



# New North Paris Fire Station Civil Works

## Functional Servicing and Stormwater Management Report

**Project Location:**

Scott Avenue, Paris, ON

**Prepared for:**

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## Drawing

Existing Conditions and Removals Plan	
MTE Drawing No. C1.1 .....	Appended Separately
Site Grading and Erosion and Sediment Control Plan	
MTE Drawing No. C2.1 .....	Appended Separately
Site Servicing Plan	
MTE Drawing No. C2.2 .....	Appended Separately
Interim Site Grading and Erosion and Sediment Control Plan	
MTE Drawing No. C2.3 .....	Appended Separately
Notes and Details Plan 1	
MTE Drawing No. C2.4 .....	Appended Separately
Notes and Details Plan 2	
MTE Drawing No. C2.5 .....	Appended Separately
Notes and Details Plan 3	
MTE Drawing No. C2.6 .....	Appended Separately

## 1.0 INTRODUCTION

MTE Consultants Inc. was retained by Masri O Architects Inc. on behalf of the property owner, County of Brant, to complete a Functional Servicing and Stormwater Management Report for the Proposed Fire Station to be constructed at the north side of Scott Avenue and east of Grand River Street North (herein referred to as 'the Site') in Paris, Ontario in support of Site Plan Approval.

The Site is bounded by vacant lots to the north, east and west, and Scott Avenue to the south. For the exact location of the Site refer to Figure 1.0.

The proposed development for the Site is the construction of a new 1-storey fire station complete with surface parking and driveway entrances off Scott Avenue. The proposed development is also intended to be the location of a paramedics station addition which will be constructed in the future.

## 2.0 EXISTING CONDITIONS

### 2.1 Existing Topography

The Site encompasses an area of 1.09ha and is currently vacant. In the existing condition, surface runoff from the Site drains from the northwest to southeast. There is an elevation difference of approximately 2.3m between the northwest corner and southeast corner of the Site. The Site is approximately 0% impervious in the existing condition.



SITE



GRAND RIVER STREET NORTH

SCOTT AVENUE



PROJECT  
**NORTH PARIS FIRE STATION**

TITLE  
**SITE LOCATION PLAN**

Drawn	GLC	Scale	N.T.S.
Checked	WAM	Project No.	55275-200
Date (yyyy-mm-dd)	2025-01-31	Rev No.	0

Figure  
**1.0**

## 2.2 Existing Servicing

### 2.2.1 Water

There is an existing 600mm diameter municipal watermain along Scott Avenue. The closest municipal fire hydrant is located on Scott Avenue along the frontage of the Site. There are no known existing water services to the Site.

A hydrant flow test was conducted by Northern Sprinkler Design on October 24, 2024 on the existing municipal hydrants located on Scott Avenue. The following table illustrates the results of the testing completed by Northern Sprinkler Design.

**Table 2.1 – Results of Flow Test Completed October 24, 2024**

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	70	n/a
2	2.5	1	30	69	919
3	2.5	2	28 + 28	67	1,776

Refer to Appendix B for information obtained by Northern Sprinkler Design.

### 2.2.2 Sanitary

There is an existing 100mm diameter sanitary forcemain along Scott Avenue which drains toward the west. The existing sanitary forcemain drains to an existing sanitary manhole, located approximately 36m west of the Site. The existing sanitary manhole is approximately 2.7m deep. There are no known existing sanitary services to the Site.

### 2.2.3 Storm

There are no existing storm sewers located along Scott Avenue nor are there any known existing storm services to the Site.

Surface runoff from the Site is conveyed overland to the southeast corner of the Site and to the Scott Avenue roadway. Surface runoff is then conveyed overland towards Gilbert Creek.

## 2.3 Existing Soils Information

A geotechnical investigation was completed by Englobe Corp. (Englobe) as part of the Geotechnical Engineering Report, dated October 24, 2024. Based on their investigation, the subsurface stratigraphy is generally comprised of topsoil overlying sand which is underlain by sand and gravel.

Ten boreholes were advanced as part of the geotechnical investigation, to which groundwater observations were made in each borehole. Groundwater was observed at approximately 3.0 to 4.0 metres below grade. The hydraulic conductivity and factored infiltration rates were determined from samples taken from two boreholes as part of the geotechnical investigation. For additional details, refer to the Geotechnical Engineering Report by Englobe which is to be submitted under separate cover.



