Bayview Hospitality Holdings Ltd

6301 Campeau Drive

Stormwater Management Report

August 20, 2021

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Stormwater Management Report

Bayview Hospitality Holdings Ltd

Confidential
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1 INTRODUCTION

1.1 Scope

WSP Canada Inc. was retained by Bayview Hospitality Group to conduct a stormwater management study to service the proposed new residential development, including apartments and townhouses.

1.2 Site Location

The existing site is located at 6301 Campeau Drive, Ottawa, Ontario, bounded by Campeau Drive to the north, Cordillera Street to the east, future Canadian Shield Avenue to the south, and an existing property at 6501 Campeau Drive to the west. The location of the proposed re-development is split into two parcels and is illustrated in **Figure 1-1**.

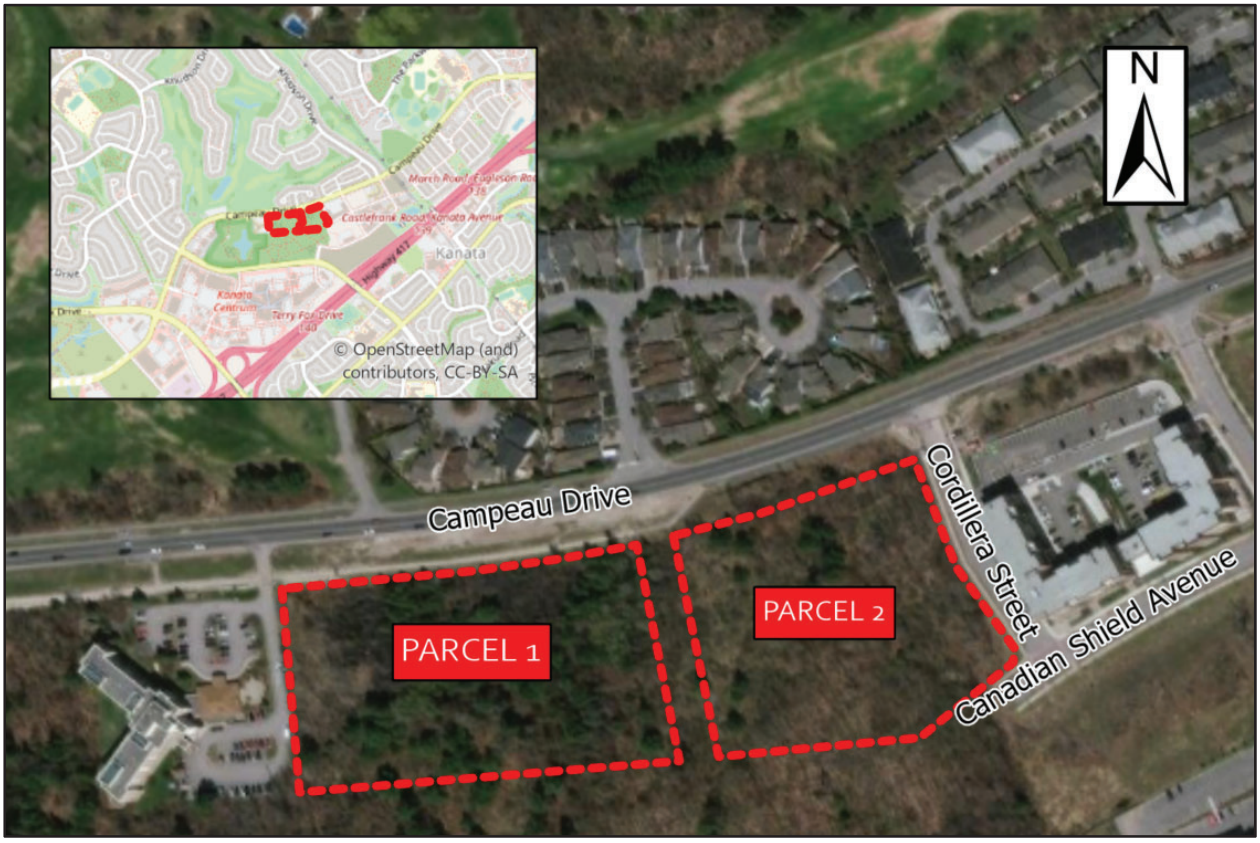


Figure 1-1: Site Location

1.3 Stormwater Management Plan Objectives

The objectives of the stormwater management (SWM) study are as follows:

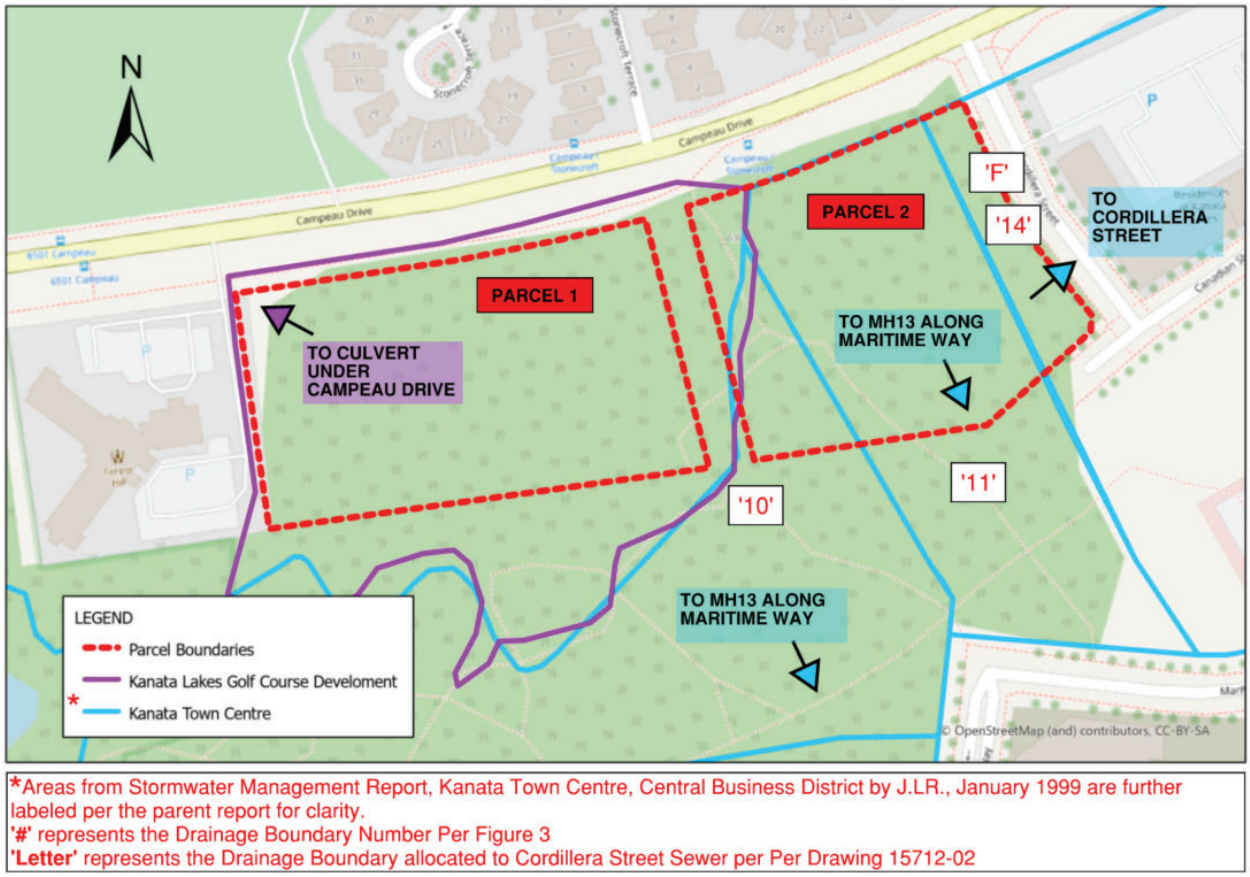
- Collect and review background information.
- Determine site specific stormwater management requirements to ensure that future development projects are in line with Bayview Hospitality Holdings Ltd's vision for the site and conform with the requirements of the City, Mississippi Valley Conservation Authority (MVCA), and established reports.
- Ensure downstream capacity is sufficient for receiving allowed discharge.
- Evaluate various stormwater management practices that meet the stormwater management requirements and recommend a preferred stormwater management strategy.

1.4 Design Criteria

There are two sets of stormwater management criteria for 6301 Campeau drive as governed by the pre-development drainage boundaries and the existing drainage strategies of adjacent developments. The criteria for these two areas were discussed in a pre-consultation meeting with the City, owner (OCLDC), and development applicant (Bayview Hospitality Inc.) dated November 8, 2019 **(Appendix A)** and supported by the following stormwater management reports and resources:

1. Kanata Town Centre Phasing and Servicing Overview by IBI (September 23, 2013)
2. Stormwater Management Report, Kanata Town Centre, Central Business District by J.L. Richards & Associates Limited (January 1999)
3. Kanata Lakes Golf Course Development Application: Preliminary Stormwater Management Plan Technical Memo, JFSA (July 9, 2020) and Functional Servicing Report for 7000 Campeau Drive, DSEL (July 2020)
4. Further discussions with the City (**Appendix A**) and ongoing communication.

Select figures and tables from the above reports detailing storm drainage boundaries have been provided in **Appendix B**. PDFs from the reports have been overlain and traced to show their relation to the proposed development boundaries in **Figure 2**.



*Areas from Stormwater Management Report, Kanata Town Centre, Central Business District by J.LR., January 1999 are further labeled per the parent report for clarity.
'#' represents the Drainage Boundary Number Per Figure 3
'Letter' represents the Drainage Boundary allocated to Cordillera Street Sewer per Per Drawing 15712-02

Figure 1-2: Approximate Stormwater Management Boundaries

All of Parcel 1 lands and a portion of Parcel 2 are governed by the criteria set forward by the Kanata Lakes Golf Course development (purple) whereas the majority of parcel 2 is governed by drainage captured by the Kanata Town Centre SWMF (blue).

1.4.1 Stormwater management criteria for lands draining toward the Kanata Lakes Golf Course Development

The first set of criteria is detailed in the *Kanata Town Centre Phasing and Servicing Overview by IBI (September 23, 2013)* and *Kanata Lakes Development Application Documents (2020)*. These criteria are for the lands draining northwest toward Campeau Drive.

The following are key points regarding the stormwater servicing from this report:

- The existing storm sewer along Campeau Drive adjacent to Parcel 1 is a shallow sewer designed to capture roadway drainage and has no identified capacity for receiving drainage from additional developments
- A 1200 mm diameter culvert crossing Campeau drive exists at the northwest edge of the site. “This storm outlet is directly available to Blocks A to D inclusive. On-site

attenuation to predevelopment flow should be considered a requirement for the purposes of advancing use of this storm outlet"

CRITERIA

Water Quality – Treatment must provide a removal of 80% TSS on an annual basis (Enhanced Level Treatment) for Parcel 1.

Water Quantity Control and Discharge to Municipal Infrastructure – Runoff from the 5-year to 100-year design storms must not exceed the peak 5-year pre-development flow rate with a runoff coefficient of 0.20.

1.4.2 Stormwater management criteria for lands draining toward the Kanata Town Centre SWMF

The second set of criteria is detailed in *Stormwater Management Report, Kanata Town Centre, Central Business District by J.L. Richards & Associates Limited (January 1999)*.

The following are key points regarding the stormwater servicing from this report:

- Lands are accommodated by a major/ minor storm system discharging to a SWMF in the southeast corner of the Kanata Town Centre development.
- The proposed development at 6301 Campeau Drive sits within three separate drainage areas; two of which are accounted for at a maintenance hole along Marine Way (by way of Canadian Shield Avenue) and one of which is accounted for along Cordillera Avenue.

CRITERIA

Water Quality – Water quality is accommodated by the SWMF in the southeast of the Kanata Town Centre. The facility was designed to a level of 86% sediment removal based on N.U.R.O. settling curves per *J.L. Richards & Associates Limited (January 1999)*. Therefore, there is no water quality target for Parcel 2.

Water Quantity Control and Discharge to Municipal Infrastructure – Correspondence on April 8, 2021 with the City of Ottawa (**Appendix A**) states that the sewer capacity (60 L/s) along Cordillera Street as read by the City's stormwater model governs the allowable release rate for the site for runoff to Cordillera Street during the 100-year storm. Further discussions in a meeting on May 7, 2021 indicate that 10-year on site storage is acceptable, provided overflow to Cordillera Street remains within tolerable flow depths and velocities.

Flows to Canadian Shield Avenue do not need to be controlled as they are largely undeveloped, but they must follow three conditions: **1-** In the interim, prior to the full build out of Canadian Shield Avenue, the overland flow path must remain within the

public right of way to Maritime Way and **2-** 5-year flows must be connected to the minor system along Canadian Shield Avenue and **3-** 100-year flows along the future Canadian Shield Avenue must remain within tolerable flow depths and velocities per the City of Ottawa Sewer Guidelines, 8.3.9.3.

2 PRE-DEVELOPMENT CONDITIONS

2.1 General

Currently the land proposed for the residential development is undeveloped, mainly covered by grass and tress, and forms part of the Kanata Town Centre development lands. The total study area for Parcels 1 and 2 are 1.964 and 1.741 ha, respectively. Please refer to **Appendix C** for existing site conditions as provided by the Topographical Survey Plan by Annis, O'Sullivan, Vollebekk Ltd. (February 2020).

2.2 Rainfall Information

The rainfall intensity is calculated in accordance with Section 5.4.2 of the Ottawa Sewer Design Guidelines (October 2012):

$$i = \left[\frac{A}{(T_d + C)^B}\right]$$

Where;

- A, B, C = regression constants for each return period (defined in section 5.4.2)
- i = rainfall intensity (mm/hour)
- T_d = storm duration (minutes)
- The IDF parameters/regression constants are included in **Appendix D**.

2.3 Allowable Flow Rates – Parcel 1

As noted in **Section 1.4.1**, post-development stormwater runoff from the 5-year to 100-year design storms must not exceed the peak 5-year pre-development flow rate with a runoff coefficient value of 0.20.

The total site area draining through the site is 3.09 ha. This area will discharge to a 750mm storm pipe at the northwest edge of the site which ultimately drains through a culvert toward the Kanata Lakes Development (previously golf course lands). Of the 3.09 ha draining to the boundary of the site, the undeveloped area (1.29 ha) will be routed through a swale with underdrain downstream of proposed site controls (i.e. bypassing the system and remaining unchanged from existing conditions). Therefore, only the remaining 1.8 ha. were included in the pre /post-development allowable release

rates. The calculated peak flow rates for the site in the pre-development condition are summarized below and shown in **Appendix D**.

Table 2-1: Pre-Development Peak Flow Rate Calculations for flows to Campeau Drive (Runoff Coefficient, C = 0.20 and T_c=20 min)

Return Period (Years)	Rainfall Intensity (MM/hour)	Peak Flow Rate (l/s)	Target Release Rate (l/s)
2	52.0	52.0	**70.3**
5	70.3	**70.3**	
10	82.2	82.2	
25	97.3	107.0	
50	108.5	130.2	
100	120.0	149.9	

2.4 Allowable Flow Rates – Parcel 2

The northwest corner of the site (**Figure 2**) will remain undeveloped and drains through Parcel 1 in accordance with the criteria set out in **Section 2.3**. The remaining site area which was accounted for by J.L. Richards (January 1999) during the design of the Kanata Town Centre minor system. However, this report **1-** assumed Canadian Shield Avenue would be fully constructed prior to the development of this parcel and **2-** was established prior to current City of Ottawa standards and practices for overland flow.

In this Report (J.L. Richards, 1999) which was used as a high level plan for the Kanata Town Centre storm system (major and minor) the majority of site area was accounted for in 'Maintenance hole 13' along Maritime Way (areas '10' and '11' from **Figure 2**), the roadway and associated minor pipe systems along Canadian Shield Avenue which tie into Maritime Way have not yet been constructed. The remaining 0.25 ha. (area '14' or 'F' from **Figure 2**) of site area has been accounted for in the design of the minor system along Cordillera Street. However, since Canadian Shield Avenue is not yet constructed, all site areas not draining toward Cordillera Street must be controlled to criteria deemed acceptable by the City (**Appendix A and ongoing discussions**) in order to provide a safe and functional system. Flows draining to Canadian Shield Avenue are largely undeveloped. Per the City of Ottawa Guidelines (8.3.9.3), flow depth x velocity must remain below 0.6 to be considered safe. The City of Ottawa will be checking the downstream flow path for both Canadian Shield Avenue and Canadian Shield Avenue.

A summary of the Parcel 2 Criteria is provided (**Table 2-2**) as described in **Section 1.4.2**.

Table 2-2: Summary of Parcel 2 Criteria

Return Period (Years)	Flow to Cordillera Street	Flow to Canadian Shield Avenue prior to build out	Flow to Canadian Shield after build out of roadway
5	Storage must be provided to limit offsite flows to 60 L/s	Flow must remain within an acceptable path to Maritime Way (through future ROW)	Flows routed to sewer
10	Storage must be provided to limit offsite flows to 60 L/s		Excess flows may be routed along the roadway but must remain within tolerable depths and velocities
100	Any excess flows over the 10-year release rate to the roadway must remain within tolerable depths and velocities		

The calculated peak flow rates for the site to Cordillera Street (0.25 ha) and the future Canadian Shield Avenue (1.49 ha) in the 5-year storm, which align with the flow rates provided in the report by J.L. Richards (1999) are summarized below in **Table 2-3** for Cordillera Street. Detailed calculations are contained within **Appendix D**.

Table 2-3: Post-Development Peak Flow Rate Calculations to Cordillera Street (Runoff Coefficient, C = 0.80 and T_c=20 min)

Return Period (Years)	Rainfall Intensity (MM/hour)	Peak Flow Rate (l/s)	Target Release Rate (l/s)
2	52.0	29.0	**39.1**
5	70.3	**39.1**	
10	82.2	45.8	
25	97.3	59.6	
50	108.5	72.5	
100	120.0	83.5	

3 POST-DEVELOPMENT CONDITIONS

3.1 General

The two parcels each have new proposed residential developments, including apartments and townhouses. Please refer to **Appendix E** for an illustration of the project (Storm Drainage Area Plan).

The following assumptions have been used to quantify stormwater runoff for modelling/analysis purposes: 100% of proposed apartment roof surfaces have been considered as impervious, and 100% of the rooftop area of each of these apartment buildings will be available for temporary surface ponding (via drainage by controlled discharge roof drains).

Each parcel will comply with their respective allowable release rates; 100-year discharge from Parcel 1 excluding undeveloped areas routed around the site will be limited to 70.3 L/s and 100-year minor-system discharge from Parcel 2 will be limited to 60 L/s along Cordillera Street.

3.2 Water Quality – Parcel 1

Parcel 1 will provide on site treatment for water quality. The preferred method for treatment for this parcel is an OGS unit downstream of roof and cistern controls. A preliminary sizing for a proposed OGS designed to meet a TSS removal of 80% has been provided in **Appendix F**.

3.3 Water Quantity – Parcel 1

As noted in **Section 2.3**, the target allowable discharge rate discharging to the to Campeau Drive excluding undeveloped areas routed around the site is 70.3 l/s. This is equivalent to the peak runoff rate under pre-development conditions during a 5-year design storm event with a runoff coefficient of 0.20. Compliance with the 100-yr target offsite discharge rate will be achieved through use of rooftop ponding on the apartment building with flow control drains, pipe storage, and the provision of an underground cistern storage structure. Post-development runoff calculations have accounted for uncontrolled runoff from portions of the site that will not drain to storage features.

Most water quantity control will be provided with the provision of an underground storage cistern and upstream pipe storage. This system will be designed to receive

runoff (for all events up to and including the 100-year return period) from the townhouses fronting onto Campeau Drive and at-grade areas within the development **Appendix E** illustrates the small portions of the project site that will drain offsite uncontrolled in post-development conditions. These uncontrolled runoff rates contribute to the total allowable release rate modelled. Storage was calculated using HydroCAD (**Appendix G**).

The cistern will discharge to Campeau Drive via gravity, and peak outflow rates will be controlled via an orifice control device. Sizing was completed iteratively using HydroCAD (**Appendix G**) and checked in Excel (**Appendix D**). To satisfy net target release rates for controlled and uncontrolled site areas, the recommended peak discharge rate for flow control device is 29.37 l/s (at HGL = Top of cistern). A 122 mm diameter circular orifice has been specified to meet the target release rate. It is important to note that an “HGL = Top of Cistern” would represent a design event greater than the 100-year storm and that the return period associated with an overflow event requiring these facilities to spill would exceed 100-years.

The apartment building will provide its own stormwater detention through use of temporary surface ponding. It has been assumed that 98% of the apartment building rooftop will be available for ponding with 7 roof drains provided per AutoCAD roof plans provided by API Consultants on April 30, 2021. For modelling purposes, these outlets were simulated using rating curves for a *Watts Accutrol* product (in the “3/4 exposed” position, **Appendix F**). Controlled runoff from the roof is directed downstream of the cistern storage structure.

As mentioned above, flows from the proposed townhouses fronting onto Campeau Drive will be directed to the stormwater cistern instead of being released directly to Campeau Drive. Foundation drains will be connected to a secondary pipe system which will discharge downstream of system controls to protect foundations from backups in the cistern.

Largely undeveloped lands at the south and eastern sides of the building are routed around the site. The portions of land with some development (i.e. A-108b and A-109a) are counted toward uncontrolled flows leaving the site. Various methods for time of concentration were tested (**Appendix D-2**) including Kinematic Wave Equation, Bransby Williams Equation, and the Federal Aviation Agency were tested. Since the Federal Aviation Agency time of concentration was quite large (61 minutes), it was considered an outlier and ignored. The average time of concentration from the remaining methods, 17.2 minutes, was applied to the lands draining around the site. All remaining developed areas (i.e. parking lot, building roof etc.) has a time of concentration of 10 minutes.

A HydroCAD model of the project was constructed and utilized to include:

- storage and controlled release of stormwater from apartment rooftop areas on 63% of the rooftop area downstream of the cistern
- controlled runoff from at-grade areas directed to pipe storage + cistern
- controlled runoff from townhouse areas directed to pipe storage + cistern
- uncontrolled runoff rates generated from at grade areas constructed with soft and hard landscaping
- uncontrolled runoff rates generated from undeveloped areas routed around site

The Modified Rational Method (an inherent subroutine of the HydroCAD software) has been used for the modelling exercise, and the model has informed the maximum storage volume used in the stormwater cistern based on the proposed flow. The peak flow rate generated from uncontrolled drainage areas within the project site and controlled flow from the cistern, pipe storage, and rooftops is 71.3 l/s which is a slight exceedance to the allowable 100-year release rate of 70.3 l/s. Modelling results are summarized below in **Table 3-1** and shown in **Appendix G**.

Table 3-1: Summary of Modelling Results

Return Period (Years)	Storm Duration (min)	Utilized Cistern / Pipe / Roof Storage (m^3)	Peak Water Elevation in Cistern (m)	Un-developed Bypass Flows (L/s)	Controlled Flow Rate from Cistern (L/s)	Controlled Flow Rate from Roof (L/s)	Uncontrolled Flow from the site (L/s)	Total Flow Leaving Site** (L/s)	Allowable 100-yr Flow Rate (L/s)
5 (Peak Discharge)	18	148.6 1.7 69.1	103.498	54.0	16.5	7.9	19.4	40.9	
100 (Peak Discharge)	18	318.4 4.1 191.1	103.818	115.3	24.1	9.9	41.7	**71.3**	**70.3**
100 (Peak Storage)	108	444.1 4.0 191.1	32.0	28.5	11.0	11.6	50.6	32.0	

*For detailed calculations of Time of Concentration, see **Appendix D**

**Total Flow Leaving Site includes cistern/pipe flow, uncontrolled areas, and apartment rooftop runoff but excludes the undeveloped areas being routed around the site as these are left unchanged and do not impact the criteria. Note that the flow from cistern, roof, and uncontrolled may not match the total flow leaving the site as each peak occurs at a different time.

3.4 Water Quantity – Parcel 2

As noted in **Section 2.4**, the target allowable release rate to the municipal sewer along Cordillera Street during a 10-year storm provided no adverse impacts from major-system flows is 60.0 L/s. Compliance with this target discharge rate will be achieved

through use of rooftop ponding on the apartment building with flow control drains, pipe storage, and the provision of an underground cistern storage structure. Flows directed to the future Canadian Shield Avenue (mostly undeveloped) will be routed through a ditch inlet catch basin and discharge to the future Canadian Shield Avenue. Major flows will be directed toward the major system.

Runoff rates and storage volumes for Parcel 2 were determined using the modelling software PCSWMM. Post-development runoff calculations have accounted for uncontrolled runoff from portions of the site that will not drain to storage features.

A significant portion of quantity control will be provided with the provision of an underground storage cistern and upstream pipe storage. This system will be designed to control runoff draining to Cordillera Street in the 10-year storm. The figure in **Appendix E** illustrates the controlled, uncontrolled, and undeveloped areas and further shows which areas are being directed to the future Canadian Shield Avenue and which areas are being directed to Cordillera Street. Uncontrolled runoff to Cordillera Street contributes to the total allowable release rate modelled. Storage was calculated using HydroCAD (**Appendix G**).

The cistern will discharge to Cordillera Street via gravity, and peak outflow rates will be controlled via an orifice control device. Sizing was completed iteratively using PCSWMM (**Appendix G**) and checked in Excel (**Appendix D**). To satisfy net target release rates for controlled and uncontrolled site areas, the recommended peak discharge rate for flow control device is 39.75 l/s (at HGL = Cistern Spill). A 110 mm diameter circular orifice has been specified to meet the target release rate. It is important to note that an “HGL = Top of Cistern” would represent a design event greater than the 10-year storm and that the return period associated with an overflow event requiring these facilities to spill would exceed 10-years. In all events flows to the Cordillera Street minor system (cistern + roof control) remain under 60 L/s.

The apartment building will provide its own stormwater detention through use of temporary surface ponding. It has been assumed that 77% of the apartment building rooftop will be available for ponding with 15 roof drains provided per AutoCAD roof plans provided by API Consultants on April 30, 2021. For modelling purposes, these outlets were simulated using rating curves for a *Watts Accutrol* product (in the “1/4 exposed” position, **Appendix F**). Controlled runoff from the roof is directed downstream of the cistern storage structure.

As mentioned above, flows from the proposed townhouses fronting onto Campeau Drive will be directed to the stormwater cistern instead of being released directly to Campeau Drive. Foundation drains will be connected to a secondary pipe system which

will discharge downstream of system controls to protect foundations from backups in the cistern.

If a storm event that occurs fills the cistern, the downstream maintenance hole (Rim = 101.65m) would allow water to spill to the Cordillera Street major system at 101.80m. It is noted that the return period associated with an overflow event requiring these facilities to spill would exceed 10-years. Overflow for the 100-year event has been provided to the City of Ottawa for review against tolerable right of way flooding depth and velocities.

As per Site Servicing Plan Drawing discharge from the cistern is proposed to the Cordillera Street trunk storm sewer.

Appendix E illustrates the small portions of the project site that will drain offsite uncontrolled to Cordillera Street in post-development conditions. These uncontrolled runoff rates contribute to the total allowable release rate modelled. **Appendix E** also illustrates the areas draining to the future Canadian Shield Avenue.

A PCSWMM model of the project was constructed for Parcel 2 for its ability to provide detailed runoff hydrographs resulting from tested design storm distributions for use within the City's model when checking critical major system flow depths and velocities. This model was utilized to include:

- storage and controlled release of stormwater from apartment rooftop areas on 77% of the rooftop area downstream of the cistern
- controlled runoff from at-grade areas directed to pipe storage + cistern
- controlled runoff from townhouse areas directed to pipe storage + cistern
- small areas of uncontrolled runoff rates generated from at grade areas constructed with soft and hard landscaping directed to Cordillera Street
- small areas of uncontrolled runoff rates generated from at grade areas constructed with soft and hard landscaping directed to the future Canadian Shield Avenue
- undeveloped areas directed to the future Canadian Shield Avenue

Flows rates generated from areas within the project site discharging to Cordillera Street remain below 60 L/s in the 10-year storm. Peak storage and peak discharge from the site to Cordillera Street both occurred under the 6-hour Chicago storm. Hydrographs showing peak discharge from the site to 1- Cordillera Major System, 2- Cordillera Minor System, and 3- Combined Discharge to the Future Canadian Shield Avenue under 3, 6, and 24-hour Chicago Storms with 5, 10, and 100-year return periods have been provided to the City of Ottawa on May 13, 2021. Results from the City of Ottawa (July 2021) confirm that no adverse impacts to the Cordillera Major system exist. Canadian Shield Avenue is to be built out at the same time as Parcel 2, with flows from Parcel 2 directed through a DICB to the Canadian Shield Avenue minor system.

Modelling results are summarized below in **Table 3-2** and shown in **Appendix H**.

Table 3-2: Summary of Modelling Results

Return Period (Years)*	Utilized Cistern / Pipe / Roof Storage (m^3)	Peak Water Elev. in Cistern (m)	Peak Flow to Canadian Shield Avenue (L/s)	Peak Cistern Flows (L/s)	Peak Roof Flows (L/s)	Peak Cistern Spill Flows (L/s)	Peak Cordillera St. Minor System Flows (L/s)	Peak Cordillera St. Major System Flows (L/s)	Peak Total Flow to Cordillera St.** (L/s)	Cordillera Minor System Allowable 100-yr Flow Rate
5	173.7 18.7 155.8	100.50	33.57	26.5	5.2	0	33.0	4.5	37.5	**60**
10	210.0 18.7 102.1	100.76	43.71	29.4	5.7	0	37.3	5.5	**42.8**	
100	220.0 19.8 110.1	102.05	79.38	40.9	7.0	251	59.9	233.6	293.5	

*Critical Storm Duration = 24-hours for peak flow and storage requirements

**Total Flow to Cordillera Street includes cistern/pipe flow, uncontrolled areas, and apartment rooftop runoff. Note that the flow from cistern, roof, and uncontrolled may not match the total flow leaving the site as each peak occurs at a different time.

4 CONCLUSIONS

A stormwater management plan has been prepared to support the site plan application for the 6301 Campeau Drive development in the City of Ottawa. The key points are summarized below.

WATER QUANTITY FOR PARCEL 1

Controlled runoff collected from the project site will be directed to a stormwater cistern with a minimum active storage volume of 444.1 m^3 to control the 100-year event. Stormwater from the apartment roof top will be controlled using roof drains and discharged downstream of the cistern control. The peak 100-year discharge from the site excluding undeveloped areas routed around the site controls is 71.3 l/s using roof drains and the minimum recommended orifice diameter (122 mm), which is a slight exceedance to the 5-year pre-development flow rate of 70.3 l/s.

