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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

MATTAMY HOMES
WATERIDGE VILLAGE – BLOCK 24

CITY OF OTTAWA

PROJECT NO.: 17-949

DECEMBER 2017 – REV 2

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
WATERIDGE VILLAGE – BLOCK 24

MATTAMY HOMES

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management report in support of the Site Plan Application for Block 24 of the former CFB Rockcliffe lands, which are currently under re-development by the Canada Lands Company.

The subject property is located within the City of Ottawa urban boundary, in the Rideau-Rockcliffe area. As illustrated in ***Figure 1***, the subject property is encompassed by Hemlock Road, Mikinak Road and Moses Tennisco Street, all of which are currently under construction. Comprised of a single parcel, it measures approximately ***1.61 ha*** and is zoned Residential Fifth Density Zone (R5Y[2312]).

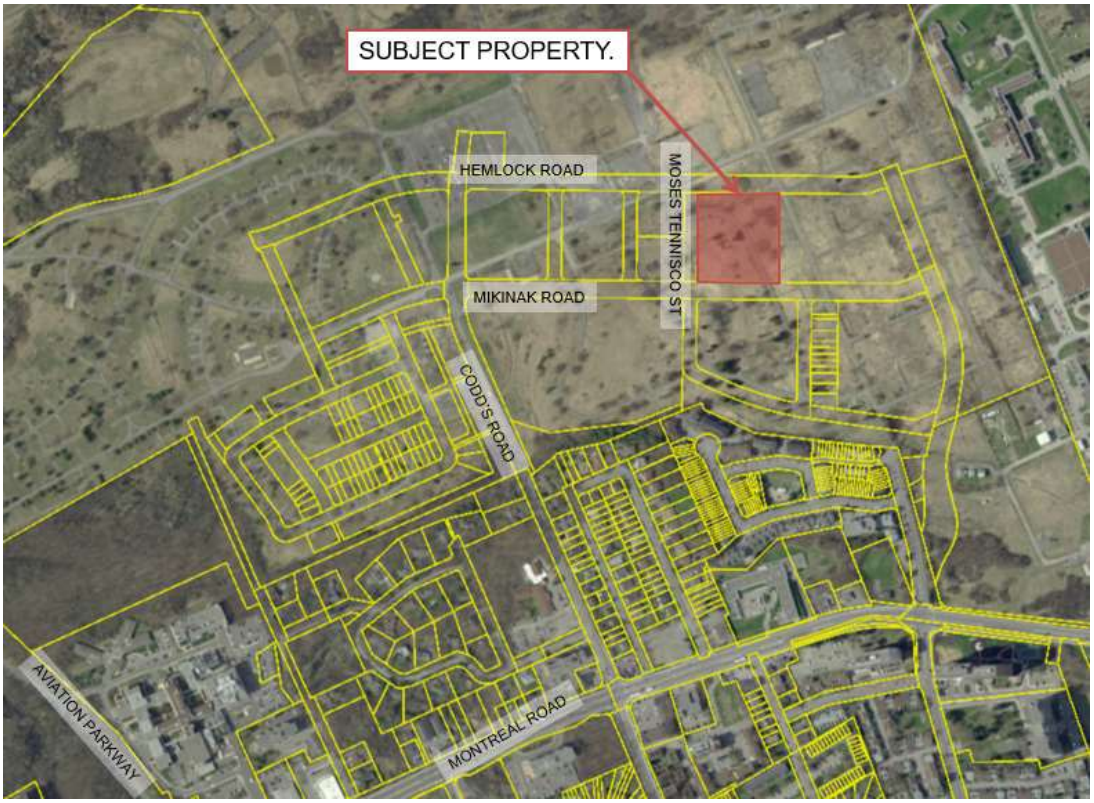

Figure 1: Site Location

The proposed development by Mattamy Homes involves the construction of 81 Rear Lane Townhomes and 48 Stacked Townhomes. The development also includes surface parking for the Stacked Townhomes within the site. A copy of the site plan and site statistics are included in ***Drawings/Figures***.

The objective of this report is to provide sufficient detail with respect to the availability of site services, to support the application for site plan control.

1.1 Existing Conditions

The existing lands are vacant, while the construction of the surrounding road network and underground services are currently underway at the time of this publication. Historically, the lands were part of the Canadian Forces Base Rockcliffe (CFB Rockcliffe).

A geotechnical investigation was completed by Paterson Group Inc. in August 2017. Per the geotechnical report, the subject site consists of a layer of existing fill from the previous land use underlain by stiff to very stiff brown silty clay. Practical refusal was encountered between 1.7 to 6.9m below existing grade.

Supplemental information from Paterson Group Inc. was also received regarding the anticipated infiltration rates. An infiltration rate of 50 mm/day was estimated for Block 19, correspondence saved in ***Appendix A***.

The Canada Lands Company will be delivering the site to a pre-grade condition in accordance with Mattamy Homes requirements.

Hemlock Road

- 300mm diameter PVC watermain
- 600mm diameter storm sewer
- 250mm diameter sanitary sewer

Mikinak Road

- 900mm diameter watermain
- 375mm diameter storm sewer
- 250mm diameter sanitary sewer

Moses Tennisco Street

- 200mm diameter watermain
- 750mm diameter storm sewer
- 250mm diameter sanitary sewer

Infrastructure described above is based on design drawings, not as-built drawings. The design drawings are as per the Wateridge Village at Rockcliffe Phase 1B drawing set prepared by IBI Group (dated February 16, 2017).

The servicing received from IBI Group September 15, 2017 has been updated to provide stubs to the proposed property and confirmed storm and sanitary capacity within the external system at these new connection points.

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process. The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control.

1.3 Pre-consultation

Pre-consultation correspondence, along with the servicing guidelines checklist are located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report.

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012
  (City Standards)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch,
  January 1, 2010 Update
  (OBC)

- **Water Supply for Public Fire Protection**
  Fire Underwriters Survey, 1999.
  (FUS)

- **Low Impact Development Stormwater Management Planning and Design Guide**
  Credit Valley Conservation & Toronto and Region Conservation, 2010.
  (LID Guide)

- **Former CFB Rockcliffe Master Servicing Study**
  IBI Group, August 2015
  (MSS)

- **Low Impact Development (LID) Demonstration Project**
  Aquafor Beech Ltd., August 2015
  (LID Demonstration Project)

- **Design Brief Wateridge Village at Rockcliffe Phase 1A**
  IBI Group., April 2016
  (Design Brief Phase 1A)

- **Design Brief Wateridge Village at Rockcliffe Phase 1B**
  IBI Group., June 2017
  (Design Brief Phase 1B)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa MONT pressure zone, as shown by the Pressure Zone map in ***Appendix B***. Based on the design drawings for the Wateridge Phase 1B subdivision, a local 200 mm diameter watermain is currently being constructed within Moses Tennisco Street right-of-way to service the subject site.

The water servicing for the subject site was accounted for in the design of the water distribution system outlined in the ***Design Brief Phase 1B***, water demand summarized below:

Table 1
Summary of Water Demand per *MSS*

Design Parameter	Total Demand (L/min)
Average Day	97.2
Max Day	437.5
Max Day + Fire Flow	13,000 + 291.7

Fire flow for the site has been assumed at ***12,000 L/min*** and all nodes surrounding the site have the ability to provide the required fire flow at greater than 140 kPa (20 PSI).

3.2 Water Supply Servicing Design

It is proposed to provide two connections to the 200mm watermain within Moses Tennisco Street. The site is serviced by surrounding fire hydrants on Hemlock Road, Michael Moses Tennisco Street, Mikinak Road, and internal hydrants proposed on-site.

Due to the width of the right-of-way and the proximity of the Rear Lane Townhomes, it is proposed to provide a watermain 1.5m away from the proposed sanitary sewer. The water and sanitary sewers are designed in accordance with *Procedures to Govern Seperation of Sewers and Watermains (Procedure F-6-1)* prepared by the Ministry of the Environment.

Table 2 summarizes the ***Water Supply Guidelines*** employed in the preparation of the water demand estimate for the proposed development.

Table 2
Water Supply Design Criteria

Design Parameter	Value
Townhouse	2.7 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	3.0 x avg. day *
Residential Maximum Hourly	4.5 x max. day *
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure must not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa

Daily average based on Appendix 4-A from **Water Supply Guidelines*
*** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
-Table updated to reflect ISD-2010-2

Table 3 summarizes the anticipated water supply demand and proposed boundary conditions. Boundary conditions for the subject site were extracted from the ***MSS*** for the nodes closest to the proposed connection points on Moses Tennisco Street.

Table 3
Water Demand and Boundary Conditions
Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] Connection 1 (m H_2O / kPa)		Boundary Condition[2] Connection 2 (m H_2O / kPa)	
Average Daily Demand	82.2	55.2	514.2	53.5	525.0
Peak Hour	369.7	51.0	500.3	52.1	511.1
Max Day + Fire Flow	12,000 + 246.5	33.7	331.0	33.8	331.1

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions per the ***Design Brief Phase 1B*** Connection 1 is to Moses Tennisco (Node J68 from Brief), Connection 2 is to Moses Tennisco / Mikinak (Node J54 from Brief)

The ***Design Brief Phase 1B*** describes the Average Daily Demand, Peak Hour and Max Day + Fire Flow scenarios. The above pressures are assuming the Future hydraulic grade line (HGL). As per the ***Design Brief Phase 1B***, future development will reduce the HGL within the compared to the existing condition. There may be slightly higher pressures observed during the existing condition, a pressure check is recommended during installation to determine if pressure reducing valves are required.

Fire flow requirements are to be determined in accordance with City of Ottawa ***Water Supply Guidelines***. The Water Supply Guidelines specific that fire flows are to be estimated using the FUS in conjunction with the technical bulletin ISDTB-2014-02.

The following assumptions were provided by Mattamy Homes for both Stacked Townhomes and standard Townhomes and were used in estimating the fire supply requirements:

Type of construction – Non-Combustible Construction

Occupancy type – Non-Combustible

Sprinkler Protection – Non-Sprinklered

The estimated fire flow is ***13,000 L/min****;* actual building materials selected will affect the estimated flow; see ***Appendix B*** for detailed FUS calculations.

The ***Design Brief Phase 1B*** had contemplated a higher domestic demands and greater fire flow as predicted in this study. Therefore, the development complies with the design brief, a water distribution model was completed to ensure that the internal pipe network can adequately service the development.

3.3 Watermain Modeling

EPANet was utilized to determine pipe sizing and the availability of pressures throughout the system during Average Day demand, Peak Hour, and Max Day plus Fire Flow. The static model determines pressures based on the available head obtained from the boundary conditions from the ***Design Brief Phase 1B***, as indicated in ***Table 3.***

The model utilizes the Hazen-Williams equation to determine pressure drops, while the pipe properties, including friction factors, have been selected in accordance with Table 4.4 of the ***Water Supply Guidelines***.

A summary of the resulting pressures at all nodes are summarized in ***Table 4*** below.

Table 4
Resulting Pressures Proposed Conditions

Node ID	Average Day (kPa)	Peak Hour (kPa)	Max Day + Fire Flow* (kPa)
2	559.8	525.4	335.6
4	545.8	514.1	300.3
6	533.4	499.4	261.9
17	552.6	531.6	312.5
20	550.8	526.9	249.7
21	542.0	511.0	245.9
FH2*	551.0	529.5	235.6
*The fire flow yielding the lowest pressure was found at fire hydrant 2, which was used in this analysis.			

The minimum and maximum pressures shown in ***Table 4*** fall within the allowable pressures described in ***Table 2*** during the Max Day plus Fire Flow scenario. Pressures during Peak Hour are at the high end of the allowable pressure. A pressure test should

be conducted at the time of construction to determine if pressure reducing valves are required. Pressures during Average Day exceed the maximum allowable pressure, therefore pressure reducing valves are recommended.

The model predicted that water will flow in all areas of the system and no 'dead' zones were found.

3.4 Water Supply Conclusion

The boundary conditions at the site were determined from the ***Design Brief Phase 1B***. As demonstrated by ***Table 4***, the municipal system is capable of delivering water within the ***Water Supply Guidelines*** pressure range. Sufficient flow is available to provide fire protection for the site. Pressure reducing valves are recommended for the Average Day scenario.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The sanitary flow from the subject property has been considered in the wastewater design for the Wateridge Subdivision, outlined in the ***Design Brief Phase 1B***.

The total wastewater flow summarized in ***Table 5*** below.

Table 5
Wastewater Flow per Design Brief – Total Site Area

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.62
Estimated Peak Dry Weather Flow	6.48
Estimated Peak Wet Weather Flow	6.93

4.2 Wastewater Design

It is proposed that the development will connect to the 250 mm diameter sewer within the Moses Tennisco Street right-of-way.

Table 6 summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 6
Wastewater Design Criteria

Design Parameter	Value
Townhouse	2.7 P/unit
Average Daily Demand - Residential	350 L/d/per
Peaking Factor	Harmon's Peaking Factor. 4.0
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.	

Table 7 demonstrates the anticipated peak flow from the proposed development. See ***Appendix C*** for associated calculations.

Table 7
Summary of Estimated Peak Wastewater Flow

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.37
Estimated Peak Dry Weather Flow	5.48
Estimated Peak Wet Weather Flow	5.93

The estimated sanitary flow, based on the site plan provided in ***Drawings/Figures,*** anticipates a peak wet weather flow of ***5.93 L/s***.

The anticipated peak wastewater flow generated from the proposed development is less than contemplated in the ***Design Brief Phase 1B***, therefore, it can be concluded there is capacity in the downstream system.

A sanitary calculation sheet was prepared showing the on-site capacity of the local sanitary sewers, see ***Appendix C*** for the calculation sheet and ***SAN-1*** for the sanitary drainage area drawing.

4.3 Wastewater Servicing Conclusions

The sanitary flow from the subject property has been considered in the wastewater design for the Wateridge Subdivision, outlined in the ***MSS***.

The proposed development results in a wastewater flow that is less than contemplated in the ***Design Brief Phase 1B***, therefore, the existing sanitary sewers can convey the flow.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Minor and major flow from the subject site were accounted for in the Wateridge Subdivision. The subject site was contemplated in the ***Design Brief Phase 1B*** to be conveyed to the Eastern SWM Facility. Major flow is proposed to be directed to a dry pond to the south of Mikinak Road for quantity control and will eventually be discharged through the minor system to the Easter SWM Facility.

Refer to ***Appendix D*** for a reduced copy of the storm design sheet and drainage area figures prepared by IBI for the Wateridge Subdivision.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Ottawa River watershed, and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA).

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa, where the proposed development is required to:

- Follow quantity and quality controls outlined in the ***Design Brief Phase 1B***
- Incorporate Low Impact Development measures in accordance with the ***Design Brief Phase 1B*** and ***LID Demonstration Project***

5.3 Proposed Stormwater Management System

It is proposed that the stormwater from the development will be directed to the 750mm storm sewer within Michael Stoqua Street.

As discussed in ***Section 5.1***, the quantity controls for Block 24 will be provided by the dry pond south of the subject site and through the Eastern SWM Facility outlined in the ***Design Brief Phase 1B***.

The subject site was also accounted for in design of the permanent pool of the Eastern SWM Facility, which provides 80% TSS removal for the subdivision.

A storm design sheet was prepared to support the capacity of the internal and external storm sewers, refer to ***Appendix D*** for the calculation sheet and ***SWM-1*** for the drainage area figure. The overall Runoff Coefficient from the site is equal to that allocated in the ***Design Brief Phase 1B*** and therefore, no additional quantity or quality controls are required.

Major flow on-site has been modeled using SWMHYMO. The analysis of different storm events resulted in the 24 Hour Chicago storm distribution resulting in the highest flows

on-site. Major overland flow was determined based on the capture rate of the catch basins and minor system, the remaining overland flow was modeled within critical cross sections within the rear lane and at the exit of the site to the municipal ROW. It was determined that the depth of flow will be contained within the road cross section at both critical sections and not extend up to garages within the rear lane during the simulated 100-year storm event. Please refer to ***Appendix D*** for input and output summary of the SWMHYMO analysis.

5.4 Low Impact Development (LID) Practices

LID measures are proposed in accordance with the ***Design Brief Phase 1B*** and ***LID Demonstration Project***. It is proposed to direct all roof flow to side yard and bioswales, eventually draining to area drains. Grassed swales are proposed adjacent to the townhouse blocks to direct roof drainage to the area drains and to the oversized perforated pipe infiltration system and underground infiltration storage tanks. The granular base surrounding the perforated pipe and underground storage has been sized in accordance with the ***LID Design Guide*** based on infiltration rates, ensuring a maximum drawdown time of 48 hours. Based on correspondence with Paterson Group, an infiltration rate of 50mm/day has been estimated for the soil in Block 19, a Block owned by the applicant north-west of Block 15. It is proposed to use material from this Block as fill on the adjacent sites, therefore, the LID infiltration practices will be placed within the fill from Block 19.

Within the Mews a bioswale is proposed consisting of riverstone and larger vegetation which collects roof and rear yard drainage. The term “bioswale” as the proposed LID practice is a combination of “bioretention” and “enhanced grass swale” as defined by the ***LID Design Guide***. A layer of riverstone is proposed as ground cover along with native plants to slow down runoff to promote infiltration and evapotranspiration. The bioswale will continue to convey flow, similar to an enhanced grass swale, to a series of area drains connected to a rainwater harvesting unit located at the downstream end of the Mews.

The rainwater harvesting tank is proposed to store runoff from the Mews to be used for irrigation. The rainwater harvesting tank is equipped with a connection to the local watermain for use during dry periods. The rainwater harvesting is also equipped with an overflow to the local storm system in case of overflow and with an open grate to the surface in case of very large storm events that overwhelm the local storm sewer system. A schematic of the rainwater harvesting system prepared by LRL is included in Appendix D.

All LID measures are designed to infiltrate an equivalent of the 4mm event over the site area and each LID measure must treat the minimum of the 15mm event. A total infiltration requirement of 4mm or ***64.0m^3*** and a total treatment volume of the 15mm event, or ***111.4m^3*** is required as per the ***LID Demonstration Project***. The current underground storage and perforated pipe system provides ***187.3m^3*** of volume to be infiltrated or detained for irrigation, exceeding the above noted requirements.

Details of the LID practices are shown on ***DS-1***.

5.5 Stormwater Servicing Conclusions

Minor and major system flow from Block 24 were accounted for in the subdivision design. Quantity and quality controls are provided through a dry stormwater pond to the south and the Eastern SWM Facility to the north.

LID practices in the form bioswales, grassed swales, rainwater harvesting tanks and oversized perforated pipes are proposed to treat, storage and infiltrate roof and landscaped runoff from the site, in accordance with the ***LID Demonstration Project***

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies.

6.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management for the proposed development for Block 24 of the former CFB Rockcliffe lands, which are currently under re-development. The preceding report outlines the following:

- Based on boundary conditions from the ***MSS*** and a water distribution model completed for the site, sufficient pressure exists to support the development.
- Based on estimated fire flow per the ***FUS***, there is sufficient pressure within the local system to provide the required fire flow.
- The proposed development is anticipated to have a peak wet weather flow of ***6.11 L/s***; the adjacent sanitary sewer has capacity to convey the increase in flow
- The quantity and quality controls are provided for the site through a dry pond to the south of the site and the Eastern SWM Facility outlined in the ***MSS***
- LID practices in the form bioswales, grassed swales, rainwater harvesting tanks and oversized perforated pipes are proposed to treat, storage and infiltrate roof and landscaped runoff from the site, in accordance with the ***LID Demonstration Project***

Prepared by,
David Schaeffer Engineering Ltd.

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Per: Adam D. Fobert, P. Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-948 08/08/2017

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	Figure 1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	N/A
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	N/A

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 1.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.3
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	N/A
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	N/A
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 7.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

Steve Merrick

From: David Gilbert <DGilbert@Patersongroup.ca>
Sent: Friday, September 22, 2017 2:30 PM
To: Steve Merrick
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Steve,

As discussed, the upper portion of the soils profile within Block 19 consists mainly of a silty clay. If this material were re-compacted across the other blocks, we estimate that the infiltration rate would be approximately 50 mm/day. To provide an accurate infiltration rate assessment, we could complete a series of pask permeameter tests once the material has been placed and re-compacted or in its presence state within Block 19.

Best regards,

David Gilbert, P.Eng.
Senior Geotechnical Engineer

patersongroup
Solution Oriented Engineering
60 years serving our clients

154 Colonnade Road South
Ottawa, Ontario
K2E 7J5
Tel: 613.226-7381 ext. 205

From: Steve Merrick [mailto:SMerrick@dsel.ca]
Sent: Thursday, September 21, 2017 9:21 AM
To: David Gilbert <DGilbert@Patersongroup.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Dave, same project but a different question. Can Paterson please provide an average infiltration rate for the Block 19? We are looking for this to size our LID systems understanding that the LID measures for Blocks 15, 22 and 24 will be within fill taken from Block 19.

I'll follow up with a phone call this morning to discuss.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Steve Merrick
Sent: Wednesday, September 20, 2017 4:03 PM
To: 'David Gilbert' <DGilbert@Patersongroup.ca>
Cc: 'Adam Fobert' <afobert@dsel.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Thanks Dave, we are trying to get the feasibility of this option back to Mattamy quickly and your input would really help.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Steve Merrick
Sent: Wednesday, September 20, 2017 3:29 PM
To: David Gilbert <DGilbert@Patersongroup.ca>
Cc: 'Adam Fobert' <afobert@dsel.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Dave,

We are looking at some servicing options for Mattamy' blocks at Wateridge and wanted to input from Paterson on zone of influence and sewers in close proximity to the units. I have attached 3 sketches (very rough) showing some restrictive areas. Can you advise on the zone of influence from the footings and provide any other geotechnical recommendations or issues with the proposed sections?

