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.

MTE
Engineers, Scientists, Surveyors

PROJECT
ALMA GUELPH PHASE 2

TITLE
SITE LOCATION PLAN

Drawn: TXT	Scale: 1:3,000	Figure: **1.0**
Checked: AJS	Project No.: 49791-101	
Date: 2023-08-11	Rev No.: 0	

CAD: P:\P\49791\101\49791-101-F1.DWG

Plot Date: September 22, 2023 - 1:09 PM

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 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.

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

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

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:

i) Attenuation of the post-development peak flows for the 2- through 100-year storm events to the pre-development (existing) peak flow;

ii) 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.

Table 4.1 – Catchment Parameters

#	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-Development Catchment Areas							
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

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.

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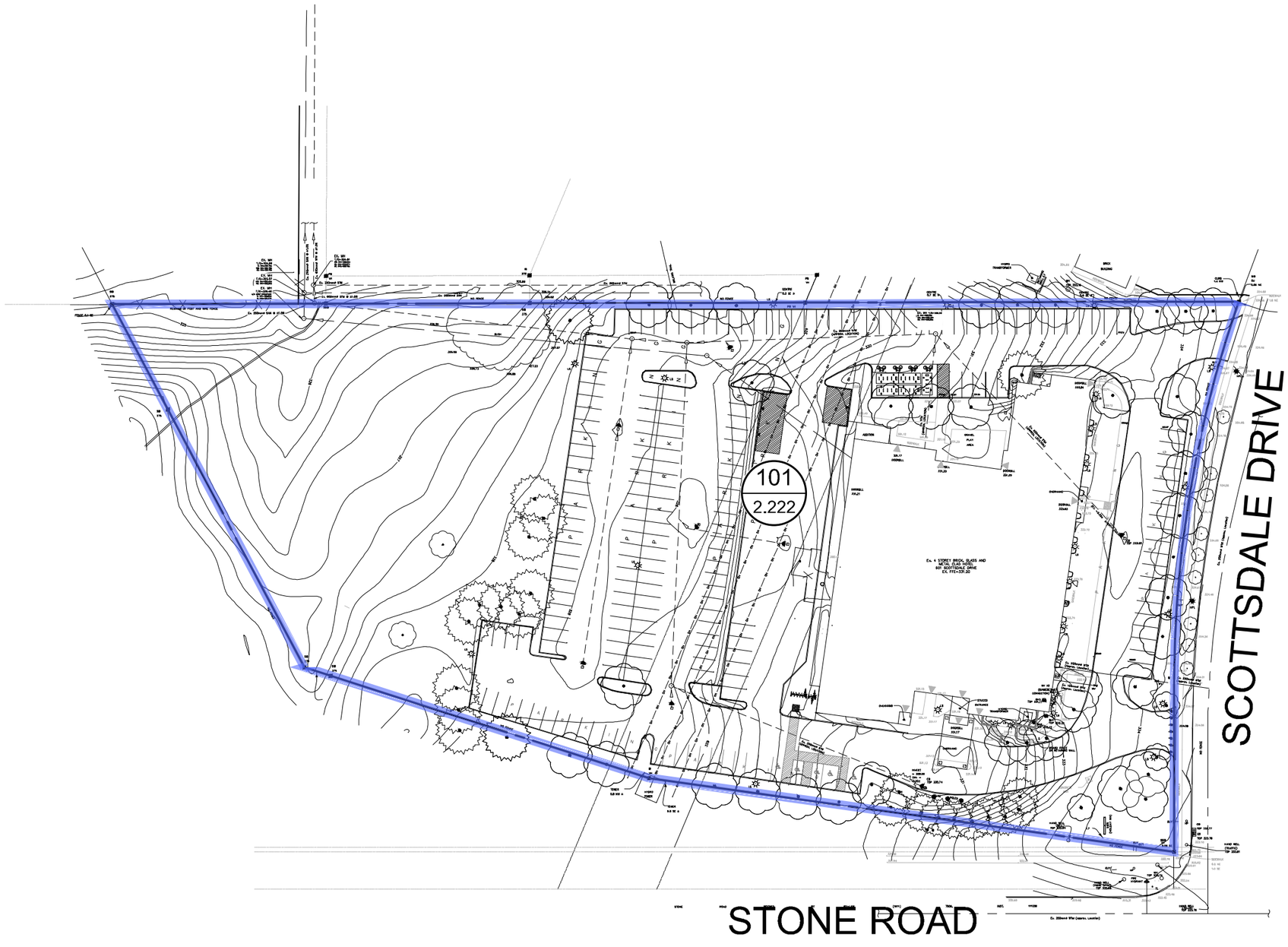
HIGHWAY 6 (HANLON EXPRESSWAY)



LEGEND

CATCHMENT 101

101 — SUB-CATCHMENT NUMBER

2.222 — AREA (ha.)

0 10 20 30 40 50m

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PROJECT
ALMA GUELPH PHASE 2

TITLE
PRE-DEVELOPMENT CATCHMENT AREA

Drawn: TXT	Scale: 1:1000	Figure: **2.0**
Checked: AJS	Project No.: 49791-101	
Date: 2023-08-11	Rev No.: 0	

Plot Date: September 22, 2023 - 1:11 PM

CAD: P:\P_49791\101\49791-101-F2.DWG

HIGHWAY 6 (HANLON EXPRESSWAY)

LEGEND

CATCHMENT 201

CATCHMENT 202

CATCHMENT 203

201 / 0.188 — SUB-CATCHMENT NUMBER / AREA (ha.)

0 10 20 30 40 50m

MTE
Engineers, Scientists, Surveyors

PROJECT
ALMA GUELPH PHASE 2

TITLE
POST-DEVELOPMENT CATCHMENT AREAS

Drawn: TXT	Scale: 1:1000	Figure: **3.0**
Checked: AJS	Project No.: 49791-101	
Date: 2023-08-11	Rev No.: 0	

Plot Date: September 22, 2023 - 1:10 PM

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 150m^3 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.

Table 4.2 – Stage-Storage-Discharge Information

Elevation (m)	Head (m)	Orifice Flow (m^3/s)	Volume (m^3)	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

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 0.270m^3/s, 0.382m^3/s, and 0.724m^3/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.

Table 4.3 – Summary of Flows

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 (m^3/s)	50-Year Storm Event (m^3/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

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

Table 4.4 – Summary of Ponding Depths

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

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 0.549m^3/s, 0.700m^3/s and 0.752m^3/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 0.724m^3/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 $9.9x10^{-7}$m/sec and $8.4x10^{-7}$m/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:

i) 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:

i) 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.

Adam Slawich, C.E.T., E.I.T.
Designer
519-743-6500 ext. 1458
aslawich@mte85.com

Lynn Ingram, P.Eng.
Design Engineer
519-743-6500 ext. 1381
lingram@mte85.com

AJS:DXN:dlb

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Appendix A

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

Development Information[1]								Fire Flow[2]														Domestic Flow[3,4]					
								Ontario Building Code						Fire Underwriters Survey													
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Beds	Population	Bldg Area (1st Floor)	Total Bldg Area	Building Volume	K	V	S_{tot}	Q	F	F	C	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
				# of people	m^2	m^2	m^3		m^3		*L*	*L/min*	*L/s*		m^2	*L/min*				*L/min*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*
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	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**								**183**	**183**	**1.36**	**1.36**	**3.74**	**5.62**	**0.54**	**187**
																										Sum of Maximum Day Flows + OBC Fire Flow (L/s) =		**154**
																										Sum of Maximum Day Flows + FUS Fire Flow (L/s) =		**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

Appendix B

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	*m*	59	*psi*	
P1 - Pressure at Q1	37.27	*m*	53	*psi*	
Q1 - From Fire Flow Test	4467	*L/min*	1180	*U.S. gal/min*	
Q2 - Required Flow	9000	*L/min*	2378	*U.S. gal/min*	From: Water Demand calculations by MTE
P-loss 1	4.22	*m*	6	*psi*	
P-loss 2	15.44	*m*	22	*psi*	
P2 - Residual Pressure	**26.05**	***m***	**37**	***psi***	Extrapolated from Fire Flow Test Results

2. Friction Losses Through Water 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**	**K**	**Velocity**	**Head Loss**	**Total Loss**	
			m/s	*m*	*m*	*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/Gain	**-4.08**	**m**	**-5.8**	**psi**

ANALYSIS SUMMARY					
Total Losses	**6.922**	**m**			
	67.90	**kPa**	**9.8**	**psi**	
Residual Pressure after Losses	**19.13**	**m**			
	188	**kPa**	**27.2**	**psi**	**PASS**
Allowable Residual Pressure	*140*	*kPa*	*20.3*	*psi*	

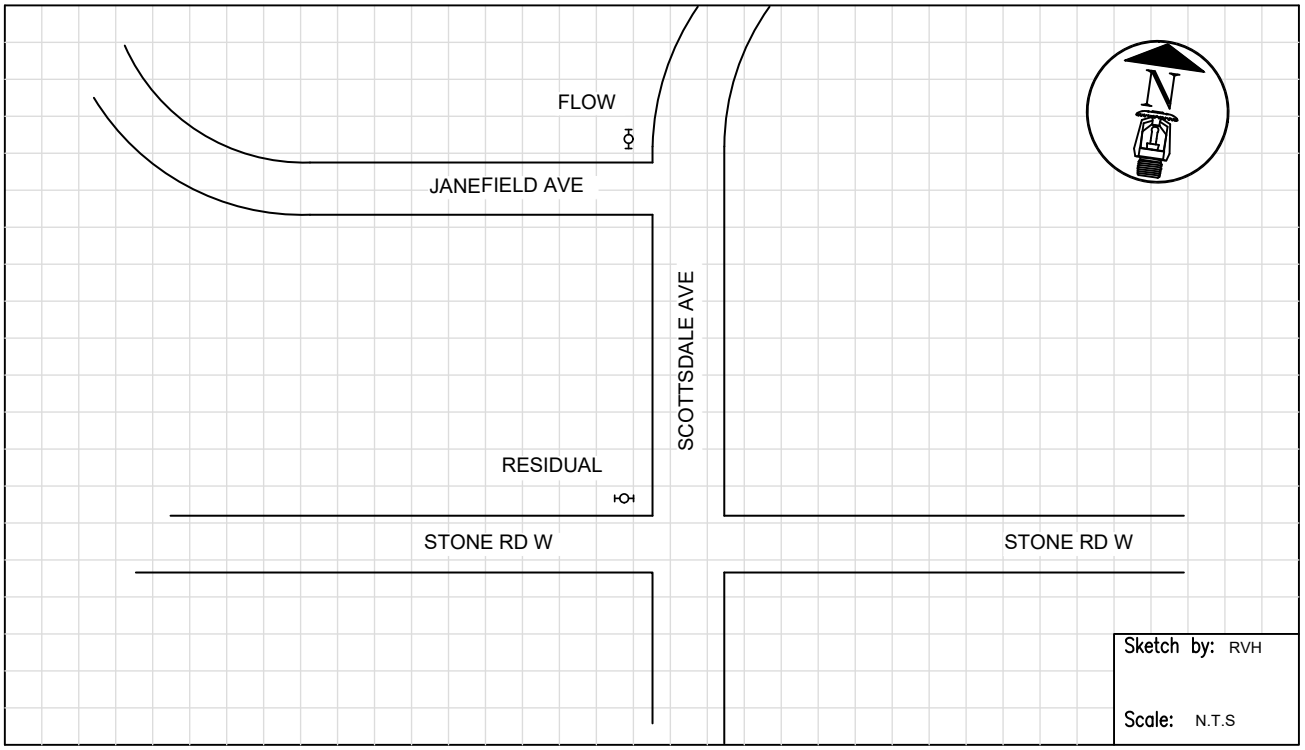
SPIRA FIRE PROTECTION LTD.
31 HAYES AVE., GUELPH, ONTARIO N1E 5V6 Phone: (519) 823-1150 Fax: (519) 822-7752
www.spira.ca

WATER SUPPLY TEST

Facility Name: Proposed Development	File/Project #: 49034
Facility Address: 601 Scottsdale Ave, Guelph, Ontario	
Tested by: Ron Van Hulst	Witnessed by: Guelph Waterworks
Size of Main: ø8"	Comments:
☐ Dead End ☐ Two Ways ☒ Loop	
Flow Hydrant Location: Hydrant Located On West Side Of Scottsdale Ave North Corner Of Janefield Ave	
Residual Hydrant Location: Hydrant Located On West Side Of Scottsdale Ave North Corner Of Stone Rd West	
Static Pressure: 59 psi	Date: Sept 7, 2021
Time: 8:00 ☐ AM ☒ PM	

Test No.	No. of Outlets	Orifice Size (in.)	Pitot Reading (psi)	Equivalent Flow gpm (U.S.)	Total Flow gpm (U.S.)	Residual Pressure (psi)	Comments
1	1	2½"	40	1180	1180	53	
2	2	2½"	2(20)	2(834)	1668	48	
3							
4							

Site Map:



Name and Address of authority who should recieve a copy.