WATER QUANTITY FOR PARCEL 2

Controlled runoff collected from the project site will be directed to a stormwater cistern with a minimum active storage volume of 220 m^3 to control the 10-year event and reduce overflow in the 100-year event. Stormwater from the apartment roof top will be controlled using roof drains and discharged downstream of the cistern control. The cistern will be controlled with a 110 mm orifice control. The peak 10 discharge to Cordillera Street from the site excluding the undeveloped area draining through Parcel 1 and flows to the future Canadian Shield Avenue is 51.3 l/s which is below the peak allowable release rate of 60.0 l/s. Flows in excess of the 10-year storm will be directed as surface flows along Cordillera toward the Kanata Town Centre SWMF and are confirmed to be within tolerable flow depths and velocities to be confirmed with the City of Ottawa. The peak flow to the Cordillera Minor system is 59.9 L/s in the 100-year storm.

Runoff draining to the future Canadian Shield Avenue is largely undeveloped and will be controlled through a ditch inlet catch basin to the sewer along Canadian Shield Avenue. This sewer will be constructed in tandem with Parcel 2. Flows in excess of the minor event will be directed to the major system and are within tolerable flow depths and velocities as confirmed with the City of Ottawa.

WATER QUALITY FOR PARCEL 1

An OGS will be provided at the downstream end of Parcel 1 to provide treatment to ensure an 80% TSS removal rate.

WATER QUALITY FOR PARCEL 2

Water treatment is be provided for as part of downstream systems and therefore, no specific water quality treatment features are required.

This report demonstrates that the proposed SWM strategy will address stormwater management related impacts from this project and meet the requirements of the City of Ottawa.

APPENDIX

A City Correspondence

APPENDIX

A-1 Pre-consultation Meeting Minutes (November 8, 2019)

Part of 6301 Campeau Drive
Pre-Consultation Meeting Minutes

Location: Room 4102E, City Hall
Date: November 8, 2:00pm to 3:00pm

Attendee	Role	Organization
Mark Young	Planner	City of Ottawa
Justin Armstrong	Project Manager (Infrastructure)	
Neeti Paudel	Project Manager (Transportation)	
Matthew Hayley	Planner (Environment)	
Justyna Garbos	Planner (Parks)	
Matthew Ippersiel	Planner (Urban Design)	
Lauren Reeves	Owner	OCLDC
Sameer Gulamani	Applicant	Bayview Hospitality
Alnoor Gulamani	Applicant	Bayview Hospitality

Comments from Applicant

1. The applicant is proposing a phased development of purpose-built 6-storey multi-residential apartment buildings at the south side of the site and 3-storey townhouses on the north side of the site along Campeau Drive. The buildings would have shared covered podium parking in the middle of the site which will have amenity space on top. Access is provided through Cordillera street and through a laneway shared with the adjacent private retirement home (which may not be feasible).
2. A central access point or alternative access point for the western development block would be preferable.
3. Zoning By-law relief will be requested for the requirement for 50% at grade commercial development.

Planning Comments

1. The proposal will require a major Zoning By-law Amendment Application and a New complex site plan approval application.
2. Please ensure that all zoning requirements and provisions are indicated on the provided plans.
3. Commercial uses should be maintained as a permitted use at grade, but a stringent requirement for 50% should be revisited. Commercial viability at grade on Cordillera Street and Maritme Way.

4. A joint access for both parcels on Campeau Drive aligned with Stonecroft Terrace may be a viable option. This would also need to include accessible pedestrian access to the Town Centre Park.
5. Consideration for the opportunity for flexible units that could accommodate small businesses on Campeau Drive needs to be considered as part of the design and zoning.
6. The maximum permitted height is 3 storeys – therefore the basement level as proposed must be more than 50% below grade. We would recommend front to back ground floor suites, with accessible access to allow for home based business opportunities.
7. Zoning By-law amendment application will need to address portions of the site currently zoned Development Reserve (DR), proposed performance standards and the addition of townhouse as a permitted use.

Urban Design Comments

1. Generally supportive of the proposed scale of the buildings and the urban treatment of Campeau.
2. The apartment building in the south-east corner of the site should be an L-shaped building, wrapping the corner of the site with a frontage on Cordillera Street. This may also be an appropriate location for ground floor retail.
3. The greening of the rooftops of the parking decks as amenity space is supported. The internal courtyard spaces would likely be even stronger places if they were entirely at grade level.
4. Consider the relationship that will be created between the townhomes and the parking garage, what the pedestrian experience will be in that space, and how the raised amenity space will be accessed from the north. Alternatively, connecting the raised parking structure directly to the buildings, as suggested, may be worth exploring as an option.
5. As the plan progresses, consider what the interface between the development and the park to the south will be. Try to establish a clear delineation between public and private space and ensure there are pedestrian connections through the site.
6. Consider relocating the east-west drive aisle to the south of the property, between the development and the park. This would improve the relationship with the park, clarify the distinction of public and private space, and may help connect the apartment buildings to the amenity space (as they would be shifted north).
7. The proposal will be subject to a formal review with the Urban Design Review Panel. An informal pre-consultation meeting with the panel is also recommended at an early stage in the development review process. The next meetings are scheduled for:
    - December 6th (Nov 22nd submission deadline)
    - January 10th (Dec 27th submission deadline)

- More details available on the UDRP webpage. For questions, email UDRP coordinator David Maloney: David.Maloney@ottawa.ca

Parks Planning:

1. Parks will take cash-in-lieu of parkland at an amount equivalent to 10% of the value of the land area of the site being developed. The exact amount will be identified as a condition of site plan approval. In addition, the applicant will be charged a land appraisal fee of $565 (HST included).
2. Bill Teron Park is planned to be expanded in the future. Please see the attached plan for illustration of the expansion. The applicant should be mindful of their development's transition to/connection into the future parkland south of it.
3. If a combined vehicular/pedestrian site access is considered on the intervening city parkland access block, Parks planning will play an active role in the detailed design of this access to ensure that pedestrian access to Bill Teron Park is prioritized, designed in accordance with the Parks Development Manual, and meets accessibility requirements. The construction of said vehicular and pedestrian access shall be solely at the cost of the developer, and shall not be credited toward cash-in-lieu of parkland requirements. Parks Planning is willing and wanting to work with the developer to help find solutions that benefit both parties.
4. All efforts shall be utilized to protect and retain city owned trees on the abutting city park land. The required TCR shall identify how these trees are being protected. The report shall also address any mitigation measures required for tree retention if blasting and associated grading is required adjacent to the park property line.
5. Efforts shall be undertaken to ensure that the grade differential between the park block and the development sites is minimized to the greatest extent possible.

Engineering Comments

The following are engineering comments related to the recent pre-consultation meeting for the development of 6301 Campeau Drive that was held on Friday November 8th, 2019. It is recommended that the developer retain a local engineering firm familiar with the City of Ottawa's procedures and requirements in order to navigate the comments made below and provide recommendations pertaining to the potential engineering design for the proposed site.

1. WATER

- Water is available along Campeau and along Cordillera/Canadian Shield.
- Watermain looping will be required for the proposed development.

- As per The City of Ottawa's Water Distribution Guidelines Technical Bulletin ISDTB-2014-02, individual residential facilities with a basic day demand greater than 50m^3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area.
- A watermain boundary condition request should be made for each proposed connection to the City watermain. As part of the request, anticipated domestic demands and FUS fireflow requirements should be provided along with a screenshot of the proposed connection locations. The request can be sent to justin.armstrong@ottawa.ca.

2. SANITARY

- Sanitary is available along Campeau and along Cordillera/Canadian Shield. For discharge to either location, it should be demonstrated that capacity exists within the receiving sewers. The Servicing Brief (Revised) Kanata Town Centre Central Business District Subdivision Memo prepared by J.L.Richards for Urbandale Corporation, dated June 13, 2012 (attached), and the sanitary sewer design sheet prepared by J.L.Richards for Urbandale dated October 12, 2016 (attached) are related to the design of the sanitary sewers along Cordillera/Canadian shield. These documents should be consulted when demonstrating capacity exists for sewage discharging to this location.

6. STORM

- The report titled *Kanata Town Centre Phasing and Servicing Overview*, prepared by IBI Group, dated September 23, 2013 (attached) states that "*a 1200 mm diameter culvert under Campeau Drive at the Omnicare site and the storm sewer outlet for Omnicare were designed to outlet a portion of the Kanata Town Centre lands adjacent to Campeau Drive. This storm outlet is directly available to Block A to D inclusive. On-site attenuation to predevelopment flow should be considered a requirement for the purposes of advancing use of the storm outlet.*" The referenced 1200 mm diameter culvert outlets under Campeau Drive to the existing Kanata Lakes Golf Course. This statement is consistent with the proposed Storm Servicing and Drainage Plan submitted by DSEL as part of the proposed Kanata Lakes Golf Course development application (D07-16-19-0026), in which a 3.32 ha drainage area (runoff coefficient = 0.2) located south of Campeau Drive has been proposed for allocation to drain to the golf course lands. The proposed Kanata Lakes Golf Course development application files can be obtained from the following link: https://app01.ottawa.ca/postingplans/appDetails.jsf?lang=en&appId=__BONQGQ

Please keep in mind that providing onsite attenuation to restrict the storm release rate to predevelopment flows will require significant onsite storage (given that the site is currently grassed/landscaped).

- IBI's report, noted above, also states that *"A local storm sewer varying in size from 525mm diameter to 1650 mm diameter exists in Kanata Main Street and Canadian Shield Avenue across the full frontage of the Kanata Town Centre site. This storm sewer has limited capacity available for direct connection from the Town Centre development, with the understanding that onsite attenuation will be required to match the sewer design capacity as specified in MOE Certificate of Approval Number 3-1378-98-006."* The above-mentioned sewers ultimately outlet to Urbandale's stormwater management pond located at the south-east corner of the Town Centre lands. The SWM pond was designed in accordance with the report titled *Stormwater Management Report, Kanata Town Centre, Central Business District,* prepared by J.L. Richards, dated January 1999 (attached). JLR's report is consistent with IBI's report in which Blocks E, G, H, I and J have been allocated to the existing storm sewers within Kanata Main Street and Canadian Shield Avenue with an outlet to Urbandale's pond. The allocated release rate for each parcel of land will be restricted to the sewer design capacity of the storm sewers as well as the stormwater allocations set with JLR's report.

If servicing allows it, there may be an opportunity to re-direct storm flows from Block A through D to outlet to Canadian Shield Avenue and ultimately Urbandale's pond if it can be demonstrated that the storm sewers and stormwater management pond have capacity to accept the additional flows.

Transportation Planning:

1. Follow Traffic Impact Assessment Guidelines
    - Scoping form should be submitted– triggers trip generation. Meets the triggers for full Traffic Impact Assessment.
    - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
    - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
    - All requested access locations including the access between the two parcels on Campeau Drive (if proposed) will be reviewed at the TIA strategy (analysis) stage.
2. ROW protection on Campeau Drive between Didsbury and Teron is 40m even. Ensure that this is protected. Campeau Drive at this section is identified to be widened in the 2031 network concept of the TMP (Terry Fox to March) and no parking is currently proposed on Campeau. An eyebrow Street within the right of way is not supported as a temporary measure. Please note that if and when the EA for the widening of Campeau Drive is updated on-street parking may be considered.

3. Site triangles at the following locations on the final plan will be required:
    - Arterial Road to Local Road: 5 metre x 5 metres
4. Noise Impact Studies required:
    - Road
5. On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Sidewalk is to be continuous across access as per City Specification 7.1.

Planning Forester:

1. A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City;
2. Tree removal
    a. any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR
    b. any removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR
3. The TCR must list all trees on site by species, diameter and health condition – separate stands of trees may be combined using averages
4. The TCR must clearly show where tree removal will occur.
5. Tree permits for geotechnical work are possible, but tree removal must be limited to areas required for machinery access and drilling; please provide a plan supported by the TCR showing travel routes and landings
6. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines listed on Ottawa.ca
7. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca

Environment:

1. An EIS/TCR is required to address species at risk.
2. They will also need to address the Protocol for Wildlife protection during Construction which is available at www.ottawa.ca

Requested Plans and Studies

1. A list of required plans and studies required for a complete Site Plan Control application have been attached.

Process

1. This is a pre-consultation for a Zoning By-law Amendment and Site Plan Control application at 6301 Campeau Drive to the requirements for a complete application.

2. This proposal will trigger a Major Zoning By-law Amendment Application and a New Site Plan Control application, Manager Approval, subject to Public Consultation. The proposal would fall under the 'complex' category as per the Site Plan Control Subtype Threholds. The application form, timeline and fees can be found here.

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please contact me at Mark.Young@ottawa.ca or at 613-580-2424 extension 41396 if you have any questions.

Sincerely,

Mark Young MCIP RPP
Planner III
Development Review - West

APPENDIX

A-2 E-mail Correspondence (April 8, 2021)

Stewart, Michael

From: Yang, Winston
Sent: April 12, 2021 1:55 PM
To: Dennis Jacobs
Cc: Hughes, Michelle; Girard, Louis-Marc; Jafferjee, Ishaque; Stewart, Michael
Subject: FW: 6301 and 6475 Campeau First Round of Comments

Hi Dennis,

We have received some feedback from the City last week. Please see email below for the city direction regarding the SWM design criteria. Our team will look into it this week and will let you know the status later this week.

Yours truly,

Ding Bang (Winston) Yang, P.Eng.
Project Engineer
Infrastructure

T+ 1 613-690-0538

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Ottawa, Ontario,
K2B 8K2, Canada

www.wsp.com

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: April 8, 2021 5:04 PM
To: Yang, Winston <Winston.Yang@wsp.com>
Cc: Stewart, Michael <michael.stewart@wsp.com>; Jafferjee, Ishaque <Ishaque.Jafferjee@wsp.com>; Hughes, Michelle <Michelle.Hughes@wsp.com>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Hi Winston,

I have heard back from our Water Resources Engineer in regard to the Parcel 2 comment below and he has indicated the following:

The JLR table WSP used in determining the stormwater storage requirements for the site was used in JLR's report as a conservative pond sizing exercise for sizing the SWM pond and was not intended to indicate post-development stormwater storage requirements for each contributing parcel. The JLR report can be used to determine the allowable release rate to the storm sewer but should not be used in determining on-site storage requirements. The City's SWM guidelines are in place to protect private adjacent owners and to ensure that flooding does not occur at the street level and these guidelines will need to be enforced here. That being said, given the fact that the existing JLR report caused some confusion, and that there are some on-site topographical constraints, we may be flexible. Unfortunately, the sewer in Cordillera was only designed to receive a small portion of Parcel 2 runoff so there is not much residual capacity

in the sewer, however, we have had a look at the City's storm sewer model and there does seem to be some available capacity in the Cordillera sewer to increase the total allowable release rate for Parcel 2 from the 39.1L/s proposed by WSP to 60L/s. Please apply the new release rate of 60L/s to the site and provide additional on-site storage as required to store up to the post-development 100-yr on site. After applying the new release rate and providing as much additional storage as is feasible, indicate the following:

- Where does the excess flow (up to 100 year) spill. If it spills onto adjacent lands, then it would be completely unacceptable because the future developer of the adjacent lands would need to account for this flow in their SWM analysis. A development cannot impose its flows onto an adjacent landowner.
- If the flow spills to the City ROW (i.e. the street), then what is the impact on the street? At the time (1996), we did not look at depth of flow on streets but today this has become a big issue. Now, if we are only talking about a small peak flow, then it may be negligible, but I would need to know how much 100-year flow is spilling to the street if it does. The excess flow from the property would then make its way to the pond via the streets and we would want to make sure that it does not cause flooding along the way (if the flow is significant). Unfortunately, we cannot do this assessment ourselves at this time due to existing workload issues and we would only be able to get to it late in the year. WSP would therefore have to undertake this analysis themselves for the flow path from the site to the pond (if they are spilling to the street) and we would need to review. Due to our workload issues this would still take some time but would be quicker than if we performed the analysis ourselves.

To summarize, the allowable release rate from the site can be increased from 39L/s to 60L/s. Additional on-site storage up to the 100-year to be provided. No flow up to the 100-year storm will be allowed to spill on any adjacent lands. If spilling to the street, then how much is it and what is the impact on the street system?

Let me know if there are any questions. Once the points above have been implemented, provide a response to me and I can continue to coordinate with our Water Resources group. Hopefully, the increased release rate can lessen the on-site storage burden and enough additional on-site storage can be provided.

Regards,

Justin

From: Yang, Winston <Winston.Yang@wsp.com>
Sent: March 31, 2021 5:01 PM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Stewart, Michael <michael.stewart@wsp.com>; Jafferjee, Ishaque <ishaque.jafferjee@wsp.com>; Hughes, Michelle <Michelle.Hughes@wsp.com>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Hi Justin,

Understood. Thanks for looking into the concerns.
Hope we can sort things out after the meeting.

Thanks,

Ding Bang (Winston) Yang, P.Eng.
Project Engineer
Infrastructure

T+ 1 613-690-0538

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Ottawa, Ontario,
K2B 8K2, Canada

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From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: March 31, 2021 4:54 PM
To: Yang, Winston <Winston.Yang@wsp.com>
Cc: Stewart, Michael <michael.stewart@wsp.com>; Jafferjee, Ishaque <Ishaque.Jafferjee@wsp.com>; Hughes, Michelle <Michelle.Hughes@wsp.com>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Hi Winston,

In terms of the Parcel 1 comments below and in the first round of comments, they are in line with what was requested in the pre-consultation meeting. The pre-consultation notes indicate, "*On-site attenuation to predevelopment flow should be considered a requirement for the purposes of advancing use of the storm outlet".* This requirement does not change whether the Club Link subdivision moves forward or not and has not changed as a result of any comments. The pre-consultation notes do not specifically mention quality control, however, it is standard that the quality control for any given site-plan must meet the Conservation Authority's requirement. The future of the Club Link subdivision was never a certainty, as the application has been contested by the City since its inception. Club Link has appealed the judge's decision to prevent the subdivision from moving forward, but this does not change the fact that, as of this moment, the subdivision development is not moving forward and so Parcel 1 cannot rely on it for its SWM design.

I have discussed Michael's request related to the Parcel 2 comment (attached) with the Senior Engineer in our Water Resources Unit. He is looking into the viability of the request and is going to get back to me. Following his response, I will reach out and I can organize a meeting.

Have a great evening,

Justin

During this period of uncertainty surrounding COVID-19, we are following best practices recommended to minimize the risk of exposure, while ensuring that service to our clients remains as uninterrupted as possible. For the most part I am working from home and will respond to emails at my earliest opportunity. Should there be delays due to internet connectivity, I thank your understanding and patience.

Justin Armstrong, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2400 ext./poste 21746, justin.armstrong@ottawa.ca

From: Yang, Winston <Winston.Yang@wsp.com>
Sent: March 31, 2021 3:22 PM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Stewart, Michael <michael.stewart@wsp.com>; Jafferjee, Ishaque <ishaque.jafferjee@wsp.com>; Hughes, Michelle <Michelle.Hughes@wsp.com>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Hi Justin,

Due to the dramatically changes in SWM design criteria that are completely difference than what have already been set in the pre-consultation meeting.
We would like to go over the new design criteria and the associated comments with you and the reviewer from SWM sector prior to the next submission.

Could you help to setup a team meeting next week?

Thanks,

Ding Bang (Winston) Yang, P.Eng.
Project Engineer
Infrastructure

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Ottawa, Ontario,
K2B 8K2, Canada

www.wsp.com

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: March 24, 2021 4:13 PM
To: Yang, Winston <Winston.Yang@wsp.com>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Good afternoon Winston,

See below for a few additional comments related to the 6301 Campeau Parcel 1 Development as it relates to its stormwater discharge location of the Kanata Lakes Golf Club lands. I just wanted to make sure a couple of the comments I had made in the attached are clear, as well as to pass on a couple additional comments so that they can be addressed with your second submission. Please be sure to consider the following for your second submission:

- As indicated in Comments B4 and B16 of the attached, the stormwater design for Parcel 1 should be considered under two scenarios (1 - If the Kanata Lakes Golf Club remains as is; 2 – If the subdivision moves forward on ClubLink lands). The stormwater design for Parcel 1 should not be presented in the servicing and SWM reports as relying on the redevelopment of the ClubLink lands in order to support the Parcel 1 development. Rather, the Servicing and SWM Reports should be written to present the SWM design under both possibilities listed above.

Since the more conservative of the two scenarios would be if the golf course remains as is, the reports and plans should err on the side of caution and present the stormwater design for Parcel 1 as if the golf course is to remain as is. A key factor that should be discussed in the reports and shown on the drawings is water treatment/water quality. On-site water quality control for Parcel 1 should be provided to MVCA's satisfaction, and this should be presented in both the reports and plans.

- The following statement is made in Section 4.2 of the Servicing Report, "*For Parcel 1, the DSEL and J.F.Sabourin and Associates' SWM Pond Sizing for the Proposed Redevelopment of Kanata Golf And Country Club indicates that the present contributing area to the 750mm diameter storm sewer on the Campeau Drive is 3.22 ha, comprised of entirely impervious area."* It seems that stating that the 3.22 ha is entirely impervious is a typo, as the entire 3.22 ha is currently undeveloped. Was it meant to say pervious instead of impervious? Please correct this for the second submission.
- Ensure that the most recent Kanata Lakes Golf Course Development Application plans and reports are consulted for your second submission and ensure that *Section 1.4 – Design Criteria* of the Stormwater Management report is updated accordingly. Currently, Section 1.4 indicates the following plans were consulted, *"Kanata Lakes Golf Course Development Application: Stormwater Management Technical Memo, JFSA Water Resources and Environmental Consultants (September 20, 2019) and Storm Servicing and Drainage Plan, DSEL Engineering Ltd. (August 2019*)". There are more recent plans and reports available and can again be accessed at the following link: https://app01.ottawa.ca/postingplans/appDetails.jsf?lang=en&appId=__BONQGQ.

Apologies again for continuing to pass on additional comments, but I just want to pass them on to you so that you have a chance to address them before your second submission. As always, give me a call if you would like to discuss.

Justin

From: Armstrong, Justin
Sent: March 17, 2021 10:18 AM
To: Yang, Winston <Winston.Yang@wsp.com>
Subject: FW: 6301 and 6475 Campeau First Round of Comments

Good morning Winston,

I was informed by our Senior Engineer in our Water Resources Unit yesterday that the storage requirements outlined in the JLR tables you included in Appendix B-3 of the 6301 Campeau Report are no longer valid as JLR's report is an old pre-amalgamation and pre-City guidelines report. As such, the City's current guidelines govern the storage requirement for parcel 2. The allowable release to the sewer in Cordillera can still use the C-value provided in the report for Area 14 (i.e. 0.85), however flows in excess of the allowable release rate will need to be stored on site up to the 100-yr. The highlighted portion of engineering comment B21 in the attached should be replaced with the following: *Furthermore, flows in excess of the allowable release rate are to be stored on-site up until the 100-year storm. Please demonstrate that adequate on-site storage is being proposed to meet this requirement.*

Apologies for not including this with the comments that were sent out on Thursday. Please apply this comment to the redesign of parcel 2. Feel free to give me a call at my extension (21746) if you would like to discuss.

Regards,

Justin

During this period of uncertainty surrounding COVID-19, we are following best practices recommended to minimize the risk of exposure, while ensuring that service to our clients remains as uninterrupted as possible. For the most part I am

working from home and will respond to emails at my earliest opportunity. Should there be delays due to internet connectivity, I thank your understanding and patience.

Justin Armstrong, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West Branch
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110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2400 ext./poste 21746, justin.armstrong@ottawa.ca

From: Dennis Jacobs <djacobs@momentumplancom.ca>
Sent: March 11, 2021 10:21 AM
To: Shen, Stream <Stream.Shen@ottawa.ca>
Cc: Sameer Gulamani <sameer.gulamani@bayviewhospitality.com>; Paudel, Neeti <neeti.paudel@ottawa.ca>; Armstrong, Justin <justin.armstrong@ottawa.ca>
Subject: RE: 6301 and 6475 Campeau First Round of Comments

Thanks Shen.
We'll review this with the team and let you know if we have any follow up questions or clarifications as we prepare the response.

Dennis Jacobs

From: Shen, Stream <Stream.Shen@ottawa.ca>
Sent: March 11, 2021 8:51 AM
To: Dennis Jacobs <djacobs@momentumplancom.ca>
Cc: Sameer Gulamani <sameer.gulamani@bayviewhospitality.com>; Paudel, Neeti <neeti.paudel@ottawa.ca>; Armstrong, Justin <justin.armstrong@ottawa.ca>
Subject: 6301 and 6475 Campeau First Round of Comments

Hi Dennis,

Please find attached the 1st round of comments for 6301 and 6475 Campeau OPA, ZBLA and Site Plan applications. We are available to meet to discuss as required.

Regards,

Stream Shen MCIP RPP
Planner II | Urbaniste II
Development Review | Examen des projets d'aménagement

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stream.shen@ottawa.ca

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APPENDIX

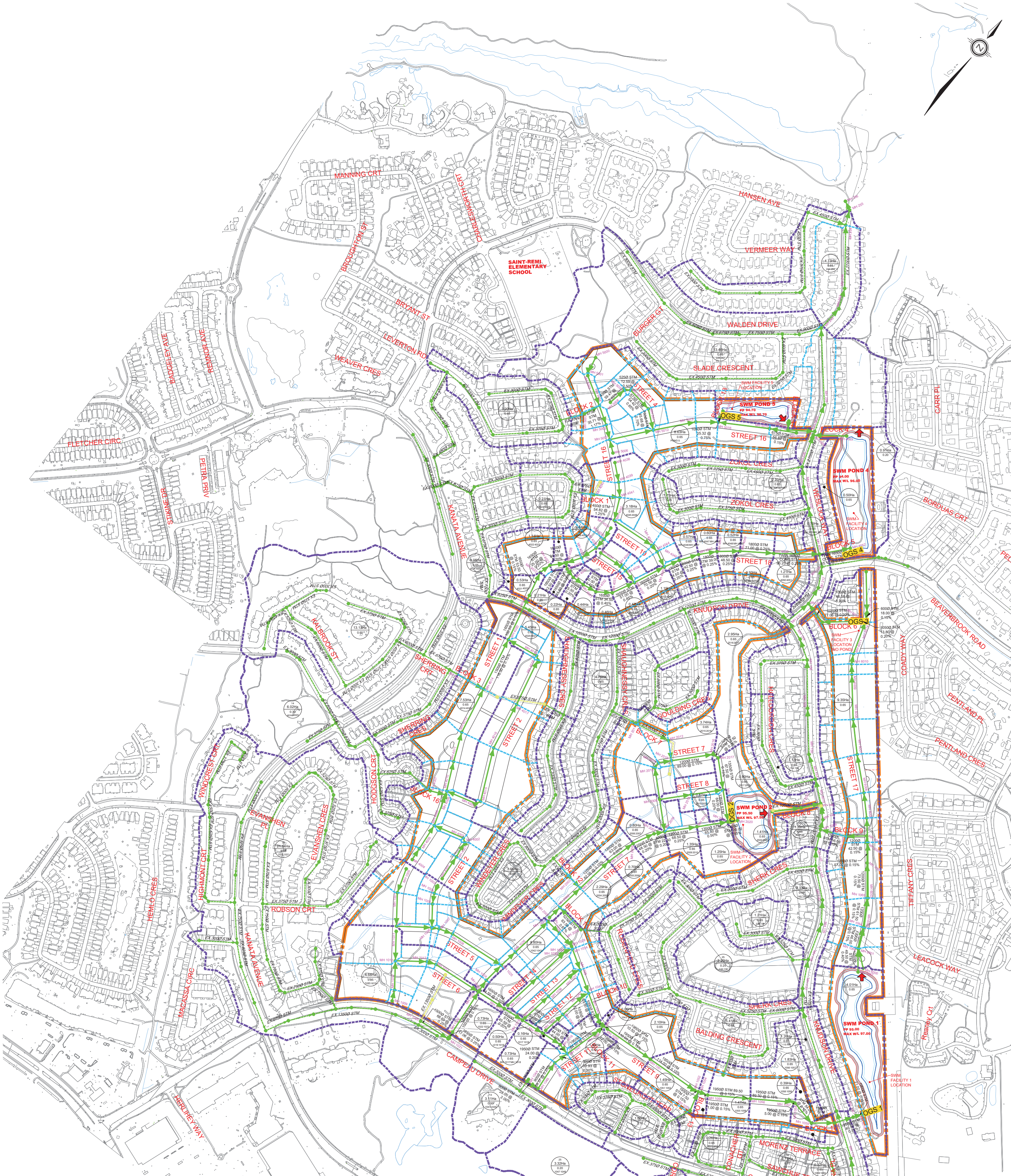
B

Relevant excerpts from background studies and reports

APPENDIX

B-1 Stormwater Catchment Draining to Kanata Lakes Golf Course Development

Except from *Storm Servicing and Drainage Plan, DSEL Engineering Ltd. (July 2020)*



LEGEND

SUBJECT LANDS	DRAINAGE AREA / RUN-OFF COEFFICIENT / CONTRIBUTING UPSTREAM AND DOWNSTREAM MANHOLES
STORM TRUNK	POND EMERGENCY OVERLAND FLOW ROUTE
LOCAL STORM SEWER	ACCESS ROAD
EXISTING STORM SEWER	OGS — OIL GRIT SEPARATOR
STORM MANHOLE	
EXISTING STORM SEWER TO BE REMOVED	
STORM MANHOLE TO BE REMOVED	
STORM TRUNK DRAINAGE AREA	
STORM SUB-DRAINAGE AREA	

CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

STORM SERVICING AND DRAINAGE PLAN

SCALE:	1:2500	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING No.:	03D

APPENDIX

B-2 Stormwater Catchments Draining to Kanata Town Centre SWMF

Excerpt from *Stormwater Management Report, Kanata Town Centre, Central Business District by J.L. Richards & Associates Limited (January 1999)*

EXERPTS FROM **STORMWATER MANAGEMENT REPORT**

KANATA TOWN CENTRE
CENTRAL BUSINESS DISTRICT

VOLUME 1 OF 2

January, 1999

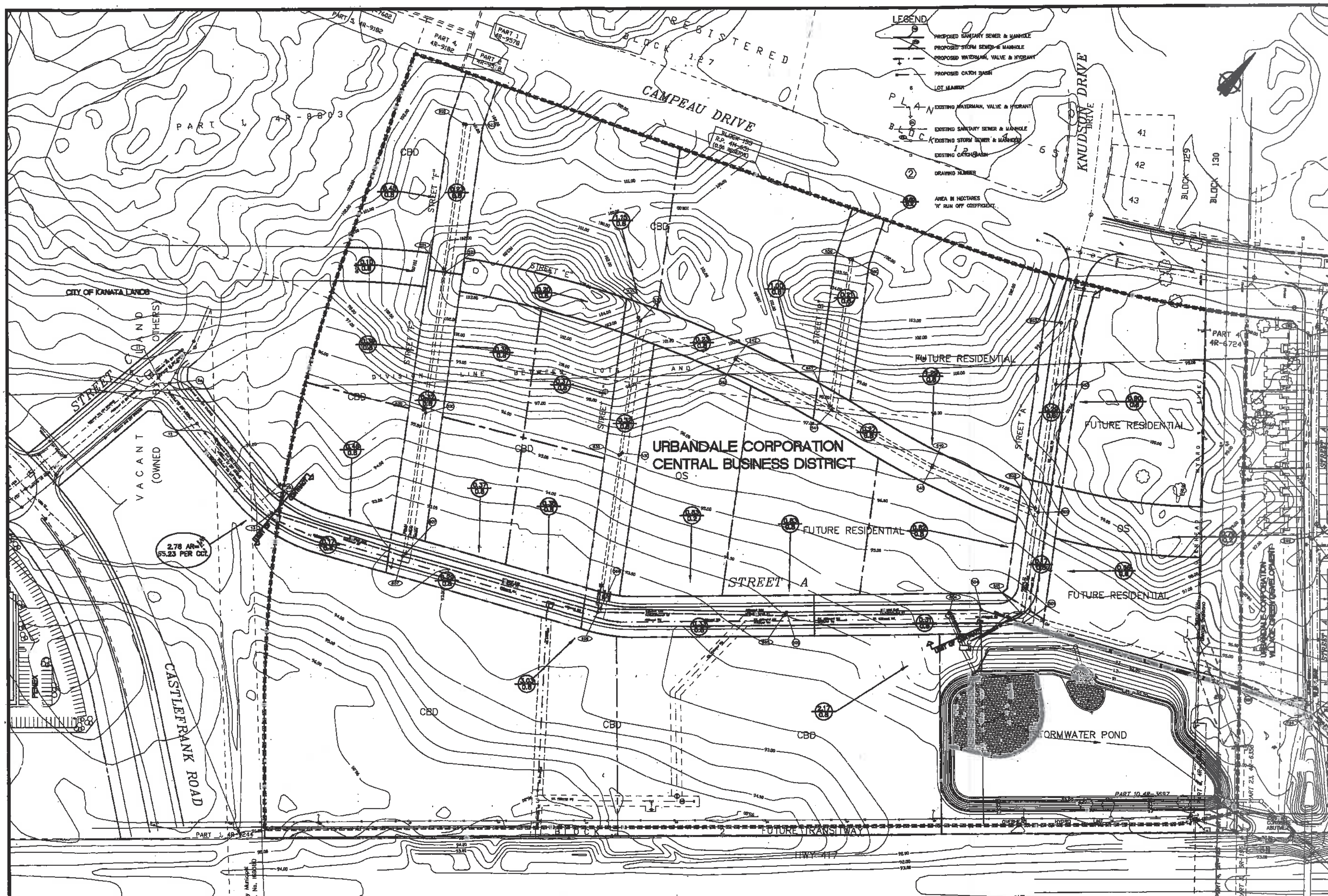
Prepared for:

URBANDALE CORPORATION
2193 Arch Street
Ottawa, ON K1G 2H5

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
Consulting Engineers, Architects & Planners
864 Lady Ellen Place
Ottawa, ON K1Z 5M2

JLR 15712



DATE	REVISIONS	BY	NO.	DATE	REVISIONS	BY
			2	03/11/98	REVISED PER RMOC	MFS
			1	09/10/98	ISSUED FOR MOE APPROVAL (ST&WM)	MFS

SCALE
HORIZONTAL 1:1000

J.L.Richards & Associates Limited
Consulting Engineers, Architect & Planners
OTTAWA,KINGSTON,SUDBURY,CANADA.