### 3.0 METHODOLOGY

Grading and servicing strategies for the proposed development have been developed based on the topographic survey, plan and profile information, and Site Plan prepared by Masri O Architects Inc., dated February 6, 2025.

#### 3.1 Proposed Grading

The proposed development will have one 1-storey fire station building, complete with surface parking and driveway accesses off Scott Avenue. As Scott Avenue is to be re-constructed, the proposed grading strategy will respect the proposed grades along Scott Avenue as well as the existing grades along the neighboring properties. As there is a large portion of land to the northwest which conveys its runoff through the Site in its existing condition, runoff from these lands will be diverted through swales around the development towards the Scott Avenue right-of-way without entering the proposed development. Any overland flow will be routed to the Scott Avenue right-of-way. Proposed grading is to be coordinated with the Scott Avenue reconstruction consultant.

#### 3.2 Proposed Servicing

##### 3.2.1 Water

A 150mm diameter water service is proposed to service the Fire Station. The proposed water service will connect to the existing 150mm diameter municipal hydrant lead located along the frontage of the Site in order to avoid a new connection to the existing 600mm diameter watermain along Scott Avenue which would require a shutdown of the main. The water service will run along the west side of the proposed building where it will enter the north side of the proposed building. The existing municipal hydrant is to be removed and relocated to accommodate the Fire Station's water service connection. It is anticipated that the relocated municipal hydrant will be sufficient to provide fire protection for the proposed building.

The required fire flow under the OBC and FUS for the proposed development were calculated and summarized in the table below. The demand may be updated as building design progresses. Please refer to Appendix B for further details.

**Table 3.1 – Required Fire Flow**

Scenario	Demand
Max Day	0.97L/s
OBC	150.0L/s
FUS	133.0L/s

Many municipalities in Ontario use both the OBC and 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 always reasonable to expect that the existing water infrastructure has the operational capacity to supply water at the rates prescribed in the FUS guidelines. As a result, at no time shall the available minimum residual pressure under firefighting conditions be less than 140kPa as required by the OBC (2012).

Therefore, the required minimum water supply flow rate is 150.97L/s (9,059L/min) for the proposed building. This is the maximum fire flow rate specified by the Ontario Building Code

including the Maximum Day domestic flow rate. Based on the flow test provided by Northern Sprinkler Design it can be concluded that the residual pressure at the nozzle of the relocated municipal hydrant was calculated to be 414kPa for a flow rate of 150.97L/s (9,059L/min), which is greater than the minimum allowable pressure of 140kPa per OBC 2012, thus meeting the minimum requirements of the OBC and FUS. These calculations will be further refined and verified as the building design progresses. Refer to Appendix B for calculations.

### **3.2.2 Sanitary**

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed development. Under the proposed building classification of F3, low hazard industrial occupancy, a light industrial flow rate of 0.324L/s/ha (28.0m<sup>3</sup>/ha/day) per County of Brant Development and Engineering Standards, and an industrial peaking factor of 2.0, the maximum anticipated peak sanitary flow generation rate is 0.648L/s/ha. With a site area of 1.09ha and an infiltration allowance of 0.23L/s/ha, the resulting flow is expected to be 0.957L/s from the Site.

Based on further discussions with the County of Brant, a second sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed development using a flow rate provided by the County of Brant of 0.023L/s/ha (2.0m<sup>3</sup>/ha/day) which is a conservative estimate based on historical sanitary flows from another fire station within the County. Based on a revised flow rate of 0.023L/s/ha (2.0m<sup>3</sup>/ha/day), and an industrial peaking factor of 2.0, the maximum anticipated peak sanitary flow generation rate is 0.046L/s/ha. With a site area of 1.09ha and an infiltration allowance of 0.23L/s/ha, the resulting flow is expected to be 0.301L/s from the Site.

