Road, and south to Franklin Street.

2.3.1 Lot-Level Controls

Lot-level controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system. These controls are proposed on private properties. Incorporating controls that do not require maintenance can be an effective method in the treatment train approach to SWM; however, enforcement of controls that require ongoing maintenance can be more challenging for the municipality. The following lot level controls have been evaluated for potential use on this site:

Increased Topsoil Depth – An increase in the restored topsoil depth on lots can be used to promote lot level infiltration and evapotranspiration. Increased topsoil depth can contribute to lot level quality and water balance control. A minimum depth of 0.3 m is proposed to be utilized in all landscaped areas.

Roof Runoff to Rain Barrels – Directing roof runoff to rain barrels may be used to provide on-site retention of the 5 mm of initial runoff. However, as the TRCA typically does not provide credit for the use of rain barrels as a BMP, directing roof runoff to rain barrels is not proposed.

Roof Leaders to Soak-away Pits – Directing roof runoff to subsurface soak-away pits can be used to promote infiltration and provide on-site retention of runoff. By promoting infiltration, water quality and quantity control is provided for the volume of water retained. Infiltration of roof runoff can provide significant SWM benefits as part of the overall treatment train approach. As sewage systems and private wells are already proposed in the rear of the residential lots, soak-away pits are recommended to be implemented in the front yards. The Geotechnical Investigation prepared by Golder Associates indicates that high groundwater levels are encountered throughout the proposed development, which may restrict the ability to implement infiltration measures. Therefore, directing roof runoff to soak-away pits is proposed where groundwater permits. As per Pickering SWM Guidelines, soak-away pits will be privately maintained and in private ownership. The maximum drawdown time will be less than 72 hours. The soak-away pits will be located a minimum of 5 m from buildings with basements and an overflow will be provided.

Roof Leaders to Grassed Areas – Directing roof leaders to grassed areas could contribute to water quality and water balance control by encouraging stormwater retention. As per the Pickering SWM Guidelines, roof leaders can be discharged to the ground via splash pads or extension pipes and flows will be directed a minimum of 600 mm away from buildings. Directing roof leaders to grassed areas is proposed where roof leaders are not directed to soak-away pits.

A summary of the suitability of potential lot level controls for the subject lands is provided in **Table 2.4**.

2.3.2 Conveyance Controls

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility and present opportunities to distribute stormwater management techniques throughout a development. The following conveyance controls have been evaluated for use on the site:

Grassed Swales – A grassed swale could promote infiltration, filtration, and evapotranspiration, contributing to water quality and quantity control. Grassed swales need an unimpeded and relatively wide stretch of landscaped area, such as within a wide boulevard with no driveways, to function properly. Due to the proposed urban cross-section, grassed swales are not recommended for the proposed development.

Exfiltration at Rear Lot Catchbasins – Where rear lot catchbasins are required due to grading constraints, a perforated pipe system could be incorporated into the rear lot catchbasin design to promote infiltration of ‘clean’ stormwater runoff. By promoting infiltration, water quality and quantity control are provided for the volume of water retained. Infiltration can provide significant SWM benefits as part of the overall treatment train approach. As previously discussed, the high groundwater encountered throughout the proposed development may restrict the ability to implement infiltration techniques. Furthermore, due to the location of the septic systems in the rear yards, exfiltration in rear yards is not recommended.

Catchbasin Infiltration System – A street catchbasin infiltration system may form part of the treatment train approach to provide on-site retention of storm runoff. The street catchbasins may be connected to infiltration trenches located in the road boulevard. Deep sumps within the catchbasins and a gosstrap are typically used to provide pre-treatment. Based on high groundwater levels, a catchbasin infiltration system is not recommended for the proposed development.

A summary of the suitability of the conveyance controls is provided in **Table 2.4**.

2.3.3 End-of-Pipe Controls

Stormwater management facilities at the end-of-pipe receive stormwater flows from a conveyance system and provide treatment of stormwater prior to discharging flows to the receiving watercourse or outfall. While lot level and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the subject development. The following end-of-pipe controls have been evaluated for use on this site:

Wet Ponds, Wetlands, Dry Ponds – Sized in accordance with the MOE criteria, these end-of-pipe facilities can provide water quality, quantity, and erosion control treatment. Due to the large size of the proposed development, one end-of-pipe dry pond and one end-of-pipe wet pond are proposed to provide water quality, quantity, and erosion control treatment.

Stormwater Detention Facility – To meet quantity and erosion control targets, stormwater runoff storage and attenuation through the use of flow restrictors can be used to control stormwater release rates. As the proposed dry and wet ponds will provide the required erosion and quantity control for the stormwater runoff, stormwater detention facilities are not recommended for the proposed development.

Manufactured Treatment Device – A properly sized manufactured treatment device (MTD) can assist in providing MECP Enhanced (Level 1) treatment and can contribute to the treatment train approach for water quality control. Oil-grit separators are recommended for two localized drainage areas that are unable to be directed to the proposed dry pond.

2.3.4 Selection of Best Management Practices

Table 2.4 summarizes the suitability of the various stormwater management controls identified for the proposed development.

Table 2.4 - Recommended Stormwater Best Management Practices

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICE	Feasible (Yes/No)	RECOMMENDED (Yes/No)
Increased Topsoil Depth	Yes	Yes
Roof Runoff to Rain Barrels	Yes	No
Roof Leader to Soak-away Pits	Yes	Yes, where groundwater is at sufficient depth
Roof Leaders to Grassed Areas	Yes	Yes
Vegetated Filter Strips	No	No
Grassed Swales	No	No
Exfiltration at Rear Lot Catchbasins	No	No
Catchbasin Infiltration System	No	No
Wet Ponds, Wetlands, Dry Ponds	Yes	Yes
Stormwater Detention Facility	Yes	No
Manufactured Treatment Device	Yes	Yes

2.4 Proposed Storm Drainage

As shown on the proposed storm drainage plan (**Figure 2.2)**, major and minor system flows from the site will generally follow the existing drainage patterns. **Figure 2.3** shows a simplified drainage schematic. The proposed residential lots are relatively large (approximately 0.3 ha) to accommodate the required septic systems, and will therefore include significant amounts of pervious areas.

Runoff from the rear yards of proposed lots in Catchment 212 (2.08 ha) is proposed to drain uncontrolled in a northerly direction to the SWC1 wetland. Runoff from the rear yards of proposed lots in Catchment 213 (0.69 ha) will be captured by a rear lot catchbasin (RLCB) system and directed to the MAM2 wetland. In total, approximately 14.95 ha is proposed to drain to the SWC1 wetland to the north and 2.08 ha is proposed to drain to the MAM2 wetland. Runoff from the rear yards of proposed lots in Catchment 214 (0.74 ha) will drain in a northerly direction to the existing ditch on Brock Road via RLCBs. This drainage flowing northeast of the subject lands discharges to Catchment 51 of the Duffins Creek watershed.

Runoff from Catchment 211 (11.32 ha) is proposed to drain to the West SWM Pond, adjacent to Old Brock Road. Major system flows will be captured at the north cul-de-sac on Street D and conveyed via storm sewer to the West SWM Pond. Major system flows at the 100 year capture locations on Street C and Street A will also be captured and conveyed to the West SWM Pond. The West SWM Pond will outlet via a storm sewer on Street A and be conveyed to Street B, and ultimately to the Southeast SWM Pond (refer to **Figure 2.6**).

Runoff from the rear yards of proposed lots in Catchment 210 (0.40 ha) is proposed to drain uncontrolled to the east ditch at Old Brock Road and be conveyed southerly and westerly toward Mitchell Creek via the existing box culvert under Old Brock Road. Drainage to the low point at Street C and Old Brock Road (Catchment 219, 0.58 ha) will be too low to be conveyed to the West SWM Pond; therefore, an oil-grit separator is proposed to provide quality controls for this small area before the flows are discharged to the easterly Old Brock Road ditch. Drainage to the low point at Street A and Old Brock Road (Catchment 221, 0.31 ha) will be too low to be conveyed to the West SWM Pond; therefore, an oil-grit separator is proposed to provide quality controls for this small area before the flows are discharged easterly to Old Brock Road ditch. The drainage area of the pond berm of the West SWM Pond (Catchment 220, 0.24 ha) will drain to the easterly Old Brock Road ditch. The drainage flowing west of the subject lands discharges to Catchment 49 of the Duffins Creek watershed.

Runoff from the existing residential Lot 71 and rear yards of the proposed lots located in Catchment 207 (2.49 ha) will drain uncontrolled in a westerly direction to the east ditch on Old Brock Road. These flows will be conveyed west toward Mitchell Creek via the existing culvert at Old Brock Road. The drainage from this southwest portion of the site also contributes to Catchment 49 of the Duffins Creek watershed.

In order to reduce the amount of flows draining to Franklin Street and alleviate the existing flooding south of the subject lands, runoff from Catchment 201 (8.94 ha) is proposed to drain to the Southeast SWM Pond, adjacent to Brock Road. Major system flows will be captured at the south limit of the site on Street B and conveyed via storm sewer to the Southeast SWM Pond.

Flows from Catchment 200 (0.33 ha) will continue to drain to Franklin Street, as it does under existing conditions.

The Southeast SWM Pond is proposed to outlet to the Brock Road west ditch approximately 430 m south of Central Street via a proposed storm sewer. Approximately 160 m of ditch regrading (south of Central Street) is proposed to accommodate the elevation required for the proposed storm sewer outlet. The west Brock Road ditch conveys flows to Mitchell Creek approximately 1.7 km south of the proposed development. Refer to the Proposed Brock Road Ditch Regrading Plan and Profile in **Appendix D** for more details.

Rear yard drainage from the proposed lots located in Catchment 205 (1.32 ha) is proposed to drain uncontrolled in a southerly direction to the existing ditch on Brock Road and eventually to the SWD3 wetland to the south. RLCBs will be provided to convey rear yard drainage under the proposed noise berm to the west Brock Road ditch. As under existing conditions, runoff from the existing lots located in Catchment 215 (0.22 ha) will also be conveyed via a proposed ditch inlet catchbasin and storm sewer to the SWD3 wetland. Under proposed conditions, the SWD3 wetland will receive runoff from a drainage area of approximately 4.05 ha. Minor regrading of the west Brock Road ditch (approximately 130 m – north of Central Street) is proposed to maintain flows to the existing wetland. This drainage flowing south of the subject lands discharges to Catchment 47 of the Duffins Creek watershed.

2.5 Proposed Stormwater Management Plan

2.5.1 Quantity Control

The proposed end-of-pipe SWM ponds will control proposed peak flows from the site to the allowable release rates for the 2 to 100 year storm events. The preliminary design requirements of the end-of-pipe SWM facilities are discussed further in **Section 2.6**.

2.5.2 Quality Control

The proposed end-of-pipe Southeast SWM Pond (wet pond) will provide Enhanced quality protection per the Ministry of the Environment 2003 Stormwater Management Planning and Design Manual (i.e., 80% TSS Removal).

Quality control will also include a treatment train of Low Impact Development (LID) techniques as described in **Section 2.3** of this report.

Quality control will be provided for the catchments from the site draining to the intersection of Street C and Old Brock Road and the intersection of Street A and Old Brock Road through oil-grit separators. Refer to **Appendix I** for oil-grit separator sizing.

2.5.3 Erosion Control

The erosion control criteria is to retain the initial 5 mm runoff from the site. Where feasible, measures to retain the runoff volume from a 5 mm rainfall event will be incorporated. A preliminary review to determine if the 5 mm retention is feasible for the proposed development was completed and is further discussed in **Section 2.9**. Based on the Preliminary Hydrogeology Investigation provided by Golder Associates, it is anticipated the northeast portion of the site will be suitable for infiltration-based LIDs, such as soak-away pits; however, the majority of the site will likely have groundwater levels that are too high relative to the proposed ground elevation. Additional groundwater level monitoring was completed in Spring of 2018 to confirm seasonal high groundwater levels.

A minimum of 48 hours of extended detention of the runoff from a 25 mm rainfall event will be provided in the end-of-pipe SWM ponds.

2.5.4 Water Budget

The overall site water balance for the subject lands is provided in the Preliminary Hydrogeological Investigation prepared by Golder Associates (July 2021). As noted in the Preliminary Hydrogeological Investigation, the pre-development average annual infiltration volume is 39,900 m^3. Without mitigation, the estimated average annual infiltration volume will be 33,950 m^3. With the addition of septic system discharge, the average annual post-development infiltration volume will be increased to approximately 47,750 m^3, which is greater than the pre-development infiltration volume. Therefore, no further water balance mitigation measures are required to increase post-development infiltration rates.

2.6 Stormwater Management Ponds

Two stormwater management (SWM) ponds are proposed for this site: the West SWM Pond, a dry SWM pond outletting to a storm sewer that ultimately outlets to the Southeast SWM Pond, and the Southeast SWM Pond, a wet SWM pond outletting via a storm sewer to the Brock Road west ditch, approximately 430 m south of Central Street, ultimately draining to Mitchell Creek approximately 1.7 km south of the proposed development.

2.6.1 General Pond Design Criteria

Preliminary pond grading is provided on **Figures 2.3** and **2.4**. The pond designs were established based on the following general criteria, as applicable:

- A 4 m wide maintenance access road from a proposed municipal road with a maximum longitudinal slope of 10% and a maximum crossfall of 2%. This access road is to be used by machinery to access the forebay and outlet structure for maintenance purposes;
- Maintenance access road to include two access points from municipal roads, where feasible;
- Maintenance access roads to include hammerhead turning area at dead ends;
- A maximum slope of 3:1 from the pond bottom to 0.5 m below the normal water level;
- A maximum slope of 6:1 from 0.5 m below and above the normal water level;
- A maximum slope of 4:1 from 0.5 m above the normal water level to the pond grading limits along areas adjacent to municipal boundaries and rear yard lot lines. A maximum slope of 5:1 from 0.5 m above the normal water level to the pond grading limits where the slope backs on to an adjacent road system;
- A 1.5 m deep permanent pool in the forebay;
- A 3 m deep permanent pool in the aftbay for pond outletting to Contributing Redside Dace Habitat; and
- Sediment drying areas to be sized for a minimum of 10 years sediment accumulation, with a maximum slope of 10:1 and a maximum sediment height of 1.5 m.

2.6.2 Permanent Pool

The function of the permanent pool is to provide sediment removal from the storm runoff conveyed to the pond.

As the West SWM Pond is proposed to be a dry pond, no permanent pool storage volume is proposed (refer to **Figure 2.3)**.

The Southeast SWM Pond will be designed to provide permanent pool storage of 120.3 m^3/ha based on MECP's Enhanced Level Protection for a wet pond having a 28% impervious drainage area (see Table 3.2, 2003 MOE Guidelines). The required permanent pool volume is 1,876 m^3 based on a total area draining to the pond of 23.36 ha. The available permanent pool storage is 2,136 m^3 (refer to **Figure 2.4**).

The calculations for the permanent pool storage requirements of the proposed wet SWM pond are provided in **Appendix E**.

2.6.3 Extended Detention

The attenuation of the extended detention volume in the pond will provide erosion protection for the downstream watercourse as well as promote sediment removal for water quality. The extended detention volume for the proposed stormwater management facilities was sized based on the detention of the 25 mm - 4 hour Chicago rainfall event. The volume calculated for the extended detention will be attenuated for a minimum of 48 hours.

The required extended detention volume for the West SWM Pond is 984 m^3. This volume is greater than the 2003 MECP guidelines minimum extended detention volume of 64.6 m^3/ha, or 806 m^3 based on the 12.49 ha drainage area. The peak release rate for the extended detention volume is approximately 0.003 m^3/s, with a 50 mm diameter control orifice, and an extended detention time of approximately 127 hours.

The required extended detention volume for the Southeast SWM Pond is 894 m^3. This volume is greater than the 2003 MECP guidelines minimum extended detention volume of 80 m^3/ha, or 870 m^3 based on the 10.87 ha drainage area. The peak release rate for the extended detention volume is approximately 0.003 m^3/s, with a 50 mm diameter control orifice, and an extended detention time of approximately 110 hours.

The calculations for the extended detention requirements of the proposed SWM ponds are provided in **Appendix E**.

2.6.4 Quantity Control

The proposed ponds will control post-development flows from the site to the maximum allowable release rates. Hydrology modelling for the proposed conditions was completed using the VO2 model to determine the required pond volumes. A summary of modelling parameters and a VO2 schematic are provided in **Appendix C**. A CD containing the VO2 hydrology model is also provided in **Appendix C**.

The 1-hour AES and 12-hour AES design storms and the 4-hour Chicago Storm distribution per TRCA and City of Pickering requirements were modelled. Summaries of the resulting storage requirements for the SWM ponds are provided in **Tables 2.5** and **2.6**.

Table 2.5 - West SWM Pond Storage Requirements

Return Period Storm	1-Hour AES		12-Hour AES		4-Hour Chicago	
	Discharge (m^3/s)	Storage (m^3)	Discharge (m^3/s)	Storage (m^3)	Discharge (m^3/s)	Storage (m^3)
2 Year	0.003	874	0.003	**1988**	0.003	1409
5 Year	0.003	1428	0.004	**2943**	0.004	2204
10 Year	0.003	1841	0.004	**3636**	0.004	2759
25 Year	0.004	2401	0.005	**4546**	0.004	3539
50 Year	0.004	2843	0.005	**5261**	0.005	4100
100 Year	0.004	3297	0.005	**5984**	0.005	4718

Note: Bold values indicate the more conservative (higher) proposed storage volumes

Table 2.6 - Southeast SWM Pond Storage Requirements

Return Period Storm	1-Hour AES		12-Hour AES		4-Hour Chicago	
	Discharge (m^3/s)	Storage (m^3)	Discharge (m^3/s)	Storage (m^3)	Discharge (m^3/s)	Storage (m^3)
2 Year	0.003	815	0.004	**1857**	0.004	1303
5 Year	0.004	1306	0.005	**2711**	0.004	2009
10 Year	0.004	1674	0.005	**3327**	0.005	2501
25 Year	0.004	2169	0.006	**4133**	0.005	3191
50 Year	0.005	2559	0.006	**4765**	0.006	3685
100 Year	0.005	2959	0.007	**5404**	0.006	4228

Note: Bold values indicate the more conservative (higher) proposed storage volumes

The stage-storage-discharge characteristics of the SWM Ponds are provided below in **Tables 2.7** and **2.8**.

Table 2.7 - West SWM Pond Stage-Storage-Discharge Characteristics

Return Period Storm	Governing Design Storm	Stage (m)	Storage (m^3)	Discharge (m^3/s)
2 Year	12-Hour AES	267.69	1988	0.003
5 Year	12-Hour AES	267.83	2943	0.004
10 Year	12-Hour AES	267.93	3636	0.004
25 Year	12-Hour AES	268.05	4546	0.005
50 Year	12-Hour AES	268.15	5261	0.005
100 Year	12-Hour AES	268.24	5984	0.005

Note: The 12-Hour AES design storm resulted in the largest storage volume requirements in the West SWM pond.

Table 2.8 - Southeast SWM Pond Stage-Storage-Discharge Characteristics

Return Period Storm	Governing Design Storm	Stage (m)	Storage (m^3)	Discharge (m^3/s)
2 Year	12-Hour AES	264.13	1857	0.004
5 Year	12-Hour AES	264.37	2711	0.005
10 Year	12-Hour AES	264.54	3327	0.005
25 Year	12-Hour AES	264.74	4133	0.006
50 Year	12-Hour AES	264.89	4765	0.006
100 Year	12-Hour AES	265.04	5404	0.007

Note: The 12-Hour AES design storm resulted in the largest storage volume requirements in the Southeast SWM pond.

2.6.4.1 Comparison of Pond Release Rates

Tables 2.9 and **2.10** below compare the maximum allowable release rates to the Duffins Creek Watershed Catchments with the proposed release rates from the SWM ponds. A 50 mm diameter control orifice is proposed for both ponds to minimize the release rates to the extent feasible. As shown in **Table 2.9**, the release rates from the West SWM Pond will not exceed the target releases rates. As shown in **Table 2.10**, the release rates from the Southeast SWM Pond will exceed the maximum allowable release rates by 2 L/s in the 2 year storm event and 1 L/s in the 5 year storm event. The target release rates for the 2 and 5 year storm events are based on release rates provided by TRCA, which are significantly lower than the existing condition peak flows. Meeting the proposed TRCA target release rates would require an orifice size of less than 50 mm, which is not recommended. As outlined in **Section 2.7** below, the overall downstream proposed peak release rates are significantly lower than existing peak release rates for every storm event.

Table 2.9 - Comparison of Maximum Allowable Release Rates with Proposed Release Rates from West SWM Pond

	West SWM Pond Flows (m^3/s)					
	2 Year	**5 Year***	**10 Year***	**25 Year***	**50 Year***	**100 Year**
Maximum Allowable Discharge to Catchment 49	0.003	-	-	-	-	0.006
Maximum Proposed West SWM Pond Release Rates	0.003	0.004	0.004	0.005	0.005	0.005

*Note: 5, 10, 25 and 50 year targets have not been provided by TRCA

Table 2.10 - Comparison of Maximum Allowable Release Rates with Proposed Release Rates from Southeast SWM Pond

	Southeast SWM Pond Flows (m^3/s)					
	2 Year	**5 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Maximum Allowable Discharge to Catchment 47	0.002	0.004	0.005	0.006	0.007	0.008
Maximum Proposed Southeast SWM Pond Release Rates	0.004	0.005	0.005	0.006	0.006	0.007

2.7 Comparison of Proposed Release Rates to Existing Peak Flows

The proposed release rates to the Duffins Creek Watershed catchments from the site, including release rates from the proposed ponds and runoff from uncontrolled areas, were compared to the existing peak flows. As shown in **Tables 2.11** to **2.13**, the proposed peak flows to the Duffins Creek Watershed catchments will not exceed and are well below existing peak flows from the subject development.

Table 2.11 - Comparison of Existing and Proposed Peak Flows to Duffins Creek Watershed Catchments with 1-Hour AES Storm

Return Period Storm	Duffins Creek Watershed Catchment 47 (north of Central St.)		Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m^3/s)	**Proposed (m^3/s)**	**Existing (m^3/s)**	**Proposed (m^3/s)**	**Existing (m^3/s)**	**Proposed (m^3/s)**
2 Year	0.070	0.021	0.178	0.141	0.110	0.073
5 Year	0.139	0.040	0.352	0.211	0.218	0.117
10 Year	0.194	0.054	0.493	0.261	0.305	0.152
25 Year	0.274	0.075	0.694	0.333	0.429	0.206
50 Year	0.338	0.092	0.857	0.390	0.531	0.264
100 Year	0.406	0.109	1.027	0.466	0.637	0.317

Table 2.12 - Comparison of Existing and Proposed Peak Flows to Duffins Creek Watershed Catchments with 12-Hour AES Storm

Return Period Storm	Duffins Creek Watershed Catchment 47 (north of Central St.)		Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m^3/s)	Proposed (m^3/s)	Existing (m^3/s)	Proposed (m^3/s)	Existing (m^3/s)	Proposed (m^3/s)
2 Year	0.067	0.022	0.199	0.074	0.114	0.056
5 Year	0.108	0.034	0.323	0.114	0.185	0.091
10 Year	0.139	0.043	0.417	0.144	0.238	0.117
25 Year	0.179	0.055	0.542	0.184	0.309	0.151
50 Year	0.212	0.064	0.642	0.216	0.365	0.179
100 Year	0.245	0.074	0.744	0.247	0.423	0.207

Table 2.13 - Comparison of Existing and Proposed Peak Flows to Duffins Creek Watershed Catchments with 4-Hour Chicago Storm

Return Period Storm	Duffins Creek Watershed Catchment 47 (north of Central St.)		Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m^3/s)	Proposed (m^3/s)	Existing (m^3/s)	Proposed (m^3/s)	Existing (m^3/s)	Proposed (m^3/s)
2 Year	0.083	0.025	0.203	0.165	0.127	0.097
5 Year	0.163	0.048	0.397	0.260	0.248	0.161
10 Year	0.226	0.065	0.548	0.332	0.342	0.214
25 Year	0.316	0.089	0.765	0.437	0.478	0.296
50 Year	0.387	0.108	0.937	0.522	0.585	0.354
100 Year	0.466	0.128	1.128	0.605	0.703	0.417

2.8 Franklin Street Drainage Improvements

Based on the proposed storm drainage concept, there will be a significant reduction in the drainage area and resulting peak flows and runoff volume to the Franklin Street outlet. **Table 2.14** below summarizes these reductions. The most conservative result based on AES and Chicago storm modelling have been shown **in Table 2.14.** A full summary of the results is provided in **Appendix C**.

