

ALMA Guelph Phase 2

Functional Servicing and Stormwater Management Report

Project Location: 601 Scottsdale Drive, Guelph, ON

Prepared for: Forum 601 Scottsdale LP 181 Bay Street East, Toronto, ON

Prepared by: MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, ON N2B 3X9

September 22, 2023

MTE File No.: 49791-101

Engineers, Scientists, Surveyors.



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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by FEP Real Estate Development Ltd. to complete a Functional Servicing and Stormwater Management Report for a new student residential development to be constructed at 601 Scottsdale Drive (herein referred to as 'the Site') in the City of Guelph in support of the Official Plan and Zoning By-Law Amendment Application. The current zoning of the Site is Special Service Commercial (SC.1-40) Zone, and the proposed application is to apply various site specific amendments including but not limited to measures related to density, setbacks and parking requirements.

The property is bounded to the north by an existing church, vacant lands, and a commercial building, to the east by Scottsdale Drive, to the south by Stone Road West, and to the west by Hanlon Parkway (Highway 6). For the exact location of the Site refer to Figure 1.0.

The proposed development for the Site is the construction of a student residential building which consists of two 7-storey towers connected by a single-storey indoor amenity hub, on top of a podium, providing a total of 489 units (with 587 beds). The proposed development will include surface parking, underground parking and outdoor amenity areas. An existing student residence building currently occupies the east side of the Site and will remain. The existing driveway connection near the northeast corner of the Site is to be realigned while the existing driveway connection near the southeast corner of the Site will be removed.

The purpose of this study is to support the Official Plan Amendment and Zoning By-Law Amendment Applications. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property. Pending approval of the Amendment application, detailed design of the Site will commence and be submitted to the City in support of Site Plan Approval.

2.0 CRITERIA

2.1 Existing Topography

The Site encompasses an area of 2.22ha and currently comprises a student residence building located on the east side of the Site, surface parking, two driveway connections to Scottsdale Drive, and undeveloped green space located on the west side of the Site. In the existing condition, surface runoff from the Site generally drains from east to west. There is an elevation difference of approximately 9.8m between the east property line and the northwest corner of the Site. The Site is approximately 59% impervious in the existing condition.



2.2 Existing Servicing

2.2.1 Water

There is an existing 200mm diameter municipal watermain along Scottsdale Drive and an existing 250mm diameter municipal watermain along Stone Road West. The closest municipal fire hydrant is located at the northwest corner of the Scottsdale Drive and Stone Road West intersection. The Site is currently serviced by a 250mm diameter water service off the Scottsdale Drive watermain, entering near the southeast corner of the Site. As per the original drawings for the Site, the 250mm diameter water service splits into a 200mm diameter fire main and a 100mm diameter domestic service before entering near the southeast corner of the southeast corner of the service splits into a 200mm diameter fire main and a 100mm diameter domestic service before entering near the southeast corner of the service splits into a 200mm diameter fire main and a 100mm diameter domestic service before entering near the southeast corner of the service splits into a 200mm diameter fire main and a 100mm diameter domestic service before entering near the southeast corner of the service splits into a 200mm diameter fire main and a 100mm diameter domestic service before entering near the southeast corner of the existing student residence building.

2.2.2 Sanitary

There is a 250mm diameter sanitary sewer within an easement located at the north property line which drains towards north to Torch Lane. The closest manhole is located on the Site, just south of the easement. At this manhole, the sewer invert is approximately 3.7m below the top of grate elevation. Upstream of this manhole, there are a series of 200mm diameter sanitary sewers which traverse east to service the existing student residence building on Site. As the location of this existing sanitary service conflicts with the proposed building, the existing on-site 200mm diameter sanitary sewers will be decommissioned and removed, and the existing building will connected to the proposed relocated on-site sanitary network system.

2.2.3 Storm

There is a 600mm diameter storm sewer within the above mentioned easement that drains north towards Torch Lane. The closest existing manhole is located on the north property line at the easement. At this manhole, the sewer invert is approximately 2.7m below the top of grate elevation. Upstream of this manhole, there are a series of varying size storm sewers which connect to existing manholes and catchbasins located throughout the Site. As there are numerous conflicts with the existing sewers, manholes and catchbasins and the proposed building, extensive on-site decommissioning and removals will occur. Surface runoff from a majority of the Site is conveyed overland to the west corner of the Site where it drains towards Torch Lane.

2.3 Existing Soils Information

A geotechnical investigation was undertaken by MTE and is dated September 22, 2023. A complete copy of the report is submitted separately for the City's records. Sixteen boreholes and three monitoring wells were advanced by MTE between February 21 and March 9, 2023 in order to determine the underlying soil and groundwater conditions of the Site. The investigation revealed that the Site is generally comprised of asphalt or fill material overlying interlayered native sand and silt deposits. The native soil deposits range in composition from gravelly sand to sandy silt. Groundwater levels were observed between the depths of 9.6m to 9.8m below grade, or between 316.9masl and 318.9masl.

2.4 Reviewing Agencies

Preliminary grading, servicing, and this Functional Servicing and Stormwater Management Report will be required for submission to the City of Guelph in support of the Official Plan Amendment and the Zoning By-Law Amendment applications. The City will also be responsible for the review and approval of site plans, lighting, and landscape design and ultimately issuing building permits.

Hanlon Parkway (Highway 6) is maintained by the Ministry of Transportation (MTO). As such, the MTO will be circulated on the Site Plan Application submission and will need to approve the site grading, servicing and stormwater management design.

3.0 METHODOLOGY

Preliminary grading and servicing strategies for the proposed development have been developed based on the topographic survey prepared by Van Harten Surveying Inc., dated July 20, 2022, and Conceptual Site Plan prepared by Sweeny&Co Architects, dated March 13, 2023.

3.1 Proposed Grading

The proposed development will include two seven-storey towers connected by a single-storey indoor amenity hub and podium, complete with surface parking, underground parking, outdoor amenity areas, and a relocated driveway connection to Scottsdale Drive. The proposed grading strategy will respect the existing grades along the property line, as well as the existing grades surrounding the existing student residence building. To realign the existing driveway connection near the northeast corner of the site, a portion of the parking lot in the vicinity will be regraded.

3.2 Proposed Servicing

3.2.1 Water

To service the proposed building, a new connection to the existing 250mm diameter water service located near the southeast corner of the Site will be required.

A connection to a new water meter is proposed for the existing 250mm diameter water service on the Site prior to branching out to service the existing and the proposed buildings. The private water service size required to service the new building will be determined during detailed design but will likely be 250mm in diameter. This new water service will run along the drive aisle located south of the existing building, then bend 90-degrees towards the northern limits of the Site before entering near the northeast corner of the proposed building.

It should be noted that an internal booster pump may be specified in the building to achieve appropriate flow and pressure on the upper floors, given the proposed height of the building. This will be confirmed by the mechanical engineer during detailed design.

It is anticipated that a new private hydrant will be required to service the proposed building. An on-site hydrant will be located on the landscaped island within the drop off area.

Preliminary water demands were calculated for the proposed building and are included in Appendix A. The maximum day domestic water demand for the proposed building was determined to be 3.74L/s. The maximum day domestic demand for the existing building was calculated as 1.05L/s in the Phase 1 Functional Servicing and Stormwater Management Brief prepared by MTE dated October 29, 2021, thus the total domestic demand for the Site is 4.79L/s.

The proposed development was analyzed using both the OBC and FUS fire flow requirements. Tower A was The fire flow requirement was determined to be 9,000L/min and 11,000L/min based on the OBC and FUS fire flow requirements, respectively. Many municipalities in Ontario use both the OBC and the FUS fire flow requirements for assessing firefighting water supply requirements. Ideally, fire flow demands for new developments are calculated based on the FUS criteria; however, it is not reasonable to expect that the existing municipal watermain infrastructure always has the operational capacity to supply water at the rates prescribed in the FUS guidelines. As a result, at no time shall the available fire flow be less than that required by the Ontario Building Code. The minimum allowable pressure permitted under firefighting conditions is 140kPa (20.3psi) per OBC 2012 A-3.2.5.7 3(b).

A hydrant flow test was completed on the existing municipal hydrants located on Scottsdale Drive. The following table illustrates the results of the testing completed by Spira Fire Protection Ltd.

Test #	Outlet Inside Diameter (in.)	Number of Outlets	Pitot Pressure (PSI)	Residual Pressure (PSI)	Flow @ Residual (gal/min)
1	n/a	n/a	n/a	59	n/a
2	2.5	1	40	53	1,180
3	2.5	2	20 + 20	48	834 + 834

Table 3.1 – Results of Flow Tests Completed (September 7, 2021)

Refer to Appendix B for the information obtained by Spira Fire Protection Ltd.

The residual pressure at the proposed private hydrant was calculated to be 188kPa when subject to a fire flow demand of 9,000L/min under the OBC condition. The required flow to meet the FUS demand cannot be achieved by the proposed private hydrant. Therefore, the residual pressures are greater than the minimum allowable pressure of 140kPa per OBC 2012. Refer to Appendix B for calculations.

The proposed building will have a sprinkler system. Section A-3.2.5.7.2 of the OBC relates to water supply for firefighting in sprinklered buildings. For sprinklered buildings, water supply additional to that required by the sprinkler systems should be provided for firefighting using fire hoses in accordance with the hose stream demands and water supply durations for different hazard classifications as specified in National Fire Protection Association's (NFPA) NFPA 13, "Standard for the Installation of Sprinkler Systems".

The building-specific system demand for the proposed sprinkler system is not known at this time; however, it is expected that the sprinkler system demand will be significantly less than the OBC demand of 9,000L/min. Therefore, the private hydrant will be able to provide the required demand. The actual sprinkler system demand will be provided by a qualified fire suppression contractor during detailed design.

3.2.2 Sanitary

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the Site. With the proposed building having 489 units (with 587 beds) and the existing building having 164 units (with 177 beds) on a Site which comprises 2.22ha, the total resulting flow is expected to be 15.5L/s. The proposed building will generate a sanitary flow of approximately 11.6L/s and the existing building will generate a sanitary flow of approximately 3.9L/s. As part of the Phase 1 Functional Servicing and Stormwater Management Brief prepared by MTE dated October 29, 2021, the demand for the existing building was calculated as

approximately 7L/s. Previous calculations utilized the City of Guelph's average daily flow of 6.00L/s/ha for a 150 unit per hectare apartment which reflected the Site's density at the time. As the density is proposed to increase significantly, the calculation now utilizes the City of Guelph's average daily flow rate of 7.00L/s/had for a 295 unit per hectare apartment. The existing 250mm diameter sanitary pipe within the easement between the Site and Torch Lane has a capacity of 59.4L/s, which is larger than calculated cumulative flow for the Site of 15.5L/s. It is noted the existing 250mm diameter municipal sanitary sewer within the easement only services the Site and the existing development at the corner of Janefield Avenue and Scottsdale Drive, which is expected to have a substantially smaller design flow than the Site. Refer to Appendix C for sanitary flow calculations.

As discussed in Section 2.2.2, the existing 200mm diameter sanitary sewers currently servicing the existing building will be decommissioned and removed. In its place, a series of new 200mm diameter sanitary sewers will be extended from the existing sanitary manhole located near the northwest corner of the Site. The new 200mm diameter sanitary sewer will be installed to the north of the proposed building and both the proposed and the existing buildings will be serviced by the new 200mm diameter sanitary sewer. The private sanitary sewer is to be installed at a slope that provides depth for the servicing of the buildings while maintaining adequate capacity. The service sizes and inverts will be confirmed at detailed design.

3.2.3 Storm

A private storm sewer system will be installed on-site to collect runoff from the common driveway and parking areas. This storm sewer system will include catchbasins, manholes, and catchbasin manholes. The runoff collected in the storm sewers will be directed to an orifice in the northwest corner of the Site prior to being treated by an oil-grit separator (OGS) unit and on to the municipal storm sewer within the easement draining north to Torch Lane. An underground storage tank will be provided in the northwest corner of the Site.

4.0 PRELIMINARY STORMWATER MANAGEMENT DESIGN

4.1 SWM Criteria

The stormwater management (SWM) design criteria for the Site, as provided by the City of Guelph, are as follows:

- Attenuation of the post-development peak flows for the 2- through 100-year storm events to the pre-development (existing) peak flow;
- Excess runoff from the 2-year storm event is to be stored entirely underground, or on rooftops;
- iii) Implementation of Enhanced (Level 1) water quality controls;
- iv) Complete a Water Balance Analysis to confirm existing infiltration is maintained or enhanced; and,
- v) Implementation of Erosion and Sediment Control measures.

4.2 Water Quantity Control

In order to successfully complete the preliminary stormwater management design for the Site, the following specific tasks were undertaken:

- i) Calculate the allowable runoff rates using MIDUSS NET;
- ii) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSSS modeling; and,
- iii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modeling of the Site. The pre-development condition was modelled as one catchment area; the total Site area. The post-development condition was separated into two catchment areas; the controlled area and the uncontrolled area. Figure 2.0 illustrates the limits of the pre-development catchment area. Figure 3.0 illustrates the limits of the post-development catchment areas.

#	Catchment	Area (ha)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)		
Pre-Development Catchment Area									
101	Total Site	2.222	59	81	98	4.0	45		
Post-I	Development Catch	ment Ar	eas						
201	Uncontrolled Area	0.188	4	81	98	7.5	20		
202	Controlled Roof Area	0.298	100	81	98	1.5	10		
203	Controlled Area	1.736	82	81	98	3.0	25		

Table 4.1 – Catchment Parameters

A geotechnical investigation was undertaken by MTE as discussed above in Section 2.3. Based on the underlying soil conditions, a pervious CN of 81 is appropriate.









4.3 Water Quantity Control – Modelling Results

In order to achieve the stormwater management requirements for the Site, runoff generated from the controlled parking areas will be conveyed to double catchbasin-manhole DCBMH8, located in the northwest corner of the Site, wherein the flow will be controlled with two orifice plates installed on a weir wall within the DCBMH. The weir wall will be installed to approximately 0.15m higher than the 100-year storm ponding elevation, and ponding for all storms up to and including the 100-year storm event will be stored underground and on the proposed building roofs. Storage volume for the orifice plates will be provided within a 150m³ underground storage tank. The maximum depth of ponding permitted within the proposed parking areas by grading is 0.30m.

As mentioned, 11 flow control roof drains, single notch, are proposed to be installed on the roofs of the two proposed towers. This will help to further reduce the post-development runoff from the Site.

The flow equation for the orifice is included in Appendix D. Refer to Appendix E for the MIDUSS NET output.

The following table illustrates the stage-storage-discharge relationship of the storm system.