To service the proposed development, a 150mm diameter gravity sewer system is proposed from the proposed building to an on-site pumping station (designed by others) which will convey the flows through a 32mm diameter forcemain (sized by others) to the property line where it will be expanded to a 50mm diameter forcemain (by others) and ultimately convey flows to the existing 250mm diameter sanitary sewer located on Scott Avenue, west of the Site. An on-site oil interceptor is to be installed and designed by others. The proposed 150mm diameter sanitary sewer system is to be installed at a slope of 2.0%, with a capacity of 21.5L/s. Refer to Appendix C for the sanitary sewer design sheet. A Sanitary Pump Station Design Report will be completed by others to provide further information for the on-site pumping station and forcemain.

### **3.2.3 Storm**

A private storm sewer system will be installed on-site to collect runoff from the driveway and parking areas. This storm sewer system, which will include catchbasins and catchbasin-manholes, will be directed towards the proposed stormwater management facility located at the southeast corner of the Site. A separate clean water storm network will be installed to convey runoff from the roof and landscape area from the frontage of the property towards a proposed infiltration gallery located within the west entrance of the Site. The proposed storm sewer networks have been sized to convey the 5-year storm event.

The proposed storm sewer system will outlet to the proposed on-site stormwater management facility and into the new municipal storm sewer which is to be located within the Scott Avenue right-of-way that is proposed as part of the Scott Avenue reconstruction. The proposed servicing connection is to be coordinated with the Scott Avenue reconstruction consultant. A 250mm diameter storm service is proposed to be installed at a slope of 1.0%, with a capacity of 59.5L/s. A storm sewer design sheet has been prepared for the last pipe of the private storm sewer network. Refer to Appendix D for the storm sewer design sheet.



## 4.0 STORMWATER MANAGEMENT

### 4.1 SWM Criteria

The stormwater management design criteria for the subject site, as established by the County of Brant, are as follows:

- i) Attenuation of the post-development peak flows for the 2-, 5-, 10-, 25-, 50- and 100-year storm event to the pre-development (existing) peak flow.
- ii) Implementation of Enhanced (Level 1) water quality controls.
- iii) Water Balance Analysis to maintain groundwater recharge as detailed in the *Gilbert Wellfield in Paris Ontario Preliminary Master Drainage Plan and Preliminary Hydrogeological Assessment* (Stantec March 2024).
- iv) 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:

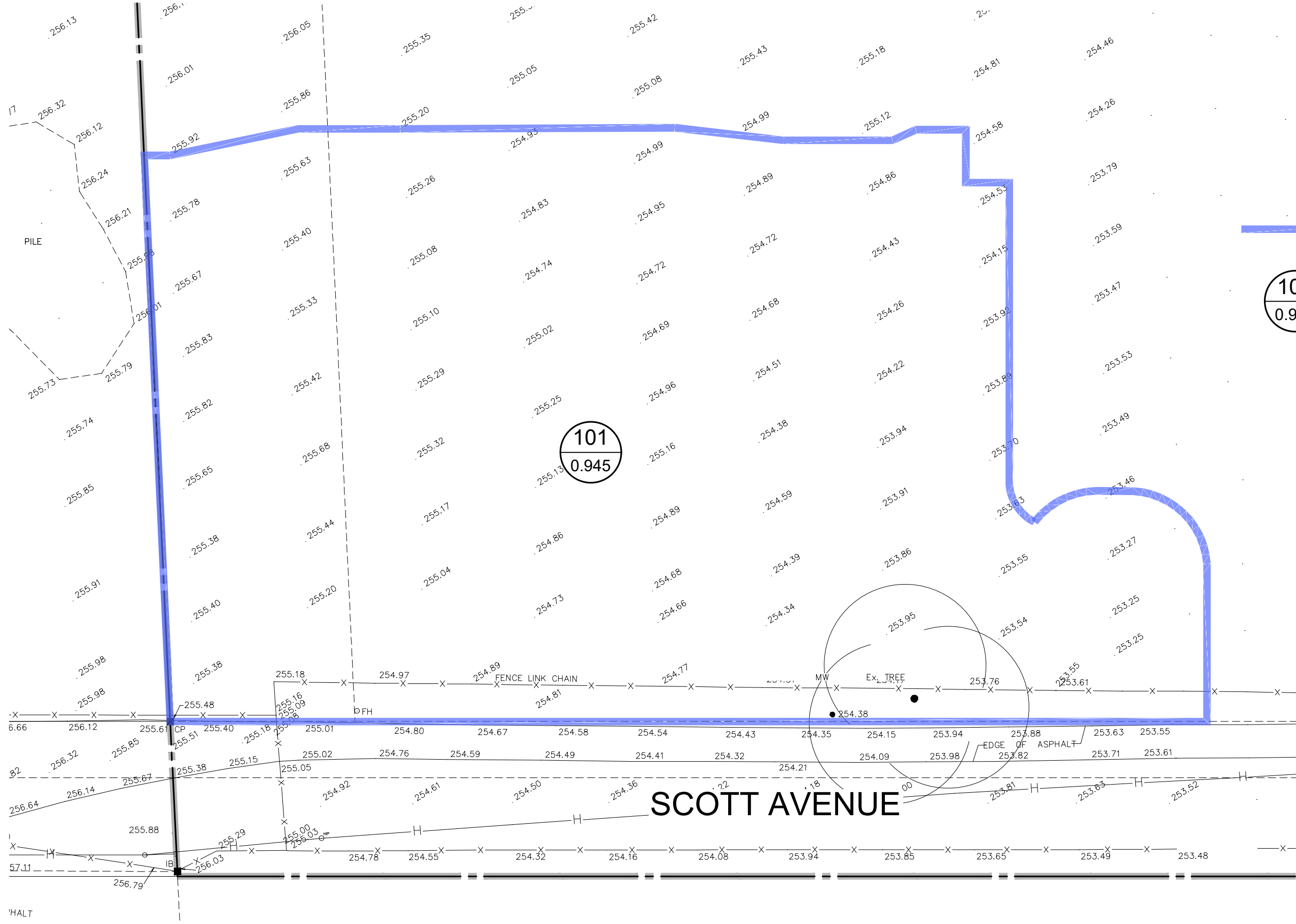
- i) Calculate the allowable runoff rates using MIDUSS NET using the Chicago 3-hour rainfall distribution and County of Brant IDF Curve Parameters (County of Brant Development and Engineering Standards, 2018).
- ii) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSS modeling.
- iii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modeling of the Site. The post-development condition was separated into three catchment areas; the area draining to the infiltration gallery, the parking lot and landscaping area, and the paramedic addition parking area. Catchment 203 represents the ultimate condition of the future paramedic station addition and parking lot. Figure 2.0 illustrates the limits of the pre-development catchment area. Figure 3.0 illustrates the limits of the post-development catchment areas.

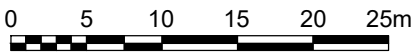
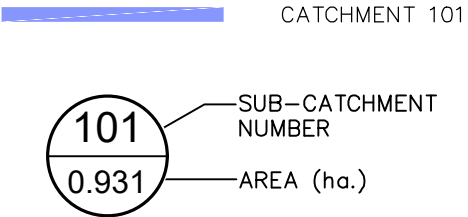
**Table 4.1 – Catchment Parameters**

#	Catchment	Area (m)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
<b>Pre-Development Catchment Area</b>							
101	Pre-Development Area	0.945	0	69	98	2.0	120.0
<b>Post-Development Catchment Area</b>							
201	Area Draining to the Infiltration Gallery	0.208	69	69	98	2.0	20.0
202	Parking Lot and Landscaping Area	0.436	82	69	98	2.0	15.0
203	Paramedic Addition Parking Area	0.301	51	69	98	2.0	23.0

Based on the Geotechnical Engineering Report completed by Englobe, dated October 24, 2024, the investigation revealed the Site is underlain by sand and sand and gravel. Therefore, a pervious CN of 69 for grass area is appropriate. As the infiltration gallery is located near Borehole 5, a factored infiltration rate of 50mm/hr for the post-development modelling is appropriate.