Table 2.14 – Existing and Proposed Drainage to Franklin Street

	Drainage Area to Franklin St. (ha)	100 Year Peak Flow to Franklin St. from Subject Lands (m^3/s)	100 Year Peak Flow at the Franklin St. DICB's, north of Joseph St. (m^3/s)	100 Year Peak Flow at Franklin St. and Central St. (L/s)	100 Year Runoff Volume to Franklin St. from Subject Lands (m^3)	100 Year Runoff Volume at Franklin St. and Centre St. (m^3)
Existing	8.71	0.128	0.835	0.985	3409	4919
Proposed	0.33	0.037	0.141	0.291	117	1619
Change*	-96%	-97%	-83%	-70%	-97%	-67%

* Note that a negative value represents a decrease or reduction.

As illustrated in **Table 2.14**, the 100 year peak flows and runoff volumes from the site to Franklin Street will be reduced by 97%, thus, dramatically improving the current drainage conditions. Slightly lower reductions in peak flows and runoff volumes will be realized at the intersection of Franklin and Centre Streets of 83% and 70%, respectively, as the drainage from Catchment 300 (1.83 ha) and Catchment 301 (2.31 ha) of existing development and drainage from the proposed development of Catchment 200 (0.33 ha) along Franklin Street will continue to drain to this location. The detailed hydrology (VO2) modelling has been enclosed on a CD in **Appendix C**.

2.9 Soak-away Pits

Soak-away pits are proposed in front yards on lots where depth to groundwater is sufficient, with a minimum setback of 5 m to the house. Roof leaders from the front half of roofs will be directly connected to the soak-away pits and overflow connections to the storm sewer system will be provided. **Figure 2.6** illustrates the 36 lots proposed to have soak-away pits.

2.9.1 Sizing

Soak-away pits are proposed to provide on-site retention of the 5 mm runoff volume, for the purpose of providing erosion control. Based on the preliminary sizing, a total soak-away pit storage volume of 381 m^3 is required. Soak-away pits are proposed on approximately 36 lots, with a depth of 0.50 m, width of 2.0 m and a length of 27 m. The proposed soak-away pits will provide the required storage volume. Refer to **Appendix F** for sizing calculations.

2.9.2 General Soak-away Design Criteria

The soak-away pits will be designed with the following general criteria:

- Soak-away pits will be in private ownership;
- Estimated infiltration rate is 50 mm/hour with a 3.5 safety factor (14 mm/hr);
- Soak-away pits to consist of 50 mm diameter clearstone wrapped in non-woven filter cloth;

- Minimum 1.0 m separation from high groundwater level; and
- A maximum drawdown time of 72 hours.

The specific lots which are suitable for soak-away pits are to be verified upon confirmation of seasonal high groundwater levels.

2.10 Storm Servicing

A proposed municipal storm sewer system (minor system) will be designed for the 5 year return storm as per the City of Pickering standards.

The major system flow drainage (up to the 100 year storm event) will generally be conveyed overland along the road rights-of-way and easements. **Figure 2.2** indicates the locations where the 100 year storm event will be captured by the proposed storm sewer system.

The storm sewer system will typically be designed with grades between 0.5% and 2% and will generally be constructed at a minimum depth of 1.8 m to top of pipe. The preliminary layout for the proposed storm sewers within the subject lands is provided on **Figure 2.6**.

As shown on **Figure 2.6**, sump pumps are proposed on approximately 28 lots where the proposed storm sewer will not be at sufficient depth to accommodate foundation drain connections.

The storm drainage system will be designed in accordance with the City of Pickering and MOE guidelines, including the following:

- Pipes to be sized to accommodate runoff from a 5 year storm event,
- Minimum Pipe Size: 300 mm diameter,
- Maximum Flow Velocity: 5.0 m/s,
- Minimum Flow Velocity: 0.8 m/s,
- Minimum Pipe Depth: 1.8 m to top of pipe.

The rainfall intensity will be calculated as follows, where 'i' is the rainfall intensity (mm/hour) and A, B, and C are as per **Table 2.15**:

$$i = A / (T_c + B)^c$$

Table 2.15 - Rainfall Intensity Parameters

Return Period Storm	A	B	C
2 Year	715.076	5.262	0.815
5 Year	1082.901	6.007	0.837
10 Year	1313.979	6.026	0.845
25 Year	1581.718	6.007	0.848
50 Year	1828.009	6.193	0.856
100 Year	2096.425	6.485	0.863

2.11 Overland Flow

A portion of the major system flows (greater than the 5 year up to the 100 year storm event) will be conveyed within the rights-of-way directly to the proposed SWM ponds. The major system flows to the 100 year capture points on Streets B and D will be captured by catchbasins and conveyed to the SWM ponds. 100 year capture points on Streets A and C are provided to minimize uncontrolled drainage to Old Brock Road. Right-of-way capacity calculations are provided in **Appendix G** and show that the major system flows can be safely conveyed within the proposed road rights-of-way. As discussed in **Section 2.8**, overland flow to Franklin Street will be reduced from existing conditions and the majority of flows will be conveyed via storm sewer to the Southeast SWM Pond.

3.0 SANITARY SERVICING

3.1 Existing System

There are no existing municipal sanitary sewers or wastewater treatment plants available to service the site. The existing residential lots adjacent to the site are currently serviced by privately owned on-site sewage systems.

3.2 Proposed System

The proposed sanitary treatment system for the site will consist of privately owned on-site Level IV (tertiary) sewage systems approved under the Ontario Building Code. As discussed in the Private Servicing Feasibility Letter prepared by Golder Associates (July 2021), the proposed draft plan will be technically achievable for private sewage systems. The privately owned sewage systems and sizing will be described in greater detail at the detailed design stage.

3.3 Servicing Allocation

No sanitary servicing allocation will be required from the Region of Durham or the City of Pickering since the subject lands are proposed to be serviced by private septic systems.

4.0 WATER SUPPLY AND DISTRIBUTION

4.1 Existing Water Distribution

There are no existing municipal watermains or water treatment plants available to service the site. The existing residences adjacent to the site are currently serviced by private wells.

4.2 Proposed Water System

The proposed water source for the site will consist of privately owned wells. As discussed in the Private Servicing Feasibility Letter by Golder Associates (July 2021), data from the Ontario Ministry of the Environment, Conservation and Parks (MECP) Water Well Records suggest there is adequate to more than adequate water supply potential for the site.

4.3 Servicing Allocation

No water servicing allocation will be required from the Region of Durham or the City of Pickering since the subject lands are proposed to be serviced by private wells.

5.0 SITE GRADING

5.1 Existing Grading Conditions

Under existing conditions, the majority of the site slopes down from its centre to the boundaries of the property, towards the existing roads on the west and east sides and towards the existing environmental features to the north and south. The existing site topography has slopes in the range of 1% to 5%. The ground surface elevations through the site range from approximately 278.5 m in the northwest to approximately 264.85 m in the southeast corner.

5.2 Proposed Grading Concept

In general, the site will be graded in a manner which satisfies the following goals:

- City of Pickering lot and road grading criteria including:
  - Minimum Road Grade: 0.5%
  - Maximum Road Grade: 6.0%
  - Minimum Lot Grade: 2%
  - Maximum Lot Grade: 5%
- Provide continuous road grades for overland flow conveyance;
- Eliminate the need for retaining walls;
- Minimize the volume of earth to be moved and minimize cut/fill differential;
- Match existing drainage patterns;
- Provide sufficient cover for the storm sewer system; and
- Achieve the stormwater management objectives required for the site.

A preliminary grading plan is provided on **Figure 5.1**. The site will generally be graded to match existing elevations along the boundaries on all sides. As illustrated on **Figure 5.1**, a maximum of 3:1 sloping will be required at the northeast limit of the site to accommodate the grade difference between existing and proposed ground elevations.

At the detailed design stage, the preliminary grading shown on **Figure 5.1** will be subject to a more in-depth analysis in an attempt to balance the cut and fill volumes and minimize slopes and retaining walls.

6.0 RIGHTS-OF-WAY

The City of Pickering standard 20 m residential right-of-way cross-section with 8.5 m pavement width is proposed (refer to **Appendix H**). Sidewalks are not proposed for this development.

7.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During the detailed design stage, erosion and sediment control measures will be designed with a focus on erosion control practices (such as stabilization, track walking, staged earthworks, etc.) as well as sediment controls (such as fencing, mud mats, catchbasin sediment control devices, rock check dams and temporary sediment control ponds). These measures will be designed and constructed as per the "Erosion and Sediment Control Guide for Urban Construction" document published by the Greater Golden Horseshoe Area Conservation Authorities (December 2019). A detailed erosion and sediment control plan will be prepared for review and approval by the City of Pickering and TRCA prior to any site grading being undertaken. This plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses and properties are minimized both during and following construction.

8.0 SUMMARY

This Functional Servicing and Stormwater Management Report has been prepared in connection with the Draft Plan of Subdivision and Zoning By-law Amendment applications for the proposed development in the Hamlet of Claremont, in the City of Pickering. This report outlines the means by which the site can be graded and serviced in accordance with the City of Pickering, TRCA, Durham Region, MNRF, MECP design criteria and policies.

General Information

- The existing land use is primarily agricultural;
- The site is located in the East Duffins Creek subwatershed and is within the catchment area to Mitchell Creek.
- The proposed development consists of 70 proposed residential lots and 1 existing lot.

Stormwater Management and Storm Servicing

- Quality Control: MOE Enhanced (Level 1) water quality protection will be provided through the use of a wet SWM pond and oil-grit separators;
- Erosion Control: On-site retention of the initial 5 mm runoff from the site will be provided through LIDs (such as soak-away pits) to the extent feasible. The runoff volume from a 25 mm rainfall event will be detained over a minimum of 48 hours by the SWM ponds;
- Quantity Control: Quantity control will be provided via two SWM ponds to control proposed release rates to the target release rates provided by the TRCA for East Duffins watershed, in the community of Claremont;
- Major system flows to Franklin Street will be captured at the south limit of the site and piped to the Southeast SWM Pond to alleviate the existing flooding on Franklin Street, south of the subject lands.
- Water Budget: Golder Associates has completed a water budget analysis demonstrating that the proposed annual infiltration rates will be greater than existing rates;
- Storm Servicing:
    - Storm runoff will be conveyed by storm sewers designed in accordance with City of Pickering and MECP criteria;
    - Storm sewers will generally be designed for the 5 year storm event; and
    - Adequate 100 year overland flow routes and capture locations will be provided.

Sanitary Sewage Disposal

- The proposed sanitary treatment system will consist of privately owned on site Level IV sewage systems.

Water Supply

- The proposed water supply will consist of privately owned wells.

Site Grading

- The site grading has been developed to match the existing surrounding grades, and provide conveyance of stormwater runoff; and
- The lot grading will be subject to further grading design at the detailed design stage prior to the building permit applications.

Rights-of-Way and Sidewalks

- The City of Pickering Design Standard 20 m right-of-way with 8.5 m pavement width is proposed (without sidewalks).

Erosion and Sediment Control during Construction

- An erosion and sediment control plan will be prepared at the detailed engineering stage, in accordance with the Greater Golden Horseshoe Area Conservation Authorities "Erosion and Sediment Control Guide for Urban Construction" (December 2019).

Respectfully Submitted:

SCS Consulting Group Ltd.

LICENSED PROFESSIONAL ENGINEER
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JULY 07, 2021
PROVINCE OF ONTARIO

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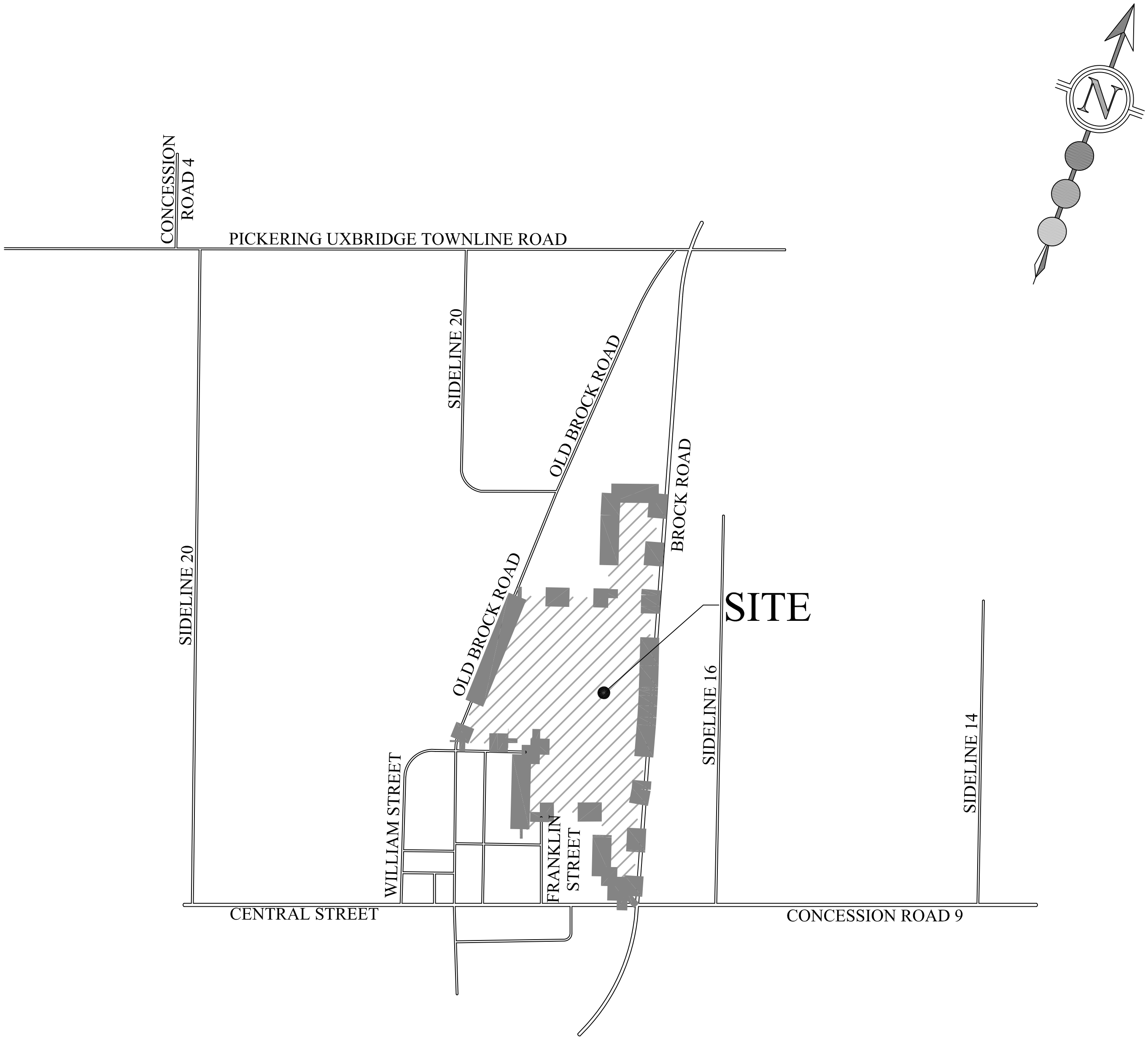

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5113 BROCK ROAD - FSSR

SITE LOCATION PLAN

DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	PROJECT No: 1470	FIGURE No: 1.1
SCALE: N.T.S.	DATE: JULY 2021		

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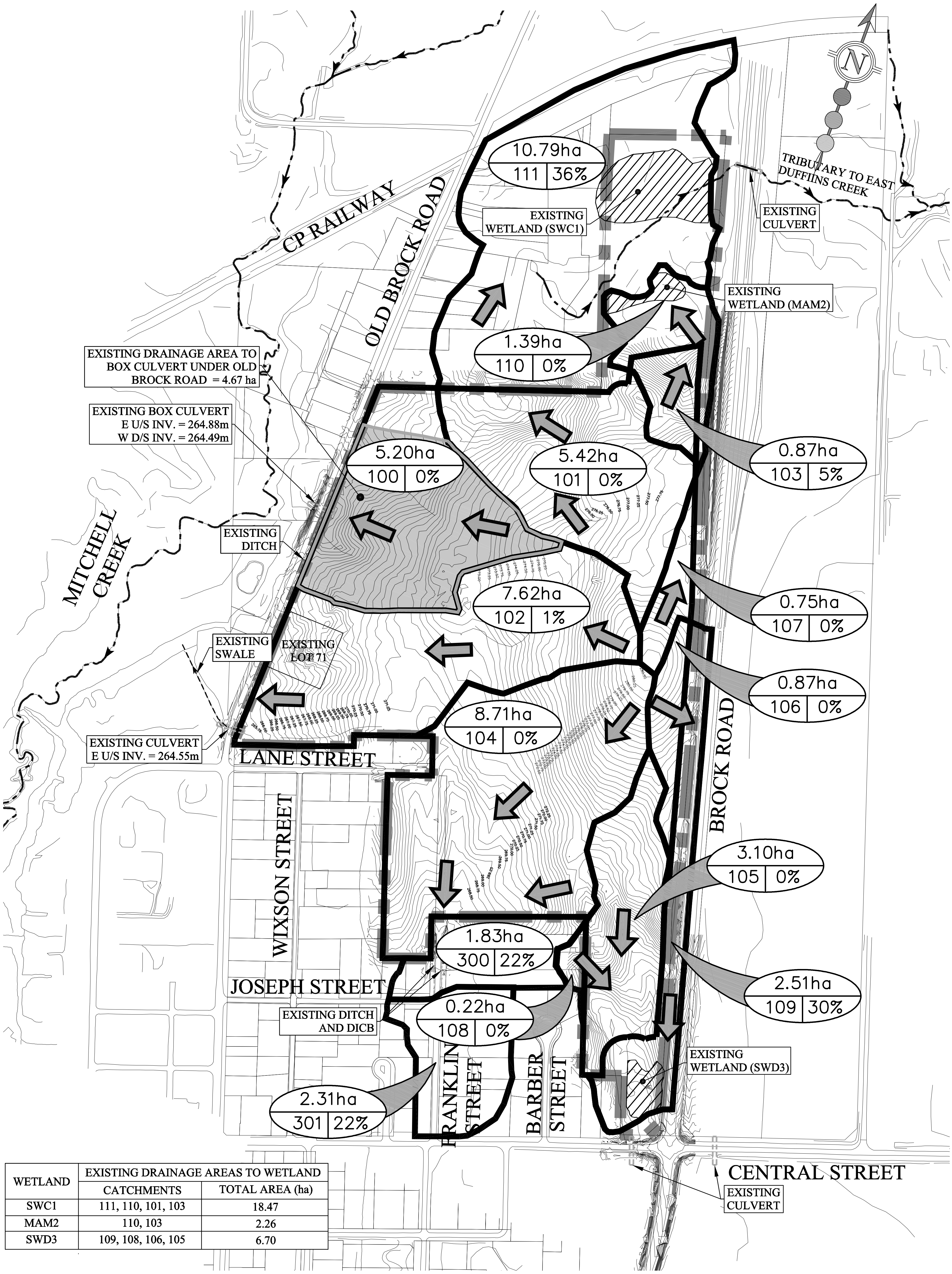

WETLAND	EXISTING DRAINAGE AREAS TO WETLAND	
	CATCHMENTS	TOTAL AREA (ha)
SWC1	111, 110, 101, 103	18.47
MAM2	110, 103	2.26
SWD3	109, 108, 106, 105	6.70

LEGEND:

- PROPERTY BOUNDARY
- STORM DRAINAGE BOUNDARY
- WATERCOURSE
- 270.25 EXISTING CONTOUR
- 12.52ha — DRAINAGE AREA (HECTARES)
- 211 25% — % IMPERVIOUSNESS; CATCHMENT ID
- OVERLAND FLOW
- EXISTING WETLAND

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EXISTING STORM DRAINAGE PLAN

DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	PROJECT No: 1470	FIGURE No: 2.1
SCALE: 1:5000	DATE: JULY 2021		

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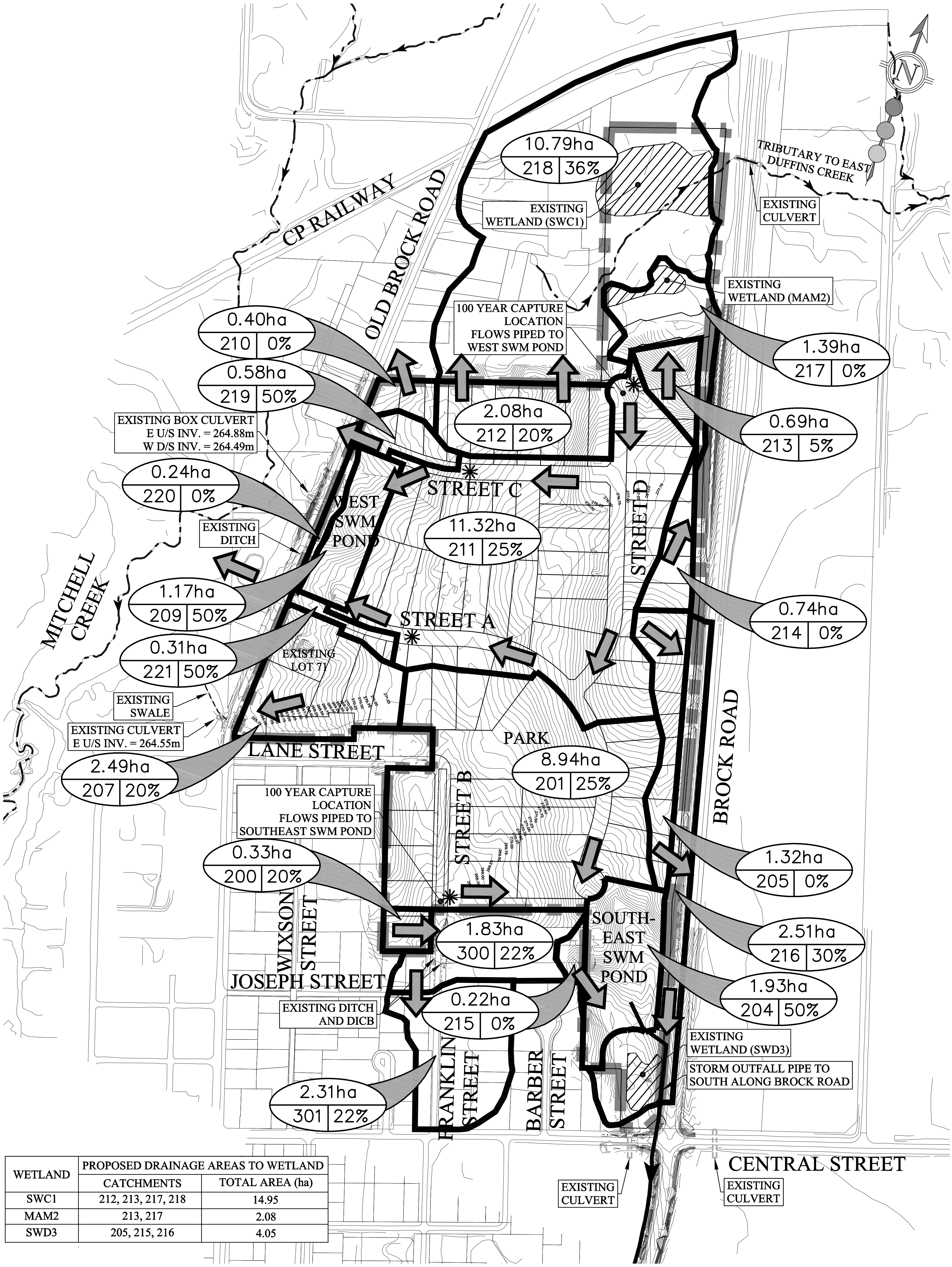