Elevation (m)	Head (m)	Orifice Flow (m³/s)	Volume (m³)	Remarks
322.600	0.000	0.000	0	500mm diameter orifice invert and Bottom of Underground Storage Tank
323.500	0.900	0.413	75	250mm diameter orifice invert
324.400	1.800	0.781	150	Top of Underground Storage Tank
324.450	1.850	0.796	150	Top of Weir Wall
325.350	2.750	3.388	150	Top of grate DCBMH
325.450	2.850	3.814	155	Contour
325.550	2.950	4.261	165	Contour
325.650	3.050	4.727	175	Contour

Table 4.2 – Stage-Storage-Discharge Information

With the addition of the 500mm and 250mm diameter orifice plates, the post-development runoff from the controlled portion of the Site for the 2-, 5-, and 100-year storm events is controlled to 0.270m³/s, 0.382m³/s, and 0.724m³/s, respectively. The following table summarizes the expected flows that will be generated by the whole Site. Please note that these flows are subject to change at the detailed design stage.

Modelling Condition	2-Year Storm Event (m ³ /s)	5-Year Storm Event (m ³ /s)	10-Year Storm Event (m ³ /s)	25-Year Storm Event (m³/s)	50-Year Storm Event (m³/s)	100-Year Storm Event (m ³ /s)
Pre-Development	0.284	0.403	0.508	0.605	0.704	0.805
Post-Development	0.277	0.398	0.499	0.596	0.688	0.781

Table 4.3 – Summary of Flows

The following table summarizes the maximum ponding elevations and surface ponding depths for the modelled storm events.

Modelling Condition	2-Year Storm Event	5-Year Storm Event	10-Year Storm Event	25-Year Storm Event	50-Year Storm Event	100-Year Storm Event
Ponding Elevation (m)	323.197	323.443	323.659	323.871	324.072	324.275
Maximum Ponding Depth within Underground Storage Tank (cm)	59.7	94.3	105.9	127.1	147.2	167.5

Table 4.4 – Summary of Ponding Depths

It is noted the Site's emergency overland flow route in the existing condition is directed towards the neighbouring properties to the north of the Site and is maintained in the proposed condition. However, the Site's stormwater management design has been completed to ensure sufficient storage volume is provided on-site for all storms up to and including the 100-year storm event. As shown in Table 4.4, the 100-year storm ponding elevation is 324.275 which indicates the entirety of the 100-year storm event is stored below grade with no runoff overflowing from the parking area towards the neighbouring properties. Therefore, the proposed condition represents an improvement over the existing condition as runoff directed to neighbouring properties is reduced.

Further, the existing downstream 600mm diameter municipal storm sewer within the easement consists of three sections: 4m at 1.5%, 66m at 0.8% and 60m at 1.3%. Therefore, these sections have capacities of 0.549m³/s, 0.700m³/s and 0.752m³/s, respectively. The existing municipal storm sewer within the easement services the Site as well as the existing development at the corner of Scottsdale Drive and Janefield Avenue. While the controlled flow from the Site is 0.724m³/s during the 100-year storm event, it is expected that the hydraulic grade line within the existing storm sewer will be below the manhole top of grates within the easement and therefore will be capable of conveying the 100-year flow from the Site as well as the existing development. The existing development is at least 7m higher than the top of grate elevations within the easement and therefore no negative impacts on upstream developments, or the properties adjacent to the storm sewer easement, are expected. Further downstream capacity analysis can be undertaken during detailed design if required.

4.4 Water Quality Control

A Stormceptor Model EFO8 will be installed on the proposed storm sewer system to provide water quality control for the Site. The chosen unit is expected to provide Enhanced (Level 1) water quality control. Refer to Appendix F for the sizing output from the Stormceptor Expert program. The Stormceptor will require regular annual maintenance to ensure it is operating properly. The owner may be required to enter into a maintenance agreement with a suitable contractor to complete this work. In addition, all the storm structures will have a 600 mm sump.

4.5 Water Balance

The City of Guelph requires that through the development of land, groundwater levels are maintained or enhanced through the infiltration of clean runoff. Infiltration testing summarized in the Geotechnical Report and Preliminary Hydrogeology Investigation, both prepared by MTE, generally revealed fill underlain with native soils ranging from gravelly sand to sandy silt. The Geotechnical Report estimated infiltration rates utilizing particle size distributions of two samples of gravelly silty sand and three samples of silt, from five boreholes. All samples resulted in an infiltration rate of <1mm/hr. The Preliminary Hydrogeology Investigation completed in-situ hydraulic response tests in two monitoring wells and found rates of 9.9x10⁻⁷m/sec and 8.4x10⁻⁷m/sec indicating tight soils with a negligible infiltration capacity. Due to the existing soils, no active infiltration methods are proposed.

4.6 Erosion and Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

- Erosion and sedimentation facilities are to be installed prior to any area grading operations;
- ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required;
- iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site;
- iv) Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas; and,
- v) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

- The proposed grading design will respect the natural topography of the Site to achieve a reasonable cut/fill balance where possible;
- ii) Existing municipal infrastructure for sanitary and storm is available on Torch Lane and within an existing easement to the Site, and water is available from Scottsdale Drive;
- iii) The domestic water and sanitary demands for the proposed building are 3.74L/s and 11.6L/s respectively. The overall Site water and sanitary demands (including the existing building) are 4.79L/s and 15.5L/s, respectively. The City of Guelph is to incorporate the calculated demands into their modelling to confirm there is sufficient capacity available for the proposed development;
- iv) The SWM criteria can be satisfied with the implementation of on-site controls for water quantity and water quality;
- v) Due to the low infiltration capacity of the on-site soils, infiltration measures are not proposed; and,
- vi) Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

MTE Consultants Inc.

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Water Demand Calculation





601 Scottsdale Drive Phase 2 FIRE FLOW DEMANDS

Guelph, Ontario

Project #: 49791-101 Date: September 15, 2023 Date Printed: 9/15/2023 Designed By: AJS Checked By: LEI

								Fire Flow ²								Domestic Flow ^{3,4}												
	Development Information ¹								Ont	tario B	uilding (Code					Fire Under	writers S	urvey									
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Beds	Population	Bldg Area (1 st Floor)	Total Bldg Area	Building Volume	к	V	S _{tot}	Q	F	F	С	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F	Fire Flow (Max OBC/FUS)	MOE Guidelines	Average Day	Max Day	Peak Hour	Minimum Hour	Max Day + Fire Flow
Proposed	329.61	Student Residence	587	704	1,890	2,835	50,954	16	50,954	1.00	815,270	9,000	150	0.90	2,835	5 10,542	-15%	-30%	50%	11,000	183	183	1.362	1.362	3.744	5.623	0.545	187
		TOTALS FOR SITE	587	704	1890	2835	50954				Max Fire	Flow =	150						Max Fir	e Flow =	183	183	1.36	1.36	3.74	5.62	0.54	187
																						Sum of Sum o	Maximum f Maximum	Day Flow Day Flow	/s + OBC /s + FUS	Fire Flo	ow (L/s) = ow (L/s) =	154 187

Assumptions:

1 Number of beds and total building area is based on the Site Plan by Sweeny&Co Architects, dated September 15, 2023. Population was calculated assuming 1.2 persons per bed as advised by Forum Equity Partners for Phase 1 of development. Building Area (1st Floor) is based on Block B Tower 1st floor.

Total Building Area is calculated for Block B Tower per FUS method of floor area was 25% of two adjoining floor areas.

Building volume is based on Block B tower 1st floor area and a height of 26.96m.

2 The proposed building is classified as occupancy group C (Residential Occupancy) and building construction type is assumed to be Type IV-B Mass Timber Construction (all structural components have a minimum 1hr fire rating).

3 Average Daily Demand is based on "Final Water Supply Master Plan Update" prepared for the City of Guelph by AECOM, dated July 2022:

Residential = 167 L/cap/day

4 Peaking Factors based on "Design Guidelines for Drinking-Water Systems" (MOE, 2008):

Average Day =	1
Maximum Day =	2.75
Peak Hour =	4.13
Minimum Hour =	0.4



Fire Flow Analysis





601 Scottsdale Drive Phase 2 FIRE FLOW ANALYSIS

Guelph, Ontario

Project Number:	49791-101
Date:	August 2, 2023
Design By:	DXN
Checked By:	LEI
File:	Q:\49791\101\Water\Site Fire Flow Analysis.xlsx

CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

1. Boundary Conditions (Based on Fire Flow Test Results):								
	Metric	Imperial						
P0 - Starting Pressure	41.49 <i>m</i>	59 psi						
P1 - Pressure at Q1	37.27 m	53 psi						
Q1 - From Fire Flow Test	4467 <i>L/min</i>	1180 U.S. gal/min						
Q2 - Required Flow	9000 <i>L/min</i>	2378 U.S. gal/min	From: Water Demand calculations by MTE					
P-loss 1	4.22 m	6 psi						
P-loss 2	15.44 <i>m</i>	22 psi						
P2 - Residual Pressure	26.05 m	37 psi	Extrapolated from Fire Flow Test Results					
2. Friction Losses Through Wa	ater Service:							
Hazen-Williams Equation	Metric	Imperial						
C _{hw} = Pipe Friction Factor	150	150						
k = conversion factor	10.675	4.727						
n = constant	1.852	1.852						
m = constant	4.8704	4.8704						
Q = Flow	9000 L/min							
Q = Flow	0.15 m ³ /s	2378 U.S. gal/min						
d = Pipe Diameter	250 mm	9.84 in						
	0.25 m							
p = Loss/Length	0.0254 m/m	0.0110 psi/ft						
Length	123 m	404 ft						
Loss	3.12 m	4.4 psi						
	31 kPa							
Hazen-Williams Equation	Metric	Imperial						
C _{hw} = Pipe Friction Factor	150	150						
k = conversion factor	10.675	4.727						
n = constant	1.852	1.852						
m = constant	4.8704	4.8704						
Q = Flow	9000 L/min							
Q = Flow	0.15 m ³ /s	0 U.S. gal/min						
d = Pipe Diameter	150 mm	5.91 in						
	0.15 m							
p = Loss/Length	0.3056 m/m	0.1324 psi/ft						
Length	8 m	26 ft						
Loss	2.44 m	3.5 psi						
	24 kPa	•						
Total Loss	6 m							
	55 kPa							



3. Friction Losses Through Apurtenances:									
Apurtenances	Number	Κ	Velocity	Head Loss	Total	Loss			
			m/s	т	т	psi			
250mm dia. Tee (branch)	1	0.840	3.056	0.400	0.400	0.568			
250mm dia. Valve	2	0.110	3.056	0.052	0.105	0.149			
250mm dia 90 deg Bend	3	0.420	3.056	0.200	0.600	0.853			
250mm dia 45 deg Bend	2	0.224	3.056	0.107	0.213	0.303			
WMC*	1	0.780	3.056	0.371	0.371	0.528			
150mm dia. Tee (branch)	1	0.900	8.488	3.305	3.305	4.700			
150mm dia. Valve	1	0.120	8.488	0.441	0.441	0.627			
Total Minor Losses					5.434	7.727			

*WMC K Value based on two 250mm dia valves and two thru flow 250mm dia tees.

4. Elevation - Elevational differences from existing hydrant to proposed hydrant								
	Metric		Imperial					
Elevation at Boundary (i.e. Residual Hydrant):	333.68 m		1095 ft					
Elevation at Site Hydrant:	329.60 m		1081 ft					
Elevation Difference = Loss/Gai	n -4.08 m		-5.8 psi					
ANALYSIS SUMMARY								
Total Losses 6.92	2 m							
67.9	0 kPa	9.8 psi						
Residual Pressure after Losses 19.1	3 m							
18	8 kPa	27.2 psi	PASS					
Allowable Residual Pressure 14	0 kPa	20.3 psi						



31 HAYES AVE., GUELPH, ONTARIO N1E 5V6 Phone: (519) 823-1150 Fax: (519) 822-7752

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	WATER SUPPLY TEST								
Facilit	y Name:	Proposed	Developm	ent				File/Project #: 49034	
Facilit	y Address	601 Scott	sdale Ave	, Guelph, C	Intario				
Teste	d by:	Ron Van	Hulst			Witnessed by:	Guelph Waterwo	rks	
Size	of Main:	Co	mments:						
	ø8"								
	ead End								
	oop								
FIOW			Hydrant L	ocated On	West Side Of So	ottsdale Ave N	orth Corner Of .	Janefield Ave	
Resid	ual Hydrai	nt Location:	Hydrant L	ocated On	West Side Of So	ottsdale Ave N	orth Corner Of S	Stone Rd West	
Static	Pressure	:	59	Do	nte: Sept 7, 202 ⁻		Time	8:00	
Test No.	No. of Outlets	Orifice Size (in)	Pitot	Reading	Equivalent Flow	Total Flow	Residual Pressure	Comments	
1	1	21/2"	(03)	40	1180	1180	53		
2	2	21/2"		2(20)	2(834)	1668	48		
3									
4									
	мар:								
		<u></u>							
					FLOW			$\left(\underline{N} \right)$	
		\setminus \setminus			ξ				
				JA	NEFIELD AVE				
						AVE			
						DALE			
						01TS			
					RESIDUAL	SC SC			
					ю				
				ST	ONE RD W			STONE RD W	
								Sketch by:	RVH
								Scale: N.T	r.s
]
Name	and Add	ress of autho	rity who sho	uld recieve a	сору.				
C	ity Of (Guelph Wate	erworks De	ept. Att: Jir	n Hill				





Sanitary Sewer Design Calculation



601 Scottsdale	Prive Phase	e 2								De	sign Param	eters				
CITY OF GUELPH	CITY OF GUELPH			SANITARY SEWER DESIGN SHEET			Average Daily F	low ¹								
									Residential	1.00) L/s/ha	Manning's "n"	0.013			
					ENGINEE	RING SE	RVICES		Commercial	1.70) L/s/ha					
Project Number: 49791-100				Industrial	1.70) L/s/ha	Velocity	(<u>m/s</u>)								
Date: Design By:	Date: September 15, 2023				Apt (150upha)	6.00) L/s/na) L/s/ha	Maximum	0.6							
Checked By:	LEI								Apt (295upha)	7.00) L/s/ha					
File: Q:\49791\101\SAN\Sanitary Sewer Design S			wer Design Shee	t.xls					High Density Apt	7.00) L/s/ha					
LOCATION				SANITARY FLOW			DESIGN									
STREET	AREA NUMBER	MANHOLE FROM MH	LOCATION TO MH	AREA	CONTRIBUTING UNIT TYPE	SANITARY COEFF.	SANITARY FLOW	CUMULATIVE FLOW	PIPE SIZE	PIPE TYPE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL FLOW VELOCITY	% PIPE FULL
				ha		L/s/ha	L/s	L/s	mm		т	%	L/s	m/s	m/s	%
Proposed Building				1.66	Apartments (295upha)	7.00	11.6200	11.6200								
Existing Building				0.56	Apartments (295upha)	7.00	3.9200	3.9200								
Total Site				2.22	Apartments (295upha)	7.00	15.5400	15.5400	250	PVC	78.0	1.00	59.4373	1.2115	1.0195	26.1%

* All sanitary design flows include an allowance for peaking and 10.0 cm/ha/day for infiltration.

