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# Functional Servicing & Stormwater Management Report for 3523 25<sup>th</sup> Sideroad Innisfil Ontario

FINAL

Prepared For:

AA1 Inc.

Prepared By:

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## 1 Introduction

Greenland International Consulting Ltd. (Greenland) was retained by AA1 Inc. to undertake a Functional Servicing and Stormwater Management Report (FS-SWM Report) in support of a Zoning By-law Amendment, Official Plan Amendment and Plan of Subdivision applications for 3523 25<sup>th</sup> Sideroad, in the Town of Innisfil, County of Simcoe (the Site).

The Site is located at the north end of Innisfil, near the Big Bay Point Community, southwest of Friday Harbour Resort and directly south of the Nest golf course. This 24.4 ha property is bounded by 25<sup>th</sup> Sideroad to the west, 13<sup>th</sup> Line to the north, and undeveloped land to the south and east. The general site location is identified in **Figure 1**.



*Figure 1 Site Location*

A resort residential community is proposed on the subject lands with a variety of zoning classifications, which will consist of 593 residential units (single detached, semi-detached, townhouse and apartment), outdoor recreational areas, a park amenity area, a stormwater management (SWM) facility and natural heritage areas with a proposed trail system.

The Site currently consists of a single detached residential building and associated outbuildings, and is zoned for agricultural purposes.

The objective of this report is to summarize the proposed servicing for this development, including, but not limited to, the following:

- Determine the proposed fire and domestic water supply source and connections and verify that water pressures and flow rates of the connected municipal infrastructure are adequate to service this development;
- Identify proposed sanitary peak flows to provide confirmation that there is adequate capacity in the receiving sanitary sewer system;
- Confirm whether there is adequate water supply and wastewater treatment capacity at the water treatment plant (WTP) and water pollution control plant (WPCP), respectively; and,
- Identify existing and post-development storm event peak flows, and detail the proposed plans for stormwater management to be implemented on-site to account for any change in the site drainage patterns (peak flow control, to be matched to existing conditions), stormwater quality (receiving water body water quality protection), volume control, infiltration balance and identification of a suitable outlet for controlled SWM facility discharge.

### 1.1 Background Studies

In order to complete the FS-SWM Report, including confirmation of Innisfil's existing water supply and wastewater treatment capacity, and the ability to service the future development areas proposed, the following studies and guidelines were reviewed and considered:

- Annual Performance Report – Lakeshore Wastewater Treatment Plant (2024);
- Annual Summary Report – Innisfil Lake Simcoe (Lakeshore Water Treatment Plant) (2022-2024);
- City of Kawartha Lakes Omemee Beach Park Splash Pad Feasibility Study (2024);
- Health and Promotion Act - Reg. 565 (1990);
- MECP Design Guidelines for Drinking Water Systems (updated 2023);
- MECP Stormwater Management Planning and Design Manual (2003).
- LSRCA Technical Guidelines for Stormwater Management (2022);
- Ontario Building Code (2024);
- Town of Innisfil Engineering Design Standards and Specifications Manual (2022);
- Town of Innisfil Master Servicing Plan Update (2023);
- Town of Innisfil Official Plan (2018).

### 1.2 Pre-Consultation

A pre-consultation meeting was held with the project team, Town of Innisfil, InnServices and the Lake Simcoe Region Conservation Authority (LSRCA) on December 15, 2022. Preliminary comments regarding servicing concerns were provided, as the proposed development is not within the existing settlement areas, therefore does not have allocated municipal servicing. Additional comments in writing were provided on February 29, 2024 reiterating servicing concerns that must be addressed.

A second pre-consultation meeting was held in December 2024. Formal comments were provided January 15, 2025, reiterating concerns regarding municipal servicing. The following report has been prepared with consideration of all comments provided, with the understanding that further discussions with InnServices and Friday Harbour Resort (as necessary) will be required to ensure that servicing concerns are addressed.

## 2 Water Servicing

The proposed Site is located outside of an existing settlement area in Innisfil and, is therefore not connected to any existing municipal water services. While there is no existing connection to the water

distribution system, there is servicing along 25<sup>th</sup> Sideroad and 13<sup>th</sup> Line which services Friday Harbour to the northeast.

The Site is located in the vicinity of the Big Bay Point Community in the northeast end of Innisfil. The residents of this community are currently on private wells and septic systems. Friday Harbour Resort is located northeast of the Site, and is currently partially constructed. Friday Harbour Resort is serviced by the Lakeshore water supply system.

## 2.1 Existing Water Supply & Distribution System

The Lakeshore water supply system supplies water to Alcona, the Leonard’s Beach shoreline, parts of Lefroy, Gilford, Fennel’s Corners, Cookstown, and Friday Harbour Resort. In addition, water is supplied to the Town of Bradford West Gwillimbury.

Currently, there is no municipal water servicing to the Site. Therefore, any future development of the Site will need to be connected to Innisfil’s existing infrastructure, or other feasible alternatives, should servicing from the Lakeshore Water Treatment Plant (WTP) not be possible.

**Table 1** below summarizes the capacity and demand from the Lakeshore WTP, derived from the 2024 Annual Summary Report for the Innisfil Lake Simcoe Drinking Water System.

*Table 1 Lakeshore Water System Existing Capacity and Demand (2024 MDD)*

Serviced Areas	MDD 2024 (ML/day)	Existing WTP Capacity (ML/day)	Residual Capacity (ML/day)
Current Serviced Areas	11.52	-	-
Bradford West Gwillimbury	10.63		
Total	22.15	38	15.85

Currently, there is significant residual capacity in the Lakeshore WTP. Additional demands on the supply from proposed development have also been estimated based on active planning applications available on the Town’s website (<https://www.getinvolvedinnisfil.ca/planning>). Allocated capacity was estimated based on 2024 MDD for existing areas and approved Functional Servicing Reports that are proposing to connect future development to the Lakeshore water supply system. The estimated allocated capacity is summarized in **Table 2**, below.

*Table 2 Allocated Capacity, Water Supply*

Serviced Areas	Proposed MDD (ML/day)	Existing WTP Capacity (ML/day)	Residual Capacity (ML/day)
Current Serviced Areas	11.52	-	-
Allocated Capacity	11.06		
Bradford West Gwillimbury	10.63		
Total	33.21	38	4.79

Taking into consideration active planning files within the Town, there is still significant residual capacity in the Lakeshore WTP. Residual capacity (i.e., available capacity post-allocation) will need to be confirmed with the Town.

An existing 400mm diameter watermain along 25<sup>th</sup> Sideroad and 13<sup>th</sup> Line supplies water to Friday Harbour Resort from the Lakeshore WTP, per excerpts from the Friday Harbour Resort Development External Servicing As-Recorded Submission (SCS Consulting Group Ltd., 2017).

## 2.2 Design Flows

The watermain system will be designed in accordance with: the Town of Innisfil Engineering Design and Standards and Specifications Manual (2022), Town of Innisfil Master Servicing Plan (MSP) (2023), the Health and Promotion Act (R.R.O. 1990, Reg 565: Public Pools), Ontario Building Code (2024), per. comm with InnServices (2025), and MECP Design Guidelines for Drinking Water Systems (2023), and will consist of the following:

- Residential Population Density: 3.36 persons per unit (single/semi-detached), 2.7 ppu (Townhouse), 1.9 ppu (Apartment);
- Water Feature Population Density: 0.71 person/m<sup>2</sup> (pool), 1 person/m<sup>2</sup> (spa);
- Residential Water Usage Rate: 250 l/c/d Average Day Demand (ADD);
- Pool/ Spa Water Usage Rate: 40 l/c/d;
- Splash Pad Water Usage Rate: 136 m<sup>3</sup>/d (6.31 L/s over 6 hours usage);
- Maximum Day Peaking Factor: 1.8;
- Peak Hour Factor: 2.7 (MECP);
- Fire Flow: 200L/s (Downtown).

Watermains must be designed to accommodate the greater of peak hourly demand or MDD plus fire flow, per the Engineering Design Standards and Specifications Manual.

The proposed demands for the development based on the above criteria are summarized in **Table 3**. Please note that fire flows have been conservatively estimated based on the Town’s preferred fire flow for Downtown uses (apartment building) in absence of detailed information on proposed building layouts and sizes to complete a calculation using the Fire Underwriter’s Survey (2020). As design progresses, the required fire flow will be re-calculated based on the 2020 Fire Underwriter’s Survey.

*Table 3 Proposed Development Water Demands*

	Equivalent Population	Area (m <sup>2</sup> )	ADD (L/s)	MDD (L/s)	Fire Flow (L/s)	Peak Hour Demand (L/s)
Residential	755	-	3.90	7.02	200	16.11
Splash Pad <sup>1</sup>	211	295	1.58	2.84		1.96
Pool <sup>2</sup>	1,571	2,200	0.73	1.31		1.55
Spa <sup>2</sup>	1,243	1,243	0.58	1.04		4.26
<b>Total</b>	<b>3,780</b>	-	<b>6.78</b>	<b>12.20</b>	<b>200</b>	<b>23.88</b>

**Notes:** 1. No existing Town Standard. Water usage rate obtained from City of Kawartha Lakes Omemee Beach Park Splash Pad Feasibility Study (2024).

2. No existing Town Standard. Capacity estimate obtained from Health and Promotion Act (R.R.O. 1990, Reg. 565-Public Pools); Per capita water usage rate obtained from Ontario Building Code Table 8.2.1.3B.

Based on the results in **Table 3**, watermains shall be designed based on the MDD plus fire flow (212.2 L/s). Hydrants must have 212 L/s available fire flow at a minimum pressure of 140 kPa. The available capacity and pressure of existing external watermains will need to be confirmed by InnServices, through water

system modelling. Subject to comments on this FSR, this modeling request will be made formally in support of a future submission. Upon confirmation that there is existing capacity in the system, per the Town’s water modelling, a hydrant test will be conducted to confirm available pressure.

The MDD for the development will be 12.20L/s or 1,054 m<sup>3</sup>/d. Based on the proposed MDD, there is sufficient residual capacity in the Lakeshore WTP to service the proposed development, to be confirmed by InnServices.

The proposed internal watermain layout has been provided in the preliminary Site Servicing Plan, to be submitted under a separate cover.

### 2.3 Water Storage

A calculation of required water storage for the development has been completed based on preliminary fire flows. It is anticipated that the required water storage will be adjusted with fire flows as design progresses.

As outlined in the MECP Design Guidelines for Drinking Water Systems, the Water Storage Capacity is calculated as the sum of the Fire Storage, Equalization Storage and Emergency Storage.

$$\text{Total Water Storage} = \text{Fire Storage} + \text{Equalization Storage} + \text{Emergency Storage}$$

Where:

Fire Storage is the design fire flow x the design fire duration

Equalization Storage is 25% the maximum daily demand

Emergency Storage is 25% of A + B

Fire flow duration was determined based on the equivalent population for the proposed development, per the MECP Guidelines.

The required water storage is presented in **Table 4**.

*Table 4 Required Water Storage*

<b>Fire Flow</b>	<b>Fire Flow Duration</b>	<b>Fire Storage</b>	<b>Equalization Storage</b>	<b>Emergency Storage</b>	<b>Total Storage</b>
L/s	hours	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>
200	2	1,440	263.62	425.90	2,129.52

The total required storage for the development is 2,129 m<sup>3</sup>. Preliminary discussions have been held with Friday Harbour Resort to discuss the possibility of connecting to the Friday Harbour Standpipe. Based on this discussion, connecting to the Friday Harbour Standpipe is not supported by the Resort. As the Site is not within an existing settlement area, existing Alcona water storage or proposed storage upgrades do not have consideration for the proposed development. Unless otherwise indicated through discussions with InnServices that there is sufficient water storage or water pressure to service the proposed development through existing systems, water storage will be provided on-site.

Onsite water storage is proposed to be provided through a standpipe system (i.e. Greatario tanks), with specific location and details to be confirmed through detailed design and discussions with InnServices. There is sufficient room on-site for the proposed water storage.

### 3 Sanitary Servicing

As discussed in **Section 2: Water Servicing**, the proposed Site is located outside of an existing settlement area in Innisfil and, is therefore not connected to any existing municipal sanitary services. While there is no existing connection to the wastewater collection system, there is servicing along 25<sup>th</sup> Sideroad and 13<sup>th</sup> Line which services Friday Harbour to the north. It is proposed that the Site will connect to this collection system.

#### 3.1 Existing Wastewater Treatment and Collection System

The existing Lakeshore wastewater system in consists of one (1) water pollution control plant (WPCP) and nine (9) sewage pumping stations (SPS).

Per ECA 2748-C5EJLK, the existing average daily treatment capacity of the WPCP is 17,000 m<sup>3</sup>/d. Construction of an expansion to the WPCP was initiated in spring 2025 to expand the rated capacity to 25,000 m<sup>3</sup>/d. The existing demand and residual capacity are shown below in **Table 5**, based on the 2024 Annual Summary Report for the Lakeshore WPCP.

*Table 5 Existing Lakeshore Wastewater System (2024 ADF)*

ADF 2024 (ML/day)	Existing WPCP Capacity (ML/day)	Residual Capacity (ML/day)
10.6	17	6.4

There is currently significant residual capacity in the wastewater treatment system to service future development. Additional demands of the treatment system from proposed development have also been estimated based on active planning applications available on the Town’s website (<https://www.getinvolvedinnisfil.ca/planning>). Allocated capacity was estimated based on 2024 ADF for existing areas and Functional Servicing Reports that are proposing to connect future development to the Lakeshore wastewater treatment system. The estimated allocated capacity is summarized in **Table 6**, below.

*Table 6 Allocated Capacity, Wastewater Treatment*

	ADF (ML/day)	Existing WPCP Capacity (ML/day)	Residual Capacity (ML/day)
Current Serviced Areas	10.6	-	-
Allocated Capacity	6.4		
Total	17.0	25	8

As construction for the upgrade to the WPCP has commenced, with expected completion in 2027, the expanded rated capacity of the WPCP was assumed for calculations of residual capacity in the wastewater treatment system, with allocated capacity for future developments also accounted for. Based on the

results above, there will be significant residual capacity in the WPCP, post-allocation. Residual capacity (i.e., available capacity post-allocation) for wastewater treatment will need to be confirmed by the Town. It is also our understanding that membership in a developer's group is required for cost sharing to receive WPCP allocation and that AA1 Inc. has initiated discussions with the trustee for this group on a preliminary basis.