City Of Guelph Waterworks Dept. Att: Jim Hill

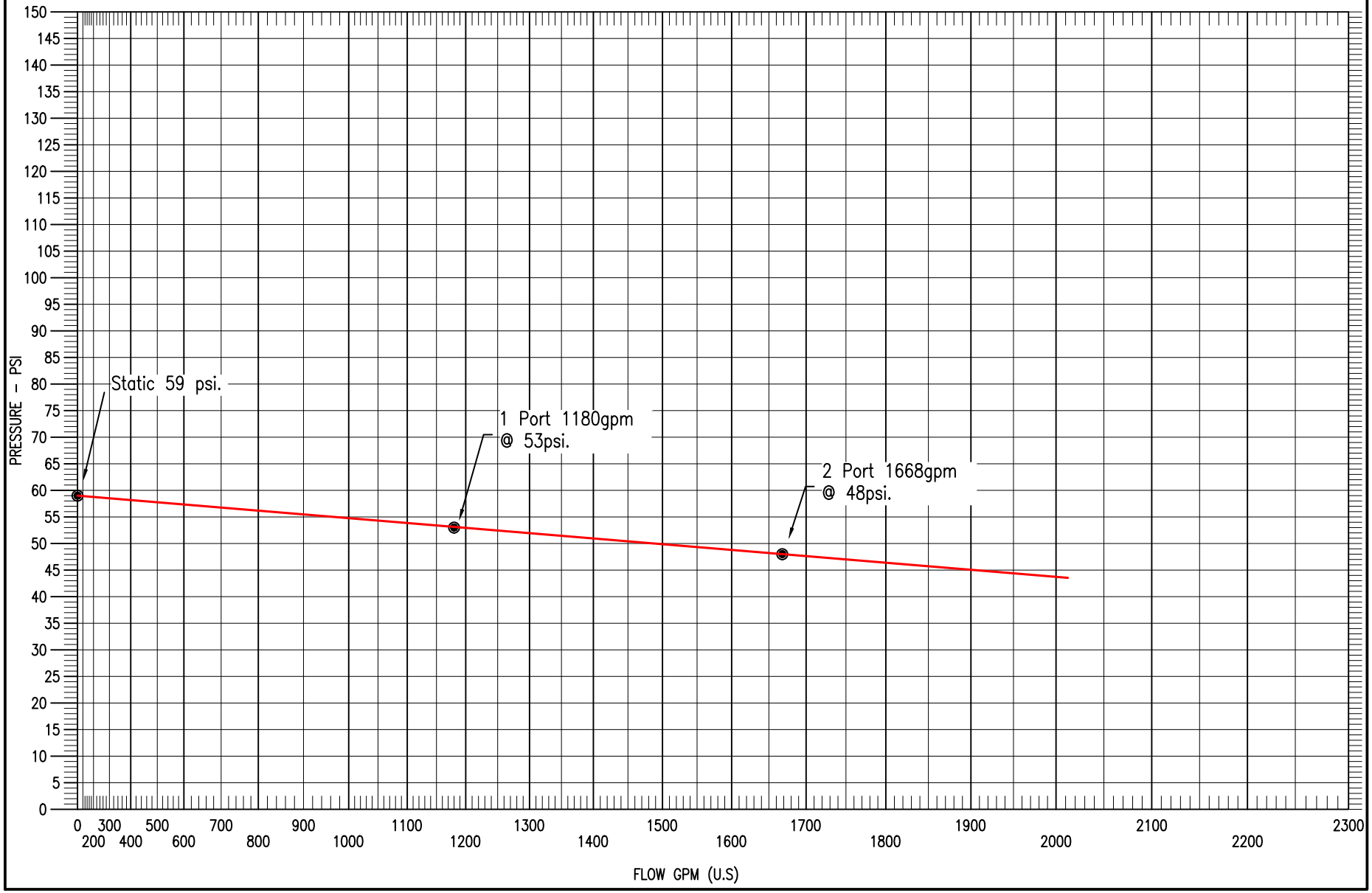
SPIRA FIRE PROTECTION LTD.

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

Facility Name: Proposed Development File/Project # 49034

Facility Address: 601 Scottsdale Ave, Guelph, Ontario

Tested by: Ron Van Hulst/Guelph Waterworks Date: Sept 7, 2021



Appendix C

Sanitary Sewer Design Calculation

601 Scottsdale Drive Phase 2

CITY OF GUELPH

SANITARY SEWER DESIGN SHEET

ENGINEERING SERVICES

Project Number: 49791-100
Date: September 15, 2023
Design By: AJS
Checked By: LEI
File: Q:\49791\101\SAN\Sanitary Sewer Design Sheet.xls

Design Parameters

Average Daily Flow[1]

Residential	1.00	L/s/ha	Manning's "n"	0.013
Commercial	1.70	L/s/ha		
Industrial	1.70	L/s/ha	**Velocity**	**(m/s)**
School/Mult Fam	2.50	L/s/ha	Minimum	0.6
Apt (150upha)	6.00	L/s/ha	Maximum	3.0
Apt (295upha)	7.00	L/s/ha		
High Density Apt	7.00	L/s/ha		

LOCATION				SANITARY FLOW					DESIGN							
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE 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*		*m*	*%*	*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.

Appendix D

MIDUSS Calculations

CALCULATIONS

Orifice Equation (MIDUSS NET)

$$Q = C_c \, p/4 \, D^5 \, \text{sqrt}(2g(H-2/3D))$$

where

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

Appendix E

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:                                  Q:\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          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          109.401    mm/hr"
"             Total depth                 34.276    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular 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 coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.284     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.911      1.311      2.222      hectare"
"             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"
"             Rainfall volume        312.27     449.36     761.62     c.m"
"             Rainfall losses        25.164     5.480      13.550     mm"
"             Runoff depth           9.113      28.797     20.726     mm"
"             Runoff volume          83.02      377.52     460.54     c.m"
"             Runoff coefficient     0.266      0.840      0.605      "
"             Maximum flow           0.024      0.282      0.284      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                      0.284     0.284     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                      0.284     0.284     0.284     0.000"
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"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          139.288    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular 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."
"        0.357   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."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.403     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total 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      "
"             Maximum flow           0.059      0.394      0.403      c.m/sec"
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"            4   Add Runoff "
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"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          169.551    mm/hr"
"             Total depth                 56.290    mm"
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" 33          CATCHMENT 101"
"            1   Triangular 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 Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.508     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.911      1.311      2.222      hectare"
"             Time of concentration  14.450     1.887      4.918      minutes"
"             Time to Centroid       112.513    87.661     93.657     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        512.81     737.95     1250.77    c.m"
"             Rainfall losses        33.266     5.963      17.157     mm"
"             Runoff depth           23.025     50.327     39.133     mm"
"             Runoff volume          209.76     659.78     869.53     c.m"
"             Runoff coefficient     0.409      0.894      0.695      "
"             Maximum flow           0.091      0.491      0.508      c.m/sec"
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"            4   Add Runoff "
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"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
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"        1.000   Time step multiplier"
"             Maximum intensity          191.557    mm/hr"
"             Total depth                 68.266    mm"
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"            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."
"        0.465   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."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.605     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total 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"
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"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          215.802    mm/hr"
"             Total depth                 77.647    mm"
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" 33          CATCHMENT 101"
"            1   Triangular 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 coefficient"
"        0.100   Pervious Ia/S coefficient"
"        5.958   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.919   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.704     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.911      1.311      2.222      hectare"
"             Time of concentration  11.869     1.703      4.504      minutes"
"             Time to Centroid       107.108    86.511     92.186     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        707.38     1017.94    1725.33    c.m"
"             Rainfall losses        38.599     6.288      19.535     mm"
"             Runoff depth           39.049     71.359     58.112     mm"
"             Runoff volume          355.74     935.51     1291.25    c.m"
"             Runoff coefficient     0.503      0.919      0.748      "
"             Maximum flow           0.173      0.658      0.704      c.m/sec"
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"            4   Add Runoff "
"                      0.704     0.704     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                      0.704     0.704     0.704     0.000"
```

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"    1500.000   Max. Hydrograph"
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"           1   Chicago storm"
"    4688.000   Coefficient A"
"      17.000   Constant B"
"       0.962   Exponent C"
"       0.400   Fraction R"
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"       1.000   Time step multiplier"
"            Maximum intensity          239.650    mm/hr"
"            Total depth                 87.263    mm"
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"           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."
"       0.536   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 coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.805     0.000     0.000     0.000 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.911      1.311      2.222      hectare"
"             Time of concentration  11.039     1.631      4.331      minutes"
"             Time to Centroid       105.344    86.109     91.630     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        794.99     1144.01    1938.99    c.m"
"             Rainfall losses        40.465     6.485      20.417     mm"
"             Runoff depth           46.799     80.778     66.847     mm"
"             Runoff volume          426.34     1058.99    1485.33    c.m"
"             Runoff coefficient     0.536      0.926      0.766      "
"             Maximum flow           0.219      0.741      0.805      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                      0.805     0.805     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                      0.805     0.805     0.805     0.000"
```