Notes:

1. Average daily flow values taken from City of Guelph Development Engineering Manual (2019).

2. Existing building has 164 units, proposed building has 489 units.

3. Pipe analyzed is the municipal main located within the easement between the Site and Torch Lane.



MIDUSS Calculations



CALCULATIONS

Orifice Equation (MIDUSS NET)

 $Q = C_c p/4 D_5 sqrt(2g(H-2/3D))$

where

- C_c coefficient of contraction
- H head relative to the invert of the orifice
- D orifice diameter
- g gravitational acceleration



MIDUSS Output



Pre-Development



			MIDUSS Output	>"
			MIDUSS version	Version 2.25 rev. 473"
			MIDUSS created	Sunday, February 7, 2010"
		10	Units used:	ie METRIC"
			Job folder:	0:\49791\101\SWM''
			Output filename	2 Year Pre out"
			Licensee name	A"
			Company	
			Date & Time Last used	9/14/2023 at 9.21.13 AM"
	31	TI	ME PARAMETERS"	// 1// 2023 at /. 21. 13 /iw
	51	5 000	Time Sten"	
		180,000	Max Storm Length"	
		1500.000	Max Hydrograph"	
	30	1300.000 T2	TOPM Chicago storm"	
	52	1	Chi cago storm"	
		742 000	Coofficient A"	
		43.000	Constant P"	
		0.000	CUIISIAIIL D	
		0.799	Exponent C	
		0.400		
		180.000	Duration	
		1.000	lime step multiplier	
		Ma	aximum intensity 109	2.401 mm/nr ²
		ĨC	otal depth 34	
		6	002hyd Hydrograph extensio	n used in this file"
	33	CA	ATCHMENT TOT"	
		1	Iriangular SCS"	
		1	Equal length"	
		1	SCS method"	
		101	Entire Site"	
"		59.000	% Impervious"	
		2.222	Total Area"	
		45.000	Flow length"	
		4.000	Overland Slope"	
		0. 911	Pervious Area"	
		45.000	Pervious length"	
		4.000	Pervious slope"	
		1.311	Impervious Area"	
		45.000	Impervious length"	
		4.000	Impervious slope"	
		0.250	Pervious Manning 'n'"	
		81.000	Pervious SCS Curve No."	
		0.266	Pervious Runoff coefficient"	
		0.100	Pervious Ia/S coefficient"	
		5.958	Pervious Initial abstraction	"
		0.015	Impervious Manning 'n'"	
		98.000	Impervious SCS Curve No."	
		0.840	Impervious Runoff coefficien	t"
		0.100	Impervious Ia/S coefficient"	
		0.518	Impervious Initial abstracti	on"
			0.284 0.000 0.0	00 0.000 c.m/sec"
"		Ca	atchment 101 Pervious	Impervious Total Area "

н	Surface Area	0. 911	1.311	2.222	hectare"
н	Time of concentration	21. 424	2.289	5.738	minutes"
	Time to Centroid	128.049	91.377	97.988	minutes"
	Rainfall depth	34.276	34.276	34.276	mm''
н	Rainfall volume	312.27	449.36	761.62	C. M"
	Rainfall losses	25.164	5.480	13.550	mm''
н	Runoff depth	9. 113	28.797	20. 726	mm''
н	Runoff volume	83.02	377.52	460.54	C. M"
	Runoff coefficient	0. 266	0.840	0.605	
н	Maximum flow	0.024	0. 282	0.284	c.m/sec"
" 40	HYDROGRAPH Add Runoff	н			
п	4 Add Runoff "				
	0.284 0.28	0.000	0.000"		
" 40	HYDROGRAPH Copy to Out	flow"			
	8 Copy to Outflow"				
	0.284 0.28	0. 284	0.000"		

		MIDUSS Output	>"
		MIDUSS version	Version 2.25 rev. 473"
		MIDUSS created	Sunday, February 7, 2010"
	10	Units used:	ie METRIC"
		Job folder:	0:\49791\101\SWM''
		Output filename:	5 Year Pre.out"
		Licensee name	A"
		Company	
		Date & Time Last used	9/14/2023 at 9.40.57 AM"
 31	ті	ME PARAMETERS"	,, , , , , , , , , , , , , , , , , , ,
 51	5 000	Time Sten"	
	180,000	Max Storm Length"	
	1500.000	Max Hydrograph"	
 32	1300.000	TORM Chicago storm"	
 52	1	Chicago storm"	
	1593 000	Coefficient A"	
	11 000	Constant R"	
	0 970	Exponent C"	
	0.079	Exponent C Eraction P"	
	100 000	Duration"	
	1 000	Time stop multiplier"	
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 33	0 <i>F</i>	Triangular SCS"	
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	59.000 2.222	% Impervious	
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	45.000	Pervious Tength	
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	1.311	Impervious Area	
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	4.000	Impervious siope	
	0.250	Pervious Manning n	
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	0.357	Pervious Runott coetticient	
	0.100	Pervious 1a/S coefficient	
	5.958	Pervious initial abstraction	
	0.015	Impervious Manning n."	
	98.000	Impervious SCS Curve No."	T 11
	0.8/8	Impervious Runott coetticien	l
	0.100	impervious ia/S coefficient"	
	0.518	impervious initial abstracti	
	0	U. 4U3 U. UUU U. U	UU U. UUU C. M/SEC
	La	Atchinent 101 PerVLOUS	Impervious Iotal Area

	Surface Area	0. 911	1.311	2.222	hectare"
	Time of concentration	16. 719	2.052	5.282	minutes"
	Time to Centroid	117.355	88.885	95.155	minutes"
	Rainfall depth	47.265	47.265	47.265	mm''
	Rainfall volume	430.59	619.63	1050.22	C. M"
	Rainfall losses	30.390	5.749	15.852	mm''
	Runoff depth	16.875	41.515	31. 413	mm''
	Runoff volume	153.73	544.26	697.99	c.m"
	Runoff coefficient	0.357	0.878	0.665	н
	Maximum flow	0.059	0.394	0.403	c.m/sec"
" 40	HYDROGRAPH Add Runoff	н			
	4 Add Runoff "				
	0.403 0.40	0.000	0.000"		
" 40	HYDROGRAPH Copy to Out	tflow"			
	8 Copy to Outflow"				
	0.403 0.40	0. 403	0.000"		

		MIDUSS Output	>"
		MIDUSS version	Version 2.25 rev. 473"
		MIDUSS created	Sunday, February 7, 2010"
	10	Units used:	ie METRIC"
		Job folder:	0: \49791\101\SWM''
		Output filename:	10 Year Pre.out"
		Licensee name:	A"
		Company	
		Date & Time Last used	9/14/2023 at 9.46.32 AM"
 31	ті	ME PARAMETERS"	// TT/ 2023 at 7. 10. 32 / W
 51	5 000	Time Sten"	
	180,000	Max Storm Length"	
	1500.000	Max. Hydrograph"	
 30	1300.000	Max. Hydrograph FOPM Chicago storm"	
 52	1	Chi cago storm"	
	1 2221 000	Coofficient A"	
	12 000	Constant P"	
	12.000	CUISIAIL D	
	0.908	Exponent C	
	0.400	Fraction R	
	180.000	Duration	
	1.000	lime step multiplier	
	Ma T -	AXIMUM INTENSITY 169.55	
		otal depth 56.29	U mm ²
 ~~	6	010hyd Hydrograph extension u	ised in this file"
 33	CA	ATCHMENT TOT"	
	1	Iriangular SCS"	
	1	Equal length"	
	1	SCS method"	
	101	Entire Site"	
	59.000	% Impervious"	
	2.222	Total Area"	
	45.000	Flow length"	
	4.000	Overland Slope"	
	0. 911	Pervious Area"	
	45.000	Pervious length"	
	4.000	Pervious slope"	
	1.311	Impervious Area"	
	45.000	Impervious length"	
	4.000	Impervious slope"	
	0.250	Pervious Manning 'n'"	
	81.000	Pervious SCS Curve No."	
	0.409	Pervious Runoff coefficient"	
	0.100	Pervious Ia/S coefficient"	
	5.958	Pervious Initial abstraction"	
	0.015	Impervious Manning 'n'"	
	98.000	Impervious SCS Curve No."	
	0.894	Impervious Runoff coefficient"	
	0.100	Impervious la/S coefficient"	
	0.518	Impervious Initial abstraction"	
		0.508 0.000 0.000	0.000 c.m/sec"
	Ca	atchment 101 Pervious	Impervious Total Area "

н		Surface Ar	rea	0. 911	1. 311	2.222	hectare"
		Time of co	oncentrati on	14.450	1.887	4.918	minutes"
н		Time to Ce	entroi d	112.513	87.661	93.657	minutes"
		Rainfall d	lepth	56.290	56.290	56.290	mm''
		Rainfall v	volume	512.81	737.95	1250.77	C. M"
		Rainfall I	osses	33.266	5.963	17.157	mm''
		Runoff dep	oth	23.025	50.327	39.133	mm''
		Runoff vol	ume	209.76	659.78	869.53	C. M"
		Runoff coe	efficient	0.409	0.894	0.695	
		Maximum fl	OW	0.091	0. 491	0.508	c.m/sec"
	40	HYDROGRAPH	l Add Runoff '	•			
		4 Add Run	noff "				
		0.	508 0.508	0.000	0.000"		
	40	HYDROGRAPH	I Copy to Out	flow"			
		8 Copy to	o Outflow"				
		0.	508 0.508	0.508	0.000"		

		MIDUSS Output	>"
		MIDUSS version	Version 2.25 rev. 473"
		MIDUSS created	Sunday, February 7, 2010"
	10	Units used:	ie METRIC"
		Job folder:	0:\49791\101\SWM''
		Output filename:	25 Year Pre.out"
		Licensee name	20 1001 11010001 A''
		Company	
		Date & Time Last used	9/14/2023 at 9.47.43 AM"
 31	TI	ME PARAMETERS"	// I// 2020 at // I// IO / III
 51	5 000	Time Sten"	
	180,000	Max Storm Length"	
	1500.000	Max Hydrograph"	
 30	1300.000 T2	"OPM Chicago storm"	
 52	1	Chi cago storm"	
	3158 000	Coefficient A"	
	15 000	Constant P"	
	0.026	Exponent C"	
	0. 400	Exponent C Eraction P"	
	190,000	Duration"	
	1 000	Time stop multiplier"	
	1.000 Ma	nine step nurtipiter	
	Ma To	tal dopth	1.007 /1 0.044 mm''
	10	O2Ebud Uudrograph ovtopoli	0.200 IIIII
 າາ	0	UZSHYU HYULUYLAPH EXTENSIO	on used in this file
 33	LA 1	Triangular SCS"	
	1	Fried Longth"	
	1	Equal Tength	
	101	SUS method	
		Entire Site	
	59.000	% Impervious	
	2.222		
	45.000	Flow length"	
	4.000	Uverland Slope"	
	0.911	Pervious Area	
	45.000	Pervious length"	
	4.000	Pervious slope"	
	1.311	Impervious Area	
	45.000	Impervious length"	
	4.000	Impervious slope"	
	0.250	Pervious Manning 'n'"	
	81.000	Pervious SCS Curve No."	
	0.465	Pervious Runoff coefficient	
	0.100	Pervious Ta/S coefficient"	
	5.958	Pervious Initial abstraction	ר"
	0.015	Impervious Manning 'n'"	
	98.000	Impervious SCS Curve No."	
	0.910	Impervious Runoff coefficien	nt"
	0.100	Impervious Ia/S coefficient	•
	0.518	Impervious Initial abstract	on"
	-	0.605 0.000 0.0	0.000 c.m/sec"
	Ca	itchment 101 Pervious	s Impervious lotal Area "

	Surface Area	0. 911	1.311	2.222	hectare"
	Time of concentration	12.922	1.790	4.707	minutes"
	Time to Centroid	109.335	87.027	92.873	minutes"
	Rainfall depth	68.266	68.266	68.266	mm''
	Rainfall volume	621.92	894.96	1516.88	C. M"
	Rainfall losses	36.516	6. 131	18.589	mm''
	Runoff depth	31.750	62.135	49.677	mm''
	Runoff volume	289.25	814.57	1103.82	C. M"
	Runoff coefficient	0.465	0. 910	0. 728	
	Maximum flow	0.133	0.574	0.605	c.m/sec"
" 40	HYDROGRAPH Add Runoff				
	4 Add Runoff "				
	0.605 0.60	0.000	0.000"		
" 40	HYDROGRAPH Copy to Out	flow"			
	8 Copy to Outflow"				
	0.605 0.60	0.605	0.000"		

			MIDUSS Output	>"
			MIDUSS version	Version 2.25 rev. 473"
			MIDUSS created	Sunday, February 7, 2010"
		10	Units used:	ie METRIC"
			Job folder:	0:\49791\101\SWM''
			Output filename:	50 Year Pre.out"
			Licensee name	A"
			Company	
			Date & Time Last used	9/14/2023 at 9.48.30 AM"
	31	TI	ME PARAMETERS"	
	51	5 000	Time Sten"	
		180,000	Max Storm Length"	
		1500.000	Max Hydrograph"	
	30	1300.000 T2	Max. Hydrograph MPM Chicago storm"	
	52	1	Chicago storm"	
		3886 000	Coefficient A"	
		14 000	Constant P"	
		10.000	Constant D	
		0.950	Exponent C	
		0.400		
		180.000		
		1.000	lime step multiplier	
		Ma T	aximum intensity 2	15.802 mm/nr
			otal depth	//.64/ mm ²
	~~	6	050hyd Hydrograph extens	ion used in this file"
	33	CA	ATCHMENT TOT"	
		1	Iriangular SCS"	
		1	Equal length"	
		1	SCS method"	
		101	Entire Site"	
		59.000	% Impervious"	
		2.222	Total Area"	
		45.000	Flow length"	
		4.000	Overland Slope"	
		0. 911	Pervious Area"	
		45.000	Pervious length"	
		4.000	Pervious slope"	
		1.311	Impervious Area"	
		45.000	Impervious length"	
		4.000	Impervious slope"	
		0.250	Pervious Manning 'n'"	
		81.000	Pervious SCS Curve No."	
		0.503	Pervious Runoff coefficien	t"
		0.100	Pervious Ia/S coefficient"	
		5.958	Pervious Initial abstracti	on"
		0.015	Impervious Manning 'n'"	
		98.000	Impervious SCS Curve No."	
		0. 919	Impervious Runoff coeffici	ent"
		0.100	Impervious la/S coefficien	t"
		0.518	Impervious Initial abstrac	tion"
			0.704 0.000 0	.000 0.000 c.m/sec"
"		Са	atchment 101 Pervio	us Impervious Total Area "