An existing 525mm diameter gravity sanitary sewer along 25<sup>th</sup> Sideroad and 13<sup>th</sup> Line collects wastewater flows from Friday Harbour Resort to the Lakeshore WPCP, per excerpts from the Friday Harbour Resort Development External Servicing As-Recorded Submission (SCS Consulting Group Ltd., 2017). Wastewater is conveyed to SPS #8 located at Mapleview Drive, immediately west of 25<sup>th</sup> Sideroad. Based on the external sanitary sewer design sheet prepared by SCS Consulting Ltd. for Friday Harbour Resort (2017), the minimum residual capacity in the existing sanitary sewer between the proposed development and SPS #8 is 27.62 L/s, assuming a maximum of 85% capacity. External upgrades of the existing sewer will be required if peak flow from the Site exceeds 27.62 L/s. Proposed peak flow of the proposed development is shown in **Table 7**, below.

SPS #8 has been designed for flows from Friday Harbour Resort and the Big Bay Point community. The proposed expansion, per the 2023 MSP, is not designed for any additional flows from further development. It has been assumed for this report that future discussions with the Town and Friday Harbour Resort will be required to address an additional or larger expansion to the SPS to receive the proposed wastewater flows from the Site. As the SPS upgrade will be triggered by development at Friday Harbour Resort, preliminary discussions were held with the Friday Harbour development team to discuss the possibility of working together on the SPS expansion, when it is required. This would include a cost-sharing agreement to be developed between the Site and Friday Harbour. Initial discussions were positive, and will be pursued further, as design of the Site progresses.

### 3.2 Design Flows

The sanitary sewer system will be designed in accordance with the Town of Innisfil Engineering Design Standards and Specifications Manual (2022), The Innisfil MSP (2023) and per. Comm with InnServices (2025) and will consist of the following:

- Residential Population Density: 3.36 persons per unit (single/semi-detached), 2.7 ppu (Townhouse), 1.9 ppu (Apartment);
- Water Feature Population Density: 0.71 person/m<sup>2</sup> (pool), 1 person/m<sup>2</sup> (spa);
- Residential Water Usage Rate: 250 l/c/d Average Day Demand (ADD);
- Commercial Water Usage Rate: 20m<sup>3</sup>/ha/day (ADD);
- Residential Per Capita Flows: 300 l/c/d Average Day Flow (ADF);
- Residential Peak Flows: 250 l/c/d x Harmon Factor;
- Residential I/I: 400 l/c/d;
- Pool/ Spa Wastewater Flows: 40 l/c/d;
- Splash Pad Wastewater Flows: 136 m<sup>3</sup>/d (6.31 L/s over 6 hours usage);
- Peaking Factor: Hamon factor, based on calculation  $M = 1 + (14/[4+p^{0.5}])$ ,  $2 \leq M \leq 4$ ;
- Area-Based Infiltration Rate (non-residential): 20 m<sup>3</sup>/ha/day;
- Minimum Velocity: 0.6 m/s (flowing full); and,
- Maximum Velocity: 4.0 m/s (flowing full).

Sanitary sewers must be designed to accommodate peak design flows. If flows will exceed 85% of full flow under peak conditions, sewers must be upsized.

The proposed flows for the development based on the above criteria are summarized in **Table 7**.

*Table 7 Proposed Wastewater Flows*

	<b>Equivalent Population</b>	<b>ADF (L/s)</b>	<b>Harmon Factor</b>	<b>Recreation Area (ha)</b>	<b>Infiltration Flow (L/s)</b>	<b>Peak Flow (L/s)</b>
Residential	1,348	4.68	3.71	-	6.24	20.72
Splash Pad <sup>1</sup>	211	1.58	2.00	2.22	0.51	6.27
Pool <sup>2</sup>	1,571	0.73	2.00			
Spa <sup>2</sup>	1,243	0.58	2.00			
<b>Total</b>	<b>3,780</b>	<b>7.56</b>	-	-	<b>6.75</b>	<b>27.00</b>

**Notes:** No existing Town Standard. 1. Wastewater flow rate obtained from City of Kawartha Lakes Omemee Beach Park Splash Pad Feasibility Study (2024).

2. No existing Town Standard. Capacity estimate obtained from Health and Promotion Act (R.R.O. 1990, Reg. 565-Public Pools); Per capita wastewater flow obtained from Ontario Building Code Table 8.2.1.3B.

The peak flow for the proposed development is 27.00 L/s, which is less than the residual capacity (27.62 L/s, based on 85% maximum capacity) of the existing sanitary sewer when accounting for full buildout of Friday Harbour. Therefore, there is sufficient capacity in the existing external sanitary sewer to convey flows. The ADF for the development is 7.56 L/s or 653 m<sup>3</sup>/d, which the Lakeshore WPCP has sufficient residual capacity to treat. Wastewater modeling by InnServices will be required to confirm the available capacity in the existing collection system.

The preliminary Site Servicing Plan has been prepared depicting proposed sanitary sewer layout and flow direction, to be submitted under a separate cover.

## 4 Stormwater Management

### 4.1 SWM Design Criteria

The proposed development is considered a ‘major development’ by the Town of Innisfil. As such the following stormwater management design criteria will apply to the development, in accordance with Town, Lake Simcoe Region Conservation Authority (LSRCA) and MECP requirements:

- Water Quantity Control – peak flow rates from the 2 through to 100 year storm events must be controlled to pre-development levels (4 hr Chicago, 12 hr SCS Type II, 24 Hr SCS Type II);
- Water Quality Control – water quality treatment must achieve MECP enhanced protection, corresponding to 80% TSS removal;
- Water Volume Control – post development runoff volumes from impervious surfaces must be captured and retained on-site for a 25mm event, or best efforts based on site conditions;
- Water Balance – (LSRCA Water Balance Recharge Policy for the Lake Simcoe Protection Plan, 2021) post development groundwater recharge (infiltration) deficit must be zero;
- Phosphorus Balance – (LSRCA Phosphorus Offsetting Policy, 2023) the proposed development must demonstrate that phosphorus loadings will equal pre-development phosphorus loading for the same area; and,
- Sufficient outlet for stormwater generated on-site.

#### 4.2 Existing Drainage Conditions

The existing drainage areas have been delineated from contour lines provided by the LSRCA, which are LiDAR-derived. The total drainage area of the Site is 24.4 ha. There is an external drainage area of 9.47 ha, for a total drainage area of 33.87 ha. A figure of the delineated catchments of the existing drainage area and associated catchment parameters are provided in **Appendix A**.

#### 4.3 Proposed Drainage Conditions

Based on the Concept Plan developed by Innovative Planning Solutions (IPS), dated June 24, 2025, the proposed development area of the Site is 15.09 ha. The existing natural heritage area (9.31 ha) will remain undeveloped. A figure of the delineated catchments for the proposed drainage conditions and associated catchment parameters are provided in **Appendix A**.

#### 4.4 Storm Servicing

There is no existing storm servicing on the Site. Stormwater on the Site currently flows uncontrolled overland via sheet flow to the southeast, toward an existing wetland complex outside the study area which outlets to Lake Simcoe. There is an existing ditch system along the west and north edges of the property which also convey stormwater to Lake Simcoe via 13<sup>th</sup> Line north of the Site and Mapleview Drive south of the Site.

Runoff from the residential lots is proposed to be conveyed to infiltration galleries along rear lots to provide water volume control post development, per LSRCA SWM Guidelines. Excess runoff will be directed to an internal storm sewer system which will discharge to an on-site SWM facility. The sewer system will be designed to convey flows up to the 5-year storm event. As the Site is located on a Highly Vulnerable Aquifer, no stormwater from unclean surfaces (e.g. roads) is proposed to be infiltrated. The size, type and location of the infiltration galleries will be confirmed through preliminary and detailed design.

A preliminary Site Servicing Plan and Stormwater Management Plan have been prepared, to be submitted under a separate cover.

#### 4.5 Major System Conveyance

Peak flows generated on-site that exceed capacity of the infiltration galleries and storm sewers (minor system) up to the 100 year storm event will be conveyed within the ROW of the internal road network, directing flow toward the on-site SWM Pond.

#### 4.6 Water Quantity Control

A hydrologic model for the study area was developed in VO6, to simulate synthetic storm events. A 24 hour SCS Type II design storm was modelled to demonstrate peak flow for the study area.

The City of Barrie IDF curves adapted for climate change were used for the studied design storms. Parameters were calculated based on land use and soil data. All parameters are based on the LSRCA SWM Guidelines. The existing conditions VO6 parameters utilized for this analysis are provided in **Appendix A**.

A summary of the modeled flows under existing conditions is provided in **Table 8**.

Table 8 Existing Flow

Return Period	Existing Condition	
	Node 6 (m <sup>3</sup> /s)	Node 7 (m <sup>3</sup> /s)
25mm	0.019	0.052
2 yr.	0.161	0.367
5 yr.	0.33	0.73
10 yr.	0.466	1.018
25 yr.	0.66	1.427
50 yr.	0.819	1.759
100 yr.	0.988	2.107
Regional Storm	1.633	3.499

The model schematics for the pre development condition are shown below in **Figure 2**. Existing Conditions catchment parameters are provided in **Appendix A**.

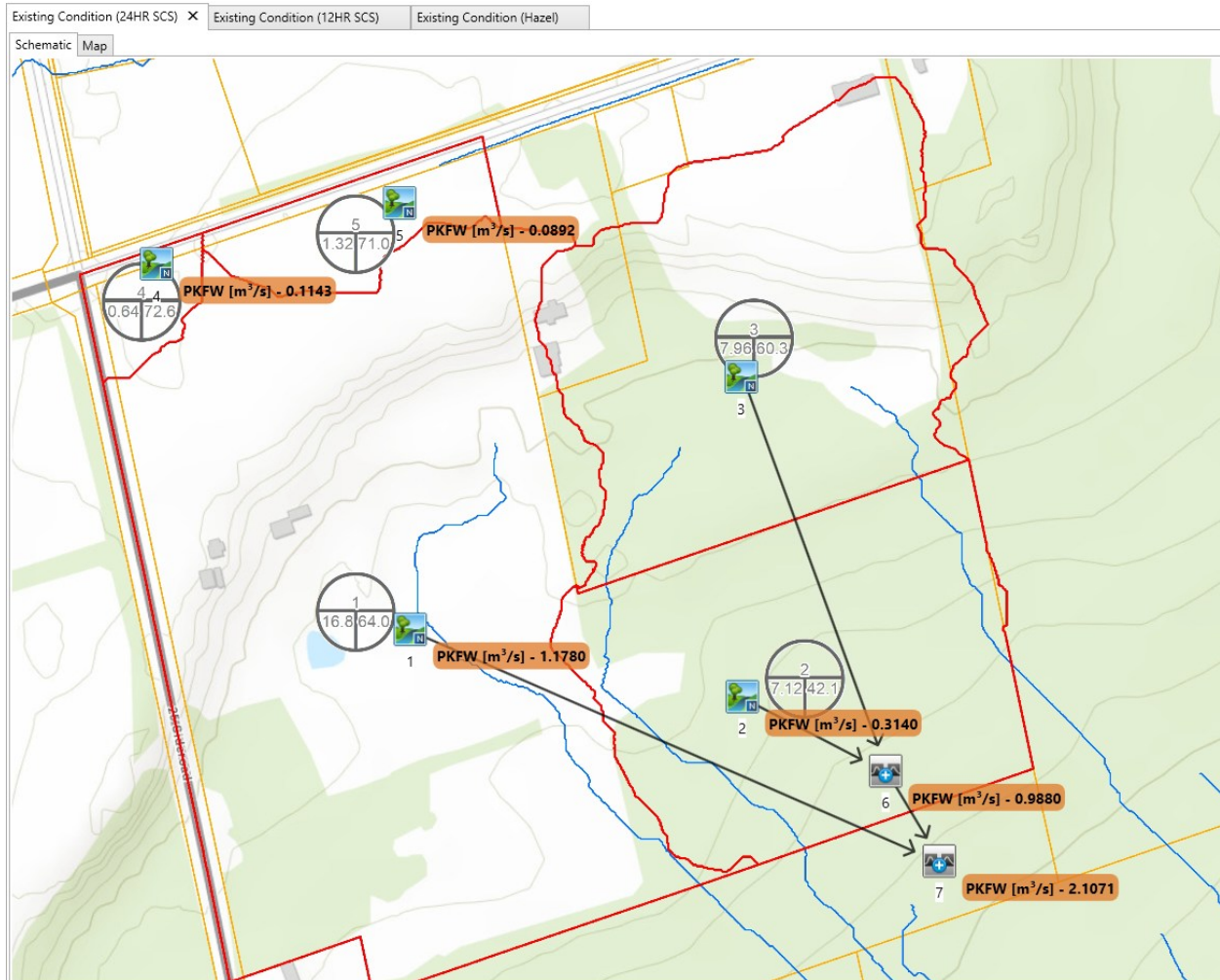


Figure 2 Existing Conditions VO6 Model Schematic

The post development model was then prepared based on the Concept Plan prepared by IPS. The model schematics for the post development condition are shown below in **Figure 3**. Post-development catchment parameters are provided in **Appendix A**.