Post-Development

```
" MIDUSS Output ----------------------------------------------->"
" MIDUSS version                          Version 2.25  rev. 473"
" MIDUSS created                        Sunday, February 7, 2010"
"    10   Units used:                                  ie METRIC"
" Job folder:                                 Q:\49791\101\SWM"
" Output filename:                             2 Year Post.out"
" Licensee name:                                             A"
" Company                                                    "
" Date & Time last used:              9/22/2023 at 1:17:13 PM"
" 31  TIME PARAMETERS"
"  5.000   Time Step"
"  180.000   Max. Storm length"
"  1500.000   Max. Hydrograph"
" 32  STORM Chicago storm"
"    1   Chicago storm"
"  743.000   Coefficient A"
"  6.000   Constant B"
"  0.799   Exponent C"
"  0.400   Fraction R"
"  180.000   Duration"
"  1.000   Time step multiplier"
"  Maximum intensity          109.401    mm/hr"
"  Total depth                 34.276    mm"
"    6   002hyd   Hydrograph extension used in this file"
" 33  CATCHMENT 201"
"    1   Triangular SCS"
"    1   Equal length"
"    1   SCS method"
"  201   Uncontrolled Area"
"  4.000   % Impervious"
"  0.188   Total Area"
"  20.000   Flow length"
"  7.500   Overland Slope"
"  0.180   Pervious Area"
"  20.000   Pervious length"
"  7.500   Pervious slope"
"  0.008   Impervious Area"
"  20.000   Impervious length"
"  7.500   Impervious slope"
"  0.250   Pervious Manning 'n'"
"  81.000   Pervious SCS Curve No."
"  0.265   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."
"  0.832   Impervious Runoff coefficient"
"  0.100   Impervious Ia/S coefficient"
"  0.518   Impervious Initial abstraction"
"          0.008     0.000     0.000     0.000 c.m/sec"
"    Catchment 201          Pervious   Impervious Total Area "
"    Surface Area           0.180      0.008      0.188      hectare"
"    Time of concentration  10.907     1.165      9.780      minutes"
"    Time to Centroid       114.363    89.618     111.501    minutes"
"    Rainfall depth         34.276     34.276     34.276     mm"
"    Rainfall volume        61.86      2.58       64.44      c.m"
"    Rainfall losses        25.186     5.742      24.409     mm"
"    Runoff depth           9.090      28.534     9.868      mm"
"    Runoff volume          16.41      2.15       18.55      c.m"
"    Runoff coefficient     0.265      0.832      0.288      "
"    Maximum flow           0.007      0.002      0.008      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"   4   Add Runoff "
"          0.008     0.008     0.000     0.000"
" 40  HYDROGRAPH Copy to Outflow"
"   8   Copy to Outflow"
"          0.008     0.008     0.008     0.000"
" 40  HYDROGRAPH   Combine    1"
"    6   Combine "
"    1   Node #"
"    Site"
```



```
"    Maximum flow                 0.008    c.m/sec"
"    Hydrograph volume           18.552    c.m"
"          0.008     0.008     0.008     0.008"
" 40  HYDROGRAPH Start - New Tributary"
"   2   Start - New Tributary"
"          0.008     0.000     0.008     0.008"
" 33  CATCHMENT 202"
"    1   Triangular SCS"
"    1   Equal length"
"    1   SCS method"
"  202   Proposed Roof Area"
"  100.000   % Impervious"
"  0.298   Total Area"
"  10.000   Flow length"
"  1.500   Overland Slope"
"  0.000   Pervious Area"
"  10.000   Pervious length"
"  1.500   Pervious slope"
"  0.298   Impervious Area"
"  10.000   Impervious length"
"  1.500   Impervious slope"
"  0.250   Pervious Manning 'n'"
"  81.000   Pervious SCS Curve No."
"  0.000   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."
"  0.835   Impervious Runoff coefficient"
"  0.100   Impervious Ia/S coefficient"
"  0.518   Impervious Initial abstraction"
"          0.070     0.000     0.008     0.008 c.m/sec"
"    Catchment 202          Pervious   Impervious Total Area "
"    Surface Area           0.000      0.298      0.298      hectare"
"    Time of concentration  11.662     1.246      1.246      minutes"
"    Time to Centroid       115.322    89.766     89.766     minutes"
"    Rainfall depth         34.276     34.276     34.276     mm"
"    Rainfall volume        0.00       102.14     102.14     c.m"
"    Rainfall losses        25.167     5.642      5.642      mm"
"    Runoff depth           9.109      28.635     28.635     mm"
"    Runoff volume          0.00       85.33      85.33      c.m"
"    Runoff coefficient     0.000      0.835      0.835      "
"    Maximum flow           0.000      0.070      0.070      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"   4   Add Runoff "
"          0.070     0.070     0.008     0.008"
" 54  POND DESIGN"
"  0.070   Current peak flow    c.m/sec"
"  0.086   Target outflow    c.m/sec"
"  85.3   Hydrograph volume    c.m"
"  11.   Number of stages"
"  0.000   Minimum water level    metre"
"  0.150   Maximum water level    metre"
"  0.000   Starting water level    metre"
"    0   Keep Design Data: 1 = True; 0 = False"
"      Level Discharge    Volume"
"      0.000     0.000     0.000"
"    0.01500   0.00247    0.2240"
"    0.03000   0.00495    1.792"
"    0.04500   0.00742    6.048"
"    0.06000   0.00990    14.336"
"    0.07500   0.01237    28.000"
"    0.09000   0.01485    48.384"
"     0.1050   0.01733    76.832"
"     0.1200   0.01980   110.408"
"     0.1350   0.02228   144.008"
"     0.1500   0.02475   177.608"
"  1.   ROOFTOP"
"    Roof area  Store area  Area/drain  Drain flow  Roof slope"
"      hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"        0.298       0.224     200.000      22.500      66.667"
```

```
"             Using 11 roofdrains on roofstorage area of 2240. square metre"
"             Peak outflow                 0.014    c.m/sec"
"             Maximum level                0.083    metre"
"             Maximum storage             38.452    c.m"
"             Centroidal lag               2.000   hours"
"                  0.070     0.070     0.014     0.008 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                  0.070     0.014     0.014     0.008"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Controlled Area"
"      82.000   % Impervious"
"       1.736   Total Area"
"      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"
"       0.250   Pervious Manning 'n'"
"      81.000   Pervious SCS Curve No."
"       0.265   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."
"       0.842   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.322     0.014     0.014     0.008 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.312      1.424      1.736      hectare"
"            Time of concentration  16.415     1.754      2.703      minutes"
"            Time to Centroid       121.573    90.465     92.479     minutes"
"            Rainfall depth         34.276     34.276     34.276     mm"
"            Rainfall volume        107.11     487.93     595.04     c.m"
"            Rainfall losses        25.177     5.431      8.985      mm"
"            Runoff depth           9.100      28.845     25.291     mm"
"            Runoff volume          28.44      410.62     439.05     c.m"
"            Runoff coefficient     0.265      0.842      0.738      "
"            Maximum flow           0.010      0.320      0.322      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.322     0.332     0.014     0.008"
" 54          POND DESIGN"
"        0.332   Current peak flow    c.m/sec"
"        0.086   Target outflow    c.m/sec"
"        524.4   Hydrograph volume    c.m"
"           8.   Number of stages"
"      322.600   Minimum water level    metre"
"      325.650   Maximum water level    metre"
"      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"
"                325.350     3.388   150.000"
"                325.450     3.814   155.000"
"                325.550     4.261   165.000"
"                325.650     4.727   175.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                324.450     0.900     1.800     0.000     0.000"
```



```
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                322.600     0.630    0.5000     1.000"
"                323.500     0.630    0.2500     1.000"
"             Peak outflow                 0.270    c.m/sec"
"             Maximum level              323.197    metre"
"             Maximum storage             49.785    c.m"
"             Centroidal lag               1.666   hours"
"                  0.322     0.332     0.270     0.008 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Site"
"             Maximum flow                 0.277    c.m/sec"
"             Hydrograph volume          542.924    c.m"
"                    0.322     0.332     0.270     0.277"
```

```
 1 "               MIDUSS Output ------------------------------------------------>"
 2 "               MIDUSS version                          Version 2.25  rev. 473"
 3 "               MIDUSS created                        Sunday, February 7, 2010"
 4 "          10   Units used:                                        ie METRIC"
 5 "               Job folder:                                 Q:\49791\101\SWM"
 6 "               Output filename:                             5 Year Post.out"
 7 "               Licensee name:                                             A"
 8 "               Company                                                    "
 9 "               Date & Time last used:              9/22/2023 at 1:16:26 PM"
10 " 31          TIME PARAMETERS"
11 "        5.000   Time Step"
12 "      180.000   Max. Storm length"
13 "     1500.000   Max. Hydrograph"
14 " 32          STORM Chicago storm"
15 "            1   Chicago storm"
16 "     1593.000   Coefficient A"
17 "       11.000   Constant B"
18 "        0.879   Exponent C"
19 "        0.400   Fraction R"
20 "      180.000   Duration"
21 "        1.000   Time step multiplier"
22 "             Maximum intensity          139.288    mm/hr"
23 "             Total depth                 47.265    mm"
24 "            6   005hyd   Hydrograph extension used in this file"
25 " 33          CATCHMENT 201"
26 "            1   Triangular SCS"
27 "            1   Equal length"
28 "            1   SCS method"
29 "          201   Uncontrolled Area"
30 "        4.000   % Impervious"
31 "        0.188   Total Area"
32 "       20.000   Flow length"
33 "        7.500   Overland Slope"
34 "        0.180   Pervious Area"
35 "       20.000   Pervious length"
36 "        7.500   Pervious slope"
37 "        0.008   Impervious Area"
38 "       20.000   Impervious length"
39 "        7.500   Impervious slope"
40 "        0.250   Pervious Manning 'n'"
41 "       81.000   Pervious SCS Curve No."
42 "        0.356   Pervious Runoff coefficient"
43 "        0.100   Pervious Ia/S coefficient"
44 "        5.958   Pervious Initial abstraction"
45 "        0.015   Impervious Manning 'n'"
46 "       98.000   Impervious SCS Curve No."
47 "        0.864   Impervious Runoff coefficient"
48 "        0.100   Impervious Ia/S coefficient"
49 "        0.518   Impervious Initial abstraction"
50 "                  0.017     0.000     0.000     0.000 c.m/sec"
51 "             Catchment 201          Pervious   Impervious Total Area "
52 "             Surface Area           0.180      0.008      0.188      hectare"
53 "             Time of concentration  8.512      1.044      7.827      minutes"
54 "             Time to Centroid       106.791    87.449     105.017    minutes"
55 "             Rainfall depth         47.265     47.265     47.265     mm"
56 "             Rainfall volume        85.30      3.55       88.86      c.m"
57 "             Rainfall losses        30.425     6.451      29.466     mm"
58 "             Runoff depth           16.840     40.813     17.799     mm"
59 "             Runoff volume          30.39      3.07       33.46      c.m"
60 "             Runoff coefficient     0.356      0.864      0.377      "
61 "             Maximum flow           0.016      0.002      0.017      c.m/sec"
62 " 40          HYDROGRAPH Add Runoff "
63 "            4   Add Runoff "
64 "                  0.017     0.017     0.000     0.000"
65 " 40          HYDROGRAPH Copy to Outflow"
66 "            8   Copy to Outflow"
67 "                  0.017     0.017     0.017     0.000"
68 " 40          HYDROGRAPH   Combine    1"
69 "            6   Combine "
70 "            1   Node #"
71 "                Site"
```



```
72 "             Maximum flow                 0.017    c.m/sec"
73 "             Hydrograph volume           33.462    c.m"
74 "                   0.017     0.017     0.017     0.017"
75 " 40          HYDROGRAPH Start - New Tributary"
76 "            2   Start - New Tributary"
77 "                  0.017     0.000     0.017     0.017"
78 " 33          CATCHMENT 202"
79 "            1   Triangular SCS"
80 "            1   Equal length"
81 "            1   SCS method"
82 "          202   Proposed Roof Area"
83 "      100.000   % Impervious"
84 "        0.298   Total Area"
85 "       10.000   Flow length"
86 "        1.500   Overland Slope"
87 "        0.000   Pervious Area"
88 "       10.000   Pervious length"
89 "        1.500   Pervious slope"
90 "        0.298   Impervious Area"
91 "       10.000   Impervious length"
92 "        1.500   Impervious slope"
93 "        0.250   Pervious Manning 'n'"
94 "       81.000   Pervious SCS Curve No."
95 "        0.000   Pervious Runoff coefficient"
96 "        0.100   Pervious Ia/S coefficient"
97 "        5.958   Pervious Initial abstraction"
98 "        0.015   Impervious Manning 'n'"
99 "       98.000   Impervious SCS Curve No."
100 "       0.867   Impervious Runoff coefficient"
101 "       0.100   Impervious Ia/S coefficient"
102 "       0.518   Impervious Initial abstraction"
103 "                 0.095     0.000     0.017     0.017 c.m/sec"
104 "             Catchment 202          Pervious   Impervious Total Area "
105 "             Surface Area           0.000      0.298      0.298      hectare"
106 "             Time of concentration  9.101      1.117      1.117      minutes"
107 "             Time to Centroid       107.552    87.559     87.559     minutes"
108 "             Rainfall depth         47.265     47.265     47.265     mm"
109 "             Rainfall volume        0.00       140.85     140.85     c.m"
110 "             Rainfall losses        30.426     6.267      6.267      mm"
111 "             Runoff depth           16.839     40.997     40.997     mm"
112 "             Runoff volume          0.00       122.17     122.17     c.m"
113 "             Runoff coefficient     0.000      0.867      0.867      "
114 "             Maximum flow           0.000      0.095      0.095      c.m/sec"
115 " 40          HYDROGRAPH Add Runoff "
116 "            4   Add Runoff "
117 "                  0.095     0.095     0.017     0.017"
118 " 54          POND DESIGN"
119 "       0.095   Current peak flow    c.m/sec"
120 "       0.086   Target outflow    c.m/sec"
121 "       122.2   Hydrograph volume    c.m"
122 "         11.   Number of stages"
123 "       0.000   Minimum water level    metre"
124 "       0.150   Maximum water level    metre"
125 "       0.000   Starting water level    metre"
126 "           0   Keep Design Data: 1 = True; 0 = False"
127 "                 Level Discharge    Volume"
128 "                 0.000     0.000     0.000"
129 "               0.01500   0.00247    0.2240"
130 "               0.03000   0.00495     1.792"
131 "               0.04500   0.00742     6.048"
132 "               0.06000   0.00990    14.336"
133 "               0.07500   0.01237    28.000"
134 "               0.09000   0.01485    48.384"
135 "                0.1050   0.01733    76.832"
136 "                0.1200   0.01980   110.408"
137 "                0.1350   0.02228   144.008"
138 "                0.1500   0.02475   177.608"
139 "           1.   ROOFTOP"
140 "                Roof area  Store area  Area/drain  Drain flow  Roof slope"
141 "                  hectare     hectare    sq.metre  L/min/25mm      g H:1V"
142 "                    0.298       0.224     200.000      22.500      66.667"
```

```
"             Using 11 roofdrains on roofstorage area of 2240. square metre"
"             Peak outflow                 0.016    c.m/sec"
"             Maximum level                0.098    metre"
"             Maximum storage             63.088    c.m"
"             Centroidal lag               2.181   hours"
"                  0.095     0.095     0.016     0.017 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                  0.095     0.016     0.016     0.017"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Controlled Area"
"      82.000   % Impervious"
"       1.736   Total Area"
"      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"