Please refer to the servicing plans for locations of the 3 sections.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Jillian Normand [mailto:Jillian.Normand@mattamycorp.com]
Sent: Wednesday, August 9, 2017 5:21 PM
To: Adam Fobert <AFobert@dsel.ca>; Steve Merrick <SMerrick@dsel.ca>; Anne-Claude Schellenberg <ACSchellenberg@nak-design.com>; Sean Leogreen <sleogreen@nak-design.com>; Anita Bennell <abennell@nak-design.com>; Kevin Murphy <Kevin.Murphy@mattamycorp.com>; Jessica McLellan <Jessica.Mclellan@mattamycorp.com>; Marco VanderMaas <MVanderMaas@q4architects.com>; Daniel Potechin <Daniel.Potechin@mattamycorp.com>
Subject: Wateridge Village Phase 1B - Geotech Report

Hi team,

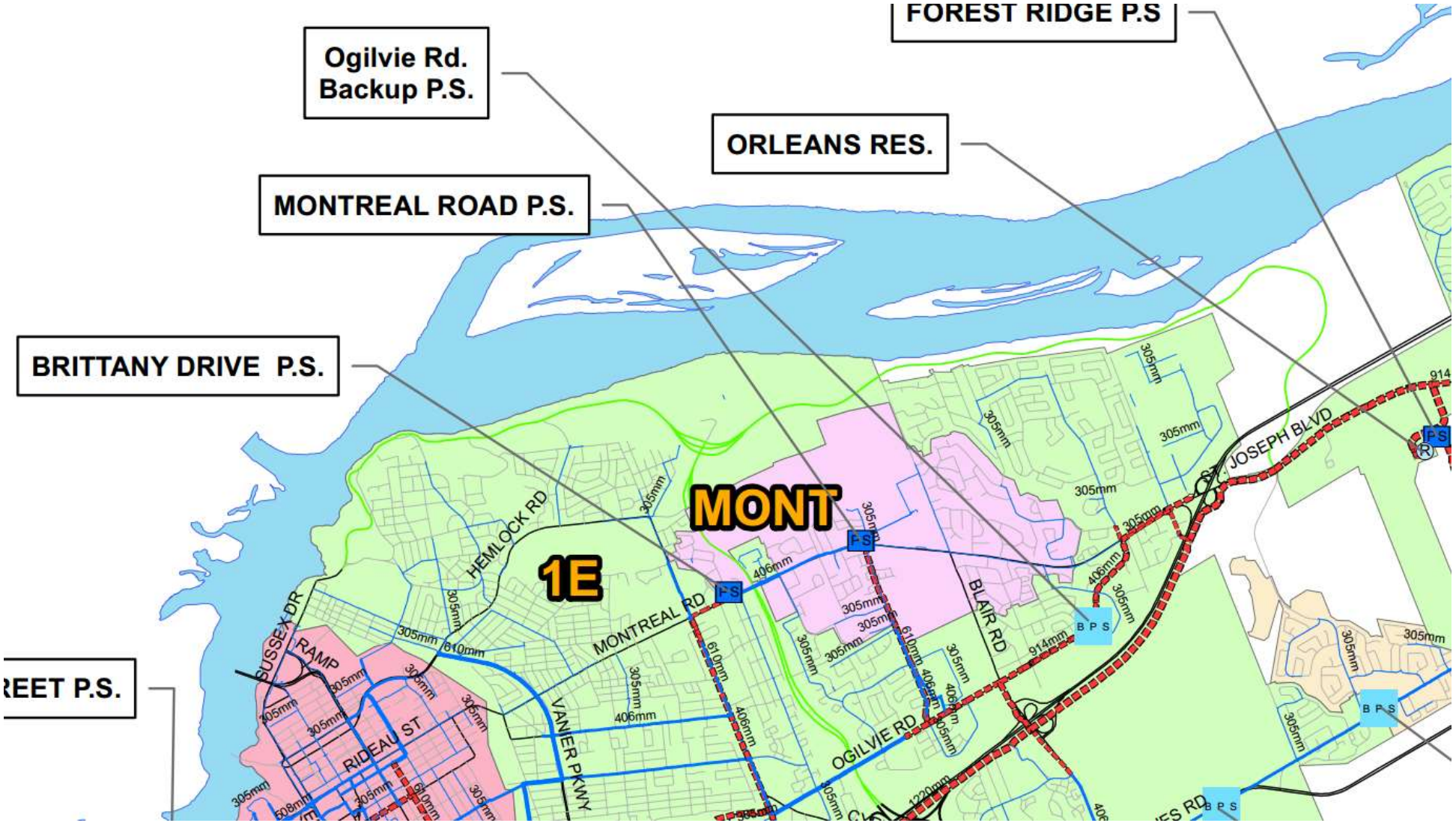
Please see attached for the updated Geotech Report, for your reference.

Jillian

Jillian Normand
Land Development Manager
T (613) 831-5144 (direct). **C** (613) 415-7786. **F** (613) 831-9060
Jillian.Normand@mattamycorp.com
Ottawa Office: 50 Hines Road, Suite 100, Ottawa, ON Canada K2K 2M5

APPENDIX B

Water Supply


FOREST RIDGE P.S
Ogilvie Rd.
Backup P.S.
ORLEANS RES.
MONTREAL ROAD P.S.
BRITTANY DRIVE P.S.
REET P.S.
MONT
1E
HEMLOCK RD
MONTREAL RD
SUSSEX DR
RAMP
RIDEAU ST
VANIER PKWY
OGILVIE RD
BLAIR RD
ST. JOSEPH BLVD
305mm
406mm
610mm
914mm
1220mm
508mm
P S
B P S

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		0
Semi-detached	2.7		0
Townhouse	2.7		400
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	400	140.0	97.2	420.0	291.7	630.0	437.5

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate	Units	Avg. Daily		Max Day		Peak Hour	
			m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial floor space	2.5 $L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Office	75 $L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
		Total I/CI Demand	0.0	0.0	0.0	0.0	0.0	0.0
		Total Demand	**140.0**	**97.2**	**420.0**	**291.7**	**630.0**	**437.5**

Mattamy Homes
Wateridge Block 24
Proposed Site Conditions

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		0
Semi-detached	2.7		0
Townhouse	2.7	125	338
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	338	118.3	82.2	354.9	246.5	532.4	369.7

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate	Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5 $L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Office	75 $L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
		Total I/CI Demand	0.0	0.0	0.0	0.0	0.0	0.0
		Total Demand	**118.3**	**82.2**	**354.9**	**246.5**	**532.4**	**369.7**

Mattamy Homes
Wateridge Block 24
Proposed Site Conditions
Dwelling Block 10

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1683.9	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9027.8	L/min	
	9000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**7650.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

N	10.1m-20m	15%
S	30.1m-45m	5%
E	10.1m-20m	15%
W	20.1m-30m	10%
	% Increase	**45%**

value not to exceed 75% per FUS Part II, Section 4

Increase	**3442.5 L/min**

Total Fire Flow

Fire Flow	11092.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	11000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Mattamy Homes
Wateridge Block 24
Proposed Site Conditions
Dwelling Block 5

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1492.2	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8498.4	L/min	
	8000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**6800.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

N	10.1m-20m	15%
S	3.1m-10m	20%
E	10.1m-20m	15%
W	3.1m-10m	20%
	% Increase	**70%**

value not to exceed 75% per FUS Part II, Section 4

Increase	**4760.0 L/min**

Total Fire Flow

Fire Flow	11560.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Mattamy Homes
Wateridge Block 24
Proposed Site Conditions
Dwelling Block 5

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1722.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	9129.3	L/min	
	9000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**7650.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

N	10.1m-20m	15%	
S	3.1m-10m	20%	
E	10.1m-20m	15%	
W	30.1m-45m	5%	
	% Increase	**55%**	*value not to exceed 75% per FUS Part II, Section 4*

Increase	**4207.5 L/min**

Total Fire Flow

Fire Flow	11857.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

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**************************************************************
*                          E P A N E T                       *
*                  Hydraulic and Water Quality               *
*                  Analysis for Pipe Networks                *
*                        Version 2.0                         *
**************************************************************
```

AVERAGE DAY - BLOCK 24

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
5	4	6	45.9	50
6	2	23	31.5	200
8	23	4	21.4	100
9	2	17	85.5	200
10	16	17	27.3	200
11	17	18	33.7	200
12	18	19	4.5	150
13	18	20	19.1	100
14	20	21	43.9	50
15	20	4	85.5	100
21	23	22	4.7	150
1	1	2	27.3	200
2	6	21	81.9	50

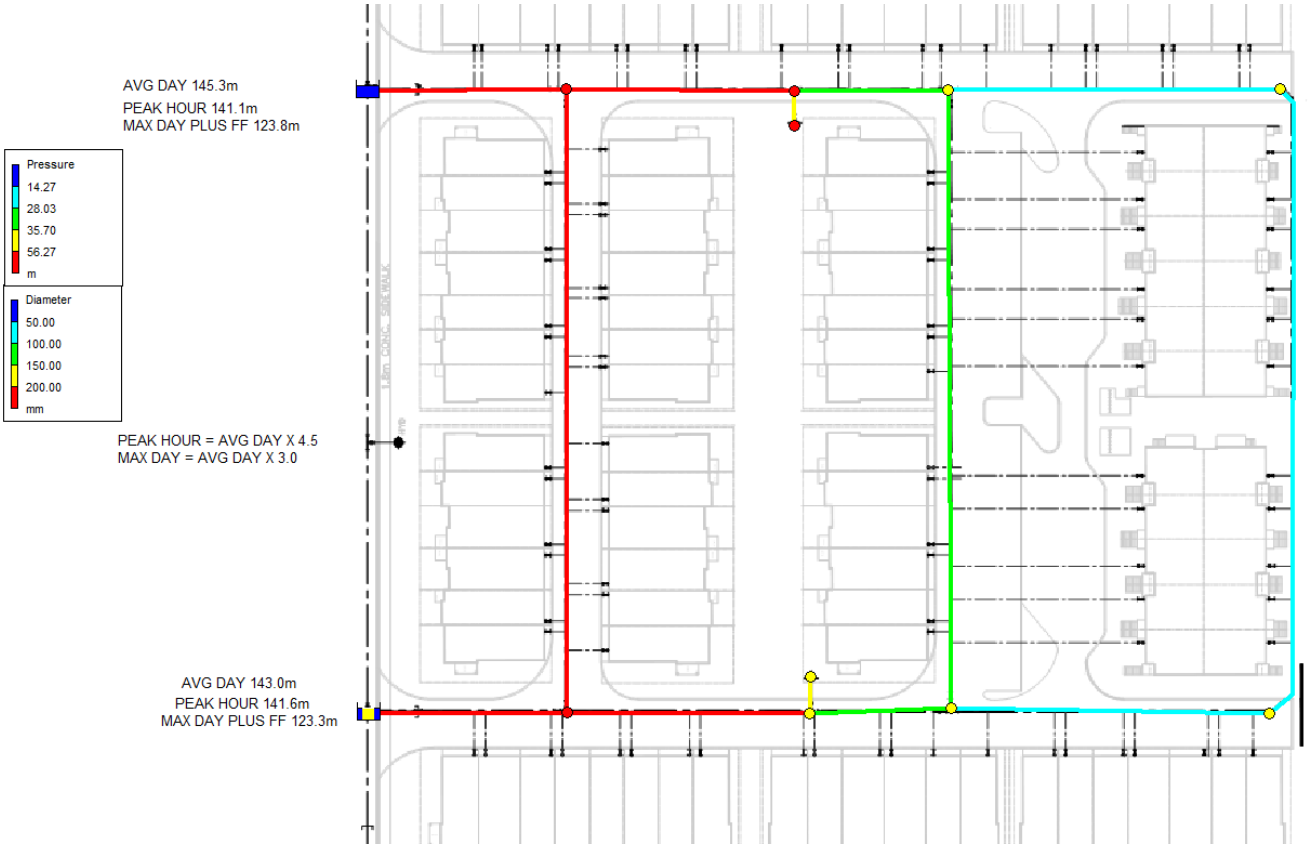
Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
2	13.70	144.69	57.06	0.00	
4	13.70	144.42	55.64	0.00	
6	13.70	144.09	54.37	0.00	
17	13.70	143.58	56.33	0.00	
18	0.00	143.59	56.14	0.00	
19	0.00	143.59	55.89	0.00	
20	13.70	143.75	56.15	0.00	
21	13.70	143.80	55.25	0.00	
22	0.00	144.68	56.56	0.00	
23	0.00	144.68	57.06	0.00	
1	-2679.85	145.30	0.00	0.00	Reservoir
16	2597.65	143.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
5	43.75	0.37	7.22	Open
6	335.27	0.18	0.33	Open
8	335.27	0.71	11.75	Open
9	2330.88	1.24	12.96	Open
10	-2597.65	1.38	21.18	Open
11	-280.47	0.15	0.24	Open
12	0.00	0.00	0.00	Open
13	-280.47	0.60	8.52	Open
14	-16.35	0.14	1.16	Open
15	-277.82	0.59	7.90	Open
21	0.00	0.00	0.00	Open
1	2679.85	1.42	22.48	Open
2	30.05	0.26	3.57	Open

AVERAGE DAY SCENARIO – BLOCK 24



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*                          E P A N E T                       *
*                  Hydraulic and Water Quality               *
*                  Analysis for Pipe Networks                *
*                        Version 2.0                         *
**************************************************************
```

PEAK HOUR - BLOCK 24

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
5	4	6	45.9	50
6	2	23	31.5	200
8	23	4	21.4	100
9	2	17	85.5	200
10	16	17	27.3	200
11	17	18	33.7	200
12	18	19	4.5	150
13	18	20	19.1	100
14	20	21	43.9	50
15	20	4	85.5	100
21	23	22	4.7	150
1	1	2	27.3	200
2	6	21	81.9	50

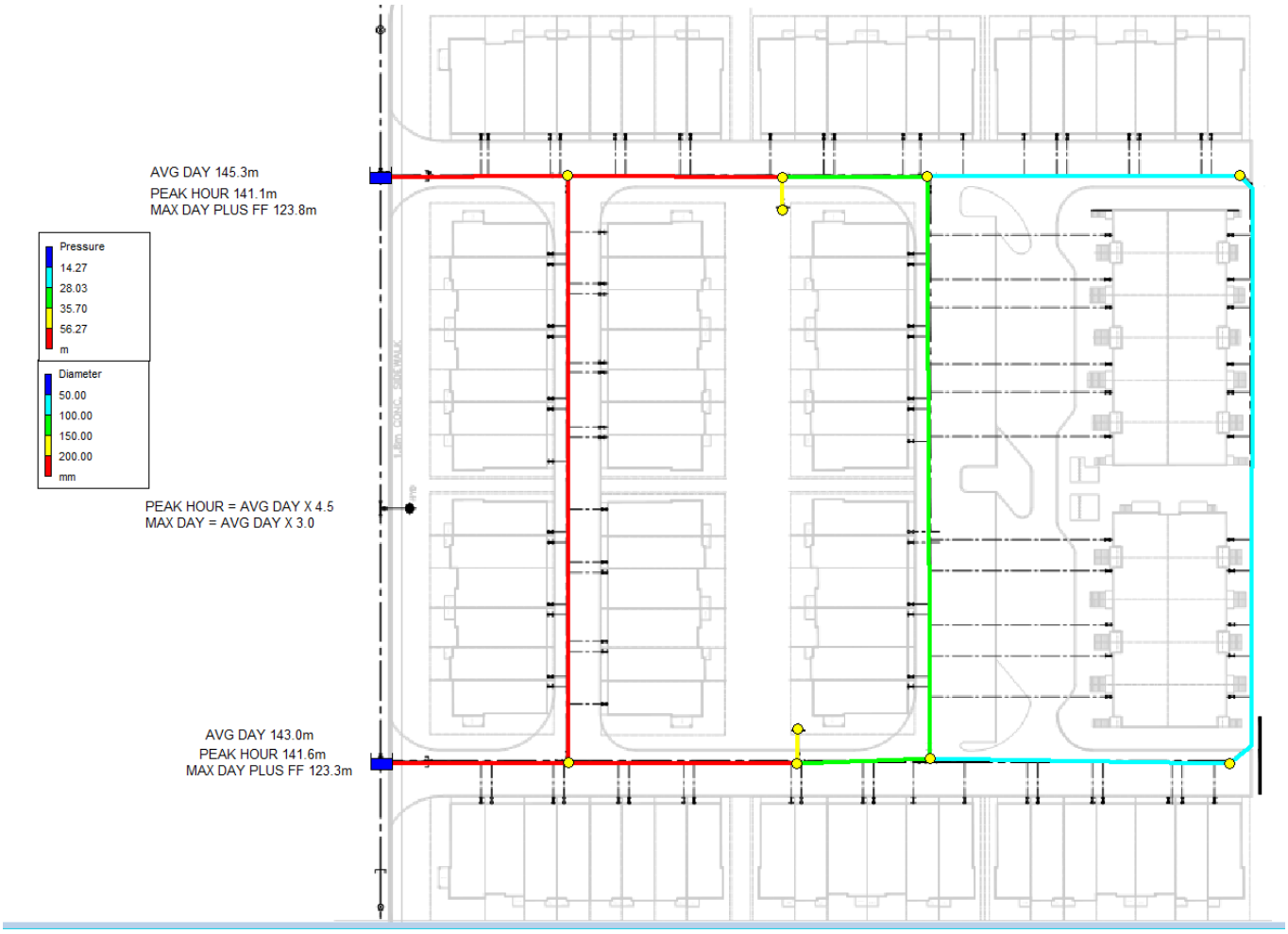
Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
2	61.65	141.19	53.56	0.00	
4	61.65	141.19	52.41	0.00	
6	61.65	140.63	50.91	0.00	
17	61.65	141.44	54.19	0.00	
18	0.00	141.43	53.98	0.00	
19	0.00	141.43	53.73	0.00	
20	61.65	141.31	53.71	0.00	
21	61.65	140.64	52.09	0.00	
22	0.00	141.19	53.07	0.00	
23	0.00	141.19	53.57	0.00	
1	973.45	141.10	0.00	0.00	Reservoir
16	-1343.35	141.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
5	57.81	0.49	12.11	Open
6	9.10	0.00	0.00	Open
8	9.10	0.02	0.01	Open
9	-1044.20	0.55	2.88	Open
10	1343.35	0.71	6.03	Open
11	237.50	0.13	0.17	Open
12	0.00	0.00	0.00	Open
13	237.50	0.50	6.24	Open
14	65.49	0.56	15.28	Open
15	110.36	0.23	1.42	Open
21	0.00	0.00	0.00	Open
1	-973.45	0.52	3.27	Open
2	-3.84	0.03	0.08	Open