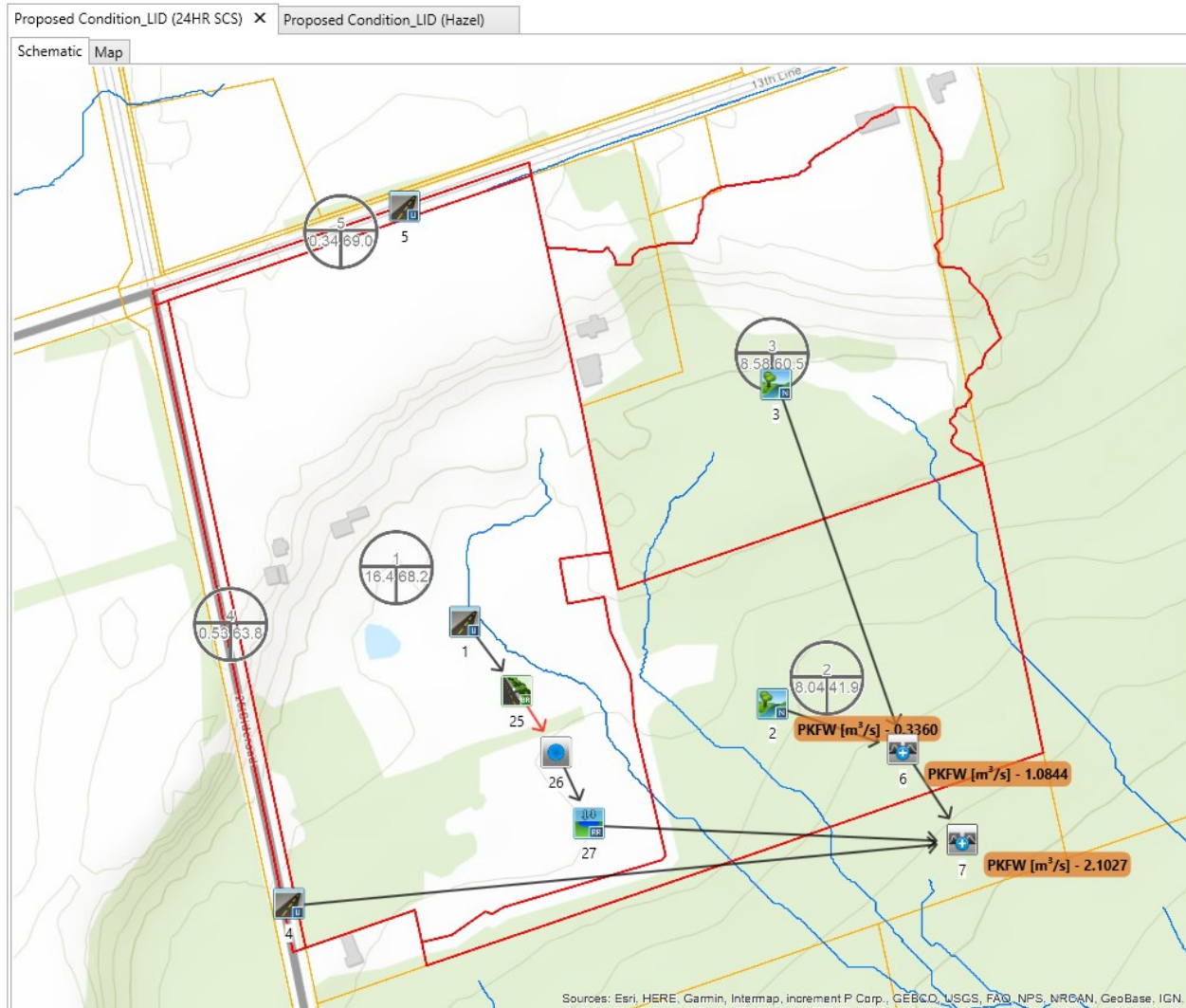


Figure 3 Proposed Conditions VO6 Model Schematic

#### 4.6.1 Lot Level / Conveyance Controls (Volume Control)

Infiltration galleries are proposed along rear lots of the residential units. The infiltration galleries have been designed to store an equivalent volume of water consistent with the 25mm event flows from all impervious surfaces on the Site as per LSRCA SWM Guidelines for volume control for non-linear development; however, the detailed grading and storm water conveyance systems will be designed to only convey water from clean surfaces, such as roofs and landscaped areas.

Based on existing soil mapping, the soil at the Site is B type (sandy loam). An infiltration rate of 1.14 cm/hr is used for this study, per the LSRCA SWM Guidelines. A rating curve for infiltration galleries was developed based on a depth of 0.8 m. The proposed depth is contingent on proposed grading and groundwater levels at the Site (to be confirmed through a hydrogeological investigation). In addition, a Guelph permeameter test will be required during detailed design to confirm infiltration rates on native soils. The proposed rating curve is presented below in **Table 8**.

*Table 9 Infiltration Galleries Rating Curve*

Depth	Discharge	Storage	Storage
m	m <sup>3</sup> /s	ha.m	m <sup>3</sup>
0	0	0	0
0.282	0	0.1829	1829
0.490	0	0.3178	3178
0.680	0.3704	0.4408	4408
0.744	0.8259	0.4824	4824
0.806	1.3316	0.5276	5276
0.806	1.9583	0.5276	5276
0.806	2.295	0.5276	5276

The total required area for the infiltration galleries is 1.44 ha (approximately 10% of the proposed development area). A preliminary layout of the proposed galleries is shown below in **Figure 4**. The design parameters and suitable locations for the proposed infiltration galleries will need to be confirmed by a hydrogeological consultant during detailed design.

A second scenario assuming no Low Impact Development (LID) features has been considered, should it be determined that the Site is unsuitable for infiltration features, further discussed in **Section 4.6.3**.

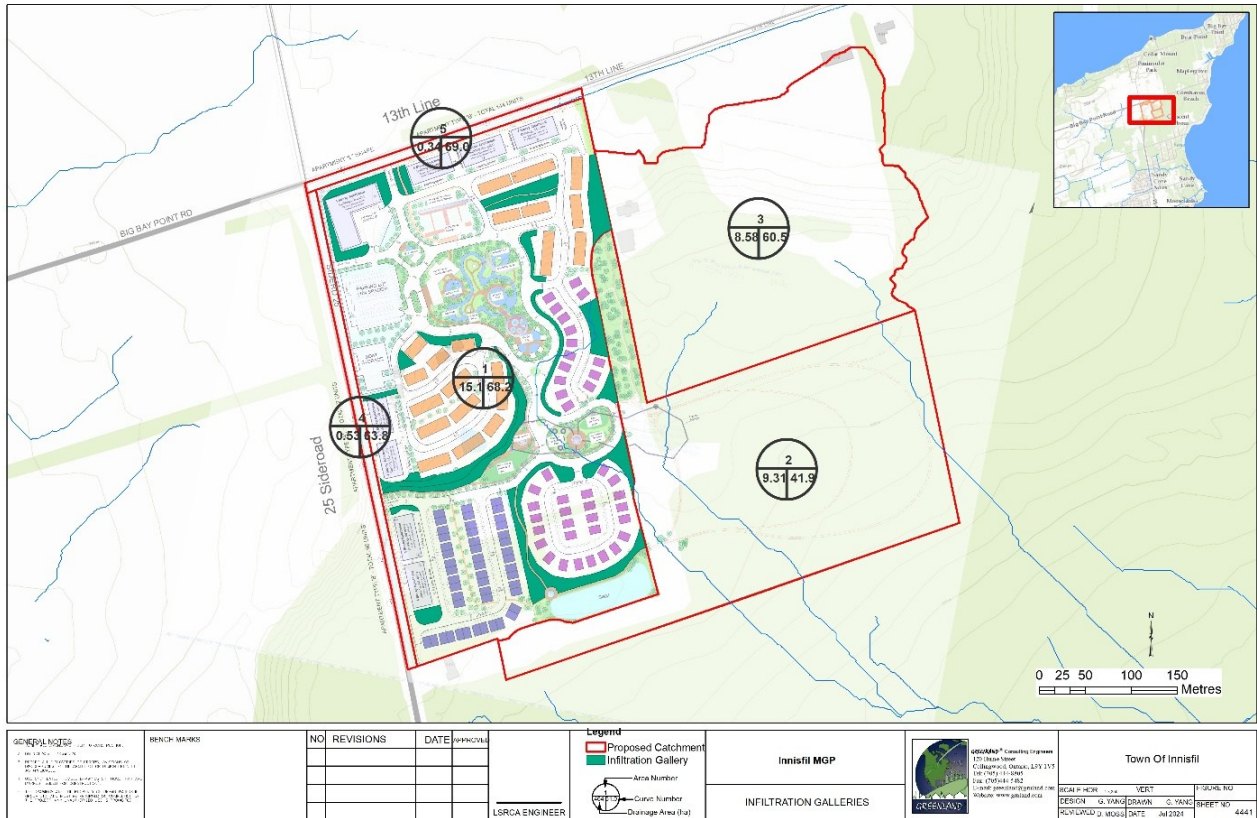


Figure 4 Proposed Infiltration Galleries

#### 4.6.2 End of Pipe Controls

A stormwater management facility (SWM facility) is proposed to receive stormwater runoff from the proposed development. The SWM facility will store the 2 through 100 year storm event flows and control flow rates to pre-development levels.

As there is no defined outlet to which flow will be discharged from the proposed SWM facility, a flow spreader at the discharge point is proposed to maintain existing conditions sheet flow characteristics towards the existing downstream wetland, per LSRCA SWM guidelines. As the proposed discharge is directed over private land, the developer must obtain a legal right of discharge registered on title from the relevant downstream property owners. It is our understanding that the AA1 Inc. have initiated this process.

Should this outlet be determined to be infeasible, an alternative to convey flow to the existing ditch along the west edge of the property will be explored. This ditch flows south to Mapleview Drive, where it is directed east to flow to Lake Simcoe. As the Site flows to the existing wetland complex to south-east under existing conditions, it was determined using the west ditch is not the preferred outlet for stormwater flows as this option would alter existing drainage patterns and consequently reduce flows to the existing wetland. More detailed investigations on the impact on the existing ditch and wetland would be required if this option were to be pursued.

4.6.3 Stormwater Detention

A preliminary rating curve for the proposed SWM facility has been developed based on the Concept Plan provided by IPS. Two (2) scenarios were considered for the development of the SWM facility rating curve: with infiltration galleries, and without infiltration galleries. The storage – discharge rating curve for each scenario has been provided in **Tables 9** and **10**, respectively.

*Table 10 SWM Facility Rating Curve - with LID*

Discharge	Storage	Storage
m <sup>3</sup> /s	ha.m	m <sup>3</sup>
0	0	0
0.025	0.061	610
0.158	0.097	970
0.345	0.141	1410
0.425	0.201	2010
0.59	0.284	2840
0.723	0.348	3480
0.85	0.413	4130

*Table 11 SWM Facility Rating Curve - without LID*

Discharge	Storage	Storage
m <sup>3</sup> /s	ha.m	m <sup>3</sup>
0	0	0
0.033	0.134	1340
0.176	0.240	2400
0.32	0.351	3510
0.44	0.425	4250
0.595	0.521	5210
0.73	0.591	5910
0.862	0.660	6600

Based on the required storage, the required pond area has been calculated for each of the two (2) scenarios: with the infiltration galleries, and without the infiltration galleries, as shown in **Table 11**.

Table 12 Preliminary Pond Area

	With Infiltration Galleries	Without Infiltration Galleries
Depth (m)	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )
0 (PP)	1,530	2,040 (PP)
1.7	2,800	4,240
2.0	3,160 (100 year level)	4,690 (100 year level)
2.3	3,540 (Top)	5,160 (Top)

The required SWM Facility area with the infiltration galleries is 0.35 ha and without the infiltration galleries, the required SWM Facility area is 0.52 ha. Adequate area for the proposed SWM Facility has been provided in the Concept Plan for both scenarios.

The peak flow comparison of pre to post development conditions for each post development scenario has been provided in **Table 12**, below. Per the Town and LSRCA requirements, post development peak flows have been controlled to pre development levels for the 2 through to 100 year storm event (24 hour SCS).

Table 13 Pre to Post Development Peak Flow Comparison

Return Period	Existing Condition		Post-development Condition	
	Node 6 (m <sup>3</sup> /s)	Node 7 (m <sup>3</sup> /s)	Node 6 (m <sup>3</sup> /s)	Node 7 (m <sup>3</sup> /s)
25mm	0.019	0.052	0.024	0.052
2 yr.	0.161	0.367	0.205	0.366
5 yr.	0.33	0.73	0.418	0.728
10 yr.	0.466	1.018	0.589	1.017
25 yr.	0.66	1.427	0.833	1.423
50 yr.	0.819	1.759	1.034	1.754
100 yr.	0.988	2.107	1.246	2.106
Regional	1.633	3.499	1.986	3.724

Please note, the slight increase of flow rate at Node 6 under the post development condition is due to a slight change in the catchment boundaries, resulting in the contributing catchment area being slightly larger under post-development conditions. A net decrease in flow at the final outlet (Node 7) is still achieved however.

#### 4.7 Water Quality Control

In order to achieve Enhanced water quality protection per the MECP SWM Guidelines (80% TSS removal), all stormwater runoff from the development will be directed to the proposed SWM facility on the southwest portion of the development. This SWM facility will be designed to achieve Enhanced/ Level 1 water quality protection. Required water quality storage has been calculated based on the MECP SWM Guidelines: Water Quality Storage Requirements for a Wet Pond facility with Enhanced Level Protection. The minimum permanent pool and extended detention sizing requirements are summarized below in **Table 13**.

Table 14 SWM Facility Water Quality Storage Requirements

Total Contributing Area (ha)	15.09
Impervious level (%)	45
Storage Volume (m <sup>3</sup> /ha)	165
Extended Detention Volume (m <sup>3</sup> /ha)	40
Extended Detention Volume (m <sup>3</sup> )	603.6
Permanent Pool Volume (m <sup>3</sup> )	2489.85
Total Storage Volume (m <sup>3</sup> )	3093.45

#### 4.7.1 Phosphorus Balance

The Site is located within the Innisfil Creeks sub-watershed of Lake Simcoe and includes the proposed construction of an impervious area greater than 500 m<sup>2</sup>. Therefore, runoff generated on the property is to be treated to a target of 80% reduction in overall phosphorus loading. The proposed development plan must also ensure the post development condition does not exceed the annual phosphorus loading from the existing conditions under the Lake Simcoe Protection Plan (LSPP). A phosphorus budget has been developed as part of the proposed SWM strategy to determine the target phosphorus removal requirements.

The Low Impact Development Treatment Train Tool (LID-TTT) has been used to assess the existing and proposed Site conditions (see results in **Appendix B**). Existing Site conditions were calculated based on parameters of the hydrologic model prepared for the SWM plan. Based on this, the total phosphorus loading for the study area was determined to be 10.103 kg/yr. Without mitigation, the phosphorus loading from the proposed development plan is expected to increase 103% to 20.493 kg/yr.

Two (2) water quality controls are proposed to meet the phosphorus loading criteria. The phosphorus removal efficiency of each feature is summarized below:

Water Quality Control Feature	Phosphorus Removal Efficiency
Infiltration Gallery	60%
Wet Pond	60%

The infiltration galleries will achieve phosphorus loading reduction by decreasing the average annual volume of runoff, thereby preventing phosphorus export from occurring. The proposed SWM pond promotes settling of sediments, reducing the export of phosphorus from the Site.

The LID TTT model was set up with all roadways, driveways and parking lots flowing directly to the SWM pond, as well as 50% of all buildings and landscaped areas. The remaining 50% of buildings and landscaped areas are directed toward the infiltration galleries. The model will be refined during detailed design and the preparation of detailed Grading and Drainage Plans.

The proposed treatment train for the Site will provide a total 65% reduction in the annual post-development phosphorus loading. Therefore, following the proposed water quality control feature implementation, the post-development annual phosphorous load is expected to be 7.189 kg/yr, and the proposed development will result in a 29% (2.91 kg/yr) net decrease in annual phosphorus export from

the property compared to pre development conditions. The report generated by the LID TTT summarizing the model parameters and results has been provided in **Appendix B**.

A summary of the phosphorus removal efficiency calculations is presented below:

Existing Phosphorous Load	= 10.103 kg/yr
Proposed Phosphorous Load (developed)	= 20.493 kg/yr
Phosphorous Removal (LID)	= 20.493 kg/yr x 0.65 = 13.304 kg/yr
Net Phosphorous Increase	= 22.493 kg/yr - 10.103 kg/yr - 13.304 kg/yr = -2.914 kg/yr

#### 4.8 Infiltration Balance

The assessment of water balance for the proposed development to confirm an infiltration deficit of zero pre to post development will be developed by a qualified hydrogeological consultant and submitted under separate cover.