"       0.250   Pervious Manning 'n'"
"      81.000   Pervious SCS Curve No."
"       0.357   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."
"       0.878   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.447     0.016     0.016     0.017 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.312      1.424      1.736      hectare"
"             Time of concentration  12.810     1.572      2.492      minutes"
"             Time to Centroid       112.343    88.134     90.117     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        147.69     672.82     820.52     c.m"
"             Rainfall losses        30.401     5.772      10.205     mm"
"             Runoff depth           16.864     41.493     37.060     mm"
"             Runoff volume          52.70      590.66     643.35     c.m"
"             Runoff coefficient     0.357      0.878      0.784      "
"             Maximum flow           0.023      0.442      0.447      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.447     0.459     0.016     0.017"
" 54          POND DESIGN"
"       0.459   Current peak flow    c.m/sec"
"       0.086   Target outflow    c.m/sec"
"       765.6   Hydrograph volume    c.m"
"          8.   Number of stages"
"     322.600   Minimum water level    metre"
"     325.650   Maximum water level    metre"
"     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"
"               325.350     3.388   150.000"
"               325.450     3.814   155.000"
"               325.550     4.261   165.000"
"               325.650     4.727   175.000"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"               324.450     0.900     1.800     0.000     0.000"
```



```
"          2.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               322.600     0.630    0.5000     1.000"
"               323.500     0.630    0.2500     1.000"
"             Peak outflow                 0.382    c.m/sec"
"             Maximum level              323.443    metre"
"             Maximum storage             70.239    c.m"
"             Centroidal lag               1.661   hours"
"                  0.447     0.459     0.382     0.017 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Site"
"             Maximum flow                 0.398    c.m/sec"
"             Hydrograph volume          799.066    c.m"
"                    0.447     0.459     0.382     0.398"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                  Q:\49791\101\SWM"
"                Output filename:                             10 Year Post.out"
"                Licensee name:                                              A"
"                Company                                                     "
"                Date & Time last used:                9/22/2023 at 1:15:19 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          169.551    mm/hr"
"             Total depth                 56.290    mm"
"           6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Uncontrolled Area"
"        4.000   % Impervious"
"        0.188   Total Area"
"       20.000   Flow length"
"        7.500   Overland Slope"
"        0.180   Pervious Area"
"       20.000   Pervious length"
"        7.500   Pervious slope"
"        0.008   Impervious Area"
"       20.000   Impervious length"
"        7.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       81.000   Pervious SCS Curve No."
"        0.407   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."
"        0.874   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.026     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.180      0.008      0.188      hectare"
"             Time of concentration  7.356      0.961      6.831      minutes"
"             Time to Centroid       103.388    86.389     101.993    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        101.59     4.23       105.83     c.m"
"             Rainfall losses        33.368     7.104      32.318     mm"
"             Runoff depth           22.922     49.187     23.972     mm"
"             Runoff volume          41.37      3.70       45.07      c.m"
"             Runoff coefficient     0.407      0.874      0.426      "
"             Maximum flow           0.025      0.003      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.026     0.026     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.026     0.026     0.026     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Site"
```



```
"             Maximum flow                  0.026    c.m/sec"
"             Hydrograph volume            45.068    c.m"
"                    0.026     0.026     0.026     0.026"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.026     0.000     0.026     0.026"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Proposed Roof Area"
"      100.000   % Impervious"
"        0.298   Total Area"
"       10.000   Flow length"
"        1.500   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.500   Pervious slope"
"        0.298   Impervious Area"
"       10.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       81.000   Pervious SCS Curve No."
"        0.000   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."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.118     0.000     0.026     0.026 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.298      0.298      hectare"
"             Time of concentration  7.865      1.027      1.027      minutes"
"             Time to Centroid       104.021    86.487     86.487     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        0.00       167.74     167.74     c.m"
"             Rainfall losses        33.320     6.851      6.851      mm"
"             Runoff depth           22.970     49.440     49.440     mm"
"             Runoff volume          0.00       147.33     147.33     c.m"
"             Runoff coefficient     0.000      0.878      0.878      "
"             Maximum flow           0.000      0.118      0.118      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.118     0.118     0.026     0.026"
" 54          POND DESIGN"
"         0.118   Current peak flow    c.m/sec"
"         0.086   Target outflow    c.m/sec"
"         147.3   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.150   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.01500   0.00247    0.2240"
"                 0.03000   0.00495     1.792"
"                 0.04500   0.00742     6.048"
"                 0.06000   0.00990    14.336"
"                 0.07500   0.01237    28.000"
"                 0.09000   0.01485    48.384"
"                  0.1050   0.01733    76.832"
"                  0.1200   0.01980   110.408"
"                  0.1350   0.02228   144.008"
"                  0.1500   0.02475   177.608"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.298       0.224     200.000      22.500      66.667"
```

```
"             Using 11 roofdrains on roofstorage area of 2240. square metre"
"             Peak outflow                 0.018    c.m/sec"
"             Maximum level                0.107    metre"
"             Maximum storage             81.572    c.m"
"             Centroidal lag               2.297   hours"
"                  0.118     0.118     0.018     0.026 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                  0.118     0.018     0.018     0.026"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Controlled Area"
"      82.000   % Impervious"
"       1.736   Total Area"
"      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"
"       0.250   Pervious Manning 'n'"
"      81.000   Pervious SCS Curve No."
"       0.408   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."
"       0.892   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.561     0.018     0.018     0.026 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.312      1.424      1.736      hectare"
"            Time of concentration  11.071     1.446      2.324      minutes"
"            Time to Centroid       108.121    86.999     88.926     minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        175.90     801.30     977.20     c.m"
"            Rainfall losses        33.317     6.058      10.965     mm"
"            Runoff depth           22.973     50.232     45.325     mm"
"            Runoff volume          71.79      715.06     786.85     c.m"
"            Runoff coefficient     0.408      0.892      0.805      "
"            Maximum flow           0.035      0.552      0.561      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.561     0.574     0.018     0.026"
" 54          POND DESIGN"
"       0.574   Current peak flow    c.m/sec"
"       0.086   Target outflow    c.m/sec"
"       934.1   Hydrograph volume    c.m"
"          8.   Number of stages"
"     322.600   Minimum water level    metre"
"     325.650   Maximum water level    metre"
"     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"
"               325.350     3.388   150.000"
"               325.450     3.814   155.000"
"               325.550     4.261   165.000"
"               325.650     4.727   175.000"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"               324.450     0.900     1.800     0.000     0.000"
```



```
"          2.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               322.600     0.630    0.5000     1.000"
"               323.500     0.630    0.2500     1.000"
"             Peak outflow                 0.472    c.m/sec"
"             Maximum level              323.659    metre"
"             Maximum storage             88.221    c.m"
"             Centroidal lag               1.661   hours"
"                  0.561     0.574     0.472     0.026 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Site"
"             Maximum flow                 0.499    c.m/sec"
"             Hydrograph volume          979.523    c.m"
"                    0.561     0.574     0.472     0.499"
```

```
                MIDUSS Output ------------------------------------------------>"
                MIDUSS version                          Version 2.25  rev. 473"
                MIDUSS created                        Sunday, February 7, 2010"
           10   Units used:                                          ie METRIC"
                Job folder:                                  Q:\49791\101\SWM"
                Output filename:                             25 Year Post.out"
                Licensee name:                                               A"
                Company                                                      "
                Date & Time last used:                9/22/2023 at 1:14:23 PM"
 31          TIME PARAMETERS"
       5.000   Time Step"
     180.000   Max. Storm length"
    1500.000   Max. Hydrograph"
 32         STORM Chicago storm"
           1   Chicago storm"
    3158.000   Coefficient A"
      15.000   Constant B"
       0.936   Exponent C"
       0.400   Fraction R"
     180.000   Duration"
       1.000   Time step multiplier"
             Maximum intensity          191.557    mm/hr"
             Total depth                 68.266    mm"
           6   025hyd   Hydrograph extension used in this file"
 33         CATCHMENT 201"
           1   Triangular SCS"
           1   Equal length"
           1   SCS method"
         201   Uncontrolled Area"
       4.000   % Impervious"
       0.188   Total Area"
      20.000   Flow length"
       7.500   Overland Slope"
       0.180   Pervious Area"
      20.000   Pervious length"
       7.500   Pervious slope"
       0.008   Impervious Area"
      20.000   Impervious length"
       7.500   Impervious slope"
       0.250   Pervious Manning 'n'"
      81.000   Pervious SCS Curve No."
       0.462   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."
       0.885   Impervious Runoff coefficient"
       0.100   Impervious Ia/S coefficient"
       0.518   Impervious Initial abstraction"
                   0.036     0.000     0.000     0.000 c.m/sec"
             Catchment 201          Pervious   Impervious Total Area "
             Surface Area           0.180      0.008      0.188      hectare"
             Time of concentration  6.578      0.911      6.159      minutes"
             Time to Centroid       101.306    85.871     100.166    minutes"
             Rainfall depth         68.266     68.266     68.266     mm"
             Rainfall volume        123.21     5.13       128.34     c.m"
             Rainfall losses        36.720     7.865      35.566     mm"
             Runoff depth           31.546     60.401     32.700     mm"
             Runoff volume          56.93      4.54       61.48      c.m"
             Runoff coefficient     0.462      0.885      0.479      "
             Maximum flow           0.034      0.003      0.036      c.m/sec"
 40          HYDROGRAPH Add Runoff "
           4   Add Runoff "
                   0.036     0.036     0.000     0.000"
 40          HYDROGRAPH Copy to Outflow"
           8   Copy to Outflow"
                   0.036     0.036     0.036     0.000"
 40          HYDROGRAPH   Combine    1"
           6   Combine "
           1   Node #"
               Site"
             Maximum flow                0.036    c.m/sec"
             Hydrograph volume          61.476    c.m"
                   0.036     0.036     0.036     0.036"
 40          HYDROGRAPH Start - New Tributary"
           2   Start - New Tributary"
                   0.036     0.000     0.036     0.036"
 33          CATCHMENT 202"
           1   Triangular SCS"
           1   Equal length"
           1   SCS method"
         202   Proposed Roof Area"
     100.000   % Impervious"
       0.298   Total Area"
      10.000   Flow length"
       1.500   Overland Slope"
       0.000   Pervious Area"
      10.000   Pervious length"
       1.500   Pervious slope"
       0.298   Impervious Area"
      10.000   Impervious length"
       1.500   Impervious slope"
       0.250   Pervious Manning 'n'"
      81.000   Pervious SCS Curve No."
       0.000   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."
       0.890   Impervious Runoff coefficient"
       0.100   Impervious Ia/S coefficient"
       0.518   Impervious Initial abstraction"
                   0.136     0.000     0.036     0.036 c.m/sec"
             Catchment 202          Pervious   Impervious Total Area "
             Surface Area           0.000      0.298      0.298      hectare"
             Time of concentration  7.034      0.974      0.974      minutes"
             Time to Centroid       101.890    85.955     85.955     minutes"
             Rainfall depth         68.266     68.266     68.266     mm"
             Rainfall volume        0.00       203.43     203.43     c.m"
             Rainfall losses        36.673     7.524      7.524      mm"
             Runoff depth           31.594     60.742     60.742     mm"
             Runoff volume          0.00       181.01     181.01     c.m"
             Runoff coefficient     0.000      0.890      0.890      "
             Maximum flow           0.000      0.136      0.136      c.m/sec"
 40          HYDROGRAPH Add Runoff "
           4   Add Runoff "
                   0.136     0.136     0.036     0.036"
 54          POND DESIGN"
       0.136   Current peak flow    c.m/sec"
       0.086   Target outflow    c.m/sec"
       181.0   Hydrograph volume    c.m"
         11.   Number of stages"
       0.000   Minimum water level    metre"
       0.150   Maximum water level    metre"
       0.000   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
                 0.000     0.000     0.000"
               0.01500   0.00247    0.2240"
               0.03000   0.00495     1.792"
               0.04500   0.00742     6.048"
               0.06000   0.00990    14.336"
               0.07500   0.01237    28.000"
               0.09000   0.01485    48.384"
                0.1050   0.01733    76.832"
                0.1200   0.01980   110.408"
                0.1350   0.02228   144.008"
                0.1500   0.02475   177.608"
          1.   ROOFTOP"
               Roof area  Store area  Area/drain  Drain flow  Roof slope"
                 hectare     hectare    sq.metre  L/min/25mm      g H:1V"
                   0.298       0.224     200.000      22.500      66.667"
```

```
" 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"
" 40 HYDROGRAPH Next link "
" 5 Next link "
" 0.136 0.019 0.019 0.036"
" 33 CATCHMENT 203"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 203 Controlled Area"
" 82.000 % Impervious"
" 1.736 Total Area"
" 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"
" 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"