PEAK HOUR SCENARIO – BLOCK 24



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*                            E P A N E T                             *
*                     Hydraulic and Water Quality                    *
*                     Analysis for Pipe Networks                     *
*                           Version 2.0                              *
**********************************************************************
```

MAX DAY PLUS FIREFLOW - BLOCK 24

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
5	4	6	45.9	50
6	2	23	31.5	200
8	23	4	21.4	100
9	2	17	85.5	200
10	16	17	27.3	200
11	17	18	33.7	200
12	18	19	4.5	150
13	18	20	19.1	100
14	20	21	43.9	50
15	20	4	85.5	100
21	23	22	4.7	150
1	1	2	27.3	200
2	6	21	81.9	50

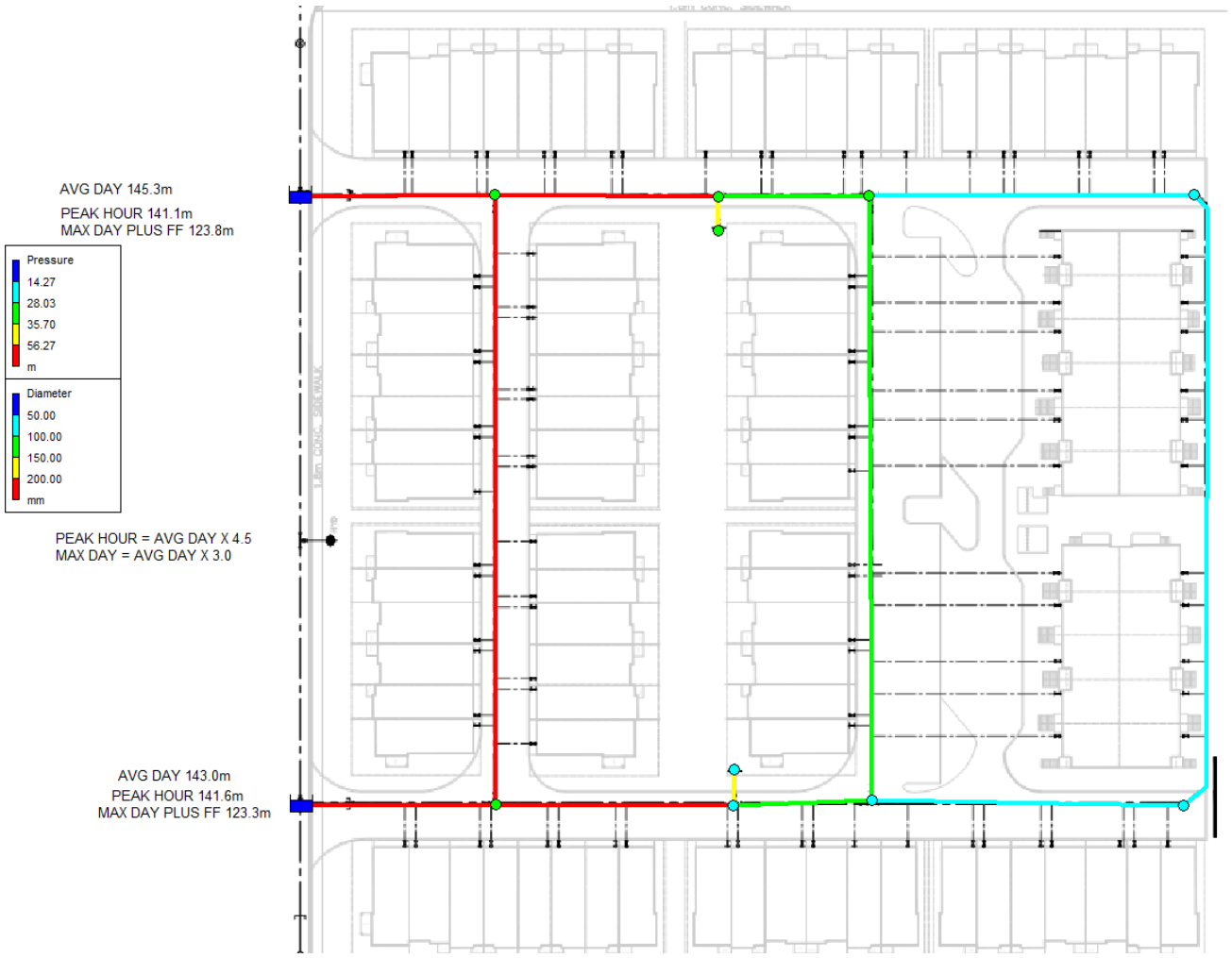
Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
2	41.10	121.84	34.21	0.00	
4	41.10	119.39	30.61	0.00	
6	41.10	116.42	26.70	0.00	
17	41.10	119.11	31.86	0.00	
18	12000.00	111.47	24.02	0.00	
19	0.00	111.47	23.77	0.00	
20	41.10	113.05	25.45	0.00	
21	41.10	113.62	25.07	0.00	
22	0.00	121.75	33.63	0.00	
23	0.00	121.75	34.13	0.00	
1	-4920.50	123.80	0.00	0.00	Reservoir
16	-7326.10	123.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
5	142.69	1.21	64.71	Open
6	1109.67	0.59	3.11	Open
8	1109.67	2.35	109.94	Open
9	3769.73	2.00	31.93	Open
10	7326.10	3.89	153.35	Open
11	11054.73	5.86	226.89	Open
12	0.00	0.00	0.00	Open
13	-945.27	2.01	82.62	Open
14	-60.49	0.51	13.18	Open
15	-925.88	1.96	74.24	Open
21	0.00	0.00	0.00	Open
1	4920.50	2.61	71.68	Open
2	101.59	0.86	34.17	Open

MAX DAY + FIRE FLOW SCENARIO – BLOCK 24



APPENDIX C

Wastewater Collection

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL													
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Phase 1B																																
Hemlock Road	201A	MH201A	MH202A	0.31						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	0.09	50.02	87.06	250	0.65	0.987	49.93	99.83%
Future Street No. 6	EX202A	BULK202AN	MH202A						2.08	358.5	358.5	4.00	5.81		0.00		0.00		0.00	0.00	2.08	2.08	0.58	0.00	6.39	31.02	21.00	250	0.25	0.612	24.63	79.40%
Hemlock Road	202A	MH202A	MH203A	0.21						0.0	358.5	4.00	5.81		0.00		0.00		0.00	0.00	0.21	2.60	0.73	0.00	6.54	75.98	86.00	250	1.50	1.500	69.44	91.40%
Future Street No. 5	EX203A	BULK203AN	MH203A						1.40	160.5	160.5	4.00	2.60		0.00		0.00		0.00	0.00	1.40	1.40	0.39	0.00	2.99	83.23	21.00	250	1.80	1.643	80.24	96.40%
Hemlock Road	203A, EXPARK2	MH203A	MH204A	0.20					0.44	0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.64	0.64	0.18	0.00	0.18	82.07	86.00	250	1.75	1.620	81.89	99.78%
rue Moses Tennisco Street	EX204A	BULK204AN	MH204A						1.39	153.5	153.5	4.00	2.49		0.00		0.00		0.00	0.00	1.39	1.39	0.39	0.00	2.88	83.23	21.00	250	1.80	1.643	80.36	96.54%
Hemlock Road	204A	MH204A	MH205A	0.21						0.0	153.5	4.00	2.49		0.00		0.00		0.00	0.00	0.21	1.60	0.45	0.00	2.94	67.96	90.00	250	1.20	1.341	65.02	95.68%
rue Michael Stoqua Street	EX205A	BULK205AN	MH205A						1.38	241.5	241.5	4.00	3.91		0.00		0.00		0.00	0.00	1.38	1.38	0.39	0.00	4.30	67.96	21.00	250	1.20	1.341	63.66	93.67%
Hemlock Road	205A	MH205A	MH206A	0.25						0.0	395.0	4.00	6.40		0.00		0.00		0.00	0.00	0.25	3.23	0.90	0.00	7.30	31.02	112.00	250	0.25	0.612	23.71	76.45%
rue Bareille-Snow Street	EX206A-B	BULK206AN	MH206A						9.61	1755.0	1755.0	3.63	25.80		0.00		0.00		0.00	0.00	9.61	9.61	2.69	0.00	28.49	87.74	21.00	250	2.00	1.731	59.24	67.52%
Hemlock Road	206A	MH206A	MH207A	0.20						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.20	13.04	3.65	0.00	34.67	55.26	89.33	300	0.30	0.757	20.59	37.26%
Block 20	PARK1	MH207AN	MH207A	0.32						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.32	0.32	0.09	0.00	0.09	39.24	14.00	250	0.40	0.774	39.15	99.77%
Hemlock Road	PARK1, 207A	MH207A	*BULK176AE*	0.12						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.12	13.48	3.77	0.00	34.79	65.38	33.16	300	0.42	0.896	30.59	46.79%
Phase 1A																																
Hemlock Road		*BULK176AE*	*MH176A*							0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.00	13.48	3.77	0.00	34.79	65.38	*21.97*	*300*	*0.42*	0.896	30.59	46.79%
Phase 1B																																
chemin Wanaki Road	200A, COM1	MH200A	MH214A	0.25						0.0	0.0	4.00	0.00		0.00	0.90	0.90		0.00	0.78	1.15	1.15	0.32	0.00	1.10	73.41	98.28	250	1.40	1.449	72.30	98.50%
chemin Wanaki Road	214A, COM2	MH214A	*BULK153AN*	0.16						0.0	0.0	4.00	0.00		0.00	0.65	1.55		0.00	1.35	0.81	1.96	0.55	0.00	1.89	51.91	44.22	250	0.70	1.024	50.01	96.35%
Phase 1B																																
chemin Wanaki Road	143B	BULK143AE	MH143A	0.31						104.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	1.77	43.87	21.50	250	0.50	0.866	42.10	95.96%
chemin Wanaki Road	143A	MH143A	MH144A	0.27						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.27	0.58	0.16	0.00	1.85	87.74	47.73	250	2.00	1.731	85.89	97.89%
chemin Wanaki Road	144A, 144B	MH144A	MH145A	0.72						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.72	1.30	0.36	0.00	2.05	87.74	40.57	250	2.00	1.731	85.69	97.66%
chemin Wanaki Road	145A, 145B, 145C	MH145A	MH146A	2.77						835.6	939.6	3.82	14.53		0.00		0.00		0.00	0.00	2.77	4.07	1.14	0.00	15.67	107.45	53.01	250	3.00	2.121	91.79	85.42%
chemin Wanaki Road	146A	MH146A	MH147A	0.14						0.0	939.6	3.82	14.53		0.00		0.00		0.00	0.00	0.14	4.21	1.18	0.00	15.71	43.54	37.48	250	1.00	1.224	27.83	63.92%
chemin Wanaki Road	PARK2	BLK147AE	MH147A	0.55						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.55	0.55	0.15	0.00	0.15	39.24	17.66	250	0.40	0.774	39.08	99.61%
chemin Wanaki Road	147C	BLK147AW	MH147A	0.10						33.6	33.6	4.00	0.54		0.00		0.00		0.00	0.00	0.10	0.10	0.03	0.00	0.57	43.87	17.33	250	0.50	0.866	43.30	98.70%
chemin Wanaki Road	147A	MH147A	MH170A	0.03						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.03	4.89	1.37	0.00	16.38	31.02	10.23	250	0.25	0.612	14.64	47.19%
chemin Wanaki Road	147B	MH107A	MH147C	0.16						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.16	5.05	1.41	0.00	16.42	31.02	39.00	250	0.25	0.612	14.59	47.05%
chemin Wanaki Road		MH147C	*BLK148AW*							0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.00	5.05	1.41	0.00	16.42	31.02	11.77	250	0.25	0.612	14.59	47.05%
Phase 1B																																
Block 9	154A	*MH158A*	MH217A	0.19						0.0	973.2	3.81	15.01		2.62		3.83		0.00	5.60	0.19	12.94	3.62	0.00	24.23	53.37	171.95	250	0.74	1.053	29.13	54.59%
croissant Squadron Crescent	215Aa-b	MH215A	MH216A	0.79	3	4				117.8	117.8	4.00	1.91		0.00		0.00		0.00	0.00	0.79	0.79	0.22	0.00	2.13	50.02	80.00	250	0.65	0.987	47.89	95.74%
croissant Squadron Crescent	216Aa-b	MH216A	MH217A	0.67	2	6				94.5	212.3	4.00	3.44		0.00		0.00		0.00	0.00	0.67	1.46	0.41	0.00	3.85	50.02	71.19	250	0.65	0.987	46.17	92.30%
croissant Squadron Crescent	217A	MH217A	MH218A	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.42	4.04	0.00	27.65	36.70	10.52	250	0.35	0.724	9.05	24.66%
croissant Squadron Crescent	218A	MH218A	MH218B	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.44	4.04	0.00	27.66	36.70	12.49	250	0.35	0.724	9.05	24.65%
	THORN1	*EX SANMH*	MH218B						5.55	1574.0	1574.0	3.66	23.36		0.00		0.00		0.00	0.00	5.55	5.55	1.55	0.00	24.92	74.13	46.02	300	0.54	1.016	49.21	66.39%
croissant Squadron Crescent	218B	MH218B	MH219A	0.07						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.07	20.06	5.62	0.00	50.04	59.68	37.08	300	0.35	0.818	9.64	16.16%
croissant Squadron Crescent	219A	MH219A	MH220A	0.15						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.15	20.21	5.66	0.00	50.08	59.68	72.49	300	0.35	0.818	9.60	16.09%
croissant Squadron Crescent	220A, 220B	MH220A	MH221A	1.46						319.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	1.46	21.67	6.07	0.00	54.48	59.68	43.77	300	0.35	0.818	5.21	8.72%
croissant Squadron Crescent	221A	MH221A	MH222A	0.02						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.02	21.69	6.07	0.00	54.48	59.68	8.66	300	0.35	0.818	5.20	8.71%
croissant Squadron Crescent	222A	MH222A	*MH169A*	0.22						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.22	21.91	6.13	0.00	54.54	59.68	89.42	300	0.35	0.818	5.14	8.61%

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.4	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.7	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5))
where P = population in thousands

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	1 of 2

IBI GROUP
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Ottawa, Ontario K1S 5N4 Canada
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SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Phase 1A																																
croissant Squadron Crescent		*MH169A*	*MH165A*							0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.00	21.91	6.13	0.00	54.54	63.80	*27.00*	*300*	*0.40*	0.874	9.26	14.51%
Phase 1B																																
rue Moses Tennisco Street	212A	MH212A	MH213A	1.20						252.0	252.0	4.00	4.08		0.00		0.00		0.00	0.00	1.20	1.20	0.34	0.00	4.42	50.02	63.80	250	0.65	0.987	45.60	91.16%
rue Moses Tennisco Street	213A	MH213A	*BULK165AN*	0.35						52.5	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.35	1.55	0.43	0.00	5.37	39.24	50.79	250	0.40	0.774	33.87	86.32%
Phase 1A																																
rue Moses Tennisco Street		*BULK165AN*	*MH165A*							0.0	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.00	1.55	0.43	0.00	5.37	39.24	*22.50*	*250*	*0.40*	0.774	33.87	86.32%
Phase 1B																																
rue Michael Stoqua Street	210A	MH210A	MH211A	0.40						52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.40	0.40	0.11	0.00	0.96	50.02	64.80	250	0.65	0.987	49.05	98.08%
rue Michael Stoqua Street	211A	MH211A	MH166B	0.35						52.5	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.35	0.75	0.21	0.00	1.91	50.02	52.19	250	0.65	0.987	48.11	96.18%
Phase 1A																																
rue Michael Stoqua Street		MH166B	*MH166A*							0.0	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.00	0.75	0.21	0.00	1.91	39.24	*21.10*	*250*	*0.40*	0.774	37.33	95.13%
Phase 1B																																
rue Bareille-Snow Street	208A	MH208A	MH209A	1.01						207.4	207.4	4.00	3.36		0.00		0.00		0.00	0.00	1.01	1.01	0.28	0.00	3.64	50.02	64.85	250	0.65	0.987	46.37	92.72%
rue Bareille-Snow Street	209A	MH209A	MH167B	0.35						52.6	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.35	1.36	0.38	0.00	4.59	50.02	52.87	250	0.65	0.987	45.42	90.82%
Phase 1A																																
rue Bareille-Snow Street		MH167B	*MH167A*							0.0	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.00	1.36	0.38	0.00	4.59	63.80	*20.43*	*300*	*0.40*	0.874	59.21	92.80%
Phase 1B																																
Codd's Road	230A	BLK231AN	MH231A						0.87	85.7	85.7	4.00	1.39		0.00		0.00		0.00	0.00	0.87	0.87	0.24	0.00	1.63	75.98	3.00	250	1.50	1.500	74.35	97.85%
Codd's Road	231A, EXPARK1	MH231A	*BULK176AN*						0.76	43.3	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.76	1.63	0.46	0.00	2.55	87.74	50.22	250	2.00	1.731	85.19	97.10%
Phase 1A																																
Codd's Road		*BULK176AN*	*MH176A*							0.0	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.00	1.63	0.46	0.00	2.55	55.49	*23.23*	*250*	*0.80*	1.095	52.94	95.41%

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	7/8/2016
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3.	City submission No. 3	1/25/2017

File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	2 of 2

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

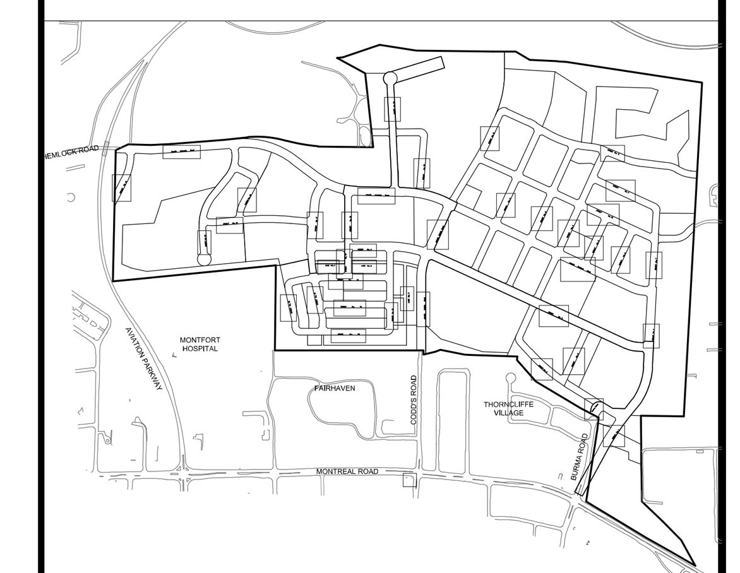
Date ____________________ 2017

Plan Number ____________________

LEGEND :

S168 2.01 0.80 — AREA NUMBER; RUNOFF COEFFICIENT; AREA IN HECTARES

POTENTIAL DRAINAGE DIRECTION



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER J. I. MOFFATT 17/06/07 PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE AREA PLAN

Scale 1 : 2000

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	501A

D07-16-15-0003

#17063

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area	1.610	**ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.45**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	0	400
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**400**	
Average Domestic Flow	**1.62**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**6.48**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	5	$L/m^2/d$		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.00**
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**1.62**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**6.48**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.93**	**L/s**

Mattamy Homes
Wateridge Block 24
Proposed Site Conditions

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 1.610 **ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.45**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	125	338
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**338**	
Average Domestic Flow	**1.37**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**5.48**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space*	5	$L/m^2/d$		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.00**
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.00**

** assuming a 12 hour commercial operation*

*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**1.37**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.48**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**5.93**	**L/s**

SANITARY SEWER CALCULATION SHEET

PROJECT: **Mattamy - Wateridge**
LOCATION: **Block 24**
FILE REF: **17-949**
DATE: **7-Dec-17**

DESIGN PARAMETERS

Avg. Daily Flow Res.	350	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.28	L/s/ha
Avg. Daily Flow Comm.	50,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population							Commercial		Institutional		Industrial			Infiltration				Pipe Data								
Area ID	Up	Down	Area	Proposed Units	Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)			(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
On site																												
SAN-6a	6	7	0.131	8	22.0	0.131	22.0	4.00	0.36		0.00		0.00		0.00	0.0	0.131	0.131	0.037	0.39	200	1.00	44.4	0.031	0.050	1.04	32.8	0.01
SAN-7b	7	4	0.465	35	95.0	0.596	117.0	4.00	1.90		0.00		0.00		0.00	0.0	0.465	0.596	0.167	2.06	200	1.70	88.5	0.031	0.050	1.36	42.8	0.05
SAN-6b	6	5	0.105	22	60.0	0.105	60.0	4.00	0.97		0.00		0.00		0.00	0.0	0.105	0.105	0.029	1.00	200	1.70	87.2	0.031	0.050	1.36	42.8	0.02
SAN-5	5	4	0.129	8	22.0	0.234	82.0	4.00	1.33		0.00		0.00		0.00	0.0	0.129	0.234	0.066	1.39	200	1.00	44.4	0.031	0.050	1.04	32.8	0.04
SAN-4	4	3	0.152	9	25.0	0.982	224.0	4.00	3.63		0.00		0.00		0.00	0.0	0.152	0.982	0.275	3.90	200	1.00	52.8	0.031	0.050	1.04	32.8	0.12
SAN-9	9	8	0.066	4	11.0	0.066	11.0	4.00	0.18		0.00		0.00		0.00	0.0	0.066	0.066	0.018	0.20	200	1.00	16.4	0.031	0.050	1.04	32.8	0.01
SAN-7a	7	8	0.152	9	25.0	0.152	25.0	4.00	0.41		0.00		0.00		0.00	0.0	0.152	0.152	0.043	0.45	200	2.30	52.8	0.031	0.050	1.58	49.7	0.01
SAN-8	8	3	0.353	26	71.0	0.571	107.0	4.00	1.73		0.00		0.00		0.00	0.0	0.353	0.571	0.160	1.89	200	0.90	88.5	0.031	0.050	0.99	31.1	0.06
SAN-3	3	2	0.066	4	11.0	1.619	342.0	4.00	5.54		0.00		0.00		0.00	0.0	0.066	1.619	0.453	5.99	200	1.00	20.7	0.031	0.050	1.04	32.8	0.18