## 5 Erosion and Sediment Control

Erosion and sediment controls (ESC) will be implemented on-site prior to construction with plans to be provided at the detailed design stage of this project. The controls will consist of a combination of sediment control fencing, and mud mats. The key components of the Erosion and Sediment Control Plan will include the following:

- Location of siltation fencing;
- Location of temporary sedimentation basins;
- Access points for construction equipment;
- Measures to minimize construction equipment from tracking mud off-site; and
- Temporary measures to stabilize all disturbed areas.

In addition, the need for temporary ESC SWM facilities during construction will be confirmed during detailed design.

Prior to finalizing any remaining topsoil stripping for the existing Site, temporary sediment basins and outfalls must be modified to suit the proposed development conditions and drainage will initially be diverted away from the Site until site storm sewers are constructed. Heavy duty silt fence will first be installed along the perimeter of the area of work to prevent sediment laden runoff from escaping to the natural environment. The contractor is to dewater low lying areas into settling basins as necessary and hoses are to be equipped with silt-sacks on outlets. Dewatering outlets are to be a minimum of 30m from any watercourse or natural drainage feature.

A dewatering contractor will be required to develop a site-specific plan for removing and filtering both groundwater and stormwater accumulated during construction within the excavated areas, as necessary. The proposed dewatering plan will be submitted under separate cover to the Town and relevant regulatory agencies at the appropriate stage of the design process.

Any deviation from this plan should intend to preserve the proper protection of the natural environment and surrounding properties.

## 6 Grading

A preliminary Grading Plan has been developed in accordance with the Town's Engineering Design Standards (2022), and will be submitted under a separate cover, along with the preliminary Site Servicing Plan and Stormwater Management Plan.

## 7 Utilities

During detailed design, the Site Servicing and Grading Plan will be circulated (as a minimum) to Enbridge Gas, Rogers Canada, Bell Canada, and InnPower (as required) for their review and mark up of the proposed utility servicing for this development. Once confirmed, the Site Servicing and Grading Plan will be updated accordingly.

## 8 Closure

Further to the above, the proposed development can be serviced through municipal servicing for water supply and wastewater treatment. In addition, adequate stormwater management controls can be implemented to meet regulatory guidelines and requirements (Town of Innisfil, LSRCA, MECP).

Water will be supplied to the development via the 400mm diameter trunk main along 25<sup>th</sup> Sideroad and 13<sup>th</sup> Line that services Friday Harbour Resort with water supply from the Lakeshore WTP. The available capacity and pressure of existing external watermains will need to be confirmed by InnServices, through water system modelling.

Wastewater from the development will drain to the existing 525mm diameter gravity sewer along 25<sup>th</sup> Sideroad that flows to SPS #8, and ultimately to the Lakeshore WPCP for treatment. The available capacity of the collection system appears to support the addition of this development based on recent design sheets for Friday Harbour and will need to be confirmed by InnServices, through wastewater system modelling.

Stormwater runoff will be managed by low impact development features (infiltration galleries), and an internal sewer system that direct all flows to an on-site SWM facility. The stormwater management plan will achieve enhanced water quality treatment and control post development peak flows exiting the Site to existing condition levels for the 2 through 100-year storm events. In addition, pre-development infiltration volumes and phosphorus loading will be achieved for the post-development condition.

Please do not hesitate to contact us if you require anything further.



**Kirsten McFarlane**

**Greenland Consulting Engineers Ltd.**



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**Appendix 'A'**  
**Hydrologic Model Inputs**



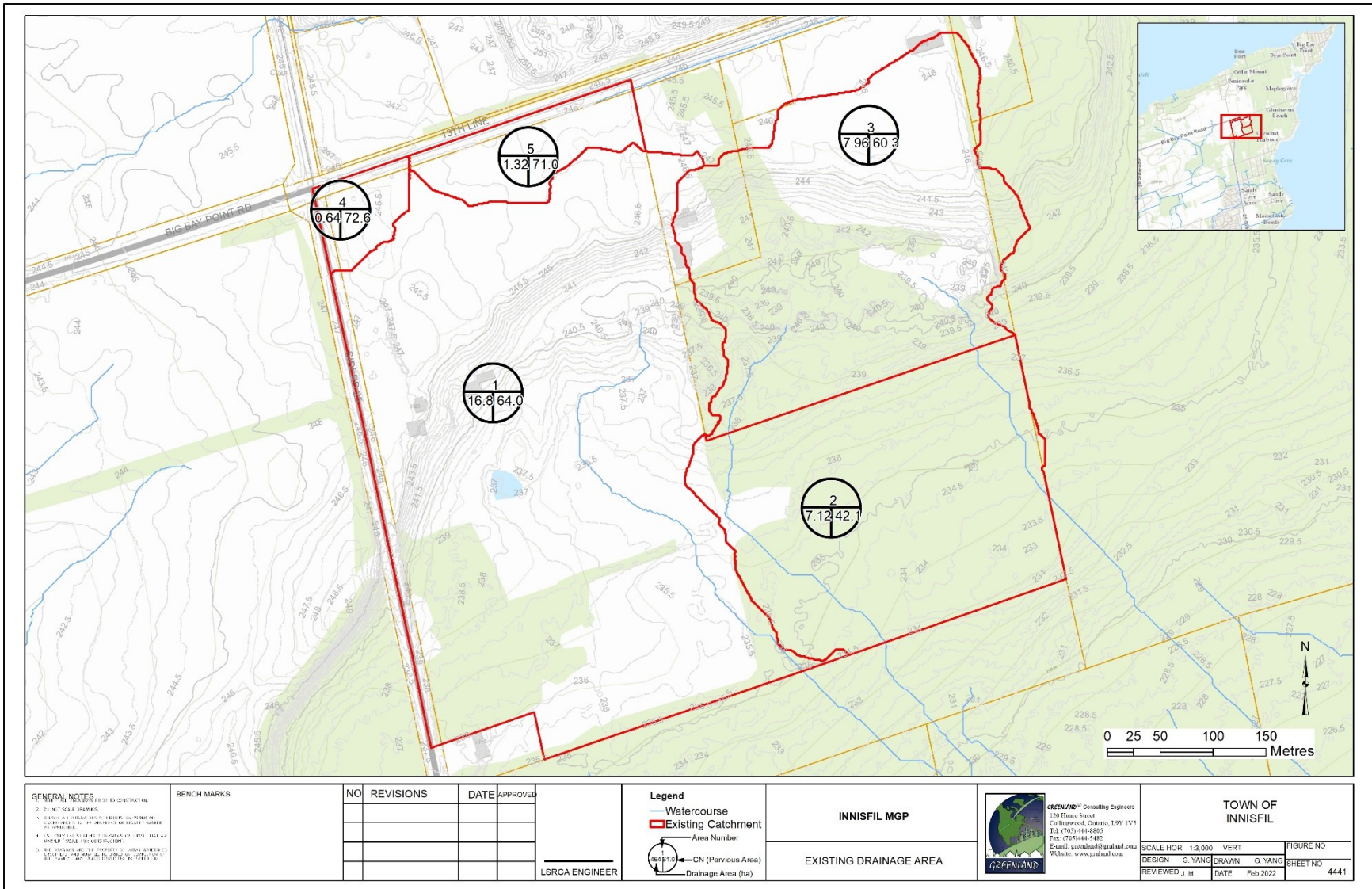


Figure 1 Existing Drainage Area

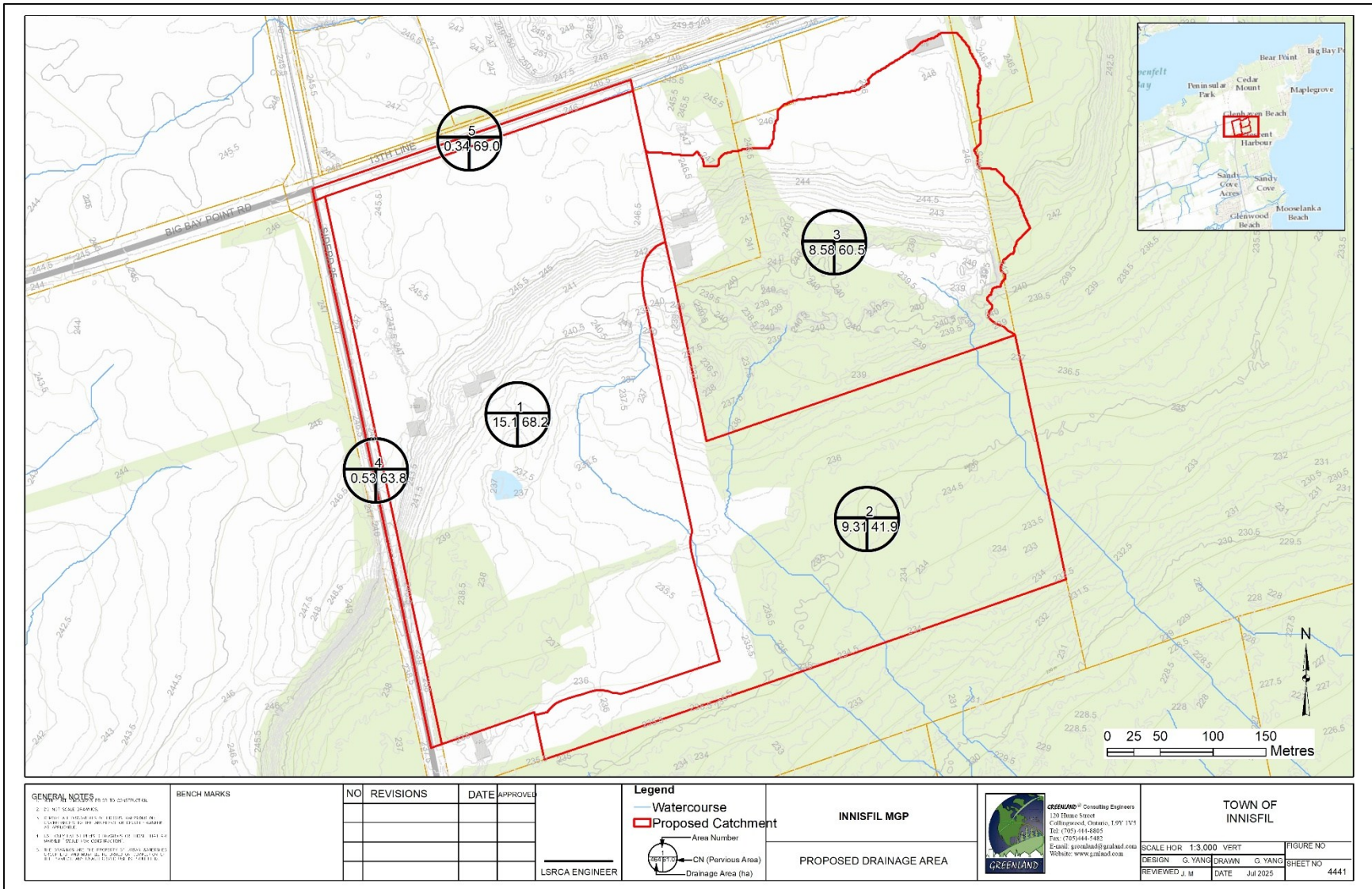


Figure 2 Proposed Drainage Area

Table 1 Storm Distribution

Design Chart 1.05: SCS Type II Distribution

6 hour			12 hour			24 hour		
Time end' g, hour	F <sub>inc</sub> (%)	F <sub>cum</sub> (%)	Time end' g, hour	F <sub>inc</sub> (%)	F <sub>cum</sub> (%)	Time end' g, hour	F <sub>inc</sub> (%)	F <sub>cum</sub> (%)
0	0	0	0	0	0	0	0	0
0.5	2	2	2	5	5	2	2.2	2.2
1	3	5	3	3	8	4	2.6	4.8
1.5	3	8	3.5	2	10	6	3.2	8.0
2	5	13	4	2	12	7	-	-
2.5	6	19	4.5	3	15	8	4.0	12.0
2.75	15	34	5	4	19	8.5	-	-
3	39	73	5.5	6	25	9	2.7	14.7
3.5	11	84	5.75	12	37	9.5	1.6	16.3
4	5	89	6	33	70	9.75	-	-
4.5	4	93	6.5	9	79	10	1.8	18.1
5	3	96	7	4	83	10.5	2.3	20.4
6	4	100	7.5	3	86	11	3.1	23.5
			8	3	89	11.5	4.8	28.3
			10	7	96	11.75	10.4	38.7
			12	4	100	12	27.6	66.3
						12.5	7.2	73.5
						13	3.7	77.2
						13.5	0.7	77.9
						14	4.1	82.0
						16	6.0	88.0
						20	7.2	95.2
						24	4.8	100

Barrie IDF Data – Adjusted to Account for Climate Change

Barrie WPCC Rainfall Intensity (mm/hr) + 15% to Account for Climate Change									
Return Period	Duration (min)								
	5	10	15	30	60	120	360	720	1440
2 years	115.5	81.5	67.4	43.1	25.3	15.5	7.0	3.9	2.3
5 years	150.0	107.9	89.9	56.2	32.8	21.9	9.9	5.4	3.2
10 years	173.0	125.5	104.9	65.1	37.6	26.1	11.8	6.3	3.8
25 years	201.8	147.4	123.7	76.0	43.8	31.4	14.3	7.6	4.5
50 years	223.3	163.9	137.7	84.3	48.4	35.4	16.0	8.5	5.1
100 years	244.7	180.1	151.6	92.3	53.0	39.3	17.7	9.4	5.5

Barrie WPCC Rainfall Depth (mm) + 15% to Account for Climate Change									
Return Period	Duration (min)								
	5	10	15	30	60	120	360	720	1440
2 years	9.7	13.6	16.8	21.5	25.3	31.1	42.3	46.7	55.0
5 years	12.5	17.9	22.4	28.2	32.8	43.8	59.5	64.3	76.0
10 years	14.4	20.9	26.2	32.5	37.6	52.2	70.8	76.0	89.9
25 years	16.8	24.6	30.9	38.1	43.8	62.9	85.2	90.7	107.5
50 years	18.6	27.3	34.4	42.1	48.4	70.7	95.9	101.7	120.6
100 years	20.4	30.0	37.8	46.2	53.0	78.5	106.5	112.5	133.6

Barrie WPCC IDF Curve Parameters - Adjusted to Account for Climate Change

Parameter	Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
A	678.085	853.608	975.865	1146.275	1236.152	1426.408
B	4.699	4.699	4.699	4.922	4.699	5.273
C	0.781	0.766	0.760	0.757	0.751	0.759

Rainfall Intensity,  $I$  (mm/hr) =  $A/(t+B)^C$ , where  $t$  is time duration in minutes  
 Parameters based on rain gauge data for the period 1979 – 2003 for the Barrie WPCC Station #6110557  
 Based on a review of the literature, the IDF intensity values for Barrie WPCC Station were increased by 15% before calculating a, b, c values to account for climate change.