WETLAND	PROPOSED DRAINAGE AREAS TO WETLAND	
	CATCHMENTS	TOTAL AREA (ha)
SWC1	212, 213, 217, 218	14.95
MAM2	213, 217	2.08
SWD3	205, 215, 216	4.05

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

- PROPERTY BOUNDARY
- STORM DRAINAGE BOUNDARY
- WATERCOURSE
- 270.25 EXISTING CONTOUR
- 12.52ha — DRAINAGE AREA (HECTARES)
- 25% — % IMPERVIOUSNESS
- 211 — CATCHMENT ID
- OVERLAND FLOW
- EXISTING WETLAND
- 100 YEAR CAPTURE POINT

CLAREMONT DEVELOPMENTS INC. 3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR	PROPOSED STORM DRAINAGE PLAN	
SCS consulting group ltd 30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M. / CHECKED BY: S.E.K. / SCALE: 1:5000 / DATE: JULY 2021	PROJECT No: 1470	FIGURE No: 2.2

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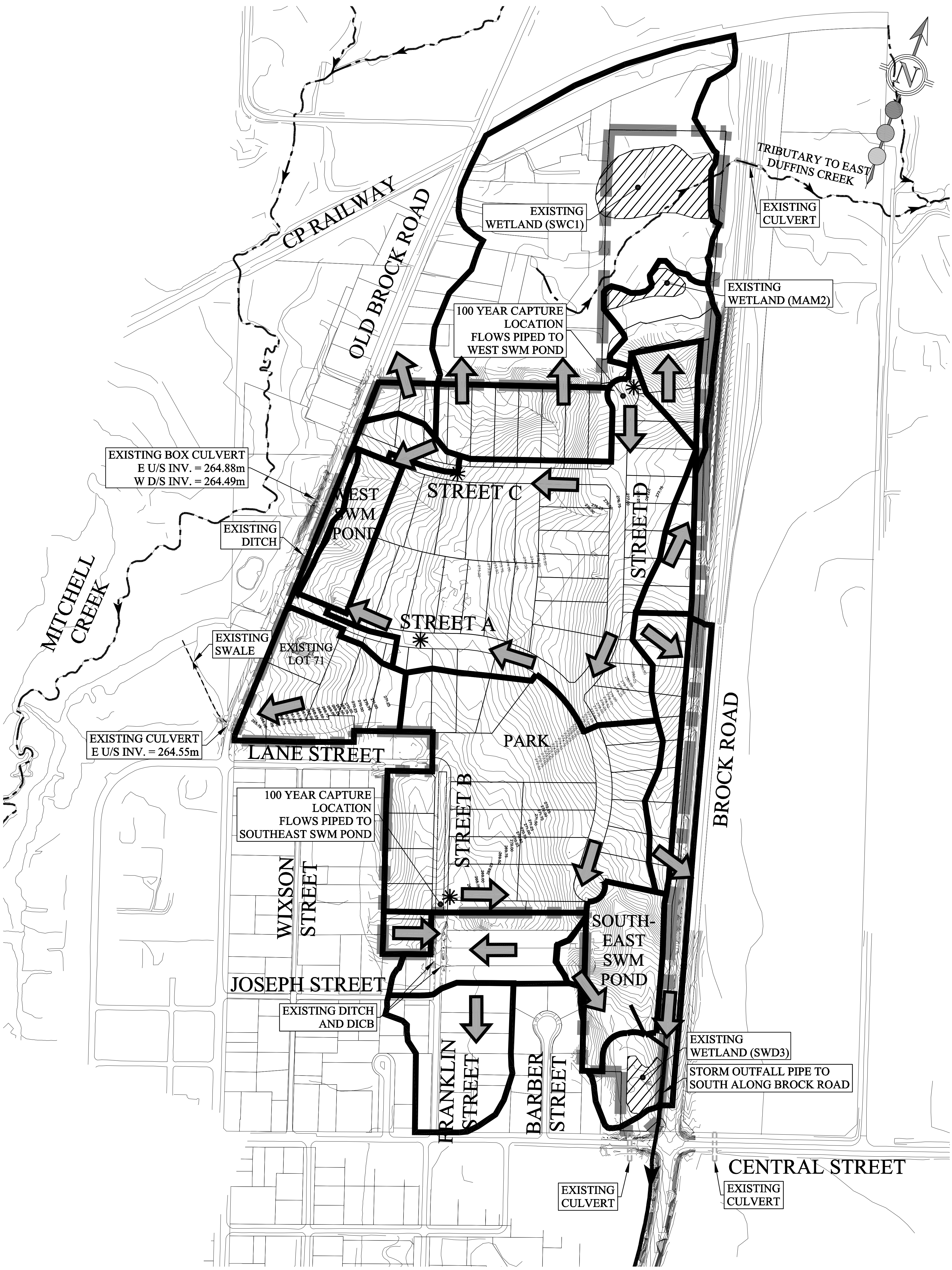

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

PROPERTY BOUNDARY

STORM DRAINAGE BOUNDARY

WATERCOURSE

270.25 EXISTING CONTOUR

OVERLAND FLOW

EXISTING WETLAND

100 YEAR CAPTURE POINT

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5113 BROCK ROAD - FSSR

PROPOSED STORM DRAINAGE SCHEMATIC

DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	PROJECT No: 1470	FIGURE No: 2.3
SCALE: 1:5000	DATE: JULY 2021		

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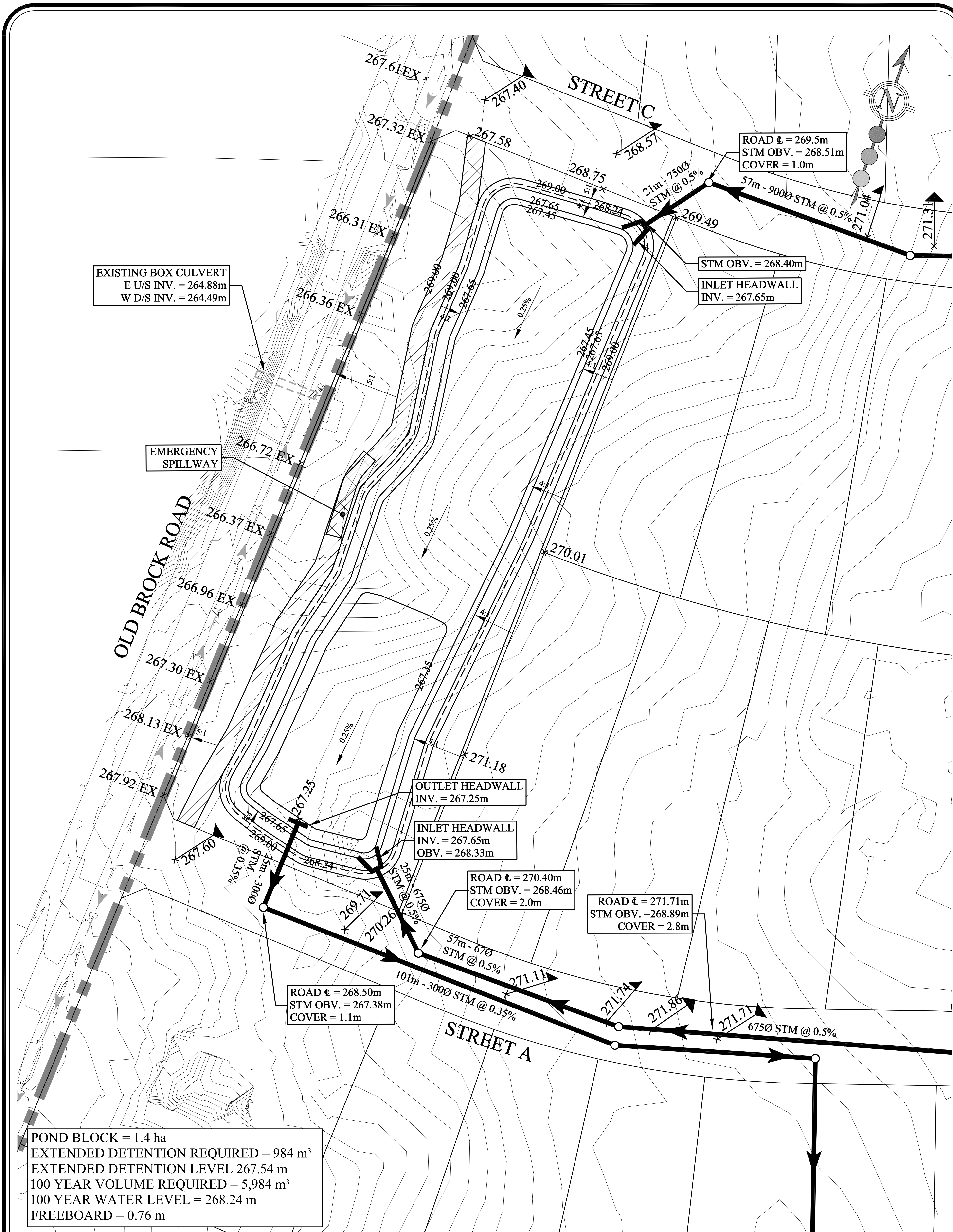

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

- PROPOSED BOUNDARY
- 270.25 — EXISTING CONTOUR AND ELEVATION
- 239.50 — PROPOSED CONTOUR AND ELEVATION
- PROPOSED STORM SEWER
- ×238.25 — PROPOSED ELEVATION
- ×238.25 EX — EXISTING ELEVATION
- EMERGENCY SPILLWAY
- MAINTENANCE ACCESS ROAD

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SCS consulting group ltd	30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M. / CHECKED BY: S.E.K. SCALE: 1:1000 / DATE: JULY 2021	PROJECT No: 1470 / FIGURE No: 2.4

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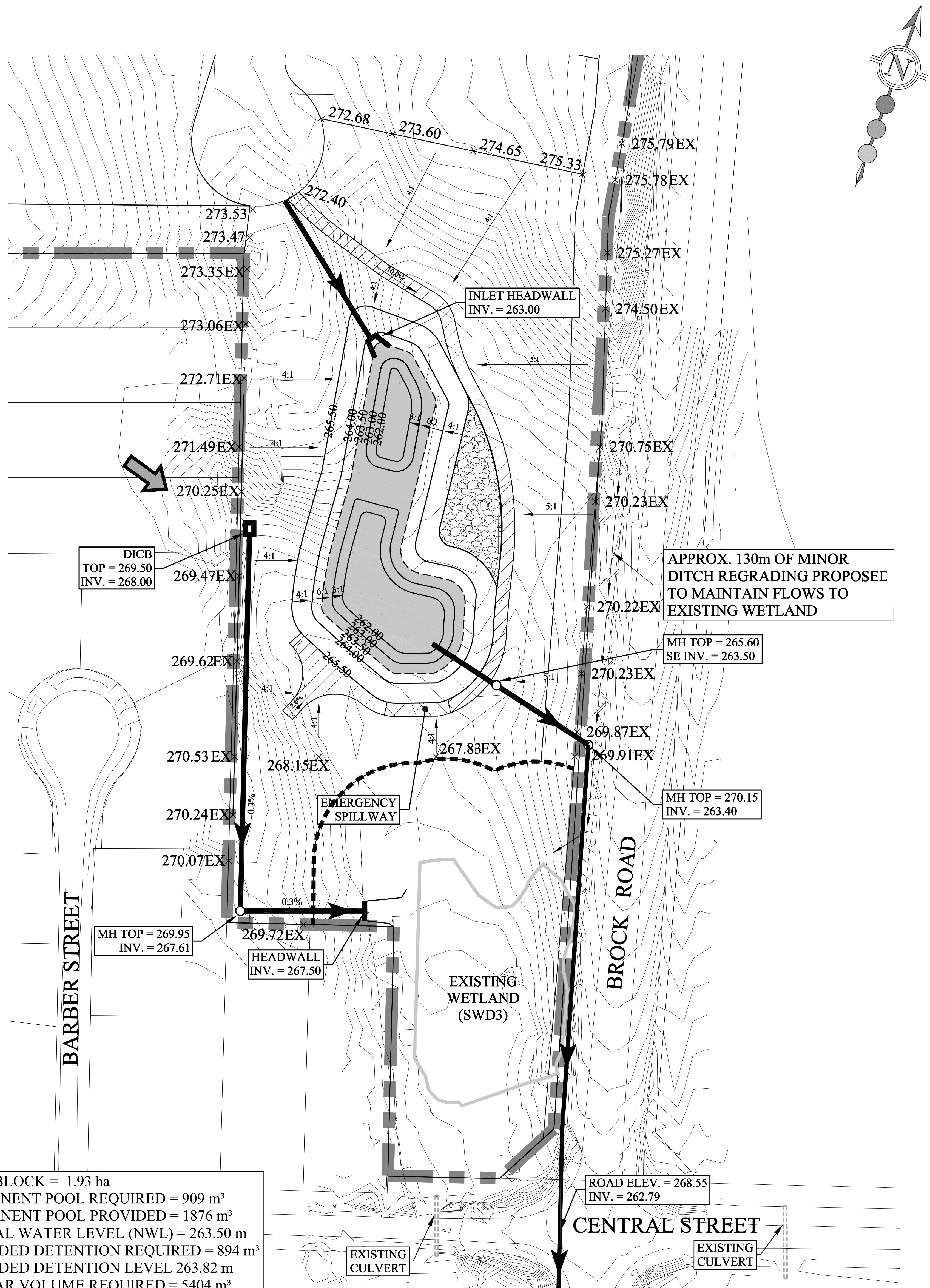


POND BLOCK = 1.93 ha
PERMANENT POOL REQUIRED = 909 m³
PERMANENT POOL PROVIDED = 1876 m³
NORMAL WATER LEVEL (NWL) = 263.50 m
EXTENDED DETENTION REQUIRED = 894 m³
EXTENDED DETENTION LEVEL 263.82 m
100 YEAR VOLUME REQUIRED = 5404 m³
100 YEAR WATER LEVEL = 265.04 m
FREEBOARD = 0.46 m

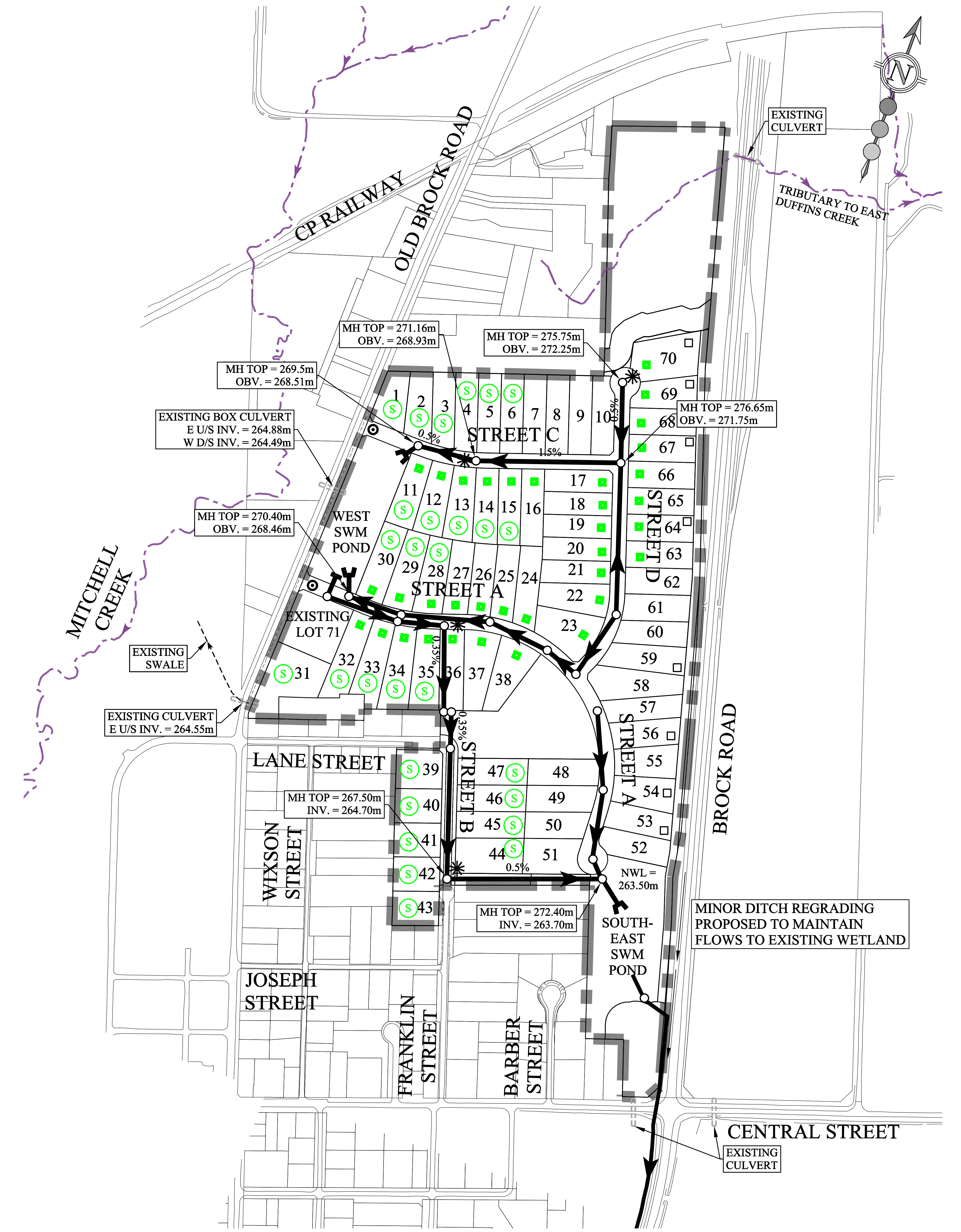
*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

- PROPOSED BOUNDARY
- 270.25 — EXISTING CONTOUR AND ELEVATION
- 239.50 — PROPOSED CONTOUR AND ELEVATION
- 10m WETLAND BUFFER
- PROPOSED STORM SEWER
- ×238.25 — PROPOSED ELEVATION
- ×238.25EX — EXISTING ELEVATION
- SEDIMENT DRYING AREA
- EMERGENCY SPILLWAY
- PERMANENT POOL
- GRANULAR MAINTENANCE ACCESS ROAD (P-1011)
- OVERLAND FLOW

CLAREMONT DEVELOPMENTS INC.	3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR	SOUTHEAST SWM POND
SCS consulting group ltd	30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M. CHECKED BY: S.E.K. SCALE: 1:1250 DATE: JULY 2021	PROJECT No: 1470 FIGURE No: 2.5

File: P:\1470 Toko - Claremont (Pickering)\Drawings\FSP\Fig\Report Figures\1470P-POND-2.5.dwg - Revised by <DDILAY> : Tue, Jun 08 2021 - 11:33pm



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

- PROPERTY BOUNDARY
- PROPOSED STORM SEWER
- 100 YEAR CAPTURE POINT
- PROPOSED LOT WITH SOAK-AWAY PIT
- LOT WITH PROPOSED SUMP PUMP
- PROPOSED REAR LOT CATCHBASIN
- OIL-GRIT SEPARATOR

CLAREMONT DEVELOPMENTS INC.	3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR	STORM SERVICING PLAN
SCS consulting group ltd	30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M. CHECKED BY: S.E.K. SCALE: 1:5000 DATE: JULY 2021	PROJECT No: 1470 FIGURE No: 2.6

File: P:\1470 Toko – Claremont (Pickering)\Drawings\FSP\Fig\Report Figures\1470P–SERV–2.6.dwg – Revised by <DDILAY> : Fri, Jun 11 2021 – 1:42am

CLAREMONT DEVELOPMENTS INC. 3190 STEELES AVENUE EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	LEGEND:	5113 BROCK ROAD - FSSR	PRELIMINARY GRADING PLAN
SCS consulting group ltd 30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	PROPOSED BOUNDARY; 270.25 EXISTING CONTOUR AND ELEVATION; 239.50 PROPOSED CONTOUR AND ELEVATION; ×238.25 PROPOSED ELEVATION; ×238.25 SW SWALE INVERT ELEVATION; ×238.25 EX EXISTING ELEVATION; F FRONT DRAIN; S SPLIT DRAIN; (S) LOT WITH PROPOSED SUMP PUMP; □ REAR LOT CATCHBASIN; ✳ 100 YEAR CAPTURE POINT	DESIGNED BY: L.C.M. CHECKED BY: S.E.K. SCALE: 1:2000 DATE: JULY 2021	PROJECT No: 1470 FIGURE No: 5.1

File: P:\1470 Toko – Claremont (Pickering)\Drawings\FSP\Fig\Report Figures\1470P-GRAD-5.1.dwg – Revised by <DDILAY> : Fri, Jun 11 2021 – 1:17am

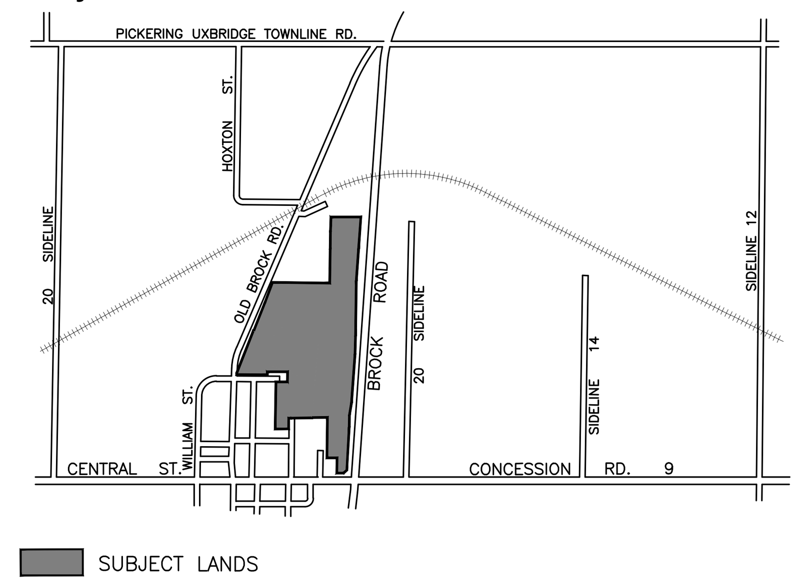
APPENDIX A

DRAFT PLAN

Draft Plan of Subdivision 21T-

Part of Lots 17 & 18, Concession 9
(Geographic Township of Pickering)
Lots 32, 47 & 48, and Part of Lot 31,
Registered Plan 12
City of Pickering
Regional Municipality of Durham

Key Plan



Schedule of Land Use

Lot/Block	Land Use	Units	Area(ha)
1-70	Estate Residential Lots	70	22.98
71	Existing Residential	1	0.58
72	Park		1.70
73-74	SWM Pond		3.32
75-77	Open Space		4.24
78-79	30m Open Space Buffers		0.84
80	Noise Attenuation		0.89
81-82	Road Widening		0.09
83-85	to be conveyed to adjacent lot		0.33
	Roads Streets A-D (20m R.O.W.) 1,605m		3.21
Total		71	38.18

NOTES

All measurements are in metres.
All elevations refer to Geodetic Datum.
All corner roundings are 5.0mR, unless otherwise stated.

Owner's Authorization

I , Boaz Feiner of Claremont Developments Inc., hereby authorize Malone Given Parsons Ltd. to prepare and submit this Draft Plan of Subdivision to the City of Pickering.

Boaz Feiner
Claremont Developments Inc.