н	Surface Area	0. 911	1.311	2.222	hectare"
н	Time of concentration	11.869	1.703	4.504	minutes"
н	Time to Centroid	107.108	86. 511	92.186	minutes"
н	Rainfall depth	77.647	77.647	77.647	mm''
н	Rainfall volume	707.38	1017.94	1725.33	C. M"
н	Rainfall losses	38.599	6.288	19. 535	mm''
н	Runoff depth	39.049	71.359	58. 112	mm''
н	Runoff volume	355.74	935.51	1291.25	C. M"
н	Runoff coefficient	0.503	0.919	0.748	
н	Maximum flow	0. 173	0.658	0.704	c.m/sec"
" 40	HYDROGRAPH Add Runoff				
н	4 Add Runoff "				
н	0.704 0.704	4 0.000	0.000"		
" 40	HYDROGRAPH Copy to Out	flow"			
н	8 Copy to Outflow"				
н	0.704 0.704	4 0.704	0.000"		

		MIDUSS Output	>"
		MIDUSS version	Version 2.25 rev. 473"
		MIDUSS created	Sunday, February 7, 2010"
	10	Units used:	ie METRIC"
		Job folder:	0:\49791\101\SWM''
		Output filename:	100 Year Pre.out"
		Licensee name	A"
		Company	н П
		Date & Time Last used	9/14/2023 at 9.20.23 AM"
 31	TI	ME PARAMETERS"	,, , , , , , , , , , , , , , , , , , ,
 51	5 000	Time Sten"	
	180,000	Max Storm Length"	
	1500.000	Max Hydrograph"	
 30	1300.000 T2	"OPM Chicago storm"	
 52	1	Chi cago storm"	
	1688 000	Coefficient A"	
	4000.000	Constant P"	
	0.062	Exponent C"	
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 33	1 CA	Triangular SCS"	
	1	Fruid Longth"	
	1	Equal Tength	
	101	SUS method	
	59.000	% Impervious	
	2.222	lotal Area	
	45.000	Flow length	
	4.000	Uveri and Si ope	
	0.911	Pervious Area	
	45.000	Pervious length"	
	4.000	Pervious slope"	
	1.311	Impervious Area"	
	45.000	Impervious length"	
	4.000	Impervious slope"	
	0.250	Pervious Manning 'n'"	
	81.000	Pervious SCS Curve No."	
	0.536	Pervious Runoff coefficient"	
	0.100	Pervious Ia/S coefficient"	
	5.958	Pervious Initial abstraction	
	0.015	Impervious Manning 'n'"	
	98.000	Impervious SCS Curve No."	
	0.926	Impervious Runoff coefficien	t"
	0.100	Impervious Ia/S coefficient"	
	0. 518	Impervious Initial abstracti	on"
	-	0.805 0.000 0.0	00 0.000 c.m/sec"
	Са	atcomment 101 Pervious	Impervious lotal Area "

н	Surface Area	0. 911	1.311	2.222	hectare"
н	Time of concentration	11.039	1.631	4.331	minutes"
н	Time to Centroid	105.344	86. 109	91.630	minutes"
н	Rainfall depth	87.263	87.263	87.263	mm''
н	Rainfall volume	794.99	1144.01	1938.99	C. M"
н	Rainfall losses	40.465	6. 485	20. 417	mm''
н	Runoff depth	46.799	80. 778	66.847	mm''
н	Runoff volume	426.34	1058.99	1485.33	C. M"
н	Runoff coefficient	0.536	0. 926	0.766	
н	Maximum flow	0. 219	0. 741	0.805	c.m/sec"
" 40	HYDROGRAPH Add Runoff				
н	4 Add Runoff "				
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Post-Development



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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	38 " 20.000 Impervious length"	109 "Rainfall volume 0.00 102.14 102.14 c.m"	
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42 0.265 Pervious Numoff coefficient* 113 * Rumoff coefficient 0.000 0.835 0.835 *** 44 5.958 Pervious Ta/S coefficient* 114 * Maximum flow 0.000 0.070 0.070 c.m/sec* 45 0.051 Impervious SCS Curve No.* 116 * 40 Runoff * 0.070 0.070 c.m/sec* 46 98.000 Impervious SCS Curve No.* 117 * 0.707 0.070 0.008 0.008* 47 0.032 Impervious SCS Curve No.* 117 * 0.707 0.070 0.008 0.008* 48 0.100 Impervious Ta/S coefficient* 119 * 0.707 Current peak flow c.m/sec* 110** 110 * 0.070 0.008 0.008* 50 0.008 0.000 0.000 0.000 0.000 0.000 113 * 85.3 Rydrograph volume c.m/sec* 51 Catchment 201 Pervious Ta/S to 14 Area * 122 * 11.00* Maximu Mater level mete* 52 Surface Area 0.180 0.188 hectare* 123 * 0.000 Nome* <td>40 0.250 PELVIOUS MAINING I</td> <td>112 " Pupoff volume 0.00 85.33 85.33 cm"</td> <td></td>	40 0.250 PELVIOUS MAINING I	112 " Pupoff volume 0.00 85.33 85.33 cm"	
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59 - Runoff Volume 16.41 2.15 16.55 C.m" 130 - 0.03000 0.00495 1.92 - 61 " Runoff coefficient 0.265 0.832 0.288 " 131 " 0.04500 0.007495 14.336" 61 " Maximum flow 0.007 0.002 0.008 c.m/sec" 132 " 0.06000 0.00990 14.336" 62 " 40 HYDROGRAPH Add Runoff " 133 " 0.07500 0.01237 28.000" 63 " 4 Add Runoff " 134 " 0.09000 0.01485 48.384" 64 " 0.008 0.000 0.000" 135 " 0.1050 0.01733 76.832" 65 " 40 HYDROGRAPH Copy to Outflow" 136 " 0.1200 0.01980 110.408" 66 " 8 Copy to Outflow" 137 " 0.1350 0.02228 144.008" 67 " 0.008 0.008 0.000" 138 " 0.1500 0.02475 177.608" 68 " 40 HYDROGRAPH Combine 1" 139 " 1. Roof area Store area Area/drain Drain flow Roof slope"	58 "Runoff depth 9.090 28.554 9.868 mm"	129 " 0.01500 0.00247 0.2240"	
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b Complete restore Area/drain Drain I/ow Store 70 " 1 Node #" 140 " Node #" hectare Area/drain Drain Drain 1/20 m of 70 " 1 Node #" 141 " hectare hectare sq.metre L/min/25 m of H:1V" 71 " Site" 0.298 0.224 200.000 22.500 66.667"	68 "40 HYDROGRAPH Combine 1"	139 " 1. ROOFTOP"	
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13 "Using 11 roofdrains on roofstorage area of 2240. square metre" 14 "Peak outflow 0.014 c.m/sec" 15 "Maximum level 0.083 metre" 16 "Maximum storage 38.452 c.m" 17 "Centroidal lag 2.000 hours" 18 "0.070 0.070	214 " 2. ORIFICES" 215 " Orifice Orifice Orifice Number of" 216 " invert coefficie diameter orifices" 217 " 322.600 0.630 0.5000 218 " 323.500 0.630 0.2500 1.000" 219 " Peak outflow 0.270 c m/sec"		
10 HYDROGRAPH Next link " 50 5 10 5 11 0.070 12 0.070 13 CATCHMENT 203" 14 1 15 1 16 1 17 1 18 1 19 1 10 1 10 1 11 1 11 1 11 1 11 1 11 1 12 1	217 Feak Gulliow 0.210 0.110 Sec 220 Maximum level 323.197 metre" 221 Maximum storage 49.785 c.m" 222 Centroidal lag 1.666 hours" 223 0.322 0.332 0.270 0.008 c.m/sec" 224 40 HYDROGRAPH Combine 1" 225 6 Combine 1"		
Star Figure 1 Equal Tengen 55 1 SCS method" 56 203 Controlled Area" 57 82.000 % Impervious" 58 1.736 Total Area" 59 25.000 Flow length" 50 2.000 Output length"	225 0 Complete 226 " 1 Node #" 227 " Site" 228 " Maximum flow 0.277 c.m/sec" 229 " Hydrograph volume 542.924 c.m" 230 " 0.322 0.332 0.270 0.277"		
1 0.312 Pervious Stope 2 25.000 Pervious length" 3 3.000 Pervious slope" 4 1.424 Impervious Area" 55 25.000 Impervious length"			
36 " 3.000 Impervious slope" 57 " 0.250 Pervious Maning 'n'" 58 81.000 Pervious SCS Curve No." 59 0.265 Pervious Runoff coefficient" 70 0.100 Pervious Ia/S coefficient" 71 5.958 Pervious Initial abstraction"			
72 " 0.015 Impervious Manning 'n'" 73 " 98.000 Impervious SCS Curve No." 74 " 0.842 Impervious Runoff coefficient" 75 " 0.100 Impervious Ia/S coefficient" 76 " 0.518 Impervious Initial abstraction" 77 " 0.322 0.014 0.008 c.m/sec"			
78 " Catchment 203 Pervious Impervious Total Area " 79 " Surface Area 0.312 1.424 1.736 hectare" 30 " Time of concentration 16.415 1.754 2.703 minutes" 31 " Time to Centroid 121.573 90.465 92.479 minutes" 32 " Rainfall depth 34.276 34.276 34.276 mm" 33 " Rainfall volume 107.11 487.93 595.04 c.m"			
34 " Rainfall losses 25.177 5.431 8.985 mm" 35 " Runoff depth 9.100 28.845 25.291 mm" 36 " Runoff volume 28.44 410.62 439.05 c.m" 37 " Runoff coefficient 0.265 0.842 0.738 " 38 " Maximum flow 0.010 0.320 0.322 c.m/sec" 39 " 40 HYDROGRAPH Add Runoff " " " "			
00" 4 Add Runoff" 01" 0.322 02" 54 032 0.332 0.332 0.014 0.008" 0.332 Current peak flow c.m/sec" 04" 0.086 55" 524.4 Hydrograph volume c.m"			
66 8. Number of stages" 97 322.600 Minimum water level metre" 88 325.650 Maximum water level metre" 99 322.600 Starting water level metre" 00 0 Keep Design Data: 1 = True; 0 = False" 01 1 Level Discharge Volume" 1			
12 " 322.600 0.000 0.000" 13 " 323.500 0.4125 75.000" 14 " 324.400 0.7809 150.000" 15 " 324.450 0.7960 150.000" 16 " 325.350 3.388 150.000" 16 " 325.450 3.814 155.000"			
08 " 325.550 4.261 165.000" 09 " 325.650 4.727 175.000" 10 " 1. WEIRS" 11 " Crest Weir Crest 12 " elevation coefficie breadth sideslope sideslope" 13 " 324.450 0.900 1.800 0.000			

Q:\49791\101\SWM\5 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 1 Q:\49791\101\SWM5 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 2
1 " MIDUSS Output>"	72 " Maximum flow 0.017 c.m/sec"	
2 " MIDUSS version Version 2.25 rev. 473"	73 "Hydrograph volume 33.462 c.m"	
3 " MIDUSS created Sunday, February 7, 2010"	74 " 0.017 0.017 0.017 0.017"	
4 " 10 Units used: ie METRIC"	75 " 40 HYDROGRAPH Start - New Tributary"	
5 " Job folder: Q:\49791\101\SWM"	76 " 2 Start - New Tributary"	
6 "Output filename: 5 Year Post.out"	77 " 0.017 0.000 0.017 0.017"	
7 "Licensee name: A"	78 " 33 CATCHMENT 202"	
8 " Company "	79 " I Triagular SCS"	
9 " Date & Illie Last used. 9/22/2023 at 1.10.20 PM" 10 # 21 "TIME DADAMETERS"	00 " I Equal length"	
10 SI IIME FARAMETERS	82 " 202 Bropsed Roof Area"	
12 " 180.000 Max. Storm length"	83 " 100.000 % Impervious"	
13 " 1500.000 Max. Hydrograph"	84 " 0.298 Total Area"	
14 " 32 STORM Chicago storm"	85 " 10.000 Flow length"	
15 " 1 Chicago storm"	86 " 1.500 Overland Slope"	
16 " 1593.000 Coefficient A"	87 " 0.000 Pervious Area"	
17 " 11.000 Constant B"	88 " 10.000 Pervious length"	
18 " 0.879 Exponent C"	89 " 1.500 Pervious slope"	
19 " 0.400 Fraction R"	90 " 0.298 Impervious Area"	
20 " 180.000 Duration"	91 " 10.000 impervious length"	
21 I. UDU Time Step multipiter 120,200 mm/hml	92 · 1.500 Impervious Stope ·	
22 Maximum Intensity 139.200 mm/	95 0.250 Pervicus Maining 11"	
23 IDdat depth 47.205 mm	95 0.000 Pervious ScS curve No.	
25 " 33 CATCHMENT 201"	96 " 0 100 Pervious Ta/S coefficient"	
26 " 1 Triangular SCS"	97 " 5 958 Pervious Initial abstraction"	
27 " 1 Egual length"	98 " 0.015 Impervious Manning 'n'"	
28 " 1 SCS method"	99 " 98.000 Impervious SCS Curve No."	
29 " 201 Uncontrolled Area"	100 " 0.867 Impervious Runoff coefficient"	
30 " 4.000 % Impervious"	101 " 0.100 Impervious Ia/S coefficient"	
31 " 0.188 Total Area"	102 " 0.518 Impervious Initial abstraction"	
32 " 20.000 Flow length"	103 " 0.095 0.000 0.017 0.017 c.m/sec"	
33 " 7.500 Overland Slope"	104 " Catchment 202 Pervious Impervious Total Area "	
34 " 0.180 Pervious Area"	105 " Surface Area 0.000 0.298 0.298 hectare"	
35 " 20.000 Pervious length"	106 "Time of concentration 9.101 1.117 1.117 minutes"	
30 " 7.500 Pervious slope"	10/ " Time to Centrola 10/.552 8/.559 8/.559 minutes"	
37 0.000 Impervious Area	100 " Rainiali depli 47.205 47.205 47.205 40.205 mm"	
39 7 500 Impervious length	105 Rainfall losses $30.426 - 6.267$ mm ^m	
40 " 0.250 Pervious Manning 'n'"	111 " Runoff depth 16 839 40 997 40 997 mm"	
41 " 81.000 Pervious SCS Curve No."	112 " Runoff volume 0.00 122.17 122.17 c.m"	
42 " 0.356 Pervious Runoff coefficient"	113 " Runoff coefficient 0.000 0.867 0.867 "	
43 " 0.100 Pervious Ia/S coefficient"	114 " Maximum flow 0.000 0.095 0.095 c.m/sec"	
44 " 5.958 Pervious Initial abstraction"	115 " 40 HYDROGRAPH Add Runoff "	
45 " 0.015 Impervious Manning 'n'"	116 " 4 Add Runoff "	
46 " 98.000 Impervious SCS Curve No."	117 " 0.095 0.095 0.017 0.017"	
47 " 0.864 Impervious Runoff coefficient"	118 " 54 POND DESIGN"	
48 " 0.100 Impervious Ia/S coefficient"	119 " 0.095 Current peak 110W C.m/sec"	
49 0.518 impervious initial abstraction 50 0.000 c m/sec"	120 " 0.000 larger outliow C.m/sec"	
51 "Catchment 201 Pervious Impervious Total Area "	122 " 11 Number of stages"	
52 "Surface Area 0.180 0.008 0.188 hectare"	123 " 0.000 Minimum water level metre"	
53 " Time of concentration 8.512 1.044 7.827 minutes"	124 " 0.150 Maximum water level metre"	
54 " Time to Centroid 106.791 87.449 105.017 minutes"	125 " 0.000 Starting water level metre"	
55 " Rainfall depth 47.265 47.265 mm"	126 " 0 Keep Design Data: 1 = True; 0 = False"	
56 " Rainfall volume 85.30 3.55 88.86 c.m"	127 " Level Discharge Volume"	
57 " Rainfall losses 30.425 6.451 29.466 mm"	128 " 0.000 0.000 0.000"	
58 " Runoff depth 16.840 40.813 17.799 mm"	129 " 0.01500 0.00247 0.2240"	
59 " Runoff volume 30.39 3.07 33.46 c.m"	130 " 0.03000 0.00495 1.792"	
00 " RUNDLI COEFFICIENT 0.350 0.864 0.377 "	132 " 0.04500 0.0000 14 232"	
62 # 40 HVDPGGBabH Add Punoff " 0.000 0.002 0.017 C.m/Sec"	132 0.00000 0.00770 14.330"	
63 4 Ad Runoff 4	134 " 0 09000 0 01485 48 384"	
64 " 0.017 0.017 0.000 0.000"	135 " 0.1050 0.01733 76.832"	
65 " 40 HYDROGRAPH Copy to Outflow"	136 " 0.1200 0.01980 110.408"	
66 " 8 Copy to Outflow"	137 " 0.1350 0.02228 144.008"	
67 " 0.017 0.017 0.000"	138 " 0.1500 0.02475 177.608"	
68 "40 HYDROGRAPH Combine 1"	139 " 1. ROOFTOP"	
69 " 6 Combine "	140 "Roof area Store area Area/drain Drain flow Roof slope"	
70 " 1 Node #"	141 " hectare hectare sq.metre L/min/25mm g H:1V"	
71 " Site"	142 " 0.298 0.224 200.000 22.500 66.667"	