Figure 3 Barrie IDF



Figure 4 Land Use Data

Table 2 Existing VO6 Model Parameters

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
1	A	Pasture	0.945	49	0.10	0.0%	0.0%	8.00
	A	Forest	0.487	25	0.08	0.0%	0.0%	10.00
	B	Lawn	1.226	69	0.16	0.0%	0.0%	5.00
	B	Pasture	10.292	69	0.28	0.0%	0.0%	8.00
	B	Forest	3.632	55	0.25	0.0%	0.0%	10.00
	B	Paved	0.231	98	0.95	62.6%	100.0%	2.00
Total			16.81	64.0	0.26	0.9%	1.4%	8.19

			tc (min)	tc (min)	tc (h)	tp (h)
	Slope (%)	Airport	B-W	hr	hr	
	2.17	51.69	22.10	0.861	0.574	

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
2	A	Forest	3.110	25	0.08	0.0%	0.0%	10.00
	B	Pasture	0.124	69	0.28	0.0%	0.0%	8.00
	B	Forest	3.889	55	0.25	0.0%	0.0%	10.00
Total			7.12	42.1	0.18	0.0%	0.0%	9.97

			tc (min)	tc (min)	tc (h)	tp (h)
	Slope (%)	Airport	B-W	hr	hr	
	1.96	40.05	11.46	0.668	0.445	

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
3	B	Lawn	0.242	69	0.16	0.0%	0.0%	5.00
	B	Pasture	2.575	69	0.28	0.0%	0.0%	8.00
	B	Forest	5.078	55	0.25	0.0%	0.0%	10.00
	B	Paved	0.068	98	0.95	0.0%	100.0%	2.00
Total			7.96	60.3	0.26	0.0%	0.9%	9.13

			tc (min)	tc (min)	tc (h)	tp (h)
	Slope (%)	Airport	B-W	hr	hr	
	2.97	33.72	11.92	0.562	0.375	

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
4	B	Pasture	0.565	69	0.28	0.0%	0.0%	8.00
	B	Paved	0.079	98	0.95	100.0%	100.0%	2.00
Total			0.64	72.6	0.36	12.3%	12.3%	7.26

			tc (min)	tc (min)	tc (h)	tp (h)
	Slope (%)	Airport	B-W	hr	hr	
	1.70	17.95	4.28	0.299	0.199	

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
5	B	Lawn	0.008	69	0.16	0.0%	0.0%	5.00
	B	Pasture	1.225	69	0.28	0.0%	0.0%	8.00
	B	Paved	0.089	98	0.95	100.0%	100.0%	2.00
Total			1.32	71.0	0.32	6.7%	6.7%	7.58

			tc (min)	tc (min)	tc (h)	tp (h)
	Slope (%)	Airport	B-W	hr	hr	
	0.34	54.07	15.12	0.901	0.601	

Table 3 Proposed VO6 Model Parameters

Catchment	Soil Group	Land Use	Area	CN_Per	C	Ximp (%)	Timp (%)	IA_per (mm)
1	A	Lawn	0.262	49	0.10	0.0%	0.0%	5.00
	B	Lawn	8.054	69	0.16	0.0%	0.0%	5.00
	B	Paved	3.168	69	0.95	71.6%	100.0%	5.00
Total			11.48	68.4	0.38	19.7%	27.6%	5.00

Catchment	Soil Group	Land Use	Area	CN_Per	C	Ximp (%)	Timp (%)	IA_per (mm)
1.2	B	Paved	3.607	69	0.95	100.0%	100.0%	5.00
Total			3.61	69.0	0.95	100.0%	100.0%	5.00

**Note: 1.2 is the road and driveway areas.**

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
2	A	Pasture	0.683	49	0.10	0.0%	0.0%	8.00
	A	Forest	3.576	25	0.08	0.0%	0.0%	10.00
	B	Lawn	0.019	69	0.16	0.0%	0.0%	5.00
	B	Pasture	0.883	69	0.28	0.0%	0.0%	8.00
	B	Forest	4.145	55	0.25	0.0%	0.0%	10.00
Total			9.31	44.4	0.18	0.0%	0.0%	9.65

Slope (%)	tc (min) Airport	tc (min) B-W	tc (h) hr	tp (h) hr
3.17	35.24	10.86	0.587	0.392

Catchment	Soil Group	Land Use	Area	CN	C	Ximp (%)	Timp (%)	IA (mm)
3	B	Lawn	0.490	69	0.16	0.0%	0.0%	5.00
	B	Pasture	2.575	69	0.28	0.0%	0.0%	8.00
	B	Forest	5.424	55	0.25	0.0%	0.0%	10.00
	B	Paved	0.090	98	0.95	0.0%	100.0%	2.00
Total			8.58	60.5	0.26	0.0%	1.1%	9.03

Slope (%)	tc (min) Airport	tc (min) B-W	tc (h) hr	tp (h) hr
3.44	32.15	11.49	0.536	0.357

Catchment	Soil Group	Land Use	Area	CN_Per	C	Ximp (%)	Timp (%)	IA_per (mm)
4	B	Lawn	0.106	69	0.16	0.0%	0.0%	5.00
	B	Pasture	0.120	69	0.28	0.0%	0.0%	8.00
	B	Forest	0.135	55	0.25	0.0%	0.0%	10.00
	B	Paved	0.173	69	0.95	100.0%	100.0%	5.00
Total			0.53	63.8	0.47	32.4%	32.4%	6.94

Catchment	Soil Group	Land Use	Area	CN_Per	C	Ximp (%)	Timp (%)	IA_per (mm)
5	B	Lawn	0.002	69	0.16	0.0%	0.0%	5.00
	B	Pasture	0.194	69	0.28	0.0%	0.0%	8.00
	B	Paved	0.141	69	0.95	100.0%	100.0%	5.00
Total			0.34	69.0	0.56	41.8%	41.8%	6.73

Table 4 Soil Infiltration Rate

Hydrologic soil group	Infiltration rate (inches/hour)	Infiltration rate (centimeters/hour)	Soil textures	Corresponding Unified Soil Classification
A	Although a value of 1.63 inches per hour (4.14 centimeters per hour) may be used, it is <b>Highly recommended</b> that you conduct field infiltration tests or amend soils. <sup>b</sup> See <a href="#">Guidance for amending soils with rapid or high infiltration rates</a> and <a href="#">Determining soil infiltration rates</a> .		gravel sandy gravel	GW - well-graded gravels, sandy gravels GP - gap-graded or uniform gravels, sandy gravels
	1.63 <sup>a</sup>	4.14	silty gravels gravelly sands sand	GM - silty gravels, silty sandy gravels SW - well-graded gravelly sands SW - uniformly graded sands
	0.8	2.03	sand loamy sand sandy loam	SP - gap-graded or poorly graded sands
B	0.45	1.14		SM - silty sands, silty gravelly sands
	0.3	0.76	loam, silt loam	MH - micaceous silts, diatomaceous silts, volcanic ash
C	0.2	0.51	Sandy clay loam	ML - silts, very fine sands, silty or clayey fine sands
D	0.06	0.15	clay loam silty clay loam loam sandy clay silty clay clay	GC - clayey gravels, clayey sandy gravels SC - clayey sands, clayey gravelly sands CL - low plasticity clays, sandy or silty clays OL - organic silts and clays of low plasticity CH - highly plastic clays and sandy clays OH - organic silts and clays of high plasticity

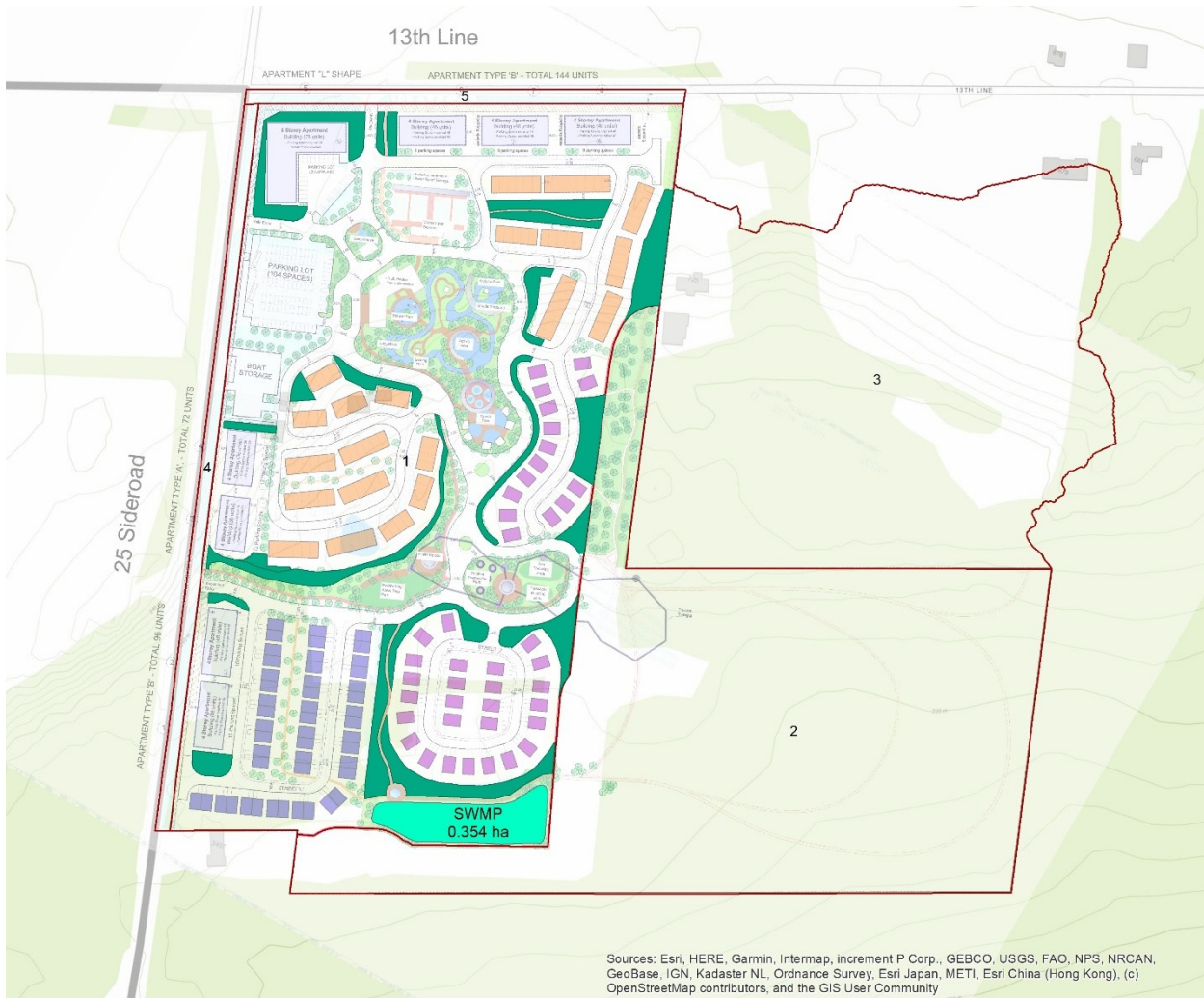


Figure 5 Proposed SWMF-with LIDS



Figure 6 Proposed SWMF – no LIDs

**Appendix 'B'**  
**LID TTT Model Results**



## Summary

Site	Project Name	Project Title	Storm Type	Runoff Continuity Error (%)	Flow Routing Continuity Error (%)
pre-development	3523 25 Sdrd Innisfil	3523 25 Sdrd Innisfil - Pre Dev	avg-annual	-0.000	-0.009

These continuity errors represent the percent difference between initial storage+ total inflow for the entire drainage system versus final storage + total outflow for the entire drainage system. If the continuity error exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are conduits that are too short, abrupt changes in storage (very small or very large storage areas), or flooding losses in the model (insufficient node depth).

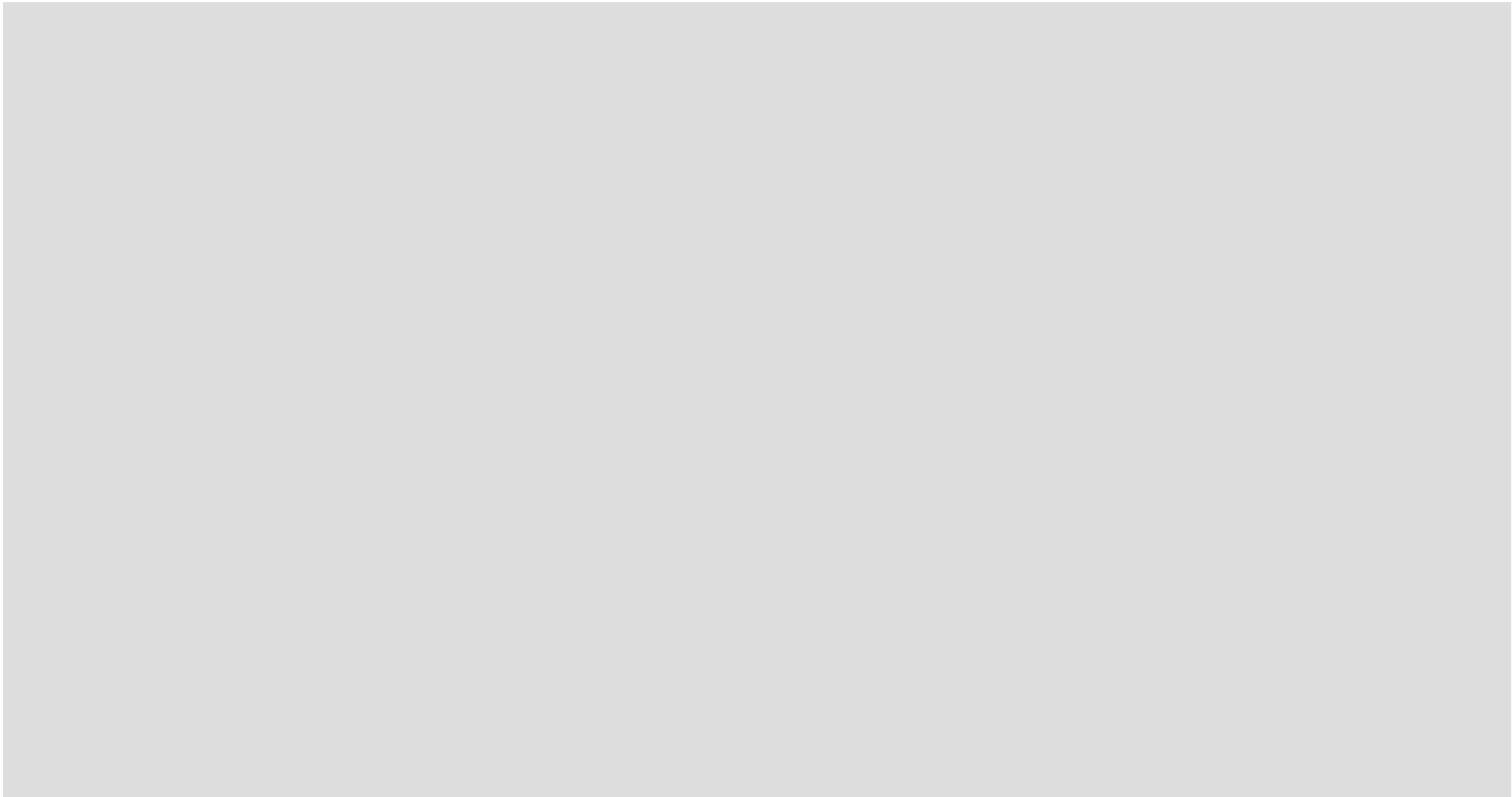
## Water Balance | 3523 25 Sdrd Innisfil - Pre Dev