DESIGN S.D.
CHECKED M.F.S.
DRAWN T.S.
CHECKED
APPROVED

CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

URBANDALE CORPORATION

URBANDALE CORPORATION
KANATA TOWN CENTRE
CENTRAL BUSINESS DISTRICT
STORM DRAINAGE PLAN

DATED JUNE 1998
DWG. No. 15712-STM

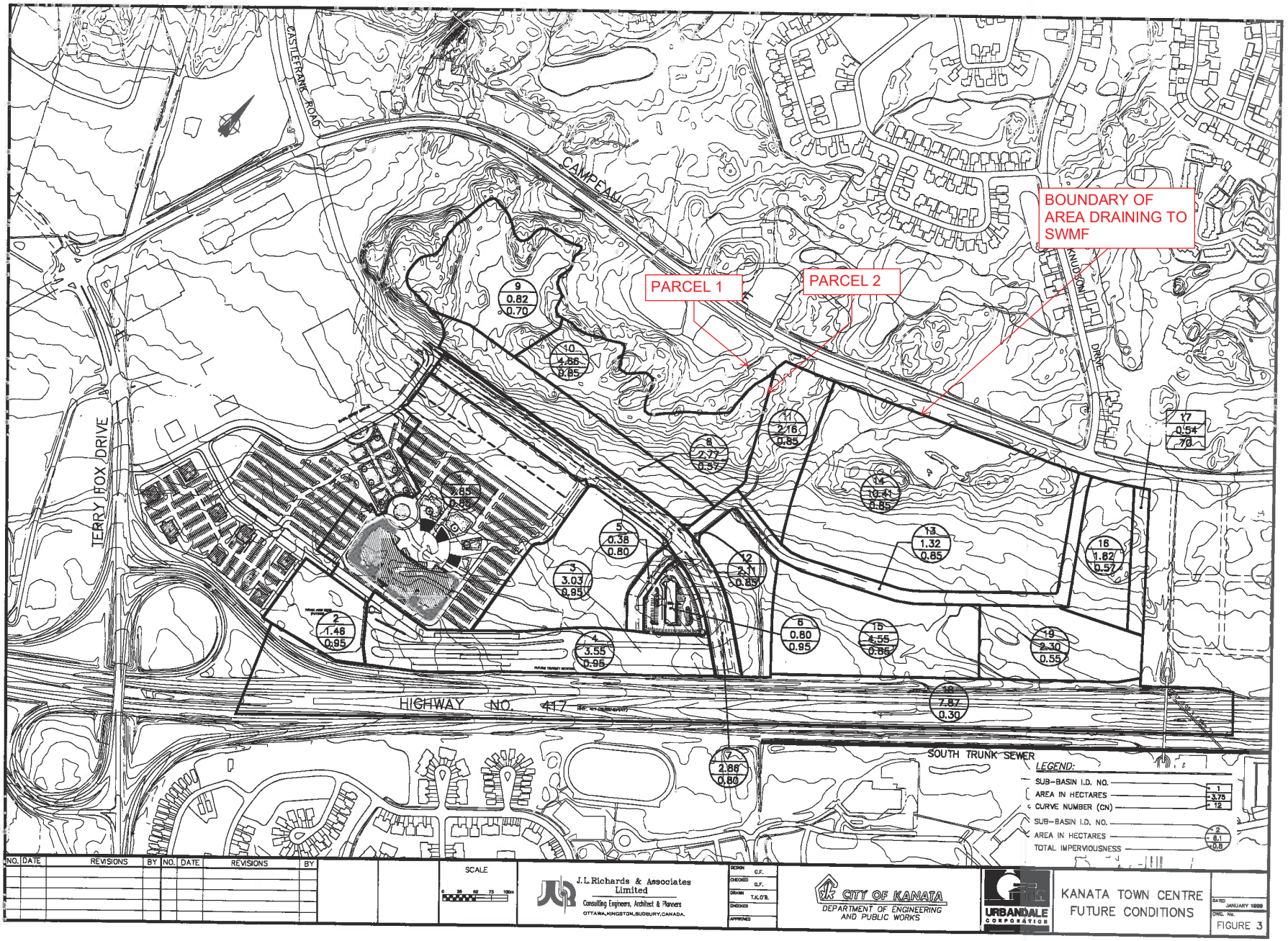

BOUNDARY OF AREA DRAINING TO SWMF
PARCEL 1
PARCEL 2
CASTLEFRANK ROAD
CAMPEAU
KNUDSON DRIVE
TERRY FOX DRIVE
HIGHWAY NO. 417
SOUTH TRUNK SEWER
LEGEND:
SUB-BASIN I.D. NO.
AREA IN HECTARES
CURVE NUMBER (CN)
SUB-BASIN I.D. NO.
AREA IN HECTARES
TOTAL IMPERVIOUSNESS
NO. DATE REVISIONS BY
SCALE
J.L. Richards & Associates Limited
Consulting Engineers, Architect & Planners
OTTAWA, KINGSTON, SUDBURY, CANADA.
CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS
URBANDALE CORPORATION
KANATA TOWN CENTRE
FUTURE CONDITIONS
JANUARY 1999
FIGURE 3

Table 10.0 - Suspended Solid Loadings for Future Controlled Conditions

Year	Hours Exceeding (% Exceeding)		Percentiles (mg/L)		Number of Exceedances above 80 mg/L
	80 mg/L	100 mg/L	50%	90%	
1967	18 (0.20)	12 (0.14)	21.8	40.2	1
1968	10 (0.11)	6 (0.07)	18.0	37.3	1
1971	17 (0.19)	10 (0.11)	15.9	39.6	1
1974	15 (0.17)	10 (0.11)	21.1	43.0	1
1983	49 (0.56)	26 (0.30)	22.6	46.8	2
1986	36 (0.41)	22 (0.25)	25.8	53.3	3
Average	24.2 (0.27)	14.3 (0.16)	20.9	43.4	1.5

Table 11.0 - Long Term Settlement Performance (Based on RRSMS 6 Years)

Fraction	Influent Loading (mg)	Effluent Loading (mg)	Removal (%)
1	.110 (10^{12})	.685 (10^{7})	100.0
2	.110 (10^{12})	.521 (10^{9})	99.5
3	.110 (10^{12})	.507 (10^{10})	95.4
4	.110 (10^{12})	.131 (10^{11})	88.1
5	.110 (10^{12})	.561 (10^{11})	49.0
Overall	.550 (10^{12})	.748 (10^{11})	86.4

REMOVAL EFFICENCY

The above table (Table 9.0, Future Uncontrolled Conditions) shows that the suspended solid concentration would exceed 80 mg/L on average 93 times per average year for a total duration of approximately 242 hours. Simulation results presented in Table 10.0 (Future Controlled Conditions) indicate that the suspended solid concentration would exceed 80 mg/L on average 1.5 times per average year (a total of 9 exceedances for 6 years) for an average duration of approximately 24 hours. It is expected that the proposed stormwater management facility will achieve approximately 86% of sediment removal based on N.U.R.P. settling curves.

APPENDIX

B-3 Minor System Capacity for Lands Draining to Kanata Town Centre SWMF

Excerpt from *Stormwater Management Report, Kanata Town Centre, Central Business District by J.L. Richards & Associates Limited (January 1999)*

JLR 15712
Kanata Town Centre - Central Business District
Tributary Subwatersheds to Proposed Stormwater Management Facility

QUALHYMO LUMPED AREA No.	OTTHYMO AREA No.	Description	Area (ha)	TIMP	On-Site Storage	Description of Storage	IMP areas (ha)
1	1	AMC Site	7.85	0.85	entirely *	up to 100 yr	6.67
	2	Park & Ride	1.46	0.95	none		1.39
	3	Phase IV	3.03	0.95	entirely	up to 100 yr	2.88
	4	Transitway	3.55	0.95	none		3.37
	5	Hotel Road	0.38	0.80	none		0.30
	6	Hotel Site	0.80	0.95	entirely	up to 100 yr	0.76
2	7	Castlefrank Road	2.84	0.80	none		2.27
	8	Adjacent Lands	2.77	0.57	none		1.58
	9	Exist Pond **	0.82	---	entirely	up to 100 yr	0.00
	10	Kanata North	4.66	0.85	none		3.96
	11	Adj Lands (east)	2.16	0.85	none		1.84
	12	Adj Lands (south-east)	2.11	0.85	entirely	up to 100 yr	1.79
3	13	Street "A"	1.32	0.85	Limited	up to 10 yr	1.12
	14	Urbandale North	10.41	0.85	Limited	up to 10 yr	8.85
	15	Urbandale South	4.48	0.85	entirely	up to 100 yr	3.81
	16	Urbandale East	1.82	0.57	Limited	up to 10 yr	1.04
	17	Urbandale East (park)	0.54	---	none		0.00
	18	Queensway	7.87	0.30	none		2.36
	19A	SWMF	0.95	0.99	none		0.94
	19B	SWMF	1.42	0.20	none		0.28
		TOTAL	61.24				45.22
						Avg. TIMP =	0.74

*: Overflow of 13 l/s @ 1:100 year storm event
**: Peak flows from this area is to be restricted to 10 year based on Rc=0.2 (from CCL)

CITY OF KANATA

Manning's Coefficient N = 0.013

5 YEARS IDF CURVE

KANATA TOWN CENTRE COMMERCIAL

JLR 15712

Designed by: S.E.D.

Checked by: M.F.S.

STORM SEWER DESIGN SHEET

NOVEMBER 1998

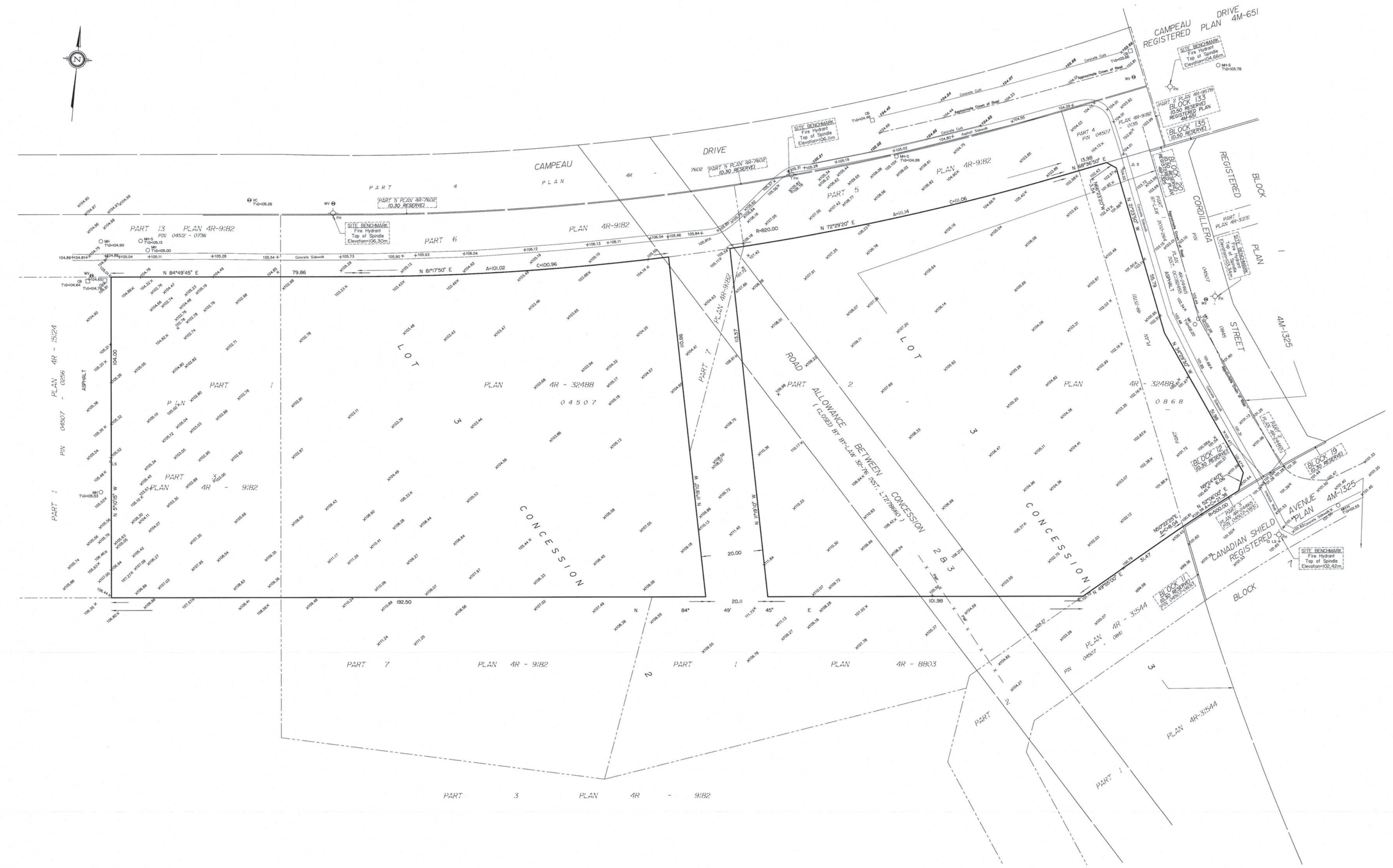
REVISED JANUARY 1999

STREET	M.H. # FROM	M.H. # TO	AREAS FOR "R" in (ha) 0.2	0.6	0.8	0.8	0.9	PEAK FLOW COMPUTATION 2.78AR	2.78AR (CUM.)	TIME (min.)	INTENS. (mm/hr)	PEAK FL. (L/s)	SEWER DATA DIA. (mm)	SLOPE (%)	CAPAC. (L/s)	VEL. (m/s)	LENGTH (m)	FL. TIME (min.)	REMARKS
AMC Site		13				7.19		15.99	15.99										area modified to match CCL incoming flow at MH 13
Park & Ride		13					1.34	3.35	19.33										area modified to match CCL incoming flow at MH 13
Phase IV		13					2.77	8.94	28.28										area modified to match CCL incoming flow at MH 13
Transitway		MH #13					3.25	8.13	34.41										area modified to match CCL incoming flow at MH 13
Hotel Road				0.17			0.17	0.73	35.13										area modified to match CCL incoming flow at MH 13
Hotel Site							0.73	1.83	36.97										area modified to match CCL incoming flow at MH 13
Castlefrank Road		13		1.30			1.30	5.42	42.39										area modified to match CCL incoming flow at MH 13
Adjacent Lands		13		2.54				4.23	46.62										area modified to match CCL incoming flow at MH 13
Exist Pond		13	0.75					0.42	47.04										area modified to match CCL incoming flow at MH 13
Kanata North		13				4.27		9.49	56.53										area modified to match CCL incoming flow at MH 13
Adj. Lands (east)		13				1.96		4.40	60.93										area modified to match CCL incoming flow at MH 13
Adj. Lands (SE)		13				1.93		4.30	65.23										area modified to match CCL incoming flow at MH 13
A	13	607			0.17	0.46		1.40	66.63	28.52	97.82	3052.52	1650	0.30	4992.06	2.33	48.40	0.35	as per CCL
F	622	621			0.43	0.23		1.47	1.47	20.00	72.56	106.50	300	2.00	136.74	1.93	87.00	0.75	not for MOE approval
F	621	620			0.10	0.77		1.93	3.40	20.75	71.05	241.77	375	2.00	247.94	2.24	84.00	0.62	not for MOE approval
F	620	607			0.32			0.71	4.11	21.37	69.86	287.44	450	2.00	403.17	2.53	86.00	0.57	not for MOE approval
A	607	606			0.28	0.75		2.31	73.08	28.87	57.38	4190.21	1800	0.22	5391.39	2.12	120.10	0.94	MOE Approved
D	631	630			1.35	0.37		3.83	3.83	20.00	72.56	277.55	525	0.50	304.08	1.40	82.00	0.97	not for MOE approval
D	630	606				0.32		0.71	4.54	20.97	70.62	320.38	525	0.75	372.42	1.72	82.00	0.68	not for MOE approval
A	606	605	0.03		0.33	3.03		7.93	85.53	29.81	56.13	4800.80	1475 x 2310	0.25	6203.38	2.26	109.80	0.81	MOE Approved
	605	604			0.31	0.03		2.54	88.06	30.62	55.01	4844.34	1475 x 2310	0.25	6203.38	2.26	87.00	0.48	MOE Approved (Length Revised)
	604	pond						0.00	100.45	31.11	54.17	5441.77	1475 x 2310	0.25	6203.38	2.26	40.00	0.30	MOE Approved (Flows from 601 to 604 added)
			1.56	4.01	3.30	22.13	0.57	100.45	100.45										
								COMPARISON											
E	642	641			1.00	0.23		2.74	2.74	20.00	72.56	198.48	450	0.60	220.83	1.39	62.00	0.74	not for MOE approval
B	650	641				0.21		0.47	0.47	20.00	72.56	33.89	300	1.00	98.69	1.37	88.00	1.07	not for MOE approval
E	641	640				0.27		0.60	3.80	21.07	70.43	267.84	525	0.50	304.08	1.40	70.00	0.83	not for MOE approval
E	640	602				1.29		2.87	9.67	21.90	68.89	458.85	600	0.60	475.56	1.68	65.00	0.64	not for MOE approval
A	603	602		0.90	0.29			2.15	2.15	20.00	72.56	155.72	375	1.50	214.72	1.94	65.00	0.56	not for MOE approval
A	602	601	0.78	0.56	0.82	0.17		3.59	12.39	22.55	67.77	839.83	600	2.00	868.28	3.07	65.00	0.35	not for MOE approval
A	601	604						0.00	12.39	22.42	67.98	842.54	675	1.40	994.54	2.78	73.10	0.44	MOE Approved (Diameter and Length Revised)
			0.78	1.48	2.11	2.17	0.00	12.39	12.39										
								COMPARISON											
FUTURE COMMERCIAL		pond				2.17		4.83	4.83	20.00	72.56	350.17	600	0.40	388.31	1.37	65.00	0.79	not for MOE approval
			0.00	0.00	0.00	2.17	0.00	4.83	4.83										
								COMPARISON											

APPENDIX

C

Existing Site Conditions



DATA COLLECTION SKETCH OF

PART OF LOT 3 CONCESSION 2
PART OF LOT 3 CONCESSION 3
AND PART OF ROAD ALLOWANCE BETWEEN CONCESSION 2 AND 3
(CLOSED BY INST. LT278660)
GEOGRAPHIC TOWNSHIP OF MARCH
CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebekk Ltd.
Field Work Completed February 10, 2020.

Scale 1 : 500

20 15 10 5 0 10 20 Metres

Metric

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

Notes & Legend

MH-S	"	Maintenance Hole (Sanitary)
MH-B	"	Maintenance Hole (Bell Telephone)
MH-H	"	Maintenance Hole (Hydro)
MH	"	Maintenance Hole (Unidentified)
VC	"	Valve Chamber (Watermain)
FH	"	Fire Hydrant
LS	"	Light Standard
S	"	Sign
WV	"	Water Valve
PWF	"	Post & Wire Fence
+ 65.00	"	Location of Elevations
+ 65.00	"	Top of Concrete Curb Elevation

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999911.

SITE AREA = 37064.5 m²

BOUNDARY INFORMATION COMPILED FROM PLAN 4R-32488.

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Ontario Land Surveyors
ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com

Job No. 20191-20 PrtLt3Con2 T DI | DG

APPENDIX

D

Stormwater Management Calculations

APPENDIX

D-1 Pre-development Calculations

	Stormwater Management Calculations	Project: 6301 Campeau Drive	No.: 201-03048-00	
	Release Rates - Parcel 1	By: MS Checked: BW	Date: 2020-02-21	Page: 1

Step 1: Determine Pre-development Flow using Rational Formula

* Runoff Coefficient, C in accordance with City of Ottawa Sewer Design Guidelines (section 8.3.7.3)

Return Period	2	5	10	25	50	100
C Multiplier (OSDG Table 5.7) =	1.00	1.00	1.00	1.10	1.20	1.25
Runoff Coefficient, C =	0.20	0.20	0.20	0.22	0.24	0.25

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes)

Time of Concentration = 20 minutes
Catchment Area = 1.8 ha

Return Period	2	5	10	25	50	100
a =	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
b =	0.810	0.814	0.816	0.819	0.820	0.820
c =	6.199	6.053	6.014	6.018	6.014	6.014
$Intensity_{peak}$ (mm/hr) =	52.0	70.3	82.2	97.3	108.5	120.0
Q_{peak} (L/s) =	52.0	70.3	82.2	107.0	130.2	149.9
Q_{peak} (m^3/s) =	0.052	0.070	0.082	0.107	0.130	0.150

Return Period = 5 year
Q = 70.3 L/s Pre-development flow rate

Conclusion:

The 5-year pre-development flow rate for a 20-minute Tc governs the 100-year maximum post-development release rate for Parcel 1 and is 70.3 L/s.

Filepath:

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	Stormwater Management Calculations	Project: 6301 Campeau Drive	No.: 201-03048-00	
	Release Rates - Parcel 2 to Cordillera Street	By: MS	Date: 2020-02-21	Page: 2
		Checked: BW		

Step 1: Determine Pre-development Flow using Rational Formula

* Runoff Coefficient, C in accordance with JLR Report per Appendix B-3

Return Period	2	5	10	25	50	100
C Multiplier (OSDG Table 5.7) =	1.00	1.00	1.00	1.10	1.20	1.25
Runoff Coefficient, C =	0.80	0.80	0.80	0.88	0.96	1.00

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes)

Time of Concentration = 20 minutes
Catchment Area = 0.2506 ha 1.74 ha. Site Area; 0.25 ha. Draining to Cordillera

Return Period	2	5	10	25	50	100
a =	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
b =	0.810	0.814	0.816	0.819	0.820	0.820
c =	6.199	6.053	6.014	6.018	6.014	6.014
$Intensity_{peak}$ (mm/hr) =	52.0	70.3	82.2	97.3	108.5	120.0
Q_{peak} (L/s) =	29.0	39.1	45.8	59.6	72.5	83.5
Q_{peak} (m^3/s) =	0.029	0.039	0.046	0.060	0.072	0.083

Return Period = 5 year
Q = 39.1 L/s Pre-development flow rate

Sewer Capacity = 60.0 L/s Capacity as provided by the City of Ottawa

Conclusion:

The sewer capacity along Cordillera Street governs the minor system allowable release rate at 60 L/s

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APPENDIX

D-2 Post-Development Calculations

	Stormwater Management Calculations	Project: 6301 Campeau Drive	No.: 201-03048-00	
	Time of Concentration	By: MS	Date: 2020-02-21	Page: 3
		Checked:		

	Parcel 1			
	Cistern Controlled Area	Undeveloped/ Routed around controls		Notes
Watershed Area	1.066	1.571	ha	Area Draining to outlet (excluding undeveloped areas)
Slope	0.005	0.005	m/m	Average Slope Approximated
Flow Length (pavement)	30	0	m	Manually Measured
Flow Lenth (vegetated)	40	280	m	
Total	70	280	m	
Roughness	0.023	0.035	-	Calculated as n = 0.013 for concrete and n = 0.035 for grassed area along measured flow path
100-year Rational 'C'	0.74	0.21	-	Average C for areas draining to Cistern + Pipe Storage
i, 100-years	178.6	178.6	mm/hr	~100-year ToC 10-minute intensity - Used for Kinematic wave
Pipe Length	155	0	m	Approximate Length from drainage Plan
Pipe Velocity	0.87	0.87	m/s	From Sewer Design Sheet (Average)
Pipe Time	**3.0**	**0.0**	min	
Kinematic Wave Equation	8.6	16.8	min	Times include 'Pipe Time'
Bransby Williams	**7.6**	**17.7**	min	
Federal Aviation Agency	15.3	61.0	min	
Average	10.5	17.2		

Conclusion:

Removing the Federal Aviation Agency Method (outlier) leaves and average Time of concentration of 17.2 min for the uncontrolled areas.

Filepath:

\\corp.pbwan.net\ca\CAOTT300\CAOTT100DAT01\data\data2\L\Water Resources\Projects\2020\201-03048-00_6301 Campeau Drive\Analysis\[2021-08-16 6301 Campeau Drive.xlsx]ToC appen

	Stormwater Management Calculations	Project: 6301 Campeau Drive	No.: 201-03048-00	
	Orifice Control Rate Checks	By: MS	Date: 2020-02-21	Page: 4
		Checked:		

Orifice sizing was determined iteratively using computer software (HydroCAD, Parcel 1 and PCSWMM, Parcel 2). This design sheet confirms the specified sizing calculation under the orifice equation.