Date: Jul-14-2021

Surveyor's Certificate

I hereby certify that the boundaries of the land to be subdivided and their relationship to the adjoining properties are correctly shown on this Draft Plan.

C.P. Edward, O.L.S.
Rady-Pentek & Edward Surveying Ltd.

Date: July 13, 2021

Additional Information

As required under section 51(17) of the Planning Act (R.S.O. 1990 C.P. 13)

a), e), f), j) As shown on Draft Plan.
b), g) As shown on Draft and Key Plans.
c) As shown on Key Plan.
d) Residential.
h), k) Municipal services to be provided.
i) Silt Loam soil.
l) As shown on Draft Plan.

Note: Contours relate to Canadian Geodetic Datum.

MALONE GIVEN PARSONS LTD.
140 Renfrew Drive, Suite 201
Markham, Ontario, L3R 6B3
Tel. (905) 513-0170
Fax. (905) 513-0177

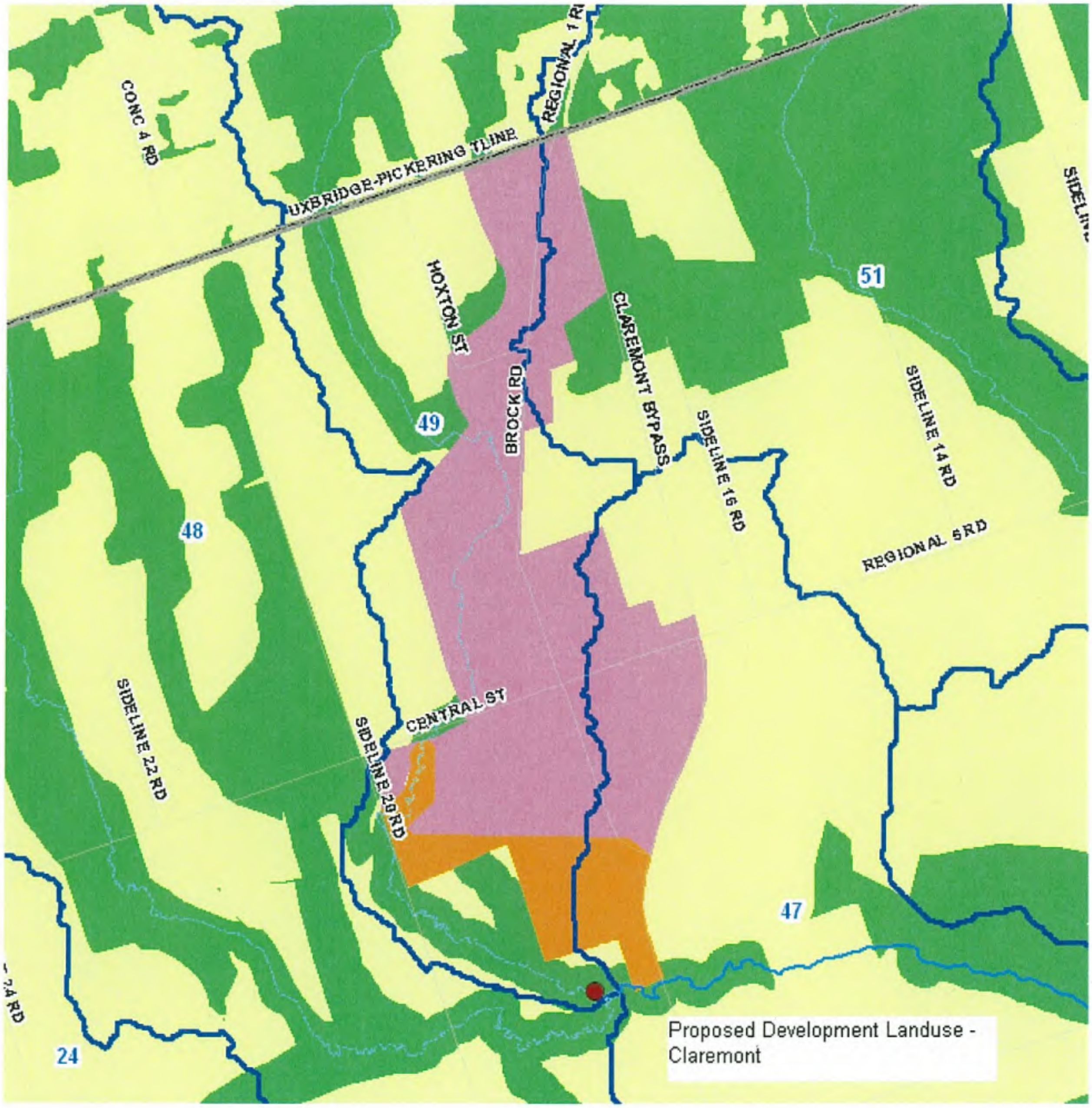
Project No. 12-2110
Date: January 31, 2018
Revised: March 1, 2018
July 2021

Scale:
0 50 100 150 200m

APPENDIX B

BACKGROUND INFORMATION

SCS consulting group ltd



TRCA Duffins Creek Watershed Catchments

Tse, Noel

From:	Wang, Eric
Sent:	May-07-14 3:45 PM
To:	Kurtz, Sarah
Cc:	Dunning, Cameron
Subject:	FW: Claremont Unit Release Rates
Attachments:	Claremont Estates_1.pdf

Hi Sarah,

We have received the formal letter from the TRCA re: the allowable unit release flow rate for the Toko Claremont site.

Eric Wang, P. Eng.
SCS Consulting Group Ltd.
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8
Phone: (905) 475-1900 (ext. 2239)
Fax: (905) 475-8335
E-Mail: ewang@scsconsultinggroup.com
http://www.scsconsultinggroup.com

From: Chris Jones [mailto:cjones@trca.on.ca]
Sent: May-07-14 3:13 PM
To: Wang, Eric
Cc: Steve Heuchert; Rob Grech; mgadzovski@city.pickering.on.ca
Subject: Claremont Unit Release Rates

Hello Eric:

Further to your discussion with Rob, please find the following letter attached.

Thanks,

Chris Jones, MCIP, RPP
Senior Planner
Planning and Development
Toronto and Region Conservation Authority
5 Shoreham Drive
Downsview, Ontario M3N 1S4
Phone: (416) 661-6600 ext. 5718
Fax: (416) 661-6898
cjones@trca.on.ca
www.trca.on.ca

May 7, 2014

CFN

VIA MAIL AND EMAIL (ewang@scsconsultinggroup.com)

Eric Wang, P. Eng.
SCS Consulting Group Ltd.
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8

Dear Mr Wang:

Re: Revised Unit Release Rates
Duffins Creek Watershed at the Community of Claremont
City of Pickering

As you know, we have completed a consultation with you in order to look at the proposed changes in the land use Claremont, and the resulting impact on the unit release rates. The specific catchments that were impacted by the analysis are Catchments 47, 49 and 51, as per the 2013 Duffins Hydrology Study.

As part of our analysis, it was determined that there is only a single large area designated for development within the settlement boundary, as per Schedule IV – 10 of the Pickering Official Plan. The following changes were made to the base models:

- A change in impervious values within the existing village from existing to Future OP was noted, and the proposed conditions model was altered to include no change in those areas.
- An area at the north end of the Settlement Boundary is designated for employment uses, and was included as such in the proposed conditions model.
- The existing conditions model was updated to reflect the low density residential approved and partially built on Tom Thomson Court.

In order to determine release rates for the proposed development of the Toko Claremont site, located north of Franklin Street, East of Lane Street, this site was entered into the proposed conditions model.

Given the layout of the two development sites, it is clear that the proposed Toko site would be expected to split drain to Catchments 47 and 49, and the future employment lands would drain to Catchment 51. As such, route reservoirs entered in the modelling are representative of a pond on each catchment, and directly represent the ponds that would be required as part of the development process, rather than a lumped approach to multiple ponds in a single catchment.

In order to simplify the process moving forward, release rates are provided on a flow basis for each development area, given that there are no other development areas that exist, rather than the typical flow per area basis.

	Discharge (m^3/s)		
	Catchment 47	Catchment 49	Catchment 51
2 yr	0.002	0.003	0.003
5 yr	0.004		0.005
10 yr	0.005		0.006
25 yr	0.006		0.008
50 yr	0.007		0.01
100 yr	0.008	0.006	0.011

The specific storage values can be determined during the Functional Servicing Report or detailed design stage based on more detailed land use plans.

We trust that this is of assistance. Please contact Mr. Rob Grech, Senior Water Resources Engineer for questions or clarification.

Yours truly,

Chris Jones, MCIP, RPP
Senior Planner,
Planning and Development,
Extension 5718

cc: Steve Heuchert, TRCA (via email only: sheuchert@trca.on.ca)
Rob Grech, TRCA (via email only: rgrech@trca.on.ca)
Marilee Gadzovski, City of Pickering (via email mgadzovski@pickering.ca)

F:\Home\Public\Development Services\Durham Region\Pickering\Claremont Estates_1.wpd

APPENDIX C

HYDROLOGY MODELLING

SCS consulting group ltd

DIGITAL REPORT AND MODELLING FILES

The following secure link is being provided by **SCS Consulting Group** to share 5113 Brock Road, Claremont related digital data:
https://filesafecloud.scsconsultinggroup.com/url/mkwdjvuhxym24cmu

Please click on the link and download all files from this location.
This file transfer link will expire on September 16, 2021.

- Visual Otthymo modelling

SCS consulting group ltd

Percent Impervious Calculation - Catchment 111

total impervious area = 3.95 ha

File: P:\1470 Toko - Claremont (Pickering) - Geranium\Drawings\FSP\Fig\ ~~Report Figures~~ 2018(02)Feb13 - Percent Impervious Calc for External North Area \1470P-STRM-EXST-2.1-Percent Impervious Calcs.dwg.

Existing Conditions
VO2 Parameter Summary

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

NASHYD

Number	100	101	102	103	104	105	106	107
Description								
DT(min)	2	2	2	2	2	2	2	2
Area (ha)	5.2	5.42	7.62	0.87	8.71	3.1	0.87	0.75
CN*	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
IA(mm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TP Method	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands	Uplands
TP (hr)	0.13	0.19	0.29	0.06	0.21	0.14	0.19	0.24

STANDHYD

Number	300	301
Description		
DT(min)	2	2
Area (ha)	1.83	2.31
XIMP[1,2]	0.17	0.17
TIMP[2]	0.22	0.22
CN*	73.0	73.0
IA(mm)	5.0	5.0
SLPP(%)	2	2
LGP(m)	40	40
MNP	0.25	0.25
DPSI (mm)	2.0	2.0
SLPI(%)	1	1
LGI(m)	110.45	124.10
MNI	0.013	0.013

Existing Conditions

Site Soils: (per Golder Associates)

Soil Type	**Hydrologic Soil Group**
Sandy Silt and Clayey Soil	C

TABLE OF CURVE NUMBERS (CN's)**									
Land Use	Hydrologic Soil Type							Manning's	Source
	A	AB	B	BC	C	CD	D	'n'	
Meadow "Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot "Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel	76	80.5	85	87	89	90	91	0.30	USDA
Lawns "Good"	39	50	61	67.5	74	77	80	0.25	USDA
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop	66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)	77	82	86	89	91	93	94	0.05	MTO
Low Density Residences	57	64.5	72	76.5	81	83.5	86	0.25	USDA
Streets, paved	98	98	98	98	98	98	98	0.01	USDA

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. USDA (1986), Urban Hydrology for Small Watersheds, Table 2.2-Runoff Curve Numbers for Urban Areas

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
100					100			100
101					100			100
102					100			100
103					100			100
104					100			100
105					100			100
106					100			100
107					100			100
300					100			100
301					100			100

LAND USE (%) - Existing Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
100				100.0						100.0
101				100.0						100.0
102				100.0						100.0
103				100.0						100.0
104				100.0						100.0
105				100.0						100.0
106				100.0						100.0
107				100.0						100.0
300				100.0						100.0
301				100.0						100.0

Note: Where STANDHYD command used (shaded), impervious fraction is not considered in CN determination, since %Imp directly input in STANDHYD command

CURVE NUMBER (CN) - Existing Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN
100	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
101	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
102	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
103	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
104	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
105	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
106	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
107	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
300	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
301	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74

** AMC II assumed

SCS consulting group ltd

Existing Conditions
CN Calculations

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Step	Input Values											
	Subcatchment:	100		101	102	103	104	105	106	107	300	301
1	**CN (AMC II):**	**74**		**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**
2	CN (AMC III) =	88		88	88	88	88	88	88	88	88	88
3	100 Year Precipitation, P =	86.48	mm	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

Step	Output Values											
	Subcatchment:	100		101	102	103	104	105	106	107	300	301
	S_{III} =	34.64	mm	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64
	SCS Assumption of 0.2 S = Ia =	6.93	mm	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93
4	Q_{III} =	55.42	mm	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42
	Preferred Initial Abstraction, Ia =	5.0	mm	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5	S^*_{III} =	38.31	mm	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31
6	CN^*_{III} =	86.89	mm	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89
	CN^*_{III}=	**87**	Rounded	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**
7	**CN^*_{II}=**	**73**	convert	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (attached)
2 Convert CN from AMC II to AMC III conditions (standard SCS tables)
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined)
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using SCS conversion table

SCS consulting group ltd

Existing Conditions
IA Calculations

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Existing Conditions

LAND USE (%) - Existing Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
100				100.0						100.0
101				100.0						100.0
102				100.0						100.0
103				100.0						100.0
104				100.0						100.0
105				100.0						100.0
106				100.0						100.0
107				100.0						100.0
300				100.0						100.0
301				100.0						100.0

IA VALUES (mm) - Existing Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
IA (mm)	8	10	2	5	8	8	3	2	2	
100				5.0						5.0
101				5.0						5.0
102				5.0						5.0
103				5.0						5.0
104				5.0						5.0
105				5.0						5.0
106				5.0						5.0
107				5.0						5.0
300				5.0						5.0
301				5.0						5.0

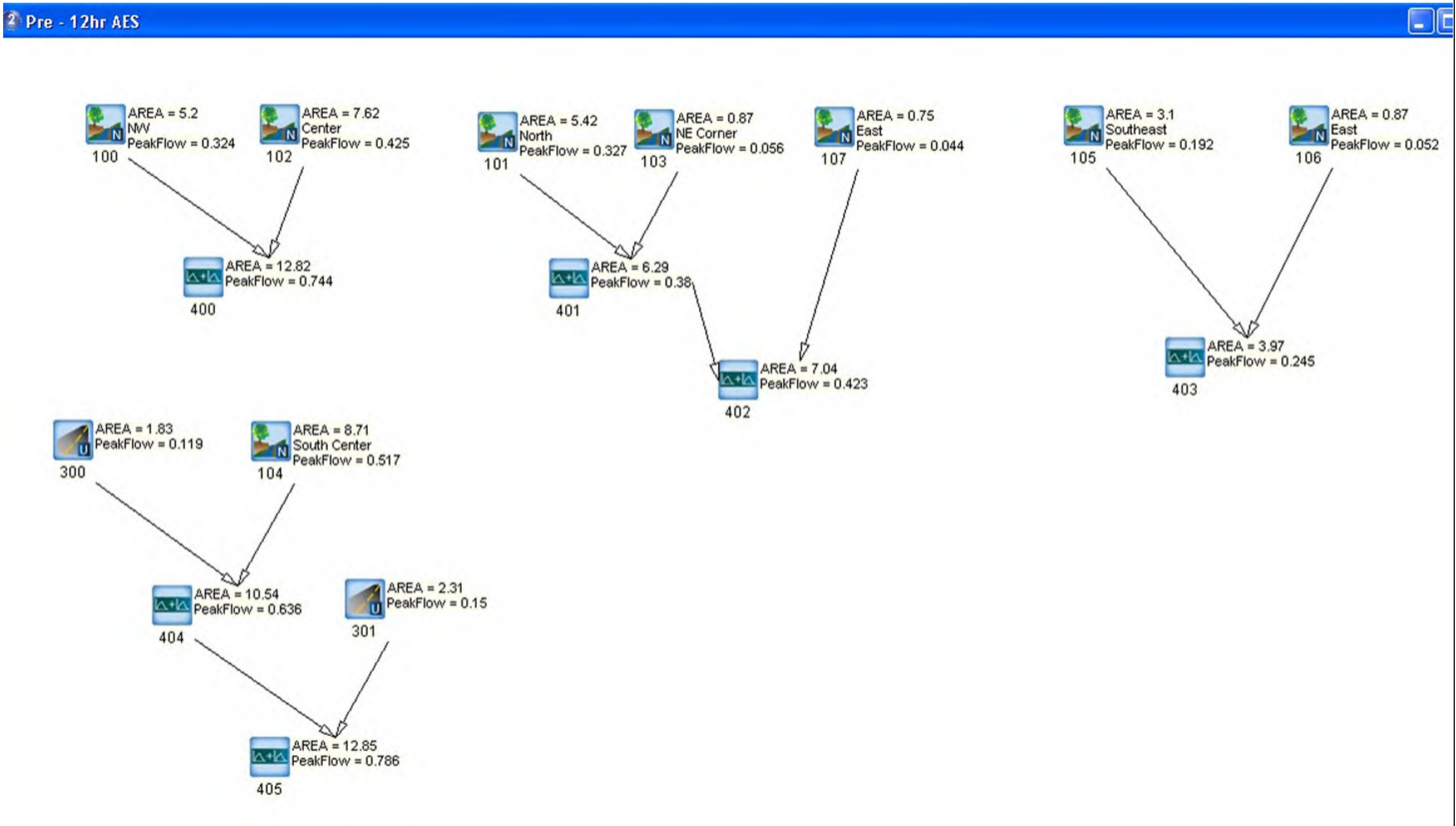
* IA values based on TRCA guidelines

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Existing Conditions
Time to Peak Calculations

Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)
100a	275.00	269.50	212	2.59	Pasture	0.35	602.6	0.17	0.11
100b	269.50	266.12	60	5.63	Pasture	0.52	115.4	0.03	0.02
100									**0.13**
101a	280.13	278.50	79	2.06	Pasture	0.31	252.5	0.07	0.05
101b	278.50	272.00	239	2.72	Pasture	0.36	664.6	0.18	0.12
101c	272.00	268.25	66	5.73	Pasture	0.52	124.9	0.03	0.02
101									**0.19**
102a	280.25	274.15	119	5.11	Pasture	0.50	240.8	0.07	0.04
102b	274.15	271.50	217	1.22	Pasture	0.24	900.9	0.25	0.17
102c	271.50	265.50	167	3.60	Pasture	0.42	400.9	0.11	0.07
102									**0.29**
103a	278.13	271.00	147	4.85	Pasture	0.48	304.8	0.08	0.06
103									**0.06**
104a	280.25	268.00	416	2.94	Pasture	0.37	1111.1	0.31	0.21
104									**0.21**
105a	278.50	273.25	102	5.17	Pasture	0.50	203.9	0.06	0.04
105b	273.25	268.25	192	2.61	Pasture	0.35	544.2	0.15	0.10
105									**0.14**
106a	280.25	275.50	291	1.63	Pasture	0.28	1045.2	0.29	0.19
106									**0.19**
107a	280.25	278.00	257	0.87	Pasture	0.20	1265.9	0.35	0.24
107									**0.24**



SCS consulting group ltd

EXISTING CONDITIONS
VO2 MODEL SCHEMATIC

Project Name: Toko Claremont
Project No.: 1470
Date: June 2021
Designer: N.O.T.

Proposed Conditions
VO2 Parameter Summary

Proposed Conditions

NASHYD

Number	205	210	213	214	220
Description					
DT(min)	15	2	2	2	2
Area (ha)	1.32	0.4	0.69	0.74	0.24
CN*	73.0	73.0	73.0	73.0	73.0
IA(mm)	5.0	5.0	5.0	5.0	5.0
TP Method	Uplands	Uplands	Uplands	Uplands	Uplands
TP (hr)	0.17	0.03	0.04	0.50	0.04

STANDHYD

Number	201	204	207	209	211	212	200	300	301	219	221
Description											
DT(min)	15	15	2	15	15	2	2	2	2	2	2
Area (ha)	8.94	1.93	2.49	1.17	11.32	2.08	0.33	1.83	2.31	0.58	0.31
XIMP[1,2]	0.19	0.38	0.15	0.38	0.19	0.15	0.15	0.17	0.17	0.38	0.38
TIMP[2]	0.25	0.5	0.2	0.5	0.25	0.2	0.2	0.22	0.22	0.5	0.5
CN*	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
IA(mm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
SLPP(%)	2	2	2	2	2	2	2	2	2	2	2
LGP(m)	40	40	40	40	40	40	40	40	40	40	40
MNP	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DPSI (mm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
SLPI(%)	1	1	1	1	1	1	1	1	1	1	1
LGI(m)	244.13	113.43	128.84	88.32	274.71	117.76	46.90	110.45	124.10	62.18	45.46
MNI	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

Proposed Conditions
CN Calculations

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Proposed Conditions

Site Soils: (per Golder Associates)

Soil Type	**Hydrologic Soil Group**
Sandy Silt and Clayey Soil	C

TABLE OF CURVE NUMBERS (CN's)**

Land Use	Hydrologic Soil Type							Manning's	Source
	A	AB	B	BC	C	CD	D	'n'	
Meadow "Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot "Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel	76	80.5	85	87	89	90	91	0.30	USDA
Lawns "Good"	39	50	61	67.5	74	77	80	0.25	USDA
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop	66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)	77	82	86	89	91	93	94	0.05	MTO
Low Density Residences	57	64.5	72	76.5	81	83.5	86	0.25	USDA
Streets, paved	98	98	98	98	98	98	98	0.01	USDA

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. USDA (1986), Urban Hydrology for Small Watersheds, Table 2.2-Runoff Curve Numbers for Urban Areas

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions

Catchment	Hydrologic Soil Type							TOTAL
	A	AB	B	BC	C	CD	D	
205					100			100
210					100			100
213					100			100
214					100			100
220					100			100
201					100			100
204					100			100
207					100			100
209					100			100
211					100			100
212					100			100
200					100			100
300					100			100
301					100			100
219					100			100
221					100			100

LAND USE (%) - Proposed Conditions

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
205				100.0						100.0
210				100.0						100.0
213				100.0						100.0
214				100.0						100.0
220				100.0						100.0
201				100.0						100.0
204				100.0						100.0
207				100.0						100.0
209				100.0						100.0
211				100.0						100.0
212				100.0						100.0
200				100.0						100.0
300				100.0						100.0
301				100.0						100.0
219				100.0						100.0
221				100.0						100.0

Note: Where STANDHYD command used (shaded), impervious fraction is not considered in CN determination, since %Imp directly input in STANDHYD command

CURVE NUMBER (CN) - Proposed Conditions

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN
205	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
210	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
213	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
214	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
220	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
201	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
204	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
207	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
209	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
211	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
212	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
200	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
300	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
301	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
219	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
221	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74

** AMC II assumed

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Proposed Conditions
CN Calculations

Propos	Input Values																	
Step	Subcatchment:	205		210	213	214	220	201	204	207	209	211	212	200	300	301	219	221
1	**CN (AMC II):**	**74**		**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**
2	CN (AMC III) =	88		88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
3	100 Year Precipitation, P =	86.48	mm	86.5	86.5	86.48	86.48	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.48	86.48

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

Step	Output Values																	
	Subcatchment:	205		210	213	214	220	201	204	207	209	211	212	200	300	301	219	221
	S_{III} =	34.64	mm	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64
	SCS Assumption of 0.2 S = Ia =	6.93	mm	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93
4	Q_{III} =	55.42	mm	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42	55.42
	Preferred Initial Abstraction, Ia =	5.0	mm	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5	S^*_{III} =	38.31	mm	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31
6	CN^*_{III} =	86.89	mm	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89	86.89
	CN^*_{III}=	**87**	Rounded	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**
7	**CN^*_{II}=**	**73**	convert	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (attached)
2 Convert CN from AMC II to AMC III conditions (standard SCS tables)
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined)
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using SCS conversion table