Catchment	Site Area	Site Rainfall (mm) (m <sup>3</sup> )	Site Infiltration (mm) (m <sup>3</sup> )	Site Evapotranspiration (mm) (m <sup>3</sup> )	External Outflow (mm) (m <sup>3</sup> )	Rainfall Reduction (mm) (%)
1	33.85 ha	944.70 mm 319,780.95 m <sup>3</sup>	707.02 mm 239,327.5 m <sup>3</sup>	108.83 mm 36,839.76 m <sup>3</sup>	128.16 mm 43,381 m <sup>3</sup>	816.54 mm 86.43 %
<b>TOTAL</b>	<b>33.85 ha</b>	<b>944.7 mm</b> <b>319,780.95 m<sup>3</sup></b>	<b>707.02 mm</b> <b>239,327.5 m<sup>3</sup></b>	<b>108.83 mm</b> <b>36,839.76 m<sup>3</sup></b>	<b>128.16 mm</b> <b>43,381 m<sup>3</sup></b>	<b>816.54 mm</b> <b>86.43 %</b>

## Catchment 1

### Subcatchment

Name	Initial Soil Water (fraction)	Final Soil Water (fraction)
Catch 5	0.284	0.28
Catch 4	0.284	0.28
Catch 2	0.284	0.28
Catch 3	0.284	0.28
Catch 1	0.284	0.28



## LID Summary | 3523 25 Sdrd Innisfil - Pre Dev

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW	TSS	TP
					Flow In (m <sup>3</sup> )	Load In (kg)	Load In (kg)
					Flow Out (m <sup>3</sup> )	Load Out (kg)	Load Out (kg)
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)

## Trees | 3523 25 Sdrd Innisfil - Pre Dev

Element	Area	Rainfall	Infiltration	Evapotranspired	Runoff	Stored	Rainfall Reduction
	(ha)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
	(m <sup>2</sup> )	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )

## Loading Summary TSS | 3523 25 Sdrd Innisfil - Pre Dev

Catchment	Total Catchment TSS Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	85.903 %	0.598 m <sup>3</sup> /s	319,780.95 m <sup>3</sup>	43,381 m <sup>3</sup>
			77.59 mg/l	80.63 mg/l
			24,811.456 kg	3,497.789 kg
<b>Total</b>	<b>85.903 %</b>	<b>0.598 m<sup>3</sup>/s</b>	<b>319,780.95 m<sup>3</sup></b>	<b>43,381 m<sup>3</sup></b>
			<b>77.59 mg/l</b>	<b>80.63 mg/l</b>
			<b>24,811.456 kg</b>	<b>3,497.789 kg</b>

## Loading Summary TP | 3523 25 Sdrd Innisfil - Pre Dev

Catchment	Total Catchment TP Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	86.422 %	0.598 m <sup>3</sup> /s	319,780.95 m <sup>3</sup>	43,381 m <sup>3</sup>
			0.23 mg/l	0.23 mg/l
			74.407 kg	10.103 kg
<b>Total</b>	<b>86.422 %</b>	<b>0.598 m<sup>3</sup>/s</b>	<b>319,780.95 m<sup>3</sup></b>	<b>43,381 m<sup>3</sup></b>
			<b>0.23 mg/l</b>	<b>0.23 mg/l</b>
			<b>74.407 kg</b>	<b>10.103 kg</b>

Catchment	Element	Description	Peak outflow
1	Outlet	MAXIMUM FLOW at	0.598 m <sup>3</sup> /s
	Catch 5	PEAK RUNOFF FLOW from	0.05 m <sup>3</sup> /s
	Catch 4	PEAK RUNOFF FLOW from	0.05 m <sup>3</sup> /s
	Catch 2	PEAK RUNOFF FLOW from	0.09 m <sup>3</sup> /s
	Catch 3	PEAK RUNOFF FLOW from	0.15 m <sup>3</sup> /s
	Catch 1	PEAK RUNOFF FLOW from	0.25 m <sup>3</sup> /s

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catch 5	0 %	0.05 m <sup>3</sup> /s	12,470.04 m <sup>3</sup> 99.33 mg/l 1,238.649 kg	2,688.048 m <sup>3</sup> 99.33 mg/l 267.004 kg
Catch 4	0 %	0.05 m <sup>3</sup> /s	6,046.08 m <sup>3</sup> 98.83 mg/l 597.534 kg	1,539.648 m <sup>3</sup> 98.83 mg/l 152.163 kg
Catch 2	0 %	0.09 m <sup>3</sup> /s	67,262.64 m <sup>3</sup> 55.77 mg/l 3,750.901 kg	6,224.304 m <sup>3</sup> 55.77 mg/l 347.098 kg
Catch 3	0 %	0.15 m <sup>3</sup> /s	75,198.12 m <sup>3</sup> 70.5 mg/l	9,049.724 m <sup>3</sup> 70.5 mg/l

Catch 1	0 %	0.25 m <sup>3</sup> /s	5,301.543 kg	638.015 kg
			158,804.07 m <sup>3</sup>	23,878.605 m <sup>3</sup>
			87.67 mg/l	87.67 mg/l
			13,922.829 kg	2,093.509 kg
Outlet	0 %	0.598 m <sup>3</sup> /s	43,381 m <sup>3</sup>	43,381 m <sup>3</sup>
			80.63 mg/l	80.63 mg/l
			3,497.789 kg	3,497.789 kg

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catch 5	0 %	0.05 m <sup>3</sup> /s	12,470.04 m <sup>3</sup>	2,688.048 m <sup>3</sup>
			0.231 mg/l	0.231 mg/l
			2.875 kg	0.62 kg
Catch 4	0 %	0.05 m <sup>3</sup> /s	6,046.08 m <sup>3</sup>	1,539.648 m <sup>3</sup>
			0.23 mg/l	0.23 mg/l
			1.391 kg	0.354 kg
Catch 2	0 %	0.09 m <sup>3</sup> /s	67,262.64 m <sup>3</sup>	6,224.304 m <sup>3</sup>
			0.23 mg/l	0.23 mg/l
			15.47 kg	1.432 kg
Catch 3	0 %	0.15 m <sup>3</sup> /s	75,198.12 m <sup>3</sup>	9,049.724 m <sup>3</sup>
			0.232 mg/l	0.232 mg/l

Catch 1	0 %	0.25 m <sup>3</sup> /s	17.414 kg	2.096 kg
			158,804.07 m <sup>3</sup>	23,878.605 m <sup>3</sup>
			0.235 mg/l	0.235 mg/l
			37.257 kg	5.602 kg
Outlet	0 %	0.598 m <sup>3</sup> /s	43,381 m <sup>3</sup>	43,381 m <sup>3</sup>
			0.233 mg/l	0.233 mg/l
			10.103 kg	10.103 kg

## Outlet

Field	Value
Name	Outlet
Catchment	1
Outfall Elevation (m)	0

## Catch 5

Field	Value
Subcatchment name	Catch 5
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	99.33
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	1.32
Impervious area (HA)	0.08844
Roof area (HA)	0

Landscaped area (HA)	0.00792
Row Crop area (HA)	1.22364
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	6.7
Subcatchment Width (m)	150
Subcatchment Slope (%)	0.3
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	82

## Catch 4

Field	Value
Subcatchment name	Catch 4
Catchment	1

Soil type	Silt Loam
Weighted EMC TSS (mg/L)	98.83
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	0.64
Impervious area (HA)	0.07488
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0.56512
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	11.7
Subcatchment Width (m)	130
Subcatchment Slope (%)	1.7
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5

**Catch 2**

Field	Value
Subcatchment name	Catch 2
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	55.77
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	7.12
Impervious area (HA)	0
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0.12104
Open Space / Parkland area (HA)	0
Forest area (HA)	6.99896
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	0
Subcatchment Width (m)	250

Subcatchment Slope (%)	2
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	71.2

### Catch 3

Field	Value
Subcatchment name	Catch 3
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	70.5
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	7.96
Impervious area (HA)	0
Roof area (HA)	0.06368
Landscaped area (HA)	0.2388
Row Crop area (HA)	2.57108

Open Space / Parkland area (HA)	0
Forest area (HA)	5.08644
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	0.8
Subcatchment Width (m)	260
Subcatchment Slope (%)	3
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	74.9

## Catch 1

Field	Value
Subcatchment name	Catch 1
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	87.67
Weighted EMC TP (mg/L)	0.23

Total AREA (HA)	16.81
Impervious area (HA)	0
Roof area (HA)	0.23534
Landscaped area (HA)	1.22713
Row Crop area (HA)	11.22908
Open Space / Parkland area (HA)	0
Forest area (HA)	4.11845
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	1.4
Subcatchment Width (m)	320
Subcatchment Slope (%)	2
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	79.3

## Costing | 3523 25 Sdrd Innisfil - Pre Dev

Name	Catchment	Green Infrastructure Type	Default Values/User Edited	Construction Cost	Annual Average Maintenance Cost	25-year Maintenance Cost	Total life-cycle cost (excludes rehab)	User Comments
	<input type="text" value="all"/>	<input type="text" value="all"/>	<input type="text" value="all"/>					
<b>Total</b>				<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	

## Summary

Site	Project Name	Project Title	Storm Type	Runoff Continuity Error (%)	Flow Routing Continuity Error (%)
post-development	3523 25th Sdrd Innisfil Post Development	3523 25th Sdrd Innisfil	avg-annual	-0.000	-0.005

These continuity errors represent the percent difference between initial storage+ total inflow for the entire drainage system versus final storage + total outflow for the entire drainage system. If the continuity error exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are conduits that are too short, abrupt changes in storage (very small or very large storage areas), or flooding losses in the model (insufficient node depth).

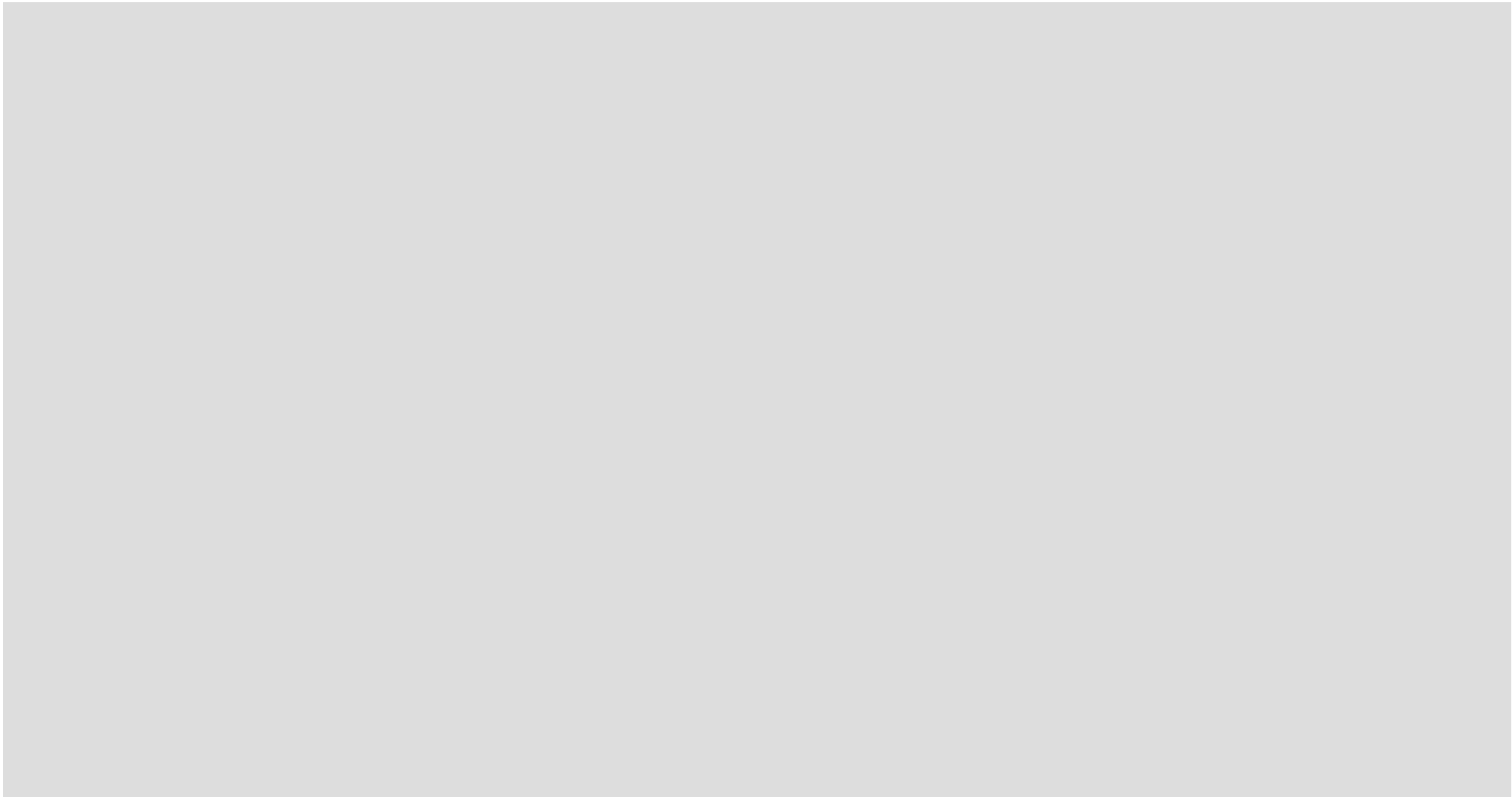
## Water Balance | 3523 25th Sdrd Innisfil