Orifice Equation:

$$Q = C \times A \times (2 \times g \times h)^{0.5}$$

Where:

Parameter	Value	Units	Notes
Q =	Calc	m^3/s	Flow though orifice device
C =	0.6	-	Orifice Coefficient
A =	Calc	m^2	orifice opening area (m^2)
g =	9.81	m/s^2	gravatational constant
h =	Calc	m	height from peak water level to centreline of orifice

Parcel 1

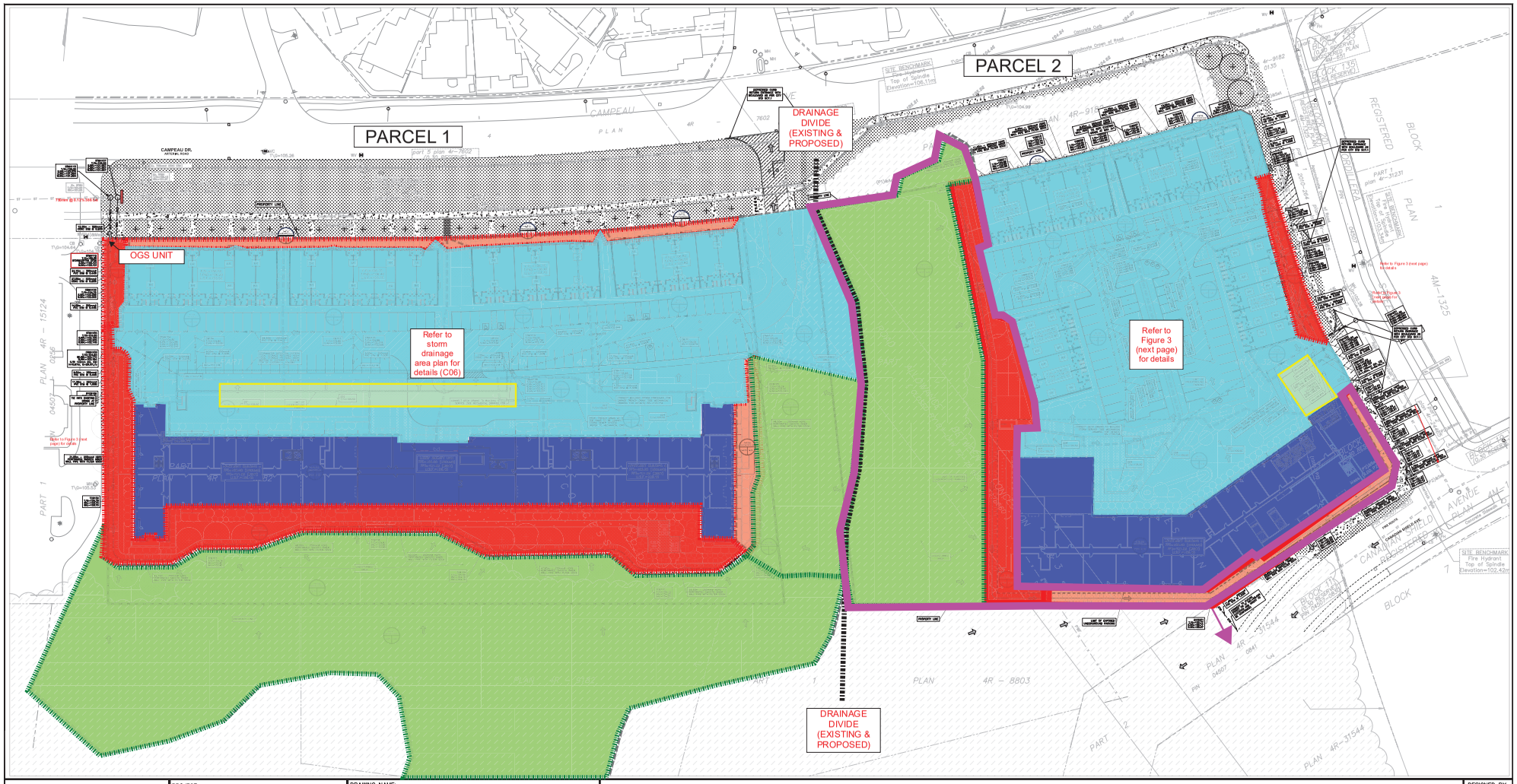
Parameter	Value	Units	Notes
Orifice Diameter =	0.122	m	
Orifice Area =	0.01169	m^2	
Orifice Invert =	103.154	m	
CL of Orifice =	103.192	m	
Top of Cistern =	104.085	m	
h =	0.89	m	
Q_Max =	0.029	m^3/s	
	29.37	L/s	

Parcel 2

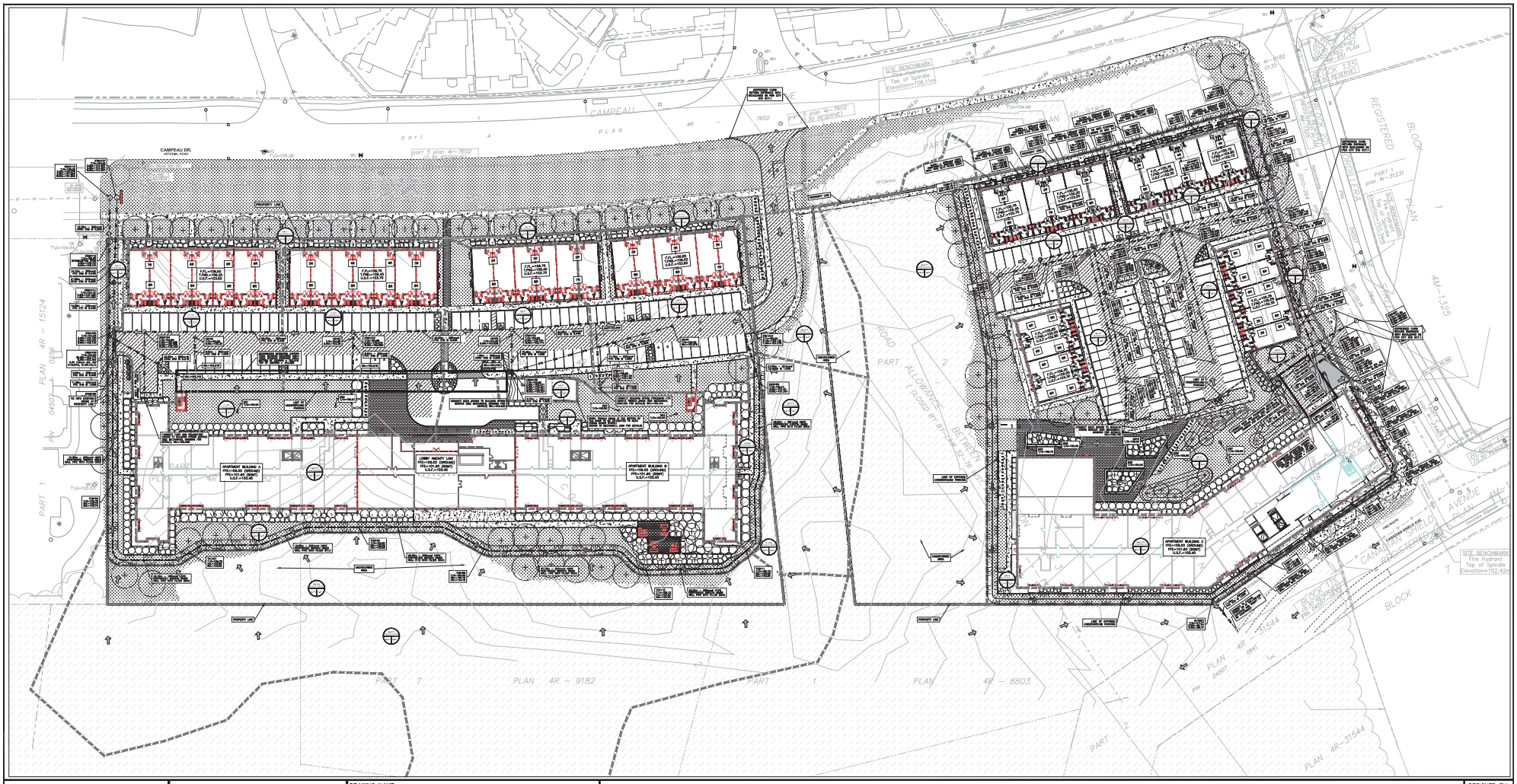
Parameter	Value	Units	Notes
Orifice Diameter =	0.11	m	
Orifice Area =	0.009503	m^2	
Orifice Invert =	99.268	m	
CL of Orifice =	99.323	m	
Spill Elevation =	101.8	m	
h =	2.48	m	
Q_Max =	0.040	m^3/s	
	39.75	L/s	

APPENDIX

E Proposed Site – Annotated Storm Drainage Plan



wsp 300-2611 QUEENSVIEW DRIVE OTTAWA ONTARIO CANADA K2B 8K2 TEL.: 1-613-829-2800	PROJECT: 6301 CAMPEAU DRIVE PROJECT NO.: 201-03048-00	DRAWING NAME: OVERALL STORM DRAINAGE PLAN DATE: 2021-05-11 REVIEWED BY: SCALE: 0 5m 10m 20m 30m SCALE: 1:300	Pipe and Cistern Controlled Rooftop Controlled Uncontrolled Undeveloped *NOTE THESE AREAS ARE REMAINING UNDEVELOPED AND ARE NOT PASSING THROUGH ANY CONTROL (NO OPTIMIZED STORM) AND THEREFORE WERE EXCLUDED FROM THE ALLOWABLE RUNOFF CALCULATION Stormwater Cistern Area Draining to Future Canadian Shield Avenue	DESIGNED BY: D.Y. DRAWN BY: D.Y. SHEET: Fig3



wsp

30-2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 1-613-829-2800 | FAX: 1-613-829-8238 | WWW.WSPGROUP.COM

PROJECT: 6301 CAMPEAU DRIVE	DRAWING NAME: OVERALL STORM DRAINAGE PLAN		DESIGNED BY: D.Y.
	DATE: 2021-08-20	REVIEWED BY:	DRAWN BY: D.Y.
PROJECT NO.: 201-03048-00	SCALE: 0 5m 10m 20m 30m SCALE: 1:300		SHEET: Fig3

APPENDIX

F

Product Calculations and Documentation

APPENDIX

F-1 Roof Drains

	Stormwater Management Calculations	Project: 6301 Campeau Drive	No.: 201-03048-00	
	Roof Drains	By: MS	Date: 2020-02-21	Page: 1
		Checked:		

Watts Adjustable Accutrol Weir

IMPERIAL	Flow Rate (GPM)					
Weir opening	1"	2"	3"	4"	5"	6"
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

1 GPM = 0.000063 m3/sec
1" = 25.4 mm

METRIC	Flow Rate (m3/sec)					
Weir opening	**25.4**	**50.8**	**76.2**	**101.6**	**127.0**	**152.4**
	0.0254	**0.0508**	**0.0762**	**0.1016**	**0.1270**	**0.1524**
Fully Exposed	0.000315	0.000630902	0.000946353	0.001262	0.001577	0.001893
3/4	0.000315	0.000630902	0.00086749	0.001104	0.001341	0.001577
1/2	0.000315	0.000630902	0.000788628	0.000946	0.001104	0.001262
1/4	0.000315	0.000630902	0.000709765	0.000789	0.000867	0.000946
Closed	0.000315	0.000315451	0.000315451	0.000315	0.000315	0.000315

Building	Parcel	Status	Common Name	Drainage Area (ha.)	Drainage Area (m^2)	Area to Cistern 1 (m^2)	Area controlled by Rooftop (m^2)	Drains Provided	Roof (%) with Controls
AB-BLDG	1	3/4 Exposed	Building	0.387	3870	0	**3794**	7	98%
C-BLDG	2	1/4 Exposed	Building	0.276	2760	0	**2135**	15	77%

Filepath:

\\corp.pbwan.net\ca\CAOTT300\CAOTT100DAT01\data\data2\L\Water Resources\Projects\2020\201-03048-00_6301 Campeau Drive\Analysis\[2021-05-27 6301 Campeau Drive.xlsx]Watts Drains

APPENDIX

F-2 Parcel 1 Oil-Grit Separator

CONTECH CASCASE OGS UNIT REMOVAL TABLE IN METRIC UNITS AS REQUESTED BY MVCA

✔ Project Design Record Updated successfully

Project Name : Campeau Drive

Site Designation : 6301 Campeau Drive Parcel 1

1 Project | 2 Design | 3 Treatment | 4 Performance

CONTECH ENGINEERED SOLUTIONS

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON AN AVERAGE PARTICLE SIZE OF 110 MICRONS
Campeau Drive
N/A, N/A
Model Name : CS-4

CASCADE separator™

Drainage Area (Hectares): 1.08

AREA DRAINING TO OGS INCLUDES ALL CISTEN CONTROLLED AREAS

CASCADE Model: CS-4

Runoff Coefficient: 0.86

NOTE THAT ROOF RUNOFF IS CONSIDERED CLEAN AND DISCHARGES DOWNSTREAM OF OGS TO STMMH 104

Particle size: 110

Time of Concentration (min): 10

CASCACADE Treatment Capacity: 1.80

Rainfall Intensity1 (mm/hr)	% Total Rainfall Volume1	Cumulative Rainfall Volume	% Rainfall Volume Treated	Total Flowrate (L/s)	Treated Flowrate (L/s)	Hydraulic Loading Rate	Removal Efficiency (%)	Incremental Removal (%)
0.508	10.7%	10.7%	10.7%	1.4158	1.4158	1.79	100%	10.71%
1.016	9.3%	20.0%	9.3%	2.5485	2.5485	3.21	100%	9.30%
1.524	10.3%	30.3%	10.3%	3.9644	3.9644	5.00	100%	10.26%
2.032	8.6%	38.9%	8.6%	5.0970	5.0970	6.43	100%	8.56%
2.540	6.7%	45.6%	6.7%	6.5129	6.5129	8.21	100%	6.74%
3.048	5.8%	51.4%	5.8%	7.9287	7.9287	10.00	100%	5.82%
3.556	5.0%	56.4%	5.0%	9.0614	9.0614	11.43	100%	5.03%
4.064	4.4%	60.8%	4.4%	10.4772	10.4772	13.21	99.48%	4.36%
4.572	2.3%	63.1%	2.3%	11.6099	11.6099	14.64	98.14%	2.29%

5.080	4.2%	67.3%	4.2%	13.0257	13.0257	16.42	96.47%	4.00%
6.350	7.4%	74.7%	7.4%	16.1406	16.1406	20.35	92.77%	6.85%
7.620	4.0%	78.7%	4.0%	19.5386	19.5386	24.64	88.74%	3.59%
8.890	3.5%	82.2%	3.5%	22.6534	22.6534	28.57	85.04%	2.98%
10.160	1.8%	84.0%	1.8%	26.0515	26.0515	32.85	81.02%	1.49%
11.430	3.8%	87.8%	3.8%	29.1663	29.1663	36.78	77.33%	2.92%
12.700	1.4%	89.2%	1.4%	32.5643	32.5643	41.06	73.30%	1.03%
19.050	5.2%	94.4%	5.2%	48.7049	48.7049	61.42	54.17%	2.82%
25.400	2.4%	96.8%	2.09%	65.1286	56.6336	71.41	38.93%	0.95%
38.100	2.3%	99.1%	1.34%	97.4098	56.6336	71.41	26.03%	0.61%

90.31%

Removal Efficiency Adjustment2 = 6.45%

Predicted % Annual Rainfall Treated = 91.38%

Predicted Net Annual Load Removal Efficiency = 83.86%

REMOVAL EFFICIENCY
> 80% TSS REMOVAL
(ANNUAL BASIS)

1 - Based on 10 years of rainfall data from Canadian Station 6105976, Ottawa CDA, ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

< Previous

SAVE DESIGN **ADD ADDITIONAL UNIT TO PROJECT**

SAVE AND DOWNLOAD DESIGN DRAWING AND SPECIFICATION

CANCEL

Hydrodynamic Separation Product Calculator

Campeau Drive

6301 Campeau Drive Parcel 1

CASCADE SEPARATOR CS-4

Project Information					
Project Name	Campeau Drive			**Option #**	A
Country	Metric	**State**	N/A	**City**	N/A

Contact Information			
First Name	Mihael	**Last Name**	Stewart
Company		**Phone #**	587-489-0196
Email	Michael.stewart@wsp.com		

Design Criteria					
Site Designation	6301 Campeau Drive Parcel 1			**Sizing Method**	Net Annual
Screening Required?	No	**Drainage Area (ac)**	1.08	**Peak Flow (cfs)**	71.40
Groundwater Depth (ft)	>15	**Pipe Invert Depth (ft)**	>15	**Bedrock Depth (ft)**	0 - 5
Multiple Inlets?	No	**Grate Inlet Required?**	No	**Pipe Size (in)**	300.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A	**180° between inlet and outlet?**	No
Runoff Coefficient	0.86	**Rainfall Station**	128 - Ottawa, ON	**TC (Min)**	10

Treatment Selection					
Treatment Unit	CASCADE SEPARATOR	**System Model**	CS-4		
Target Removal	80%	**Particle Size Distribution (PSD)**	110	**Predicted Net Annual Removal**	83.86%

*Treatment flow rate calculated using annualized weighted calculation.

CONTECH ENGINEERED SOLUTIONS

Hydrodynamic Separation Product Calculator

Campeau Drive

6301 Campeau Drive Parcel 1

CASCADE SEPARATOR CS-4

CASCADE SEPARATOR ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity[1] (in/hr)	% Rainfall Volume[1]	Cumulative Rainfall Volume	Rainfall Volume Treated	Total Flowrate (cfs)	Treated Flowrate (cfs)	Hydraulic Loading Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.0200	10.70%	10.70%	10.70%	0.0500	0.0500	1.79%	100.00%	10.71%
0.0400	9.30%	20.00%	9.30%	0.0900	0.0900	3.21%	100.00%	9.30%
0.0600	10.30%	30.30%	10.30%	0.1400	0.1400	5.00%	100.00%	10.26%
0.0800	8.60%	38.90%	8.60%	0.1800	0.1800	6.43%	100.00%	8.56%
0.1000	6.70%	45.60%	6.70%	0.2300	0.2300	8.21%	100.00%	6.74%
0.1200	5.80%	51.40%	5.80%	0.2800	0.2800	10.00%	100.00%	5.82%
0.1400	5.00%	56.40%	5.00%	0.3200	0.3200	11.43%	100.00%	5.03%
0.1600	4.40%	60.80%	4.40%	0.3700	0.3700	13.21%	99.48%	4.36%
0.1800	2.30%	63.10%	2.30%	0.4100	0.4100	14.64%	98.14%	2.29%
0.2000	4.20%	67.30%	4.20%	0.4600	0.4600	16.42%	96.47%	4.00%
0.2500	7.40%	74.70%	7.40%	0.5700	0.5700	20.35%	92.77%	6.85%
0.3000	4.00%	78.70%	4.00%	0.6900	0.6900	24.64%	88.74%	3.59%
0.3500	3.50%	82.20%	3.50%	0.8000	0.8000	28.57%	85.04%	2.98%
0.4000	1.80%	84.00%	1.80%	0.9200	0.9200	32.85%	81.02%	1.49%
0.4500	3.80%	87.80%	3.80%	1.0300	1.0300	36.78%	77.33%	2.92%
0.5000	1.40%	89.20%	1.40%	1.1500	1.1500	41.06%	73.30%	1.03%
0.7500	5.20%	94.40%	5.20%	1.7200	1.7200	61.42%	54.17%	2.82%
1.0000	2.40%	96.80%	2.09%	2.3000	2.0000	71.41%	38.93%	0.95%
1.5000	2.30%	99.10%	1.34%	3.4400	2.0000	71.41%	26.03%	0.61%
								90.31%
							Removal Efficiency Adjustment[2] =	6.45%
							Predicted % Annual Rainfall Treated =	91.38%
							Predicted Net Annual Load Removal Efficiency =	83.86%
1 - Based on 10 years of rainfall data from Canadian Station 6105976, Ottawa CDA, ON								
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.								

*Treatment flow rate calculated using annualized weighted calculation.

SECTION (_____)
STORM WATER TREATMENT DEVICE

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Cascade Separator™ by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.

1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a Cascade Separator™ device manufactured by:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.4 Related Sections

1.4.1 Section 02240: Dewatering
1.4.2 Section 02260: Excavation Support and Protection
1.4.3 Section 02315: Excavation and Fill
1.4.4 Section 02340: Soil Stabilization

1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.

1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

1.7 The SWTD manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certification” certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
- 2.2.2 Support brackets shall be manufactured of 5052 Aluminum
- 2.2.3 Fiberglass components shall conform to applicable sections of ASTM D-4097
- 2.2.4 Access system(s) conform to the following:
- 2.2.5 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

3.0 PERFORMANCE

3.1 The SWTD shall be capable of achieving an annualized weighted reduction of at least 80% of the OK-110 particle distribution having particles ranging from 53 microns to 212 microns with a d_{50} of approximately 110 microns unless otherwise stated.

3.2 The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be in accordance with the volume listed in Table 1. The boundaries of the sump chamber shall be limited to that which do not degrade the

SWTD's treatment efficiency as captured pollutants accumulate. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.

3.3 The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills and have a capacity listed in Table 1 of the required unit.

3.4 The SWTD shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute SWTD is proposed, supporting documentation shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

4.0 EXECUTION

4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.

4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.

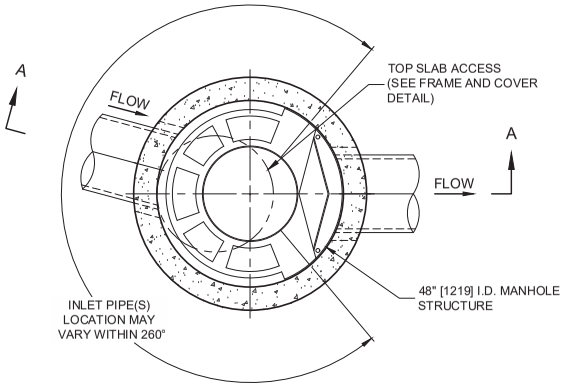
4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.

4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

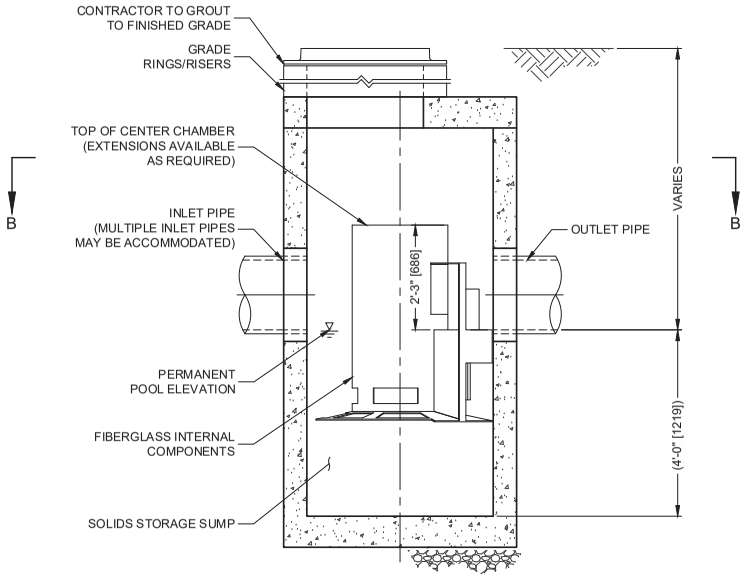
TABLE 1: Storm Water Treatment Device Storage Capacities

Cascade Model	Minimum Sump Storage Capacity (yd^3)	Minimum Oil Storage Capacity (gal)
CS-4	0.70	141.0
CS-5	1.09	269.3
CS-6	1.57	475.9
CS-8	2.79	1128.0
CS-10	4.36	2203.2
CS-12	6.28	3807.1

END OF SECTION



PLAN VIEW B-B
NOT TO SCALE



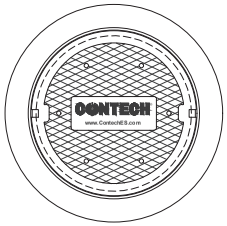
ELEVATION A-A
NOT TO SCALE

CASCADE separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-4 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-4
CASCADE SEPARATOR
STANDARD DETAIL

APPENDIX

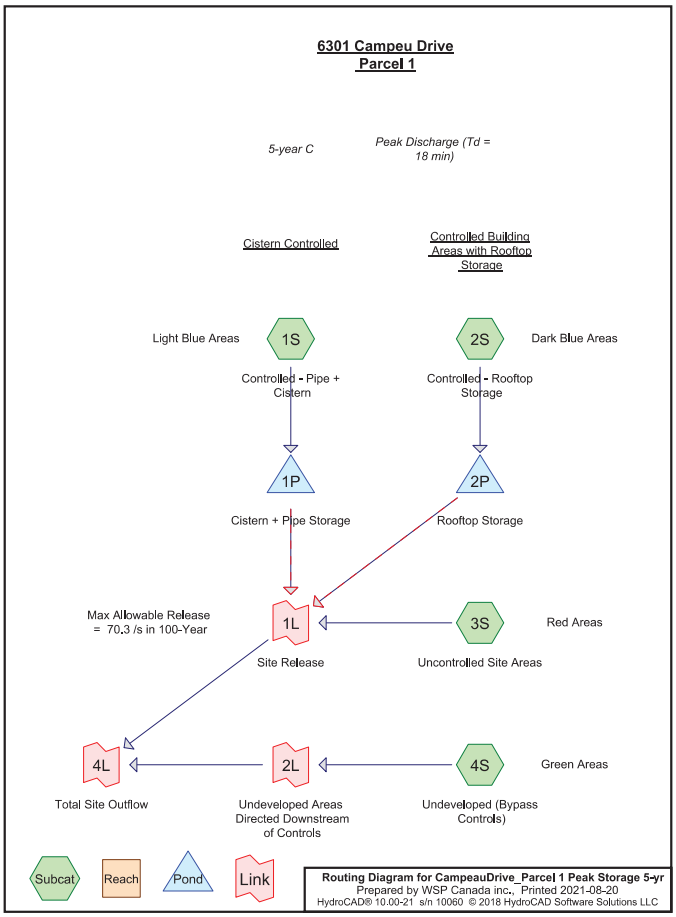
G

Parcel 1 – Model Output (HydroCAD)

APPENDIX

G-1 Parcel 1: 5-Year Analysis (Peak Discharge)

The storm system for Parcel 1 is governed by the 100-year storm. The 5-yr peak discharge scenario has been provided for information only.



Area Listing (all nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
2,130.0	0.74	A-101 (1S)
1,930.0	0.87	A-102 (1S)
2,130.0	0.82	A-103 (1S)
1,840.0	0.82	A-104 (1S)
540.0	0.25	A-105 (1S)
700.0	0.24	A-106 (1S)
150.0	0.90	A-107 (1S)
2,440.0	0.26	A-108a (3S)
2,780.0	0.20	A-108b (4S)
350.0	0.24	A-109a (3S)
130.0	0.20	A-109b (4S)
140.0	0.35	A-110 (3S)
280.0	0.33	A-111 (3S)
120.0	0.32	A-112 (3S)
110.0	0.33	A-113 (3S)
3,870.0	0.90	A-BLDG (2S)
8,510.0	0.20	A-EXT1 (4S)
1,500.0	0.20	A-EXT2 (4S)
1,240.0	0.45	A-EXT3 (1S)
30,890.0	**0.47**	**TOTAL AREA**

Summary for Subcatchment 1S: Controlled - Pipe + Cistern

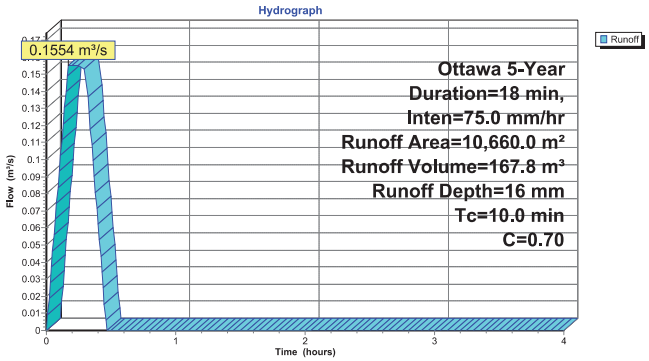
Runoff = 0.1554 m³/s @ 0.17 hrs, Volume= 167.8 m³, Depth= 16 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
2,130.0	0.74	A-101
1,930.0	0.87	A-102
2,130.0	0.82	A-103
1,840.0	0.82	A-104
540.0	0.25	A-105
700.0	0.24	A-106
150.0	0.90	A-107
1,240.0	0.45	A-EXT3
10,660.0	0.70	Weighted Average
10,660.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 1S: Controlled - Pipe + Cistern



Summary for Subcatchment 2S: Controlled - Rooftop Storage

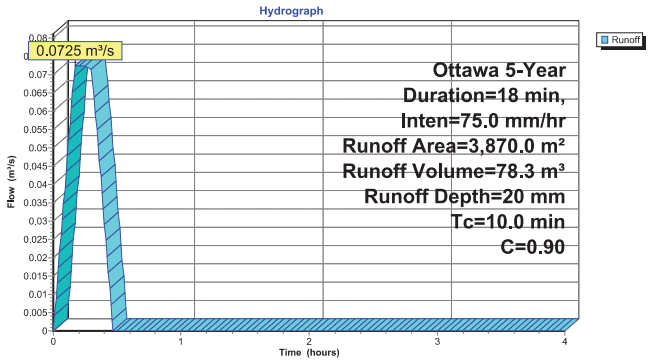
Runoff = 0.0725 m³/s @ 0.17 hrs, Volume= 78.3 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
3,870.0	0.90	A-BLDG
3,870.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 2S: Controlled - Rooftop Storage



Summary for Subcatchment 3S: Uncontrolled Site Areas

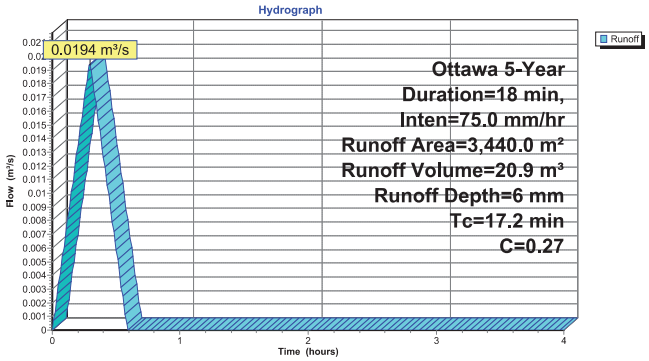
Runoff = 0.0194 m³/s @ 0.30 hrs, Volume= 20.9 m³, Depth= 6 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
280.0	0.33	A-111
120.0	0.32	A-112
110.0	0.33	A-113
2,440.0	0.26	A-108a
350.0	0.24	A-109a
140.0	0.35	A-110
3,440.0	0.27	Weighted Average
3,440.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 3S: Uncontrolled Site Areas



Summary for Subcatchment 4S: Undeveloped (Bypass Controls)

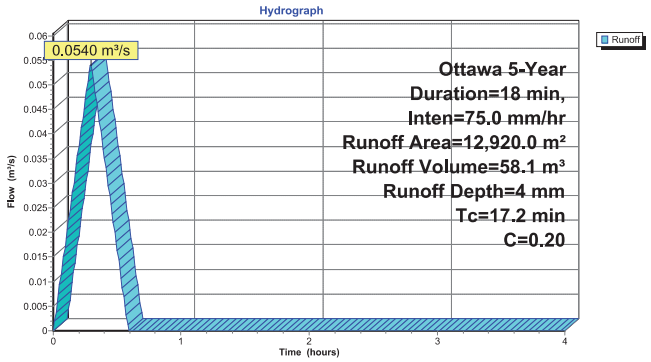
Runoff = 0.0540 m³/s @ 0.30 hrs, Volume= 58.1 m³, Depth= 4 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
8,510.0	0.20	A-EXT1
1,500.0	0.20	A-EXT2
2,780.0	0.20	A-108b
130.0	0.20	A-109b
12,920.0	0.20	Weighted Average
12,920.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 4S: Undeveloped (Bypass Controls)



Summary for Pond 1P: Cistern + Pipe Storage

Inflow Area = 10,660.0 m², 0.00% Impervious, Inflow Depth = 16 mm for 5-Year event
Inflow = 0.1554 m³/s @ 0.17 hrs, Volume= 167.8 m³
Outflow = 0.0165 m³/s @ 0.45 hrs, Volume= 155.5 m³, Atten= 89%, Lag= 16.7 min
Primary = 0.0165 m³/s @ 0.45 hrs, Volume= 155.5 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 103.498 m @ 0.45 hrs Surf.Area= 547.7 m² Storage= 150.3 m³

Plug-Flow detention time= 90.4 min calculated for 155.1 m³ (92% of inflow)
Center-of-Mass det. time= 89.9 min (103.9 - 14.0)

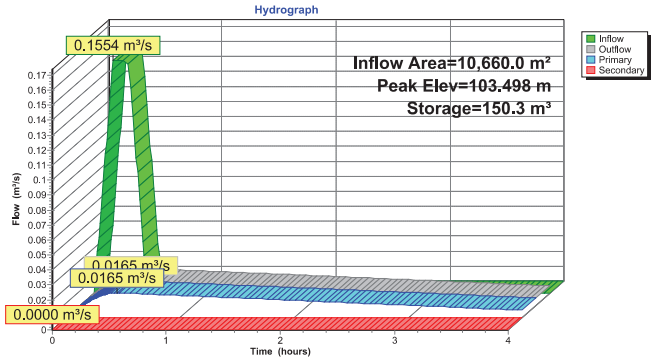
Volume	Invert	Avail.Storage	Storage Description
#1	103.218 m	461.6 m³	**10.00 mW x 53.06 mL x 0.87 mH Cistern**
#2	103.218 m	0.2 m³	**450 mm Round Pipe Storage** L= 1.55 m
#3	103.371 m	3.4 m³	**300 mm Round Pipe Storage** L= 47.40 m
#4	103.421 m	0.5 m³	**250 mm Round Pipe Storage** L= 10.45 m
		465.7 m³	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	104.085 m	***Overflow Check** Head (meters) 0.000 0.010 Disch. (m³/s) 0.00000 10.00000
#2	Primary	103.154 m	**122 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0165 m³/s @ 0.45 hrs HW=103.498 m (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.0165 m³/s @ 1.41 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=103.218 m (Free Discharge)
└**1=***Overflow Check** (Controls 0.0000 m³/s)