" 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 68.266 mm"
" 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"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.657 0.672 0.019 0.036"
" 54 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"
" 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"
" 325.350 3.388 150.000"
" 325.450 3.814 155.000"
" 325.550 4.261 165.000"
" 325.650 4.727 175.000"
" 1. WEIRS"
" Crest Weir Crest Left Right"
" elevation coefficie breadth sideslope sideslope"
" 324.450 0.900 1.800 0.000 0.000"
```



```
" 2. ORIFICES"
" Orifice Orifice Orifice Number of"
" invert coefficie diameter orifices"
" 322.600 0.630 0.5000 1.000"
" 323.500 0.630 0.2500 1.000"
" Peak outflow 0.560 c.m/sec"
" Maximum level 323.871 metre"
" Maximum storage 105.912 c.m"
" Centroidal lag 1.674 hours"
" 0.657 0.672 0.560 0.036 c.m/sec"
" 40 HYDROGRAPH Combine 1"
" 6 Combine "
" 1 Node #"
" Site"
" Maximum flow 0.596 c.m/sec"
" Hydrograph volume 1222.385 c.m"
" 0.657 0.672 0.560 0.596"
```

```
" MIDUSS Output ---------------------------------------------->"
" MIDUSS version                          Version 2.25  rev. 473"
" MIDUSS created                        Sunday, February 7, 2010"
"    10   Units used:                                  ie METRIC"
" Job folder:                                 Q:\49791\101\SWM"
" Output filename:                            50 Year Post.out"
" Licensee name:                                             A"
" Company                                                    "
" Date & Time last used:              9/22/2023 at 1:13:00 PM"
" 31  TIME PARAMETERS"
"     5.000   Time Step"
"   180.000   Max. Storm length"
"  1500.000   Max. Hydrograph"
" 32  STORM Chicago storm"
"     1   Chicago storm"
"  3886.000   Coefficient A"
"    16.000   Constant B"
"     0.950   Exponent C"
"     0.400   Fraction R"
"   180.000   Duration"
"     1.000   Time step multiplier"
"          Maximum intensity          215.802    mm/hr"
"          Total depth                 77.647    mm"
"     6   050hyd   Hydrograph extension used in this file"
" 33  CATCHMENT 201"
"     1   Triangular SCS"
"     1   Equal length"
"     1   SCS method"
"   201   Uncontrolled Area"
"     4.000   % Impervious"
"     0.188   Total Area"
"    20.000   Flow length"
"     7.500   Overland Slope"
"     0.180   Pervious Area"
"    20.000   Pervious length"
"     7.500   Pervious slope"
"     0.008   Impervious Area"
"    20.000   Impervious length"
"     7.500   Impervious slope"
"     0.250   Pervious Manning 'n'"
"    81.000   Pervious SCS Curve No."
"     0.499   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."
"     0.889   Impervious Runoff coefficient"
"     0.100   Impervious Ia/S coefficient"
"     0.518   Impervious Initial abstraction"
"             0.046     0.000     0.000     0.000 c.m/sec"
"          Catchment 201          Pervious   Impervious Total Area "
"          Surface Area           0.180      0.008      0.188      hectare"
"          Time of concentration  6.042      0.867      5.685      minutes"
"          Time to Centroid       99.713     85.444     98.727     minutes"
"          Rainfall depth         77.647     77.647     77.647     mm"
"          Rainfall volume        140.14     5.84       145.98     c.m"
"          Rainfall losses        38.881     8.612      37.671     mm"
"          Runoff depth           38.766     69.035     39.977     mm"
"          Runoff volume          69.96      5.19       75.16      c.m"
"          Runoff coefficient     0.499      0.889      0.515      "
"          Maximum flow           0.044      0.004      0.046      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"     4   Add Runoff "
"             0.046     0.046     0.000     0.000"
" 40  HYDROGRAPH Copy to Outflow"
"     8   Copy to Outflow"
"             0.046     0.046     0.046     0.000"
" 40  HYDROGRAPH   Combine    1"
"     6   Combine "
"     1   Node #"
"         Site"
"          Maximum flow                0.046    c.m/sec"
"          Hydrograph volume          75.156    c.m"
"             0.046     0.046     0.046     0.046"
" 40  HYDROGRAPH Start - New Tributary"
"    2   Start - New Tributary"
"             0.046     0.000     0.046     0.046"
" 33  CATCHMENT 202"
"     1   Triangular SCS"
"     1   Equal length"
"     1   SCS method"
"   202   Proposed Roof Area"
"   100.000   % Impervious"
"     0.298   Total Area"
"    10.000   Flow length"
"     1.500   Overland Slope"
"     0.000   Pervious Area"
"    10.000   Pervious length"
"     1.500   Pervious slope"
"     0.298   Impervious Area"
"    10.000   Impervious length"
"     1.500   Impervious slope"
"     0.250   Pervious Manning 'n'"
"    81.000   Pervious SCS Curve No."
"     0.000   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."
"     0.895   Impervious Runoff coefficient"
"     0.100   Impervious Ia/S coefficient"
"     0.518   Impervious Initial abstraction"
"             0.154     0.000     0.046     0.046 c.m/sec"
"          Catchment 202          Pervious   Impervious Total Area "
"          Surface Area           0.000      0.298      0.298      hectare"
"          Time of concentration  6.461      0.927      0.927      minutes"
"          Time to Centroid       100.284    85.516     85.516     minutes"
"          Rainfall depth         77.647     77.647     77.647     mm"
"          Rainfall volume        0.00       231.39     231.39     c.m"
"          Rainfall losses        38.878     8.178      8.178      mm"
"          Runoff depth           38.769     69.470     69.470     mm"
"          Runoff volume          0.00       207.02     207.02     c.m"
"          Runoff coefficient     0.000      0.895      0.895      "
"          Maximum flow           0.000      0.154      0.154      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"    4   Add Runoff "
"             0.154     0.154     0.046     0.046"
" 54  POND DESIGN"
"     0.154   Current peak flow    c.m/sec"
"     0.086   Target outflow    c.m/sec"
"     207.0   Hydrograph volume    c.m"
"       11.   Number of stages"
"     0.000   Minimum water level    metre"
"     0.150   Maximum water level    metre"
"     0.000   Starting water level    metre"
"        0   Keep Design Data: 1 = True; 0 = False"
"           Level Discharge    Volume"
"            0.000     0.000     0.000"
"          0.01500   0.00247    0.2240"
"          0.03000   0.00495     1.792"
"          0.04500   0.00742     6.048"
"          0.06000   0.00990    14.336"
"          0.07500   0.01237    28.000"
"          0.09000   0.01485    48.384"
"           0.1050   0.01733    76.832"
"           0.1200   0.01980   110.408"
"           0.1350   0.02228   144.008"
"           0.1500   0.02475   177.608"
"      1.   ROOFTOP"
"           Roof area  Store area  Area/drain  Drain flow  Roof slope"
"             hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"               0.298       0.224     200.000      22.500      66.667"
```

```
" Using 11 roofdrains on roofstorage area of 2240. square metre"
" Peak outflow 0.021 c.m/sec"
" Maximum level 0.126 metre"
" Maximum storage 123.101 c.m"
" Centroidal lag 2.541 hours"
" 0.154 0.154 0.021 0.046 c.m/sec"
" 40 HYDROGRAPH Next link "
" 5 Next link "
" 0.154 0.021 0.021 0.046"
" 33 CATCHMENT 203"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 203 Controlled Area"
" 82.000 % Impervious"
" 1.736 Total Area"
" 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"
" 0.250 Pervious Manning 'n'"
" 81.000 Pervious SCS Curve No."
" 0.502 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."
" 0.914 Impervious Runoff coefficient"
" 0.100 Impervious Ia/S coefficient"
" 0.518 Impervious Initial abstraction"
" 0.755 0.021 0.021 0.046 c.m/sec"
" Catchment 203 Pervious Impervious Total Area "
" Surface Area 0.312 1.424 1.736 hectare"
" Time of concentration 9.093 1.305 2.143 minutes"
" Time to Centroid 103.550 85.962 87.856 minutes"
" Rainfall depth 77.647 77.647 77.647 mm"
" Rainfall volume 242.63 1105.33 1347.96 c.m"
" Rainfall losses 38.649 6.674 12.429 mm"
" Runoff depth 38.999 70.974 65.218 mm"
" Runoff volume 121.86 1010.33 1132.19 c.m"
" Runoff coefficient 0.502 0.914 0.840 "
" Maximum flow 0.067 0.732 0.755 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.755 0.770 0.021 0.046"
" 54 POND DESIGN"
" 0.770 Current peak flow c.m/sec"
" 0.086 Target outflow c.m/sec"
" 1339.2 Hydrograph volume c.m"
" 8. Number of stages"
" 322.600 Minimum water level metre"
" 325.650 Maximum water level metre"
" 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"
" 325.350 3.388 150.000"
" 325.450 3.814 155.000"
" 325.550 4.261 165.000"
" 325.650 4.727 175.000"
" 1. WEIRS"
" Crest Weir Crest Left Right"
" elevation coefficie breadth sideslope sideslope"
" 324.450 0.900 1.800 0.000 0.000"
```



```
" 2. ORIFICES"
" Orifice Orifice Orifice Number of"
" invert coefficie diameter orifices"
" 322.600 0.630 0.5000 1.000"
" 323.500 0.630 0.2500 1.000"
" Peak outflow 0.641 c.m/sec"
" Maximum level 324.072 metre"
" Maximum storage 122.635 c.m"
" Centroidal lag 1.682 hours"
" 0.755 0.770 0.641 0.046 c.m/sec"
" 40 HYDROGRAPH Combine 1"
" 6 Combine "
" 1 Node #"
" Site"
" Maximum flow 0.688 c.m/sec"
" Hydrograph volume 1413.688 c.m"
" 0.755 0.770 0.641 0.688"
```

```
" MIDUSS Output ----------------------------------------------->"
" MIDUSS version                          Version 2.25  rev. 473"
" MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                ie METRIC"
" MIDUSS created                                  Q:\49791\101\SWM"
" Output filename:                              100 Year Post.out"
" Licensee name:                                               A"
" Company                                                      "
" Date & Time last used:              9/19/2023 at 3:34:05 PM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    4688.000   Coefficient A"
"      17.000   Constant B"
"       0.962   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          239.650    mm/hr"
"            Total depth                 87.263    mm"
"           6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled Area"
"       4.000   % Impervious"
"       0.188   Total Area"
"      20.000   Flow length"
"       7.500   Overland Slope"
"       0.180   Pervious Area"
"      20.000   Pervious length"
"       7.500   Pervious slope"
"       0.008   Impervious Area"
"      20.000   Impervious length"
"       7.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      81.000   Pervious SCS Curve No."
"       0.534   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."
"       0.892   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.057     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.180      0.008      0.188      hectare"
"            Time of concentration  5.620      0.830      5.308      minutes"
"            Time to Centroid       98.451     85.103     97.583     minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
"            Rainfall volume        157.49     6.56       164.06     c.m"
"            Rainfall losses        40.648     9.419      39.399     mm"
"            Runoff depth           46.615     77.844     47.864     mm"
"            Runoff volume          84.13      5.85       89.98      c.m"
"            Runoff coefficient     0.534      0.892      0.549      "
"            Maximum flow           0.054      0.004      0.057      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.057     0.057     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.057     0.057     0.057     0.000"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Site"
```



```
"            Maximum flow                0.057    c.m/sec"
"            Hydrograph volume          89.985    c.m"
"                  0.057     0.057     0.057     0.057"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.057     0.000     0.057     0.057"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Proposed Roof Area"
"     100.000   % Impervious"
"       0.298   Total Area"
"      10.000   Flow length"
"       1.500   Overland Slope"
"       0.000   Pervious Area"
"      10.000   Pervious length"
"       1.500   Pervious slope"
"       0.298   Impervious Area"
"      10.000   Impervious length"
"       1.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      81.000   Pervious SCS Curve No."
"       0.000   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."
"       0.898   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.172     0.000     0.057     0.057 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.298      0.298      hectare"
"            Time of concentration  6.009      0.888      0.888      minutes"
"            Time to Centroid       98.960     85.170     85.170     minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
"            Rainfall volume        0.00       260.04     260.05     c.m"
"            Rainfall losses        40.776     8.903      8.903      mm"
"            Runoff depth           46.487     78.361     78.361     mm"
"            Runoff volume          0.00       233.52     233.52     c.m"
"            Runoff coefficient     0.000      0.898      0.898      "
"            Maximum flow           0.000      0.172      0.172      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.172     0.172     0.057     0.057"
" 54          POND DESIGN"
"       0.172   Current peak flow    c.m/sec"
"       0.086   Target outflow    c.m/sec"
"       233.5   Hydrograph volume    c.m"
"         11.   Number of stages"
"       0.000   Minimum water level    metre"
"       0.150   Maximum water level    metre"
"       0.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 0.000     0.000     0.000"
"               0.01500   0.00247    0.2240"
"               0.03000   0.00495     1.792"
"               0.04500   0.00742     6.048"
"               0.06000   0.00990    14.336"
"               0.07500   0.01237    28.000"
"               0.09000   0.01485    48.384"
"                0.1050   0.01733    76.832"
"                0.1200   0.01980   110.408"
"                0.1350   0.02228   144.008"
"                0.1500   0.02475   177.608"
"          1.   ROOFTOP"
"               Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                 hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                   0.298       0.224     200.000      22.500      66.667"
```

```
" Using 11 roofdrains on roofstorage area of 2240. square metre"
" Peak outflow 0.022 c.m/sec"
" Maximum level 0.134 metre"
" Maximum storage 142.255 c.m"
" Centroidal lag 2.638 hours"
" 0.172 0.172 0.022 0.057 c.m/sec"
" 40 HYDROGRAPH Next link "
" 5 Next link "
" 0.172 0.022 0.022 0.057"
" 33 CATCHMENT 203"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 203 Controlled Area"
" 82.000 % Impervious"
" 1.736 Total Area"
" 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"
" 0.250 Pervious Manning 'n'"
" 81.000 Pervious SCS Curve No."
" 0.535 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."
" 0.920 Impervious Runoff coefficient"
" 0.100 Impervious Ia/S coefficient"
" 0.518 Impervious Initial abstraction"
" 0.852 0.022 0.022 0.057 c.m/sec"
" Catchment 203 Pervious Impervious Total Area "
" Surface Area 0.312 1.424 1.736 hectare"
" Time of concentration 8.457 1.250 2.066 minutes"
" Time to Centroid 102.026 85.599 87.459 minutes"
" Rainfall depth 87.263 87.263 87.263 mm"
" Rainfall volume 272.68 1242.21 1514.89 c.m"
" Rainfall losses 40.567 6.993 13.036 mm"
" Runoff depth 46.697 80.271 74.227 mm"
" Runoff volume 145.92 1142.67 1288.59 c.m"
" Runoff coefficient 0.535 0.920 0.851 "
" Maximum flow 0.083 0.820 0.852 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.852 0.869 0.022 0.057"
" 54 POND DESIGN"
" 0.869 Current peak flow c.m/sec"
" 0.086 Target outflow c.m/sec"
" 1522.1 Hydrograph volume c.m"
" 8. Number of stages"
" 322.600 Minimum water level metre"
" 325.650 Maximum water level metre"
" 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"
" 325.350 3.388 150.000"
" 325.450 3.814 155.000"
" 325.550 4.261 165.000"
" 325.650 4.727 175.000"
" 1. WEIRS"
" Crest Weir Crest Left Right"
" elevation coefficie breadth sideslope sideslope"
" 324.450 0.900 1.800 0.000 0.000"
```



```
" 2. ORIFICES"
" Orifice Orifice Orifice Number of"
" invert coefficie diameter orifices"
" 322.600 0.630 0.5000 1.000"
" 323.500 0.630 0.2500 1.000"
" Peak outflow 0.724 c.m/sec"
" Maximum level 324.275 metre"
" Maximum storage 139.544 c.m"
" Centroidal lag 1.690 hours"
" 0.852 0.869 0.724 0.057 c.m/sec"
" 40 HYDROGRAPH Combine 1"
" 6 Combine "
" 1 Node #"
" Site"
" Maximum flow 0.781 c.m/sec"
" Hydrograph volume 1611.776 c.m"
" 0.852 0.869 0.724 0.781"
```