Proposed Conditions
IA Calculations

Proposed Conditions

LAND USE (%) - Proposed Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
205				100.0						100.0
210				100.0						100.0
213				100.0						100.0
214				100.0						100.0
220				100.0						100.0
201				100.0						100.0
204				100.0						100.0
207				100.0						100.0
209				100.0						100.0
211				100.0						100.0
212				100.0						100.0
200				100.0						100.0
300				100.0						100.0
301				100.0						100.0
219				100.0						100.0
221				100.0						100.0

IA VALUES (mm) - Proposed Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
IA (mm)	8	10	2	5	8	8	3	2	2	
205				5.0						5.0
210				5.0						5.0
213				5.0						5.0
214				5.0						5.0
220				5.0						5.0
201				5.0						5.0
204				5.0						5.0
207				5.0						5.0
209				5.0						5.0
211				5.0						5.0
212				5.0						5.0
216				5.0						5.0
200				5.0						5.0
300				5.0						5.0
301				5.0						5.0
219				5.0						5.0
221				5.0						5.0

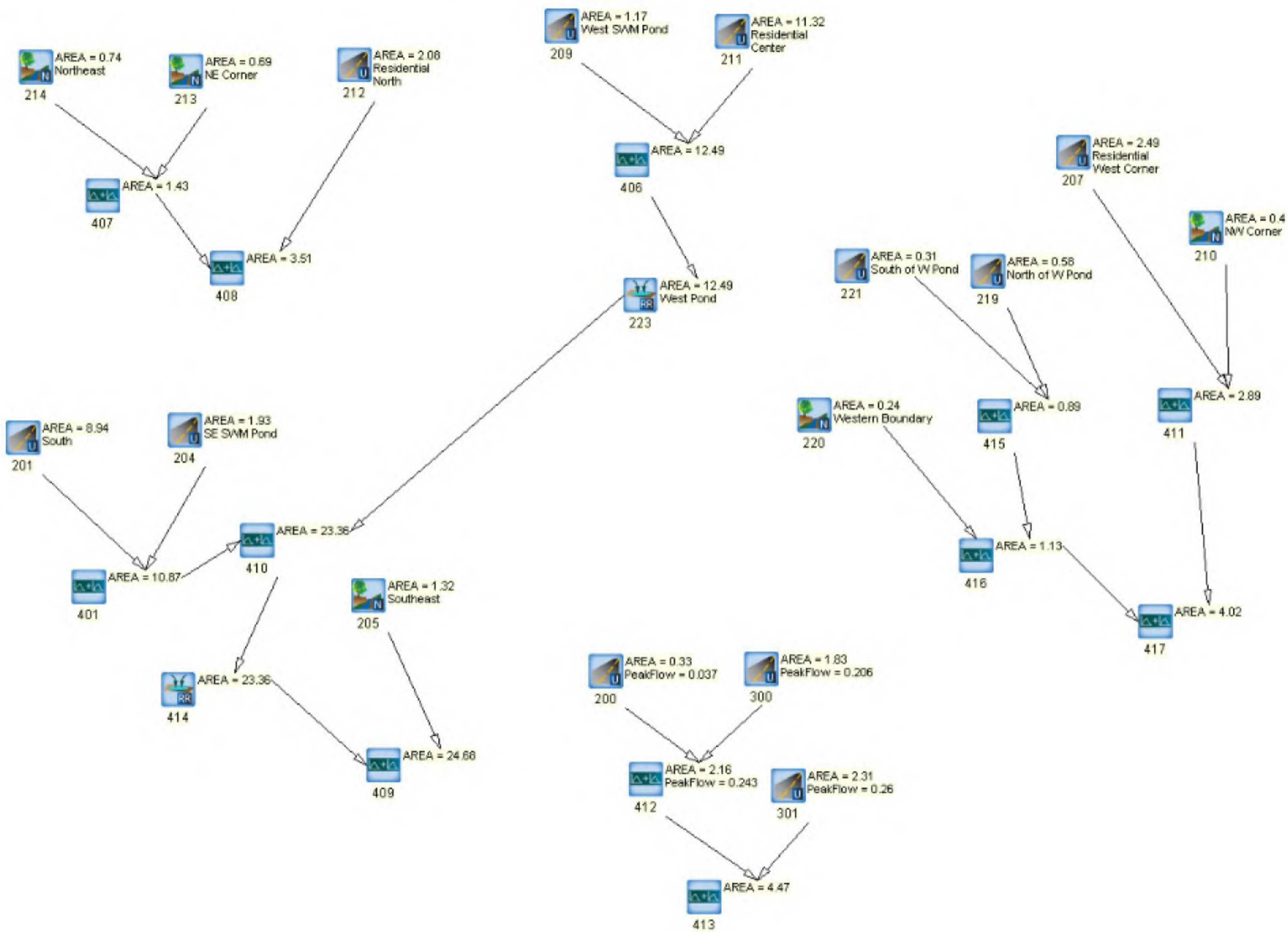
* IA values based on TRCA guidelines

Proposed Conditions
Time to Peak Calculations

Proposed Conditions

Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)
205a	278.13	275.25	376	0.77	Waterway	0.41	907.3	0.25	0.17
205									**0.17**
210a	270.90	269.82	54	2.01	Pasture	0.31	174.1	0.05	0.03
210									**0.03**
213a	278.20	271.89	105	6.03	Pasture	0.54	194.2	0.05	0.04
213									**0.04**
214a	280.05	278.60	72	2.00	Pasture	0.31	234.7	0.07	0.04
214b	278.60	278.08	245	0.21	Pasture	0.10	2465.1	0.68	0.46
214									**0.50**
220a	268.50	266.50	75	2.67	Pasture	0.36	210.3	0.06	0.04
220									**0.04**



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PROPOSED CONDITIONS
VO2 MODEL SCHEMATIC

Project Name: Toko Claremont
Project No.: 1470
Date: June 2021
Designer: N.O.T.

Peak Flows Comparison
VO2 Modelling Results

1hr AES

Return Period Storm	Duffins Creek Watershed Catchment 47 (North of Central St.)				Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m³/s) (403)	Proposed (m³/s) (409)	Existing (m³/s) (405)	Proposed (m³/s) (413) - Franklin	Existing (m³/s) (400)	Proposed (m³/s) (417)	Existing (m³/s) (402)	Proposed (m³/s) (408)
2 Year	0.070	0.021	0.200	0.140	0.178	0.141	0.110	0.073
5 Year	0.139	0.040	0.403	0.206	0.352	0.211	0.218	0.117
10 Year	0.194	0.054	0.569	0.256	0.493	0.261	0.305	0.152
25 Year	0.274	0.075	0.804	0.332	0.694	0.333	0.429	0.206
50 Year	0.338	0.092	0.998	0.421	0.857	0.390	0.531	0.264
100 Year	0.406	0.109	1.198	0.503	1.027	0.466	0.637	0.317

12hr AES

Return Period Storm	Duffins Creek Watershed Catchment 47 (North of Central St.)				Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m³/s) (403)	Proposed (m³/s) (409)	Existing (m³/s) (405)	Proposed (m³/s) (413) - Franklin	Existing (m³/s) (400)	Proposed (m³/s) (417)	Existing (m³/s) (402)	Proposed (m³/s) (408)
2 Year	0.067	0.022	0.215	0.083	0.199	0.074	0.114	0.056
5 Year	0.108	0.034	0.346	0.130	0.323	0.114	0.185	0.091
10 Year	0.139	0.043	0.444	0.167	0.417	0.110	0.238	0.117
25 Year	0.179	0.055	0.575	0.214	0.542	0.184	0.309	0.151
50 Year	0.212	0.064	0.680	0.253	0.642	0.216	0.365	0.179
100 Year	0.245	0.074	0.786	0.291	0.744	0.247	0.423	0.207

4hr CHI

Return Period Storm	Duffins Creek Watershed Catchment 47 (North of Central St.)				Duffins Creek Watershed Catchment 49		Duffins Creek Watershed Catchment 51	
	Existing (m³/s) (403)	Proposed (m³/s) (409)	Existing (m³/s) (405)	Proposed (m³/s) (413) - Franklin	Existing (m³/s) (400)	Proposed (m³/s) (417)	Existing (m³/s) (402)	Proposed (m³/s) (408)
2 Year	0.083	0.025	0.231	0.164	0.203	0.165	0.127	0.097
5 Year	0.163	0.048	0.467	0.251	0.397	0.260	0.248	0.161
10 Year	0.226	0.065	0.650	0.324	0.548	0.332	0.342	0.214
25 Year	0.316	0.089	0.916	0.440	0.765	0.437	0.478	0.296
50 Year	0.387	0.108	1.122	0.528	0.937	0.522	0.585	0.354
100 Year	0.466	0.128	1.352	0.621	1.128	0.605	0.703	0.417

Pond VO2 Modelling Results

West Pond (223)

Return Period Storm	1 Hour AES		12 Hour AES		4 Hour Chicago	
	Discharge (m3/s)	Storage (m3)	Discharge (m3/s)	Storage (m3)	Discharge (m3/s)	Storage (m3)
2 Year	0.003	874	0.003	1988	0.003	1409
5 Year	0.003	1428	0.004	2943	0.004	2204
10 Year	0.003	1841	0.004	3636	0.004	2759
25 Year	0.004	2401	0.005	4546	0.004	3539
50 Year	0.004	2843	0.005	5261	0.005	4100
100 Year	0.004	3297	0.005	5984	0.005	4718

Southeast Pond (414)

Return Period Storm	1 Hour AES		12 Hour AES		4 Hour Chicago	
	Discharge (m3/s)	Storage (m3)	Discharge (m3/s)	Storage (m3)	Discharge (m3/s)	Storage (m3)
2 Year	0.003	815	0.004	1857	0.004	1303
5 Year	0.004	1306	0.005	2711	0.004	2009
10 Year	0.004	1674	0.005	3327	0.005	2501
25 Year	0.004	2169	0.006	4133	0.005	3191
50 Year	0.005	2559	0.006	4765	0.006	3685
100 Year	0.005	2959	0.007	5404	0.006	4228

Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Franklin Street Drainage
VO2 Modelling Results

	1hr AES	12hr AES	4hr CHI
	100 Year Peak Flow to Franklin Street from Subject Lands (m3/s)		
Existing (104)	1.128	0.717	1.247
Proposed (200)	0.037	0.022	0.048
Change	-97%	-97%	-96%

	1hr AES	12hr AES	4hr CHI
	100 Year Peak Flow at the Franklin Street DICB's, north of Joseph Street (m3/s)		
Existing (404)	1.313	0.835	1.456
Proposed (412)	0.243	0.141	0.301
Change	-81%	-83%	-79%

	1hr AES	12hr AES	4hr CHI
	100 Year Peak Flow at Franklin and Central Streets (L/s)		
Existing (405)	1.549	0.985	1.741
Proposed (413)	0.503	0.291	0.621
Change	-68%	-70%	-64%

	1hr AES	12hr AES	4hr CHI
	100 Year Runoff Volume to Franklin Street from Subject Lands (m^3)		
Existing (104)	2301	4477	3409
Proposed (200)	81	152	117
Change	-96%	-97%	-97%

	1hr AES	12hr AES	4hr CHI
	100 Year Runoff Volume at Franklin and Centre Streets (m^3)		
Existing (405)	3358	6429	4919
Proposed (413)	1131	2098	1619
Change	-66%	-67%	-67%

APPENDIX D

PROPOSED SOUTHEAST POND STORM OUTFALL

SCS consulting group ltd

LEGEND:

(2m) APPROX. DEPTH TO STORM SEWER INVERT FROM EXISTING GRADES

No.	REVISIONS	DATE	BY	TOWN APPR.

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

TOKO - CLAREMONT
(PICKERING) - GERANIUM

PROPOSED BROCK ROAD DITCH
REGRADING PLAN AND PROFILE

SCALE: HOR: 1:2000 VER: 1:200	DATE: JUNE 2021	PROJECT No: 1470	
DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	DRAWING No: D1	
DRAWN BY: F.R.B.			

APPENDIX E

STORMWATER MANAGEMENT POND SIZING CALCULATIONS

West Pond
Drainage Area Characteristics

Toko Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Weighted Impervious Calculation

Development Type	Total Area	Imperviousness	Impervious Area
	(ha)	(%)	(ha)
Residential	11.32	25	2.83
Pond	1.17	50	0.59
Total	**12.49**	**27**	**3.42**

SCS consulting group ltd

West Pond
Extended Detention Sizing

Toko Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

EXTENDED DETENTION

Level of Protection = Basic (Level 3)

Weighted Impervious = 27 %

Drainage Area = 12.49 ha

SWMP Type = 5. Dry Pond (Continuous Flow)

Required Water Quality Storage Volume= 64.6 m^3/ha

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS
(FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250
Normal (Level 2)	1. Infiltration	20	20	25	30
	2. Wetlands	60	70	80	90
	3. Hybrid Wet Pond/Wetland	75	90	105	120
	4. Wet Pond	90	110	130	150
Basic (Level 3)	1. Infiltration	20	20	20	20
	2. Wetlands	60	60	60	60
	3. Hybrid Wet Pond/Wetland	60	70	75	80
	4. Wet Pond	60	75	85	95
	5. Dry Pond (Continuous Flow)	90	150	200	240

Using the 25mm - 4 hour Chicago Storm

Erosion Control Volume (V) = Runoff Depth (mm) x Drainage Area (ha) x 10 (m^3) / (mm)(ha)

Erosion Control Volume (V) = 7.88 mm x 12.49 ha x 10 m^3 / mm·ha

Erosion Control Volume (V) = 984 m^3

Using 64.6m^3/ha

Extended Detention Volume (V) = 64.6m^3/ha x Drainage Area (ha)

Extended Detention Volume (V) = 64.6 m^3/ha 12.49 ha

Extended Detention Volume (V) = 806 m^3

Governing Volume (V) = 984 m^3

	West Pond			Toko Claremont
	Volumes and Sizing			Project Number: 1470
				Date: June 2021
				Designer Initials: N.O.T.

Elevation (m)	Area (m^2)	Area (m^2)	H (m)	Vol (m^3)	Volume (m^3)	Storage (m^3)	Depth (m)
267.25	1				0	0	0
		871	0.1	87.05			
267.35	1740				87	87.05	0.1
		3798	0.1	379.8			
267.45	5856				467	466.85	0.2
		6200	0.2	1239.9			
267.65	6543				1707	1706.75	0.4
		7483	0.75	5611.875			
268.4	8422				7319	7318.625	1.15
		8705	0.6	5222.7			
269	8987				12541	12541.33	1.75

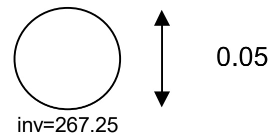
Extended Detention volume required =	984	m^3
Extended Detention waterlevel =	267.54	m
100 year control volume required =	5984	m^3
100 year waterlevel =	268.24	m
Freeboard =	0.76	m

West Pond
Control Structure Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Orifice 1

Invert =	267.25	m
Size =	0.050	m
Orifice Coefficient, C =	0.62	
Obvert =	267.3	m



West Pond
Outflow Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Starting Water Level (m) = 267.25
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
267.25	0.000	267.25	0.000	0	0.0	
267.26	0.000	267.26	0.000	1	0.0	
267.27	0.000	267.27	0.000	3	0.0	
267.28	0.000	267.28	0.000	8	0.0	
267.29	0.001	267.29	0.001	14	0.0	
267.30	0.001	267.30	0.001	21	0.0	
267.31	0.001	267.31	0.001	31	2.9	
267.32	0.001	267.32	0.001	42	5.8	
267.33	0.001	267.33	0.001	55	8.8	
267.34	0.001	267.34	0.001	70	11.9	
267.35	0.001	267.35	0.001	87	15.1	
267.36	0.002	267.36	0.002	106	18.6	
267.37	0.002	267.37	0.002	130	22.7	
267.38	0.002	267.38	0.002	157	27.2	
267.39	0.002	267.39	0.002	189	32.1	
267.40	0.002	267.40	0.002	225	37.5	
267.41	0.002	267.41	0.002	265	43.2	
267.42	0.002	267.42	0.002	309	49.3	
267.43	0.002	267.43	0.002	357	55.7	
267.44	0.002	267.44	0.002	410	62.4	
267.45	0.002	267.45	0.002	466	69.5	
267.46	0.002	267.46	0.002	525	76.6	
267.47	0.002	267.47	0.002	584	83.6	
267.48	0.002	267.48	0.002	643	90.5	
267.49	0.003	267.49	0.003	703	97.2	
267.50	0.003	267.50	0.003	763	103.8	
267.51	0.003	267.51	0.003	824	110.3	
267.52	0.003	267.52	0.003	885	116.7	
267.53	0.003	267.53	0.003	946	123.0	
267.54	0.003	267.54	0.003	1007	129.2	Ext Det
267.55	0.003	267.55	0.003	1069	135.3	
267.56	0.003	267.56	0.003	1131	141.4	
267.57	0.003	267.57	0.003	1194	147.3	
267.58	0.003	267.58	0.003	1257	153.2	
267.59	0.003	267.59	0.003	1320	159.1	
267.60	0.003	267.60	0.003	1383	164.9	
267.61	0.003	267.61	0.003	1447	170.6	
267.62	0.003	267.62	0.003	1511	176.3	
267.63	0.003	267.63	0.003	1576	181.9	
267.64	0.003	267.64	0.003	1641	187.5	
267.65	0.003	267.65	0.003	1706	193.0	
267.66	0.003	267.66	0.003	1772	198.5	
267.67	0.003	267.67	0.003	1837	203.9	

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West Pond
Outflow Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Starting Water Level (m) = 267.25
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
267.68	0.003	267.68	0.003	1904	209.3	
267.69	0.003	267.69	0.003	1970	214.6	2 Yr
267.70	0.004	267.70	0.004	2036	219.9	
267.71	0.004	267.71	0.004	2103	225.2	
267.72	0.004	267.72	0.004	2170	230.4	
267.73	0.004	267.73	0.004	2238	235.5	
267.74	0.004	267.74	0.004	2305	240.7	
267.75	0.004	267.75	0.004	2373	245.8	
267.76	0.004	267.76	0.004	2441	250.8	
267.77	0.004	267.77	0.004	2509	255.9	
267.78	0.004	267.78	0.004	2578	260.9	
267.79	0.004	267.79	0.004	2647	265.8	
267.80	0.004	267.80	0.004	2716	270.8	
267.81	0.004	267.81	0.004	2785	275.7	
267.82	0.004	267.82	0.004	2855	280.5	
267.83	0.004	267.83	0.004	2924	285.4	5 Yr
267.84	0.004	267.84	0.004	2995	290.2	
267.85	0.004	267.85	0.004	3065	295.0	
267.86	0.004	267.86	0.004	3135	299.8	
267.87	0.004	267.87	0.004	3206	304.5	
267.88	0.004	267.88	0.004	3277	309.3	
267.89	0.004	267.89	0.004	3349	314.0	
267.90	0.004	267.90	0.004	3420	318.6	
267.91	0.004	267.91	0.004	3492	323.3	
267.92	0.004	267.92	0.004	3564	327.9	
267.93	0.004	267.93	0.004	3636	332.6	10 Yr
267.94	0.004	267.94	0.004	3709	337.2	
267.95	0.004	267.95	0.004	3782	341.7	
267.96	0.004	267.96	0.004	3855	346.3	
267.97	0.004	267.97	0.004	3928	350.9	
267.98	0.005	267.98	0.005	4002	355.4	
267.99	0.005	267.99	0.005	4076	359.9	
268.00	0.005	268.00	0.005	4150	364.4	
268.01	0.005	268.01	0.005	4224	368.9	
268.02	0.005	268.02	0.005	4299	373.3	
268.03	0.005	268.03	0.005	4373	377.8	
268.04	0.005	268.04	0.005	4448	382.2	
268.05	0.005	268.05	0.005	4524	386.7	25 Yr
268.06	0.005	268.06	0.005	4599	391.1	
268.07	0.005	268.07	0.005	4675	395.5	
268.08	0.005	268.08	0.005	4751	399.8	
268.09	0.005	268.09	0.005	4828	404.2	
268.10	0.005	268.10	0.005	4904	408.6	

West Pond
Outflow Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Starting Water Level (m) = 267.25
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
268.11	0.005	268.11	0.005	4981	412.9	
268.12	0.005	268.12	0.005	5058	417.2	
268.13	0.005	268.13	0.005	5135	421.6	
268.14	0.005	268.14	0.005	5213	425.9	
268.15	0.005	268.15	0.005	5291	430.2	50 Yr
268.16	0.005	268.16	0.005	5369	434.5	
268.17	0.005	268.17	0.005	5447	438.7	
268.18	0.005	268.18	0.005	5526	443.0	
268.19	0.005	268.19	0.005	5605	447.3	
268.20	0.005	268.20	0.005	5684	451.5	
268.21	0.005	268.21	0.005	5763	455.7	
268.22	0.005	268.22	0.005	5843	460.0	
268.23	0.005	268.23	0.005	5922	464.2	
268.24	0.005	268.24	0.005	6003	468.4	100 Yr
268.25	0.005	268.25	0.005	6083	472.6	
268.26	0.005	268.26	0.005	6163	476.8	
268.27	0.005	268.27	0.005	6244	481.0	
268.28	0.005	268.28	0.005	6325	485.2	
268.29	0.005	268.29	0.005	6407	489.3	
268.30	0.005	268.30	0.005	6488	493.5	
268.31	0.005	268.31	0.005	6570	497.6	
268.32	0.006	268.32	0.006	6652	501.8	
268.33	0.006	268.33	0.006	6735	505.9	
268.34	0.006	268.34	0.006	6817	510.1	
268.35	0.006	268.35	0.006	6900	514.2	
268.36	0.006	268.36	0.006	6983	518.3	
268.37	0.006	268.37	0.006	7066	522.4	
268.38	0.006	268.38	0.006	7150	526.5	
268.39	0.006	268.39	0.006	7234	530.6	
268.40	0.006	268.40	0.006	7318	534.7	
268.41	0.006	268.41	0.006	7402	538.8	
268.42	0.006	268.42	0.006	7487	542.9	
268.43	0.006	268.43	0.006	7571	546.9	
268.44	0.006	268.44	0.006	7656	551.0	
268.45	0.006	268.45	0.006	7740	555.0	
268.46	0.006	268.46	0.006	7825	559.0	
268.47	0.006	268.47	0.006	7910	563.0	
268.48	0.006	268.48	0.006	7995	567.0	
268.49	0.006	268.49	0.006	8080	571.0	
268.50	0.006	268.50	0.006	8165	575.0	
268.51	0.006	268.51	0.006	8250	578.9	
268.52	0.006	268.52	0.006	8335	582.9	
268.53	0.006	268.53	0.006	8421	586.8	