:\49791\101 rinted at 13:	\SWM\5 Year Post.out P :29 on 22 Sep 2023	Page 3 Q:\49791\101\SWM\5 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 4
43 "	Using 11 roofdrains on roofstorage area of 2240. square metre"	214 " 2. ORIFICES"	
44 "	Peak outflow 0.016 c.m/sec"	215 " Orifice Orifice Orifice Number of"	
45 "	Maximum level 0.098 metre"	216 " invert coefficie diameter orifices"	
46 "	Maximum storage 63.088 c.m"	217 " 322.600 0.630 0.5000 1.000"	
47 "	Centroldal lag 2.181 hours"	218 " 323.500 0.630 0.2500 1.000" 219 " Perkoutflow 0.280 a m/sec"	
49 " 40	HYDROGRAPH Next. link "	220 " Maximul level 323.443 metre"	
50 "	5 Next link "	221 " Maximum storage 70.239 c.m"	
51 "	0.095 0.016 0.016 0.017"	222 " Centroidal lag 1.661 hours"	
52 " 33	CATCHMENT 203"	223 " 0.447 0.459 0.382 0.017 c.m/sec"	
53 "	1 Triangular SCS"	224 "40 HYDROGRAPH Combine 1"	
54 "	1 Equal Length"	225 " 6 Combine "	
55 " 56 "	1 SCS method" 203 Controlled Area"	220 " I NOGE #" 227 " Cite"	
57 "	200 % Impervious"	227 Site	
58 "	1.736 Total Area"	229 "Hydrograph volume 799.066 c.m"	
59 "	25.000 Flow length"	230 " 0.447 0.459 0.382 0.398"	
60 "	3.000 Overland Slope"		
61 "	0.312 Pervious Area"		
62 " 62 "	25.000 Pervious length"		
03 " 64 "	3.000 Pervious Stope"		
65 "	25 OO Impervious length"		
66 "	3.000 Impervious slope"		
67 "	0.250 Pervious Manning 'n'"		
68 "	81.000 Pervious SCS Curve No."		
69 "	0.357 Pervious Runoff coefficient"		
70 "	0.100 Pervious Ia/S coefficient"		
71 "	0.015 Impervious Manning 'n' "		
73 "	98.000 Impervious SCS Curve No "		
74 "	0.878 Impervious Runoff coefficient"		
75 "	0.100 Impervious Ia/S coefficient"		
76 "	0.518 Impervious Initial abstraction"		
77 "	0.447 0.016 0.016 0.017 c.m/sec"		
78 "	Catchment 203 Pervious Impervious Total Area "		
/9 " 80 "	Surface Area 0.312 1.424 1.736 nectare"		
81 "	Time of contraction 12.343 88.134 90.117 minutes"		
82 "	Rainfall depth 47.265 47.265 47.265 mm"		
83 "	Rainfall volume 147.69 672.82 820.52 c.m"		
84 "	Rainfall losses 30.401 5.772 10.205 mm"		
85 "	Runoff depth 16.864 41.493 37.060 mm"		
86 "	Runoff volume 52.70 590.66 643.35 c.m"		
67 " 88 "	Maximu flow 0.023 0.442 0.447 c.m/sec"		
89 " 40	HYDROGRAPH Add Runoff "		
90 "	4 Add Runoff "		
91 "	0.447 0.459 0.016 0.017"		
92 " 54	POND DESIGN"		
93 "	0.459 Current peak flow c.m/sec"		
7*1 " 95 "	765 6 Hydrograph volume c.m."		
96 "	8. Number of stages"		
97 "	322.600 Minimum water level metre"		
98 "	325.650 Maximum water level metre"		
99 "	322.600 Starting water level metre"		
00 "	0 Keep Design Data: 1 = True; 0 = False"		
01 " 02 "	322 600 0 000 0 000"		
03 "	323.500 0.4125 75.000"		
04 "	324.400 0.7809 150.000"		
05 "	324.450 0.7960 150.000"		
06 "	325.350 3.388 150.000"		
07 "	325.450 3.814 155.000"		
00 " 19 "	525.550 4.201 105.000" 325.550 4.727 175.000"		
10 "	1. WETRS"		
11 "	Crest Weir Crest Left Right"		
12 "	elevation coefficie breadth sideslope sideslope"		
13 "	324.450 0.900 1.800 0.000 0.000"		

Q:\49791\101\SWM\10 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 1 Q:\49791\101\SWM\10 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 2
1 " MIDUSS Output>"	72 " Maximum flow 0.026 c.m/sec"	
2 " MIDUSS version Version 2.25 rev. 473"	73 "Hydrograph volume 45.068 c.m"	
3 " MIDUSS created Sunday, February 7, 2010"	74 " 0.026 0.026 0.026 "	
4 " 10 Units used: ie METRIC"	75 " 40 HYDROGRAPH Start - New Tributary"	
5 Job folder: Q:\49791\101\SWM"	76 " 2 Start - New Tributary"	
6 "Output filename: 10 Year Post.out"	77 " 0.026 0.000 0.026 0.026 "	
7 "Licensee name: A"	78 " 33 CATCHMENT 202"	
8 " Company "	79 I Irlangular SCS"	
J Date & Inite Tast used: J/22/2023 at 1.13.13 PM 10 " 31 TTMF DADAMFTERS" 3/22/2023 at 1.13.13 PM	81 " 1 SCS method"	
11 " 5.000 Time Step"	82 " 202 Proposed Roof Area"	
12 " 180.000 Max. Storm length"	83 " 100.000 % Impervious"	
13 " 1500.000 Max. Hydrograph"	84 " 0.298 Total Area"	
14 " 32 STORM Chicago storm"	85 " 10.000 Flow length"	
15 " 1 Chicago storm"	86 " 1.500 Overland Slope"	
16 " 2221.000 Coefficient A"	87 " 0.000 Pervious Area"	
17 " 12.000 Constant B"	88 " 10.000 Pervious length"	
18 " 0.908 Exponent C"	89 " 1.500 Pervious slope"	
19 " 0.400 Fraction R"	90 " 0.298 Impervious Area"	
20 " 100.000 Duration"	91 10.000 Impervious slope"	
22 1.000 fille step intropier 22 " Maximum intensity 169.551 mm/br"	22 I. 500 Impervious Stope	
22 MAXIMUM INCENSICY 107.351 MM/III	94 " 81 000 Pervious SCS Curve No "	
24 " 6 010bvd Hydrograph extension used in this file"	95 " 0.000 Pervious Bunoff coefficient"	
25 " 33 CATCHMENT 201"	96 " 0.100 Pervious Ia/S coefficient"	
26 " 1 Triangular SCS"	97 " 5.958 Pervious Initial abstraction"	
27 " 1 Equal length"	98 " 0.015 Impervious Manning 'n'"	
28 " 1 SCS method"	99 " 98.000 Impervious SCS Curve No."	
29 " 201 Uncontrolled Area"	100 " 0.878 Impervious Runoff coefficient"	
30 " 4.000 % Impervious"	101 " 0.100 Impervious Ia/S coefficient"	
31 " 0.188 Total Area"	102 " 0.518 Impervious Initial abstraction"	
32 " 20.000 Flow length"	103 " 0.118 0.000 0.026 0.026 c.m/sec"	
33 " 7.500 Overland Slope"	104 " Catchment 202 Pervious Impervious Total Area "	
34 " 0.180 Pervious Area"	105 "Surface Area 0.000 0.298 0.298 nectare"	
35 " 20.000 Pervious length"	106 " Time of concentration 7.865 1.027 1.027 minutes"	
30 7.500 Feivious Stope	108 " Painfall danth 56 290 56 290 56 290 mm"	
38 " 20.000 Impervious length"	109 " Rainfall volume 0.00 167.74 167.74 c.m"	
39 " 7.500 Impervious slope"	110 " Rainfall losses 33.320 6.851 6.851 mm"	
40 " 0.250 Pervious Manning 'n'"	111 " Runoff depth 22.970 49.440 49.440 mm"	
41 " 81.000 Pervious SCS Curve No."	112 " Runoff volume 0.00 147.33 147.33 c.m"	
42 " 0.407 Pervious Runoff coefficient"	113 " Runoff coefficient 0.000 0.878 0.878 "	
43 " 0.100 Pervious Ia/S coefficient"	114 " Maximum flow 0.000 0.118 0.118 c.m/sec"	
44 " 5.958 Pervious Initial abstraction"	115 " 40 HYDROGRAPH Add Runoff "	
45 " 0.015 Impervious Manning 'n'"	116 " 4 Add Runoff "	
46 " 98.000 Impervious SCS Curve No."	117 " U.118 U.118 U.026 U.026"	
4/ " 0.8/4 Impervious Runoit coefficient"	110 " 54 FOND DESIGN C m/sec"	
49 0 518 Impervious fa/s coefficient	120 " 0.086 Target outflow c.m/sec"	
50 " 0.026 0.000 0.000 0.000 c.m/sec"	121 " 147.3 Hydrograph volume c.m"	
51 "Catchment 201 Pervious Impervious Total Area "	122 " 11. Number of stages"	
52 " Surface Area 0.180 0.008 0.188 hectare"	123 " 0.000 Minimum water level metre"	
53 " Time of concentration 7.356 0.961 6.831 minutes"	124 " 0.150 Maximum water level metre"	
54 " Time to Centroid 103.388 86.389 101.993 minutes"	125 " 0.000 Starting water level metre"	
55 " Rainfall depth 56.290 56.290 mm"	126 " 0 Keep Design Data: 1 = True; 0 = False"	
56 " Rainfall volume 101.59 4.23 105.83 c.m"	127 " Level Discharge Volume"	
5/ " Rainfall losses 33.368 /.104 32.318 mm"		
56 "Runoff deptn 22.922 49.187 23.972 mm"		
60 " Bundf coefficient 0.407 0.874 0.426 "	131 " 0.04500 0.00742 6.048"	
61 " Maximum flow 0.025 0.003 0.026 c.m/sec"	132 " 0.06000 0.00990 14.336"	
62 " 40 HYDROGRAPH Add Runoff "	133 " 0.07500 0.01237 28.000"	
63 " 4 Add Runoff "	134 " 0.09000 0.01485 48.384"	
64 " 0.026 0.026 0.000 0.000"	135 " 0.1050 0.01733 76.832"	
65 " 40 HYDROGRAPH Copy to Outflow"	136 " 0.1200 0.01980 110.408"	
66 " 8 Copy to Outflow"	137 " 0.1350 0.02228 144.008"	
67 " 0.026 0.026 0.026 0.000"	138 " 0.1500 0.02475 177.608"	
68 "40 HYDROGRAPH Combine 1"	139 " 1. ROOFTOP"	
69 " 6 Combine "	140 " Roof area Store area Area/drain Drain flow Roof slope"	
/U " L Node #"	141 " hectare hectare sq.metre L/min/25mm g H:1V"	
/1 "Site"	142 " 0.298 0.224 200.000 22.500 66.667"	