Pond 1P: Cistern + Pipe Storage



Summary for Pond 2P: Rooftop Storage

Inflow Area = 3,870.0 m², 0.00% Impervious, Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0725 m³/s @ 0.17 hrs, Volume= 78.3 m³
Outflow = 0.0079 m³/s @ 0.45 hrs, Volume= 77.9 m³, Atten= 89%, Lag= 16.7 min
Primary = 0.0079 m³/s @ 0.45 hrs, Volume= 77.9 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.108 m @ 0.45 hrs Surf.Area= 1,918.4 m² Storage= 69.1 m³

Plug-Flow detention time= 88.8 min calculated for 77.8 m³ (99% of inflow)
Center-of-Mass det. time= 89.1 min (103.1 - 14.0)

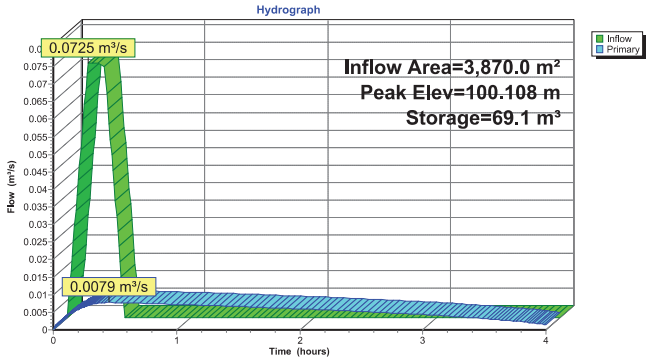
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	192.2 m³	**Custom Stage Data (Pyramidal)**Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.152	3,794.0	192.2	192.2	3,794.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**Special & User-Defined X 7.00** Head (meters) 0.000 0.152 Disch. (m³/s) 0.00000 0.00158

Primary OutFlow Max=0.0079 m³/s @ 0.45 hrs HW=100.108 m (Free Discharge)
↑**1=Special & User-Defined** (Custom Controls 0.0079 m³/s)

Pond 2P: Rooftop Storage

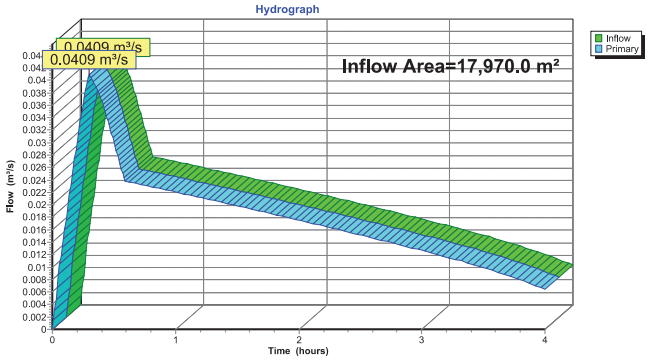


Summary for Link 1L: Site Release

Inflow Area = 17,970.0 m², 0.00% Impervious, Inflow Depth > 14 mm for 5-Year event
Inflow = 0.0409 m³/s @ 0.30 hrs, Volume= 254.3 m³
Primary = 0.0409 m³/s @ 0.30 hrs, Volume= 254.3 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 1L: Site Release

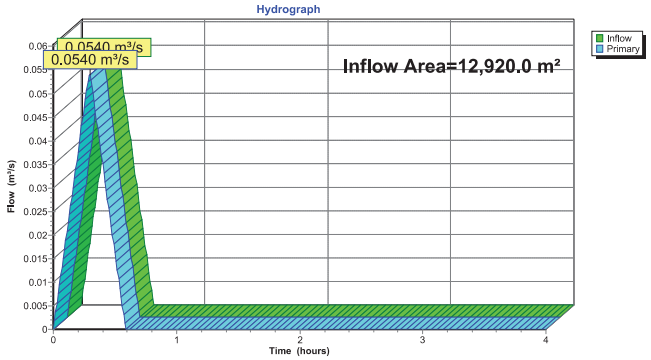


Summary for Link 2L: Undeveloped Areas Directed Downstream of Controls

Inflow Area = 12,920.0 m², 0.00% Impervious, Inflow Depth = 4 mm for 5-Year event
Inflow = 0.0540 m³/s @ 0.30 hrs, Volume= 58.1 m³
Primary = 0.0540 m³/s @ 0.30 hrs, Volume= 58.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 2L: Undeveloped Areas Directed Downstream of Controls

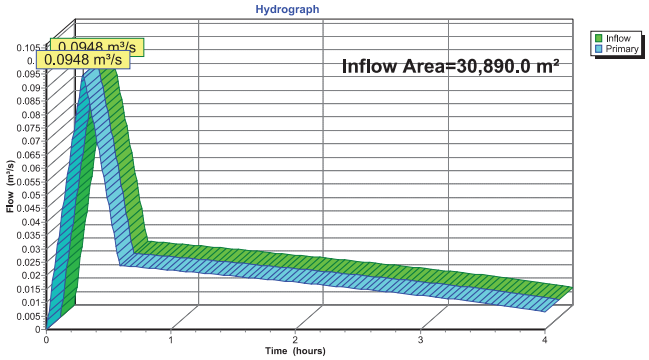


Summary for Link 4L: Total Site Outflow

Inflow Area = 30,890.0 m², 0.00% Impervious, Inflow Depth > 10 mm for 5-Year event
Inflow = 0.0948 m³/s @ 0.30 hrs, Volume= 312.4 m³
Primary = 0.0948 m³/s @ 0.30 hrs, Volume= 312.4 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

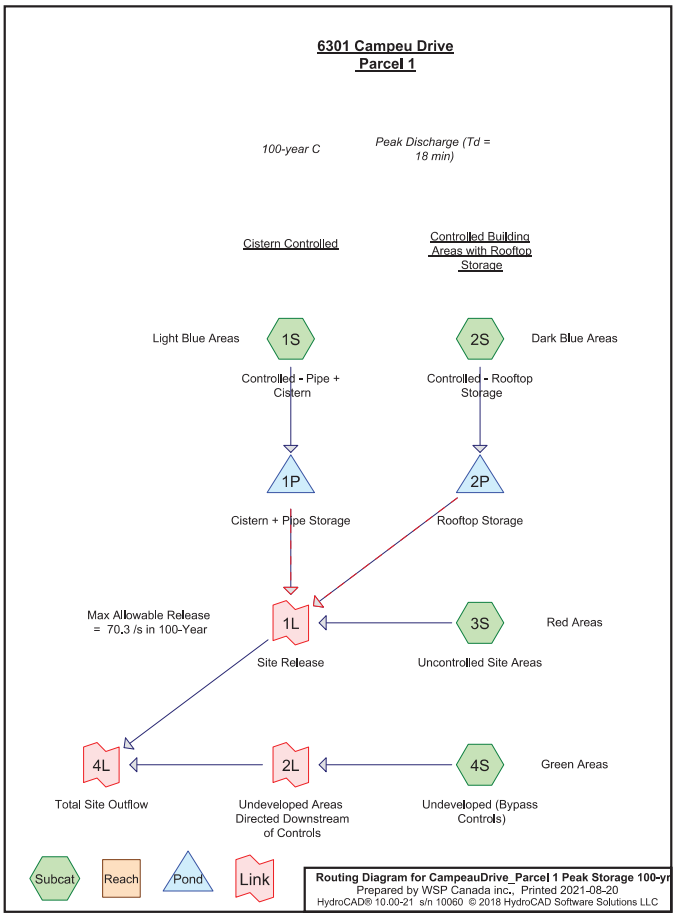
Link 4L: Total Site Outflow



APPENDIX

G-2 Parcel 1: 100-Year Analysis (Peak Discharge)

The storm system for Parcel 1 is governed by the 100-year storm. Peak storage and peak discharge occur at separate storm durations and are therefore reported separately.



Area Listing (all nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
2,130.0	0.93	A-101 (1S)
1,930.0	1.00	A-102 (1S)
2,130.0	1.00	A-103 (1S)
1,840.0	1.00	A-104 (1S)
540.0	0.31	A-105 (1S)
700.0	0.30	A-106 (1S)
150.0	1.00	A-107 (1S)
2,440.0	0.33	A-108a (3S)
2,780.0	0.25	A-108b (4S)
350.0	0.30	A-109a (3S)
130.0	0.25	A-109b (4S)
140.0	0.44	A-110 (3S)
280.0	0.41	A-111 (3S)
120.0	0.40	A-112 (3S)
110.0	0.41	A-113 (3S)
3,870.0	1.00	A-BLDG (2S)
8,510.0	0.25	A-EXT1 (4S)
1,500.0	0.25	A-EXT2 (4S)
1,240.0	0.56	A-EXT3 (1S)
30,890.0	**0.56**	**TOTAL AREA**

Summary for Subcatchment 1S: Controlled - Pipe + Cistern

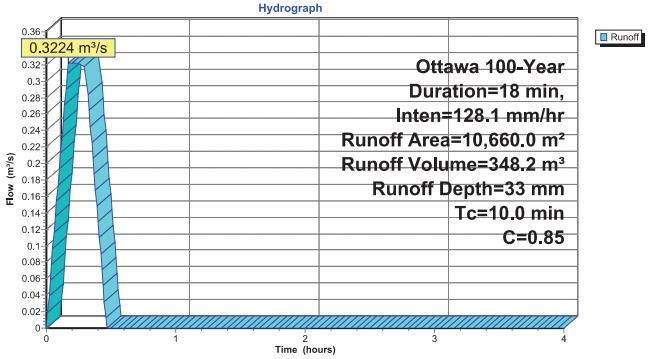
Runoff = 0.3224 m³/s @ 0.17 hrs, Volume= 348.2 m³, Depth= 33 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
2,130.0	0.93	A-101
1,930.0	1.00	A-102
2,130.0	1.00	A-103
1,840.0	1.00	A-104
540.0	0.31	A-105
700.0	0.30	A-106
150.0	1.00	A-107
1,240.0	0.56	A-EXT3
10,660.0	0.85	Weighted Average
4,610.0		43.25% Pervious Area
6,050.0		56.75% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 1S: Controlled - Pipe + Cistern



Summary for Subcatchment 2S: Controlled - Rooftop Storage

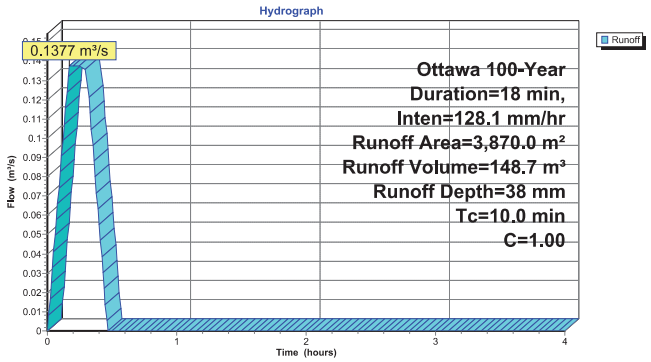
Runoff = 0.1377 m³/s @ 0.17 hrs, Volume= 148.7 m³, Depth= 38 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
3,870.0	1.00	A-BLDG
3,870.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 2S: Controlled - Rooftop Storage



Summary for Subcatchment 3S: Uncontrolled Site Areas

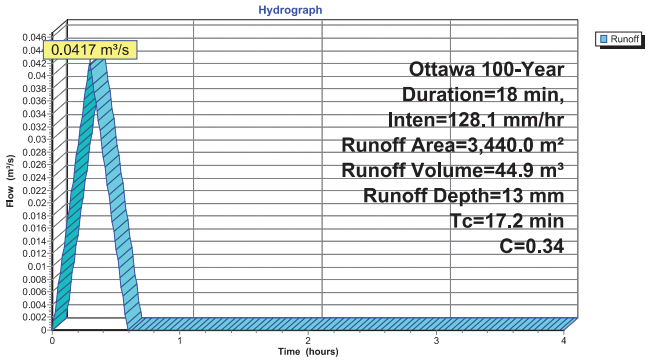
Runoff = 0.0417 m³/s @ 0.30 hrs, Volume= 44.9 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
280.0	0.41	A-111
120.0	0.40	A-112
110.0	0.41	A-113
2,440.0	0.33	A-108a
350.0	0.30	A-109a
140.0	0.44	A-110
3,440.0	0.34	Weighted Average
3,440.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 3S: Uncontrolled Site Areas



Summary for Subcatchment 4S: Undeveloped (Bypass Controls)

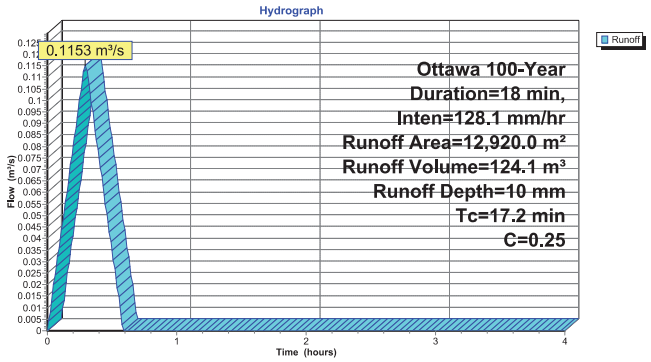
Runoff = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
8,510.0	0.25	A-EXT1
1,500.0	0.25	A-EXT2
2,780.0	0.25	A-108b
130.0	0.25	A-109b
12,920.0	0.25	Weighted Average
12,920.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 4S: Undeveloped (Bypass Controls)



Summary for Pond 1P: Cistern + Pipe Storage

Inflow Area = 10,660.0 m², 56.75% Impervious, Inflow Depth = 33 mm for 100-Year event
Inflow = 0.3224 m³/s @ 0.17 hrs, Volume= 348.2 m³
Outflow = 0.0241 m³/s @ 0.45 hrs, Volume= 260.4 m³, Atten= 93%, Lag= 17.1 min
Primary = 0.0241 m³/s @ 0.45 hrs, Volume= 260.4 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 103.818 m @ 0.45 hrs Surf.Area= 530.6 m² Storage= 322.5 m³

Plug-Flow detention time= 101.3 min calculated for 260.4 m³ (75% of inflow)
Center-of-Mass det. time= 98.7 min (112.7 - 14.0)

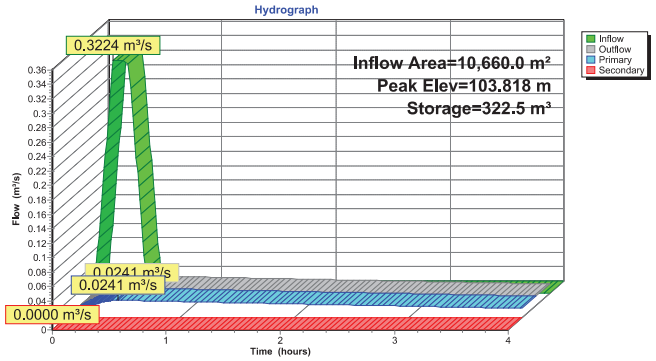
Volume	Invert	Avail.Storage	Storage Description
#1	103.218 m	461.6 m³	**10.00 mW x 53.06 mL x 0.87 mH Cistern**
#2	103.218 m	0.2 m³	**450 mm Round Pipe Storage** L= 1.55 m
#3	103.371 m	3.4 m³	**300 mm Round Pipe Storage** L= 47.40 m
#4	103.421 m	0.5 m³	**250 mm Round Pipe Storage** L= 10.45 m
		465.7 m³	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	104.085 m	***Overflow Check** Head (meters) 0.000 0.010 Disch. (m³/s) 0.00000 10.00000
#2	Primary	103.154 m	**122 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0241 m³/s @ 0.45 hrs HW=103.818 m (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.0241 m³/s @ 2.06 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=103.218 m (Free Discharge)
└**1=***Overflow Check** (Controls 0.0000 m³/s)

Pond 1P: Cistern + Pipe Storage



Summary for Pond 2P: Rooftop Storage

Inflow Area = 3,870.0 m², 100.00% Impervious, Inflow Depth = 38 mm for 100-Year event
Inflow = 0.1377 m³/s @ 0.17 hrs, Volume= 148.7 m³
Outflow = 0.0099 m³/s @ 0.45 hrs, Volume= 115.7 m³, Atten= 93%, Lag= 17.1 min
Primary = 0.0099 m³/s @ 0.45 hrs, Volume= 115.7 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.136 m @ 0.45 hrs Surf.Area= 3,027.5 m² Storage= 137.0 m³

Plug-Flow detention time= 103.3 min calculated for 115.7 m³ (78% of inflow)
Center-of-Mass det. time= 101.0 min (115.0 - 14.0)

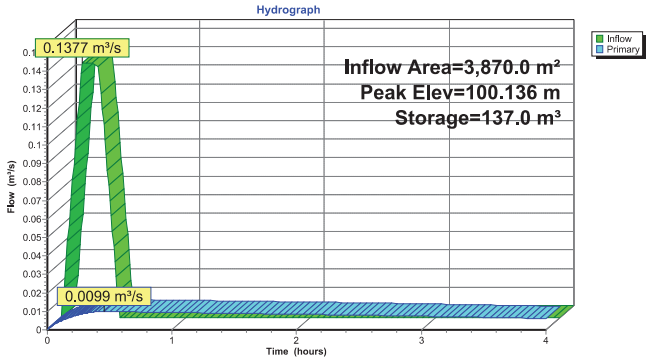
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	192.2 m³	**Custom Stage Data (Pyramidal)**Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.152	3,794.0	192.2	192.2	3,794.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**Special & User-Defined X 7.00** Head (meters) 0.000 0.152 Disch. (m³/s) 0.00000 0.00158

Primary OutFlow Max=0.0099 m³/s @ 0.45 hrs HW=100.136 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0099 m³/s)

Pond 2P: Rooftop Storage

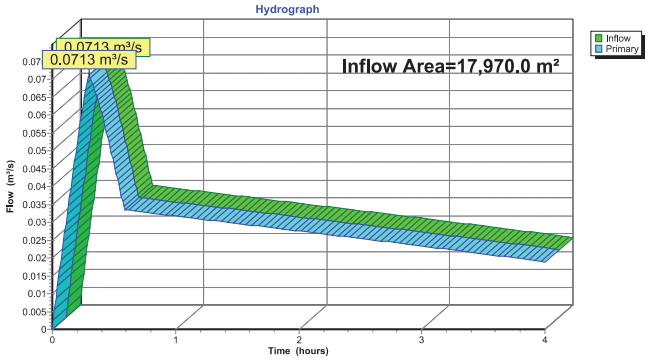


Summary for Link 1L: Site Release

Inflow Area = 17,970.0 m², 55.20% Impervious, Inflow Depth > 23 mm for 100-Year event
Inflow = 0.0713 m³/s @ 0.30 hrs, Volume= 421.1 m³
Primary = 0.0713 m³/s @ 0.30 hrs, Volume= 421.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 1L: Site Release

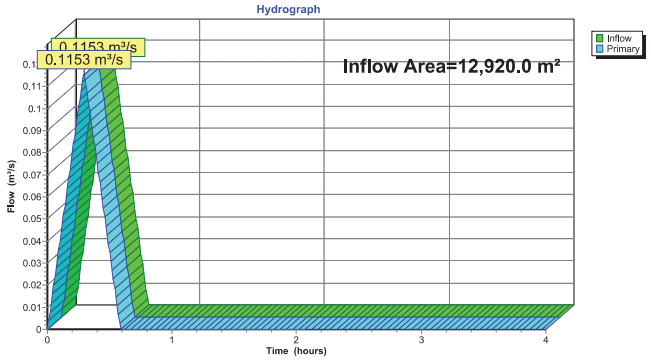


Summary for Link 2L: Undeveloped Areas Directed Downstream of Controls

Inflow Area = 12,920.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 100-Year event
Inflow = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³
Primary = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 2L: Undeveloped Areas Directed Downstream of Controls

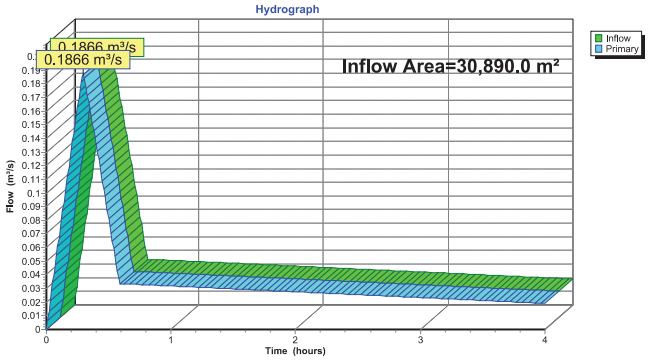


Summary for Link 4L: Total Site Outflow

Inflow Area = 30,890.0 m², 32.11% Impervious, Inflow Depth > 18 mm for 100-Year event
Inflow = 0.1866 m³/s @ 0.30 hrs, Volume= 545.2 m³
Primary = 0.1866 m³/s @ 0.30 hrs, Volume= 545.2 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

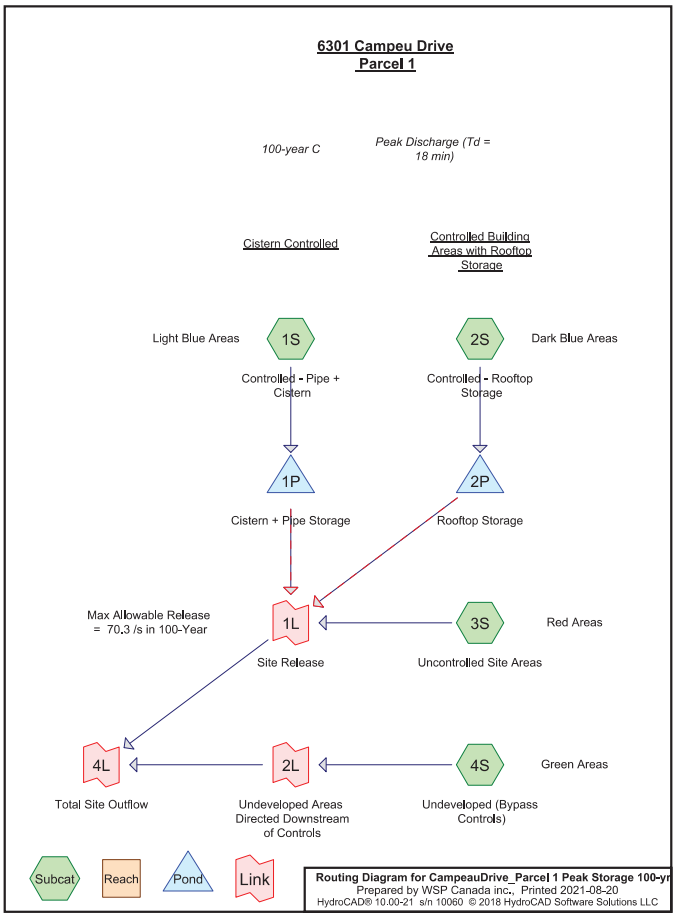
Link 4L: Total Site Outflow



APPENDIX

G-3 Parcel 1: 100-Year Analysis (Peak Storage)

The storm system for Parcel 1 is governed by the 100-year storm. Peak storage and peak discharge occur at separate storm durations and are therefore reported separately.



Area Listing (all nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
2,130.0	0.93	A-101 (1S)
1,930.0	1.00	A-102 (1S)
2,130.0	1.00	A-103 (1S)
1,840.0	1.00	A-104 (1S)
540.0	0.31	A-105 (1S)
700.0	0.30	A-106 (1S)
150.0	1.00	A-107 (1S)
2,440.0	0.33	A-108a (3S)
2,780.0	0.25	A-108b (4S)
350.0	0.30	A-109a (3S)
130.0	0.25	A-109b (4S)
140.0	0.44	A-110 (3S)
280.0	0.41	A-111 (3S)
120.0	0.40	A-112 (3S)
110.0	0.41	A-113 (3S)
3,870.0	1.00	A-BLDG (2S)
8,510.0	0.25	A-EXT1 (4S)
1,500.0	0.25	A-EXT2 (4S)
1,240.0	0.56	A-EXT3 (1S)
30,890.0	**0.56**	**TOTAL AREA**

Summary for Subcatchment 1S: Controlled - Pipe + Cistern

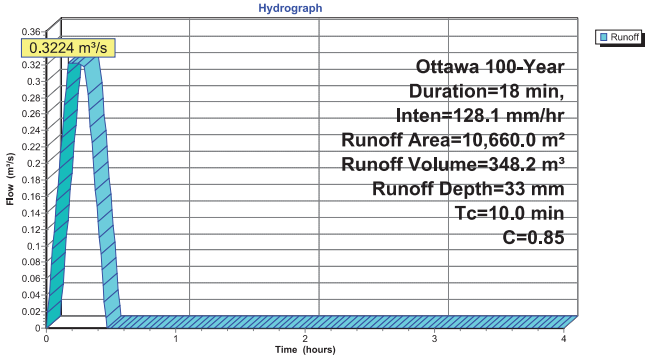
Runoff = 0.3224 m³/s @ 0.17 hrs, Volume= 348.2 m³, Depth= 33 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
2,130.0	0.93	A-101
1,930.0	1.00	A-102
2,130.0	1.00	A-103
1,840.0	1.00	A-104
540.0	0.31	A-105
700.0	0.30	A-106
150.0	1.00	A-107
1,240.0	0.56	A-EXT3
10,660.0	0.85	Weighted Average
4,610.0		43.25% Pervious Area
6,050.0		56.75% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 1S: Controlled - Pipe + Cistern



Summary for Subcatchment 2S: Controlled - Rooftop Storage

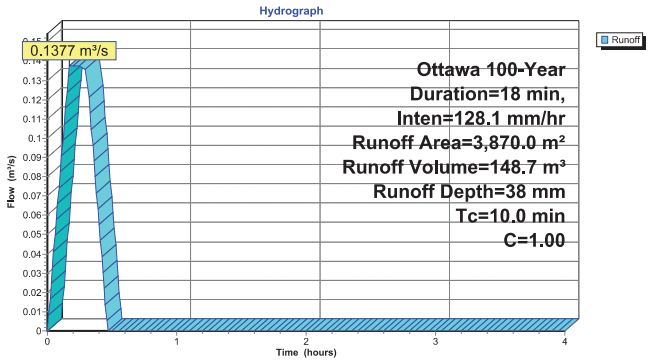
Runoff = 0.1377 m³/s @ 0.17 hrs, Volume= 148.7 m³, Depth= 38 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
3,870.0	1.00	A-BLDG
3,870.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry,

Subcatchment 2S: Controlled - Rooftop Storage



Summary for Subcatchment 3S: Uncontrolled Site Areas

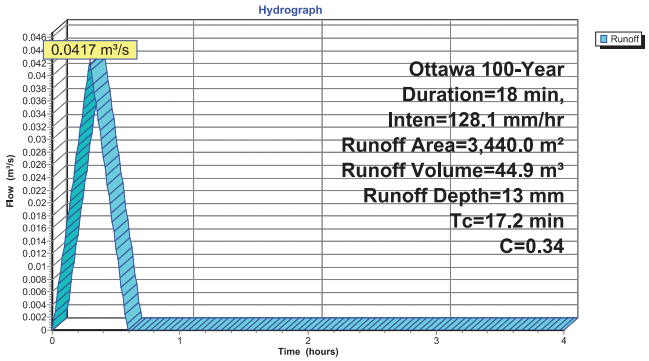
Runoff = 0.0417 m³/s @ 0.30 hrs, Volume= 44.9 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
280.0	0.41	A-111
120.0	0.40	A-112
110.0	0.41	A-113
2,440.0	0.33	A-108a
350.0	0.30	A-109a
140.0	0.44	A-110
3,440.0	0.34	Weighted Average
3,440.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 3S: Uncontrolled Site Areas



Summary for Subcatchment 4S: Undeveloped (Bypass Controls)

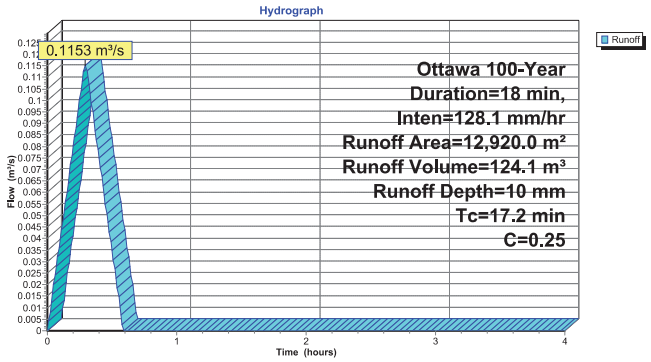
Runoff = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=18 min, Inten=128.1 mm/hr

Area (m²)	C	Description
8,510.0	0.25	A-EXT1
1,500.0	0.25	A-EXT2
2,780.0	0.25	A-108b
130.0	0.25	A-109b
12,920.0	0.25	Weighted Average
12,920.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
17.2					**Direct Entry,**

Subcatchment 4S: Undeveloped (Bypass Controls)



Summary for Pond 1P: Cistern + Pipe Storage

Inflow Area = 10,660.0 m², 56.75% Impervious, Inflow Depth = 33 mm for 100-Year event
Inflow = 0.3224 m³/s @ 0.17 hrs, Volume= 348.2 m³
Outflow = 0.0241 m³/s @ 0.45 hrs, Volume= 260.4 m³, Atten= 93%, Lag= 17.1 min
Primary = 0.0241 m³/s @ 0.45 hrs, Volume= 260.4 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 103.818 m @ 0.45 hrs Surf.Area= 530.6 m² Storage= 322.5 m³

Plug-Flow detention time= 101.3 min calculated for 260.4 m³ (75% of inflow)
Center-of-Mass det. time= 98.7 min (112.7 - 14.0)

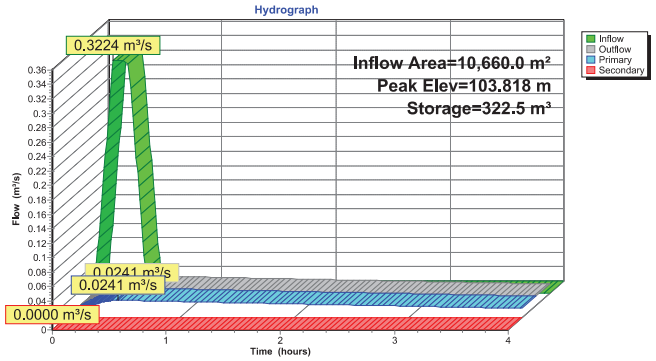
Volume	Invert	Avail.Storage	Storage Description
#1	103.218 m	461.6 m³	**10.00 mW x 53.06 mL x 0.87 mH Cistern**
#2	103.218 m	0.2 m³	**450 mm Round Pipe Storage** L= 1.55 m
#3	103.371 m	3.4 m³	**300 mm Round Pipe Storage** L= 47.40 m
#4	103.421 m	0.5 m³	**250 mm Round Pipe Storage** L= 10.45 m
		465.7 m³	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Secondary	104.085 m	***Overflow Check** Head (meters) 0.000 0.010 Disch. (m³/s) 0.00000 10.00000
#2	Primary	103.154 m	**122 mm Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.0241 m³/s @ 0.45 hrs HW=103.818 m (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.0241 m³/s @ 2.06 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=103.218 m (Free Discharge)
└**1=***Overflow Check** (Controls 0.0000 m³/s)