	2	Stub	.			1.619	342.0	4.00	5.54		0.00		0.00		0.00	0.0	0.000	1.619	0.453	5.99	250	1.00	1.0	0.049	0.063	1.21	59.5	0.10

APPENDIX D

Stormwater Management

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
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STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.30	C= 0.45	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																		
Hemlock Road	S201A-B, EX201	MH201	MH202								0.31		0.56	1.85	1.85	10.00	1.17	11.17	104.19	122.14	178.56	192.62				192.62	210.32	90.18	450			0.50	1.281	17.70	8.41%
Future Street No. 6	EX202A	BULK202N	MH202										0.90	2.00	2.00	12.23	0.27	12.50	93.72	109.82	160.45	187.60				187.60	286.47	16.00	600			0.20	0.982	98.87	34.51%
Hemlock Road	S202A, EX202B-C	MH202	MH203								0.10		0.55	1.42	5.27	12.50	0.53	13.03	92.61	108.50	158.52	487.86				487.86	784.52	86.00	600			1.50	2.688	296.66	37.81%
Future Street No. 5	S203B, EX203	BULK203N	203								0.09		0.73	1.80	1.80	10.88	0.12	11.00	99.76	116.92	170.90	179.44				179.44	351.93	16.00	450			1.40	2.144	172.49	49.01%
Hemlock Road	S203A, EXP203	MH203	MH204		0.44						0.16			0.68	7.75	13.03	0.49	13.53	90.49	106.01	154.87	700.89				700.89	847.38	86.00	600			1.75	2.903	146.49	17.29%
rue Moses Tennisco Street	S204B, EX204A	BULK204N	MH204								0.08		0.72	1.76	1.76	10.89	0.11	11.00	99.72	116.87	170.81	175.20				175.20	399.05	16.00	450			1.80	2.431	223.85	56.10%
Hemlock Road	S204A, EX204B	MH204	MH205								0.14		0.47	1.32	10.82	13.53	0.54	14.07	88.63	103.82	151.66	958.99				958.99	1,272.26	90.00	750			1.20	2.790	313.27	24.62%
rue Michael Stoqua Street	S205A, EX205A	BULK205N	MH205								0.08		0.81	1.96	1.96	11.15	0.15	11.30	98.49	115.42	168.69	192.75				192.75	297.43	16.01	450			1.00	1.812	104.68	35.20%
Hemlock Road	S205B-C, EX205B	MH205	MH206								0.17		0.63	1.73	14.51	14.07	1.20	15.26	86.70	101.55	148.32	1,257.92				1,257.92	1,818.95	112.01	1200			0.20	1.558	561.03	30.84%
Temp Ditch	FUTURE PHASE	DI 10	BULK206N		7.68									6.41	6.41	59.66	0.16	59.82	33.08	38.61	56.13	211.89				211.89	297.43	17.03	450			1.00	1.812	85.54	28.76%
rue Bareille-Snow Street	S206A, EX206A	BULK206N	MH206								0.06		1.02	2.39	2.39	10.85	0.15	11.00	99.91	117.09	171.14	238.30				238.30	448.66	17.50	525			1.00	2.008	210.35	46.89%
Hemlock Road	S206B, EX206B	MH206	MH207								0.03		0.46	1.08	17.98	15.26	0.78	16.04	82.71	96.86	141.44	1,486.80				1,486.80	2,227.75	89.33	1200			0.30	1.908	740.96	33.26%
Block 20	P207	CBMH207N	MH207		0.32									0.27	0.27	10.00	0.27	10.27	104.19	122.14	178.56	27.81				27.81	63.80	14.00	300			0.40	0.874	36.00	56.42%
Hemlock Road	S207	MH207	*BULK176E*								0.22			0.43	18.67	16.04	0.37	16.42	80.33	94.05	137.32	1,499.75				1,499.75	2,156.55	32.62	1350			0.15	1.460	656.80	30.46%
Phase 1A																																		
Ex. Hemlock Road	S176C	*BULK176E*	*MH176*								0.02			0.04	18.71	16.42	0.27	16.69	79.24	92.78	135.45	1,482.57				1,482.57	2,156.55	*24.06*	*1350*			*0.15*	1.460	673.98	31.25%
Phase 1B																																		
Codd's Road	S230, LOT230A-B	230	231								0.16		0.70	1.87	1.87	10.00	0.63	10.63	104.19	122.14	178.56	194.65				194.65	364.28	84.30	450			1.50	2.219	169.63	46.57%
Codd's Road	S231, LOT231	231	*BULK176N*								0.12		0.30	0.90	2.77	10.63	0.36	11.00	100.96	118.34	172.97	279.55				279.55	549.49	53.76	525			1.50	2.459	269.94	49.12%
Phase 1A																																		
Ex. Codd's Road	---	*BULK176N*	*MH176*											0.00	2.95	11.77	0.29	12.06	95.69	112.12	163.84	281.96				281.96	339.63	*18.21*	*525*			*1.50*	0.919	57.67	16.98%
Phase 1B																																		
chemin Wanaki Road	S200, LOT200	MH200	MH214								0.20		0.91	2.41	2.41	10.00	0.78	10.78	104.19	122.14	178.56	251.42				251.42	351.93	99.75	450			1.40	2.144	100.51	28.56%
chemin Wanaki Road	S214, LOT214	MH214	*BULK152N*								0.19		0.84	2.24	4.65	10.78	0.42	11.20	100.27	117.52	171.77	466.34				466.34	535.93	46.51	600			0.70	1.836	69.59	12.99%
Phase 1B																																		
chemin Wanaki Road	EX143	BULK143E	MH143										0.33	0.73	0.73	10.00	0.29	10.29	104.19	122.14	178.56	76.47				76.47	129.34	20.00	375			0.50	1.134	52.87	40.88%
chemin Wanaki Road		MH143	MH144											0.00	0.73	10.29	0.37	10.66	102.67	120.34	175.92	75.35				75.35	258.68	50.50	375			2.00	2.269	183.33	70.87%
chemin Wanaki Road	S144, EX144	MH144	MH145		0.55						0.18			0.81	1.54	10.66	0.30	10.97	100.81	118.15	172.70	155.54				155.54	258.68	41.15	375			2.00	2.269	103.14	39.87%
chemin Wanaki Road	S145, EX145	MH145	MH146								0.15		2.74	6.39	7.93	10.97	0.28	11.24	99.35	116.44	170.18	787.69				787.69	1,324.21	48.01	750			1.30	2.904	536.53	40.52%
chemin Wanaki Road		MH146	MH147											0.00	7.93	11.24	0.25	11.49	98.06	114.92	167.95	777.46				777.46	2,296.77	38.53	1050			0.65	2.570	1519.32	66.15%
chemin Wanaki Road	S147C	BULK147E	MH147		0.40									0.33	0.33	10.00	0.28	10.28	104.19	122.14	178.56	34.76				34.76	71.33	16.51	300			0.50	0.978	36.58	51.27%
chemin Wanaki Road	EX147	BULK 147W	MH147	0.16										0.09	0.09	12.00	0.32	12.32	94.70	110.96	162.13	8.42				8.42	71.33	18.72	300			0.50	0.978	62.91	88.19%
chemin Wanaki Road		MH147	MH170											0.00	8.35	12.32	0.09	12.41	93.35	109.38	159.81	779.62				779.62	2,296.77	13.96	1050			0.65	2.570	1517.16	66.06%
chemin Wanaki Road	S147A	MH170	BOX CULVERT								0.14			0.27	8.62	12.41	0.10	12.51	92.98	108.94	159.17	801.83				801.83	2,296.77	15.00	1050			0.65	2.570	1494.94	65.09%
Phase 1B																																		
rue Moses Tennisco Street	S212, LOT212A-B	MH212	MH213								0.15		1.03	2.58	2.58	10.00	0.66	10.66	104.19	122.14	178.56	269.09				269.09	361.72	63.80	525			0.65	1.619	92.63	25.61%
rue Moses Tennisco Street	S213, LOT213	MH213	*BULK165N*								0.21		0.23	0.92	3.50	10.66	0.82	11.47	100.85	118.20	172.77	353.25				353.25	519.40	55.71	750			0.20	1.139	166.15	31.99%
Temp Ditch	BLOCK 24	DI 1	MH165N		1.60									1.33	1.33	26.41	0.25	26.66	58.73	68.69	100.13	78.37				78.37	129.34	17.03	375			0.50	1.134	50.96	39.40%
Phase 1A																																		
Ex. Street No. 3	---	*BULK165N*	*MH165*											0.00	3.50	11.47	0.24	11.71	97.01	113.68	166.14	339.81				339.81	519.40	*16.10*	*750*			*0.20*	1.139	179.59	34.58%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: WY
Checked: JIM
Dwg. Reference: 38298-500

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference: 38298.5.7.1
Date: 7/8/2016
Sheet No: 1 of 2

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400-333 Preston Street
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ibigroup.com

STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																		
Block 9	---	*MH157*	MH217											0.00	12.28	13.26	0.93	14.19	89.63	105.00	153.38	1,100.86				1,100.86	2,337.95	168.50	975			1.00	3.034	1237.09	52.91%
croissant Squadron Crescent	S215, R215	MH215	MH216					0.14				0.38		0.99	0.99	10.00	0.94	10.94	104.19	122.14	178.56	103.06				103.06	317.25	79.94	525			0.50	1.420	214.19	67.51%
croissant Squadron Crescent	S216, R216A-B	MH216	MH217					0.20				0.28		0.88	1.87	10.94	0.86	11.80	99.48	116.60	170.41	185.91				185.91	429.70	75.99	600			0.45	1.472	243.79	56.74%
croissant Squadron Crescent	---	MH217	MH218											0.00	14.15	14.19	0.10	14.29	86.28	101.05	147.59	1,220.93				1,220.93	1,911.03	12.94	1050			0.45	2.138	690.10	36.11%
croissant Squadron Crescent	S218	MH218	MH219								0.17			0.33	14.48	14.29	0.51	14.80	85.93	100.64	146.99	1,244.42				1,244.42	1,424.40	49.00	1050			0.25	1.594	179.98	12.64%
croissant Squadron Crescent	---	MH219	MH220											0.00	14.48	14.80	0.90	15.70	84.21	98.62	144.02	1,219.47				1,219.47	1,575.26	73.09	1200			0.15	1.349	355.79	22.59%
croissant Squadron Crescent	S220, LOT220	MH220	MH221								0.18		1.96	4.71	19.19	15.70	0.54	16.24	81.35	95.26	139.09	1,561.24				1,561.24	1,575.26	43.47	1200			0.15	1.349	14.02	0.89%
														FIXED OUTLET FLOW FROM SWM FACILITY = 6660 L/s																				
croissant Squadron Crescent	---	MH221	MH222											0.00	19.19	16.24	0.11	16.35	79.75	93.38	136.33	1,530.55			6,660.00	8,190.55	8,565.43	11.97	2400			0.11	1.834	374.88	4.38%
croissant Squadron Crescent	S222A-B	MH222	*BULK165S*								0.26			0.51	19.70	16.35	0.86	17.21	79.44	93.01	135.79	1,564.69			6,660.00	8,224.69	8,565.43	94.49	2400			0.11	1.834	340.74	3.98%
Phase 1A																																		
croissant Squadron Crescent	---	*BULK165S*	*MH165*											0.00	19.70	17.21	0.23	17.43	77.04	90.19	131.66	1,517.52			6,660.00	8,177.52	8,565.43	*24.90*	*2400*			*0.11*	1.834	387.92	4.53%
Temp Ditch	BLOCK 15	DI 4	MH165S		1.96									1.63	1.63	50.88	0.17	51.05	37.18	43.41	63.14	60.73				60.73	182.91	16.50	375			1.00	1.604	122.18	66.80%
Phase 1B																																		
rue Michael Stoqua Street	S210, LOT210	MH210	MH211								0.20		0.23	0.90	0.90	10.00	0.83	10.83	104.19	122.14	178.56	93.85				93.85	147.47	64.80	375			0.65	1.293	53.62	36.36%
Temp Ditch	BLOCK 22	DI 12	MH211N		0.46									0.38	0.38	19.39	0.33	19.72	71.62	83.82	122.31	27.44				27.44	43.87	17.38	250			0.50	0.866	16.43	37.45%
Temp Ditch	BLOCK 23	DI 13	MH166N		0.46									0.38	0.38	22.34	0.34	22.68	65.50	76.63	111.77	25.06				25.06	43.87	17.50	250			0.50	0.866	18.81	42.88%
rue Michael Stoqua Street	S211, LOT211	MH211	*BULK166N*								0.17		0.23	0.84	1.74	10.83	1.09	11.93	99.98	117.18	171.27	174.27				174.27	248.09	55.70	600			0.15	0.850	73.82	29.75%
Phase 1A																																		
rue Michael Stoqua Street	---	*BULK166N*	*MH166*											0.00	1.74	11.93	0.32	12.24	95.01	111.33	162.67	165.61				165.61	248.09	*16.10*	*600*			*0.15*	0.850	82.48	33.25%
Phase 1B																																		
rue Bareille-Snow Street	S208, LOT208A-B	MH208	MH209								0.19		0.81	2.17	2.17	10.00	0.76	10.76	104.19	122.14	178.56	226.22				226.22	317.25	64.85	525			0.50	1.420	91.03	28.69%
rue Bareille-Snow Street	S209, LOT209	MH209	*BULK167N*								0.20		0.20	0.83	3.01	10.76	1.01	11.77	100.34	117.60	171.89	301.53				301.53	339.63	55.70	675			0.15	0.919	38.10	11.22%
Temp Ditch	BLOCK 21	DI 11	MH167N		1.22									1.02	1.02	35.74	0.21	35.95	47.82	55.88	81.38	48.58				48.58	100.88	17.52	300			1.00	1.383	52.30	51.84%
Phase 1A																																		
rue Bareille-Snow Street	---	*BULK167N*	*MH167*											0.00	3.01	11.77	0.29	12.06	95.69	112.12	163.84	287.55				287.55	339.63	*16.10*	*675*			*0.15*	0.919	52.08	15.34%

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File Reference: 38298.5.7.1
Date: 7/8/2016
Sheet No: 1 of 2

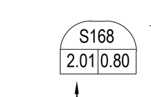
REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

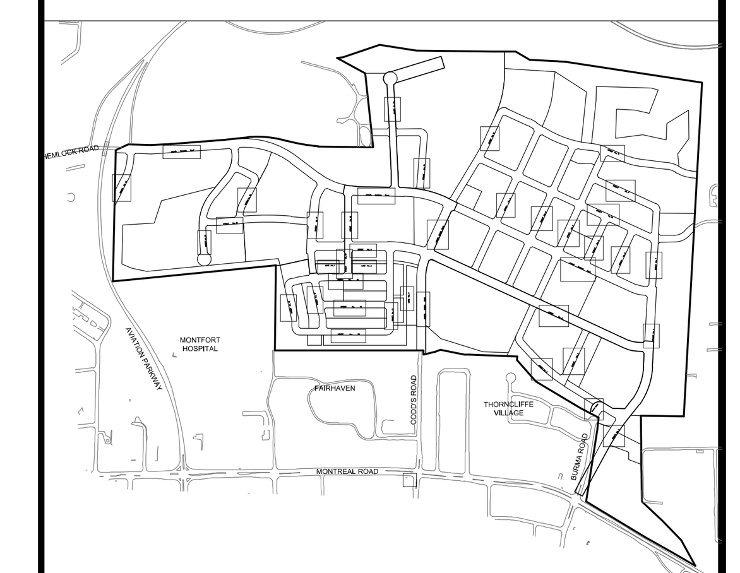
Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND :





No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title

STORM DRAINAGE AREA PLAN

Scale
1 : 2000

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	500A

D07-16-15-0003

#17063

									Sewer Data								
Up	Down	Area	C	2.78 Indiv AxC	2.78 Acc AxC	T_C	I	Q	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
		(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
On site																	
106	104	0.290	0.80	0.64	0.64	10.0	104.2	67.2	300	1.70	91.5	0.071	0.075	1.78	126.1	0.9	0.53
105	104	0.206	0.80	0.46	0.46	10.0	104.2	47.7	300	1.00	40.9	0.071	0.075	1.37	96.7	0.5	0.49
104	103	0.688	0.80	1.53	2.63	10.9	99.9	263.0	450	1.00	52.8	0.159	0.113	1.79	285.1	0.5	0.92
107	103	0.222	0.80	0.49	0.49	10.0	104.2	51.4	300	0.90	91.5	0.071	0.075	1.30	91.7	1.2	0.56
103	102	0.107	0.80	0.24	3.36	11.3	97.6	328.4	525	1.00	20.7	0.216	0.131	1.99	430.1	0.2	0.76
102	101	0.000	0.00	0.00	3.36	11.5	96.8	325.7	525	5.10	15.5	0.216	0.131	4.49	971.2	0.1	0.34
					3.36	11.6											
Off Site - Per IBI storm sewer design sheet for Former CFB Rockcliffe (January 25, 2017)																	
Block 24 Portion of U1		0.022	0.80	0.05	0.05												
MH 212	MH 213	0.150	0.70	0.29	0.34	10.0	104.2	35.5	525	0.65	63.8	0.216	0.131	1.60	346.7	0.7	0.10
MH 213	BULK165N	0.210	0.70	0.41	4.11	11.6	96.5	397.2	750	0.20	55.7	0.442	0.188	1.13	497.9	0.8	0.80

									Sewer Data								
Up	Down	Area	C	2.78 Indiv AxC	2.78 Acc AxC	T_C	I	Q	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
		(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
On site																	
106	104	0.242	0.83	0.56	0.56	10.0	104.2	58.2	300	1.70	91.5	0.071	0.075	1.78	126.1	0.9	0.46
105	104	0.225	0.83	0.52	0.52	10.0	104.2	54.1	300	1.00	26	0.071	0.075	1.37	96.7	0.3	0.56
From Mews		0.312	0.72	0.62	0.62	0.0	230.5	143.9									
104	103	0.282	0.83	0.65	2.35	10.9	99.9	235.0	450	1.00	52.8	0.159	0.113	1.79	285.1	0.5	0.82
107	103	0.321	0.83	0.74	0.74	10.0	104.2	77.2	300	0.90	91.5	0.071	0.075	1.30	91.7	1.2	0.84
103	102	0.108	0.83	0.25	3.34	11.3	97.6	326.2	525	1.00	18.8	0.216	0.131	1.99	430.1	0.2	0.76
102	STUB	0.000	0.00	0.00	3.34	11.5	96.9	323.8	525	1.00	2.6	0.216	0.131	1.99	430.1	0.0	0.75
					3.34	11.5											

ADVANCED DRAINAGE SYSTEMS, INC.

Wateridge - Block 24

Rockcliffe Village

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

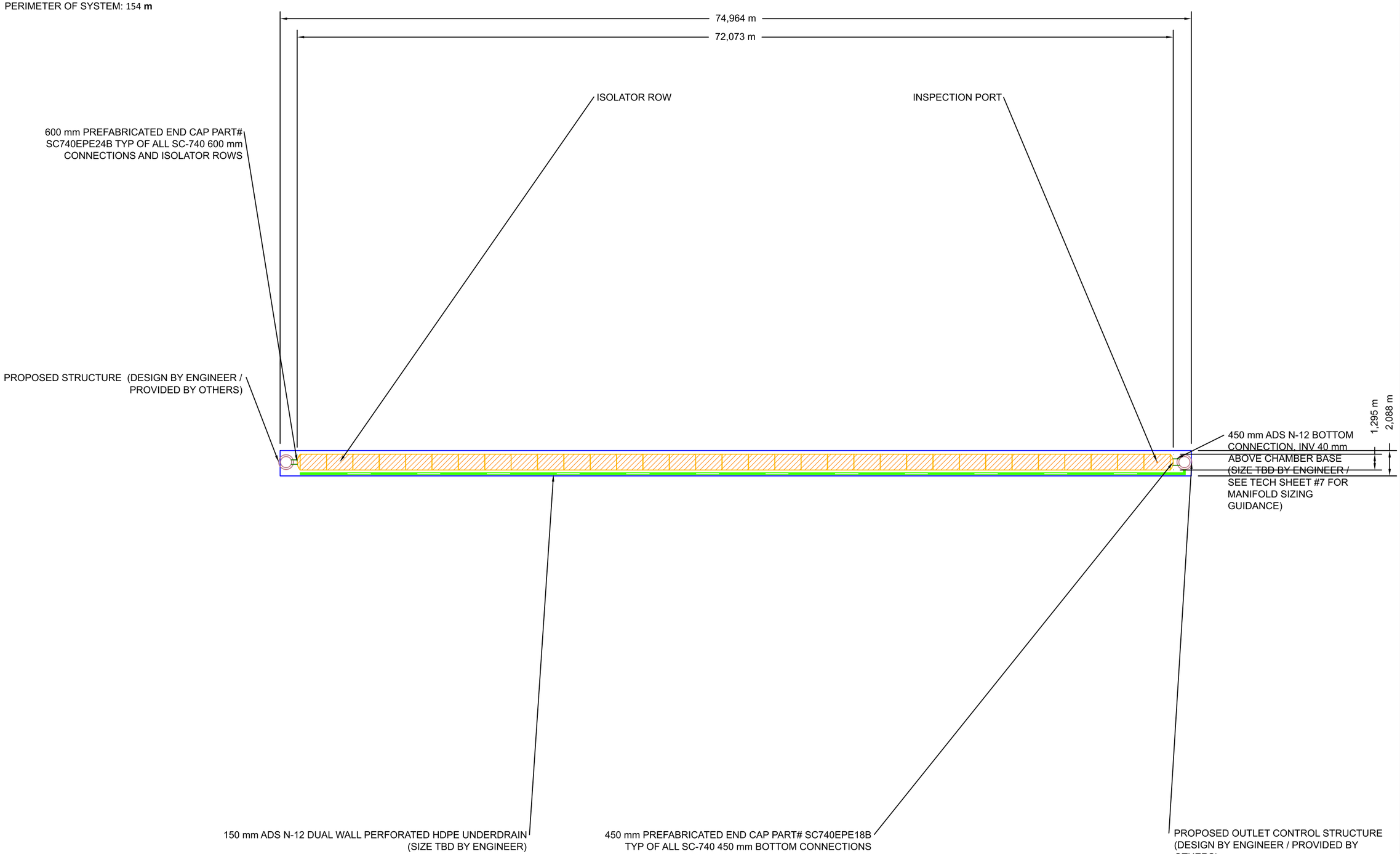
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(33) STORMTECH SC-740 CHAMBERS
(2) STORMTECH SC-740 END CAPS
INSTALLED WITH 152 mm COVER STONE, 152 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 93 m³
AREA OF SYSTEM: 157 **m²**
PERIMETER OF SYSTEM: 154 **m**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



Wateridge - Block 24
Rockcliffe Village

DATE: 08/02/2017
DRAWN: SM
PROJECT #: Tool
CHECKED: ---

REV	DRW	CHK	DESCRIPTION

StormTech®
Detention- Retention- Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

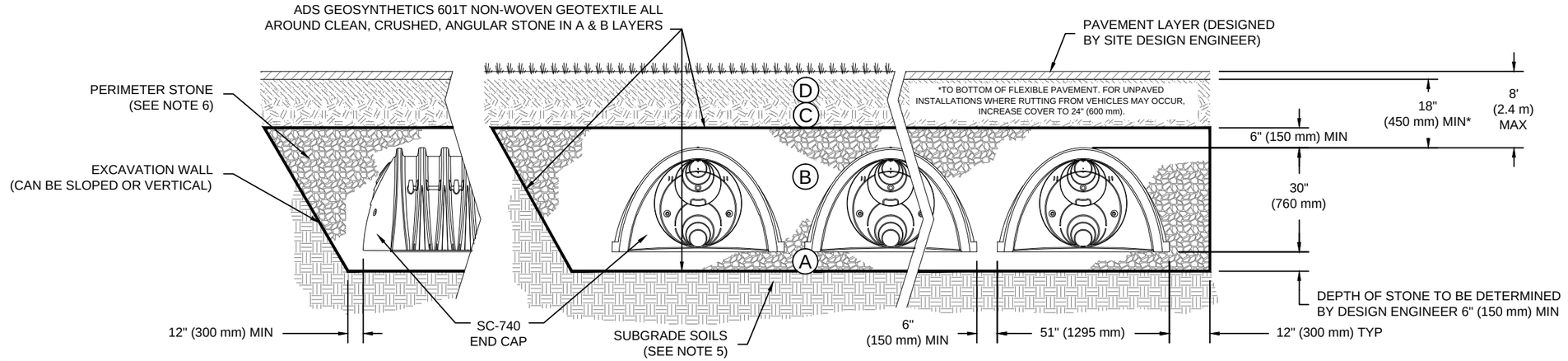
ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Wateridge - Block 24
Rockcliffe Village

DATE: 08/02/2017 | DRAWN: SM | PROJECT #: Tool | CHECKED: ---

REV	DRW	CHK	DESCRIPTION

StormTech
Detention+Retention+Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

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ADVANCED DRAINAGE SYSTEMS, INC.
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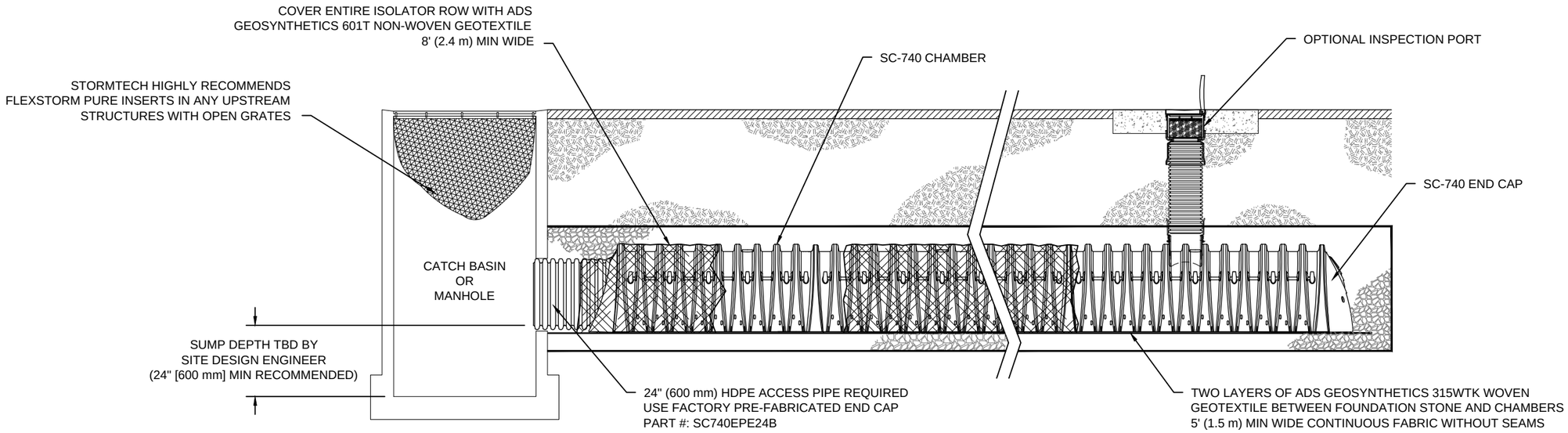


SC-740 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

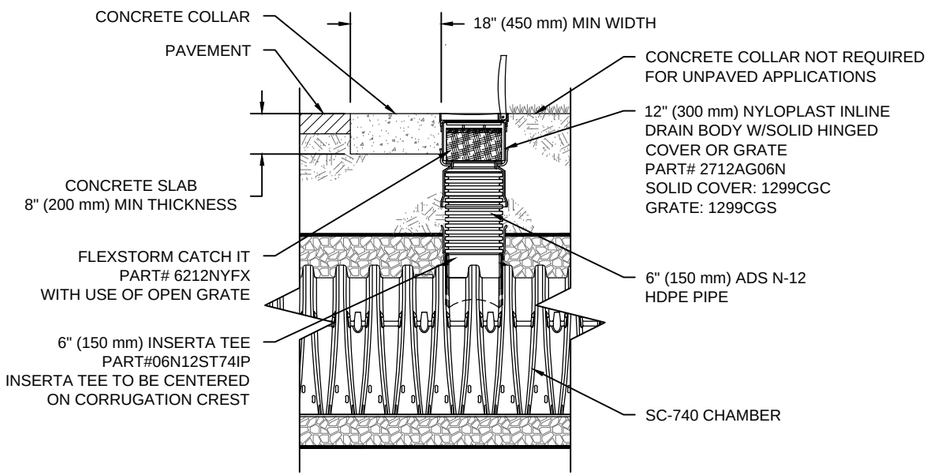
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-740 6" INSPECTION PORT DETAIL
NTS

Wateridge - Block 24
Rockcliffe Village

DATE: 08/02/2017 | DRAWN: SM | PROJECT #: Tool | CHECKED: ---

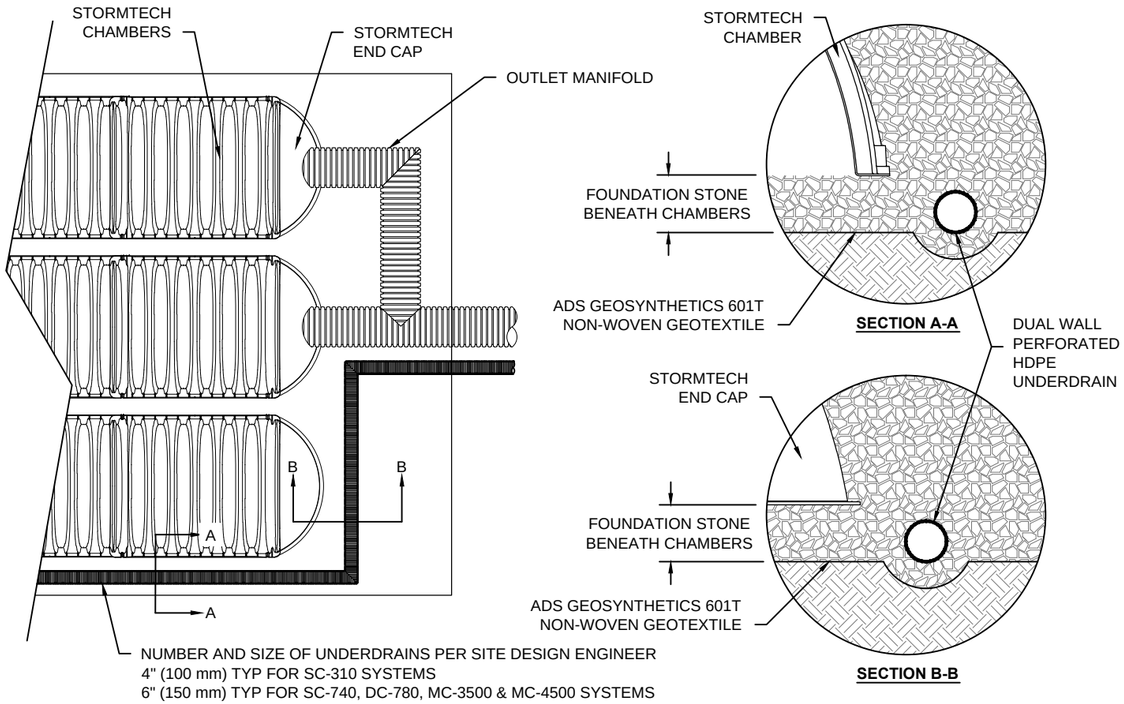
REV	DRW	CHK	DESCRIPTION

StormTech
Detention+Retention+Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

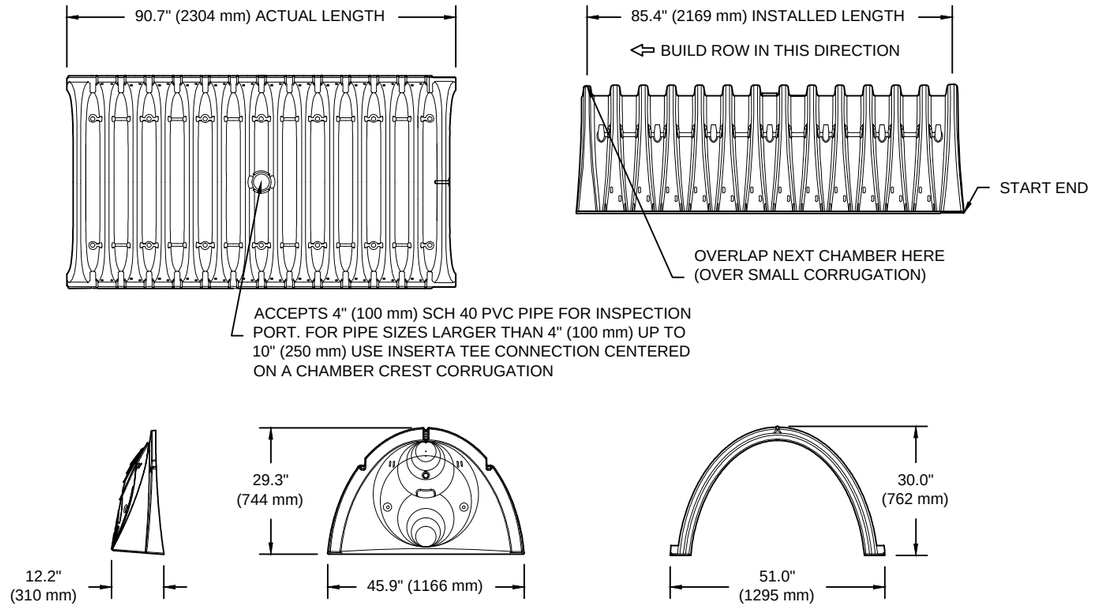
UNDERDRAIN DETAIL

NTS



SC-740 TECHNICAL SPECIFICATION

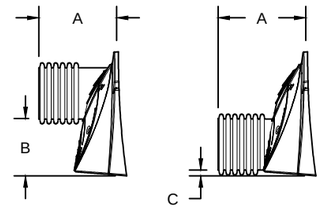
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

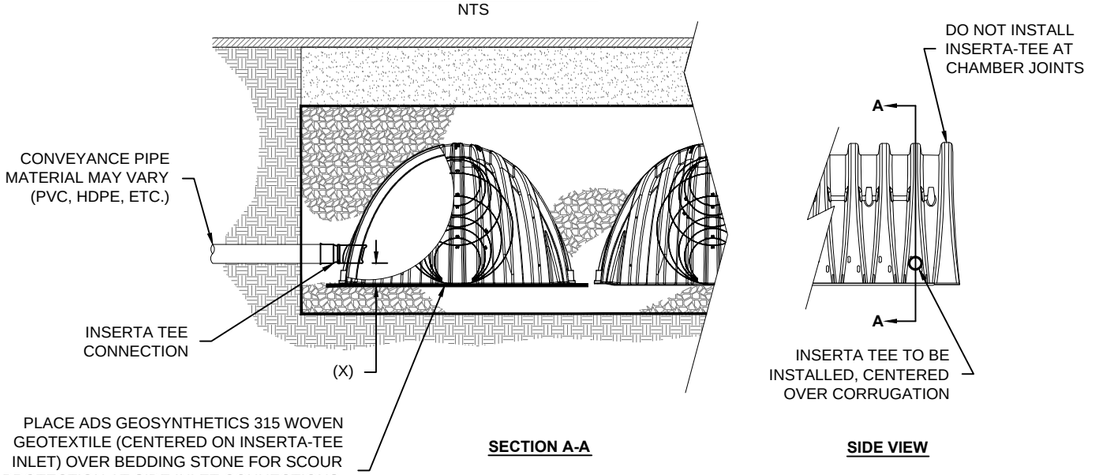
ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

INSERTA TEE DETAIL

NTS



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

Wateridge - Block 24
Rockcliffe Village

DATE: 08/02/2017 | DRAWN: SM | PROJECT #: Tool | CHECKED: ---

REV	DRW	CHK	DESCRIPTION

StormTech
Detention+Retention+Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473
ADVANCED DRAINAGE SYSTEMS, INC.