\49791\101\SWM\10 Year Post.out inted at 13:29 on 22 Sep 2023	Page 3 Q:\49791\101\SWM\10 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 4
3 " Using 11 roofdrains on roofstorage area of 2240. square metre" 4 " Peak outflow 0.018 c.m/sec" 5 " Maximum level 0.107 metre" 6 " Maximum storage 81.572 c.m" 7 " Centroidal lag 2.297 hours" 8 " 0.118 0.018 0.026 c.m/sec"	214 " 2. ORIFICES" 215 " Orifice Orifice Orifice Number of" 216 " invert coefficie diameter orifices" 217 " 322.600 0.630 0.5000 1.000" 218 " 323.500 0.630 0.2500 1.000" 219 " Peak outflow 0.472 c.m/sec"	
9 " 40 HYDROGRAPH Next link " 0 " 5 Next link " 1 " 0.118 0.018 0.018 0.026" 2 " 33 CATCHMENT 203" 3 " 1 Triangular SCS" 4 " 1 Equal length"	220 " Maximum level 323.659 metre" 221 " Maximum storage 88.221 c.m" 222 " Centroidal lag 1.661 hours" 223 " 0.561 0.574 0.472 0.026 c.m/sec" 224 " 40 HYDROGRAPH Combine 1" 225 " 6 Combine"	
5 " 1 SCS method" 6 " 203 Controlled Area" 7 " 82.000 % Impervious" 8 " 1.736 Total Area" 9 " 25.000 Flow length" 0 " 3.000 Overland Slope"	226 " 1 Node #" 227 " Site" 228 " Maximum flow 0.499 c.m/sec" 229 " Hydrograph volume 979.523 c.m" 230 " 0.561 0.574 0.472 0.499"	
1 " 0.312 Pervious Area" 2 " 25.000 Pervious length" 3 " 3.000 Pervious slope" 4 " 1.424 Impervious Area" 5 " 25.000 Impervious length" 6 " 3.000 Impervious length"		
7 " 0.250 Pervious Manning 'n'" 8 " 81.000 Pervious SCS Curve No." 9 " 0.408 Pervious Runoff coefficient" 0 " 0.100 Pervious Ia/S coefficient" 1 " 5.958 Pervious Initial abstraction" 2 " 0.015 Impervious Manning 'n'"		
3 " 98.000 Impervious SCS Curve No." 4 " 0.892 Impervious Runoff coefficient" 5 " 0.100 Impervious Ia/S coefficient" 6 " 0.518 Impervious Initial abstraction" 7 " 0.561 0.018 0.018 0.026 c.m/sec" 8 " Catchment 203 Pervious Impervious Total Area "		
9 " Surface Area 0.312 1.424 1.736 hectare" 0 " Time of concentration 11.071 1.446 2.324 minutes" 1 " Time to Centroid 108.121 86.999 88.926 minutes" 2 " Rainfall depth 56.290 56.290 mm" 3 " Rainfall volume 175.90 801.30 977.20 c.m" 4 " Rainfall losses 3.317 6.058 10.965 mm"		
5 " Runoff depth 22.973 50.232 45.325 mm" 6 " Runoff volume 71.79 715.06 786.85 c.m" 7 " Runoff coefficient 0.408 0.892 0.805 " 8 " Maximum flow 0.035 0.552 0.561 c.m/sec" 9 " 40 HYDROGRAPH Add Runoff " 4 Add Runoff " 4		
1" 0.561 0.574 0.018 0.026" 2"54 POND DESIGN" 3" 0.574 Current peak flow c.m/sec" 4" 0.086 Target outflow c.m/sec" 5" 934.1 Hydrograph volume c.m" 6" 8. Number of stages"		
7 " 322.600 Minimum water level metre" 8 " 325.650 Maximum water level metre" 9 " 322.600 Starting water level metre" 0 " 0 Keep Design Data: 1 = True; 0 = False" 1 " Level Discharge Volume" 2 " 322.600 0.000 "		
3 " 323,500 0.4125 75.000" 4 " 324.400 0.7809 150.000" 5 " 324.450 0.7960 150.000" 6 " 325.350 3.388 150.000" 7 " 325.450 3.814 155.000" 8 " 325.550 4.261 165.000"		
9 " 325.650 4.727 175.000" 0 " 1. WEIRS" 1 " Crest Weir Crest Left Right" 2 " elevation coefficie breadth sideslope sideslope" 3 " 324.450 0.900 1.800 0.000 0.000"		

Q:\49791\101\SWM\25 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 1 Q:\49791\101\SWM\25 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 2
1 " MIDUSS Output>"	72 " Maximum flow 0.036 c.m/sec"	
2 " MIDUSS version Version 2.25 rev. 473"	73 "Hydrograph volume 61.476 c.m"	
3 " MIDUSS created Sunday, February 7, 2010"	74 " 0.036 0.036 0.036 "	
4 " 10 Units used: ie METRIC"	75 " 40 HYDROGRAPH Start - New Tributary"	
5 Job folder: 0:\49791\101\SWM"	76 " 2 Start - New Tributary"	
6 " Output filename: 25 Year Post.out"	77 " 0.036 0.000 0.036 0.036"	
7 "Licensee name: A"	78 " 33 CATCHMENT 202"	
8 " Company "	79 I ITTANGULAR SCS	
J Date & fille fast used: J/22/2023 at 1-14-23 PM 10 " 31 TTME DADAMETERS"	81 " 1 SCS method"	
11 " 5.000 Time Step"	82 " 202 Proposed Roof Area"	
12 " 180.000 Max. Storm length"	83 " 100.000 % Impervious"	
13 " 1500.000 Max. Hydrograph"	84 " 0.298 Total Area"	
14 " 32 STORM Chicago storm"	85 " 10.000 Flow length"	
15 " 1 Chicago storm"	86 " 1.500 Overland Slope"	
16 " 3158.000 Coefficient A"	87 " 0.000 Pervious Area"	
17 " 15.000 Constant B"	88 " 10.000 Pervious length"	
18 " 0.936 Exponent C"	89 " 1.500 Pervious slope"	
19 " 0.400 Fraction R"	90 " 0.298 Impervious Area"	
20 " 100.000 Duration"	2 1 10.000 Impervious length	
22 1.000 fille Step intraprity 191 557 mm/br"	23 0 250 Dervice Mapping 'n'"	
22 Maximum intensity 191.557 mm/	94 81 000 Pervious SC Curve No "	
24 " 6 025bvd Hydrograph extension used in this file"	95 " 0 000 Pervious Runoff coefficient"	
25 " 33 CATCHMENT 201"	96 " 0.100 Pervious Ia/S coefficient"	
26 " 1 Triangular SCS"	97 " 5.958 Pervious Initial abstraction"	
27 " 1 Equal length"	98 " 0.015 Impervious Manning 'n'"	
28 " 1 SCS method"	99 " 98.000 Impervious SCS Curve No."	
29 " 201 Uncontrolled Area"	100 " 0.890 Impervious Runoff coefficient"	
30 " 4.000 % Impervious"	101 " 0.100 Impervious Ia/S coefficient"	
31 " 0.188 Total Area"	102 " 0.518 Impervious Initial abstraction"	
32 " 20.000 Flow length"	103 " 0.136 0.000 0.036 0.036 c.m/sec"	
33 " 7.500 Overland Slope"	104 " Catchment 202 Pervious Impervious Total Area "	
34 " 0.180 Pervious Area"	105 "Surface Area 0.000 0.298 0.298 nectare"	
35 " 20.000 Pervious length"	106 "Time of concentration 7.034 0.974 0.974 minutes"	
30 " 1.500 Pervious Stope"	107 " Time to Centrola 101.050 05.555 05.555 minutes"	
38 " 20.000 Impervious length"	109 " Bainfall volume 0.00 203 43 203 43 c m"	
39 " 7.500 Impervious slope"	110 " Rainfall Josses 36.673 7.524 7.524 mm"	
40 " 0.250 Pervious Manning 'n'"	111 " Runoff depth 31.594 60.742 60.742 mm"	
41 " 81.000 Pervious SCS Curve No."	112 " Runoff volume 0.00 181.01 181.01 c.m"	
42 " 0.462 Pervious Runoff coefficient"	113 " Runoff coefficient 0.000 0.890 0.890 "	
43 " 0.100 Pervious Ia/S coefficient"	114 " Maximum flow 0.000 0.136 0.136 c.m/sec"	
44 " 5.958 Pervious Initial abstraction"	115 " 40 HYDROGRAPH Add Runoff "	
45 " 0.015 Impervious Manning 'n'	116 " 4 Add Runoff "	
46 " 98.000 Impervious SCS Curve No."	117 " 0.136 0.136 0.036 0.036"	
4/ " 0.885 Impervious Runori coefficient"	118 " 54 POND DESIGN"	
49 0 518 Impervious fa/S coefficient	120 " 0.026 Tarree outfillow c m/sec"	
50 " 0.36 0.00 0.000 0.000 c m/sec"	120 0.000 Higher out to c.m.	
51 "Catchment 201 Pervious Impervious Total Area "	122 " 11. Number of stages"	
52 " Surface Area 0.180 0.008 0.188 hectare"	123 " 0.000 Minimum water level metre"	
53 " Time of concentration 6.578 0.911 6.159 minutes"	124 " 0.150 Maximum water level metre"	
54 " Time to Centroid 101.306 85.871 100.166 minutes"	125 " 0.000 Starting water level metre"	
55 " Rainfall depth 68.266 68.266 mm"	126 " 0 Keep Design Data: 1 = True; 0 = False"	
56 " Rainfall volume 123.21 5.13 128.34 c.m"	127 "Level Discharge Volume"	
57 " Rainfall losses 36.720 7.865 35.566 mm"	128 " 0.000 0.000 0.000"	
58 " Runoff depth 31.546 60.401 32.700 mm"	129 " 0.01500 0.00247 0.2240"	
59 "Runoff volume 56.93 4.54 61.48 C.m"		
61 " Maximum flow 0.034 0.005 0.479 "		
62 # 40 HYDROGRAPH Add Runoff "	133 " 0.07500 0.01237 28 000"	
63 " 4 Add Runoff "	134 " 0.09000 0.01485 48 384"	
64 " 0.036 0.036 0.000 0.000"	135 " 0.1050 0.01733 76.832"	
65 " 40 HYDROGRAPH Copy to Outflow"	136 " 0.1200 0.01980 110.408"	
66 " 8 Copy to Outflow"	137 " 0.1350 0.02228 144.008"	
67 " 0.036 0.036 0.000"	138 " 0.1500 0.02475 177.608"	
68 " 40 HYDROGRAPH Combine 1"	139 " 1. ROOFTOP"	
69 " 6 Combine "	140 " Roof area Store area Area/drain Drain flow Roof slope"	
70 " 1 Node #"	141 "hectare hectare sq.metre L/min/25mm gH:1V"	
/l "Site"	142 " U.298 U.224 200.000 22.500 66.667"	

Q:\49791\101\ Printed at 13:2	SWM\25 Year Post.out P: 29 on 22 Sep 2023	age 3 Q:\49791\101\SWM\25 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 4
143 " 144 " 145 " 146 " 147 " 148 " 149 " 40 150 "	Using 11 roofdrains on roofstorage area of 2240. square metre" Peak outflow 0.019 c.m/sec" Maximum level 0.117 metre" Maximum storage 104.378 c.m" Centroidal lag 2.441 hours" 0.136 0.136 0.019 0.036 c.m/sec" HYDROGRAPH Next link " 5 Next link "	214 " 2. ORIFICES" 215 " Orifice Orifice Orifice Number of " 216 " invert coefficie diameter orifices" 217 " 322.600 0.630 0.5000 1.000" 218 " 323.500 0.630 0.2500 1.000" 219 " Peak outflow 0.560 c.m/sec" 220 " Maximum level 323.871 metre" 221 " Maximum storage 105.912 c.m"	
151 " 152 " 33 153 " 154 " 155 " 155 " 156 " 157 " 158 "	0.136 0.019 0.019 0.036" CATCHMENT 203" 1 Triangular SCS" 1 Equal length" 1 SCS method" 203 Controlled Area" 82.000 % Impervious" 1.736 Total Area"	222 " Centroidal lag 1.674 hours" 223 " 0.657 0.672 0.560 0.036 c.m/sec" 224 "40 HYDROGRAPH Combine 1" 225 " 6 Combine " 226 " 1 Node #" 227 " Site" 228 " Maximum flow 0.596 c.m/sec" 229 " Hydrograph volume 1222.385 c.m"	
159 " 160 " 161 " 162 " 163 " 164 " 165 " 166 "	<pre>25.000 Flow length" 3.000 Overland Slope" 0.312 Pervious Area" 25.000 Pervious length" 3.000 Pervious slope" 1.424 Impervious Area" 25.000 Impervious length" 3.000 Impervious slope"</pre>	230 " 0.657 0.672 0.560 0.596"	
167 " 168 " 169 " 170 " 171 " 172 " 173 " 173 "	<pre>0.250 Pervious Manning 'n'" 81.000 Pervious SCS Curve No." 0.463 Pervious Runoff coefficient" 0.100 Pervious Ia/S coefficient" 5.958 Pervious Initial abstraction" 0.015 Impervious Manning 'n'" 98.000 Impervious SCS Curve No." 0.907 Impervious Runoff coefficient"</pre>		
175 " 176 " 177 " 178 " 179 " 180 " 181 " 182 "	0.100 Impervious Ia/S coefficient" 0.518 Impervious Initial abstraction" 0.657 0.019 0.019 0.036 c.m/sec" Catchment 203 Pervious Impervious Total Area " Surface Area 0.312 1.424 1.736 hectare" Time of concentration 9.900 1.372 2.232 minutes" Time to Centroid 105.475 86.427 88.348 minutes" Rainfall depth 68.266 68.266 mm"		
183 " 184 " 185 " 186 " 187 " 188 " 188 " 189 " 40 190 "	Rainfall volume 213.32 971.78 1185.10 c.m" Rainfall losses 36.626 6.360 11.808 mm" Runoff depth 31.640 61.906 56.458 mm" Runoff volume 98.87 881.25 980.12 c.m" Runoff coefficient 0.463 0.907 0.827 " Maximum flow 0.052 0.642 0.657 c.m/sec" HYDROGRAPH Add Runoff " " 4 Add Runoff		
191 " 192 " 54 193 " 194 " 195 " 196 " 197 " 198 "	0.657 0.672 0.019 0.036" POND DESIGN" 0.672 Current peak flow c.m/sec" 0.086 Target outflow c.m/sec" 1161.1 Hydrograph volume c.m" 8. Number of stages" 322.600 Minimum water level metre" 325.650 Maximum water level metre"		
199 " 200 " 201 " 202 " 203 " 203 " 204 " 205 "	322.600 Starting water level metre" 0 Keep Design Data: 1 = True; 0 = False" Level Discharge Volume" 322.600 0.000 0.000" 323.500 0.4125 75.000" 324.400 0.7809 150.000" 324.450 0.7960 150.000"		
207 " 208 " 209 " 210 " 211 " 212 " 213 "	325.450 3.814 155.000" 325.550 4.261 165.000" 325.650 4.727 175.000" 1. WEIRS" Crest Crest Weir Crest Left Right" elevation coefficie breadth sideslope 324.450 0.900 1.800 0.000 0.000"		