Pond 1P: Cistern + Pipe Storage



Summary for Pond 2P: Rooftop Storage

Inflow Area = 3,870.0 m², 100.00% Impervious, Inflow Depth = 38 mm for 100-Year event
Inflow = 0.1377 m³/s @ 0.17 hrs, Volume= 148.7 m³
Outflow = 0.0099 m³/s @ 0.45 hrs, Volume= 115.7 m³, Atten= 93%, Lag= 17.1 min
Primary = 0.0099 m³/s @ 0.45 hrs, Volume= 115.7 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.136 m @ 0.45 hrs Surf.Area= 3,027.5 m² Storage= 137.0 m³

Plug-Flow detention time= 103.3 min calculated for 115.7 m³ (78% of inflow)
Center-of-Mass det. time= 101.0 min (115.0 - 14.0)

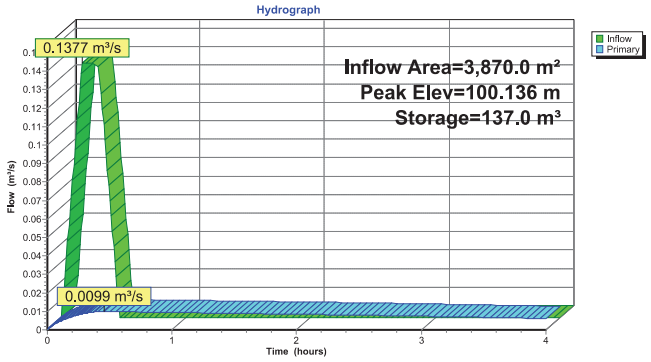
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	192.2 m³	**Custom Stage Data (Pyramidal)**Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.152	3,794.0	192.2	192.2	3,794.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**Special & User-Defined X 7.00** Head (meters) 0.000 0.152 Disch. (m³/s) 0.00000 0.00158

Primary OutFlow Max=0.0099 m³/s @ 0.45 hrs HW=100.136 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0099 m³/s)

Pond 2P: Rooftop Storage

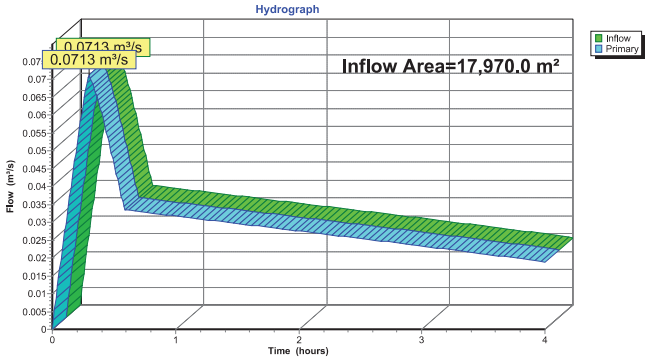


Summary for Link 1L: Site Release

Inflow Area = 17,970.0 m², 55.20% Impervious, Inflow Depth > 23 mm for 100-Year event
Inflow = 0.0713 m³/s @ 0.30 hrs, Volume= 421.1 m³
Primary = 0.0713 m³/s @ 0.30 hrs, Volume= 421.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 1L: Site Release

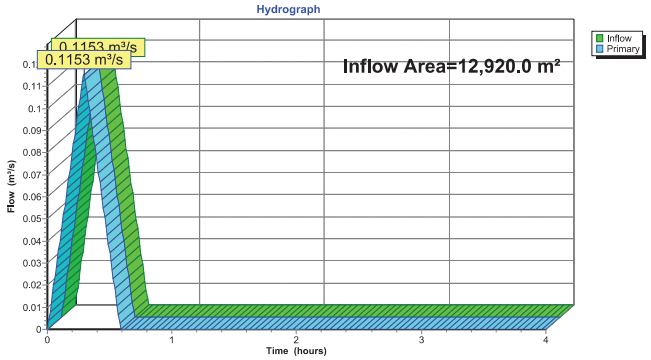


Summary for Link 2L: Undeveloped Areas Directed Downstream of Controls

Inflow Area = 12,920.0 m², 0.00% Impervious, Inflow Depth = 10 mm for 100-Year event
Inflow = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³
Primary = 0.1153 m³/s @ 0.30 hrs, Volume= 124.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 2L: Undeveloped Areas Directed Downstream of Controls

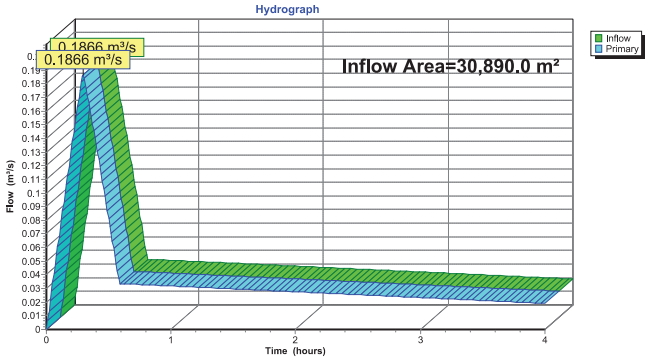


Summary for Link 4L: Total Site Outflow

Inflow Area = 30,890.0 m², 32.11% Impervious, Inflow Depth > 18 mm for 100-Year event
Inflow = 0.1866 m³/s @ 0.30 hrs, Volume= 545.2 m³
Primary = 0.1866 m³/s @ 0.30 hrs, Volume= 545.2 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

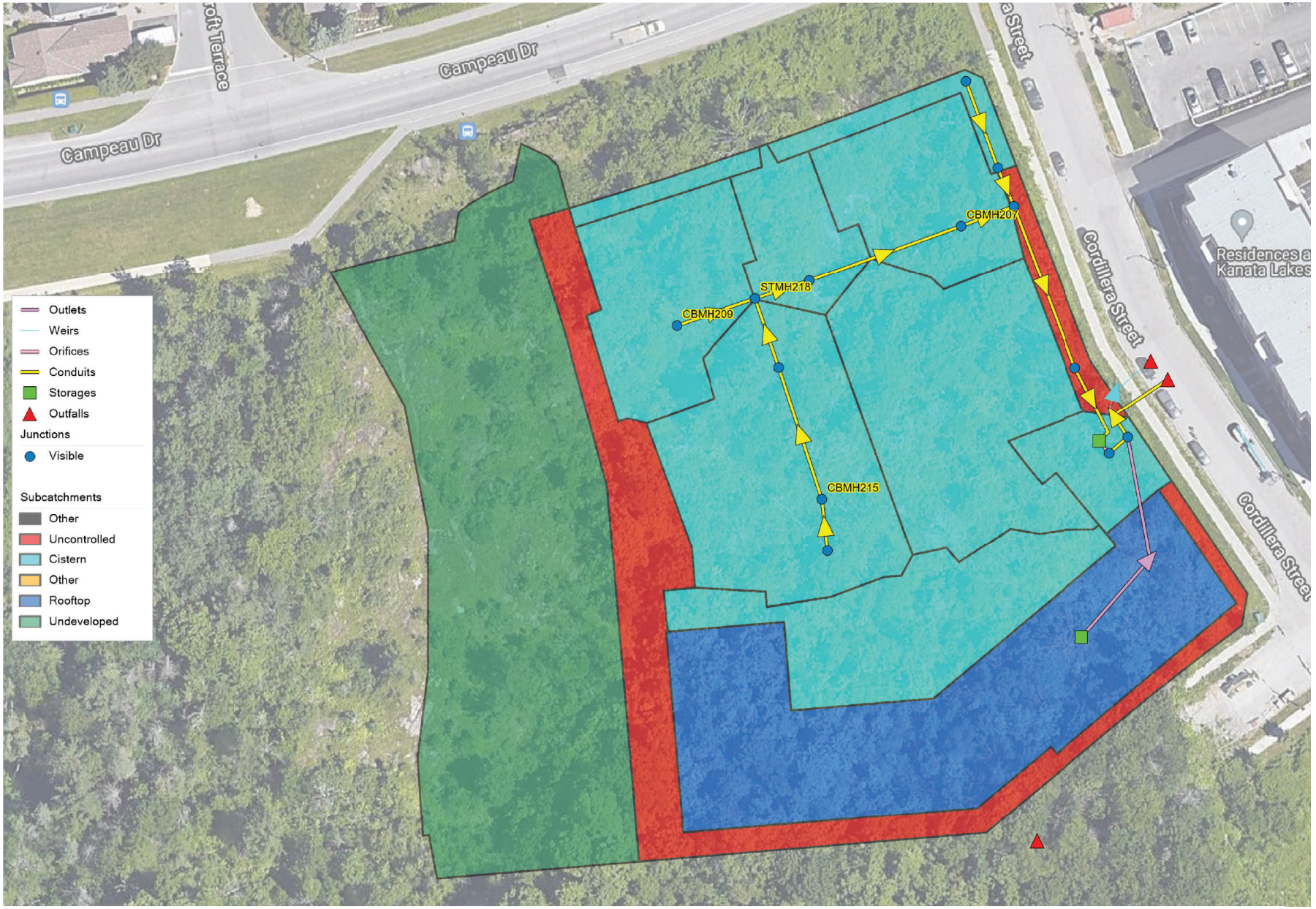
Link 4L: Total Site Outflow



APPENDIX

H

Parcel 2 - Model Output (PCSWMM)


Campeau Dr
Campeau Dr
Cordillera Street
Cordillera Street
Residences a
Kanata Lakes
CBMH207
STMH218
CBMH209
CBMH215
Outlets
Weirs
Orifices
Conduits
Storages
Outfalls
Junctions
Visible
Subcatchments
Other
Uncontrolled
Cistern
Other
Rooftop
Undeveloped

10-year 24-hour Chicago Distribution Report File Provided. Other distributions are available upon request.

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
  ---------------------------------------------------------------

  WARNING 03: negative offset ignored for Link C1_2
  WARNING 03: negative offset ignored for Link C11
  WARNING 03: negative offset ignored for Link C13
  WARNING 10: crest elevation raised to downstream invert for regulator Link OR1

  *************
  Element Count
  *************
  Number of rain gages ...... 60
  Number of subcatchments ... 13
  Number of nodes ........... 18
  Number of links ........... 16
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ----------------------------------------------------------------------
  100yr_3hr_Chicago    C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\100yr_3hr_Chicago.dat
  100yr_3hr_Chicago_Climate_Change 100yr_3hr_Chicago_Increase_20percent INTENSITY
 10 min.
  100yr_6hr_Chicago    C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\100yr_6hr_Chicago.dat
  100yr_6hr_Chicago_Climate_Change 100yr_6hr_Chicago_Increase_20percent INTENSITY
 10 min.
  100yrAES12hr         100yrAES12hr               INTENSITY    5 min.
  100yrChicago         100yrChicago               INTENSITY   10 min.
  100yrChicago12hr     C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\100yrChicago12hr.dat
  100yrChicago24hr     C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\100yrChicago24hr.dat
  100yrChicago3hr      100yrChicago               INTENSITY   10 min.
  100yrChicago6hr      100yrChicago6hr            INTENSITY   10 min.
  100yrSCS24hr         100yrSCS24hr               INTENSITY   10 min.
  10yr_24hr_Chi        10yr_24hr_Chi              INTENSITY   10 min.
  10yr_3hr_Chicago     C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\10yr_3hr_Chicago.dat
  10yr_6hr_Chicago     C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\10yr_6hr_Chicago.dat
  10yrChicago          10yrChicago                INTENSITY   10 min.
  10yrChicago24hr      C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\10yrChicago24hr.dat
  10yrChicago3hr       10yrChicago                INTENSITY   10 min.
  10yrSCS24hr          10yrSCS24hr                INTENSITY   10 min.
  25mm_3hr_Chicago     25mm_3hr_Chicago           INTENSITY   10 min.
  25mm_4hr_Chicago     25mm_4hr_Chicago           INTENSITY   10 min.
  25yr_3hr_Chicago     25yr_3hr_Chicago           INTENSITY   10 min.
  25yr_6hr_Chicago     25yr_6hr_Chicago           INTENSITY   10 min.
  25yrAES12hr          25yrAES12hr                INTENSITY    5 min.
  25yrChicago          25yrChicago                INTENSITY   10 min.
  25yrChicago12hr      25yrChicago12hr            INTENSITY   10 min.
  25yrChicago24hr      25yrChicago24hr            INTENSITY   10 min.
  25yrChicago3hr       25yrChicago                INTENSITY   10 min.
  25yrChicago6hr       25yrChicago6hr             INTENSITY   10 min.
  25yrSCS24hr          25yrSCS24hr                INTENSITY   10 min.
  2yr_3hr_Chicago      2yr_3hr_Chicago            INTENSITY   10 min.
  2yr_6hr_Chicago      2yr_6hr_Chicago            INTENSITY   10 min.
  2yrChicago           2yrChicago                 INTENSITY   10 min.
  2yrChicago24hr       2yrChicago24hr             INTENSITY   10 min.
  2yrChicago3hr        2yrChicago                 INTENSITY   10 min.
  2yrSCS24hr           2yrSCS24hr                 INTENSITY   10 min.
  50yr_3hr_Chicago     50yr_3hr_Chicago           INTENSITY   10 min.
  50yr_6hr_Chicago     50yr_6hr_Chicago           INTENSITY   10 min.
  50yrChicago          50yrChicago                INTENSITY   10 min.
  50yrChicago24hr      50yrChicago24hr            INTENSITY   10 min.
  50yrChicago3hr       50yrChicago                INTENSITY   10 min.
  50yrSCS24hr          50yrSCS24hr                INTENSITY   10 min.
  5yr_3hr_Chicago      5yr_3hr_Chicago            INTENSITY   10 min.
  5yr_6hr_Chicago      5yr_6hr_Chicago            INTENSITY   10 min.
  5yrAES12hr           5yrAES12hr                 INTENSITY    5 min.
  5yrChicago           C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\5yrChicago3hr.dat
  5yrChicago12hr       C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\5yrChicago12hr.dat
  5yrChicago24hr       C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\5yrChicago24hr.dat
  5yrChicago3hr        C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\5yrChicago3hr.dat
  5yrChicago6hr        C:\Users\michael.stewart\OneDrive - WSP
O365\Projects\Campeau Drive\PCSWMM\2021-05-13\Rainfall\5yrChicago6hr.dat
  5yrSCS24             5yrSCS24hr                 INTENSITY   10 min.
  BLANK                BLANK                      INTENSITY   10 min.
  Continuous           2010Precipitation          VOLUME      15 min.
  MTO_100yrSCS12hr     MTO_100yrSCS12hr           INTENSITY   15 min.
  MTO_10yrSCS12hr      MTO_10yrSCS12hr            INTENSITY   15 min.
  MTO_20mmSCS12hr      MTO_20mmSCS12hr            INTENSITY   15 min.
  MTO_25mmSCS12hr      MTO_25mmSCS12hr            INTENSITY   15 min.
  MTO_25yrSCS12hr      MTO_25yrSCS12hr            INTENSITY   15 min.
  MTO_2yrSCS12hr       MTO_2yrSCS12hr             INTENSITY   15 min.
  MTO_50yrSCS12hr      MTO_50yrSCS12hr            INTENSITY   15 min.
  Rainfall1980         Rainfall1980               INTENSITY    5 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage
  Outlet

------------------------------------------------------------------------------------
-------------------------
  B-101                       0.16      9.04     22.09    0.5000 10yr_24hr_Chi
  CanadianShieldAve_DICB
  B-102                       0.10     33.87     98.04    0.5000 10yr_24hr_Chi
  CBMH209
  B-103                       0.18     22.24     87.64    0.5000 10yr_24hr_Chi
  CBMH217
  B-104                       0.05     24.60     91.84    0.5000 10yr_24hr_Chi
  CBMH208
  B-105                       0.18     50.97     85.96    0.5000 10yr_24hr_Chi
  Cistern
  B-106                       0.09     29.13     97.70    0.5000 10yr_24hr_Chi
  CBMH207
  B-107                       0.01      4.40     53.85    0.5000 10yr_24hr_Chi
  B-108
  B-108                       0.02      7.63     30.43    0.5000 10yr_24hr_Chi
  CB204
  B-109                       0.04     18.20     63.27    0.5000 10yr_24hr_Chi
  STMH202
  B-110                       0.13     31.85     27.56    0.5000 10yr_24hr_Chi
  B01
  B-111                       0.02      6.54     34.78    0.5000 10yr_24hr_Chi
  Cordillera_Major
  B-BLDG                      0.28     27.56    100.00    0.5000 10yr_24hr_Chi
  BLDG
  B-EXT1                      0.44     36.38      0.00    0.5000 10yr_24hr_Chi
  CanadianShieldAve_DICB


  ************
  Node Summary
  ************
                                     Invert      Max.    Ponded    External
  Name                 Type           Elev.     Depth      Area    Inflow
  ----------------------------------------------------------------------------
  B01                  JUNCTION      100.15      5.05      10.0
  CB204                JUNCTION      101.09      2.25      10.0
  CBMH207              JUNCTION       99.55      3.60      10.0
  CBMH208              JUNCTION       99.65      3.80      10.0
  CBMH209              JUNCTION      100.03      3.72      10.0
  CBMH215              JUNCTION      100.07      4.63      10.0
  CBMH217              JUNCTION       99.89      3.86      10.0
  CisternDS            JUNCTION       99.31      2.75      10.0
  RYCB205              JUNCTION      101.28      2.77      10.0
  STMH202              JUNCTION       99.23      2.51      10.0
  STMH205              JUNCTION       99.37      3.63      10.0
  STMH206              JUNCTION       99.47      3.84      10.0
  STMH218              JUNCTION       99.75      4.15      10.0
  CanadianShieldAve_DICB OUTFALL        0.00      0.00       0.0
  Cordillera_Major     OUTFALL        0.00      0.00       0.0
  Cordillera_Minor     OUTFALL       99.02      0.30       0.0
  BLDG                 STORAGE      110.00      0.35       0.0
  Cistern              STORAGE       99.27      3.11       0.0


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length
%Slope Roughness

----------------------------------------------------------------------------------
-----------
  C1_1             STMH206          STMH205          CONDUIT           31.9
0.2442   0.0130
  C1_2             STMH205          Cistern          CONDUIT           15.8
0.3669   0.0130
  C10              B01              CBMH215          CONDUIT           16.0
0.3131   0.0130
  C11              CisternDS        STMH202          CONDUIT            3.8
1.2586   0.0130
  C13              STMH202          Cordillera_Minor CONDUIT           16.9
1.2360   0.0130
  C14              CB204            STMH206          CONDUIT            8.3
0.9993   0.0130
  C15              RYCB205          CB204            CONDUIT           16.5
1.0196   0.0100
  C3               CBMH207          STMH206          CONDUIT           10.4
0.2491   0.0130
  C4               CBMH208          CBMH207          CONDUIT           24.1
0.3071   0.0130
  C5               STMH218          CBMH208          CONDUIT           13.9
0.2308   0.0130
  C6               CBMH209          STMH218          CONDUIT           22.8
0.6763   0.0130
  C8               CBMH217          STMH218          CONDUIT           17.8
0.3418   0.0130
  C9               CBMH215          CBMH217          CONDUIT           17.0
0.7455   0.0130
  OR1              Cistern          CisternDS        ORIFICE
  W1               Cistern          Cordillera_Major WEIR
```

OL1 BLDG STMH202 OUTLET

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1_1	CIRCULAR	0.45	0.16	0.11	0.45	1	0.14
C1_2	CIRCULAR	0.45	0.16	0.11	0.45	1	0.17
C10	CIRCULAR	0.25	0.05	0.06	0.25	1	0.03
C11	CIRCULAR	0.36	0.10	0.09	0.36	1	0.18
C13	CIRCULAR	0.30	0.07	0.07	0.30	1	0.11
C14	CIRCULAR	0.25	0.05	0.06	0.25	1	0.06
C15	CIRCULAR	0.25	0.05	0.06	0.25	1	0.08
C3	CIRCULAR	0.45	0.16	0.11	0.45	1	0.14
C4	CIRCULAR	0.45	0.16	0.11	0.45	1	0.16
C5	CIRCULAR	0.38	0.11	0.09	0.38	1	0.08
C6	CIRCULAR	0.25	0.05	0.06	0.25	1	0.05
C8	CIRCULAR	0.30	0.07	0.07	0.30	1	0.06
C9	CIRCULAR	0.25	0.05	0.06	0.25	1	0.05

****
Transect Summary
****

Transect Overland_Outlet2
Area:
0.0015 0.0036 0.0065 0.0100 0.0142
0.0190 0.0246 0.0308 0.0377 0.0453
0.0535 0.0625 0.0721 0.0824 0.0934
0.1051 0.1174 0.1304 0.1441 0.1585
0.1735 0.1893 0.2057 0.2228 0.2406
0.2590 0.2782 0.2980 0.3185 0.3396
0.3615 0.3840 0.4072 0.4312 0.4566
0.4833 0.5114 0.5408 0.5716 0.6038
0.6373 0.6722 0.7084 0.7460 0.7849
0.8252 0.8669 0.9099 0.9543 1.0000
Hrad:
0.0377 0.0675 0.0945 0.1201 0.1450
0.1694 0.1936 0.2175 0.2413 0.2650
0.2886 0.3122 0.3357 0.3591 0.3826
0.4060 0.4293 0.4527 0.4760 0.4994
0.5227 0.5460 0.5693 0.5925 0.6158
0.6391 0.6623 0.6856 0.7088 0.7321
0.7553 0.7786 0.8018 0.8102 0.8132
0.8182 0.8249 0.8331 0.8426 0.8532
0.8648 0.8773 0.8906 0.9046 0.9193
0.9345 0.9502 0.9664 0.9830 1.0000
Width:
0.0390 0.0537 0.0683 0.0829 0.0976
0.1122 0.1268 0.1415 0.1561 0.1707
0.1854 0.2000 0.2146 0.2293 0.2439
0.2585 0.2732 0.2878 0.3024 0.3171
0.3317 0.3463 0.3610 0.3756 0.3902
0.4049 0.4195 0.4341 0.4488 0.4634
0.4780 0.4927 0.5073 0.5317 0.5610
0.5902 0.6195 0.6488 0.6780 0.7073
0.7366 0.7659 0.7951 0.8244 0.8537
0.8829 0.9122 0.9415 0.9707 1.0000

Transect RYCB_Overland
Area:
0.0009 0.0026 0.0050 0.0081 0.0121
0.0168 0.0222 0.0284 0.0354 0.0431
0.0516 0.0609 0.0709 0.0816 0.0931
0.1054 0.1183 0.1320 0.1464 0.1616
0.1775 0.1941 0.2114 0.2294 0.2482
0.2678 0.2880 0.3090 0.3307 0.3531
0.3763 0.4002 0.4248 0.4501 0.4762
0.5030 0.5306 0.5595 0.5895 0.6207
0.6532 0.6869 0.7218 0.7579 0.7952
0.8337 0.8735 0.9144 0.9566 1.0000
Hrad:
0.0309 0.0552 0.0782 0.1008 0.1232
0.1454 0.1676 0.1898 0.2119 0.2340
0.2561 0.2781 0.3002 0.3225 0.3453
0.3681 0.3907 0.4133 0.4358 0.4583
0.4807 0.5031 0.5254 0.5477 0.5700
0.5923 0.6146 0.6368 0.6590 0.6812
0.7034 0.7256 0.7478 0.7699 0.7921
0.8142 0.8274 0.8363 0.8463 0.8572
0.8690 0.8814 0.8945 0.9082 0.9224
0.9371 0.9523 0.9678 0.9837 1.0000
Width:
0.0290 0.0463 0.0635 0.0808 0.0980
0.1153 0.1325 0.1498 0.1671 0.1843
0.2016 0.2188 0.2361 0.2531 0.2696
0.2862 0.3028 0.3193 0.3359 0.3525
0.3690 0.3856 0.4022 0.4187 0.4353
0.4519 0.4684 0.4850 0.5016 0.5181
0.5347 0.5512 0.5678 0.5844 0.6009
0.6175 0.6411 0.6687 0.6963 0.7239
0.7515 0.7791 0.8067 0.8344 0.8620
0.8896 0.9172 0.9448 0.9724 1.0000

Transect T_Major_Asphalt_Overflow_10m
Area:
0.0200 0.0400 0.0600 0.0800 0.1000
0.1200 0.1400 0.1600 0.1800 0.2000
0.2200 0.2400 0.2600 0.2800 0.3000
0.3200 0.3400 0.3600 0.3800 0.4000
0.4200 0.4400 0.4600 0.4800 0.5000
0.5200 0.5400 0.5600 0.5800 0.6000
0.6200 0.6400 0.6600 0.6800 0.7000
0.7200 0.7400 0.7600 0.7800 0.8000
0.8200 0.8400 0.8600 0.8800 0.9000
0.9200 0.9400 0.9600 0.9800 1.0000
Hrad:
0.0316 0.0625 0.0927 0.1221 0.1509
0.1791 0.2066 0.2336 0.2599 0.2857
0.3110 0.3357 0.3599 0.3836 0.4068
0.4295 0.4518 0.4737 0.4951 0.5161
0.5367 0.5570 0.5768 0.5963 0.6154
0.6341 0.6526 0.6707 0.6884 0.7059
0.7230 0.7399 0.7564 0.7727 0.7887
0.8045 0.8199 0.8352 0.8501 0.8649
0.8794 0.8936 0.9077 0.9215 0.9351
0.9485 0.9616 0.9746 0.9874 1.0000
Width:
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000

Transect T_Major_Graham_Creek_01
Area:
0.0012 0.0034 0.0061 0.0092 0.0128
0.0167 0.0209 0.0256 0.0307 0.0364
0.0425 0.0492 0.0565 0.0643 0.0727
0.0818 0.0913 0.1014 0.1121 0.1244
0.1421 0.1616 0.1813 0.2012 0.2212
0.2415 0.2621 0.2835 0.3062 0.3303
0.3559 0.3848 0.4166 0.4506 0.4846
0.5187 0.5528 0.5870 0.6213 0.6556
0.6899 0.7242 0.7586 0.7930 0.8274
0.8619 0.8964 0.9309 0.9654 1.0000
Hrad:
0.0180 0.0389 0.0592 0.0770 0.0953
0.1135 0.1303 0.1445 0.1580 0.1714
0.1822 0.1945 0.2076 0.2186 0.2298
0.2433 0.2579 0.2705 0.2772 0.2712
0.2850 0.3038 0.3282 0.3552 0.3840
0.4109 0.4355 0.4497 0.4496 0.4662
0.4558 0.4485 0.4582 0.4747 0.5073
0.5397 0.5718 0.6036 0.6367 0.6703
0.7038 0.7372 0.7705 0.8036 0.8367
0.8696 0.9024 0.9350 0.9676 1.0000
Width:
0.0535 0.0717 0.0839 0.0973 0.1084
0.1183 0.1287 0.1416 0.1553 0.1692
0.1862 0.2020 0.2171 0.2350 0.2532
0.2689 0.2830 0.2995 0.3237 0.4231
0.5561 0.5670 0.5721 0.5772 0.5823
0.5913 0.6042 0.6315 0.6819 0.7118
0.7906 0.8795 0.9809 0.9828 0.9845
0.9862 0.9879 0.9896 0.9907 0.9915
0.9924 0.9932 0.9941 0.9949 0.9958
0.9966 0.9975 0.9983 0.9992 1.0000

Transect T_Major_Grass_Overflow_15m
Area:
0.0200 0.0400 0.0600 0.0800 0.1000
0.1200 0.1400 0.1600 0.1800 0.2000
0.2200 0.2400 0.2600 0.2800 0.3000
0.3200 0.3400 0.3600 0.3800 0.4000
0.4200 0.4400 0.4600 0.4800 0.5000
0.5200 0.5400 0.5600 0.5800 0.6000
0.6200 0.6400 0.6600 0.6800 0.7000
0.7200 0.7400 0.7600 0.7800 0.8000
0.8200 0.8400 0.8600 0.8800 0.9000
0.9200 0.9400 0.9600 0.9800 1.0000
Hrad:
0.0278 0.0551 0.0820 0.1085 0.1346