Catchment	Site Area	Site Rainfall	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (%)
1	33.85 ha	944.70 mm 319,780.95 m <sup>3</sup>	568.42 mm 192,411.05 m <sup>3</sup>	127.43 mm 43,135.21 m <sup>3</sup>	247.94 mm 83,926 m <sup>3</sup>	696.76 mm 73.76 %
<b>TOTAL</b>	<b>33.85 ha</b>	<b>944.7 mm</b> <b>319,780.95 m<sup>3</sup></b>	<b>568.42 mm</b> <b>192,411.05 m<sup>3</sup></b>	<b>127.43 mm</b> <b>43,135.21 m<sup>3</sup></b>	<b>247.94 mm</b> <b>83,926 m<sup>3</sup></b>	<b>696.76 mm</b> <b>73.76 %</b>

Catchment 1

Subcatchment

Name	Initial Soil Water (fraction)	Final Soil Water (fraction)
Catch 5	0.284	0.28
Catch 4	0.284	0.28
Catch 2	0.284	0.28
Catch 3	0.284	0.28
Catch 1	0.284	0.28
Catch1.2-Road	0.284	0



## LID Summary | 3523 25th Sdrd Innisfil

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW	TSS	TP
					Flow In (m <sup>3</sup> )	Load In (kg)	Load In (kg)
					Flow Out (m <sup>3</sup> )	Load Out (kg)	Load Out (kg)
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)

## Trees | 3523 25th Sdrd Innisfil

Element	Area	Rainfall	Infiltration	Evapotranspired	Runoff	Stored	Rainfall Reduction
	(ha)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
	(m <sup>2</sup> )	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )

## Loading Summary TSS | 3523 25th Sdrd Innisfil

Catchment	Total Catchment TSS Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	70.878 %	1.257 m <sup>3</sup> /s	319,780.95 m <sup>3</sup>	83,926 m <sup>3</sup>
			69.94 mg/l	77.61 mg/l
			22,365.652 kg	6,513.239 kg
<b>Total</b>	<b>70.878 %</b>	<b>1.257 m<sup>3</sup>/s</b>	<b>319,780.95 m<sup>3</sup></b>	<b>83,926 m<sup>3</sup></b>
			<b>69.94 mg/l</b>	<b>77.61 mg/l</b>
			<b>22,365.652 kg</b>	<b>6,513.239 kg</b>

## Loading Summary TP | 3523 25th Sdrd Innisfil

Catchment	Total Catchment TP Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	73.421 %	1.257 m <sup>3</sup> /s	319,780.95 m <sup>3</sup>	83,926 m <sup>3</sup>
			0.24 mg/l	0.24 mg/l
			77.1 kg	20.493 kg
<b>Total</b>	<b>73.421 %</b>	<b>1.257 m<sup>3</sup>/s</b>	<b>319,780.95 m<sup>3</sup></b>	<b>83,926 m<sup>3</sup></b>
			<b>0.24 mg/l</b>	<b>0.24 mg/l</b>
			<b>77.1 kg</b>	<b>20.493 kg</b>

## Peak Flow | 3523 25th Sdrd Innisfil

Catchment	Element	Description	Peak outflow
1	Outlet	MAXIMUM FLOW at	1.257 m <sup>3</sup> /s
	Catch 5	PEAK RUNOFF FLOW from	0.04 m <sup>3</sup> /s
	Catch 4	PEAK RUNOFF FLOW from	0.03 m <sup>3</sup> /s
	Catch 2	PEAK RUNOFF FLOW from	0.09 m <sup>3</sup> /s
	Catch 3	PEAK RUNOFF FLOW from	0.18 m <sup>3</sup> /s
	Catch 1	PEAK RUNOFF FLOW from	0.60 m <sup>3</sup> /s
	Catch1.2-Road	PEAK RUNOFF FLOW from	0.34 m <sup>3</sup> /s

## Detailed Loading TSS | 3523 25th Sdrd Innisfil

### TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming		Outgoing	
			Total Flow (m <sup>3</sup> )	Concentration (mg/l)	Total Flow (m <sup>3</sup> )	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)		
Catch 5	0 %	0.04 m <sup>3</sup> /s	3,211.98 m <sup>3</sup>	1,329.706 m <sup>3</sup>		
			54.24 mg/l	54.24 mg/l		
			174.218 kg	72.123 kg		
Catch 4	0 %	0.03 m <sup>3</sup> /s	5,006.91 m <sup>3</sup>	1,669.5 m <sup>3</sup>		
			69 mg/l	69 mg/l		
			345.467 kg	115.192 kg		
Catch 2	0 %	0.09 m <sup>3</sup> /s	87,951.57 m <sup>3</sup>	7,954.464 m <sup>3</sup>		
			53.1 mg/l	53.1 mg/l		
			4,669.877 kg	422.35 kg		
Catch 3	0 %	0.18 m <sup>3</sup> /s	81,055.26 m <sup>3</sup>	9,949.368 m <sup>3</sup>		
			70.59 mg/l	70.59 mg/l		

Catch 1	0 %	0.6 m <sup>3</sup> /s	5,721.286 kg	702.276 kg
			108,451.56 m <sup>3</sup>	37,119.432 m <sup>3</sup>
			77.32 mg/l	77.32 mg/l
			8,385.475 kg	2,870.074 kg
Catch1.2-Road	0 %	0.34 m <sup>3</sup> /s	34,103.67 m <sup>3</sup>	25,902.472 m <sup>3</sup>
			90 mg/l	90 mg/l
			3,069.33 kg	2,331.222 kg
Outlet	0 %	1.257 m <sup>3</sup> /s	83,926 m <sup>3</sup>	83,926 m <sup>3</sup>
			77.61 mg/l	77.61 mg/l
			6,513.239 kg	6,513.239 kg

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catch 5	0 %	0.04 m <sup>3</sup> /s	3,211.98 m <sup>3</sup>	1,329.706 m <sup>3</sup>
			0.214 mg/l	0.214 mg/l
			0.688 kg	0.285 kg
Catch 4	0 %	0.03 m <sup>3</sup> /s	5,006.91 m <sup>3</sup>	1,669.5 m <sup>3</sup>
			0.241 mg/l	0.241 mg/l
			1.207 kg	0.403 kg
Catch 2	0 %	0.09 m <sup>3</sup> /s	87,951.57 m <sup>3</sup>	7,954.464 m <sup>3</sup>
			0.228 mg/l	0.228 mg/l
			20.049 kg	1.813 kg
Catch 3	0 %	0.18 m <sup>3</sup> /s	81,055.26 m <sup>3</sup>	9,949.368 m <sup>3</sup>
			0.234 mg/l	0.234 mg/l

Catch 1	0 %	0.6 m <sup>3</sup> /s	18,945 kg	2,325 kg
			108,451.56 m <sup>3</sup>	37,119.432 m <sup>3</sup>
			0.262 mg/l	0.262 mg/l
			28,367 kg	9,709 kg
Catch1.2-Road	0 %	0.34 m <sup>3</sup> /s	34,103.67 m <sup>3</sup>	25,902.472 m <sup>3</sup>
			0.23 mg/l	0.23 mg/l
			7,844 kg	5,958 kg
Outlet	0 %	1.257 m <sup>3</sup> /s	83,926 m <sup>3</sup>	83,926 m <sup>3</sup>
			0.244 mg/l	0.244 mg/l
			20,493 kg	20,493 kg

## Detailed Report Parameters | 3523 25th Sdrd Innisfil

### Outlet

Field	Value
Name	Outlet
Catchment	1
Outfall Elevation (m)	0

### Catch 5

Field	Value
Subcatchment name	Catch 5
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	54.24
Weighted EMC TP (mg/L)	0.21
Total AREA (HA)	0.34
Impervious area (HA)	0.1411
Roof area (HA)	0

Landscaped area (HA)	0.0051
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.1938
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	41.5
Subcatchment Width (m)	650
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	76.2

## Catch 4

Field	Value
Subcatchment name	Catch 4
Catchment	1

Soil type	Silt Loam
Weighted EMC TSS (mg/L)	69
Weighted EMC TP (mg/L)	0.24
Total AREA (HA)	0.53
Impervious area (HA)	0.17278
Roof area (HA)	0
Landscaped area (HA)	0.106
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.12137
Forest area (HA)	0.12985
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	32.6
Subcatchment Width (m)	5
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5

**Catch 2**

Field	Value
Subcatchment name	Catch 2
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	53.1
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	9.31
Impervious area (HA)	0
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.63308
Forest area (HA)	8.67692
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	0
Subcatchment Width (m)	220

Subcatchment Slope (%)	2
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	71.3

### Catch 3

Field	Value
Subcatchment name	Catch 3
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	70.59
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	8.58
Impervious area (HA)	0
Roof area (HA)	0.0858
Landscaped area (HA)	0.48906
Row Crop area (HA)	2.574

Open Space / Parkland area (HA)	0
Forest area (HA)	5.43114
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	1
Subcatchment Width (m)	300
Subcatchment Slope (%)	3
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	75

## Catch 1

Field	Value
Subcatchment name	Catch 1
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	77.32
Weighted EMC TP (mg/L)	0.26

Total AREA (HA)	11.48
Impervious area (HA)	0.41328
Roof area (HA)	2.7552
Landscaped area (HA)	8.31152
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	27.6
Subcatchment Width (m)	285
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	82

## Catch1.2-Road

Field	Value
Subcatchment name	Catch1.2-Road
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	90
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	3.61
Impervious area (HA)	3.61
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	100
Subcatchment Width (m)	10
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01

Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	0

## Costing | 3523 25th Sdrd Innisfil

Name	Catchment	Green Infrastructure Type	Default Values/User Edited	Construction Cost	Annual Average Maintenance Cost	25-year Maintenance Cost	Total life-cycle cost (excludes rehab)	User Comments
	<input type="text" value="all"/>	<input type="text" value="all"/>	<input type="text" value="all"/>					
<b>Total</b>				<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	

## Summary

Site	Project Name	Project Title	Storm Type	Runoff Continuity Error (%)	Flow Routing Continuity Error (%)
post-development	3523 25th Sdrd Innisfil Post Development	3523 25th Sdrd Innisfil	avg-annual	0.135	-0.004

These continuity errors represent the percent difference between initial storage+ total inflow for the entire drainage system versus final storage + total outflow for the entire drainage system. If the continuity error exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are conduits that are too short, abrupt changes in storage (very small or very large storage areas), or flooding losses in the model (insufficient node depth).

## Water Balance | 3523 25th Sdrd Innisfil

Catchment	Site Area	Site Rainfall	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (m <sup>3</sup> )	(mm) (%)
1	33.85 ha	944.70 mm 319,790.4 m <sup>3</sup>	627.72 mm 212,488.86 m <sup>3</sup>	123.34 mm 41,752.81 m <sup>3</sup>	192.2 mm 65,062 m <sup>3</sup>	752.5 mm 79.65 %
<b>TOTAL</b>	<b>33.85 ha</b>	<b>944.7 mm</b> <b>319,790.4 m<sup>3</sup></b>	<b>627.72 mm</b> <b>212,488.86 m<sup>3</sup></b>	<b>123.34 mm</b> <b>41,752.81 m<sup>3</sup></b>	<b>192.2 mm</b> <b>65,062 m<sup>3</sup></b>	<b>752.5 mm</b> <b>79.65 %</b>

## Storage Volumes | 3523 25th Sdrd Innisfil

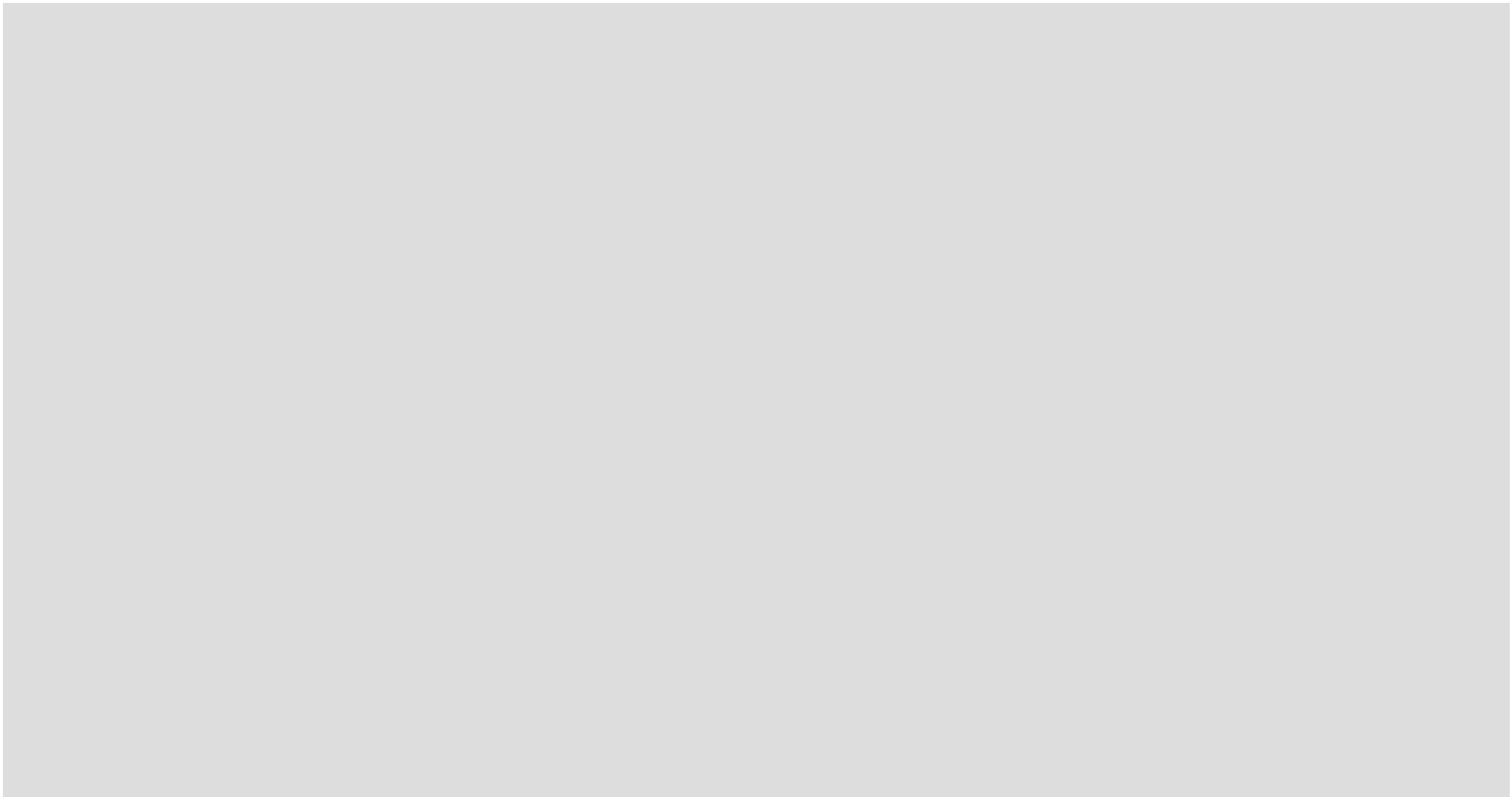
### Catchment 1

#### Subcatchment

Name	Initial Soil Water (fraction)	Final Soil Water (fraction)
Catch 5	0.284	0.28
Catch 4	0.284	0.28
Catch 2	0.284	0.28
Catch 3	0.284	0.28
Catch 1a-LID	0.284	0.28
Catch1.2-Road	0.284	0
Catch1b-noLID	0.284	0.28