Appendix F

OGS Sizing Report

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/15/2023

Province:	Ontario
City:	Guelph
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	

Drainage Area (ha):	2.034
% Imperviousness:	85.00

Runoff Coefficient 'c': 0.81

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	62.42
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	2007
Estimated Average Annual Sediment Volume (L/yr):	1632

Project Name:	601 Scottsdale Phase 2
Project Number:	62610
Designer Name:	Jolie Nguyen
Designer Company:	MTE Consultants
Designer Email:	jnguyen@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	60
EFO6	75
EFO8	83
EFO10	89
EFO12	92

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 83

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

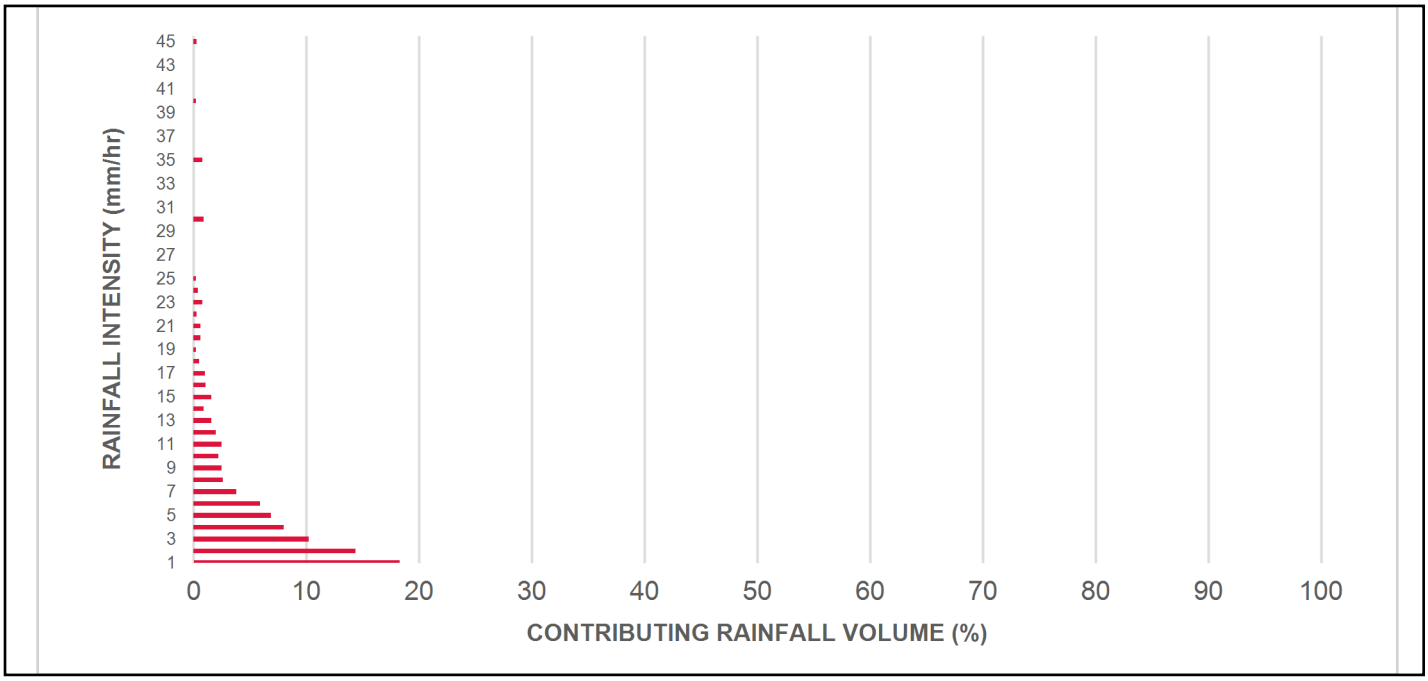
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

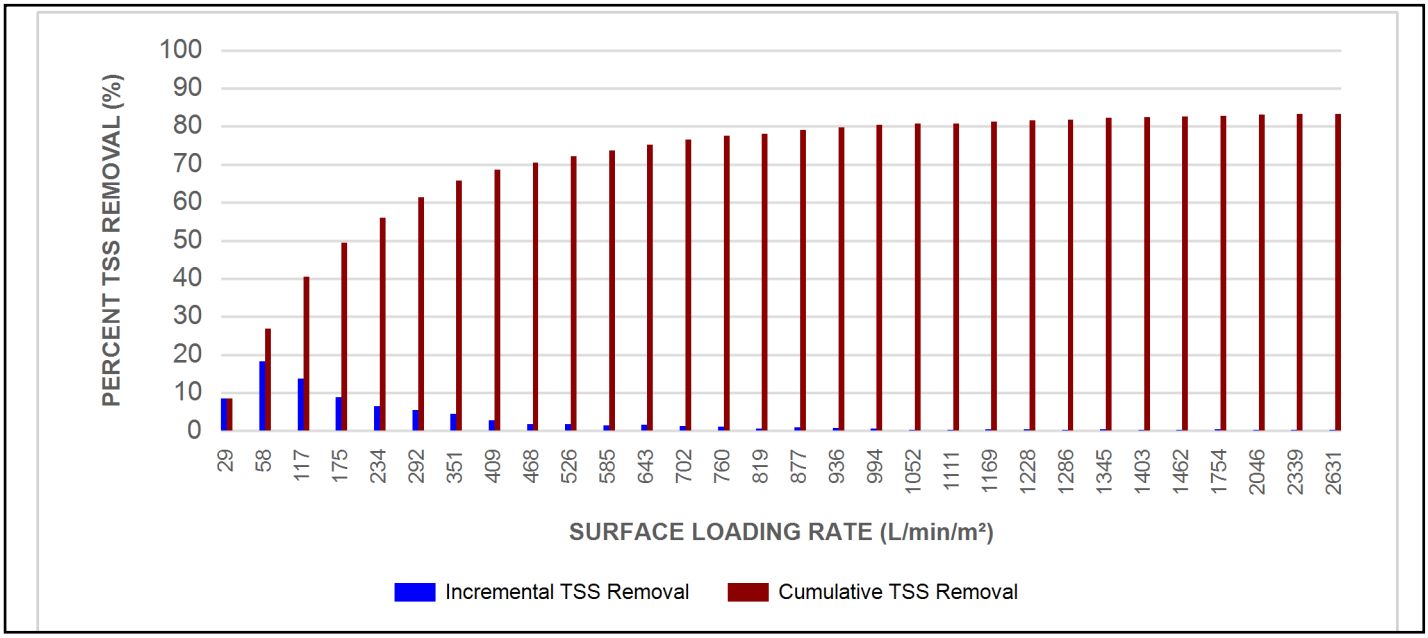
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	2.29	137.0	29.0	100	8.5	8.5
1.00	18.3	26.8	4.58	275.0	58.0	100	18.3	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