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West Pond
Outflow Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Starting Water Level (m) = 267.25
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)
268.54	0.006	268.54	0.006	8506	590.7
268.55	0.006	268.55	0.006	8592	594.7
268.56	0.006	268.56	0.006	8678	598.6
268.57	0.006	268.57	0.006	8763	602.4
268.58	0.006	268.58	0.006	8849	606.3
268.59	0.006	268.59	0.006	8935	610.2
268.60	0.006	268.60	0.006	9021	614.1
268.61	0.006	268.61	0.006	9107	617.9
268.62	0.006	268.62	0.006	9194	621.7
268.63	0.006	268.63	0.006	9280	625.6
268.64	0.006	268.64	0.006	9366	629.4
268.65	0.006	268.65	0.006	9453	633.2
268.66	0.006	268.66	0.006	9540	637.0
268.67	0.006	268.67	0.006	9626	640.8
268.68	0.006	268.68	0.006	9713	644.6
268.69	0.006	268.69	0.006	9800	648.3
268.70	0.006	268.70	0.006	9887	652.1
268.71	0.006	268.71	0.006	9974	655.8
268.72	0.006	268.72	0.006	10061	659.6
268.73	0.007	268.73	0.007	10149	663.3
268.74	0.007	268.74	0.007	10236	667.0
268.75	0.007	268.75	0.007	10323	670.8
268.76	0.007	268.76	0.007	10411	674.5
268.77	0.007	268.77	0.007	10499	678.2
268.78	0.007	268.78	0.007	10586	681.9
268.79	0.007	268.79	0.007	10674	685.5
268.80	0.007	268.80	0.007	10762	689.2
268.81	0.007	268.81	0.007	10850	692.9
268.82	0.007	268.82	0.007	10938	696.5
268.83	0.007	268.83	0.007	11027	700.2
268.84	0.007	268.84	0.007	11115	703.8
268.85	0.007	268.85	0.007	11203	707.5
268.86	0.007	268.86	0.007	11292	711.1
268.87	0.007	268.87	0.007	11380	714.7
268.88	0.007	268.88	0.007	11469	718.3
268.89	0.007	268.89	0.007	11558	721.9
268.90	0.007	268.90	0.007	11647	725.5
268.91	0.007	268.91	0.007	11736	729.1
268.92	0.007	268.92	0.007	11825	732.7
268.93	0.007	268.93	0.007	11914	736.3
268.94	0.007	268.94	0.007	12003	739.8
268.95	0.007	268.95	0.007	12093	743.4
268.96	0.007	268.96	0.007	12182	747.0

Starting Water Level (m) = 267.25
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)
268.97	0.007	268.97	0.007	12272	750.5
268.98	0.007	268.98	0.007	12361	754.1
268.99	0.007	268.99	0.007	12451	757.6
269.00	0.007	269.00	0.007	12541	761.1

Southeast Pond
Permanent Pool and
Extended Detention Sizing

Toko Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Weighted Impervious Calculation - Permanent Pool Sizing

Development Type	Total Area	Imperviousness	Impervious Area
	(ha)	(%)	(ha)
Residential	20.26	25	5.07
Pond	3.10	50	1.55
Total	**23.36**	**28**	**6.62**

Weighted Impervious Calculation - Extended Detention Sizing

Development Type	Total Area	Imperviousness	Impervious Area
	(ha)	(%)	(ha)
Residential	8.94	25	2.24
Pond	1.93	50	0.97
Total	**10.87**	**29**	**3.20**

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Southeast Pond Permanent Pool and Extended Detention Sizing

Toko Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

PERMANENT POOL

Level of Protection = Enhanced (Level 1)

Weighted Impervious = 28 %

Drainage Area = 23.36 ha

SWMP Type = 4. Wet Pond

Required Permanent Pool (including 40m^3/ha for extended detention)= 120.3 m^3/ha
Required Permanent Pool (minus 40m^3/ha for extended detention)= 80 m^3/ha

Required Permanent Pool = 1876 m^3

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS (FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250
Normal (Level 2)	1. Infiltration	20	20	25	30
	2. Wetlands	60	70	80	90
	3. Hybrid Wet Pond/Wetland	75	90	105	120
	4. Wet Pond	90	110	130	150
Basic (Level 3)	1. Infiltration	20	20	20	20
	2. Wetlands	60	60	60	60
	3. Hybrid Wet Pond/Wetland	60	70	75	80
	4. Wet Pond	60	75	85	95
	5. Dry Pond (Continuous Flow)	90	150	200	240

EXTENDED DETENTION

Using the 25mm - 4 hour Chicago Storm

Erosion Control Volume (V) = Runoff Depth (mm) x Drainage Area (ha) x 10 (m^3) / (mm)(ha)

Erosion Control Volume (V) = 8.22 mm x 10.87 ha x 10 m^3 / mm·ha

Erosion Control Volume (V) = 894 m^3

Using 80m^3/ha (for ponds in series)

Extended Detention Volume (V) = 80m^3/ha x Drainage Area (ha)

Extended Detention Volume (V) = 80 m^3/ha 10.87 ha

Extended Detention Volume (V) = 869.6 m^3

Governing Volume (V) = 894 m^3

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Southeast Pond Permanent Pool and Extended Detention Sizing

Toko Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Elevation (m)	Area (m^2)	Area (m^2)	H (m)	Vol (m^3)	Volume (m^3)	Storage (m^3)	Depth (m)	
262	860				0		0	
		1168	1	1167.5				
263	1475				1168		1	
		1937	0.5	968.25				
263.5	**2398**				2136	**0**	**1.5**	**N.W.L.**
		2824	0.5	1411.75				
264	3249				3548	1412	2	
		4127	1.5	6191				
265.5	5005				9738	7602	3.5	

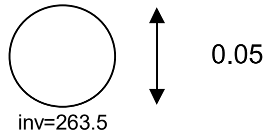
Permanent Pool Volume Required =	1876	m^3
Permanent Pool Volume Provided =	2136	m^3
Extended Detention volume required =	894	m^3
Extended Detention waterlevel =	263.82	m
100 year control volume required =	5404	m^3
100 year waterlevel =	265.04	m
Freeboard =	0.46	m

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Southeast Pond
Control Structure Summary

Orifice 1

Invert =	263.5	m
Size =	0.050	m
Orifice Coefficient, C =	0.62	
Obvert =	263.55	m



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Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Southeast Pond
Outflow Summary

Starting Water Level (m) = 263.5
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
263.50	0.000	263.50	0.000	0	0.0	
263.51	0.000	263.51	0.000	24	0.0	
263.52	0.000	263.52	0.000	48	0.0	
263.53	0.000	263.53	0.000	73	0.0	
263.54	0.001	263.54	0.001	97	0.0	
263.55	0.001	263.55	0.001	122	0.0	
263.56	0.001	263.56	0.001	147	7.4	
263.57	0.001	263.57	0.001	172	13.9	
263.58	0.001	263.58	0.001	197	19.7	
263.59	0.001	263.59	0.001	223	25.1	
263.60	0.001	263.60	0.001	248	30.1	
263.61	0.002	263.61	0.002	274	34.8	
263.62	0.002	263.62	0.002	300	39.2	
263.63	0.002	263.63	0.002	326	43.5	
263.64	0.002	263.64	0.002	352	47.6	
263.65	0.002	263.65	0.002	379	51.5	
263.66	0.002	263.66	0.002	405	55.3	
263.67	0.002	263.67	0.002	432	59.0	
263.68	0.002	263.68	0.002	459	62.6	
263.69	0.002	263.69	0.002	486	66.1	
263.70	0.002	263.70	0.002	514	69.5	
263.71	0.002	263.71	0.002	541	72.8	
263.72	0.002	263.72	0.002	569	76.1	
263.73	0.002	263.73	0.002	597	79.3	
263.74	0.003	263.74	0.003	625	82.4	
263.75	0.003	263.75	0.003	653	85.5	
263.76	0.003	263.76	0.003	681	88.6	
263.77	0.003	263.77	0.003	709	91.6	
263.78	0.003	263.78	0.003	738	94.5	
263.79	0.003	263.79	0.003	767	97.4	
263.80	0.003	263.80	0.003	796	100.3	
263.81	0.003	263.81	0.003	825	103.1	
263.82	0.003	263.82	0.003	855	106.0	
263.83	0.003	263.83	0.003	884	108.7	Ext Det
263.84	0.003	263.84	0.003	914	111.5	
263.85	0.003	263.85	0.003	944	114.2	
263.86	0.003	263.86	0.003	974	116.9	
263.87	0.003	263.87	0.003	1004	119.6	
263.88	0.003	263.88	0.003	1034	122.2	
263.89	0.003	263.89	0.003	1065	124.8	
263.90	0.003	263.90	0.003	1095	127.4	
263.91	0.003	263.91	0.003	1126	130.0	
263.92	0.003	263.92	0.003	1157	132.6	

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Southeast Pond
Outflow Summary

Starting Water Level (m) = 263.5
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
263.93	0.003	263.93	0.003	1188	135.1	
263.94	0.003	263.94	0.003	1220	137.6	
263.95	0.004	263.95	0.004	1251	140.1	
263.96	0.004	263.96	0.004	1283	142.6	
263.97	0.004	263.97	0.004	1315	145.1	
263.98	0.004	263.98	0.004	1347	147.6	
263.99	0.004	263.99	0.004	1379	150.0	
264.00	0.004	264.00	0.004	1412	152.4	
264.01	0.004	264.01	0.004	1444	154.9	
264.02	0.004	264.02	0.004	1477	157.3	
264.03	0.004	264.03	0.004	1510	159.7	
264.04	0.004	264.04	0.004	1543	162.0	
264.05	0.004	264.05	0.004	1576	164.4	
264.06	0.004	264.06	0.004	1609	166.7	
264.07	0.004	264.07	0.004	1642	169.1	
264.08	0.004	264.08	0.004	1675	171.4	
264.09	0.004	264.09	0.004	1709	173.7	
264.10	0.004	264.10	0.004	1743	176.0	
264.11	0.004	264.11	0.004	1776	178.3	
264.12	0.004	264.12	0.004	1810	180.5	
264.13	0.004	264.13	0.004	1844	182.8	2 Yr
264.14	0.004	264.14	0.004	1878	185.0	
264.15	0.004	264.15	0.004	1912	187.3	
264.16	0.004	264.16	0.004	1947	189.5	
264.17	0.004	264.17	0.004	1981	191.7	
264.18	0.004	264.18	0.004	2016	193.9	
264.19	0.004	264.19	0.004	2050	196.1	
264.20	0.004	264.20	0.004	2085	198.3	
264.21	0.004	264.21	0.004	2120	200.5	
264.22	0.004	264.22	0.004	2155	202.7	
264.23	0.005	264.23	0.005	2190	204.8	
264.24	0.005	264.24	0.005	2225	207.0	
264.25	0.005	264.25	0.005	2261	209.1	
264.26	0.005	264.26	0.005	2296	211.3	
264.27	0.005	264.27	0.005	2332	213.4	
264.28	0.005	264.28	0.005	2367	215.5	
264.29	0.005	264.29	0.005	2403	217.6	
264.30	0.005	264.30	0.005	2439	219.7	
264.31	0.005	264.31	0.005	2475	221.9	
264.32	0.005	264.32	0.005	2511	223.9	
264.33	0.005	264.33	0.005	2548	226.0	
264.34	0.005	264.34	0.005	2584	228.1	
264.35	0.005	264.35	0.005	2621	230.2	

Southeast Pond
Outflow Summary

Starting Water Level (m) = 263.5
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
264.36	0.005	264.36	0.005	2657	232.3	
264.37	0.005	264.37	0.005	2694	234.3	5 Yr
264.38	0.005	264.38	0.005	2731	236.4	
264.39	0.005	264.39	0.005	2768	238.5	
264.40	0.005	264.40	0.005	2805	240.5	
264.41	0.005	264.41	0.005	2842	242.5	
264.42	0.005	264.42	0.005	2880	244.6	
264.43	0.005	264.43	0.005	2917	246.6	
264.44	0.005	264.44	0.005	2955	248.7	
264.45	0.005	264.45	0.005	2992	250.7	
264.46	0.005	264.46	0.005	3030	252.7	
264.47	0.005	264.47	0.005	3068	254.7	
264.48	0.005	264.48	0.005	3106	256.7	
264.49	0.005	264.49	0.005	3144	258.7	
264.50	0.005	264.50	0.005	3183	260.7	
264.51	0.005	264.51	0.005	3221	262.7	
264.52	0.005	264.52	0.005	3260	264.7	
264.53	0.005	264.53	0.005	3298	266.7	
264.54	0.005	264.54	0.005	3337	268.7	10 Yr
264.55	0.005	264.55	0.005	3376	270.7	
264.56	0.005	264.56	0.005	3415	272.7	
264.57	0.006	264.57	0.006	3454	274.6	
264.58	0.006	264.58	0.006	3493	276.6	
264.59	0.006	264.59	0.006	3532	278.6	
264.60	0.006	264.60	0.006	3572	280.5	
264.61	0.006	264.61	0.006	3611	282.5	
264.62	0.006	264.62	0.006	3651	284.5	
264.63	0.006	264.63	0.006	3691	286.4	
264.64	0.006	264.64	0.006	3731	288.4	
264.65	0.006	264.65	0.006	3771	290.3	
264.66	0.006	264.66	0.006	3811	292.3	
264.67	0.006	264.67	0.006	3851	294.2	
264.68	0.006	264.68	0.006	3892	296.1	
264.69	0.006	264.69	0.006	3932	298.1	
264.70	0.006	264.70	0.006	3973	300.0	
264.71	0.006	264.71	0.006	4014	302.0	
264.72	0.006	264.72	0.006	4054	303.9	
264.73	0.006	264.73	0.006	4095	305.8	
264.74	0.006	264.74	0.006	4137	307.7	25 Yr
264.75	0.006	264.75	0.006	4178	309.7	
264.76	0.006	264.76	0.006	4219	311.6	
264.77	0.006	264.77	0.006	4261	313.5	
264.78	0.006	264.78	0.006	4302	315.4	

Southeast Pond
Outflow Summary

Toko - Claremont
Project Number: 1470
Date: June 2021
Designer Initials: N.O.T.

Starting Water Level (m) = 263.5
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	
264.79	0.006	264.79	0.006	4344	317.3	
264.80	0.006	264.80	0.006	4386	319.2	
264.81	0.006	264.81	0.006	4427	321.1	
264.82	0.006	264.82	0.006	4470	323.0	
264.83	0.006	264.83	0.006	4512	325.0	
264.84	0.006	264.84	0.006	4554	326.9	
264.85	0.006	264.85	0.006	4596	328.8	
264.86	0.006	264.86	0.006	4639	330.7	
264.87	0.006	264.87	0.006	4681	332.5	
264.88	0.006	264.88	0.006	4724	334.4	
264.89	0.006	264.89	0.006	4767	336.3	50 Yr
264.90	0.006	264.90	0.006	4810	338.2	
264.91	0.006	264.91	0.006	4853	340.1	
264.92	0.006	264.92	0.006	4896	342.0	
264.93	0.006	264.93	0.006	4940	343.9	
264.94	0.006	264.94	0.006	4983	345.8	
264.95	0.006	264.95	0.006	5027	347.7	
264.96	0.006	264.96	0.006	5070	349.5	
264.97	0.006	264.97	0.006	5114	351.4	
264.98	0.007	264.98	0.007	5158	353.3	
264.99	0.007	264.99	0.007	5202	355.2	
265.00	0.007	265.00	0.007	5246	357.0	
265.01	0.007	265.01	0.007	5290	358.9	
265.02	0.007	265.02	0.007	5335	360.8	
265.03	0.007	265.03	0.007	5379	362.7	
265.04	0.007	265.04	0.007	5424	364.5	100 Yr
265.05	0.007	265.05	0.007	5469	366.4	
265.06	0.007	265.06	0.007	5513	368.3	
265.07	0.007	265.07	0.007	5558	370.1	
265.08	0.007	265.08	0.007	5603	372.0	
265.09	0.007	265.09	0.007	5649	373.9	
265.10	0.007	265.10	0.007	5694	375.7	
265.11	0.007	265.11	0.007	5739	377.6	
265.12	0.007	265.12	0.007	5785	379.5	
265.13	0.007	265.13	0.007	5831	381.3	
265.14	0.007	265.14	0.007	5876	383.2	
265.15	0.007	265.15	0.007	5922	385.0	
265.16	0.007	265.16	0.007	5968	386.9	
265.17	0.007	265.17	0.007	6014	388.7	
265.18	0.007	265.18	0.007	6061	390.6	
265.19	0.007	265.19	0.007	6107	392.4	
265.20	0.007	265.20	0.007	6153	394.3	
265.21	0.007	265.21	0.007	6200	396.2	

Southeast Pond
Outflow Summary

Starting Water Level (m) = 263.5
Elevation Increment (m) = 0.01

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)
265.22	0.007	265.22	0.007	6247	398.0
265.23	0.007	265.23	0.007	6294	399.9
265.24	0.007	265.24	0.007	6341	401.7
265.25	0.007	265.25	0.007	6388	403.6
265.26	0.007	265.26	0.007	6435	405.4
265.27	0.007	265.27	0.007	6482	407.2
265.28	0.007	265.28	0.007	6529	409.1
265.29	0.007	265.29	0.007	6577	410.9
265.30	0.007	265.30	0.007	6625	412.8
265.31	0.007	265.31	0.007	6672	414.6
265.32	0.007	265.32	0.007	6720	416.5
265.33	0.007	265.33	0.007	6768	418.3
265.34	0.007	265.34	0.007	6816	420.2
265.35	0.007	265.35	0.007	6865	422.0
265.36	0.007	265.36	0.007	6913	423.8
265.37	0.007	265.37	0.007	6961	425.7
265.38	0.007	265.38	0.007	7010	427.5
265.39	0.007	265.39	0.007	7059	429.4
265.40	0.007	265.40	0.007	7108	431.2
265.41	0.007	265.41	0.007	7157	433.0
265.42	0.007	265.42	0.007	7206	434.9
265.43	0.007	265.43	0.007	7255	436.7
265.44	0.007	265.44	0.007	7304	438.6
265.45	0.007	265.45	0.007	7353	440.4
265.46	0.008	265.46	0.008	7403	442.2
265.47	0.008	265.47	0.008	7453	444.1
265.48	0.008	265.48	0.008	7502	445.9
265.49	0.008	265.49	0.008	7552	447.7
265.50	0.008	265.50	0.008	7602	449.6

APPENDIX F

SOAK-AWAY PIT SIZING CALCULATIONS

SCS consulting group ltd

Soak-away Pit Sizing

	Impervious Area (ha)	Rainfall Depth (mm)	Rainfall Volume (m^3)
	(1)	(2)	(3) = (2)x(1)x10 m3/ha-mm
Catchment 200	**0.07**	**5**	**3.3**
Catchment 207	**0.50**	**5**	**24.9**
Catchment 209	**0.59**	**5**	**29.3**
Catchment 210	**0.00**	**5**	**0.0**
Catchment 212	**0.42**	**5**	**20.8**
Catchment 213	**0.03**	**5**	**1.7**
Catchment 214	**0.00**	**5**	**0.0**
Catchment 205	**0.00**	**5**	**0.0**
Catchment 204	**0.97**	**5**	**48.3**
Catchment 201	**2.24**	**5**	**111.8**
Catchment 211	**2.83**	**5**	**141.5**
Total:	**7.63**		**381**

Minimum runoff storage volume to infiltrate the 5 mm storm event = **381 m^3**

72 Hour Drawdown Calculation		
I - Infiltration Rate* (Clayey Silt)	50	mm/h
n - Porosity	0.4	
t - Design Detention Time	72	h
SF - Safety Factor	3.5	
D - Maximum Depth of Trench for 72 Hour Drawdown	2.57	m

$$D = \frac{I * t}{SF * n * 1000}$$

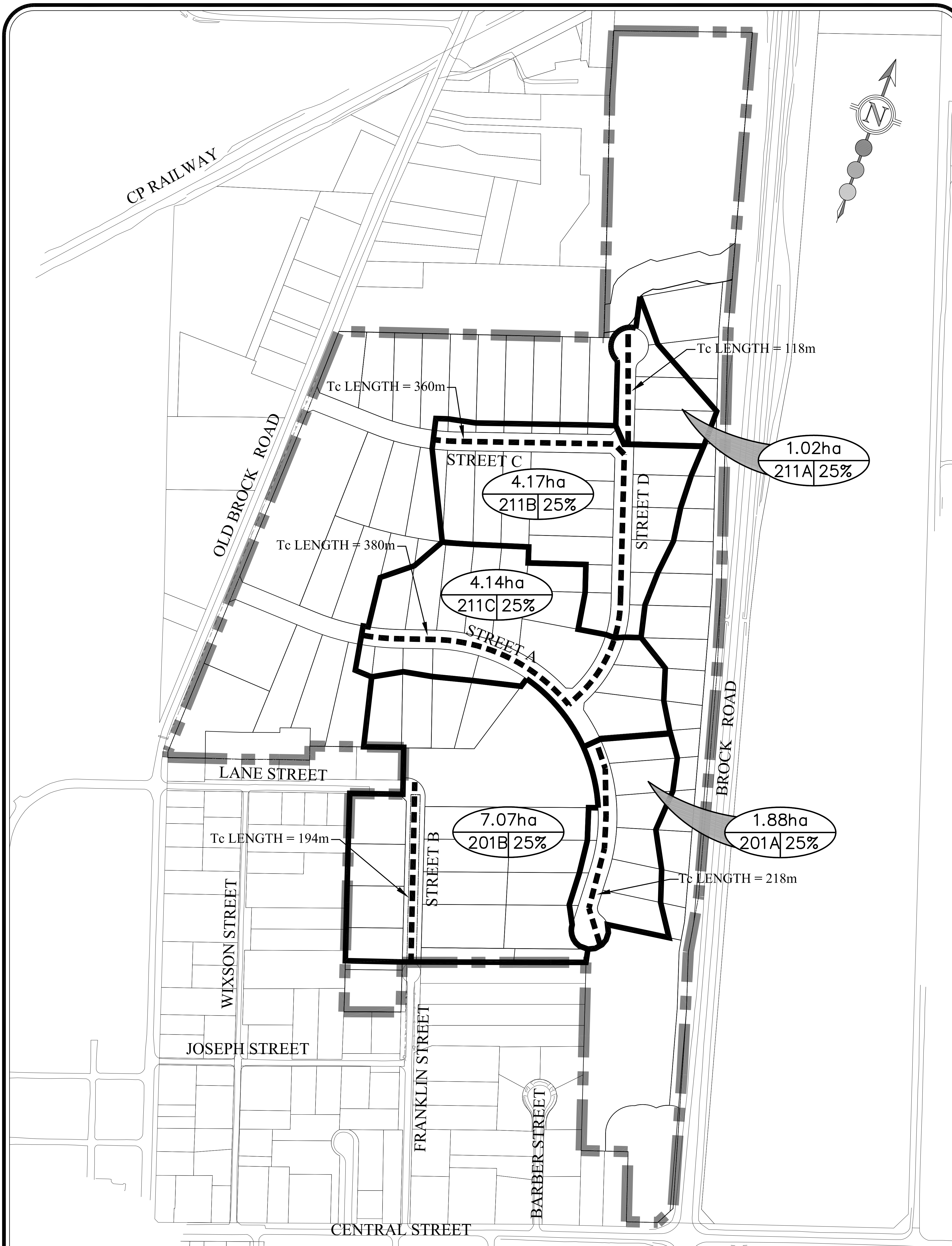
Preliminary Infiltration Trench		
Porosity Coefficient	0.4	
Depth	0.5	m
Width	2.0	m
Length	972	m
Provided Surface Area	**1944**	**m^2**
Provided Runoff Storage Volume	**389**	**m^3**

Therefore, the sizing for the soak-away pits is approximately 2.0 m wide by 0.5 m deep. The soak-away pit length of 972 m can be achieved by providing 27 m long soak-away pits on half of the proposed lots (36 lots).

*Infiltration rate per Preliminary Hydrogeological Investigation completed by Golder Associates Ltd., dated July 2021.