Q:\49791\101\SWM\50 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 1 Q:\49791\101\SWM\50 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 2
1 " MIDUSS Output>"	72 " Maximum flow 0.046 c.m/sec"	
2 " MIDUSS version Version 2.25 rev. 473"	73 "Hydrograph volume 75.156 c.m"	
3 " MIDUSS created Sunday, February 7, 2010"	74 " 0.046 0.046 0.046 "	
4 " 10 Units used: ie METRIC"	75 " 40 HYDROGRAPH Start - New Tributary"	
5 Job folder: Q:\49791\101\SWM"	76 " 2 Start - New Tributary"	
6 " Output filename: 50 Year Post.out"	77 " 0.046 0.000 0.046 0.046"	
7 "Licensee name: A"	78 " 33 CATCHMENT 202"	
8 " Company "	79 I Triangular SCS"	
Jobs Date & fille fast used. 3/22/2023 at 1.13.00 PM 10 " 31 TIME DADAMETERS" 3/22/2023 at 1.13.00 PM	81 " 1 SCS method"	
11 " 5.000 Time Step"	82 " 202 Proposed Roof Area"	
12 " 180.000 Max. Storm length"	83 " 100.000 % Impervious"	
13 " 1500.000 Max. Hydrograph"	84 " 0.298 Total Area"	
14 " 32 STORM Chicago storm"	85 " 10.000 Flow length"	
15 " 1 Chicago storm"	86 " 1.500 Overland Slope"	
16 " 3886.000 Coefficient A"	87 " 0.000 Pervious Area"	
17 " 16.000 Constant B"	88 " 10.000 Pervious length"	
18 " 0.950 Exponent C"	89 " 1.500 Pervious slope"	
19 " 0.400 Fraction K"	90 " 0.298 Impervious Area"	
20 " 100.000 Duration"	91 10.000 impervious length	
22 1.000 fille Step nutripier	23 " 0.250 Derrigus Manning 'n'"	
22 maximum incensity 213.002 mm/m	94 " 81 000 Pervious SCS Curve No "	
24 " 6 050bvd Hydrograph extension used in this file"	95 " 0 000 Pervious Runoff coefficient"	
25 " 33 CATCHMENT 201"	96 " 0.100 Pervious Ia/S coefficient"	
26 " 1 Triangular SCS"	97 " 5.958 Pervious Initial abstraction"	
27 " 1 Equal length"	98 " 0.015 Impervious Manning 'n'"	
28 " 1 SCS method"	99 " 98.000 Impervious SCS Curve No."	
29 " 201 Uncontrolled Area"	100 " 0.895 Impervious Runoff coefficient"	
30 " 4.000 % Impervious"	101 " 0.100 Impervious Ia/S coefficient"	
31 " 0.188 Total Area"	102 " 0.518 Impervious Initial abstraction"	
32 " 20.000 Flow length"	103 " 0.154 0.000 0.046 0.046 c.m/sec"	
33 " 7.500 Overland Slope"	104 " Catchment 202 Pervious Impervious Total Area "	
34 " 0.180 Pervious Area"	105 "Surface Area 0.000 0.298 0.298 hectare"	
35 " 20.000 Pervious length"	106 "Time of concentration 6.461 0.927 0.927 minutes"	
30 " 1.500 Pervious Stope"	107^{-1} Time to Centrola 100.204 65.516 65.516 (influtes)	
38 " 20.000 Impervious length"	109 " Rainfall volume 0.00 231 39 231 39 cm"	
39 " 7.500 Impervious slope"	110 " Rainfall losses 38.878 8.178 8.178 mm"	
40 " 0.250 Pervious Manning 'n'"	111 " Runoff depth 38,769 69,470 69,470 mm"	
41 " 81.000 Pervious SCS Curve No."	112 " Runoff volume 0.00 207.02 207.02 c.m"	
42 " 0.499 Pervious Runoff coefficient"	113 " Runoff coefficient 0.000 0.895 0.895 "	
43 " 0.100 Pervious Ia/S coefficient"	114 " Maximum flow 0.000 0.154 0.154 c.m/sec"	
44 " 5.958 Pervious Initial abstraction"	115 " 40 HYDROGRAPH Add Runoff "	
45 " 0.015 Impervious Manning 'n'	116 " 4 Add Runoff "	
46 " 98.000 Impervious SCS Curve No."	117 " 0.154 0.154 0.046 0.046"	
4/ " 0.889 Impervious Runori coefficient"	118 " 54 POND DESIGN"	
40 0.518 Impervious fa/S coefficient	120 " 0.086 Tarret outfield year flow c.m/sec	
50 " 0.46 0.000 0.000 c m/sec"	121 " 207 0 Hydrograph volume c m"	
51 "Catchment 201 Pervious Impervious Total Area "	122 " 11. Number of stages"	
52 " Surface Area 0.180 0.008 0.188 hectare"	123 " 0.000 Minimum water level metre"	
53 " Time of concentration 6.042 0.867 5.685 minutes"	124 " 0.150 Maximum water level metre"	
54 " Time to Centroid 99.713 85.444 98.727 minutes"	125 " 0.000 Starting water level metre"	
55 " Rainfall depth 77.647 77.647 mm"	126 " 0 Keep Design Data: 1 = True; 0 = False"	
56 " Rainfall volume 140.14 5.84 145.98 c.m"	127 " Level Discharge Volume"	
57 " Rainfall losses 38.881 8.612 37.671 mm"	128 " 0.000 0.000 0.000"	
58 " Runoff depth 38.766 59.035 39.977 mm"		
59 "Runoff coefficient 0.400 0.800 0.515 "		
61 " Maximum flow 0.044 0.004 0.046 c.m/cec"	132 0.06000 0.00042 0.060	
62 " 40 HYDROGRAPH Add Runoff "	133 " 0.07500 0.01377 28 000"	
63 " 4 Add Runoff "	134 " 0.09000 0.01485 48 384"	
64 " 0.046 0.046 0.000 0.000"	135 " 0.1050 0.01733 76.832"	
65 " 40 HYDROGRAPH Copy to Outflow"	136 " 0.1200 0.01980 110.408"	
66 " 8 Copy to Outflow"	137 " 0.1350 0.02228 144.008"	
67 ° 0.046 0.046 0.046 0.000°	138 " 0.1500 0.02475 177.608"	
68 " 40 HYDROGRAPH Combine 1"	139 " 1. ROOFTOP"	
69 " 6 Combine "	140 "Roof area Store area Area/drain Drain flow Roof slope"	
70 " 1 Node #"	141 "hectare hectare sq.metre L/min/25mm g H:LV"	
/l "Site"	142 " 0.298 0.224 200.000 22.500 66.667"	

:\49791\101\SWM\50 Year Post.out rinted at 13:29 on 22 Sep 2023	Page 3 Q:\49791\101\SWM\50 Year Post.out Printed at 13:29 on 22 Sep 2023	Page 4
13 "Using 11 roofdrains on roofstorage area of 2240. square metre" 14 "Peak outflow 0.021 c.m/sec" 15 "Maximum level 0.126 metre" 46 "Maximum storage 123.101 c.m"	214 " 2. ORIFICES" 215 " Orifice Orifice Orifice Number of" 216 " invert coefficie diameter orifices" 217 " 322 600 0.630 0.5000 1.000"	
Maximum Strate Iss.101 C.m.* 7 Centroidal lag 2.541 hours" 48 0.154 0.021 0.046 c.m/sec" 49 40 HYDROGRAPH Next link " 50	217 322.600 0.630 0.500 1.000 218 323.500 0.630 0.2500 1.000 219 Peak outflow 0.641 c.m/sec" 220 Maximum level 322.072 metre" 221 Maximum storage 122.635 c.m/sec"	
71 " 0.154 0.021 0.046" 52 " 33 CATCHMENT 203" 53 " 1 Triangular SCS" 54 " 1 Equal length"	221 Additional lag 1.682 hours" 223 0.755 0.770 0.641 0.046 c.m/sec" 224 40 HYDROGRAPH Combine 1" 225 " 6 Combine "	
<pre>i5 " 1 SCS method" i6 " 203 Controlled Area" 57 " 82.000 % Impervious" 58 " 1.736 Total Area" 58 " 25 000 Flow length"</pre>	226 " 1 Node #" 227 " Site" 228 " Maximum flow 0.688 c.m/sec" 229 " Hydrograph volume 1413.688 c.m" 230 " 0.755 0.770 0.641 0.688"	
50 " 3.000 Overland Slope" 51 " 0.312 Pervious Area" 52 " 25.000 Pervious length" 63 " 3.000 Pervious slope"	250 0.755 0.770 0.041 0.000	
i4 1.424 Impervious Area" i55 25.000 Impervious length" i66 3.000 Impervious slope" i77 0.250 Pervious Manning 'n'" i67 0.200 Pervious Manning 'n'"		
<pre>38 " 81.000 Pervious SCS Curve No." 59 " 0.500 Pervious Runoff coefficient" 70 " 0.100 Pervious Ia/S coefficient" 71 " 5.958 Pervious Initial abstraction" 72 " 0.015 Impervious Maning 'n'"</pre>		
<pre>/3 " 98.000 Impervious SCS Curve No." /4 " 0.914 Impervious Runoff coefficient" /5 " 0.100 Impervious Ia/S coefficient" /6 " 0.518 Impervious Initial abstraction"</pre>		
17 " 0.755 0.021 0.024 0.046 c.m/sec" 78 " Catchment 203 Pervious Impervious Total Area " 79 " Surface Area 0.312 1.424 1.736 80 " Time of concentration 9.093 1.305 2.143 minutes" 81 " Time to Centroid 103 550 85 962 87 856 minutes"		
32 " Rainfall depth 77.647 mm" 33 " Rainfall volume 242.63 1105.33 1347.96 c.m" 84 " Rainfall losses 38.649 6.674 12.429 mm" 85 " Runoff depth 38.999 70.974 65.218 mm"		
36 "Runoff volume 121.86 1010.33 1132.19 c.m" 37 "Runoff coefficient 0.502 0.914 0.840 " 38 "Maximum flow 0.067 0.732 0.755 c.m/sec" 89 "40 HYDROGRAPH Add Runoff " " " "		
10 " 4 Add Runoff " 11 " 0.755 0.770 0.021 0.046" 22 "54 POND DESIGN" 23 " 0.770 Current peak flow c.m/sec" 24 " 0.086 Target outflow c.m/sec"		
<pre>>5 " 1339.2 Hydrograph volume c.m" >6 " 8. Number of stages" 97 " 322.600 Minimum water level metre" 98 " 325.650 Maximum water level metre"</pre>		
39 322.600 Starting water level metre" 00 0 Keep Design Data: 1 = True; 0 = False" 01 " Level Discharge Volume" 02 " 322.600 0.000 0.000" 03 " 232.500 0.4125 75.000"		
3 323.500 0.4125 75.000 4 324.400 0.7809 150.000* 15 324.450 0.7960 150.000* 06 325.350 3.388 150.000* 07 325.450 3.814 155.000*		
<pre>18 " 325.550 4.261 165.000" 19 " 325.650 4.727 175.000" 10 " 1. WEIRS" 11 " Crest Weir Crest Left Right" 12 " cloution coefficies burgthy sidesland sidesland"</pre>		
12 "erevation coefficiepreadth slaeslope slaeslope"13 "324.4500.9001.8000.0000.000"		

Q:\49791\101\SWM\100 Year Post.out Printed at 13:28 on 22 Sep 2023	Page 1 Q:\49791\101\SWM\100 Year Post.out Printed at 13:28 on 22 Sep 2023	Page 2
1 " MIDUSS Output>"	72 " Maximum flow 0.057 c.m/sec"	
2 " MIDUSS version Version 2.25 rev. 473"	73 "Hydrograph volume 89.985 c.m"	
3 " MIDUSS created Sunday, February 7, 2010"	74 " 0.057 0.057 0.057 "	
4 " 10 Units used: ie METRIC"	75 " 40 HYDROGRAPH Start - New Tributary"	
5 " Job folder: Q:\49791\101\SWM"	76 " 2 Start - New Tributary"	
6 " Output filename: 100 Year Post.out"	77 " 0.057 0.000 0.057 0.057"	
7 "Licensee name: A"	78 " 33 CATCHMENT 202"	
8 " Company " "	/9 " I Triangular SCS"	
9 "Date & Iille Iast used. 9/19/2023 at 5-54-05 PM" 10 " 31 TTME DARAMETERS"	81 " 1 SCS method"	
10 SI FINE FARMELERS	82 " 202 Proposed Roof Area"	
12 " 180.000 Max. Storm length"	83 " 100.000 % Impervious"	
13 " 1500.000 Max. Hydrograph"	84 " 0.298 Total Area"	
14 " 32 STORM Chicago storm"	85 " 10.000 Flow length"	
15 " 1 Chicago storm"	86 " 1.500 Overland Slope"	
16 " 4688.000 Coefficient A"	87 " 0.000 Pervious Area"	
17 " 17.000 Constant B"	88 " 10.000 Pervious length"	
18 " 0.962 Exponent C"	89 " 1.500 Pervious slope"	
20 " 180.000 Duration"	90 0.296 Impervious Area	
21 " 1000 Time step multiplier"	92 " 1 500 Impervious lengen	
22 " Maximum intensity 239.650 mm/hr"	93 " 0.250 Pervious Manning 'n'"	
23 " Total depth 87.263 mm"	94 " 81.000 Pervious SCS Curve No."	
24 " 6 100hyd Hydrograph extension used in this file"	95 " 0.000 Pervious Runoff coefficient"	
25 " 33 CATCHMENT 201"	96 " 0.100 Pervious Ia/S coefficient"	
26 " 1 Triangular SCS"	97 " 5.958 Pervious Initial abstraction"	
27 " 1 Equal length"	98 " 0.015 Impervious Manning 'n'"	
28 " 1 SCS method"	99 " 98.000 Impervious SCS Curve No."	
29 " 201 Uncontrolled Area"	100 " 0.898 Impervious Runoff coefficient"	
30 " 4.000 % Impervious"	101 " 0.100 Impervious Ia/S coefficient"	
31 " 0.188 Total Area"	102 " 0.518 Impervious Initial abstraction"	
32 " 20.000 Flow length"	103 " 0.1/2 0.000 0.057 0.057 C.m/sec"	
34 0 180 Dervicus Area"	105 " Surface Izea 0.000 0.298 0.298 bectare"	
35 20.000 Pervious length"	106 " Time of concentration 6 009 0 888 0 888 minutes"	
36 " 7.500 Pervious slope"	107 " Time to Centroid 98,960 85,170 85,170 minutes"	
37 " 0.008 Impervious Area"	108 " Rainfall depth 87.263 87.263 87.263 mm"	
38 " 20.000 Impervious length"	109 " Rainfall volume 0.00 260.04 260.05 c.m"	
39 " 7.500 Impervious slope"	110 " Rainfall losses 40.776 8.903 8.903 mm"	
40 " 0.250 Pervious Manning 'n'"	111 " Runoff depth 46.487 78.361 78.361 mm"	
41 " 81.000 Pervious SCS Curve No."	112 " Runoff volume 0.00 233.52 233.52 c.m"	
42 " 0.534 Pervious Runoff coefficient"	113 " Runoff coefficient 0.000 0.898 0.898 "	
43 " 0.100 Pervious la/S coefficient"	114 " Maximum IIOW 0.000 0.1/2 0.1/2 C.m/sec"	
45 0 015 Impervious Anning to "	115 TO HIDROGRAPH AND KUNOT	
46 " 98.000 Impervious SCS Curve No."	117 " 0.172 0.172 0.057 0.057"	
47 " 0.892 Impervious Runoff coefficient"	118 " 54 POND DESIGN"	
48 " 0.100 Impervious Ia/S coefficient"	119 " 0.172 Current peak flow c.m/sec"	
49 " 0.518 Impervious Initial abstraction"	120 " 0.086 Target outflow c.m/sec"	
50 " 0.057 0.000 0.000 0.000 c.m/sec"	121 " 233.5 Hydrograph volume c.m"	
51 " Catchment 201 Pervious Impervious Total Area "	122 " 11. Number of stages"	
52 " Surface Area 0.180 0.008 0.188 hectare"	123 " 0.000 Minimum water level metre"	
53 "Time of concentration 5.620 0.830 5.308 minutes"	124 " 0.150 Maximum water level metre"	
54 "Time to Centrola 98.451 85.103 97.583 minutes"	125 " 0.000 Starting water level metre"	
55 " Rainiali deplii 07.205 07.205 07.205 umu"	120 " U Reep Design Data 1 = frue, U = raise"	
57 " Rainfall Joses 40.648 9.419 39.39 mm"		
58 " Runoff depth 46.615 77.844 47.864 mm"		
59 " Runoff volume 84.13 5.85 89.98 c.m"	130 " 0.03000 0.00495 1.792"	
60 " Runoff coefficient 0.534 0.892 0.549 "	131 " 0.04500 0.00742 6.048"	
61 " Maximum flow 0.054 0.004 0.057 c.m/sec"	132 " 0.06000 0.00990 14.336"	
62 " 40 HYDROGRAPH Add Runoff "	133 " 0.07500 0.01237 28.000"	
63 " 4 Add Runoff "	134 " 0.09000 0.01485 48.384"	
64 " 0.057 0.057 0.000 0.000"	135 " 0.1050 0.01733 76.832"	
65 " 40 HYDROGRAPH Copy to Outflow"	136 " 0.1200 0.01980 110.408"	
66 " 8 Copy to Outflow"	137 " 0.1350 0.02228 144.008"	
6/ " 0.057 0.000"	138 " 0.1500 0.02475 177.608"	
60 "40 HYDRUGRAPH COMDINE L"	159 " I. ROOFTOP"	
70 " I Node "	141 "ROUL AFEA SLOPE AFEA AREA/ORAIN DRAIN FLOW ROOF SLOPE"	
70 I Note #	142 " $0.298 0.224 200.000 22.500 6667"$	
0100	0.230 0.221 200.000 22.500 00.007	