```
2     Metric units
*#**************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date        : 06-05-2016
*#  Modeller    : [slm]
*#  Company     : David Schaeffer Engineering Ltd.
*#  License #   :  4488477
*#**************************************************************************
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
                    ["C:\SWM_PRG\STMFILES\005YC12H.stm"]
*%------------------|---------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%------------------|---------------------------------------------------------|
**************************************************************************
* Post-Development Model - Wateridge Block 24
**************************************************************************
**************************************************************************
**************************************************************************
* Drainage to Rear Lane
**************************************************************************
CALIB STANDHYD      ID=[1] NHYD=["RL1"], DT=[1](min), AREA=[0.25](ha),
                    XIMP=[0.80], TIMP=[0.80], DWF=[0](cms), LOSS=[1],
                    Horton: Fo=[76.2](mm/hr), Fc=[13.2](mm/hr),
                            DCAY=[4.14](/hr), F=[0](mm),
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[2.0](%),
                                         LGP=[10](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[1.0](%),
                                         LGI=[120](m), MNI=[0.013], SCI=[0](min)
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%------------------|---------------------------------------------------------|
* Inlet Capacity per 5-Year Design Sheet
COMPUTE DUALHYD     IDin=[1], CINLET=[0.054](cms), NINLET=[1],
                    MAJID=[2], MajNHYD=["MAJOR"],
                    MINID=[4], MinNHYD=["MINOR"],
                    TMJSTO=[0](cu-m)
*%------------------|---------------------------------------------------------|
* Rear Lane Cross Section
ROUTE CHANNEL       IDout=[3], NHYD=["LANE"], IDin=[2],
                    RDT=[1](min),
                    CHLGTH=[20](m),  CHSLOPE=[1.0](%),
                                     FPSLOPE=[1.0](%),
                    SECNUM=[15.1],      NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.013, 7.7] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0    , 100.03]
                                                   [1.0  , 99.98]
                                                   [1.2 , 99.90]
                                                   [7.7  , 100.03]

**************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
**************************************************************************
CALIB STANDHYD      ID=[1] NHYD=["A1"], DT=[1](min), AREA=[1.27](ha),
                    XIMP=[0.80], TIMP=[0.80], DWF=[0](cms), LOSS=[1],
                    Horton: Fo=[76.2](mm/hr), Fc=[13.2](mm/hr),
                            DCAY=[4.14](/hr), F=[0](mm),
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[2.0](%),
                                         LGP=[10](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[1.0](%),
                                         LGI=[220](m), MNI=[0.013], SCI=[0](min)
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------|
* Inlet Capacity per 5-Year Design Sheet
COMPUTE DUALHYD     IDin=[1], CINLET=[0.265](cms), NINLET=[1],
                    MAJID=[2], MajNHYD=["MAJOR"],
                    MINID=[4], MinNHYD=["MINOR"],
                    TMJSTO=[0](cu-m)
*%------------------|---------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Total"], IDs to add=[2+3]
*%------------------|---------------------------------------------------------|
* Cross Section at Site Entrance (Moses Tenisco St.)
ROUTE CHANNEL       IDout=[3], NHYD=["ROAD"], IDin=[1],
                    RDT=[1](min),
                    CHLGTH=[10](m),  CHSLOPE=[3.5](%),
                                     FPSLOPE=[3.5](%),
                    SECNUM=[15.2],      NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.013, 8.5] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0    , 100]
                                                   [1.8  , 99.96]
                                                   [2.0 , 99.88]
                                                   [8.5  , 100.04]

**************************************************************************
**************************************************************************
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
                   ["C:\SWM_PRG\STMFILES\100YC24H.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
                   ["C:\SWM_PRG\STMFILES\CH4H100x.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
                   ["C:\SWM_PRG\STMFILES\CH6H100x.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
                   ["C:\SWM_PRG\STMFILES\100YC12H.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
                   ["C:\SWM_PRG\STMFILES\19790701.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
                   ["C:\SWM_PRG\STMFILES\19880804.stm"]
*%------------------|---------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[8]
                   ["C:\SWM_PRG\STMFILES\19960808.stm"]
*%------------------|---------------------------------------------------------|


FINISH
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   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9   =========
                                                      9   9  9   9   # 4488477
        StormWater Management HYdrologic Model          999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: David Schaeffer Engineering Ltd.            +++++++++
 +++++++++                Stittsville           SERIAL#:4488477       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++          *********
 *********            Maximum value for ID numbers  :     10          *********
 *********            Max. number of rainfall points: 105408          *********
 *********            Max. number of flow points    : 105408          *********
 ******************************************************************************


 *********************   D E T A I L E D   O U T P U T   *********************
 ******************************************************************************
 *         DATE: 2017-12-02     TIME: 14:19:53     RUN COUNTER: 000507         *
 ******************************************************************************
 * Input   filename: C:\SWM_PRG\17-918\Block24\post.DAT                        *
 * Output  filename: C:\SWM_PRG\17-918\Block24\post.out                        *
 * Summary filename: C:\SWM_PRG\17-918\Block24\post.sum                        *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 ******************************************************************************

-------------------------------------------------------------------------------
001:0001-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date         : 06-05-2016
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#*****************************************************************************
--------------------
| START              |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
          #  1=C:\SWM_PRG\STMFILES\005YC12H.stm
-------------------------------------------------------------------------------
001:0002-----------------------------------------------------------------------
--------------------
| READ STORM         |    Filename: 5-Year 12-Hour Chicago Storm, 10 min Tim
| Ptotal=  56.17 mm|    Comments: 5-Year 12-Hour Chicago Storm, 10 min Tim
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17    .940 |   3.17   3.680 |   6.17   2.770 |   9.17   1.300
               .33    .980 |   3.33   4.580 |   6.33   2.600 |   9.33   1.270
               .50   1.020 |   3.50   6.150 |   6.50   2.440 |   9.50   1.240
               .67   1.060 |   3.67   9.610 |   6.67   2.310 |   9.67   1.200
               .83   1.110 |   3.83  24.170 |   6.83   2.190 |   9.83   1.170
              1.00   1.160 |   4.00 104.190 |   7.00   2.080 |  10.00   1.150
              1.17   1.220 |   4.17  32.040 |   7.17   1.990 |  10.17   1.120
              1.33   1.280 |   4.33  16.340 |   7.33   1.900 |  10.33   1.100
              1.50   1.360 |   4.50  10.960 |   7.50   1.820 |  10.50   1.070
              1.67   1.440 |   4.67   8.290 |   7.67   1.750 |  10.67   1.050
              1.83   1.540 |   4.83   6.690 |   7.83   1.680 |  10.83   1.030
              2.00   1.650 |   5.00   5.630 |   8.00   1.620 |  11.00   1.010
              2.17   1.780 |   5.17   4.870 |   8.17   1.570 |  11.17    .990
              2.33   1.940 |   5.33   4.300 |   8.33   1.510 |  11.33    .970
              2.50   2.130 |   5.50   3.860 |   8.50   1.470 |  11.50    .950
              2.67   2.370 |   5.67   3.510 |   8.67   1.420 |  11.67    .930
              2.83   2.680 |   5.83   3.220 |   8.83   1.380 |  11.83    .920
              3.00   3.100 |   6.00   2.980 |   9.00   1.340 |  12.00    .900

-------------------------------------------------------------------------------
001:0003-----------------------------------------------------------------------
******************************************************************************
* Post-Development Model - Wateridge Block 24
******************************************************************************
******************************************************************************
* Drainage to Rear Lane
******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .20          .05
     Dep. Storage     (mm)=      1.57         4.67
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    120.00        10.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=    104.19        67.81
               over (min)      3.00          6.00
     Storage Coeff.  (min)=      2.80 (ii)    6.39 (ii)
     Unit Hyd. Tpeak (min)=      3.00         6.00
     Unit Hyd. peak  (cms)=       .39          .18
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .06          .01           .062 (iii)
     TIME TO PEAK    (hrs)=      4.00         4.03          4.000
     RUNOFF VOLUME    (mm)=     54.60        11.56         45.995
     TOTAL RAINFALL   (mm)=     56.17        56.17         56.174
     RUNOFF COEFFICIENT   =       .97          .21           .819

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.


-------------------------------------------------------------------------------
001:0004-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .054  (cms)
                         Total major system storage [TMJSTO] =      0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                  (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:RL1           .25      .062     4.000   45.995     .000
     ======================================================================
     MAJOR SYST   02:MAJOR         .00      .008     4.000   45.995     .000
     MINOR SYST   04:MINOR         .25      .054     3.950   45.995     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0005-----------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                 LENGTH =   20.00    (m)

              <------ DATA FOR SECTION (  15.1) ------>
              Distance      Elevation       Manning
                   .00         100.03         .0130
                  1.00          99.98         .0130
                  1.20          99.90         .0130
                  7.70         100.03         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
     .007   99.907  .246E-01  .421E-03      .000      .174       1.91     .001
     .014   99.914  .984E-01  .337E-02      .001      .277       1.20     .004
     .021   99.921  .221E+00  .114E-01      .004      .363        .92     .007
     .027   99.927  .394E+00  .270E-01      .009      .439        .76     .012
     .034   99.934  .615E+00  .526E-01      .016      .510        .65     .017
     .041   99.941  .886E+00  .910E-01      .025      .575        .58     .024
     .048   99.948  .121E+01  .144E+00      .038      .638        .52     .031
     .055   99.955  .157E+01  .216E+00      .055      .697        .48     .038
     .062   99.962  .199E+01  .307E+00      .075      .754        .44     .046
     .068   99.968  .246E+01  .421E+00      .100      .809        .41     .055
     .075   99.975  .298E+01  .561E+00      .128      .862        .39     .065
     .082   99.982  .354E+01  .728E+00      .161      .908        .37     .075
     .089   99.989  .417E+01  .928E+00      .197      .945        .35     .084
     .096   99.996  .487E+01  .117E+01      .239      .983        .34     .094
     .103  100.003  .563E+01  .144E+01      .288     1.023        .33     .105
     .110  100.010  .645E+01  .177E+01      .343     1.062        .31     .116
     .116  100.016  .734E+01  .214E+01      .405     1.103        .30     .128
     .123  100.023  .830E+01  .256E+01      .474     1.143        .29     .141
     .130  100.030  .932E+01  .303E+01      .552     1.184        .28     .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                   <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2:MAJOR       .00     .008    4.00 45.995      .026      .421
   OUTFLOW: ID= 3:LANE        .00     .007    4.00 45.995      .025      .405


-------------------------------------------------------------------------------
001:0006-----------------------------------------------------------------------
******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.27
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.02          .25
     Dep. Storage     (mm)=      1.57         4.67
     Average Slope     (%)=      1.00         2.00
     Length            (m)=    220.00        10.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=    104.19        66.02
               over (min)      4.00          8.00
     Storage Coeff.  (min)=      4.03 (ii)    7.66 (ii)
     Unit Hyd. Tpeak (min)=      4.00         8.00
     Unit Hyd. peak  (cms)=       .28          .15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .26          .03           .287 (iii)
     TIME TO PEAK    (hrs)=      4.00         4.07          4.017
     RUNOFF VOLUME    (mm)=     54.60        11.56         45.995
     TOTAL RAINFALL   (mm)=     56.17        56.17         56.174
     RUNOFF COEFFICIENT   =       .97          .21           .819

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
001:0007-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .265  (cms)
                         Total major system storage [TMJSTO] =      0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                  (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:A1           1.27      .287     4.017   45.995     .000
     ======================================================================
     MAJOR SYST   02:MAJOR         .01      .022     4.017   45.995     .000
     MINOR SYST   04:MINOR        1.26      .265     3.983   45.995     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0008-----------------------------------------------------------------------
------------------------
| ADD HYD (Total     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 02:MAJOR          .01      .022    4.02  45.99    .000
                   +ID2 03:LANE           .00      .007    4.00  45.99    .000
                    ==========================================================
```

```
                    SUM 01:Total          .01     .029    4.02  45.99    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0009------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 01:Total    |     Number of SEGMENTS =  1
| OUT< 03:ROAD     |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                LENGTH =   10.00    (m)

             <------ DATA FOR SECTION (  15.2) ------>
             Distance      Elevation       Manning
                 .00         100.00         .0130
                1.80          99.96         .0130
                2.00          99.88         .0130
                8.50         100.04         .0130

  <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)     (m)   (cu.m.)   (cu.m.)    (cms)      (m/s)      (min)   (m2/s)
     .006   99.886  .860E-02  .776E-04     .000       .309       .54     .002
     .013   99.893  .344E-01  .621E-03     .002       .490       .34     .006
     .019   99.899  .774E-01  .210E-02     .005       .642       .26     .012
     .025   99.905  .138E+00  .497E-02     .011       .778       .21     .020
     .032   99.912  .215E+00  .970E-02     .019       .903       .18     .029
     .038   99.918  .310E+00  .168E-01     .032      1.020       .16     .039
     .044   99.924  .421E+00  .266E-01     .048      1.130       .15     .050
     .051   99.931  .550E+00  .397E-01     .068      1.235       .13     .062
     .057   99.937  .697E+00  .566E-01     .093      1.336       .12     .076
     .063   99.943  .860E+00  .776E-01     .123      1.433       .12     .091
     .069   99.949  .104E+01  .103E+00     .159      1.527       .11     .106
     .076   99.956  .124E+01  .134E+00     .200      1.619       .10     .123
     .082   99.962  .145E+01  .171E+00     .244      1.680       .10     .138
     .088   99.968  .170E+01  .215E+00     .289      1.701       .10     .150
     .095   99.975  .198E+01  .268E+00     .344      1.736       .10     .164
     .101   99.981  .230E+01  .331E+00     .409      1.782       .09     .180
     .107   99.987  .265E+01  .406E+00     .485      1.835       .09     .197
     .114   99.994  .303E+01  .492E+00     .573      1.892       .09     .215
     .120  100.000  .345E+01  .591E+00     .673      1.953       .09     .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
  INFLOW : ID= 1:Total          .01     .029    4.02 45.995      .037      .993
  OUTFLOW: ID= 3:ROAD           .01     .030    4.02 45.995      .037     1.003