```
            0.1603     0.1856     0.2105     0.2351     0.2593
            0.2831     0.3066     0.3297     0.3525     0.3750
            0.3972     0.4190     0.4406     0.4618     0.4828
            0.5034     0.5238     0.5439     0.5638     0.5833
            0.6026     0.6217     0.6405     0.6591     0.6774
            0.6955     0.7134     0.7310     0.7484     0.7656
            0.7826     0.7994     0.8160     0.8323     0.8485
            0.8645     0.8802     0.8958     0.9112     0.9265
            0.9415     0.9564     0.9711     0.9856     1.0000
Width:
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Grass_Overflow_5m
Area:
            0.0200     0.0400     0.0600     0.0800     0.1000
            0.1200     0.1400     0.1600     0.1800     0.2000
            0.2200     0.2400     0.2600     0.2800     0.3000
            0.3200     0.3400     0.3600     0.3800     0.4000
            0.4200     0.4400     0.4600     0.4800     0.5000
            0.5200     0.5400     0.5600     0.5800     0.6000
            0.6200     0.6400     0.6600     0.6800     0.7000
            0.7200     0.7400     0.7600     0.7800     0.8000
            0.8200     0.8400     0.8600     0.8800     0.9000
            0.9200     0.9400     0.9600     0.9800     1.0000
Hrad:
            0.0430     0.0840     0.1231     0.1606     0.1964
            0.2308     0.2637     0.2953     0.3257     0.3548
            0.3829     0.4099     0.4360     0.4611     0.4853
            0.5087     0.5313     0.5531     0.5742     0.5946
            0.6144     0.6335     0.6521     0.6701     0.6875
            0.7044     0.7209     0.7368     0.7524     0.7674
            0.7821     0.7964     0.8103     0.8238     0.8370
            0.8498     0.8623     0.8745     0.8864     0.8980
            0.9093     0.9203     0.9311     0.9416     0.9519
            0.9620     0.9718     0.9814     0.9908     1.0000
Width:
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_10.5M_CURB
Area:
            0.0022     0.0087     0.0166     0.0261     0.0373
            0.0503     0.0650     0.0815     0.0998     0.1198
            0.1415     0.1635     0.1855     0.2075     0.2296
            0.2516     0.2736     0.2956     0.3176     0.3396
            0.3616     0.3836     0.4057     0.4277     0.4497
            0.4717     0.4937     0.5157     0.5377     0.5597
            0.5818     0.6038     0.6258     0.6478     0.6698
            0.6918     0.7138     0.7358     0.7579     0.7799
            0.8019     0.8239     0.8459     0.8679     0.8899
            0.9119     0.9340     0.9560     0.9780     1.0000
Hrad:
            0.0191     0.0428     0.0791     0.1080     0.1313
            0.1508     0.1679     0.1831     0.1969     0.2098
            0.2240     0.2423     0.2617     0.2817     0.3020
            0.3226     0.3433     0.3641     0.3850     0.4059
            0.4267     0.4475     0.4683     0.4890     0.5097
            0.5303     0.5508     0.5712     0.5916     0.6119
            0.6321     0.6522     0.6722     0.6921     0.7120
            0.7318     0.7515     0.7711     0.7906     0.8100
            0.8294     0.8487     0.8679     0.8870     0.9060
            0.9250     0.9438     0.9626     0.9814     1.0000
Width:
            0.2000     0.3500     0.3900     0.4700     0.5500
            0.6300     0.7100     0.7900     0.8700     0.9500
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_10M_CURB
Area:
            0.0022     0.0086     0.0162     0.0253     0.0362
            0.0489     0.0633     0.0795     0.0974     0.1172
            0.1387     0.1607     0.1828     0.2049     0.2270
            0.2491     0.2712     0.2933     0.3153     0.3374
            0.3595     0.3816     0.4037     0.4258     0.4479
            0.4699     0.4920     0.5141     0.5362     0.5583
            0.5804     0.6025     0.6245     0.6466     0.6687
```

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            0.6908     0.7129     0.7350     0.7571     0.7791
            0.8012     0.8233     0.8454     0.8675     0.8896
            0.9117     0.9337     0.9558     0.9779     1.0000
Hrad:
            0.0195     0.0453     0.0821     0.1110     0.1341
            0.1534     0.1701     0.1849     0.1985     0.2112
            0.2240     0.2420     0.2612     0.2810     0.3013
            0.3218     0.3425     0.3633     0.3842     0.4051
            0.4260     0.4468     0.4676     0.4884     0.5091
            0.5297     0.5503     0.5707     0.5911     0.6115
            0.6317     0.6518     0.6719     0.6919     0.7118
            0.7316     0.7513     0.7709     0.7905     0.8099
            0.8293     0.8486     0.8678     0.8869     0.9060
            0.9249     0.9438     0.9626     0.9814     1.0000
Width:
            0.2000     0.3333     0.3733     0.4533     0.5333
            0.6133     0.6933     0.7733     0.8533     0.9333
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_10M_DITCH_BARRIER
Area:
            0.0007     0.0028     0.0062     0.0111     0.0173
            0.0250     0.0340     0.0444     0.0571     0.0752
            0.0978     0.1210     0.1441     0.1672     0.1904
            0.2135     0.2366     0.2598     0.2829     0.3060
            0.3292     0.3523     0.3754     0.3986     0.4217
            0.4448     0.4680     0.4911     0.5142     0.5373
            0.5605     0.5836     0.6067     0.6299     0.6530
            0.6761     0.6993     0.7224     0.7455     0.7687
            0.7918     0.8149     0.8381     0.8612     0.8843
            0.9075     0.9306     0.9537     0.9769     1.0000
Hrad:
            0.0091     0.0182     0.0274     0.0365     0.0456
            0.0547     0.0639     0.0730     0.0859     0.0972
            0.1119     0.1328     0.1561     0.1806     0.2056
            0.2310     0.2566     0.2821     0.3076     0.3330
            0.3582     0.3833     0.4082     0.4329     0.4574
            0.4816     0.5057     0.5295     0.5531     0.5765
            0.5997     0.6227     0.6454     0.6679     0.6902
            0.7123     0.7341     0.7558     0.7772     0.7985
            0.8195     0.8403     0.8610     0.8814     0.9016
            0.9217     0.9415     0.9612     0.9807     1.0000
Width:
```

```
            0.0600     0.1200     0.1800     0.2400     0.3000
            0.3600     0.4200     0.4800     0.6600     0.9000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_14M_NO_CURB
Area:
            0.0017     0.0070     0.0157     0.0276     0.0412
            0.0560     0.0721     0.0896     0.1083     0.1284
            0.1497     0.1715     0.1933     0.2151     0.2369
            0.2587     0.2805     0.3023     0.3241     0.3459
            0.3677     0.3895     0.4113     0.4331     0.4549
            0.4767     0.4985     0.5203     0.5422     0.5640
            0.5858     0.6076     0.6294     0.6512     0.6730
            0.6948     0.7166     0.7384     0.7602     0.7820
            0.8038     0.8256     0.8474     0.8692     0.8910
            0.9128     0.9346     0.9564     0.9782     1.0000
Hrad:
            0.0145     0.0289     0.0434     0.0630     0.0864
            0.1080     0.1281     0.1469     0.1645     0.1811
            0.1978     0.2188     0.2401     0.2615     0.2830
            0.3045     0.3260     0.3475     0.3689     0.3903
            0.4117     0.4330     0.4542     0.4753     0.4964
            0.5174     0.5384     0.5593     0.5800     0.6008
            0.6214     0.6420     0.6625     0.6829     0.7033
            0.7235     0.7438     0.7639     0.7839     0.8039
            0.8239     0.8437     0.8635     0.8832     0.9028
            0.9224     0.9419     0.9613     0.9807     1.0000
Width:
            0.1600     0.3200     0.4800     0.5900     0.6500
            0.7100     0.7700     0.8300     0.8900     0.9500
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_15M_CURB
Area:
            0.0013     0.0054     0.0123     0.0220     0.0331
            0.0456     0.0593     0.0745     0.0910     0.1088
```

```
            0.1280     0.1485     0.1703     0.1928     0.2152
            0.2376     0.2600     0.2825     0.3049     0.3273
            0.3497     0.3721     0.3946     0.4170     0.4394
            0.4618     0.4843     0.5067     0.5291     0.5515
            0.5740     0.5964     0.6188     0.6412     0.6636
            0.6861     0.7085     0.7309     0.7533     0.7758
            0.7982     0.8206     0.8430     0.8655     0.8879
            0.9103     0.9327     0.9552     0.9776     1.0000
Hrad:
            0.0182     0.0364     0.0539     0.0825     0.1092
            0.1328     0.1540     0.1733     0.1910     0.2075
            0.2229     0.2375     0.2517     0.2705     0.2900
            0.3100     0.3303     0.3508     0.3715     0.3923
            0.4131     0.4340     0.4548     0.4757     0.4965
            0.5173     0.5381     0.5588     0.5795     0.6001
            0.6207     0.6412     0.6617     0.6821     0.7025
            0.7227     0.7430     0.7631     0.7832     0.8032
            0.8232     0.8431     0.8629     0.8827     0.9024
            0.9221     0.9416     0.9612     0.9806     1.0000
Width:
            0.1200     0.2400     0.3900     0.4650     0.5250
            0.5850     0.6450     0.7050     0.7650     0.8250
            0.8850     0.9450     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_15M_CURB_MEDIAN
Area:
            0.0013     0.0054     0.0122     0.0208     0.0309
            0.0431     0.0569     0.0721     0.0886     0.1065
            0.1257     0.1463     0.1682     0.1907     0.2132
            0.2356     0.2581     0.2806     0.3031     0.3256
            0.3480     0.3705     0.3930     0.4155     0.4380
            0.4605     0.4829     0.5054     0.5279     0.5504
            0.5729     0.5953     0.6178     0.6403     0.6628
            0.6853     0.7077     0.7302     0.7527     0.7752
            0.7977     0.8202     0.8426     0.8651     0.8876
            0.9101     0.9326     0.9550     0.9775     1.0000
Hrad:
            0.0185     0.0371     0.0599     0.0892     0.1136
            0.1225     0.1442     0.1639     0.1821     0.1991
            0.2149     0.2299     0.2446     0.2638     0.2837
            0.3040     0.3246     0.3455     0.3664     0.3874
            0.4085     0.4296     0.4506     0.4717     0.4927
            0.5137     0.5347     0.5556     0.5765     0.5973
            0.6180     0.6387     0.6593     0.6799     0.7004
            0.7208     0.7412     0.7615     0.7817     0.8019
            0.8220     0.8420     0.8620     0.8819     0.9018
            0.9215     0.9413     0.9609     0.9805     1.0000
Width:
            0.1200     0.2400     0.3550     0.4150     0.4750
            0.5850     0.6450     0.7050     0.7650     0.8250
            0.8850     0.9450     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_20M_CURB_MEDIAN
Area:
            0.0033     0.0117     0.0217     0.0337     0.0467
            0.0608     0.0758     0.0918     0.1089     0.1270
            0.1461     0.1662     0.1873     0.2092     0.2312
            0.2532     0.2751     0.2971     0.3191     0.3410
            0.3630     0.3850     0.4069     0.4289     0.4509
            0.4728     0.4948     0.5167     0.5387     0.5607
            0.5826     0.6046     0.6266     0.6485     0.6705
            0.6925     0.7144     0.7364     0.7584     0.7803
            0.8023     0.8243     0.8462     0.8682     0.8902
            0.9121     0.9341     0.9561     0.9780     1.0000
Hrad:
            0.0160     0.0422     0.0618     0.0903     0.1163
            0.1403     0.1626     0.1834     0.2029     0.2213
            0.2387     0.2553     0.2710     0.2884     0.3074
            0.3268     0.3464     0.3663     0.3863     0.4065
            0.4266     0.4469     0.4671     0.4874     0.5076
            0.5278     0.5480     0.5682     0.5883     0.6084
            0.6285     0.6485     0.6684     0.6883     0.7082
            0.7280     0.7478     0.7675     0.7871     0.8068
            0.8263     0.8458     0.8653     0.8847     0.9040
            0.9233     0.9426     0.9618     0.9809     1.0000
Width:
            0.3000     0.4000     0.5231     0.5692     0.6154
            0.6615     0.7077     0.7538     0.8000     0.8462
            0.8923     0.9385     0.9846     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_25M_CURB_MEDIAN
Area:
            0.0032     0.0127     0.0256     0.0401     0.0558
            0.0729     0.0912     0.1108     0.1316     0.1528
            0.1740     0.1952     0.2163     0.2375     0.2587
            0.2799     0.3011     0.3222     0.3434     0.3646
            0.3858     0.4070     0.4281     0.4493     0.4705
            0.4917     0.5129     0.5340     0.5552     0.5764
            0.5976     0.6188     0.6399     0.6611     0.6823
            0.7035     0.7247     0.7458     0.7670     0.7882
            0.8094     0.8306     0.8517     0.8729     0.8941
            0.9153     0.9365     0.9576     0.9788     1.0000
Hrad:
            0.0143     0.0297     0.0541     0.0795     0.1027
            0.1241     0.1438     0.1623     0.1800     0.1995
            0.2194     0.2397     0.2601     0.2806     0.3012
            0.3218     0.3424     0.3630     0.3836     0.4042
            0.4247     0.4452     0.4657     0.4861     0.5064
            0.5268     0.5470     0.5672     0.5874     0.6075
            0.6276     0.6476     0.6676     0.6875     0.7074
            0.7272     0.7470     0.7667     0.7864     0.8060
            0.8256     0.8452     0.8647     0.8841     0.9036
            0.9229     0.9423     0.9615     0.9808     1.0000
Width:
            0.3000     0.5750     0.6550     0.7150     0.7750
            0.8350     0.8950     0.9550     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_5M_CURB_FULL
Area:
            0.0031     0.0076     0.0123     0.0190     0.0277
            0.0387     0.0518     0.0670     0.0844     0.1040
            0.1256     0.1481     0.1705     0.1929     0.2153
            0.2377     0.2602     0.2826     0.3050     0.3274
            0.3498     0.3723     0.3947     0.4171     0.4395
            0.4619     0.4844     0.5068     0.5292     0.5516
            0.5740     0.5965     0.6189     0.6413     0.6637
            0.6861     0.7085     0.7310     0.7534     0.7758
            0.7982     0.8206     0.8431     0.8655     0.8879
            0.9103     0.9327     0.9552     0.9776     1.0000
Hrad:
            0.0323     0.0775     0.1185     0.1425     0.1569
            0.1676     0.1769     0.1857     0.1945     0.2032
            0.2134     0.2318     0.2515     0.2720     0.2931
            0.3144     0.3359     0.3575     0.3792     0.4008
            0.4223     0.4438     0.4652     0.4866     0.5078
            0.5289     0.5499     0.5708     0.5916     0.6122
            0.6328     0.6532     0.6735     0.6936     0.7137
            0.7336     0.7534     0.7730     0.7926     0.8120
            0.8313     0.8505     0.8696     0.8886     0.9074
            0.9262     0.9448     0.9633     0.9817     1.0000
Width:
            0.2000     0.2000     0.2480     0.3440     0.4400
            0.5360     0.6320     0.7280     0.8240     0.9200
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_5M_CURB_MEDIAN
Area:
            0.0043     0.0105     0.0185     0.0294     0.0418
            0.0556     0.0710     0.0879     0.1062     0.1261
            0.1474     0.1693     0.1912     0.2130     0.2349
            0.2567     0.2786     0.3005     0.3223     0.3442
            0.3660     0.3879     0.4098     0.4316     0.4535
            0.4753     0.4972     0.5191     0.5409     0.5628
            0.5846     0.6065     0.6284     0.6502     0.6721
            0.6939     0.7158     0.7377     0.7595     0.7814
            0.8033     0.8251     0.8470     0.8688     0.8907
            0.9126     0.9344     0.9563     0.9781     1.0000
Hrad:
            0.0300     0.0720     0.1005     0.1207     0.1406
            0.1592     0.1764     0.1923     0.2074     0.2215
            0.2358     0.2547     0.2744     0.2947     0.3153
            0.3361     0.3569     0.3779     0.3988     0.4197
            0.4405     0.4613     0.4819     0.5025     0.5230
            0.5434     0.5636     0.5838     0.6038     0.6238
            0.6436     0.6633     0.6829     0.7024     0.7218
            0.7411     0.7602     0.7793     0.7982     0.8171
            0.8358     0.8544     0.8730     0.8914     0.9097
            0.9280     0.9461     0.9642     0.9821     1.0000
Width:
            0.2857     0.2857     0.4629     0.5314     0.6000
            0.6686     0.7371     0.8057     0.8743     0.9429
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
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            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_6M_CURB
Area:
            0.0018    0.0063    0.0111    0.0174    0.0256
            0.0357    0.0475    0.0612    0.0767    0.0940
            0.1132    0.1341    0.1567    0.1795    0.2023
            0.2251    0.2479    0.2707    0.2934    0.3162
            0.3390    0.3618    0.3846    0.4074    0.4302
            0.4530    0.4758    0.4986    0.5214    0.5442
            0.5670    0.5897    0.6125    0.6353    0.6581
            0.6809    0.7037    0.7265    0.7493    0.7721
            0.7949    0.8177    0.8405    0.8632    0.8860
            0.9088    0.9316    0.9544    0.9772    1.0000
Hrad:
            0.0231    0.0626    0.1042    0.1315    0.1501
            0.1645    0.1769    0.1882    0.1989    0.2092
            0.2193    0.2292    0.2433    0.2625    0.2826
            0.3033    0.3244    0.3457    0.3671    0.3886
            0.4101    0.4317    0.4532    0.4746    0.4960
            0.5174    0.5386    0.5598    0.5808    0.6018
            0.6227    0.6435    0.6642    0.6847    0.7052
            0.7256    0.7458    0.7660    0.7861    0.8060
            0.8259    0.8456    0.8653    0.8848    0.9043
            0.9236    0.9429    0.9620    0.9811    1.0000
Width:
            0.1600    0.2000    0.2400    0.3200    0.4000
            0.4800    0.5600    0.6400    0.7200    0.8000
            0.8800    0.9600    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_7.5M_CURB
Area:
            0.0018    0.0070    0.0130    0.0202    0.0288
            0.0388    0.0502    0.0631    0.0774    0.0931
            0.1102    0.1287    0.1487    0.1701    0.1928
            0.2159    0.2389    0.2620    0.2850    0.3081
            0.3312    0.3542    0.3773    0.4004    0.4234
            0.4465    0.4695    0.4926    0.5157    0.5387
            0.5618    0.5849    0.6079    0.6310    0.6541
            0.6771    0.7002    0.7232    0.7463    0.7694
            0.7924    0.8155    0.8386    0.8616    0.8847
            0.9077    0.9308    0.9539    0.9769    1.0000
Hrad:
            0.0216    0.0523    0.0928    0.1246    0.1496
            0.1705    0.1886    0.2047    0.2194    0.2331
            0.2460    0.2583    0.2701    0.2816    0.2949
            0.3137    0.3332    0.3533    0.3737    0.3943
            0.4152    0.4361    0.4570    0.4780    0.4990
            0.5199    0.5409    0.5617    0.5825    0.6033
            0.6239    0.6445    0.6651    0.6855    0.7058
            0.7261    0.7462    0.7663    0.7863    0.8062
            0.8260    0.8457    0.8653    0.8848    0.9042
            0.9236    0.9428    0.9620    0.9810    1.0000
Width:
            0.1600    0.2500    0.2808    0.3423    0.4038
            0.4654    0.5269    0.5885    0.6500    0.7115
            0.7731    0.8346    0.8962    0.9577    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_7.5M_NO_CURB
Area:
            0.0026    0.0100    0.0198    0.0312    0.0444
            0.0593    0.0759    0.0943    0.1144    0.1359
            0.1575    0.1791    0.2007    0.2223    0.2439
            0.2655    0.2871    0.3087    0.3303    0.3519
            0.3735    0.3951    0.4167    0.4383    0.4599
            0.4815    0.5031    0.5247    0.5463    0.5679
            0.5895    0.6111    0.6327    0.6543    0.6759
            0.6976    0.7192    0.7408    0.7624    0.7840
            0.8056    0.8272    0.8488    0.8704    0.8920
            0.9136    0.9352    0.9568    0.9784    1.0000
Hrad:
            0.0169    0.0392    0.0652    0.0876    0.1074
            0.1252    0.1416    0.1569    0.1712    0.1893
            0.2105    0.2319    0.2536    0.2753    0.2970
            0.3187    0.3403    0.3619    0.3834    0.4048
            0.4262    0.4474    0.4685    0.4895    0.5104
            0.5313    0.5520    0.5726    0.5931    0.6134
            0.6337    0.6539    0.6740    0.6939    0.7138
            0.7335    0.7532    0.7728    0.7922    0.8116
            0.8308    0.8500    0.8691    0.8881    0.9069
            0.9257    0.9444    0.9630    0.9816    1.0000
Width:
            0.2400    0.4100    0.4900    0.5700    0.6500
            0.7300    0.8100    0.8900    0.9700    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_7M_CURB
Area:
            0.0018    0.0068    0.0123    0.0193    0.0279
            0.0382    0.0501    0.0637    0.0790    0.0959
            0.1145    0.1347    0.1566    0.1794    0.2022
            0.2250    0.2478    0.2706    0.2934    0.3162
            0.3390    0.3618    0.3846    0.4074    0.4302
            0.4530    0.4758    0.4985    0.5213    0.5441
            0.5669    0.5897    0.6125    0.6353    0.6581
            0.6809    0.7037    0.7265    0.7493    0.7721
            0.7949    0.8177    0.8404    0.8632    0.8860
            0.9088    0.9316    0.9544    0.9772    1.0000
Hrad:
            0.0221    0.0556    0.0963    0.1260    0.1481
            0.1659    0.1811    0.1947    0.2072    0.2190
            0.2303    0.2412    0.2518    0.2698    0.2892
            0.3093    0.3299    0.3507    0.3718    0.3929
            0.4141    0.4354    0.4566    0.4778    0.4989
            0.5200    0.5411    0.5621    0.5829    0.6037
            0.6245    0.6451    0.6656    0.6861    0.7064
            0.7267    0.7468    0.7669    0.7868    0.8067
            0.8264    0.8461    0.8657    0.8851    0.9045
            0.9238    0.9430    0.9621    0.9811    1.0000
Width:
            0.1600    0.2333    0.2697    0.3424    0.4152
            0.4879    0.5606    0.6333    0.7061    0.7788
            0.8515    0.9242    0.9970    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_8.5M_CURB
Area:
            0.0021    0.0082    0.0159    0.0258    0.0384
            0.0535    0.0712    0.0916    0.1132    0.1348
            0.1565    0.1781    0.1997    0.2214    0.2430
            0.2646    0.2862    0.3079    0.3295    0.3511
            0.3728    0.3944    0.4160    0.4376    0.4593
            0.4809    0.5025    0.5242    0.5458    0.5674
            0.5890    0.6107    0.6323    0.6539    0.6756
            0.6972    0.7188    0.7405    0.7621    0.7837
            0.8053    0.8270    0.8486    0.8702    0.8919
            0.9135    0.9351    0.9567    0.9784    1.0000
Hrad:
            0.0197    0.0437    0.0801    0.1056    0.1240
            0.1388    0.1514    0.1628    0.1804    0.1998
            0.2201    0.2410    0.2622    0.2835    0.3049
            0.3263    0.3477    0.3690    0.3902    0.4114
            0.4325    0.4535    0.4744    0.4952    0.5159
            0.5365    0.5570    0.5774    0.5976    0.6178
            0.6379    0.6578    0.6776    0.6974    0.7170
            0.7366    0.7560    0.7753    0.7946    0.8137
            0.8327    0.8517    0.8705    0.8893    0.9080
            0.9266    0.9450    0.9635    0.9818    1.0000
Width:
            0.1920    0.3400    0.4000    0.5200    0.6400
            0.7600    0.8800    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000
            1.0000    1.0000    1.0000    1.0000    1.0000

Transect T_Major_Roads_8M_CURB
Area:
            0.0018    0.0070    0.0132    0.0210    0.0305
            0.0419    0.0551    0.0700    0.0868    0.1053
            0.1256    0.1477    0.1701    0.1925    0.2150
            0.2374    0.2598    0.2822    0.3047    0.3271
            0.3495    0.3720    0.3944    0.4168    0.4393
            0.4617    0.4841    0.5065    0.5290    0.5514
            0.5738    0.5963    0.6187    0.6411    0.6636
            0.6860    0.7084    0.7308    0.7533    0.7757
            0.7981    0.8206    0.8430    0.8654    0.8879
            0.9103    0.9327    0.9551    0.9776    1.0000
Hrad:
            0.0211    0.0490    0.0883    0.1173    0.1393
            0.1572    0.1725    0.1861    0.1987    0.2105
            0.2217    0.2348    0.2534    0.2729    0.2931
            0.3137    0.3346    0.3556    0.3767    0.3979
            0.4191    0.4402    0.4613    0.4824    0.5034
            0.5243    0.5452    0.5660    0.5867    0.6073
```