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

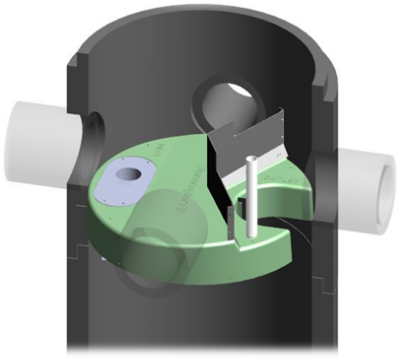
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

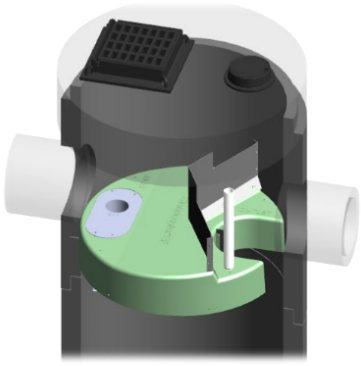
DESIGN FLEXIBILITY

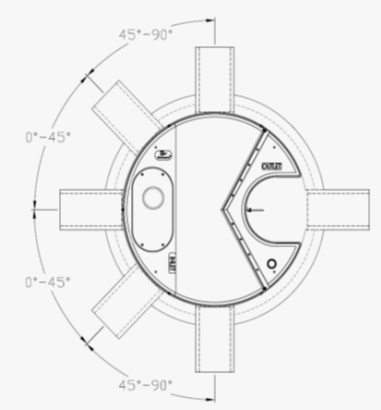
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing 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/m^2 to 1400 L/min/m^2, 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/m^2 and 1400 L/min/m^2 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/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 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/m^2.

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) 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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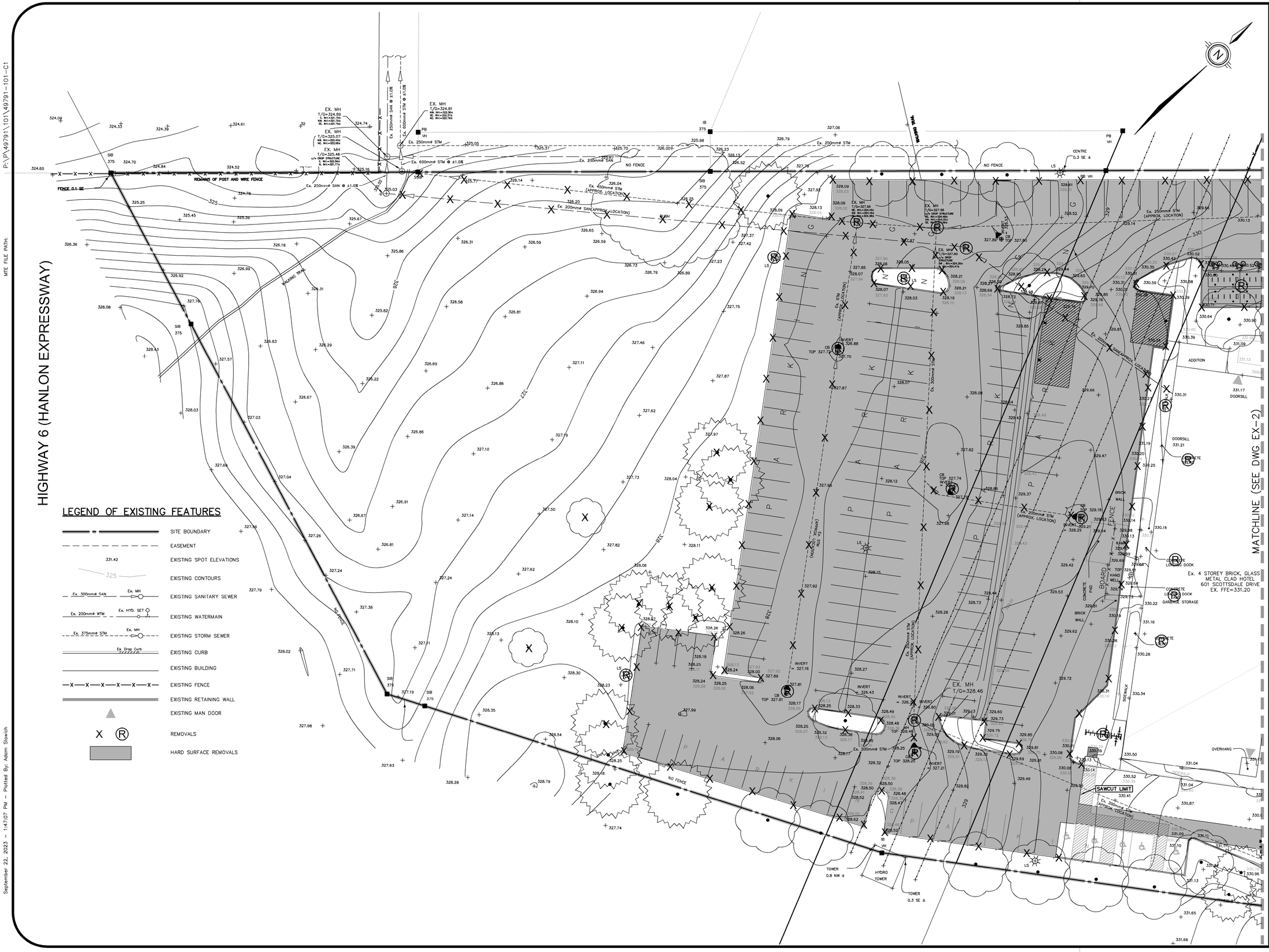
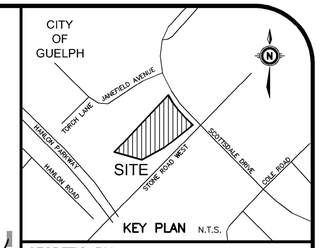
MATCHLINE (SEE DWG EX-2)



LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EASEMENT
- 331.42 EXISTING SPOT ELEVATIONS
- 325 EXISTING CONTOURS
- Ex. 300mmø SAN / Ex. MH — EXISTING SANITARY SEWER
- Ex. 200mmø WTM / Ex. HYD. SET — EXISTING WATERMAIN
- Ex. 375mmø STM / Ex. MH — EXISTING STORM SEWER
- Ex. Drop Curb — EXISTING CURB
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING RETAINING WALL
- EXISTING MAN DOOR
- X ® REMOVALS
- HARD SURFACE REMOVALS



GEODETIC BM ELEV. = m
REFER TO SURVEY COMPLETED BY VAN HARTEN SURVEYING INC. ON OCTOBER 7, 2021.

SITE BENCHMARK ELEV. = m

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NOTE:

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No.	REVISION	BY	YYYY-MM-DD
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1.	ISSUED FOR OPA/ZBA	AJS	2023-09-22

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
FORUM 601 SCOTTSDALE LP
181 BAY STREET EAST TORONTO, ON

PROJECT
ALMA GUELPH PHASE 2
601 SCOTTSDALE DRIVE GUELPH, ON

DRAWING
REMOVALS PLAN 1

Project Manager	A. SLAWICH	Project No.	49791-100
Design By	AJS	Checked By	LEI
Drawn By	TXT/DAC	Checked By	JRS
Surveyed By	OTHERS	Drawing No.	EX-1
Date	Mar.06/23		
Scale	1:250	Sheet 1 of 4	

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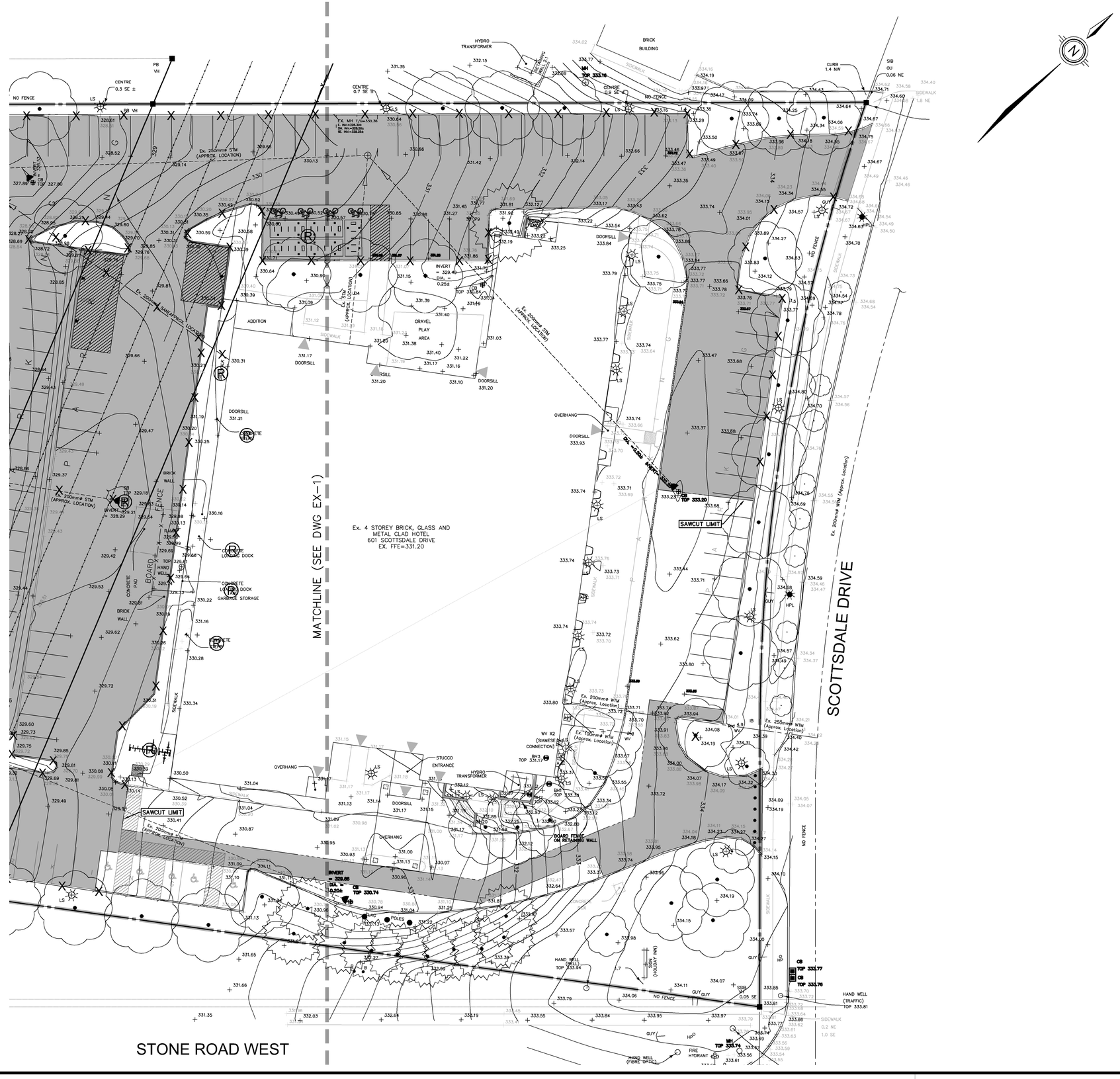

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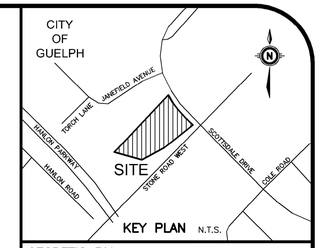
- EXISTING RETAINING WALL
- EXISTING MAN DOOR
- X ® REMOVALS
- HARD SURFACE REMOVALS

CITY OF GUELPH



KEY PLAN N.T.S.