APPENDIX G

OVERLAND FLOW CALCULATIONS



LEGEND:

LIMIT OF PROPERTY
STORM DRAINAGE BOUNDARY
TIME OF CONCENTRATION FLOW PATH

7.07ha — DRAINAGE AREA (HECTARES)
25% — PERCENT (%) IMPERVIOUS/ OR RUNOFF COEFFICIENT
201B — CATCHMENT ID

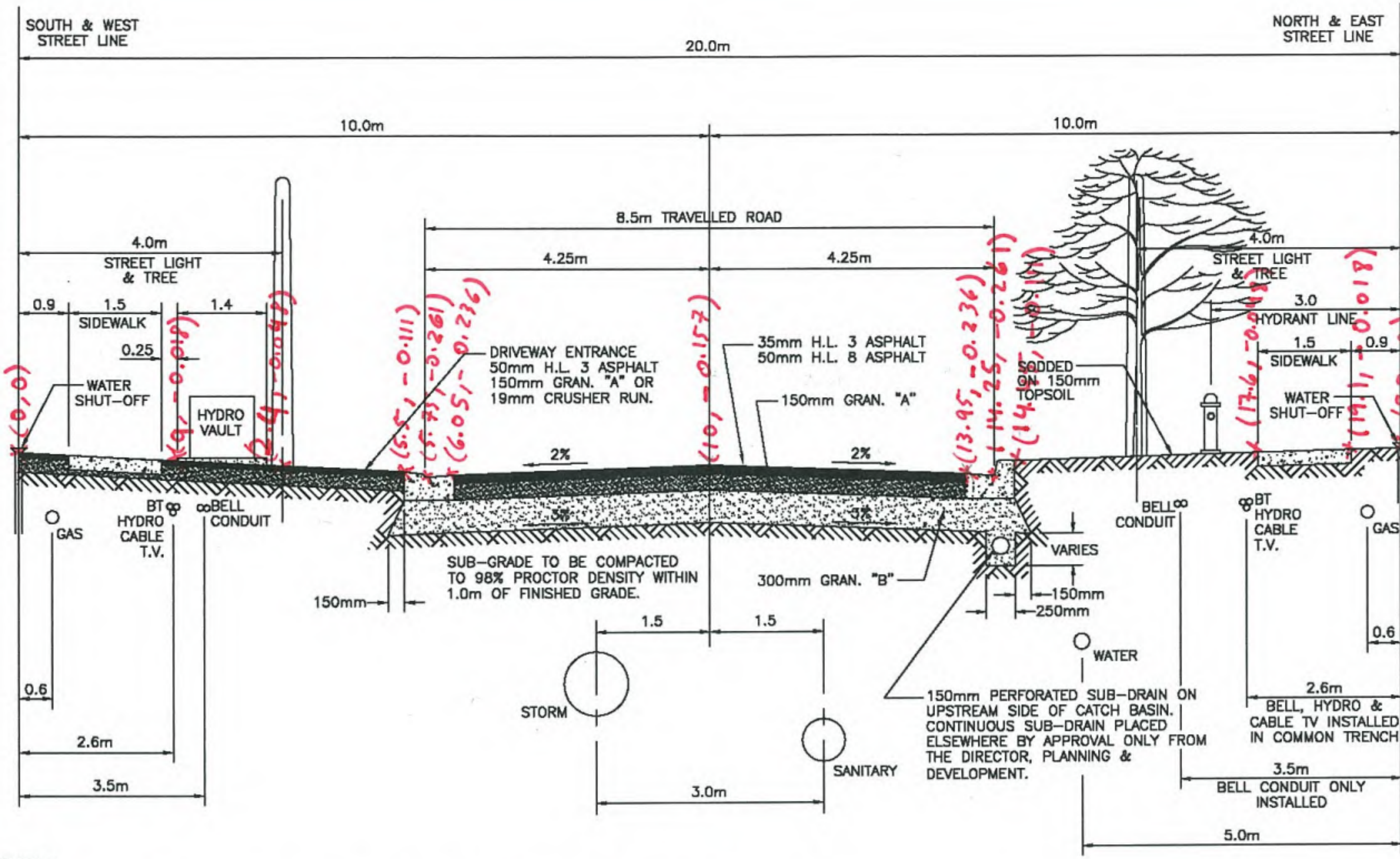
CLAREMONT DEVELOPMENTS INC. 3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR	OVERLAND FLOW CALCULATIONS
SCS consulting group ltd 30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: N.O.T. CHECKED BY: S.E.K. SCALE: 1:4000 DATE: JUNE 2021	PROJECT No: 1470 FIGURE No: G.1

File: P:\1470 Toko - Claremont (Pickering)\Drawings\FSP\Fig\Report Figures\1470P-OLF-G.1.dwg - Revised by <DDILAY> : Fri, Jun 11 2021 - 2:02am

TYPICAL CROSS - SECTION
20m ROAD ALLOWANCE - 8.5m PAVEMENT

City of Pickering
Planning & Development Department

All dimensions are in millimetres unless otherwise noted.



NOTES :

UTILITY TRENCH : PROVIDE A MINIMUM 1.0m OF CLEARANCE AT STREET LIGHT AND FIRE HYDRANT LOCATIONS.

HYDRO VAULT : SEE P-700 FOR LOCATION ON SIDE WITH 5.75m BOULEVARD.

WATERMAIN : SHALL BE INSTALLED ON THE 5.75m BOULEVARD ONLY.

GRANULAR BASE : SHALL CONSIST OF A MINIMUM COMPACTED DEPTH OF 300mm GRANULAR "B" AND 150mm OF GRANULAR "A" LAID IN ACCORDANCE WITH OPSS 501, REVISED DECEMBER 1987 OR LATEST REVISION GRANULARS TO BE COMPACTED TO 100% OF THE MAXIMUM DRY DENSITY.

ASPHALT BASE COURSE : SHALL BE A MINIMUM COMPACTED THICKNESS OF 50mm H.L. 8 BASE COURSE LAID IN ACCORDANCE WITH OPSS 310, REVISED MARCH 1993 OR LATEST REVISION.

ASPHALT SURFACE COURSE : SHALL BE A MINIMUM COMPACTED THICKNESS OF 35mm H.L. 3 SURFACE COURSE LAID IN ACCORDANCE WITH OPSS 310, REVISED MARCH 1993 OR LATEST REVISION.

BOULEVARD GRADE : BOULEVARD GRADE SHALL BE 2.0% MINIMUM TO 5.0% MAXIMUM FROM STREETLINE TO TOP OF CURB.

MINIMUM COVER	
GAS MAIN	0.9m
BELL TELEPHONE	0.6m
BELL CONDUIT	0.6m
HYDRO	0.6m
CABLE TELEVISION	0.6m
STORM SEWER	1.8m
SANITARY SEWER	2.5m
WATERMAIN	1.8m

DRAWN: P. NEUMAN
APPROVED: R. W. HOLBORN
DATE: JANUARY 1993
REVISION NO. 2
DATE: JULY 2003

P-700

Pickering 20m R.O.W.

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.70	%
Normal Depth	0.26	m

Section Definitions

Station (m)	Elevation (m)
0+000.000	0.00
0+000.900	-0.02
0+002.400	-0.05
0+005.550	-0.11
0+005.725	-0.11
0+005.750	-0.26
0+006.050	-0.24
0+010.000	-0.16
0+013.950	-0.24
0+014.250	-0.26
0+014.275	-0.11
0+014.450	-0.11
0+017.600	-0.05
0+019.100	-0.02
0+020.000	0.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+000.000, 0.00)	(0+000.900, -0.02)	0.025
(0+000.900, -0.02)	(0+002.400, -0.05)	0.025
(0+002.400, -0.05)	(0+005.550, -0.11)	0.025
(0+005.550, -0.11)	(0+014.450, -0.11)	0.013
(0+014.450, -0.11)	(0+017.600, -0.05)	0.025
(0+017.600, -0.05)	(0+019.100, -0.02)	0.025

Pickering 20m R.O.W.

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+019.100, -0.02)	(0+020.000, 0.00)	0.025

Results

Discharge	2.31	m^3/s
Elevation Range	-0.261 to 0.000 m	
Flow Area	2.37	m^2
Wetted Perimeter	20.260	m
Top Width	20.000	m
Normal Depth	0.26	m
Critical Depth	0.25	m
Critical Slope	0.00861	m/m
Velocity	0.98	m/s
Velocity Head	0.05	m
Specific Energy	0.31	m
Froude Number	0.91	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.000	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.26	m
Critical Depth	0.25	m
Channel Slope	0.00700	m/m
Critical Slope	0.00861	m/m

Cross Section for Pickering 20m R.O.W.

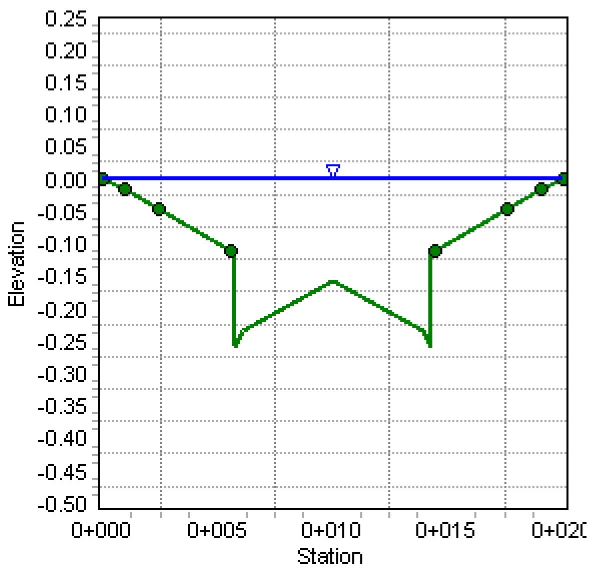
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.70	%
Normal Depth	0.26	m
Discharge	2.31	m³/s

Cross Section Image



Subcatchment ID	Subcatchment Area (ha)	Runoff Coefficient
211A	1.02	0.375

City of Pickering 100 Year (Rational Method)	
Area (ha) =	1.02
Runoff Coeff. =	0.47
T_c (min) =	10.98
a=	**2096.425**
b=	**6.485**
c=	**0.863**
Intensity (mm/hr) =	177.59
Runoff (m^3/s)=	**0.236**

(Assumes initial Tc of 10 minutes and 118m flowing at 2 m/s)

Required Flow Capacity:

Q_{100yr} = **0.236** m^3/s < 2.31 m^3/s

Therefore, the full 100 year flow can be conveyed in the right-of-way on Street D.

Pickering Standard 20m R.O.W. - 0.5% Slope

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50	%
Normal Depth	0.26	m

Section Definitions

Station (m)	Elevation (m)
0+000.000	0.00
0+000.900	-0.02
0+002.400	-0.05
0+005.550	-0.11
0+005.725	-0.11
0+005.750	-0.26
0+006.050	-0.24
0+010.000	-0.16
0+013.950	-0.24
0+014.250	-0.26
0+014.275	-0.11
0+014.450	-0.11
0+017.600	-0.05
0+019.100	-0.02
0+020.000	0.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+000.000, 0.00)	(0+000.900, -0.02)	0.025
(0+000.900, -0.02)	(0+002.400, -0.05)	0.013
(0+002.400, -0.05)	(0+005.550, -0.11)	0.025
(0+005.550, -0.11)	(0+014.450, -0.11)	0.013
(0+014.450, -0.11)	(0+017.600, -0.05)	0.025
(0+017.600, -0.05)	(0+019.100, -0.02)	0.013

Pickering Standard 20m R.O.W. - 0.5% Slope

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+019.100, -0.02)	(0+020.000, 0.00)	0.025

Results

Discharge	2.13	m³/s
Elevation Range	-0.261 to 0.000 m	
Flow Area	2.37	m²
Wetted Perimeter	20.260	m
Top Width	20.000	m
Normal Depth	0.26	m
Critical Depth	0.24	m
Critical Slope	0.00730	m/m
Velocity	0.90	m/s
Velocity Head	0.04	m
Specific Energy	0.30	m
Froude Number	0.84	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.000	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.26	m
Critical Depth	0.24	m
Channel Slope	0.00500	m/m
Critical Slope	0.00730	m/m

Cross-Section for Pickering Standard 20m R.O.W

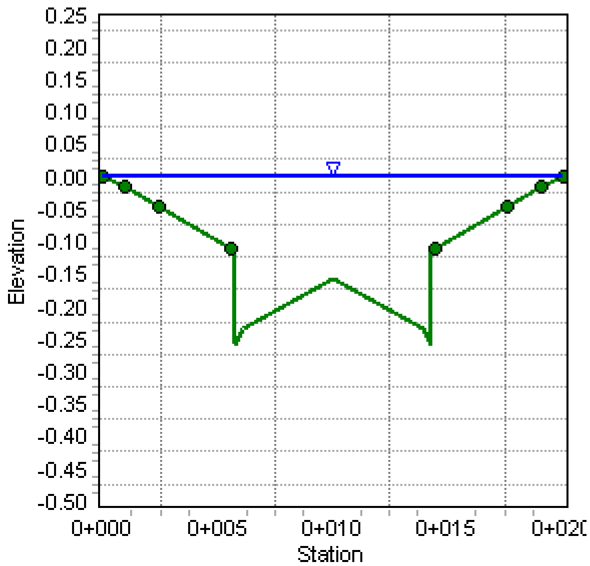
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50	%
Normal Depth	0.26	m
Discharge	2.13	m^3/s

Cross Section Image



Subcatchment ID	Subcatchment Area (ha)	5 Year Runoff Coefficient
211B	4.17	0.375

City of Pickering 5 Year (Rational Method)	
Area (ha) =	4.17
Runoff Coeff. =	0.375
T_c (min) =	13.00
a=	**1082.901**
b=	**6.007**
c=	**0.837**
Intensity (mm/hr) =	92.07
Runoff (m^3/s)=	**0.400**

(Assumes initial Tc of 10 minutes and 360m flowing at 2 m/s)

City of Pickering 100 Year (Rational Method)	
Area (ha) =	4.17
Runoff Coeff. =	0.47
T_c (min) =	13.00
a=	**2096.425**
b=	**6.485**
c=	**0.863**
Intensity (mm/hr) =	161.61
Runoff (m^3/s)=	**0.877**

Required Flow Capacity:

$Q_{100yr} - Q_{5yr} =$ **0.478** m^3/s < 2.13 m^3/s

Therefore, the 100-5 year flow can be conveyed in the right-of-way on Street C.

Subcatchment ID	Subcatchment Area (ha)	5 Year Runoff Coefficient
211C	4.14	0.375

City of Pickering 5 Year (Rational Method)	
Area (ha) =	4.14
Runoff Coeff. =	0.375
T_c (min) =	13.17
a=	**1082.901**
b=	**6.007**
c=	**0.837**
Intensity (mm/hr) =	91.40
Runoff (m^3/s)=	**0.394**

(Assumes initial Tc of 10 minutes and 380m flowing at 2 m/s)

City of Pickering 100 Year (Rational Method)	
Area (ha) =	4.14
Runoff Coeff. =	0.47
T_c (min) =	13.17
a=	**2096.425**
b=	**6.485**
c=	**0.863**
Intensity (mm/hr) =	160.43
Runoff (m^3/s)=	**0.865**

Required Flow Capacity:

$Q_{100yr} - Q_{5yr} =$ **0.471** m^3/s < 2.13 m^3/s

Therefore, the 100-5 year flow can be conveyed in the right-of-way on Street A.

Subcatchment ID	Subcatchment Area (ha)	5 Year Runoff Coefficient
201A	1.88	0.375

City of Pickering 5 Year (Rational Method)	
Area (ha) =	1.88
Runoff Coeff. =	0.375
T_c (min) =	11.82
a=	**1082.901**
b=	**6.007**
c=	**0.837**
Intensity (mm/hr) =	97.16
Runoff (m^3/s)=	**0.190**

(Assumes initial Tc of 10 minutes and 218m flowing at 2 m/s)

City of Pickering 100 Year (Rational Method)	
Area (ha) =	1.88
Runoff Coeff. =	0.47
T_c (min) =	11.82
a=	**2096.425**
b=	**6.485**
c=	**0.863**
Intensity (mm/hr) =	170.59
Runoff (m^3/s)=	**0.418**

Required Flow Capacity:

$Q_{100yr} - Q_{5yr} =$ **0.227** m^3/s < 2.31 m^3/s

Therefore, the 100-5 year flow can be conveyed in the right-of-way on Street A (south cul-de-sac).

Subcatchment ID	Subcatchment Area (ha)	Runoff Coefficient
201B	7.07	0.375

City of Pickering 100 Year (Rational Method)	
Area (ha) =	7.07
Runoff Coeff. =	0.47
T_c (min) =	11.62
a=	**2096.425**
b=	**6.485**
c=	**0.863**
Intensity (mm/hr) =	172.21
Runoff (m^3/s)=	**1.585**

(Assumes initial Tc of 10 minutes and 194m flowing at 2 m/s)

Required Flow Capacity:

Q_{100yr} = 1.585 m^3/s < 2.31m^3/s

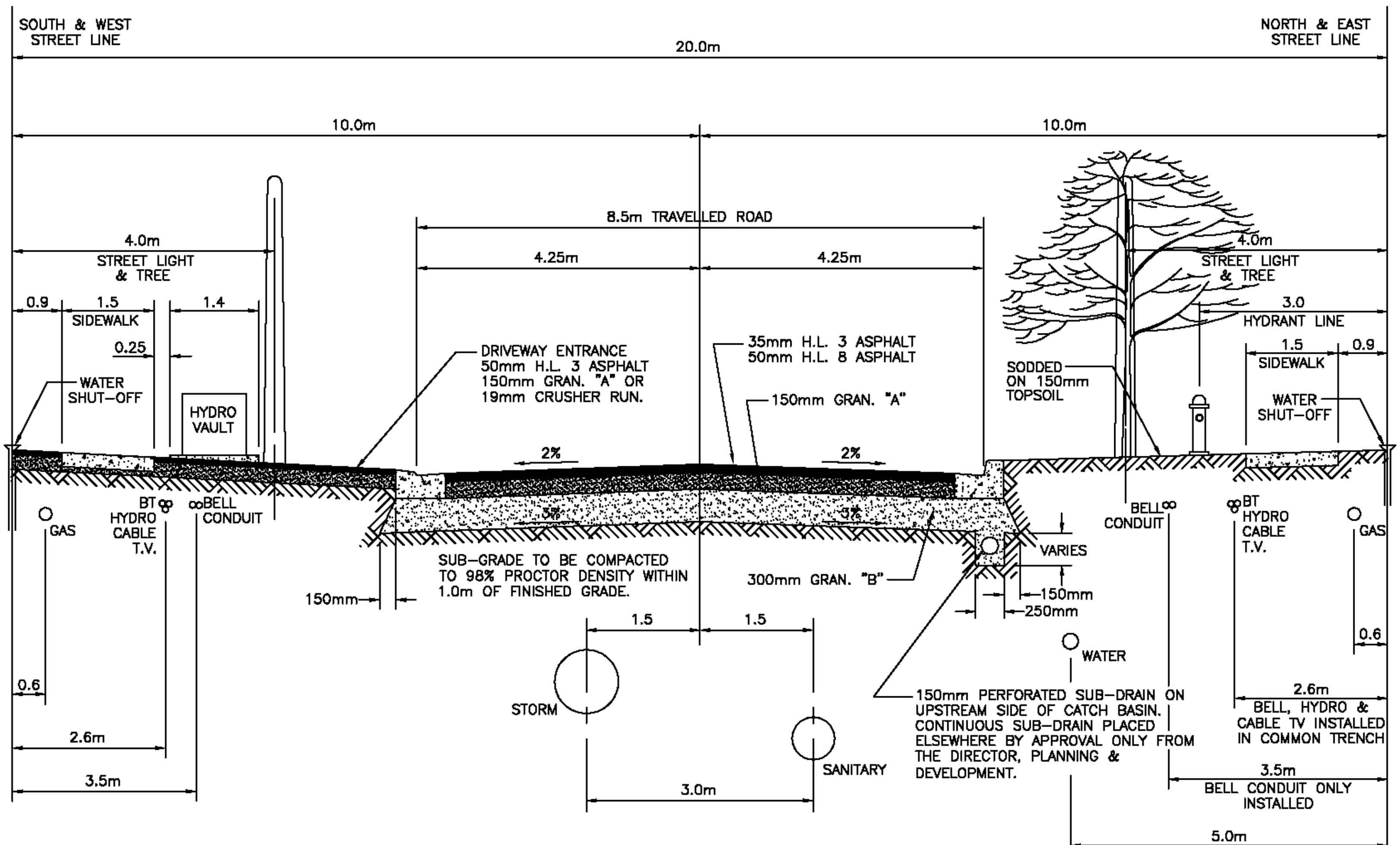
Therefore, the full 100 year flow can be conveyed in the right-of-way on Street B.

APPENDIX H

RIGHT-OF-WAY CONCEPT

City of Pickering
Planning & Development Department

All dimensions are in millimetres unless otherwise noted.



NOTES :

UTILITY TRENCH : PROVIDE A MINIMUM 1.0m OF CLEARANCE AT STREET LIGHT AND FIRE HYDRANT LOCATIONS.

HYDRO VAULT : SEE P-700 FOR LOCATION ON SIDE WITH 5.75m BOULEVARD.

WATERMAIN : SHALL BE INSTALLED ON THE 5.75m BOULEVARD ONLY.

GRANULAR BASE : SHALL CONSIST OF A MINIMUM COMPACTED DEPTH OF 300mm GRANULAR "B" AND 150mm OF GRANULAR "A" LAID IN ACCORDANCE WITH OPSS 501, REVISED DECEMBER 1987 OR LATEST REVISION GRANULARS TO BE COMPACTED TO 100% OF THE MAXIMUM DRY DENSITY.

ASPHALT BASE COURSE : SHALL BE A MINIMUM COMPACTED THICKNESS OF 50mm H.L. 8 BASE COURSE LAID IN ACCORDANCE WITH OPSS 310, REVISED MARCH 1993 OR LATEST REVISION.

ASPHALT SURFACE COURSE : SHALL BE A MINIMUM COMPACTED THICKNESS OF 35mm H.L. 3 SURFACE COURSE LAID IN ACCORDANCE WITH OPSS 310, REVISED MARCH 1993 OR LATEST REVISION.

BOULEVARD GRADE : BOULEVARD GRADE SHALL BE 2.0% MINIMUM TO 5.0% MAXIMUM FROM STREETLINE TO TOP OF CURB.