#### Storage

Name	Initial Water Level (m)	Maximum Water Level (m)
SWMF	0	0.37



## LID Summary | 3523 25th Sdrd Innisfil

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW		TSS	TP
					Flow In (m <sup>3</sup> )	Load In (kg)	Load In (kg)	
					Flow Out (m <sup>3</sup> )	Load Out (kg)	Load Out (kg)	
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)	
SWMF	Wet-Pond	-	-	-	44,800 m <sup>3</sup>	3,743.322 kg	10.726 kg	
					44,352 m <sup>3</sup>	741.178 kg	4.247 kg	
					1 %	80.2 %	60.4 %	
Infil Gallery	Infiltration	1.44 ha	40 hrs	2.181	29,671.966 m <sup>3</sup>	2,541.307 kg	8.442 kg	
					0 m <sup>3</sup>	0 kg	0 kg	
					100 %	100 %	100 %	

## Trees | 3523 25th Sdrd Innisfil

Element	Area	Rainfall	Infiltration	Evapotranspired	Runoff	Stored	Rainfall Reduction
	(ha)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
	(m <sup>2</sup> )	(m <sup>2</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )

## Loading Summary TSS | 3523 25th Sdrd Innisfil

Catchment	Total Catchment TSS Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	90.824 %	0.75 m <sup>3</sup> /s	319,790.397 m <sup>3</sup>	65,062 m <sup>3</sup>
			69.97 mg/l	31.56 mg/l
			22,374.152 kg	2,053.12 kg
<b>Total</b>	<b>90.824 %</b>	<b>0.75 m<sup>3</sup>/s</b>	<b>319,790.397 m<sup>3</sup></b>	<b>65,062 m<sup>3</sup></b>
			<b>69.97 mg/l</b>	<b>31.56 mg/l</b>
			<b>22,374.152 kg</b>	<b>2,053.12 kg</b>

## Loading Summary TP | 3523 25th Sdrd Innisfil

Catchment	Total Catchment TP Removal	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	88.235 %	0.75 m <sup>3</sup> /s	319,790.397 m <sup>3</sup>	65,062 m <sup>3</sup>
			0.24 mg/l	0.14 mg/l
			77.122 kg	9.074 kg
<b>Total</b>	<b>88.235 %</b>	<b>0.75 m<sup>3</sup>/s</b>	<b>319,790.397 m<sup>3</sup></b>	<b>65,062 m<sup>3</sup></b>
			<b>0.24 mg/l</b>	<b>0.14 mg/l</b>
			<b>77.122 kg</b>	<b>9.074 kg</b>

## Peak Flow | 3523 25th Sdrd Innisfil

Catchment	Element	Description	Peak outflow
1	Outlet	MAXIMUM FLOW at	0.750 m <sup>3</sup> /s
	Catch 5	PEAK RUNOFF FLOW from	0.04 m <sup>3</sup> /s
	Catch 4	PEAK RUNOFF FLOW from	0.03 m <sup>3</sup> /s
	Catch 2	PEAK RUNOFF FLOW from	0.09 m <sup>3</sup> /s
	Catch 3	PEAK RUNOFF FLOW from	0.18 m <sup>3</sup> /s
	Catch 1a-LID	PEAK RUNOFF FLOW from	0.32 m <sup>3</sup> /s
	Catch1.2-Road	PEAK RUNOFF FLOW from	0.34 m <sup>3</sup> /s
	SWMF	MAXIMUM OUTFLOW from	0.456 m <sup>3</sup> /s
	SWMF Out	MAXIMUM FLOW in	0.456 m <sup>3</sup> /s
	Infil Gallery	PEAK RUNOFF FLOW from	0.00 m <sup>3</sup> /s
Catch1b-noLID	PEAK RUNOFF FLOW from	0.31 m <sup>3</sup> /s	

## Detailed Loading TSS | 3523 25th Sdrd Innisfil

### TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catch 5	0 %	0.04 m <sup>3</sup> /s	3,211.98 m <sup>3</sup>	1,329.706 m <sup>3</sup>
			54.24 mg/l	54.24 mg/l
			174.218 kg	72.123 kg
Catch 4	0 %	0.03 m <sup>3</sup> /s	5,006.91 m <sup>3</sup>	1,669.5 m <sup>3</sup>
			69 mg/l	69 mg/l
			345.467 kg	115.192 kg
Catch 2	0 %	0.09 m <sup>3</sup> /s	87,951.57 m <sup>3</sup>	7,954.464 m <sup>3</sup>
			53.1 mg/l	53.1 mg/l
			4,669.877 kg	422.35 kg
Catch 3	0 %	0.18 m <sup>3</sup> /s	81,055.26 m <sup>3</sup>	9,949.368 m <sup>3</sup>
			70.59 mg/l	70.59 mg/l

Catch 1a-LID	0 %	0.32 m <sup>3</sup> /s	5,721.286 kg	702.276 kg
			45,440.07 m <sup>3</sup>	16,068.286 m <sup>3</sup>
			73.5 mg/l	73.5 mg/l
Catch1.2-Road	0 %	0.34 m <sup>3</sup> /s	3,339.618 kg	1,180.939 kg
			34,103.67 m <sup>3</sup>	25,902.472 m <sup>3</sup>
			90 mg/l	90 mg/l
Catch1b-noLID	0 %	0.31 m <sup>3</sup> /s	3,069.33 kg	2,331.222 kg
			49,417.257 m <sup>3</sup>	18,890.71 m <sup>3</sup>
			74.75 mg/l	74.75 mg/l
Infil Gallery	75 %	0 m <sup>3</sup> /s	3,693.989 kg	1,412.099 kg
			29,671.966 m <sup>3</sup>	0 m <sup>3</sup>
			85.65 mg/l	21.41 mg/l
SWMF	80 %	0.456 m <sup>3</sup> /s	2,541.307 kg	0 kg
			44,800 m <sup>3</sup>	44,352 m <sup>3</sup>
			83.56 mg/l	16.71 mg/l
SWMF Out	0 %	0.456 m <sup>3</sup> /s	3,743.322 kg	741.178 kg
			44,352 m <sup>3</sup>	44,352 m <sup>3</sup>
			16.71 mg/l	16.71 mg/l
			741.178 kg	741.178 kg

Outlet

0 %

0.75 m<sup>3</sup>/s

65,062 m<sup>3</sup>

65,062 m<sup>3</sup>

31.56 mg/l

31.56 mg/l

2,053.12 kg

2,053.12 kg

## Detailed Loading TP | 3523 25th Sdrd Innisfil

### TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m <sup>3</sup> )	Total Flow (m <sup>3</sup> )
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catch 5	0 %	0.04 m <sup>3</sup> /s	3,211.98 m <sup>3</sup>	1,329.706 m <sup>3</sup>
			0.214 mg/l	0.214 mg/l
			0.688 kg	0.285 kg
Catch 4	0 %	0.03 m <sup>3</sup> /s	5,006.91 m <sup>3</sup>	1,669.5 m <sup>3</sup>
			0.241 mg/l	0.241 mg/l
			1.207 kg	0.403 kg
Catch 2	0 %	0.09 m <sup>3</sup> /s	87,951.57 m <sup>3</sup>	7,954.464 m <sup>3</sup>
			0.228 mg/l	0.228 mg/l
			20.049 kg	1.813 kg
Catch 3	0 %	0.18 m <sup>3</sup> /s	81,055.26 m <sup>3</sup>	9,949.368 m <sup>3</sup>
			0.234 mg/l	0.234 mg/l

Catch 1a-LID	0 %	0.32 m <sup>3</sup> /s	18,945 kg	2.325 kg
			45,440.07 m <sup>3</sup>	16,068.286 m <sup>3</sup>
			0.254 mg/l	0.254 mg/l
Catch1.2-Road	0 %	0.34 m <sup>3</sup> /s	11,562 kg	4.089 kg
			34,103.67 m <sup>3</sup>	25,902.472 m <sup>3</sup>
			0.23 mg/l	0.23 mg/l
Catch1b-noLID	0 %	0.31 m <sup>3</sup> /s	7,844 kg	5.958 kg
			49,417.257 m <sup>3</sup>	18,890.71 m <sup>3</sup>
			0.252 mg/l	0.252 mg/l
Infil Gallery	60 %	0 m <sup>3</sup> /s	12.473 kg	4.768 kg
			29,671.966 m <sup>3</sup>	0 m <sup>3</sup>
			0.285 mg/l	0.114 mg/l
SWMF	60 %	0.456 m <sup>3</sup> /s	8.442 kg	0 kg
			44,800 m <sup>3</sup>	44,352 m <sup>3</sup>
			0.239 mg/l	0.096 mg/l
SWMF Out	0 %	0.456 m <sup>3</sup> /s	10.726 kg	4.247 kg
			44,352 m <sup>3</sup>	44,352 m <sup>3</sup>
			0.096 mg/l	0.096 mg/l
			4.247 kg	4.247 kg

Outlet	0 %	0.75 m <sup>3</sup> /s	65,062 m <sup>3</sup>	65,062 m <sup>3</sup>
			0.139 mg/l	0.139 mg/l
			9.074 kg	9.074 kg

## Detailed Report Parameters | 3523 25th Sdrd Innisfil

### Outlet

Field	Value
Name	Outlet
Catchment	1
Outfall Elevation (m)	-3

### Catch 5

Field	Value
Subcatchment name	Catch 5
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	54.24
Weighted EMC TP (mg/L)	0.21
Total AREA (HA)	0.34
Impervious area (HA)	0.1411
Roof area (HA)	0

Landscaped area (HA)	0.0051
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.1938
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	41.5
Subcatchment Width (m)	650
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	76.2

## Catch 4

Field	Value
Subcatchment name	Catch 4
Catchment	1

Soil type	Silt Loam
Weighted EMC TSS (mg/L)	69
Weighted EMC TP (mg/L)	0.24
Total AREA (HA)	0.53
Impervious area (HA)	0.17278
Roof area (HA)	0
Landscaped area (HA)	0.106
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.12137
Forest area (HA)	0.12985
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	32.6
Subcatchment Width (m)	5
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5

**Catch 2**

Field	Value
Subcatchment name	Catch 2
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	53.1
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	9.31
Impervious area (HA)	0
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.63308
Forest area (HA)	8.67692
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	0
Subcatchment Width (m)	220

Subcatchment Slope (%)	2
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	71.3

### Catch 3

Field	Value
Subcatchment name	Catch 3
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	70.59
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	8.58
Impervious area (HA)	0
Roof area (HA)	0.0858
Landscaped area (HA)	0.48906
Row Crop area (HA)	2.574

Open Space / Parkland area (HA)	0
Forest area (HA)	5.43114
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	1
Subcatchment Width (m)	300
Subcatchment Slope (%)	3
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	75

## Catch 1a-LID

Field	Value
Subcatchment name	Catch 1a-LID
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	73.5
Weighted EMC TP (mg/L)	0.25

Total AREA (HA)	4.81
Impervious area (HA)	0
Roof area (HA)	1.37085
Landscaped area (HA)	3.43915
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	28.5
Subcatchment Width (m)	285
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	82

### Catch1.2-Road

Field	Value
Subcatchment name	Catch1.2-Road
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	90
Weighted EMC TP (mg/L)	0.23
Total AREA (HA)	3.61
Impervious area (HA)	3.61
Roof area (HA)	0
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	100
Subcatchment Width (m)	10
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01

Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	0

## SWMF

Field	Value
Name	SWMF
Storage Type	Wet Retention Ponds
Catchment	1
Bottom Elevation (m)	-2.3
Maximum Depth (m)	2.3
Initial Water Depth (m)	0
Lined/Unlined	lined
Evaporation Factor	1
Suction Head (mm)	100
Saturated Conductivity (mm/hr)	2.5
Initial Soil Moisture Deficit (Fraction)	0

## SWMF Out

Field	Value
Name	SWMF Out
Catchment	1
Upstream Node	SWMF
Downstream Node	Outlet
Length (m)	60
Manning's Roughness	0.013
Upstream Invert (m)	-2.3
Downstream Invert (m)	-3
Pipe Diameter (m)	0.6
Seepage in MM per Hour	0

## Infil Gallery

Field	Value
Name	Infil Gallery
LID type	Infiltration/Exfiltration Systems
Catchment	1
% Imperv	100
Width (m)	5

Total AREA (HA)	1.44
Paved surface (HA)	0
Roof (HA)	0
Landscaped Area (HA)	1.44
Row Crop (HA)	0
Open Space/Parkland (HA)	0
Forest (HA)	0
Wetland (HA)	0
(HA)	0
Weighted EMC TSS (mg/L)	100
Weighted EMC TP (mg/L)	0.32
Berm Height (mm)	0
Surface Roughness (Manning's n)	0.2
Surface Slope (%)	1
Swale Side Slopes (run/rise)	3
Soil curve number	68.2
Pavement Thickness (mm)	30
Void Ratio	0.4
Impervious Surface Fraction	0.5

Permeability (mm/hr)	10
Clogging Factor	0
Soil Thickness (mm)	300
Porosity (Fraction)	0.5
Field Capacity (Fraction)	0.3
Wilting Point (Fraction)	0.1
Conductivity (mm/hr)	10
Conductivity Slope (Dimensionless)	45
Suction Head (mm)	200
Storage Thickness (mm)	800
Seepage Rate (mm/hr)	8
Design Drawdown Time (Hrs)	48
Computed drawdown time	40
Is there a drain?	no
Flow Coefficient	1
Flow Exponent	1
Offset Height (mm)	50
Mannings Roughness	0.1

Field	Value
Subcatchment name	Catch1b-noLID
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	74.75
Weighted EMC TP (mg/L)	0.25
Total AREA (HA)	5.231
Impervious area (HA)	0.413249
Roof area (HA)	1.375753
Landscaped area (HA)	3.441998
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	34.2
Subcatchment Width (m)	100
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01

Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	82

## Costing | 3523 25th Sdrd Innisfil

Name	Catchment	Green Infrastructure Type	Default Values/User Edited	Construction Cost	Annual Average Maintenance Cost	25-year Maintenance Cost	Total life-cycle cost (excludes rehab)	User Comments
	<input type="text" value="all"/>	<input type="text" value="all"/>	<input type="text" value="all"/>					
<b>Total</b>				<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	