t:\49791\101\SWM\100 Year Post.out \rinted at 13:28 on 22 Sep 2023	Page 3 Q:\49791\101\SWM\100 Year Post.out Printed at 13:28 on 22 Sep 2023	Page 4
43 " Using 11 roofdrains on roofstorage area of 2240. square metre" 44 " Peak outflow 0.022 c.m/sec" 45 " Maximum level 0.134 metre" 46 " Maximum storage 142.255 c.m" 47 " Centroidal lag 2.638 hours" 48 " 0.172 0.022 0.057 c.m/sec" 49 " 40 HYDROGRAPH Next link " 50 " 5 Next link " 51 " 0.172 0.022 0.057 " 52 " 33 CATCHMENT 203" CATCHMENT 203"	214 " 2. ORIFICES" 215 " Orifice Orifice Orifice Number of" 216 " invert coefficie diameter orifices" 217 " 322.600 0.630 0.5000 218 " 323.500 0.630 0.2500 1.000" 219 " Peak outflow 0.724 c.m/sec" 220 " Maximum level 324.275 metre" 221 " Maximum storage 139.544 c.m" 222 " Centroidal lag 1.690 hours" 223 " 0.852 0.869 0.724	
53 " 1 Triangular SCS" 54 " 1 Equal length" 55 " 1 SCS method" 56 " 203 Controlled Area" 57 " 82.000 % Impervious" 58 " 1.736 Total Area" 59 " 25.000 Flow length" 60 " 3.000 Overland Slope" 61 " 0.312 Pervious Area" 62 " 25.000 Pervious length"	224 " 40 HYDROGRAPH Combine 1" 225 " 6 Combine " 226 " 1 Node #" 227 " Site" 228 " Maximum flow 0.781 c.m/sec" 229 " Hydrograph volume 1611.776 c.m" 230 " 0.852 0.869 0.724 0.781"	
63 " 3.000 Pervious slope" 64 " 1.424 Impervious Area" 65 " 25.000 Impervious length" 66 " 3.000 Impervious slope" 67 " 0.250 Pervious Slope" 68 " 81.000 Pervious SC Curve No." 69 " 0.535 Pervious Runoff coefficient" 70 " 0.100 Pervious Ia/S coefficient" 71 " 5.958 Pervious Manning 'n'" 72 " 0.015 Impervious Manning 'n'"		
73 " 98.000 Impervious SCS Curve No." 74 " 0.920 Impervious Runoff coefficient" 75 " 0.100 Impervious Ia/S coefficient" 76 " 0.518 Impervious Initial abstraction" 77 " 0.852 0.022 0.057 c.m/sec" 78 " Catchment 203 Pervious Impervious Total Area " 79 " Surface Area 0.312 1.424 1.736 80 " Time of concentration 8.457 1.250 2.066 minutes" 81 " Time to Centroid 102.026 85.599 87.459 minutes"		
82 " Rainfall depth 87.263 87.263 mm" 83 " Rainfall volume 272.68 1242.21 1514.89 c.m" 84 " Rainfall losses 40.567 6.993 13.036 mm" 85 " Runoff depth 46.697 80.271 74.227 mm" 86 " Runoff coefficient 0.535 0.920 0.851 " 87 " Maximum flow 0.083 0.820 0.852 c.m/sec" 89 " 40 HYDROGRAPH Add Runoff " " 90 " 4 Add Runoff " "		
91 " 0.852 0.869 0.022 0.057" 92 " 54 POND DESIGN" 93 " 0.869 Current peak flow c.m/sec" 94 " 0.086 Target outflow c.m/sec" 95 " 1522.1 Hydrograph volume c.m" 96 " 8. Number of stages" 97 " 322.600 Minimum water level metre" 98 " 325.550 Maximum water level metre"		
99 " 322.600 Starting water level metre" 00 " 0 Keep Design Data: 1 = True; 0 = False" 01 " Level Discharge Volume" 02 " 322.600 0.000 0.000" 03 " 323.500 0.4125 75.000" 04 " 324.400 0.7809 150.000" 05 " 324.450 0.7960 150.000" 06 " 325.350 3.818 150.000" 07 " 325.450 3.814 155.000" 08 " 325.550 4.261 165.000"		
09 " 325.650 4.727 175.000" 10 " 1. WEIRS" 11 " Crest Weir Crest Left Right" 12 " elevation coefficie breadth sideslope sideslope" 13 " 324.450 0.900 1.800 0.000		



OGS Sizing Report







Province:	Ontario		Project Name:	601 Scottsdale Pha	ise 2	
City:	Guelph		Project Number:	62610		
Nearest Rainfall Station:	WATERLOO WELLINGTON	N AP	Designer Name:	Jolie Nguyen		
Climate Station Id:	6149387		Designer Company:	MTE Consultants		
Years of Rainfall Data:	34		Designer Email:	jnguyen@mte85.c	om	
			Designer Phone:	519-743-6500		
Site Name:			EOR Name:			
 Drainage Area (ha):	2.034		EOR Company:			
% Imperviousness:	85.00		EOR Email:			
Runoff Co	pefficient 'c': 0.81					
Particle Size Distribution:	Fine			Net Annua	l Sediment	
 Target TSS Removal (%):	80.0			(TSS) Load	Reduction	
Required Water Quality Runo	ff Volume Capture (%):	90.00		Sizing S	ummary	
Estimated Water Quality Flow	v Rate (L/s):	62.42		Stormceptor	TSS Removal	
Dil / Fuel Spill Risk Site?		Yes		Model	Provided (%)	
Jpstream Flow Control?		No		EFO4	60	
Peak Conveyance (maximum)	Flow Rate (L/s):			EFO6	75	
Influent TSS Concentration (m	ng/L):	200		EFO8	83	
 Estimated Average Annual Sec	diment Load (kg/yr):	2007		EFO10	89	
Estimated Average Annual Se	diment Volume (L/yr):	1632		EFO12	92	
		ł	Becommended	Stormcentor FEO		
	Ectimo	tod Not A	neual Sadimant ((0/)	
	LStillia	iteu Net A				
		V	Nater Quality Run	off Volume Capt	ure (%): >	





THIRD-PARTY TESTING AND VERIFICATION

► Stormceptor® EF and Stormceptor® EFO are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators and performance has been third-party verified in accordance with the ISO 14034 Environmental Technology Verification (ETV) protocol.

PERFORMANCE

► Stormceptor® EF and EFO remove stormwater pollutants through gravity separation and floatation, and feature a patentpending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including highintensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV *Procedure for Laboratory Testing of Oil-Grit Separators* for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle	Percent Less	Particle Size	Deveent	
Size (µm)	Than	Fraction (µm)	Percent	
1000	100	500-1000	5	
500	95	250-500	5	
250	90	150-250	15	
150	75	100-150	15	
100	60	75-100	10	
75	50	50-75	5	
50	45	20-50	10	
20	35	8-20	15	
8	20	5-8	10	
5	10	2-5	5	
2	5	<2	5	







Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	2.29	137.0	29.0	100	8.5	8.5
1.00	18.3	26.8	4.58	275.0	58.0	100	18.3	26.8
2.00	14.4	41.3	9.16	550.0	117.0	95	13.7	40.5
3.00	10.2	51.5	13.74	824.0	175.0	87	8.9	49.4
4.00	8.0	59.5	18.32	1099.0	234.0	82	6.5	55.9
5.00	6.9	66.4	22.90	1374.0	292.0	79	5.5	61.4
6.00	5.9	72.3	27.48	1649.0	351.0	76	4.5	65.8
7.00	3.8	76.1	32.06	1924.0	409.0	73	2.8	68.6
8.00	2.6	78.7	36.64	2198.0	468.0	71	1.8	70.5
9.00	2.5	81.1	41.22	2473.0	526.0	68	1.7	72.1
10.00	2.2	83.3	45.80	2748.0	585.0	66	1.4	73.6
11.00	2.5	85.8	50.38	3023.0	643.0	64	1.6	75.2
12.00	2.0	87.8	54.96	3298.0	702.0	64	1.3	76.5
13.00	1.6	89.4	59.54	3573.0	760.0	63	1.0	77.5
14.00	0.9	90.4	64.12	3847.0	819.0	63	0.6	78.1
15.00	1.6	91.9	68.70	4122.0	877.0	63	1.0	79.0
16.00	1.1	93.0	73.28	4397.0	936.0	62	0.7	79.7
17.00	1.0	94.0	77.86	4672.0	994.0	62	0.6	80.4
18.00	0.5	94.6	82.44	4947.0	1052.0	60	0.3	80.7
19.00	0.2	94.8	87.02	5221.0	1111.0	59	0.1	80.8
20.00	0.6	95.4	91.60	5496.0	1169.0	58	0.4	81.2
21.00	0.6	96.1	96.18	5771.0	1228.0	56	0.4	81.6
22.00	0.3	96.4	100.76	6046.0	1286.0	55	0.2	81.7
23.00	0.8	97.2	105.34	6321.0	1345.0	54	0.5	82.2
24.00	0.4	97.6	109.92	6595.0	1403.0	52	0.2	82.4
25.00	0.2	97.8	114.50	6870.0	1462.0	50	0.1	82.5
30.00	0.9	98.7	137.40	8244.0	1754.0	42	0.4	82.8
35.00	0.8	99.5	160.31	9618.0	2046.0	36	0.3	83.1
40.00	0.2	99.7	183.21	10992.0	2339.0	31	0.1	83.2
45.00	0.3	100.0	206.11	12366.0	2631.0	28	0.1	83.3
Estimated Net Annual Sediment (TSS) Load Reduction =								83 %

Climate Station ID: 6149387 Years of Rainfall Data: 34













Maximum Pipe Diameter / Peak Conveyance									
Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inle Diame	et Pipe eter	Max Out Diame	let Pipe eter	Peak Cor Flow	nveyance Rate
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EF012	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

► Stormceptor[®] EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor[®] EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor[®] EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.











INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

- 0° 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
- 45° 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

i onatant capacity												
Stormceptor EF / EFO	Moo Diam	del eter	Depth Pipe In Sump	(Outlet vert to Floor)	Oil Vo	Oil Volume Recommended Maintenance Depth *		Oil Volume Recommended Sediment Sediment * Maintenance Depth *		num Volume *	* Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

Pollutant Capacity

*Increased sump depth may be added to increase sediment storage capacity ** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To	
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer	
Third-party verified light liquid capture	Proven performance for fuel/oil hotspot	Regulator, Specifying & Design Engineer,	
and retention for EFO version	locations	Site Owner	
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer	
Minimal drop between inlet and outlet	Site installation ease	Contractor	
Large diameter outlet riser for inspection	Easy maintenance access from grade	Maintenance Contractor & Site Owner	

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef





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

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1 4 ft (1219 mm) Diameter OGS Units:

6 ft (1829 mm) Diameter OGS Units:

8 ft (2438 mm) Diameter OGS Units:

10 ft (3048 mm) Diameter OGS Units:

12 ft (3657 mm) Diameter OGS Units:

 $\begin{array}{l} 1.19 \ m^{3} \ sediment \ / \ 265 \ L \ oil \\ 3.48 \ m^{3} \ sediment \ / \ 609 \ L \ oil \\ 8.78 \ m^{3} \ sediment \ / \ 1,071 \ L \ oil \\ 17.78 \ m^{3} \ sediment \ / \ 1,673 \ L \ oil \\ 31.23 \ m^{3} \ sediment \ / \ 2,476 \ L \ oil \\ \end{array}$

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall







remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 $L/min/m^2$ shall be assumed to be identical to the sediment removal efficiency at 40 $L/min/m^2$. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 $L/min/m^2$.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This reentrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to





assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.





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LEGEND OF EXISTING FEATURES



EXISTING SPOT ELEVATIONS EXISTING CONTOURS EXISTING BUILDING EXISTING RETAINING WALL EXISTING MAN DOOR REMOVALS

HARD SURFACE REMOVALS





LEGEND OF EXISTING FEATURES



SITE BOUNDARY		
EASEMENT		
EXISTING SPOT ELEVATIONS		
EXISTING CONTOURS		
EXISTING SANITARY SEWER		
EXISTING WATERMAIN		
EXISTING STORM SEWER		
EXISTING CURB		
EXISTING BUILDING		
EXISTING FENCE		
EXISTING RETAINING WALL		
EXISTING MAN DOOR		

LEGEND OF PROPOSED FEATURES





SIB OU O.OS NE SIDEWALK 1.8 NE U U U U U U U U U U	CITY OF GUELPH Warner of New SITE BENCHMARK ELEV. = m
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DALE DRIVE EX. 200mp WM (Aprov. Locular)	8.
SCOTISI	Engineers, Scientists, Surveyors 519-743-6500
HAND WELL (TRAFFIC) TOP 333.81	SCOTTSDALE LP 181 BAY STREET EAST TORONTO, ON PROJECT ALMA GUELPH PHASE 2 601 SCOTTSDALE DRIVE GUELPH, ON DRAWING FUNCTIONAL GRADING AND SERVICING PLAN 2 Project Manager Project No. A. SLAWICH Project No. Design By AJS Checked By LEI
SIDEWALK 0.2 NE 1.0 SE	Drawn By TXT/DAC Checked By JRS Surveyed By OTHERS Drawing No. Date Jun.30/23 GP-2 Scale Scale