--------------------------------------------------------------------------------
001:0010------------------------------------------------------------------------
******************************************************************************
*******************************************************************************
  ** END OF RUN :   1

*******************************************************************************





--------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
            #  1=C:\SWM_PRG\STMFILES\100YC24H.stm
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date        : 06-05-2016
*#  Modeller    : [slm]
*#  Company     : David Schaeffer Engineering Ltd.
*#  License #   :  4488477
*#******************************************************************************
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 100-Year 24-Hour Chicago Storm, 10 min T
| Ptotal= 106.74 mm|    Comments: 100-Year 24-Hour Chicago Storm, 10 min T
--------------------
                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17    .830 |   6.17   2.900 |  12.17   2.550 |  18.17   1.190
                  .33    .850 |   6.33   3.160 |  12.33   2.460 |  18.33   1.170
                  .50    .860 |   6.50   3.480 |  12.50   2.380 |  18.50   1.160
                  .67    .880 |   6.67   3.880 |  12.67   2.310 |  18.67   1.140
                  .83    .900 |   6.83   4.390 |  12.83   2.240 |  18.83   1.130
                 1.00    .910 |   7.00   5.070 |  13.00   2.180 |  19.00   1.110
                 1.17    .930 |   7.17   6.050 |  13.17   2.120 |  19.17   1.100
                 1.33    .950 |   7.33   7.540 |  13.33   2.060 |  19.33   1.090
                 1.50    .970 |   7.50  10.160 |  13.50   2.010 |  19.50   1.070
                 1.67    .990 |   7.67  15.970 |  13.67   1.960 |  19.67   1.060
                 1.83   1.020 |   7.83  40.650 |  13.83   1.910 |  19.83   1.050
                 2.00   1.040 |   8.00 178.560 |  14.00   1.860 |  20.00   1.040
                 2.17   1.070 |   8.17  54.050 |  14.17   1.820 |  20.17   1.020
                 2.33   1.090 |   8.33  27.320 |  14.33   1.780 |  20.33   1.010
                 2.50   1.120 |   8.50  18.240 |  14.50   1.740 |  20.50   1.000
                 2.67   1.150 |   8.67  13.740 |  14.67   1.700 |  20.67    .990
                 2.83   1.180 |   8.83  11.060 |  14.83   1.670 |  20.83    .980
                 3.00   1.210 |   9.00   9.290 |  15.00   1.630 |  21.00    .970
                 3.17   1.250 |   9.17   8.020 |  15.17   1.600 |  21.17    .960
                 3.33   1.290 |   9.33   7.080 |  15.33   1.570 |  21.33    .950
                 3.50   1.330 |   9.50   6.350 |  15.50   1.540 |  21.50    .940
                 3.67   1.370 |   9.67   5.760 |  15.67   1.510 |  21.67    .930
                 3.83   1.420 |   9.83   5.280 |  15.83   1.480 |  21.83    .920
                 4.00   1.470 |  10.00   4.880 |  16.00   1.460 |  22.00    .910
                 4.17   1.520 |  10.17   4.540 |  16.17   1.430 |  22.17    .900
                 4.33   1.580 |  10.33   4.250 |  16.33   1.410 |  22.33    .890
                 4.50   1.650 |  10.50   3.990 |  16.50   1.390 |  22.50    .880
                 4.67   1.720 |  10.67   3.770 |  16.67   1.360 |  22.67    .880
                 4.83   1.800 |  10.83   3.570 |  16.83   1.340 |  22.83    .870
                 5.00   1.880 |  11.00   3.400 |  17.00   1.320 |  23.00    .860
                 5.17   1.980 |  11.17   3.240 |  17.17   1.300 |  23.17    .850
                 5.33   2.090 |  11.33   3.100 |  17.33   1.280 |  23.33    .840
                 5.50   2.210 |  11.50   2.970 |  17.50   1.260 |  23.50    .840
                 5.67   2.340 |  11.67   2.850 |  17.67   1.240 |  23.67    .830
                 5.83   2.500 |  11.83   2.740 |  17.83   1.230 |  23.83    .820
                 6.00   2.690 |  12.00   2.640 |  18.00   1.210 |  24.00    .810

--------------------------------------------------------------------------------
002:0003------------------------------------------------------------------------
```

```
******************************************************************************
* Post-Development Model - Wateridge Block 24
******************************************************************************
******************************************************************************
* Drainage to Rear Lane
******************************************************************************
----------------------
| CALIB STANDHYD     |    Area    (ha)=     .25
| 01:RL1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .05
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     120.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       159.14
               over (min)        2.00         5.00
     Storage Coeff.  (min)=       2.26 (ii)    4.81 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .52          .23
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .10          .02          .116 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.02         8.000
     RUNOFF VOLUME    (mm)=     105.17        37.31        91.599
     TOTAL RAINFALL   (mm)=     106.74       106.74       106.742
     RUNOFF COEFFICIENT   =        .99          .35          .858

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |    Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |    Number of inlets in system [NINLET] =      1
----------------------    Total minor system capacity          =    .054  (cms)
                          Total major system storage [TMJSTO] =       0.(cu.m.)

                   ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                   (ha)     (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1           .25      .116     8.000    91.599     .000
     ==================================================================
     MAJOR SYST   02:MAJOR         .03      .062     8.000    91.599     .000
     MINOR SYST   04:MINOR         .22      .054     7.867    91.599     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0005------------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                LENGTH =   20.00    (m)

             <------ DATA FOR SECTION (  15.1) ------>
             Distance      Elevation       Manning
                 .00         100.03         .0130
                1.00          99.98         .0130
                1.20          99.90         .0130
                7.70         100.03         .0130

  <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)     (m)   (cu.m.)   (cu.m.)    (cms)      (m/s)      (min)   (m2/s)
     .007   99.907  .246E-01  .421E-03     .000       .174      1.91     .001
     .014   99.914  .984E-01  .337E-02     .001       .277      1.20     .004
     .021   99.921  .221E+00  .114E-01     .004       .363       .92     .007
     .027   99.927  .394E+00  .270E-01     .009       .439       .76     .012
     .034   99.934  .615E+00  .526E-01     .016       .510       .65     .017
     .041   99.941  .886E+00  .910E-01     .025       .575       .58     .024
     .048   99.948  .121E+01  .144E+00     .038       .638       .52     .031
     .055   99.955  .157E+01  .216E+00     .055       .697       .48     .038
     .062   99.962  .199E+01  .307E+00     .075       .754       .44     .046
     .068   99.968  .246E+01  .421E+00     .100       .809       .41     .055
     .075   99.975  .298E+01  .561E+00     .128       .862       .39     .065
     .082   99.982  .354E+01  .728E+00     .161       .908       .37     .075
     .089   99.989  .417E+01  .928E+00     .197       .945       .35     .084
     .096   99.996  .487E+01  .117E+01     .239       .983       .34     .094
     .103  100.003  .563E+01  .144E+01     .288      1.023       .33     .105
     .110  100.010  .645E+01  .177E+01     .343      1.062       .31     .116
     .116  100.016  .734E+01  .214E+01     .405      1.103       .30     .128
     .123  100.023  .830E+01  .256E+01     .474      1.143       .29     .141
     .130  100.030  .932E+01  .303E+01     .552      1.184       .28     .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
  INFLOW : ID= 2:MAJOR          .03     .062    8.00 91.599      .057      .715
  OUTFLOW: ID= 3:LANE           .03     .061    8.00 91.599      .057      .714


--------------------------------------------------------------------------------
002:0006------------------------------------------------------------------------
******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
******************************************************************************
----------------------
| CALIB STANDHYD     |    Area    (ha)=    1.27
| 01:A1      DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02          .25
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     220.00        10.00
     Mannings n          =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.56       158.91
               over (min)        3.00         6.00
     Storage Coeff.  (min)=       3.25 (ii)    5.80 (ii)
     Unit Hyd. Tpeak (min)=       3.00         6.00
     Unit Hyd. peak  (cms)=        .36          .19
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .48          .08          .557 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.03         8.000
     RUNOFF VOLUME    (mm)=     105.16        37.31        91.599
     TOTAL RAINFALL   (mm)=     106.74       106.74       106.742
```

```
     RUNOFF COEFFICIENT   =        .99          .35           .858

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0007------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity         =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA      QPEAK      TPEAK      R.V.      DWF
                                  (ha)      (cms)      (hrs)      (mm)     (cms)
     TOTAL HYD.   01:A1           1.27       .557      8.000    91.599     .000
     =========================================================================
     MAJOR SYST   02:MAJOR         .16       .292      8.000    91.599     .000
     MINOR SYST   04:MINOR        1.11       .265      7.883    91.599     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0008------------------------------------------------------------------------
------------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.     DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 02:MAJOR            .16      .292    8.00  91.60    .000
                  +ID2 03:LANE             .03      .061    8.00  91.60    .000
                   ===========================================================
                   SUM 01:Total            .19      .354    8.00  91.60    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0009------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 01:Total    |     Number of SEGMENTS =  1
| OUT< 03:ROAD     |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                  LENGTH =   10.00     (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                     .00        100.00         .0130
                    1.80         99.96         .0130
                    2.00         99.88         .0130
                    8.50        100.04         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)       (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)   (m2/s)
     .006   99.886  .860E-02  .776E-04      .000      .309        .54     .002
     .013   99.893  .344E-01  .621E-03      .002      .490        .34     .006
     .019   99.899  .774E-01  .210E-02      .005      .642        .26     .012
     .025   99.905  .138E+00  .497E-02      .011      .778        .21     .020
     .032   99.912  .215E+00  .970E-02      .019      .903        .18     .029
     .038   99.918  .310E+00  .168E-01      .032     1.020        .16     .039
     .044   99.924  .421E+00  .266E-01      .048     1.130        .15     .050
     .051   99.931  .550E+00  .397E-01      .068     1.235        .13     .062
     .057   99.937  .697E+00  .566E-01      .093     1.336        .12     .076
     .063   99.943  .860E+00  .776E-01      .123     1.433        .12     .091
     .069   99.949  .104E+01  .103E+00      .159     1.527        .11     .106
     .076   99.956  .124E+01  .134E+00      .200     1.619        .10     .123
     .082   99.962  .145E+01  .171E+00      .244     1.680        .10     .138
     .088   99.968  .170E+01  .215E+00      .289     1.701        .10     .150
     .095   99.975  .198E+01  .268E+00      .344     1.736        .10     .164
     .101   99.981  .230E+01  .331E+00      .409     1.782        .09     .180
     .107   99.987  .265E+01  .406E+00      .485     1.835        .09     .197
     .114   99.994  .303E+01  .492E+00      .573     1.892        .09     .215
     .120  100.000  .345E+01  .591E+00      .673     1.953        .09     .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                        <---- hydrograph ---->   <-pipe / channel->
                                  AREA     QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                  (ha)     (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 1:Total            .19      .354    8.00 91.599      .096     1.743
   OUTFLOW: ID= 3:ROAD             .19      .352    8.00 91.599      .096     1.742


--------------------------------------------------------------------------------
002:0010------------------------------------------------------------------------
******************************************************************************
*******************************************************************************
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
  ** END OF RUN :    2

*******************************************************************************






--------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
          #  1=C:\SWM_PRG\STMFILES\CH4H100x.stm
--------------------------------------------------------------------------------
003:0002------------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date         : 06-05-2016
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#******************************************************************************
--------------------------------------------------------------------------------
003:0002------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename:  100 years Chicago Storm 4 Hours step 10
| Ptotal=  76.00 mm|    Comments:  100 years Chicago Storm 4 Hours step 10
--------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .17   4.390 |   1.17  40.670 |   2.17  11.050 |   3.17   5.280
                 .33   5.080 |   1.33 178.560 |   2.33   9.280 |   3.33   4.880
                 .50   6.050 |   1.50  54.040 |   2.50   8.020 |   3.50   4.540
                 .67   7.550 |   1.67  27.310 |   2.67   7.080 |   3.67   4.240
                 .83  10.170 |   1.83  18.230 |   2.83   6.340 |   3.83   3.990
                1.00  15.980 |   2.00  13.730 |   3.00   5.760 |   4.00   3.770

--------------------------------------------------------------------------------
003:0003------------------------------------------------------------------------
*******************************************************************************
* Post-Development Model - Wateridge Block 24
*******************************************************************************
*******************************************************************************
* Drainage to Rear Lane
*******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .20          .05
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=        1.00         2.00
     Length            (m)=      120.00        10.00
     Mannings n           =        .013         .250

     Max.eff.Inten.(mm/hr)=      178.56       147.31
                over (min)         2.00         5.00
     Storage Coeff.  (min)=        2.26 (ii)    4.89 (ii)
     Unit Hyd. Tpeak (min)=        2.00         5.00
     Unit Hyd. peak  (cms)=         .52          .23
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .10          .02         .114 (iii)
     TIME TO PEAK    (hrs)=        1.33         1.35        1.333
     RUNOFF VOLUME    (mm)=       74.43        30.74       65.690
     TOTAL RAINFALL   (mm)=       76.00        76.00       75.998
     RUNOFF COEFFICIENT   =         .98          .40         .864

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0004------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity         =    .054  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA      QPEAK      TPEAK      R.V.      DWF
                                  (ha)      (cms)      (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1           .25       .114      1.333    65.690     .000
     =========================================================================
     MAJOR SYST   02:MAJOR         .04       .060      1.333    65.690     .000
     MINOR SYST   04:MINOR         .21       .054      1.200    65.690     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0005------------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                  LENGTH =   20.00     (m)

                <------ DATA FOR SECTION (  15.1) ------>
                Distance      Elevation       Manning
                     .00        100.03         .0130
                    1.00         99.98         .0130
                    1.20         99.90         .0130
                    7.70        100.03         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)       (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)   (m2/s)
     .007   99.907  .246E-01  .421E-03      .000      .174       1.91     .001
     .014   99.914  .984E-01  .337E-02      .001      .277       1.20     .004
     .021   99.921  .221E+00  .114E-01      .004      .363        .92     .007
     .027   99.927  .394E+00  .270E-01      .009      .439        .76     .012
     .034   99.934  .615E+00  .526E-01      .016      .510        .65     .017
     .041   99.941  .886E+00  .910E-01      .025      .575        .58     .024
     .048   99.948  .121E+01  .144E+00      .038      .638        .52     .031
     .055   99.955  .157E+01  .216E+00      .055      .697        .48     .038
     .062   99.962  .199E+01  .307E+00      .075      .754        .44     .046
     .068   99.968  .246E+01  .421E+00      .100      .809        .41     .055
     .075   99.975  .298E+01  .561E+00      .128      .862        .39     .065
     .082   99.982  .354E+01  .728E+00      .161      .908        .37     .075
     .089   99.989  .417E+01  .928E+00      .197      .945        .35     .084
     .096   99.996  .487E+01  .117E+01      .239      .983        .34     .094
     .103  100.003  .563E+01  .144E+01      .288     1.023        .33     .105
     .110  100.010  .645E+01  .177E+01      .343     1.062        .31     .116
     .116  100.016  .734E+01  .214E+01      .405     1.103        .30     .128
     .123  100.023  .830E+01  .256E+01      .474     1.143        .29     .141
     .130  100.030  .932E+01  .303E+01      .552     1.184        .28     .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                        <---- hydrograph ---->   <-pipe / channel->
                                  AREA     QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                  (ha)     (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2:MAJOR            .04      .060    1.33 65.690      .056      .710
   OUTFLOW: ID= 3:LANE             .04      .059    1.33 65.690      .056      .708


--------------------------------------------------------------------------------
003:0006------------------------------------------------------------------------
*******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
*******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.27
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        1.02          .25
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=        1.00         2.00
     Length            (m)=      220.00        10.00
     Mannings n           =        .013         .250

     Max.eff.Inten.(mm/hr)=      178.56       146.64
                over (min)         3.00         6.00
     Storage Coeff.  (min)=        3.25 (ii)    5.89 (ii)
```

```
     Unit Hyd. Tpeak (min)=       3.00         6.00
     Unit Hyd. peak  (cms)=        .36          .19
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .48          .07          .547 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.37         1.333
     RUNOFF VOLUME    (mm)=      74.43        30.74        65.690
     TOTAL RAINFALL   (mm)=      76.00        76.00        75.998
     RUNOFF COEFFICIENT   =        .98          .40          .864

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
003:0007------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                  (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:A1           1.27      .547     1.333   65.690      .000
     ======================================================================
     MAJOR SYST   02:MAJOR         .21      .282     1.333   65.690      .000
     MINOR SYST   04:MINOR        1.06      .265     1.217   65.690      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0008------------------------------------------------------------------------
------------------------
| ADD HYD (Total     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 02:MAJOR          .21      .282    1.33  65.69    .000
                   +ID2 03:LANE           .04      .059    1.33  65.69    .000
                    =========================================================
                    SUM 01:Total          .25      .341    1.33  65.69    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0009------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 01:Total    |     Number of SEGMENTS =  1
| OUT< 03:ROAD     |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                 LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00         .0130
                   1.80         99.96         .0130
                   2.00         99.88         .0130
                   8.50        100.04         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
      .006   99.886  .860E-02  .776E-04      .000      .309        .54     .002
      .013   99.893  .344E-01  .621E-03      .002      .490        .34     .006
      .019   99.899  .774E-01  .210E-02      .005      .642        .26     .012
      .025   99.905  .138E+00  .497E-02      .011      .778        .21     .020
      .032   99.912  .215E+00  .970E-02      .019      .903        .18     .029
      .038   99.918  .310E+00  .168E-01      .032     1.020        .16     .039
      .044   99.924  .421E+00  .266E-01      .048     1.130        .15     .050
      .051   99.931  .550E+00  .397E-01      .068     1.235        .13     .062
      .057   99.937  .697E+00  .566E-01      .093     1.336        .12     .076
      .063   99.943  .860E+00  .776E-01      .123     1.433        .12     .091
      .069   99.949  .104E+01  .103E+00      .159     1.527        .11     .106
      .076   99.956  .124E+01  .134E+00      .200     1.619        .10     .123
      .082   99.962  .145E+01  .171E+00      .244     1.680        .10     .138
      .088   99.968  .170E+01  .215E+00      .289     1.701        .10     .150
      .095   99.975  .198E+01  .268E+00      .344     1.736        .10     .164
      .101   99.981  .230E+01  .331E+00      .409     1.782        .09     .180
      .107   99.987  .265E+01  .406E+00      .485     1.835        .09     .197
      .114   99.994  .303E+01  .492E+00      .573     1.892        .09     .215
      .120  100.000  .345E+01  .591E+00      .673     1.953        .09     .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 1:Total        .25     .341    1.33 65.690       .094     1.734
   OUTFLOW: ID= 3:ROAD         .25     .340    1.33 65.690       .094     1.733


--------------------------------------------------------------------------------
003:0010------------------------------------------------------------------------
*****************************************************************************
******************************************************************************
--------------------------------------------------------------------------------
003:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
003:0002------------------------------------------------------------------------
  ** END OF RUN :   3

******************************************************************************





--------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=C:\SWM_PRG\STMFILES\CH6H100x.stm
--------------------------------------------------------------------------------
004:0002------------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date         : 06-05-2016
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#******************************************************************************
--------------------------------------------------------------------------------
004:0002------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 100 years Chicago Storm 6 Hours step 10
| Ptotal=  82.34 mm|    Comments: 100 years Chicago Storm 6 Hours step 10
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   2.910 |   1.67  15.980 |   3.17   8.020 |   4.67   3.770
              .33   3.170 |   1.83  40.670 |   3.33   7.080 |   4.83   3.570
              .50   3.480 |   2.00 178.650 |   3.50   6.340 |   5.00   3.400
              .67   3.880 |   2.17  54.040 |   3.67   5.760 |   5.17   3.240
              .83   4.390 |   2.33  27.310 |   3.83   5.280 |   5.33   3.100
             1.00   5.080 |   2.50  18.230 |   4.00   4.880 |   5.50   2.970
             1.17   6.050 |   2.67  13.730 |   4.17   4.540 |   5.67   2.850
             1.33   7.550 |   2.83  11.050 |   4.33   4.250 |   5.83   2.740
             1.50  10.170 |   3.00   9.280 |   4.50   3.990 |   6.00   2.640

--------------------------------------------------------------------------------
004:0003------------------------------------------------------------------------
*****************************************************************************
* Post-Development Model - Wateridge Block 24
*****************************************************************************
*****************************************************************************
* Drainage to Rear Lane
*****************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .05
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     120.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     178.65       151.15
               over (min)         2.00         5.00
     Storage Coeff.  (min)=       2.26 (ii)    4.86 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .52          .23
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .10          .02          .114 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.02         2.000
     RUNOFF VOLUME    (mm)=      80.77        32.23        71.062
     TOTAL RAINFALL   (mm)=      82.34        82.34        82.340
     RUNOFF COEFFICIENT   =        .98          .39          .863

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0004------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .054  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                  (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:RL1           .25      .114     2.000   71.062      .000
     ======================================================================
     MAJOR SYST   02:MAJOR         .04      .060     2.000   71.062      .000
     MINOR SYST   04:MINOR         .21      .054     1.867   71.062      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0005------------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                 LENGTH =   20.00    (m)

               <------ DATA FOR SECTION (  15.1) ------>
               Distance      Elevation       Manning
                    .00        100.03         .0130
                   1.00         99.98         .0130
                   1.20         99.90         .0130
                   7.70        100.03         .0130