GEODETIC BM ELEV. = m

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1.	ISSUED FOR OPA/ZBA	AJS	2023-09-22

MTE

Engineers, Scientists, Surveyors

519-743-6500

OWNER

FORUM 601 SCOTTSDALE LP

181 BAY STREET EAST TORONTO, ON

PROJECT

ALMA GUELPH PHASE 2

601 SCOTTSDALE DRIVE GUELPH, ON

DRAWING

REMOVALS PLAN 2

Project Manager: A. SLAWICH	Project No.: 49791-100
Design By: AJS	Checked By: LEI
Drawn By: TXT/DAC	Checked By: JRS
Surveyed By: OTHERS	Drawing No.: EX-2
Date: Mar.06/23	
Scale: 1:250	Sheet 2 of 4

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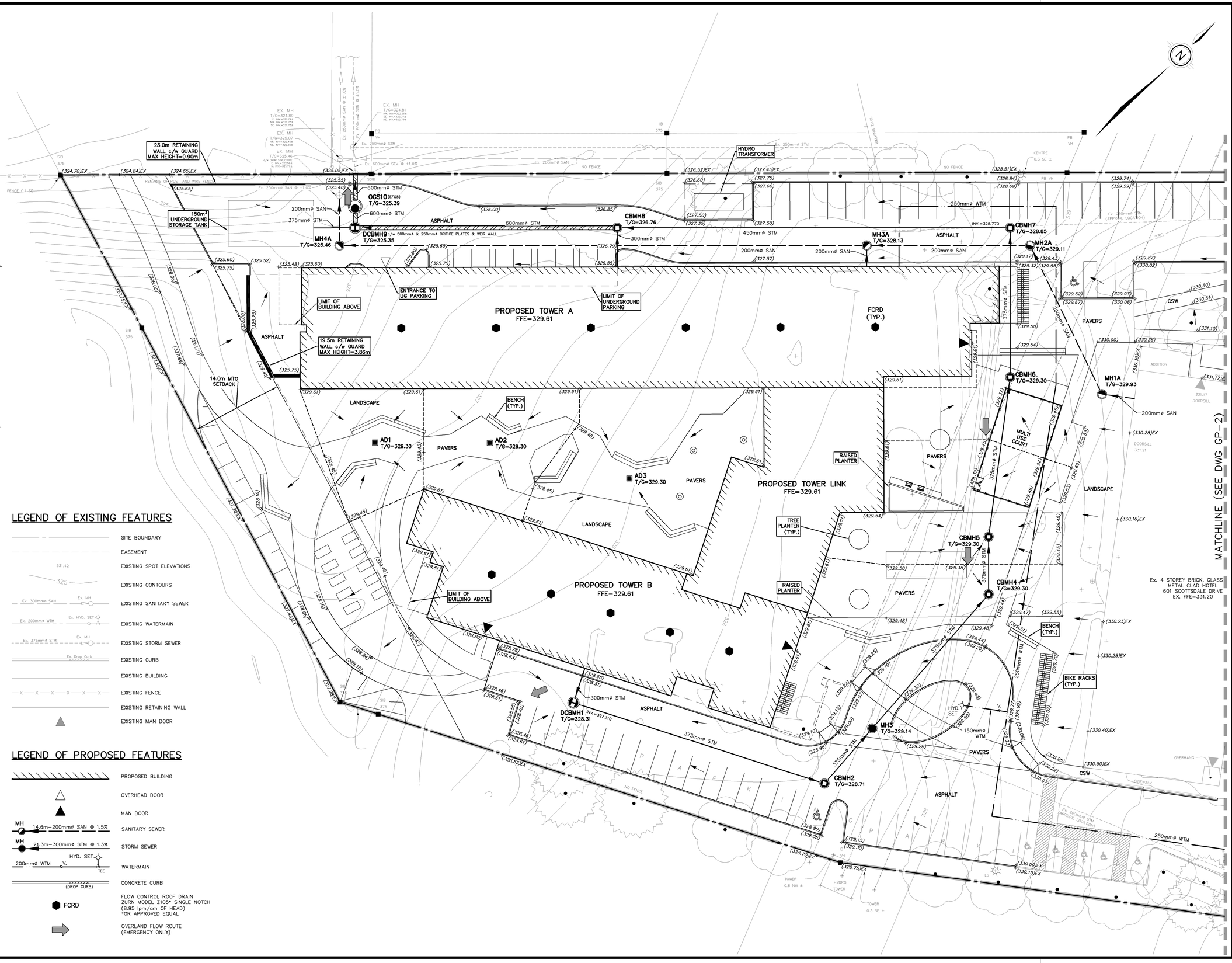

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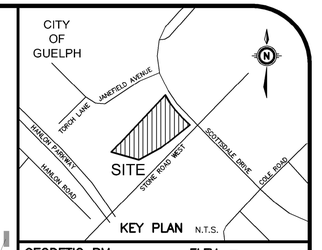
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD. SET)
- EXISTING STORM SEWER (Ex. 375mmø STM, Ex. MH)
- EXISTING CURB (Ex. Drop Curb)
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING RETAINING WALL
- EXISTING MAN DOOR

LEGEND OF PROPOSED FEATURES

- PROPOSED BUILDING
- OVERHEAD DOOR
- MAN DOOR
- SANITARY SEWER (MH — 14.6m–200mmø SAN @ 1.5%)
- STORM SEWER (MH — 21.3m–300mmø STM @ 1.3%)
- WATERMAIN (HYD. SET — V. — TEE — 200mmø WTM)
- CONCRETE CURB (DROP CURB)
- FCRD — FLOW CONTROL ROOF DRAIN ZURN MODEL Z105* SINGLE NOTCH (8.95 lpm/cm OF HEAD) *OR APPROVED EQUAL
- OVERLAND FLOW ROUTE (EMERGENCY ONLY)



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MTE
Engineers, Scientists, Surveyors
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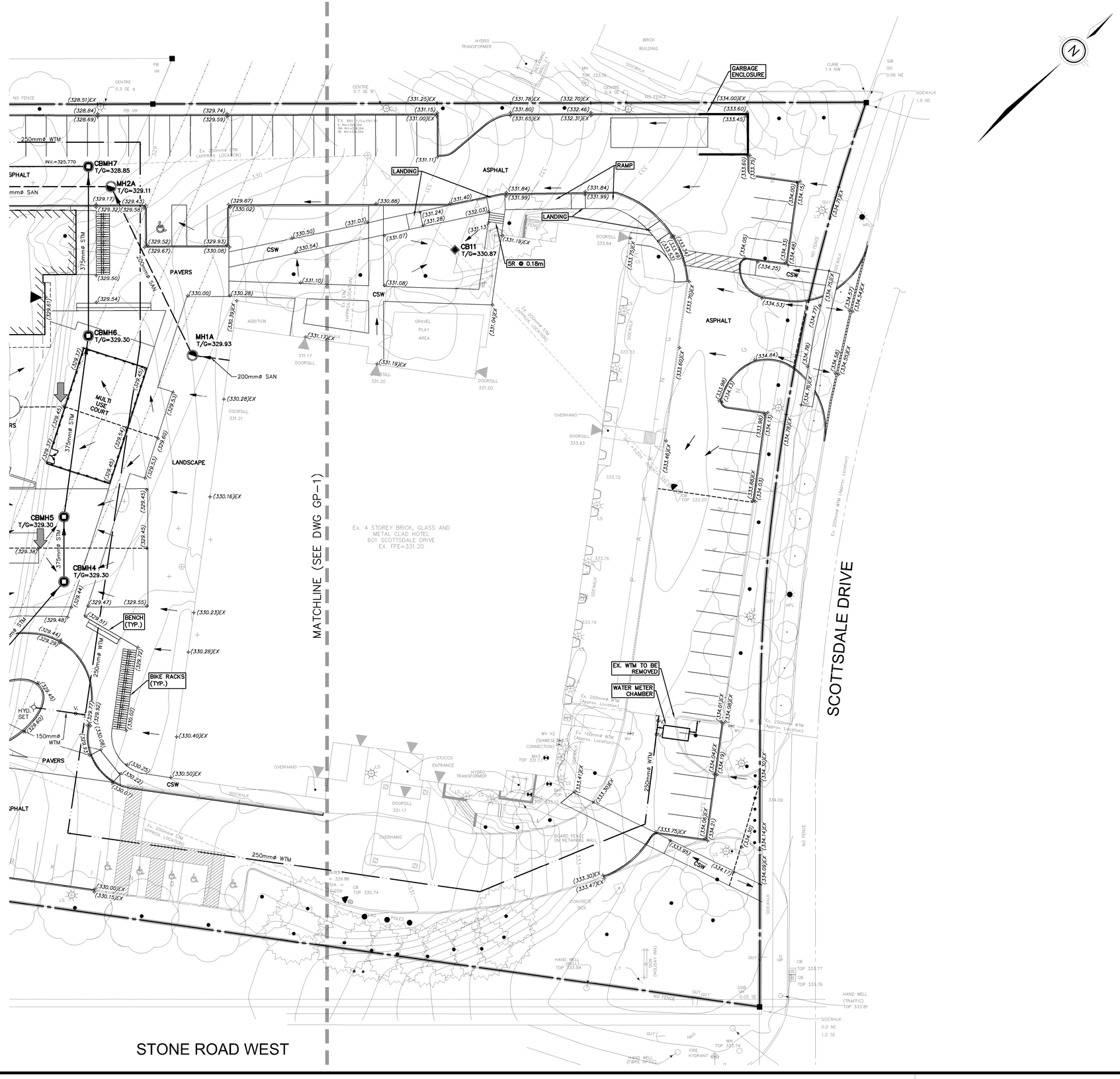
181 BAY STREET EAST TORONTO, ON

PROJECT
ALMA GUELPH PHASE 2
601 SCOTTSDALE DRIVE GUELPH, ON

DRAWING
FUNCTION GRADING AND SERVICING PLAN 1

Project Manager: A. SLAWICH	Project No.: 49791-100
Design By: AJS	Checked By: LEI
Drawn By: TXT/DAC	Checked By: JRS
Surveyed By: OTHERS	Drawing No.: GP-1
Date: Jun.30/23	
Scale: 1:250	Sheet 3 of 4



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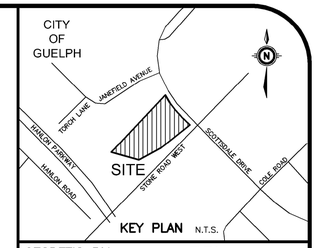

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PROJECT

ALMA GUELPH PHASE 2

601 SCOTTSDALE DRIVE GUELPH, ON

DRAWING

FUNCTIONAL GRADING AND SERVICING PLAN 2

Project Manager	A. SLAWICH	Project No.	49791-100
Design By	AJS	Checked By	LEI
Drawn By	TXT/DAC	Checked By	JRS
Surveyed By	OTHERS	Drawing No.	GP-2
Date	Jun.30/23		
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