MINIMUM COVER	
GAS MAIN	0.9m
BELL TELEPHONE	0.6m
BELL CONDUIT	0.6m
HYDRO	0.6m
CABLE TELEVISION	0.6m
STORM SEWER	1.8m
SANITARY SEWER	2.5m
WATERMAIN	1.8m

DRAWN: P. NEUMAN
APPROVED: R. W. HOLBORN
DATE: JANUARY 1993

TYPICAL CROSS - SECTION
20m ROAD ALLOWANCE - 8.5m PAVEMENT

REVISION NO.: 2
DATE: JULY 2003

P-700

APPENDIX I

OIL/GRIT SEPARATOR SIZING

SCS consulting group ltd

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

06/07/2021

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

Site Name:	OGS 1

Drainage Area (ha):	0.58 Street C
Runoff Coefficient 'c':	0.55

Particle Size Distribution:	Fine
Target TSS Removal (%):	60.0
Required Water Quality Runoff Volume Capture (%):	90.0

Estimated Water Quality Flow Rate (L/s):	5.01
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	Claremont
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Noel Tse
EOR Company:	SCS Consulting Group Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	86
EFO6	90
EFO8	92
EFO10	92
EFO12	93

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 86

Water Quality Runoff Volume Capture (%): > 90

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 waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

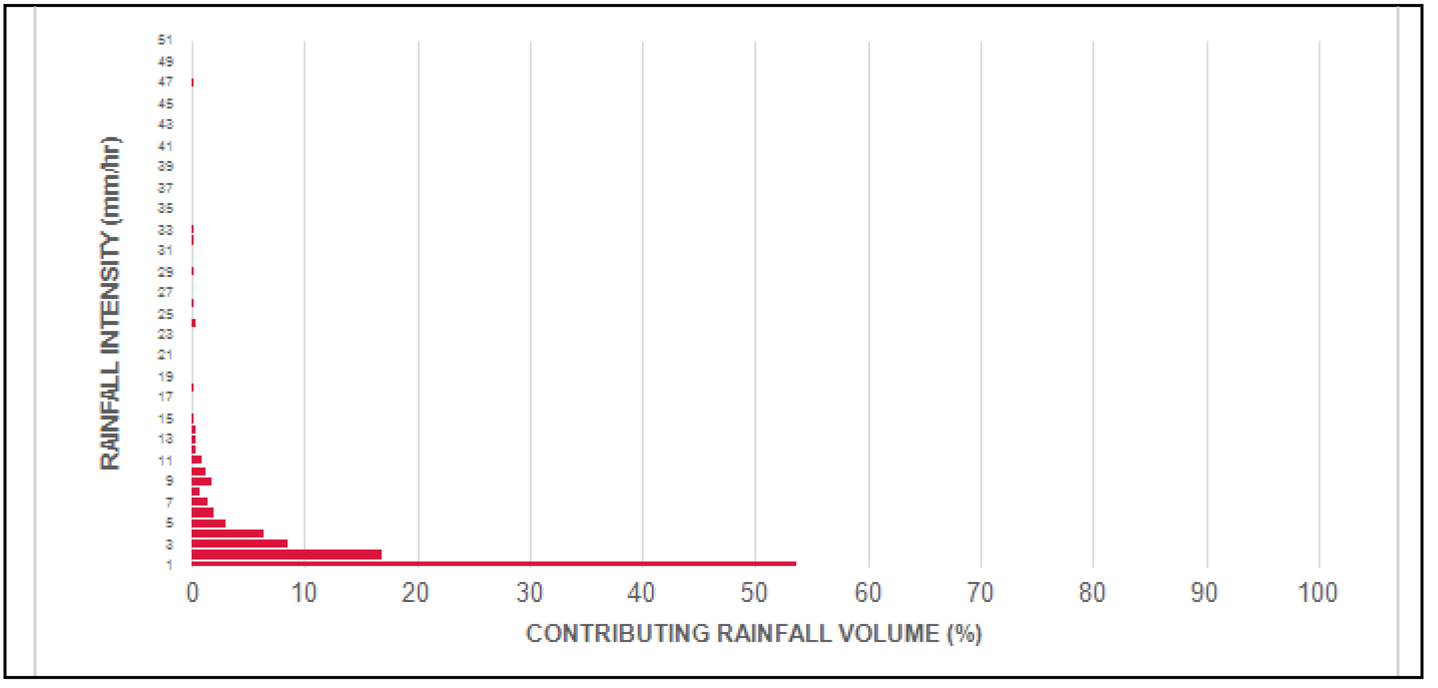
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a 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

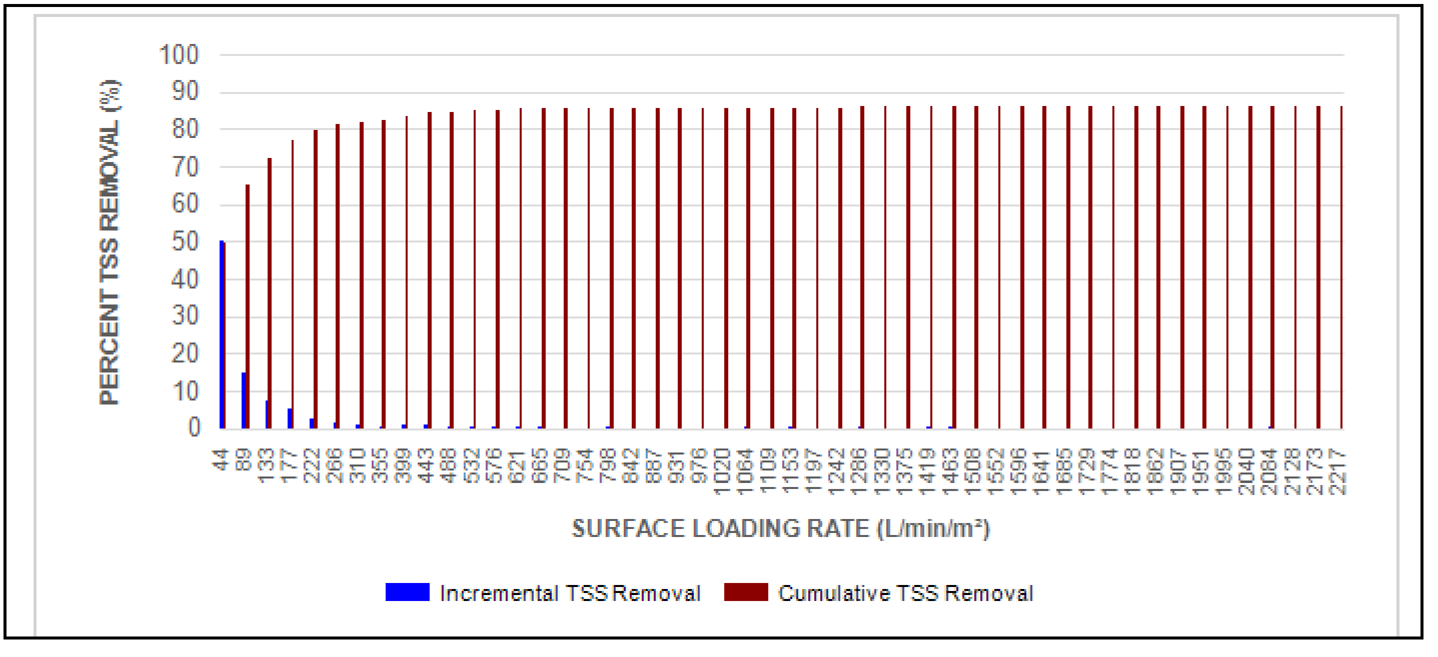
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	53.7	53.7	0.89	53.0	44.0	93	49.9	49.9
2	16.9	70.6	1.77	106.0	89.0	89	15.0	65.0
3	8.6	79.2	2.66	160.0	133.0	84	7.2	72.2
4	6.4	85.6	3.55	213.0	177.0	79	5.1	77.2
5	3.1	88.7	4.43	266.0	222.0	74	2.3	79.5
6	2.0	90.7	5.32	319.0	266.0	71	1.4	81.0
7	1.5	92.2	6.21	372.0	310.0	66	1.0	81.9
8	0.7	92.9	7.09	426.0	355.0	63	0.4	82.4
9	1.8	94.7	7.98	479.0	399.0	58	1.0	83.4
10	1.3	96.0	8.87	532.0	443.0	57	0.7	84.2
11	0.9	96.9	9.76	585.0	488.0	56	0.5	84.7
12	0.4	97.3	10.64	639.0	532.0	54	0.2	84.9
13	0.4	97.7	11.53	692.0	576.0	53	0.2	85.1
14	0.4	98.1	12.42	745.0	621.0	52	0.2	85.3
15	0.2	98.3	13.30	798.0	665.0	52	0.1	85.4
16	0.0	98.3	14.19	851.0	709.0	51	0.0	85.4
17	0.0	98.3	15.08	905.0	754.0	51	0.0	85.4
18	0.2	98.5	15.96	958.0	798.0	51	0.1	85.5
19	0.0	98.5	16.85	1011.0	842.0	51	0.0	85.5
20	0.0	98.5	17.74	1064.0	887.0	51	0.0	85.5
21	0.0	98.5	18.62	1117.0	931.0	50	0.0	85.5
22	0.0	98.5	19.51	1171.0	976.0	50	0.0	85.5
23	0.0	98.5	20.40	1224.0	1020.0	50	0.0	85.5
24	0.4	98.9	21.28	1277.0	1064.0	49	0.2	85.7
25	0.0	98.9	22.17	1330.0	1109.0	49	0.0	85.7

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	23.06	1383.0	1153.0	49	0.1	85.8
27	0.0	99.1	23.94	1437.0	1197.0	48	0.0	85.8
28	0.0	99.1	24.83	1490.0	1242.0	48	0.0	85.8
29	0.2	99.3	25.72	1543.0	1286.0	47	0.1	85.9
30	0.0	99.3	26.60	1596.0	1330.0	47	0.0	85.9
31	0.0	99.3	27.49	1649.0	1375.0	46	0.0	85.9
32	0.2	99.5	28.38	1703.0	1419.0	46	0.1	86.0
33	0.2	99.7	29.27	1756.0	1463.0	44	0.1	86.1
34	0.0	99.7	30.15	1809.0	1508.0	43	0.0	86.1
35	0.0	99.7	31.04	1862.0	1552.0	42	0.0	86.1
36	0.0	99.7	31.93	1916.0	1596.0	41	0.0	86.1
37	0.0	99.7	32.81	1969.0	1641.0	39	0.0	86.1
38	0.0	99.7	33.70	2022.0	1685.0	38	0.0	86.1
39	0.0	99.7	34.59	2075.0	1729.0	37	0.0	86.1
40	0.0	99.7	35.47	2128.0	1774.0	36	0.0	86.1
41	0.0	99.7	36.36	2182.0	1818.0	36	0.0	86.1
42	0.0	99.7	37.25	2235.0	1862.0	35	0.0	86.1
43	0.0	99.7	38.13	2288.0	1907.0	34	0.0	86.1
44	0.0	99.7	39.02	2341.0	1951.0	33	0.0	86.1
45	0.0	99.7	39.91	2394.0	1995.0	32	0.0	86.1
46	0.0	99.7	40.79	2448.0	2040.0	32	0.0	86.1
47	0.2	99.9	41.68	2501.0	2084.0	31	0.1	86.1
48	0.0	99.9	42.57	2554.0	2128.0	30	0.0	86.1
49	0.0	99.9	43.45	2607.0	2173.0	30	0.0	86.1
50	0.0	99.9	44.34	2660.0	2217.0	29	0.0	86.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**86 %**

RAINFALL DATA FROM TORONTO CENTRAL RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter (m)	Model Diameter (ft)	Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter (mm)	Max Inlet Pipe Diameter (in)	Max Outlet Pipe Diameter (mm)	Max Outlet Pipe Diameter (in)	Peak Conveyance Flow Rate (L/s)	Peak Conveyance Flow Rate (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

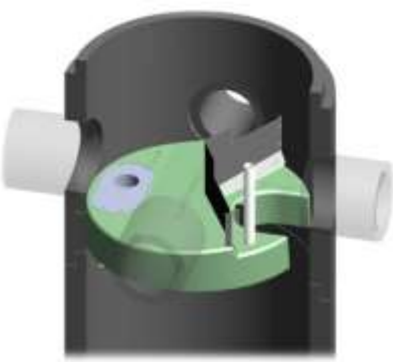
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

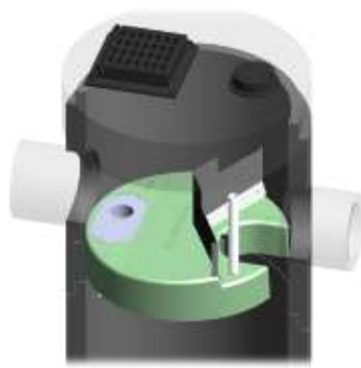
DESIGN FLEXIBILITY

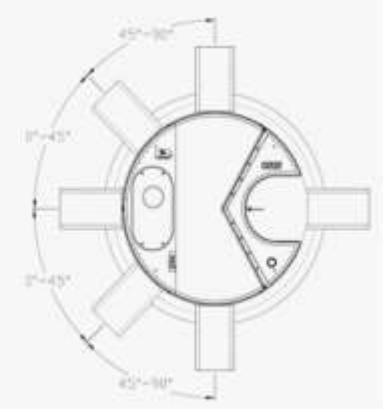
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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)	(ft³)	(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/ft³)

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

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

PART 1 – GENERAL

1.1 <u>WORK INCLUDED</u>

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 <u>REFERENCE STANDARDS & PROCEDURES</u>

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 <u>SUBMITTALS</u>

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 <u>OGS POLLUTANT STORAGE</u>

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

06/12/2021

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

Site Name:	OGS 2

Drainage Area (ha):	0.31 Street A
Runoff Coefficient 'c':	0.55

Particle Size Distribution:	Fine
Target TSS Removal (%):	60.0
Required Water Quality Runoff Volume Capture (%):	90.0

Estimated Water Quality Flow Rate (L/s):	2.68
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	Claremont
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Noel Tse
EOR Company:	SCS Consulting Group Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	90
EFO6	92
EFO8	93
EFO10	93
EFO12	93

Recommended Stormceptor EFO Model:	**EFO4**
Estimated Net Annual Sediment (TSS) Load Reduction (%):	**90**
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 waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

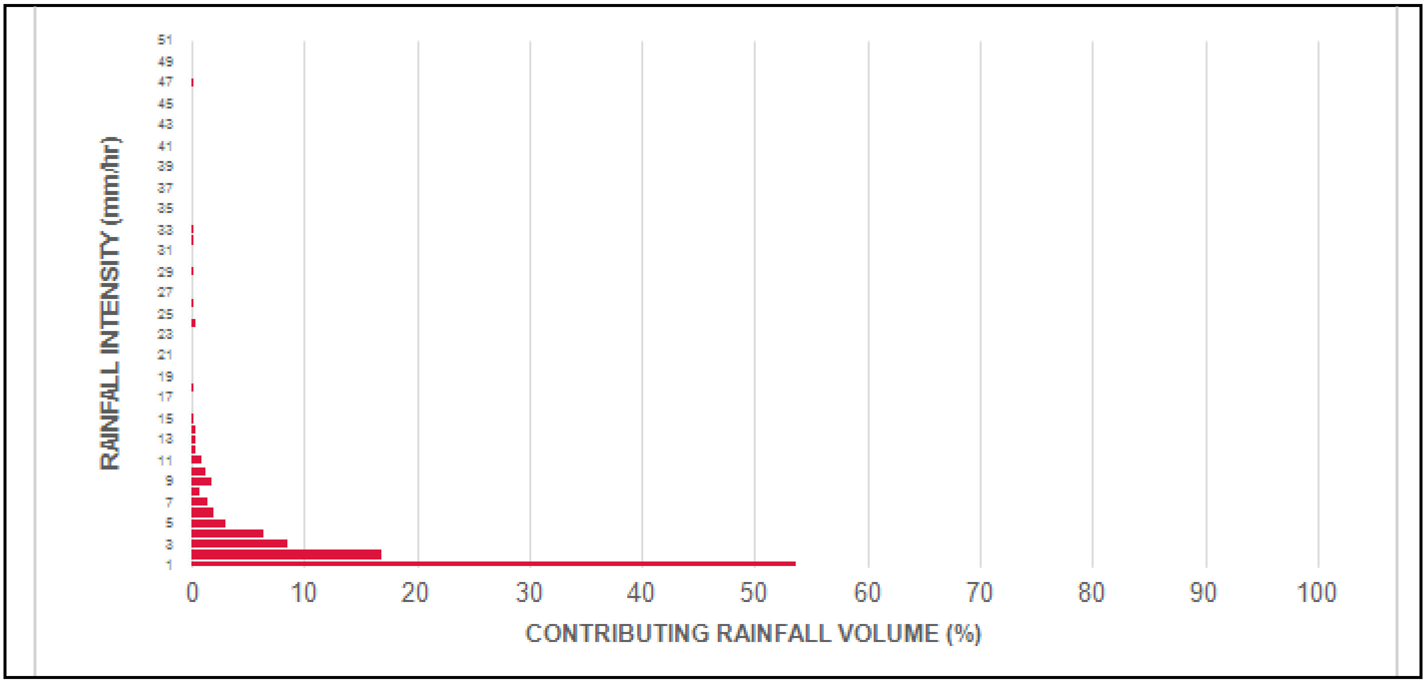
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a 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

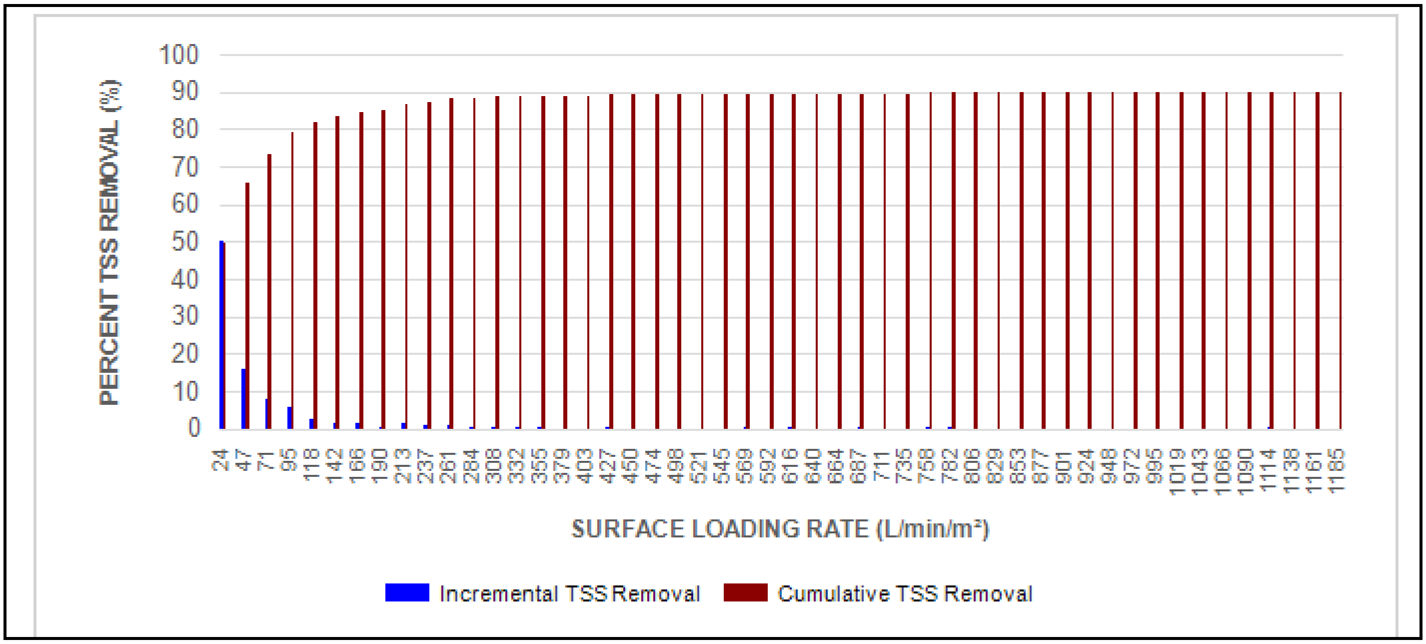
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	53.7	53.7	0.47	28.0	24.0	93	49.9	49.9
2	16.9	70.6	0.95	57.0	47.0	93	15.7	65.7
3	8.6	79.2	1.42	85.0	71.0	90	7.7	73.4
4	6.4	85.6	1.90	114.0	95.0	88	5.6	79.0
5	3.1	88.7	2.37	142.0	118.0	86	2.7	81.7
6	2.0	90.7	2.84	171.0	142.0	83	1.7	83.3
7	1.5	92.2	3.32	199.0	166.0	80	1.2	84.5
8	0.7	92.9	3.79	228.0	190.0	77	0.5	85.1
9	1.8	94.7	4.27	256.0	213.0	75	1.4	86.4
10	1.3	96.0	4.74	284.0	237.0	73	1.0	87.4
11	0.9	96.9	5.21	313.0	261.0	71	0.6	88.0
12	0.4	97.3	5.69	341.0	284.0	69	0.3	88.3
13	0.4	97.7	6.16	370.0	308.0	67	0.3	88.6
14	0.4	98.1	6.64	398.0	332.0	64	0.3	88.8
15	0.2	98.3	7.11	427.0	355.0	63	0.1	88.9
16	0.0	98.3	7.58	455.0	379.0	60	0.0	88.9
17	0.0	98.3	8.06	483.0	403.0	58	0.0	88.9
18	0.2	98.5	8.53	512.0	427.0	57	0.1	89.1
19	0.0	98.5	9.01	540.0	450.0	57	0.0	89.1
20	0.0	98.5	9.48	569.0	474.0	56	0.0	89.1
21	0.0	98.5	9.95	597.0	498.0	55	0.0	89.1
22	0.0	98.5	10.43	626.0	521.0	54	0.0	89.1
23	0.0	98.5	10.90	654.0	545.0	54	0.0	89.1
24	0.4	98.9	11.38	683.0	569.0	53	0.2	89.3
25	0.0	98.9	11.85	711.0	592.0	52	0.0	89.3

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	12.32	739.0	616.0	52	0.1	89.4
27	0.0	99.1	12.80	768.0	640.0	52	0.0	89.4
28	0.0	99.1	13.27	796.0	664.0	52	0.0	89.4
29	0.2	99.3	13.75	825.0	687.0	52	0.1	89.5
30	0.0	99.3	14.22	853.0	711.0	51	0.0	89.5
31	0.0	99.3	14.69	882.0	735.0	51	0.0	89.5
32	0.2	99.5	15.17	910.0	758.0	51	0.1	89.6
33	0.2	99.7	15.64	939.0	782.0	51	0.1	89.7
34	0.0	99.7	16.12	967.0	806.0	51	0.0	89.7
35	0.0	99.7	16.59	995.0	829.0	51	0.0	89.7
36	0.0	99.7	17.06	1024.0	853.0	51	0.0	89.7
37	0.0	99.7	17.54	1052.0	877.0	51	0.0	89.7
38	0.0	99.7	18.01	1081.0	901.0	51	0.0	89.7
39	0.0	99.7	18.49	1109.0	924.0	50	0.0	89.7
40	0.0	99.7	18.96	1138.0	948.0	50	0.0	89.7
41	0.0	99.7	19.43	1166.0	972.0	50	0.0	89.7
42	0.0	99.7	19.91	1194.0	995.0	50	0.0	89.7
43	0.0	99.7	20.38	1223.0	1019.0	50	0.0	89.7
44	0.0	99.7	20.86	1251.0	1043.0	50	0.0	89.7
45	0.0	99.7	21.33	1280.0	1066.0	49	0.0	89.7
46	0.0	99.7	21.80	1308.0	1090.0	49	0.0	89.7
47	0.2	99.9	22.28	1337.0	1114.0	49	0.1	89.8
48	0.0	99.9	22.75	1365.0	1138.0	49	0.0	89.8
49	0.0	99.9	23.23	1394.0	1161.0	48	0.0	89.8
50	0.0	99.9	23.70	1422.0	1185.0	48	0.0	89.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**90 %**

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

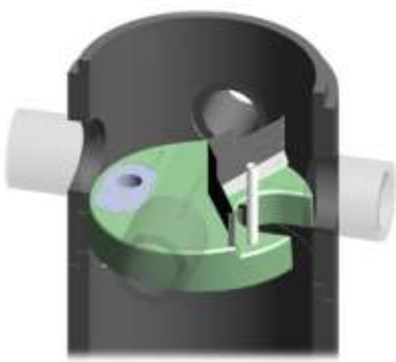
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

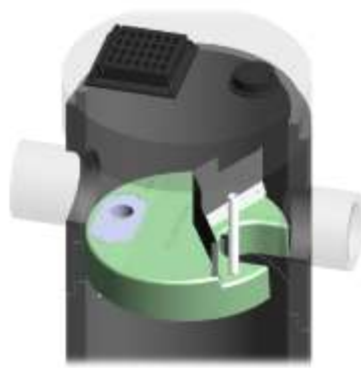
DESIGN FLEXIBILITY

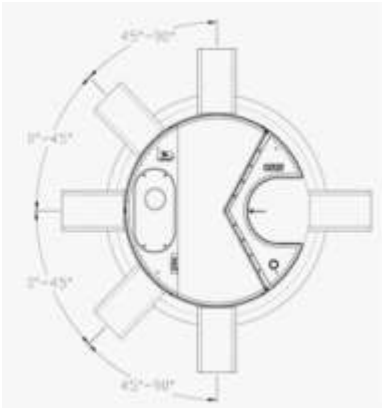
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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 (m)	Model Diameter (ft)	Depth (Outlet Pipe Invert to Sump Floor) (m)	Depth (Outlet Pipe Invert to Sump Floor) (ft)	Oil Volume (L)	Oil Volume (Gal)	Recommended Sediment Maintenance Depth * (mm)	Recommended Sediment Maintenance Depth * (in)	Maximum Sediment Volume * (L)	Maximum Sediment Volume * (ft³)	Maximum Sediment Mass ** (kg)	Maximum Sediment Mass ** (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/ft³)

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

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.

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