   <--------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)       (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
      .007   99.907  .246E-01  .421E-03      .000      .174       1.91     .001
      .014   99.914  .984E-01  .337E-02      .001      .277       1.20     .004
      .021   99.921  .221E+00  .114E-01      .004      .363        .92     .007
      .027   99.927  .394E+00  .270E-01      .009      .439        .76     .012
      .034   99.934  .615E+00  .526E-01      .016      .510        .65     .017
      .041   99.941  .886E+00  .910E-01      .025      .575        .58     .024
      .048   99.948  .121E+01  .144E+00      .038      .638        .52     .031
      .055   99.955  .157E+01  .216E+00      .055      .697        .48     .038
      .062   99.962  .199E+01  .307E+00      .075      .754        .44     .046
      .068   99.968  .246E+01  .421E+00      .100      .809        .41     .055
      .075   99.975  .298E+01  .561E+00      .128      .862        .39     .065
      .082   99.982  .354E+01  .728E+00      .161      .908        .37     .075
      .089   99.989  .417E+01  .928E+00      .197      .945        .35     .084
      .096   99.996  .487E+01  .117E+01      .239      .983        .34     .094
      .103  100.003  .563E+01  .144E+01      .288     1.023        .33     .105
      .110  100.010  .645E+01  .177E+01      .343     1.062        .31     .116
      .116  100.016  .734E+01  .214E+01      .405     1.103        .30     .128
      .123  100.023  .830E+01  .256E+01      .474     1.143        .29     .141
      .130  100.030  .932E+01  .303E+01      .552     1.184        .28     .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 2:MAJOR        .04     .060    2.00 71.062       .057      .711
   OUTFLOW: ID= 3:LANE         .04     .060    2.00 71.062       .056      .710


--------------------------------------------------------------------------------
004:0006------------------------------------------------------------------------
*****************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
*****************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.27
```

```
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        1.02          .25
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=        1.00         2.00
     Length            (m)=      220.00        10.00
     Mannings n            =        .013         .250

     Max.eff.Inten.(mm/hr)=      178.65       150.62
                   over (min)        3.00         6.00
     Storage Coeff.  (min)=        3.25 (ii)    5.86 (ii)
     Unit Hyd. Tpeak (min)=        3.00         6.00
     Unit Hyd. peak  (cms)=         .36          .19
                                                      *TOTALS*
     PEAK FLOW       (cms)=         .48          .08          .550 (iii)
     TIME TO PEAK    (hrs)=        2.00         2.03         2.000
     RUNOFF VOLUME    (mm)=       80.77        32.23        71.062
     TOTAL RAINFALL   (mm)=       82.34        82.34        82.340
     RUNOFF COEFFICIENT   =         .98          .39          .863

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20        K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0007--------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .265  (cms)
                         Total major system storage [TMJSTO] =      0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:A1           1.27      .550     2.000   71.062      .000
     ==========================================================================
     MAJOR SYST   02:MAJOR         .20      .285     2.000   71.062      .000
     MINOR SYST   04:MINOR        1.07      .265     1.883   71.062      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0008--------------------------------------------------------------------------
----------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.    DWF
----------------------                     (ha)     (cms)    (hrs)   (mm)   (cms)
                        ID1 02:MAJOR          .20      .285    2.00  71.06    .000
                       +ID2 03:LANE           .04      .060    2.00  71.06    .000
                        ==========================================================
                        SUM 01:Total          .24      .345    2.00  71.06    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0009--------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
----------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 01:Total    |     Number of SEGMENTS =  1
| OUT< 03:ROAD     |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
----------------------                 LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00         100.00         .0130
                   1.80          99.96         .0130
                   2.00          99.88         .0130
                   8.50         100.04         .0130

   <----------------------------- TRAVEL TIME TABLE ------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)     (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
     .006   99.886  .860E-02  .776E-04       .000      .309       .54     .002
     .013   99.893  .344E-01  .621E-03       .002      .490       .34     .006
     .019   99.899  .774E-01  .210E-02       .005      .642       .26     .012
     .025   99.905  .138E+00  .497E-02       .011      .778       .21     .020
     .032   99.912  .215E+00  .970E-02       .019      .903       .18     .029
     .038   99.918  .310E+00  .168E-01       .032     1.020       .16     .039
     .044   99.924  .421E+00  .266E-01       .048     1.130       .15     .050
     .051   99.931  .550E+00  .397E-01       .068     1.235       .13     .062
     .057   99.937  .697E+00  .566E-01       .093     1.336       .12     .076
     .063   99.943  .860E+00  .776E-01       .123     1.433       .12     .091
     .069   99.949  .104E+01  .103E+00       .159     1.527       .11     .106
     .076   99.956  .124E+01  .134E+00       .200     1.619       .10     .123
     .082   99.962  .145E+01  .171E+00       .244     1.680       .10     .138
     .088   99.968  .170E+01  .215E+00       .289     1.701       .10     .150
     .095   99.975  .198E+01  .268E+00       .344     1.736       .10     .164
     .101   99.981  .230E+01  .331E+00       .409     1.782       .09     .180
     .107   99.987  .265E+01  .406E+00       .485     1.835       .09     .197
     .114   99.994  .303E+01  .492E+00       .573     1.892       .09     .215
     .120  100.000  .345E+01  .591E+00       .673     1.953       .09     .234

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                    <---- hydrograph ---->   <-pipe / channel->
                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
    INFLOW : ID= 1:Total         .24     .345    2.00 71.062      .095     1.737
    OUTFLOW: ID= 3:ROAD          .24     .343    2.00 71.062      .095     1.736

--------------------------------------------------------------------------------
004:0010--------------------------------------------------------------------------
********************************************************************************
********************************************************************************
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004:0002--------------------------------------------------------------------------
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004:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
004:0002--------------------------------------------------------------------------
   ** END OF RUN :   4

********************************************************************************

----------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block24\
----------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
     TZERO =   .00 hrs on       0

     METOUT=   2 (output = METRIC)
     NRUN  = 005
     NSTORM=   1
              #  1=C:\SWM_PRG\STMFILES\100YC12H.stm
--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date        : 06-05-2016
*#  Modeller    : [slm]
*#  Company     : David Schaeffer Engineering Ltd.
*#  License #   :  4488477
*#*****************************************************************************
--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
----------------------
| READ STORM       |    Filename: 100-Year 12-Hour Chicago Storm, 10 min T
| Ptotal=  93.91 mm|    Comments: 100-Year 12-Hour Chicago Storm, 10 min T
----------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   1.520 |   3.17   6.050 |   6.17   4.540 |   9.17   2.120
               .33   1.580 |   3.33   7.540 |   6.33   4.250 |   9.33   2.060
               .50   1.650 |   3.50  10.160 |   6.50   3.990 |   9.50   2.010
               .67   1.720 |   3.67  15.970 |   6.67   3.770 |   9.67   1.960
               .83   1.800 |   3.83  40.650 |   6.83   3.570 |   9.83   1.910
              1.00   1.880 |   4.00 178.560 |   7.00   3.400 |  10.00   1.860
              1.17   1.980 |   4.17  54.050 |   7.17   3.240 |  10.17   1.820
              1.33   2.090 |   4.33  27.320 |   7.33   3.100 |  10.33   1.780
              1.50   2.210 |   4.50  18.240 |   7.50   2.970 |  10.50   1.740
              1.67   2.340 |   4.67  13.740 |   7.67   2.850 |  10.67   1.700
              1.83   2.500 |   4.83  11.060 |   7.83   2.740 |  10.83   1.670
              2.00   2.690 |   5.00   9.290 |   8.00   2.640 |  11.00   1.630
              2.17   2.900 |   5.17   8.020 |   8.17   2.550 |  11.17   1.600
              2.33   3.160 |   5.33   7.080 |   8.33   2.460 |  11.33   1.570
              2.50   3.480 |   5.50   6.350 |   8.50   2.380 |  11.50   1.540
              2.67   3.880 |   5.67   5.760 |   8.67   2.310 |  11.67   1.510
              2.83   4.390 |   5.83   5.280 |   8.83   2.240 |  11.83   1.480
              3.00   5.070 |   6.00   4.880 |   9.00   2.180 |  12.00   1.460

--------------------------------------------------------------------------------
005:0003--------------------------------------------------------------------------
********************************************************************************
* Post-Development Model - Wateridge Block 24
********************************************************************************
********************************************************************************
* Drainage to Rear Lane
********************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .20          .05
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=        1.00         2.00
     Length            (m)=      120.00        10.00
     Mannings n            =        .013         .250

     Max.eff.Inten.(mm/hr)=      178.56       154.67
                   over (min)        2.00         5.00
     Storage Coeff.  (min)=        2.26 (ii)    4.84 (ii)
     Unit Hyd. Tpeak (min)=        2.00         5.00
     Unit Hyd. peak  (cms)=         .52          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=         .10          .02          .115 (iii)
     TIME TO PEAK    (hrs)=        4.00         4.02         4.000
     RUNOFF VOLUME    (mm)=       92.33        34.06        80.681
     TOTAL RAINFALL   (mm)=       93.91        93.91        93.907
     RUNOFF COEFFICIENT   =         .98          .36          .859

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20        K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0004--------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .054  (cms)
                         Total major system storage [TMJSTO] =      0.(cu.m.)

                  ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
                                   (ha)     (cms)     (hrs)     (mm)     (cms)
     TOTAL HYD.   01:RL1           .25      .115     4.000   80.681      .000
     ==========================================================================
     MAJOR SYST   02:MAJOR         .04      .061     4.000   80.681      .000
     MINOR SYST   04:MINOR         .21      .054     3.867   80.681      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0005--------------------------------------------------------------------------
* Rear Lane Cross Section
----------------------
| ROUTE CHANNEL    |     Routing time step (min) =  1.00
|  IN> 02:MAJOR    |     Number of SEGMENTS =  1
| OUT< 03:LANE     |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
----------------------                 LENGTH =   20.00    (m)

               <------ DATA FOR SECTION (  15.1) ------>
               Distance      Elevation       Manning
                    .00         100.03         .0130
                   1.00          99.98         .0130
                   1.20          99.90         .0130
                   7.70         100.03         .0130

   <----------------------------- TRAVEL TIME TABLE ------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)     (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)   (m2/s)
     .007   99.907  .246E-01  .421E-03       .000      .174      1.91     .001
     .014   99.914  .984E-01  .337E-02       .001      .277      1.20     .004
     .021   99.921  .221E+00  .114E-01       .004      .363       .92     .007
     .027   99.927  .394E+00  .270E-01       .009      .439       .76     .012
     .034   99.934  .615E+00  .526E-01       .016      .510       .65     .017
     .041   99.941  .886E+00  .910E-01       .025      .575       .58     .024
     .048   99.948  .121E+01  .144E+00       .038      .638       .52     .031
     .055   99.955  .157E+01  .216E+00       .055      .697       .48     .038
     .062   99.962  .199E+01  .307E+00       .075      .754       .44     .046
     .068   99.968  .246E+01  .421E+00       .100      .809       .41     .055
     .075   99.975  .298E+01  .561E+00       .128      .862       .39     .065
     .082   99.982  .354E+01  .728E+00       .161      .908       .37     .075
     .089   99.989  .417E+01  .928E+00       .197      .945       .35     .084
     .096   99.996  .487E+01  .117E+01       .239      .983       .34     .094
```

```
      .103  100.003  .563E+01  .144E+01       .288      1.023       .33      .105
      .110  100.010  .645E+01  .177E+01       .343      1.062       .31      .116
      .116  100.016  .734E+01  .214E+01       .405      1.103       .30      .128
      .123  100.023  .830E+01  .256E+01       .474      1.143       .29      .141
      .130  100.030  .932E+01  .303E+01       .552      1.184       .28      .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                         <---- hydrograph ---->   <-pipe / channel->
                                   AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2:MAJOR             .04     .061    4.00 80.681      .057      .713
   OUTFLOW: ID= 3:LANE              .04     .060    4.00 80.681      .057      .711


-------------------------------------------------------------------------------
005:0006-----------------------------------------------------------------------
*******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
*******************************************************************************
---------------------
| CALIB STANDHYD     |   Area    (ha)=    1.27
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        1.02           .25
     Dep. Storage     (mm)=        1.57          4.67
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      220.00         10.00
     Mannings n          =         .013          .250

     Max.eff.Inten.(mm/hr)=      178.56        154.27
                over (min)         3.00          6.00
     Storage Coeff.  (min)=        3.25 (ii)     5.83 (ii)
     Unit Hyd. Tpeak (min)=        3.00          6.00
     Unit Hyd. peak  (cms)=         .36           .19
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .48           .08             .553 (iii)
     TIME TO PEAK    (hrs)=        4.00          4.03            4.000
     RUNOFF VOLUME    (mm)=       92.33         34.06           80.681
     TOTAL RAINFALL   (mm)=       93.91         93.91           93.907
     RUNOFF COEFFICIENT   =         .98           .36             .859

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20            K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20      Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
005:0007-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity        =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                     ID: NHYD        AREA      QPEAK     TPEAK      R.V.      DWF
                                     (ha)      (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:A1              1.27       .553     4.000    80.681     .000
     ====================================================================
     MAJOR SYST   02:MAJOR            .18       .288     4.000    80.681     .000
     MINOR SYST   04:MINOR           1.09       .265     3.883    80.681     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
005:0008-----------------------------------------------------------------------
------------------------
| ADD HYD (Total      ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 02:MAJOR       .18      .288    4.00  80.68    .000
                       +ID2 03:LANE        .04      .060    4.00  80.68    .000
                        ======================================================
                        SUM 01:Total       .21      .348    4.00  80.68    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
005:0009-----------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL     |     Routing time step (min) =  1.00
|  IN> 01:Total     |     Number of SEGMENTS =  1
| OUT< 03:ROAD      |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                LENGTH =    10.00     (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                    .00        100.00          .0130
                   1.80         99.96          .0130
                   2.00         99.88          .0130
                   8.50        100.04          .0130

   <---------------------------- TRAVEL TIME TABLE --------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)      (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)    (m2/s)
     .006   99.886  .860E-02  .776E-04     .000      .309        .54      .002
     .013   99.893  .344E-01  .621E-03     .002      .490        .34      .006
     .019   99.899  .774E-01  .210E-02     .005      .642        .26      .012
     .025   99.905  .138E+00  .497E-02     .011      .778        .21      .020
     .032   99.912  .215E+00  .970E-02     .019      .903        .18      .029
     .038   99.918  .310E+00  .168E-01     .032     1.020        .16      .039
     .044   99.924  .421E+00  .266E-01     .048     1.130        .15      .050
     .051   99.931  .550E+00  .397E-01     .068     1.235        .13      .062
     .057   99.937  .697E+00  .566E-01     .093     1.336        .12      .076
     .063   99.943  .860E+00  .776E-01     .123     1.433        .12      .091
     .069   99.949  .104E+01  .103E+00     .159     1.527        .11      .106
     .076   99.956  .124E+01  .134E+00     .200     1.619        .10      .123
     .082   99.962  .145E+01  .171E+00     .244     1.680        .10      .138
     .088   99.968  .170E+01  .215E+00     .289     1.701        .10      .150
     .095   99.975  .198E+01  .268E+00     .344     1.736        .10      .164
     .101   99.981  .230E+01  .331E+00     .409     1.782        .09      .180
     .107   99.987  .265E+01  .406E+00     .485     1.835        .09      .197
     .114   99.994  .303E+01  .492E+00     .573     1.892        .09      .215
     .120  100.000  .345E+01  .591E+00     .673     1.953        .09      .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                         <---- hydrograph ---->   <-pipe / channel->
                                   AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 1:Total             .21     .348    4.00 80.681      .095     1.739
   OUTFLOW: ID= 3:ROAD              .21     .347    4.00 80.681      .095     1.738


-------------------------------------------------------------------------------
005:0010-----------------------------------------------------------------------
*******************************************************************************
*******************************************************************************
-------------------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
-------------------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
-------------------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
-------------------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
  ** END OF RUN :   5

*******************************************************************************






--------------------
| START              |   Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------     Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=  1
           #  1=C:\SWM_PRG\STMFILES\19790701.stm
-------------------------------------------------------------------------------
006:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date         : 06-05-2016
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#*****************************************************************************
-------------------------------------------------------------------------------
006:0002-----------------------------------------------------------------------
--------------------
| READ STORM        |    Filename: City of Ottawa July 1, 1979 Storm - 5min
| Ptotal=  83.99 mm|    Comments: City of Ottawa July 1, 1979 Storm - 5min
--------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .08   2.300 |    .83  38.100 |   1.58  71.100 |   2.33   3.800
                 .17   2.300 |    .92  38.100 |   1.67  71.100 |   2.42   3.800
                 .25   8.890 |   1.00  38.100 |   1.75  30.500 |   2.50   3.800
                 .33   8.890 |   1.08  38.100 |   1.83  30.500 |   2.58   3.800
                 .42   8.890 |   1.17  50.800 |   1.92  30.500 |   2.67   3.800
                 .50   8.890 |   1.25  50.800 |   2.00  30.500 |   2.75   3.800
                 .58  38.100 |   1.33  76.200 |   2.08   3.800 |   2.83   3.800
                 .67  38.100 |   1.42 106.700 |   2.17   3.800 |   2.92   3.800
                 .75  38.100 |   1.50 106.700 |   2.25   3.800 |   3.00   3.800

-------------------------------------------------------------------------------
006:0003-----------------------------------------------------------------------
*******************************************************************************
* Post-Development Model - Wateridge Block 24
*******************************************************************************
*******************************************************************************
* Drainage to Rear Lane
*******************************************************************************
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .20           .05
     Dep. Storage     (mm)=        1.57          4.67
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      120.00         10.00
     Mannings n          =         .013          .250

     Max.eff.Inten.(mm/hr)=      106.70         91.38
                over (min)         3.00          6.00
     Storage Coeff.  (min)=        2.78 (ii)     5.96 (ii)
     Unit Hyd. Tpeak (min)=        3.00          6.00
     Unit Hyd. peak  (cms)=         .39           .19
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .06           .01             .069 (iii)
     TIME TO PEAK    (hrs)=        1.50          1.53            1.500
     RUNOFF VOLUME    (mm)=       82.42         42.29           74.393
     TOTAL RAINFALL   (mm)=       83.99         83.99           83.988
     RUNOFF COEFFICIENT   =         .98           .50             .886

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20            K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20      Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
006:0004-----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity        =    .054  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                     ID: NHYD        AREA      QPEAK     TPEAK      R.V.      DWF
                                     (ha)      (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1              .25       .069     1.500    74.393     .000
     ====================================================================
     MAJOR SYST   02:MAJOR            .01       .015     1.500    74.393     .000
     MINOR SYST   04:MINOR            .24       .054     1.383    74.393     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
006:0005-----------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL     |     Routing time step (min) =  1.00
|  IN> 02:MAJOR     |     Number of SEGMENTS =  1
| OUT< 03:LANE      |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                LENGTH =    20.00     (m)

                <------ DATA FOR SECTION (  15.1) ------>
                Distance      Elevation       Manning
                    .00        100.03          .0130
                   1.00         99.98          .0130
                   1.20         99.90          .0130
                   7.70        100.03          .0130

   <---------------------------- TRAVEL TIME TABLE --------------------------->
```

```
     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
      .007   99.907  .246E-01  .421E-03      .000      .174       1.91     .001
      .014   99.914  .984E-01  .337E-02      .001      .277       1.20     .004
      .021   99.921  .221E+00  .114E-01      .004      .363        .92     .007
      .027   99.927  .394E+00  .270E-01      .009      .439        .76     .012
      .034   99.934  .615E+00  .526E-01      .016      .510        .65     .017
      .041   99.941  .886E+00  .910E-01      .025      .575        .58     .024
      .048   99.948  .121E+01  .144E+00      .038      .638        .52     .031
      .055   99.955  .157E+01  .216E+00      .055      .697        .48     .038
      .062   99.962  .199E+01  .307E+00      .075      .754        .44     .046
      .068   99.968  .246E+01  .421E+00      .100      .809        .41     .055
      .075   99.975  .298E+01  .561E+00      .128      .862        .39     .065
      .082   99.982  .354E+01  .728E+00      .161      .908        .37     .075
      .089   99.989  .417E+01  .928E+00      .197      .945        .35     .084
      .096   99.996  .487E+01  .117E+01      .239      .983        .34     .094
      .103  100.003  .563E+01  .144E+01      .288     1.023        .33     .105
      .110  100.010  .645E+01  .177E+01      .343     1.062        .31     .116
      .116  100.016  .734E+01  .214E+01      .405     1.103        .30     .128
      .123  100.023  .830E+01  .256E+01      .474     1.143        .29     .141
      .130  100.030  .932E+01  .303E+01      .552     1.184        .28     .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 2:MAJOR        .01     .015    1.50 74.393      .034      .503
   OUTFLOW: ID= 3:LANE         .01     .015    1.50 74.393      .033      .499


--------------------------------------------------------------------------------
006:0006------------------------------------------------------------------------
*******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
*******************************************************************************
----------------------
| CALIB STANDHYD      |   Area    (ha)=    1.27
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02          .25
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     220.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     106.70        91.30
                over (min)        4.00         7.00
     Storage Coeff.  (min)=       4.00 (ii)    7.18 (ii)
     Unit Hyd. Tpeak (min)=       4.00         7.00
     Unit Hyd. peak  (cms)=        .28          .16
                                                               *TOTALS*
     PEAK FLOW       (cms)=        .29          .05              .338 (iii)
     TIME TO PEAK    (hrs)=       1.50         1.55             1.517
     RUNOFF VOLUME    (mm)=      82.42        42.29            74.393
     TOTAL RAINFALL   (mm)=      83.99        83.99            83.988
     RUNOFF COEFFICIENT   =        .98          .50              .886

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0007------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity          =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                     ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                     (ha)     (cms)     (hrs)      (mm)    (cms)
     TOTAL HYD.    01:A1             1.27      .338     1.517    74.393     .000
     =======================================================================
     MAJOR SYST    02:MAJOR           .05      .073     1.517    74.393     .000
     MINOR SYST    04:MINOR          1.22      .265     1.400    74.393     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0008------------------------------------------------------------------------
-------------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.     DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 02:MAJOR         .05      .073    1.52  74.39    .000
                      +ID2 03:LANE          .01      .015    1.50  74.39    .000
                       =========================================================
                       SUM 01:Total         .06      .087    1.52  74.39    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0009------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
---------------------
| ROUTE CHANNEL     |     Routing time step (min) =  1.00
|  IN> 01:Total     |     Number of SEGMENTS =  1
| OUT< 03:ROAD      |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
---------------------                LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00          .0130
                   1.80         99.96          .0130
                   2.00         99.88          .0130
                   8.50        100.04          .0130