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            0.6278     0.6482     0.6686     0.6888     0.7090
            0.7290     0.7490     0.7688     0.7886     0.8083
            0.8279     0.8474     0.8667     0.8861     0.9053
            0.9244     0.9434     0.9624     0.9812     1.0000
Width:
            0.1600     0.2667     0.3067     0.3867     0.4667
            0.5467     0.6267     0.7067     0.7867     0.8667
            0.9467     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_9M_CURB
Area:
            0.0018     0.0073     0.0143     0.0225     0.0320
            0.0428     0.0549     0.0683     0.0830     0.0990
            0.1164     0.1350     0.1550     0.1762     0.1987
            0.2216     0.2445     0.2674     0.2903     0.3132
            0.3361     0.3590     0.3819     0.4048     0.4277
            0.4506     0.4735     0.4964     0.5192     0.5421
            0.5650     0.5879     0.6108     0.6337     0.6566
            0.6795     0.7024     0.7253     0.7482     0.7711
            0.7940     0.8169     0.8397     0.8626     0.8855
            0.9084     0.9313     0.9542     0.9771     1.0000
Hrad:
            0.0202     0.0429     0.0816     0.1137     0.1405
            0.1637     0.1840     0.2024     0.2191     0.2346
            0.2492     0.2629     0.2760     0.2886     0.3022
            0.3207     0.3400     0.3598     0.3800     0.4003
            0.4209     0.4415     0.4622     0.4829     0.5036
            0.5243     0.5449     0.5655     0.5861     0.6066
            0.6270     0.6474     0.6677     0.6879     0.7080
            0.7281     0.7481     0.7679     0.7877     0.8075
            0.8271     0.8466     0.8661     0.8855     0.9048
            0.9240     0.9431     0.9622     0.9811     1.0000
Width:
            0.1600     0.3000     0.3286     0.3857     0.4429
            0.5000     0.5571     0.6143     0.6714     0.7286
            0.7857     0.8429     0.9000     0.9571     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_CUL-DE-SAC
Area:
            0.0021     0.0085     0.0189     0.0317     0.0467
            0.0637     0.0829     0.1040     0.1253     0.1467
            0.1680     0.1893     0.2107     0.2320     0.2533
            0.2747     0.2960     0.3173     0.3387     0.3600
            0.3813     0.4027     0.4240     0.4453     0.4667
            0.4880     0.5093     0.5307     0.5520     0.5733
            0.5947     0.6160     0.6373     0.6587     0.6800
            0.7013     0.7227     0.7440     0.7653     0.7867
            0.8080     0.8293     0.8507     0.8720     0.8933
            0.9147     0.9360     0.9573     0.9787     1.0000
Hrad:
            0.0161     0.0321     0.0553     0.0809     0.1022
            0.1206     0.1368     0.1534     0.1725     0.1925
            0.2129     0.2336     0.2544     0.2753     0.2963
            0.3173     0.3382     0.3591     0.3800     0.4009
            0.4217     0.4425     0.4632     0.4838     0.5044
            0.5249     0.5454     0.5658     0.5862     0.6064
            0.6267     0.6468     0.6669     0.6870     0.7070
            0.7269     0.7468     0.7666     0.7863     0.8060
            0.8257     0.8453     0.8648     0.8843     0.9037
            0.9231     0.9424     0.9616     0.9808     1.0000
Width:
            0.2000     0.4000     0.5500     0.6500     0.7500
            0.8500     0.9500     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_Queensway
Area:
            0.0028     0.0111     0.0249     0.0442     0.0649
            0.0857     0.1065     0.1273     0.1481     0.1688
            0.1896     0.2104     0.2312     0.2519     0.2727
            0.2935     0.3143     0.3351     0.3558     0.3766
            0.3974     0.4182     0.4390     0.4597     0.4805
            0.5013     0.5221     0.5429     0.5636     0.5844
            0.6052     0.6260     0.6468     0.6675     0.6883
            0.7091     0.7299     0.7506     0.7714     0.7922
            0.8130     0.8338     0.8545     0.8753     0.8961
            0.9169     0.9377     0.9584     0.9792     1.0000
Hrad:
            0.0123     0.0246     0.0369     0.0521     0.0764
            0.1004     0.1243     0.1480     0.1715     0.1948
            0.2179     0.2409     0.2637     0.2863     0.3087
            0.3310     0.3531     0.3751     0.3968     0.4185
            0.4399     0.4612     0.4824     0.5033     0.5242
            0.5449     0.5654     0.5858     0.6060     0.6261
            0.6461     0.6659     0.6856     0.7051     0.7245
            0.7438     0.7629     0.7819     0.8008     0.8195
            0.8381     0.8566     0.8750     0.8932     0.9113
            0.9293     0.9471     0.9649     0.9825     1.0000
Width:
            0.2667     0.5333     0.8000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_Queensway_Pinecrest_N-W
Area:
            0.0025     0.0098     0.0221     0.0393     0.0601
            0.0809     0.1018     0.1227     0.1436     0.1645
            0.1854     0.2063     0.2272     0.2480     0.2689
            0.2898     0.3107     0.3316     0.3525     0.3734
            0.3943     0.4151     0.4360     0.4569     0.4778
            0.4987     0.5196     0.5405     0.5614     0.5822
            0.6031     0.6240     0.6449     0.6658     0.6867
            0.7076     0.7285     0.7493     0.7702     0.7911
            0.8120     0.8329     0.8538     0.8747     0.8956
            0.9164     0.9373     0.9582     0.9791     1.0000
Hrad:
            0.0170     0.0340     0.0510     0.0680     0.0967
            0.1286     0.1596     0.1899     0.2193     0.2481
            0.2760     0.3033     0.3300     0.3560     0.3813
            0.4061     0.4303     0.4539     0.4770     0.4996
            0.5217     0.5432     0.5644     0.5850     0.6052
            0.6250     0.6444     0.6634     0.6820     0.7002
            0.7180     0.7355     0.7527     0.7695     0.7860
            0.8021     0.8180     0.8336     0.8489     0.8639
            0.8786     0.8931     0.9073     0.9212     0.9349
            0.9484     0.9616     0.9746     0.9874     1.0000
Width:
            0.2353     0.4706     0.7059     0.9412     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_Queensway_Pinecrest_W-N/S
Area:
            0.0004     0.0014     0.0033     0.0058     0.0091
            0.0130     0.0178     0.0235     0.0309     0.0408
            0.0533     0.0682     0.0858     0.1058     0.1284
            0.1531     0.1780     0.2029     0.2278     0.2527
            0.2776     0.3025     0.3274     0.3524     0.3773
            0.4022     0.4271     0.4520     0.4769     0.5018
            0.5267     0.5516     0.5765     0.6014     0.6264
            0.6513     0.6762     0.7011     0.7260     0.7509
            0.7758     0.8007     0.8256     0.8505     0.8755
            0.9004     0.9253     0.9502     0.9751     1.0000
Hrad:
            0.0089     0.0177     0.0266     0.0354     0.0443
            0.0531     0.0620     0.0698     0.0801     0.0897
            0.0990     0.1092     0.1203     0.1323     0.1450
            0.1638     0.1875     0.2121     0.2372     0.2626
            0.2882     0.3138     0.3395     0.3651     0.3907
            0.4163     0.4417     0.4671     0.4924     0.5176
            0.5427     0.5676     0.5925     0.6173     0.6419
            0.6665     0.6909     0.7153     0.7395     0.7637
            0.7877     0.8117     0.8355     0.8593     0.8830
            0.9066     0.9300     0.9534     0.9768     1.0000
Width:
            0.0291     0.0582     0.0873     0.1164     0.1455
            0.1745     0.2036     0.2594     0.3467     0.4485
            0.5503     0.6521     0.7539     0.8558     0.9576
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_Major_Roads_Transitway
Area:
            0.0011     0.0045     0.0104     0.0205     0.0346
            0.0512     0.0689     0.0866     0.1045     0.1245
            0.1462     0.1681     0.1900     0.2119     0.2338
            0.2557     0.2775     0.2994     0.3213     0.3432
            0.3651     0.3870     0.4089     0.4308     0.4527
            0.4746     0.4965     0.5184     0.5403     0.5622
            0.5840     0.6059     0.6278     0.6497     0.6716
```

0.6935 0.7154 0.7373 0.7592 0.7811
0.8030 0.8249 0.8468 0.8686 0.8905
0.9124 0.9343 0.9562 0.9781 1.0000
Hrad:
0.0148 0.0297 0.0397 0.0504 0.0682
0.0877 0.1167 0.1451 0.1639 0.1744
0.1960 0.2234 0.2503 0.2767 0.3028
0.3284 0.3535 0.3783 0.4026 0.4266
0.4501 0.4733 0.4961 0.5186 0.5407
0.5625 0.5839 0.6050 0.6258 0.6463
0.6665 0.6864 0.7060 0.7253 0.7443
0.7631 0.7816 0.7998 0.8178 0.8355
0.8530 0.8702 0.8872 0.9040 0.9205
0.9368 0.9529 0.9688 0.9845 1.0000
Width:
0.1026 0.2051 0.3590 0.5641 0.7051
0.8077 0.8077 0.8077 0.8590 0.9615
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.25m_10m
Area:
0.0019 0.0076 0.0171 0.0317 0.0526
0.0737 0.0947 0.1158 0.1368 0.1579
0.1789 0.2000 0.2211 0.2421 0.2632
0.2842 0.3053 0.3263 0.3474 0.3684
0.3895 0.4105 0.4316 0.4526 0.4737
0.4947 0.5158 0.5368 0.5579 0.5789
0.6000 0.6211 0.6421 0.6632 0.6842
0.7053 0.7263 0.7474 0.7684 0.7895
0.8105 0.8316 0.8526 0.8737 0.8947
0.9158 0.9368 0.9579 0.9789 1.0000
Hrad:
0.0144 0.0288 0.0431 0.0471 0.0714
0.0992 0.1266 0.1535 0.1800 0.2061
0.2319 0.2572 0.2821 0.3067 0.3309
0.3548 0.3783 0.4015 0.4243 0.4469
0.4691 0.4910 0.5125 0.5338 0.5548
0.5756 0.5960 0.6162 0.6360 0.6557
0.6750 0.6942 0.7130 0.7317 0.7500
0.7682 0.7861 0.8038 0.8213 0.8385
0.8556 0.8724 0.8890 0.9055 0.9217
0.9377 0.9536 0.9692 0.9847 1.0000
Width:
0.1800 0.3600 0.5400 0.9200 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.25m_15m
Area:
0.0037 0.0147 0.0298 0.0483 0.0690
0.0897 0.1103 0.1310 0.1517 0.1724
0.1931 0.2138 0.2345 0.2552 0.2759
0.2966 0.3172 0.3379 0.3586 0.3793
0.4000 0.4207 0.4414 0.4621 0.4828
0.5034 0.5241 0.5448 0.5655 0.5862
0.6069 0.6276 0.6483 0.6690 0.6897
0.7103 0.7310 0.7517 0.7724 0.7931
0.8138 0.8345 0.8552 0.8759 0.8966
0.9172 0.9379 0.9586 0.9793 1.0000
Hrad:
0.0141 0.0307 0.0501 0.0678 0.0936
0.1207 0.1474 0.1737 0.1996 0.2251
0.2502 0.2749 0.2993 0.3233 0.3469
0.3702 0.3932 0.4158 0.4381 0.4601
0.4817 0.5031 0.5242 0.5450 0.5655
0.5857 0.6056 0.6253 0.6447 0.6639
0.6828 0.7015 0.7199 0.7381 0.7560
0.7737 0.7912 0.8085 0.8255 0.8424
0.8590 0.8755 0.8917 0.9077 0.9236
0.9392 0.9547 0.9700 0.9851 1.0000
Width:
0.3600 0.6533 0.8133 0.9733 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.25m_20m
Area:
0.0043 0.0170 0.0334 0.0524 0.0730
0.0936 0.1142 0.1348 0.1554 0.1760

0.1966 0.2172 0.2378 0.2584 0.2790
0.2996 0.3202 0.3408 0.3614 0.3820
0.4026 0.4232 0.4438 0.4644 0.4850
0.5056 0.5262 0.5468 0.5674 0.5880
0.6086 0.6292 0.6498 0.6704 0.6910
0.7116 0.7322 0.7528 0.7734 0.7940
0.8146 0.8352 0.8558 0.8764 0.8970
0.9176 0.9382 0.9588 0.9794 1.0000
Hrad:
0.0131 0.0292 0.0496 0.0682 0.0926
0.1180 0.1431 0.1679 0.1925 0.2168
0.2407 0.2644 0.2879 0.3110 0.3340
0.3566 0.3790 0.4012 0.4231 0.4447
0.4662 0.4874 0.5083 0.5291 0.5496
0.5699 0.5900 0.6099 0.6296 0.6490
0.6683 0.6874 0.7063 0.7250 0.7434
0.7618 0.7799 0.7978 0.8156 0.8332
0.8506 0.8679 0.8849 0.9018 0.9186
0.9352 0.9516 0.9679 0.9840 1.0000
Width:
0.4200 0.7400 0.8600 0.9800 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.2m_20m
Area:
0.0084 0.0242 0.0426 0.0628 0.0832
0.1036 0.1239 0.1443 0.1647 0.1851
0.2054 0.2258 0.2462 0.2666 0.2869
0.3073 0.3277 0.3480 0.3684 0.3888
0.4092 0.4295 0.4499 0.4703 0.4907
0.5110 0.5314 0.5518 0.5722 0.5925
0.6129 0.6333 0.6537 0.6740 0.6944
0.7148 0.7351 0.7555 0.7759 0.7963
0.8166 0.8370 0.8574 0.8778 0.8981
0.9185 0.9389 0.9593 0.9796 1.0000
Hrad:
0.0149 0.0369 0.0568 0.0801 0.1054
0.1305 0.1552 0.1797 0.2039 0.2277
0.2514 0.2747 0.2978 0.3206 0.3432
0.3655 0.3876 0.4094 0.4310 0.4524
0.4735 0.4944 0.5151 0.5355 0.5558
0.5758 0.5956 0.6152 0.6346 0.6538
0.6728 0.6916 0.7102 0.7287 0.7469
0.7650 0.7828 0.8005 0.8181 0.8354
0.8526 0.8696 0.8865 0.9032 0.9197
0.9361 0.9523 0.9683 0.9842 1.0000
Width:
0.7200 0.8400 0.9600 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.5m_12.5m
Area:
0.0033 0.0129 0.0252 0.0391 0.0544
0.0713 0.0897 0.1096 0.1307 0.1519
0.1731 0.1943 0.2155 0.2367 0.2580
0.2792 0.3004 0.3216 0.3428 0.3640
0.3852 0.4064 0.4276 0.4488 0.4700
0.4912 0.5124 0.5336 0.5548 0.5760
0.5972 0.6184 0.6396 0.6608 0.6820
0.7032 0.7244 0.7456 0.7668 0.7880
0.8092 0.8304 0.8516 0.8728 0.8940
0.9152 0.9364 0.9576 0.9788 1.0000
Hrad:
0.0149 0.0334 0.0575 0.0796 0.1003
0.1199 0.1388 0.1571 0.1816 0.2091
0.2361 0.2625 0.2885 0.3140 0.3391
0.3637 0.3878 0.4116 0.4349 0.4578
0.4804 0.5025 0.5243 0.5458 0.5668
0.5876 0.6079 0.6280 0.6477 0.6672
0.6863 0.7051 0.7237 0.7419 0.7599
0.7776 0.7950 0.8122 0.8291 0.8458
0.8622 0.8784 0.8944 0.9101 0.9256
0.9409 0.9560 0.9709 0.9855 1.0000
Width:
0.3120 0.5440 0.6160 0.6880 0.7600
0.8320 0.9040 0.9760 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.5m_15m
Area:
0.0019 0.0077 0.0174 0.0304 0.0452
0.0618 0.0801 0.1001 0.1214 0.1429
0.1643 0.1857 0.2071 0.2286 0.2500
0.2714 0.2929 0.3143 0.3357 0.3571
0.3786 0.4000 0.4214 0.4429 0.4643
0.4857 0.5071 0.5286 0.5500 0.5714
0.5929 0.6143 0.6357 0.6571 0.6786
0.7000 0.7214 0.7429 0.7643 0.7857
0.8071 0.8286 0.8500 0.8714 0.8929
0.9143 0.9357 0.9571 0.9786 1.0000
Hrad:
0.0143 0.0286 0.0429 0.0620 0.0823
0.1013 0.1195 0.1370 0.1609 0.1879
0.2143 0.2404 0.2661 0.2914 0.3163
0.3408 0.3650 0.3888 0.4122 0.4354
0.4581 0.4806 0.5027 0.5245 0.5460
0.5672 0.5882 0.6088 0.6291 0.6492
0.6690 0.6885 0.7078 0.7268 0.7455
0.7641 0.7823 0.8004 0.8182 0.8358
0.8531 0.8703 0.8872 0.9039 0.9204
0.9367 0.9528 0.9687 0.9845 1.0000
Width:
0.1800 0.3600 0.5400 0.6533 0.7333
0.8133 0.8933 0.9733 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.5m_20m
Area:
0.0032 0.0125 0.0244 0.0380 0.0531
0.0698 0.0881 0.1081 0.1292 0.1504
0.1717 0.1929 0.2142 0.2354 0.2566
0.2779 0.2991 0.3204 0.3416 0.3628
0.3841 0.4053 0.4265 0.4478 0.4690
0.4903 0.5115 0.5327 0.5540 0.5752
0.5965 0.6177 0.6389 0.6602 0.6814
0.7027 0.7239 0.7451 0.7664 0.7876
0.8088 0.8301 0.8513 0.8726 0.8938
0.9150 0.9363 0.9575 0.9788 1.0000
Hrad:
0.0133 0.0297 0.0509 0.0703 0.0885
0.1058 0.1224 0.1385 0.1608 0.1861
0.2112 0.2359 0.2603 0.2845 0.3084
0.3320 0.3553 0.3784 0.4012 0.4238
0.4461 0.4681 0.4900 0.5115 0.5329
0.5540 0.5749 0.5955 0.6160 0.6362
0.6562 0.6760 0.6956 0.7150 0.7342
0.7532 0.7720 0.7906 0.8090 0.8273
0.8453 0.8632 0.8809 0.8984 0.9158
0.9329 0.9499 0.9668 0.9835 1.0000
Width:
0.3000 0.5250 0.6000 0.6750 0.7500
0.8250 0.9000 0.9750 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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Transect T_Major_RY_0.7m_25m
Area:
0.0020 0.0078 0.0176 0.0307 0.0449
0.0602 0.0766 0.0940 0.1124 0.1319
0.1524 0.1739 0.1957 0.2174 0.2391
0.2609 0.2826 0.3043 0.3261 0.3478
0.3696 0.3913 0.4130 0.4348 0.4565
0.4783 0.5000 0.5217 0.5435 0.5652
0.5870 0.6087 0.6304 0.6522 0.6739
0.6957 0.7174 0.7391 0.7609 0.7826
0.8043 0.8261 0.8478 0.8696 0.8913
0.9130 0.9348 0.9565 0.9783 1.0000
Hrad:
0.0129 0.0258 0.0387 0.0575 0.0783
0.0980 0.1169 0.1351 0.1526 0.1697
0.1864 0.2055 0.2301 0.2545 0.2786
0.3025 0.3262 0.3496 0.3729 0.3959
0.4187 0.4413 0.4637 0.4859 0.5079
0.5297 0.5513 0.5727 0.5940 0.6150
0.6358 0.6565 0.6770 0.6973 0.7175
0.7374 0.7572 0.7769 0.7963 0.8156
0.8347 0.8537 0.8725 0.8912 0.9097
0.9281 0.9463 0.9643 0.9822 1.0000
Width:
0.1800 0.3600 0.5400 0.6320 0.6800
0.7280 0.7760 0.8240 0.8720 0.9200
0.9680 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000

1.0000 1.0000 1.0000 1.0000 1.0000
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1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000

Transect T_Major_Watercourse_1
Area:
0.0005 0.0018 0.0042 0.0073 0.0110
0.0153 0.0201 0.0254 0.0312 0.0375
0.0444 0.0517 0.0595 0.0679 0.0766
0.0859 0.0957 0.1059 0.1165 0.1277
0.1393 0.1514 0.1640 0.1770 0.1906
0.2048 0.2198 0.2357 0.2539 0.2732
0.2935 0.3153 0.3387 0.3642 0.3921
0.4217 0.4548 0.4962 0.5382 0.5802
0.6222 0.6642 0.7061 0.7481 0.7901
0.8321 0.8741 0.9160 0.9580 1.0000
Hrad:
0.0197 0.0394 0.0592 0.0832 0.1072
0.1313 0.1542 0.1763 0.1979 0.2190
0.2396 0.2610 0.2821 0.3029 0.3234
0.3438 0.3640 0.3849 0.4054 0.4250
0.4444 0.4638 0.4831 0.5024 0.5201
0.5295 0.5382 0.5364 0.5159 0.5273
0.5354 0.5381 0.5374 0.5221 0.5306
0.5326 0.5088 0.5394 0.5732 0.6091
0.6464 0.6847 0.7235 0.7628 0.8023
0.8419 0.8815 0.9211 0.9606 1.0000
Width:
0.0220 0.0440 0.0660 0.0818 0.0956
0.1079 0.1201 0.1324 0.1447 0.1569
0.1693 0.1808 0.1922 0.2036 0.2151
0.2265 0.2379 0.2486 0.2595 0.2710
0.2824 0.2939 0.3054 0.3168 0.3293
0.3482 0.3684 0.3977 0.4479 0.4723
0.5008 0.5366 0.5790 0.6435 0.6830
0.7338 0.9296 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000

Transect T_Major_Watercourse_Ramp
Area:
0.0005 0.0016 0.0031 0.0049 0.0070
0.0094 0.0120 0.0149 0.0180 0.0214
0.0250 0.0288 0.0328 0.0371 0.0416
0.0463 0.0512 0.0563 0.0617 0.0674
0.0734 0.0797 0.0865 0.0946 0.1039
0.1147 0.1262 0.1399 0.1579 0.1869
0.2219 0.2605 0.3014 0.3425 0.3836
0.4247 0.4658 0.5069 0.5480 0.5890
0.6301 0.6712 0.7123 0.7534 0.7945
0.8356 0.8767 0.9178 0.9589 1.0000
Hrad:
0.0573 0.1418 0.2143 0.2820 0.3516
0.4179 0.4818 0.5502 0.6163 0.6816
0.7455 0.8081 0.8696 0.9303 0.9926
1.0597 1.1106 1.1610 1.2118 1.2629
1.3049 1.3352 1.3656 1.2257 1.1010
1.1504 1.1632 1.1089 1.1271 0.8066
0.2651 0.2987 0.3128 0.3547 0.3963
0.4378 0.4791 0.5203 0.5612 0.6020
0.6426 0.6830 0.7232 0.7633 0.8032
0.8429 0.8824 0.9218 0.9610 1.0000
Width:
0.0237 0.0318 0.0398 0.0476 0.0543
0.0610 0.0677 0.0734 0.0790 0.0845
0.0900 0.0955 0.1010 0.1065 0.1116
0.1160 0.1224 0.1288 0.1353 0.1417
0.1494 0.1587 0.1776 0.2072 0.2553
0.2701 0.3092 0.3591 0.5261 0.8186
0.8946 0.9705 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000

Transect T_Parking_Lot
Area:
0.0025 0.0100 0.0225 0.0401 0.0609
0.0817 0.1026 0.1235 0.1443 0.1652
0.1861 0.2070 0.2278 0.2487 0.2696
0.2904 0.3113 0.3322 0.3530 0.3739
0.3948 0.4157 0.4365 0.4574 0.4783
0.4991 0.5200 0.5409 0.5617 0.5826
0.6035 0.6243 0.6452 0.6661 0.6870
0.7078 0.7287 0.7496 0.7704 0.7913
0.8122 0.8330 0.8539 0.8748 0.8957
0.9165 0.9374 0.9583 0.9791 1.0000
Hrad:
0.0133 0.0266 0.0399 0.0532 0.0772
0.1031 0.1286 0.1539 0.1788 0.2035
0.2279 0.2520 0.2758 0.2994 0.3227
0.3457 0.3685 0.3910 0.4133 0.4354
0.4572 0.4787 0.5000 0.5211 0.5420
0.5627 0.5831 0.6033 0.6233 0.6431
0.6627 0.6821 0.7013 0.7203 0.7391
0.7577 0.7762 0.7944 0.8125 0.8304
0.8481 0.8656 0.8830 0.9002 0.9172
0.9341 0.9508 0.9674 0.9838 1.0000
Width:

```
            0.2400     0.4800     0.7200     0.9600     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

Transect T_RY_Rockway_Pond
Area:
            0.0037     0.0145     0.0271     0.0402     0.0536
            0.0674     0.0816     0.0961     0.1110     0.1263
            0.1419     0.1580     0.1744     0.1911     0.2082
            0.2258     0.2436     0.2619     0.2805     0.2995
            0.3188     0.3386     0.3587     0.3792     0.4000
            0.4212     0.4428     0.4648     0.4871     0.5098
            0.5329     0.5563     0.5801     0.6043     0.6289
            0.6536     0.6784     0.7031     0.7278     0.7526
            0.7773     0.8021     0.8268     0.8515     0.8763
            0.9010     0.9258     0.9505     0.9753     1.0000
Hrad:
            0.0130     0.0302     0.0550     0.0791     0.1026
            0.1256     0.1479     0.1698     0.1913     0.2123
            0.2329     0.2532     0.2731     0.2927     0.3121
            0.3311     0.3499     0.3684     0.3867     0.4048
            0.4227     0.4404     0.4579     0.4752     0.4924
            0.5094     0.5263     0.5430     0.5597     0.5761
            0.5925     0.6088     0.6249     0.6409     0.6569
            0.6807     0.7044     0.7279     0.7513     0.7746
            0.7977     0.8207     0.8436     0.8663     0.8889
            0.9114     0.9337     0.9560     0.9780     1.0000
Width:
            0.3000     0.5050     0.5200     0.5350     0.5500
            0.5650     0.5800     0.5950     0.6100     0.6250
            0.6400     0.6550     0.6700     0.6850     0.7000
            0.7150     0.7300     0.7450     0.7600     0.7750
            0.7900     0.8050     0.8200     0.8350     0.8500
            0.8650     0.8800     0.8950     0.9100     0.9250
            0.9400     0.9550     0.9700     0.9850     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000


*********************
Rainfall File Summary
*********************
```

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
100yr_3hr_Chicago	11/10/2013	11/10/2013	10 min	18	0	0
100yr_6hr_Chicago	11/10/2013	11/10/2013	10 min	36	0	0
100yrChicago12hr	11/10/2013	11/10/2013	10 min	73	0	0
100yrChicago24hr	11/10/2013	11/11/2013	10 min	145	0	0
10yr_3hr_Chicago	11/10/2013	11/10/2013	10 min	18	0	0
10yr_6hr_Chicago	11/10/2013	11/10/2013	10 min	36	0	0
10yrChicago24hr	11/10/2013	11/11/2013	10 min	145	0	0
5yrChicago3hr	11/10/2013	11/10/2013	10 min	19	0	0
5yrChicago12hr	11/10/2013	11/10/2013	10 min	73	0	0
5yrChicago24hr	11/10/2013	11/11/2013	10 min	145	0	0
5yrChicago3hr	11/10/2013	11/10/2013	10 min	19	0	0
5yrChicago6hr	11/10/2013	11/10/2013	10 min	37	0	0

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

  ***************
  Analysis Options
  ***************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ YES
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN

Starting Date ............ 11/10/2013 00:00:00
Ending Date .............. 11/13/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:05
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 20
Number of Threads ........ 2
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.126        74.345
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.014         8.251
Surface Runoff ...........         0.111        65.471
Final Storage ............         0.001         0.864
Continuity Error (%) .....        -0.326


**************************        Volume        Volume
Flow Routing Continuity        hectare-m       10^6 ltr
**************************     ---------       ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.111         1.108
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.110         1.104
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.001         0.005
Continuity Error (%) .....        -0.091


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
  All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    1.000 -  0.871 sec      :   100.00 %
    0.871 -  0.758 sec      :     0.00 %
    0.758 -  0.660 sec      :     0.00 %
    0.660 -  0.574 sec      :     0.00 %
    0.574 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm
B-101	74.34	0.00	0.00	14.72	16.17
B-102	74.34	0.00	0.00	0.33	71.72
B-103	74.34	0.00	0.00	2.12	64.13
B-104	74.34	0.00	0.00	1.39	67.11
B-105	74.34	0.00	0.00	2.40	62.89
B-106	74.34	0.00	0.00	0.39	71.47
B-107	74.34	0.00	0.00	7.95	39.33

Subcatchment	Perv mm	Total mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
B-101	43.24	59.40	0.10	0.02	0.799
B-102	1.13	72.85	0.07	0.03	0.980
B-103	7.10	71.24	0.13	0.06	0.958
B-104	4.71	71.82	0.04	0.02	0.966
B-105	8.10	70.98	0.13	0.06	0.955
B-106	1.33	72.80	0.06	0.03	0.979
B-107	26.47	65.81	0.01	0.00	0.885

```
  B-108                     74.34      37.93       0.00      12.27      33.71
66.02      99.73        0.02     0.01   0.888
  B-109                     74.34       0.00       0.00       6.28      46.18
21.15      67.32        0.02     0.01   0.906
  B-110                     74.34       0.00       0.00      12.65      20.11
41.32      61.42        0.08     0.03   0.826
  B-111                     74.34       0.00       0.00      11.33      25.38
37.28      62.66        0.01     0.01   0.843
  B-BLDG                    74.34       0.00       0.00       0.00      73.14
 0.00      73.14        0.20     0.09   0.984
  B-EXT1                    74.34       0.00       0.00      18.65       0.00
55.75      55.75        0.24     0.03   0.750


  ******************
  Node Depth Summary
  ******************

-------------------------------------------------------------------------------
                                  Average  Maximum  Maximum  Time of Max
Reported
                                    Depth    Depth      HGL   Occurrence   Max
Depth
  Node                 Type       Meters   Meters   Meters  days hr:min
Meters
-------------------------------------------------------------------------------
  B01                  JUNCTION     0.02     0.87   101.01     0  08:28
0.81
  CB204                JUNCTION     0.00     0.06   101.15     0  08:30
0.06
  CBMH207              JUNCTION     0.05     1.21   100.76     0  09:02
1.21
  CBMH208              JUNCTION     0.04     1.12   100.76     0  09:01
1.12
  CBMH209              JUNCTION     0.02     0.73   100.76     0  09:01
0.73
  CBMH215              JUNCTION     0.02     0.71   100.78     0  08:28
0.70
  CBMH217              JUNCTION     0.03     0.88   100.77     0  09:01
0.88
  CisternDS            JUNCTION     0.01     0.10    99.40     0  09:02
0.10
  RYCB205              JUNCTION     0.00     0.00   101.28     0  00:00
0.00
  STMH202              JUNCTION     0.02     0.12    99.35     0  08:30
0.12
  STMH205              JUNCTION     0.06     1.39   100.76     0  09:02
1.39
  STMH206              JUNCTION     0.06     1.29   100.76     0  09:02
1.29
  STMH218              JUNCTION     0.04     1.01   100.76     0  09:01
1.01
  CanadianShieldAve_DICB OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  Cordillera_Major     OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  Cordillera_Minor     OUTFALL      0.02     0.12    99.15     0  08:30
0.12
  BLDG                 STORAGE      0.02     0.12   110.12     0  09:29
0.12
  Cistern              STORAGE      0.11     1.49   100.76     0  09:02
1.49


  ******************
  Node Inflow Summary
  ******************

-------------------------------------------------------------------------------
---------------
                                  Maximum  Maximum                  Lateral
Total        Flow
                                  Lateral    Total  Time of Max      Inflow
Inflow     Balance
                                   Inflow   Inflow   Occurrence      Volume
Volume       Error
  Node                 Type           CMS      CMS  days hr:min    10^6 ltr
10^6 ltr     Percent
-------------------------------------------------------------------------------
---------------
  B01                  JUNCTION     0.027    0.027     0  08:30      0.0783
0.0783       0.241
  CB204                JUNCTION     0.008    0.008     0  08:30      0.0228
0.0228       0.002
  CBMH207              JUNCTION     0.029    0.164     0  08:30      0.0636
0.378      -0.082
  CBMH208              JUNCTION     0.017    0.135     0  08:30      0.0353
0.314      -0.151
  CBMH209              JUNCTION     0.034    0.034     0  08:30       0.074
0.074       0.413
  CBMH215              JUNCTION     0.000    0.027     0  08:30           0
0.0781      -0.231
  CBMH217              JUNCTION     0.057    0.084     0  08:30       0.127
0.205       0.228
  CisternDS            JUNCTION     0.000    0.029     0  09:02           0
0.523      -0.000
  RYCB205              JUNCTION     0.000    0.000     0  00:00           0
   0       0.000 ltr
  STMH202              JUNCTION     0.012    0.037     0  08:30      0.0245
0.749       0.002
  STMH205              JUNCTION     0.000    0.167     0  08:30           0
0.401      -0.108
  STMH206              JUNCTION     0.000    0.172     0  08:30           0
0.401      -0.055
  STMH218              JUNCTION     0.000    0.118     0  08:30           0
0.278      -0.121
  CanadianShieldAve_DICB OUTFALL      0.044    0.044     0  08:30        0.34
  0.34       0.000
  Cordillera_Major     OUTFALL      0.006    0.006     0  08:30      0.0143
0.0143       0.000
  Cordillera_Minor     OUTFALL      0.000    0.037     0  08:30           0
0.749       0.000
  BLDG                 STORAGE      0.086    0.086     0  08:30       0.202
0.202      -0.001
  Cistern              STORAGE      0.060    0.225     0  08:30       0.127
0.528      -0.006


  ***********************
  Node Surcharge Summary
  ***********************

  Surcharging occurs when water rises above the top of the highest conduit.
  -------------------------------------------------------------------
                                          Max. Height   Min. Depth
                                Hours       Above Crown    Below Rim
  Node                 Type   Surcharged         Meters       Meters
  -------------------------------------------------------------------
  B01                  JUNCTION        1.75          0.615        4.189
  CBMH207              JUNCTION        2.80          0.739        2.389
  CBMH208              JUNCTION        2.57          0.666        2.688
  CBMH209              JUNCTION        2.05          0.482        2.986
  CBMH215              JUNCTION        1.88          0.433        3.921
  CBMH217              JUNCTION        2.31          0.578        2.983
  STMH205              JUNCTION        3.46          0.921        2.241
  STMH218              JUNCTION        2.48          0.635        3.137


  *********************
  Node Flooding Summary
  *********************

  No nodes were flooded.


  ***********************
  Storage Volume Summary
  ***********************

-------------------------------------------------------------------------------
---------------
                          Average     Avg  Evap Exfil       Maximum     Max    Time
of Max    Maximum
                           Volume    Pcnt  Pcnt  Pcnt        Volume    Pcnt
Occurrence    Outflow
  Storage Unit           1000 m3    Full  Loss  Loss       1000 m3    Full    days
hr:min        CMS
-------------------------------------------------------------------------------
---------------
  BLDG                     0.009       1     0     0         0.102      12       0
 09:29      0.006
  Cistern                  0.015       7     0     0         0.210      95       0
 09:02      0.029


  ***********************
  Outfall Loading Summary
  ***********************

  ---------------------------------------------------------
                        Flow       Avg       Max       Total
                        Freq      Flow      Flow      Volume
  Outfall Node          Pcnt       CMS       CMS    10^6 ltr
  ---------------------------------------------------------
  CanadianShieldAve_DICB  33.60     0.004     0.044       0.340
  Cordillera_Major      21.40     0.000     0.006       0.014
  Cordillera_Minor      41.84     0.007     0.037       0.749
  ---------------------------------------------------------
  System                32.28     0.011     0.086       1.104


  *********************
  Link Flow Summary
  *********************

  -------------------------------------------------------------------------------
                                  Maximum  Time of Max   Maximum    Max/    Max/
                                  |Flow|   Occurrence   |Veloc|    Full    Full
  Link                 Type          CMS  days hr:min     m/sec    Flow   Depth
  -------------------------------------------------------------------------------
  C1_1                 CONDUIT     0.167     0  08:30      1.05    1.18    1.00
  C1_2                 CONDUIT     0.166     0  08:30      1.05    0.96    1.00
  C10                  CONDUIT     0.027     0  08:30      0.88    0.82    1.00
  C11                  CONDUIT     0.029     0  09:02      1.28    0.16    0.27
```

C13	CONDUIT	0.037	0	08:30	1.38	0.35	0.41
C14	CONDUIT	0.008	0	08:30	0.84	0.13	0.25
C15	CONDUIT	0.000	0	00:00	0.00	0.00	0.08
C3	CONDUIT	0.164	0	08:30	1.15	1.15	1.00
C4	CONDUIT	0.135	0	08:30	0.99	0.85	1.00
C5	CONDUIT	0.118	0	08:30	1.26	1.40	1.00
C6	CONDUIT	0.034	0	08:30	1.08	0.70	1.00
C8	CONDUIT	0.084	0	08:30	1.21	1.48	1.00
C9	CONDUIT	0.027	0	08:30	0.67	0.53	1.00
OR1	ORIFICE	0.029	0	09:02			1.00
W1	WEIR	0.000	0	00:00			0.00
OL1	DUMMY	0.006	0	09:29			

****
Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1_1	1.00	0.03	0.00	0.00	0.09	0.00	0.00	0.88	0.01	0.00
C1_2	1.00	0.03	0.00	0.00	0.37	0.00	0.00	0.59	0.26	0.00
C10	1.00	0.03	0.00	0.00	0.03	0.00	0.00	0.93	0.00	0.00
C11	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00
C13	1.00	0.03	0.00	0.00	0.32	0.65	0.00	0.00	0.10	0.00
C14	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
C15	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.03	0.00	0.00	0.07	0.00	0.00	0.90	0.00	0.00
C4	1.00	0.03	0.00	0.00	0.07	0.00	0.00	0.90	0.01	0.00
C5	1.00	0.03	0.00	0.00	0.05	0.00	0.00	0.91	0.00	0.00
C6	1.00	0.03	0.00	0.00	0.05	0.00	0.00	0.92	0.01	0.00
C8	1.00	0.03	0.00	0.00	0.05	0.00	0.00	0.92	0.00	0.00
C9	1.00	0.03	0.00	0.00	0.04	0.00	0.00	0.92	0.01	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1_1	3.17	3.17	3.45	0.07	0.06
C1_2	3.54	3.54	3.78	0.01	0.01
C10	1.75	1.75	1.88	0.01	0.01
C3	2.87	2.87	2.95	0.05	0.05
C4	2.57	2.57	2.80	0.01	0.01
C5	2.48	2.48	2.57	0.14	0.08
C6	2.05	2.05	2.48	0.01	0.01
C8	2.31	2.31	2.48	0.15	0.10
C9	1.96	1.96	2.31	0.01	0.01

Analysis begun on: Thu Aug 19 17:09:21 2021
Analysis ended on: Thu Aug 19 17:09:50 2021
Total elapsed time: 00:00:29