   <---------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
      .006   99.886  .860E-02  .776E-04      .000      .309        .54     .002
      .013   99.893  .344E-01  .621E-03      .002      .490        .34     .006
      .019   99.899  .774E-01  .210E-02      .005      .642        .26     .012
      .025   99.905  .138E+00  .497E-02      .011      .778        .21     .020
      .032   99.912  .215E+00  .970E-02      .019      .903        .18     .029
      .038   99.918  .310E+00  .168E-01      .032     1.020        .16     .039
      .044   99.924  .421E+00  .266E-01      .048     1.130        .15     .050
      .051   99.931  .550E+00  .397E-01      .068     1.235        .13     .062
      .057   99.937  .697E+00  .566E-01      .093     1.336        .12     .076
      .063   99.943  .860E+00  .776E-01      .123     1.433        .12     .091
      .069   99.949  .104E+01  .103E+00      .159     1.527        .11     .106
      .076   99.956  .124E+01  .134E+00      .200     1.619        .10     .123
      .082   99.962  .145E+01  .171E+00      .244     1.680        .10     .138
      .088   99.968  .170E+01  .215E+00      .289     1.701        .10     .150
      .095   99.975  .198E+01  .268E+00      .344     1.736        .10     .164
      .101   99.981  .230E+01  .331E+00      .409     1.782        .09     .180
      .107   99.987  .265E+01  .406E+00      .485     1.835        .09     .197
      .114   99.994  .303E+01  .492E+00      .573     1.892        .09     .215
      .120  100.000  .345E+01  .591E+00      .673     1.953        .09     .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 1:Total        .06     .087    1.52 74.393      .055     1.311
   OUTFLOW: ID= 3:ROAD         .06     .088    1.52 74.393      .055     1.313


--------------------------------------------------------------------------------
006:0010------------------------------------------------------------------------
******************************************************************************
*******************************************************************************
--------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
  ** END OF RUN :   6

*******************************************************************************






--------------------
| START            |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
          #  1=C:\SWM_PRG\STMFILES\19880804.stm
--------------------------------------------------------------------------------
007:0002------------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date         : 06-05-2016
*#  Modeller     : [slm]
*#  Company      : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#******************************************************************************
--------------------------------------------------------------------------------
007:0002------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: City of Ottawa August 4, 1988 Storm - 5m
| Ptotal=  80.59 mm|    Comments: City of Ottawa August 4, 1988 Storm - 5m
--------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .08    .100 |   1.50 104.400 |   2.92    .200 |   4.33    .200
                .17    .100 |   1.58  27.500 |   3.00  12.800 |   4.42    .200
                .25    .000 |   1.67  62.500 |   3.08  14.000 |   4.50    .200
                .33   3.700 |   1.75  31.800 |   3.17  22.200 |   4.58    .200
                .42   6.200 |   1.83  79.800 |   3.25  21.800 |   4.67    .200
                .50 101.500 |   1.92  67.500 |   3.33   1.400 |   4.75    .200
                .58  15.500 |   2.00 156.200 |   3.42    .200 |   4.83    .200
                .67  29.300 |   2.08   5.100 |   3.50    .200 |   4.92    .200
                .75  19.800 |   2.17    .200 |   3.58    .200 |   5.00   2.900
                .83   1.500 |   2.25    .200 |   3.67    .200 |   5.08   7.800
                .92   1.700 |   2.33    .200 |   3.75    .200 |   5.17  10.000
               1.00   5.400 |   2.42    .200 |   3.83    .200 |   5.25   6.300
               1.08  24.600 |   2.50    .200 |   3.92    .200 |   5.33   5.100
               1.17  26.500 |   2.58    .200 |   4.00    .200 |   5.42   9.800
               1.25  34.900 |   2.67    .200 |   4.08    .200 |   5.50   2.600
               1.33  10.200 |   2.75    .200 |   4.17    .200 |   5.58   1.700
               1.42  27.100 |   2.83    .200 |   4.25    .200 |

--------------------------------------------------------------------------------
007:0003------------------------------------------------------------------------
*******************************************************************************
* Post-Development Model - Wateridge Block 24
*******************************************************************************
*******************************************************************************
* Drainage to Rear Lane
*******************************************************************************
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .05
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     120.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     156.20       142.02
                over (min)        2.00         5.00
     Storage Coeff.  (min)=       2.38 (ii)    5.05 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .50          .22
                                                               *TOTALS*
     PEAK FLOW       (cms)=        .08          .01              .091 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.03             2.000
     RUNOFF VOLUME    (mm)=      79.02        37.60            70.738
     TOTAL RAINFALL   (mm)=      80.59        80.59            80.591
     RUNOFF COEFFICIENT   =        .98          .47              .878

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
007:0004------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity          =    .054  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

```

```
                 ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                 (ha)     (cms)     (hrs)      (mm)     (cms)
    TOTAL HYD.   01:RL1           .25      .091     2.000    70.738      .000
    ======================================================================
    MAJOR SYST   02:MAJOR         .01      .037     2.000    70.738      .000
    MINOR SYST   04:MINOR         .24      .054     1.500    70.738      .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
007:0005----------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL     |     Routing time step (min) =  1.00
|  IN> 02:MAJOR     |     Number of SEGMENTS =  1
| OUT< 03:LANE      |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                   LENGTH =   20.00     (m)

               <------ DATA FOR SECTION (  15.1) ------>
               Distance      Elevation       Manning
                    .00        100.03          .0130
                   1.00         99.98          .0130
                   1.20         99.90          .0130
                   7.70        100.03          .0130

   <--------------------------- TRAVEL TIME TABLE -------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)      (m)   (cu.m.)   (cu.m.)    (cms)      (m/s)     (min)    (m2/s)
     .007   99.907  .246E-01  .421E-03     .000       .174      1.91      .001
     .014   99.914  .984E-01  .337E-02     .001       .277      1.20      .004
     .021   99.921  .221E+00  .114E-01     .004       .363       .92      .007
     .027   99.927  .394E+00  .270E-01     .009       .439       .76      .012
     .034   99.934  .615E+00  .526E-01     .016       .510       .65      .017
     .041   99.941  .886E+00  .910E-01     .025       .575       .58      .024
     .048   99.948  .121E+01  .144E+00     .038       .638       .52      .031
     .055   99.955  .157E+01  .216E+00     .055       .697       .48      .038
     .062   99.962  .199E+01  .307E+00     .075       .754       .44      .046
     .068   99.968  .246E+01  .421E+00     .100       .809       .41      .055
     .075   99.975  .298E+01  .561E+00     .128       .862       .39      .065
     .082   99.982  .354E+01  .728E+00     .161       .908       .37      .075
     .089   99.989  .417E+01  .928E+00     .197       .945       .35      .084
     .096   99.996  .487E+01  .117E+01     .239       .983       .34      .094
     .103  100.003  .563E+01  .144E+01     .288      1.023       .33      .105
     .110  100.010  .645E+01  .177E+01     .343      1.062       .31      .116
     .116  100.016  .734E+01  .214E+01     .405      1.103       .30      .128
     .123  100.023  .830E+01  .256E+01     .474      1.143       .29      .141
     .130  100.030  .932E+01  .303E+01     .552      1.184       .28      .154

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                        <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 2:MAJOR         .01     .037    2.00 70.738      .047      .631
   OUTFLOW: ID= 3:LANE          .01     .035    2.00 70.738      .046      .620


------------------------------------------------------------------------------
007:0006----------------------------------------------------------------------
******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
******************************************************************************
---------------------
| CALIB STANDHYD     |   Area    (ha)=    1.27
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=        1.02          .25
    Dep. Storage     (mm)=        1.57         4.67
    Average Slope     (%)=        1.00         2.00
    Length            (m)=      220.00        10.00
    Mannings n          =        .013         .250

    Max.eff.Inten.(mm/hr)=      156.20       127.20
               over (min)         3.00         6.00
    Storage Coeff.  (min)=        3.43 (ii)    6.22 (ii)
    Unit Hyd. Tpeak (min)=        3.00         6.00
    Unit Hyd. peak  (cms)=         .34          .18
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .36          .06          .411 (iii)
    TIME TO PEAK    (hrs)=        2.00         2.03         2.000
    RUNOFF VOLUME    (mm)=       79.02        37.60        70.738
    TOTAL RAINFALL   (mm)=       80.59        80.59        80.591
    RUNOFF COEFFICIENT  =         .98          .47          .878

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
007:0007----------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
---------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
---------------------    Total minor system capacity        =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                 ID: NHYD        AREA     QPEAK     TPEAK      R.V.      DWF
                                 (ha)     (cms)     (hrs)      (mm)     (cms)
    TOTAL HYD.   01:A1           1.27      .411     2.000    70.738      .000
    ======================================================================
    MAJOR SYST   02:MAJOR         .05      .146     2.000    70.738      .000
    MINOR SYST   04:MINOR        1.22      .265     1.950    70.738      .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
007:0008----------------------------------------------------------------------
-----------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.    DWF
-----------------------                   (ha)     (cms)    (hrs)   (mm)   (cms)
                      ID1 02:MAJOR         .05      .146     2.00  70.74    .000
                     +ID2 03:LANE          .01      .035     2.00  70.74    .000
                      =======================================================
                      SUM 01:Total         .06      .181     2.00  70.74    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
007:0009----------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL     |     Routing time step (min) =  1.00
|  IN> 01:Total     |     Number of SEGMENTS =  1
| OUT< 03:ROAD      |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                   LENGTH =   10.00     (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00          .0130
                   1.80         99.96          .0130
                   2.00         99.88          .0130
                   8.50        100.04          .0130

   <--------------------------- TRAVEL TIME TABLE -------------------------->
    DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
     (m)      (m)   (cu.m.)   (cu.m.)    (cms)      (m/s)     (min)    (m2/s)
     .006   99.886  .860E-02  .776E-04     .000       .309       .54      .002
     .013   99.893  .344E-01  .621E-03     .002       .490       .34      .006
     .019   99.899  .774E-01  .210E-02     .005       .642       .26      .012
     .025   99.905  .138E+00  .497E-02     .011       .778       .21      .020
     .032   99.912  .215E+00  .970E-02     .019       .903       .18      .029
     .038   99.918  .310E+00  .168E-01     .032      1.020       .16      .039
     .044   99.924  .421E+00  .266E-01     .048      1.130       .15      .050
     .051   99.931  .550E+00  .397E-01     .068      1.235       .13      .062
     .057   99.937  .697E+00  .566E-01     .093      1.336       .12      .076
     .063   99.943  .860E+00  .776E-01     .123      1.433       .12      .091
     .069   99.949  .104E+01  .103E+00     .159      1.527       .11      .106
     .076   99.956  .124E+01  .134E+00     .200      1.619       .10      .123
     .082   99.962  .145E+01  .171E+00     .244      1.680       .10      .138
     .088   99.968  .170E+01  .215E+00     .289      1.701       .10      .150
     .095   99.975  .198E+01  .268E+00     .344      1.736       .10      .164
     .101   99.981  .230E+01  .331E+00     .409      1.782       .09      .180
     .107   99.987  .265E+01  .406E+00     .485      1.835       .09      .197
     .114   99.994  .303E+01  .492E+00     .573      1.892       .09      .215
     .120  100.000  .345E+01  .591E+00     .673      1.953       .09      .234

 X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                        <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
   INFLOW : ID= 1:Total         .06     .181    2.00 70.738      .073     1.575
   OUTFLOW: ID= 3:ROAD          .06     .181    2.02 70.738      .073     1.575


------------------------------------------------------------------------------
007:0010----------------------------------------------------------------------
*****************************************************************************
******************************************************************************
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
  ** END OF RUN :   7

******************************************************************************






--------------------
| START             |  Project  dir.: C:\SWM_PRG\17-918\Block24\
--------------------   Rainfall dir.: C:\SWM_PRG\17-918\Block24\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 008
    NSTORM=   1
          #  1=C:\SWM_PRG\STMFILES\19960808.stm
------------------------------------------------------------------------------
008:0002----------------------------------------------------------------------
*#****************************************************************************
*#  Project Name: []    Project Number: [16-833]
*#  Date          : 06-05-2016
*#  Modeller      : [slm]
*#  Company       : David Schaeffer Engineering Ltd.
*#  License #    :  4488477
*#****************************************************************************
------------------------------------------------------------------------------
008:0002----------------------------------------------------------------------
--------------------
| READ STORM        |     Filename: City of Ottawa August 8, 1996 Storm - 5m
| Ptotal=  73.90 mm|     Comments: City of Ottawa August 8, 1996 Storm - 5m
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   4.000 |   1.58   9.300 |   3.08  63.700 |   4.58   1.300
               .17  11.900 |   1.67   8.000 |   3.17  58.400 |   4.67   1.300
               .25  26.500 |   1.75   4.000 |   3.25  47.800 |   4.75    .000
               .33  13.300 |   1.83    .000 |   3.33  15.900 |   4.83    .000
               .42    .000 |   1.92   2.700 |   3.42  13.300 |   4.92    .000
               .50   2.700 |   2.00    .000 |   3.50   8.000 |   5.00    .000
               .58    .000 |   2.08    .000 |   3.58   5.300 |   5.08   2.700
               .67   8.000 |   2.17    .000 |   3.67   6.600 |   5.17    .000
               .75  18.600 |   2.25   5.300 |   3.75   2.700 |   5.25    .000
               .83  10.600 |   2.33    .000 |   3.83   4.000 |   5.33    .000
               .92  21.200 |   2.42    .000 |   3.92   2.700 |   5.42    .000
              1.00   2.700 |   2.50    .000 |   4.00   4.000 |   5.50    .000
              1.08   2.700 |   2.58    .000 |   4.08   2.700 |   5.58    .000
              1.17  15.900 |   2.67    .000 |   4.17   5.300 |   5.67    .000
              1.25  66.300 |   2.75    .000 |   4.25   4.000 |   5.75   1.300
              1.33  55.700 |   2.83   4.000 |   4.33   2.700 |
              1.42 122.000 |   2.92  53.100 |   4.42   4.000 |
              1.50  88.900 |   3.00  69.000 |   4.50   2.700 |

------------------------------------------------------------------------------
008:0003----------------------------------------------------------------------
******************************************************************************
* Post-Development Model - Wateridge Block 24
******************************************************************************
******************************************************************************
* Drainage to Rear Lane
******************************************************************************
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .25
| 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=         .20          .05
    Dep. Storage     (mm)=        1.57         4.67
    Average Slope     (%)=        1.00         2.00
    Length            (m)=      120.00        10.00
    Mannings n          =        .013         .250
```

```

     Max.eff.Inten.(mm/hr)=     122.00        86.47
                over (min)        3.00         6.00
     Storage Coeff.  (min)=       2.63 (ii)    5.89 (ii)
     Unit Hyd. Tpeak (min)=       3.00         6.00
     Unit Hyd. peak  (cms)=        .41          .19
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .06          .01          .066 (iii)
     TIME TO PEAK    (hrs)=       1.43         1.50         1.433
     RUNOFF VOLUME    (mm)=      72.33        33.77        64.617
     TOTAL RAINFALL   (mm)=      73.90        73.90        73.900
     RUNOFF COEFFICIENT   =        .98          .46          .874

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20    Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0004------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
---------------------
| COMPUTE DUALHYD    |    Average inlet capacities   [CINLET] =    .054  (cms)
| TotalHyd 01:RL1    |    Number of inlets in system [NINLET] =       1
---------------------    Total minor system capacity          =    .054  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                      ID: NHYD        AREA      QPEAK     TPEAK      R.V.      DWF
                                      (ha)      (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:RL1               .25       .066     1.433    64.617     .000
     ===================================================================
     MAJOR SYST   02:MAJOR             .01       .012     1.433    64.617     .000
     MINOR SYST   04:MINOR             .24       .054     1.400    64.617     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
008:0005------------------------------------------------------------------------
* Rear Lane Cross Section
--------------------
| ROUTE CHANNEL      |     Routing time step (min) =  1.00
|  IN> 02:MAJOR      |     Number of SEGMENTS =  1
| OUT< 03:LANE       |     Slopes (%), CHANNEL=1.00   FLOODPLAIN=1.00
--------------------                   LENGTH =   20.00     (m)

                <------ DATA FOR SECTION (  15.1) ------>
                Distance      Elevation       Manning
                    .00        100.03          .0130
                   1.00         99.98          .0130
                   1.20         99.90          .0130
                   7.70        100.03          .0130

    <--------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)      (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)    (m2/s)
     .007   99.907  .246E-01  .421E-03      .000      .174       1.91      .001
     .014   99.914  .984E-01  .337E-02      .001      .277       1.20      .004
     .021   99.921  .221E+00  .114E-01      .004      .363        .92      .007
     .027   99.927  .394E+00  .270E-01      .009      .439        .76      .012
     .034   99.934  .615E+00  .526E-01      .016      .510        .65      .017
     .041   99.941  .886E+00  .910E-01      .025      .575        .58      .024
     .048   99.948  .121E+01  .144E+00      .038      .638        .52      .031
     .055   99.955  .157E+01  .216E+00      .055      .697        .48      .038
     .062   99.962  .199E+01  .307E+00      .075      .754        .44      .046
     .068   99.968  .246E+01  .421E+00      .100      .809        .41      .055
     .075   99.975  .298E+01  .561E+00      .128      .862        .39      .065
     .082   99.982  .354E+01  .728E+00      .161      .908        .37      .075
     .089   99.989  .417E+01  .928E+00      .197      .945        .35      .084
     .096   99.996  .487E+01  .117E+01      .239      .983        .34      .094
     .103  100.003  .563E+01  .144E+01      .288     1.023        .33      .105
     .110  100.010  .645E+01  .177E+01      .343     1.062        .31      .116
     .116  100.016  .734E+01  .214E+01      .405     1.103        .30      .128
     .123  100.023  .830E+01  .256E+01      .474     1.143        .29      .141
     .130  100.030  .932E+01  .303E+01      .552     1.184        .28      .154

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                          <---- hydrograph ---->   <-pipe / channel->
                                   AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
    INFLOW : ID= 2:MAJOR            .01     .012    1.43 64.617      .031      .474
    OUTFLOW: ID= 3:LANE             .01     .012    1.45 64.617      .031      .474


--------------------------------------------------------------------------------
008:0006------------------------------------------------------------------------
*******************************************************************************
* Remaining Drainage Area to Moses Tenisco St.
*******************************************************************************
---------------------
| CALIB STANDHYD     |    Area    (ha)=     1.27
| 01:A1     DT= 1.00 |    Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02          .25
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     220.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     122.00        83.06
                over (min)        4.00         7.00
     Storage Coeff.  (min)=       3.79 (ii)    7.10 (ii)
     Unit Hyd. Tpeak (min)=       4.00         7.00
     Unit Hyd. peak  (cms)=        .29          .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .28          .04          .316 (iii)
     TIME TO PEAK    (hrs)=       1.45         1.52         1.467
     RUNOFF VOLUME    (mm)=      72.33        33.77        64.617
     TOTAL RAINFALL   (mm)=      73.90        73.90        73.900
     RUNOFF COEFFICIENT   =        .98          .46          .874

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20           K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20    Cum.Inf.   (mm)=   .00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0007------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
---------------------
| COMPUTE DUALHYD    |    Average inlet capacities   [CINLET] =    .265  (cms)
| TotalHyd 01:A1     |    Number of inlets in system [NINLET] =       1
---------------------    Total minor system capacity          =    .265  (cms)
                         Total major system storage [TMJSTO] =       0.(cu.m.)

                      ID: NHYD        AREA      QPEAK     TPEAK      R.V.      DWF
                                      (ha)      (cms)     (hrs)      (mm)     (cms)
     TOTAL HYD.   01:A1               1.27       .316     1.467    64.617     .000
     ===================================================================
     MAJOR SYST   02:MAJOR             .03       .051     1.467    64.617     .000
     MINOR SYST   04:MINOR            1.24       .265     1.417    64.617     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
008:0008------------------------------------------------------------------------
------------------------
| ADD HYD (Total     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 02:MAJOR       .03      .051    1.47  64.62    .000
                      +ID2 03:LANE        .01      .012    1.45  64.62    .000
                       ===================================================
                       SUM 01:Total       .03      .062    1.47  64.62    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
008:0009------------------------------------------------------------------------
* Cross Section at Site Entrance (Moses Tenisco St.)
--------------------
| ROUTE CHANNEL      |     Routing time step (min) =  1.00
|  IN> 01:Total      |     Number of SEGMENTS =  1
| OUT< 03:ROAD       |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
--------------------                   LENGTH =   10.00     (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                    .00        100.00          .0130
                   1.80         99.96          .0130
                   2.00         99.88          .0130
                   8.50        100.04          .0130

    <--------------------------- TRAVEL TIME TABLE --------------------------->
     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
      (m)      (m)   (cu.m.)   (cu.m.)     (cms)     (m/s)      (min)    (m2/s)
     .006   99.886  .860E-02  .776E-04      .000      .309        .54      .002
     .013   99.893  .344E-01  .621E-03      .002      .490        .34      .006
     .019   99.899  .774E-01  .210E-02      .005      .642        .26      .012
     .025   99.905  .138E+00  .497E-02      .011      .778        .21      .020
     .032   99.912  .215E+00  .970E-02      .019      .903        .18      .029
     .038   99.918  .310E+00  .168E-01      .032     1.020        .16      .039
     .044   99.924  .421E+00  .266E-01      .048     1.130        .15      .050
     .051   99.931  .550E+00  .397E-01      .068     1.235        .13      .062
     .057   99.937  .697E+00  .566E-01      .093     1.336        .12      .076
     .063   99.943  .860E+00  .776E-01      .123     1.433        .12      .091
     .069   99.949  .104E+01  .103E+00      .159     1.527        .11      .106
     .076   99.956  .124E+01  .134E+00      .200     1.619        .10      .123
     .082   99.962  .145E+01  .171E+00      .244     1.680        .10      .138
     .088   99.968  .170E+01  .215E+00      .289     1.701        .10      .150
     .095   99.975  .198E+01  .268E+00      .344     1.736        .10      .164
     .101   99.981  .230E+01  .331E+00      .409     1.782        .09      .180
     .107   99.987  .265E+01  .406E+00      .485     1.835        .09      .197
     .114   99.994  .303E+01  .492E+00      .573     1.892        .09      .215
     .120  100.000  .345E+01  .591E+00      .673     1.953        .09      .234

  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

                                          <---- hydrograph ---->   <-pipe / channel->
                                   AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
    INFLOW : ID= 1:Total            .03     .062    1.47 64.617      .049     1.202
    OUTFLOW: ID= 3:ROAD             .03     .063    1.47 64.617      .049     1.207


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008:0010------------------------------------------------------------------------
******************************************************************************
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008:0002------------------------------------------------------------------------
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008:0002------------------------------------------------------------------------
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008:0002------------------------------------------------------------------------
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008:0002------------------------------------------------------------------------
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008:0002------------------------------------------------------------------------
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008:0002------------------------------------------------------------------------
--------------------------------------------------------------------------------
008:0002------------------------------------------------------------------------
      FINISH
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2017-12-02     at 14:19:54
================================================================================
```

DRAWINGS / FIGURES