LEGEND

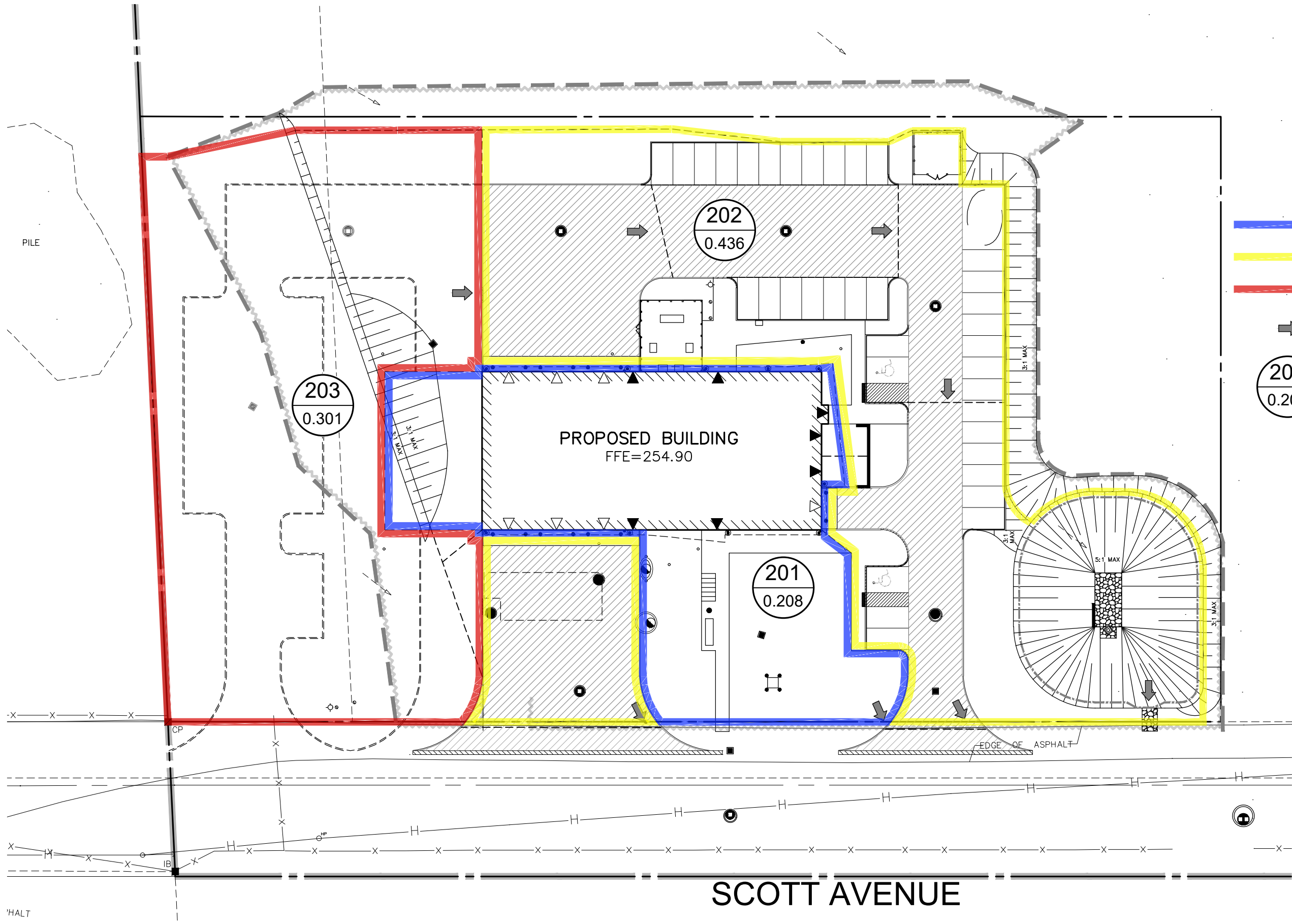


Engineers, Scientists, Surveyors

PROJECT		
NORTH PARIS FIRE STATION		
TITLE		
PRE-DEVELOPMENT CATCHMENTS AREA		
Drawn	GLC	Scale 1:500
Checked	WAM	Project No. 55275-200
Date (yyyy-mm-dd)	2025-02-05	Rev No. 0

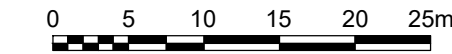
Figure


2.0



LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- OVERLAND FLOW ROUTE (MAJOR STORM)
- SUB-CATCHMENT NUMBER
- AREA (ha.)





Engineers, Scientists, Surveyors

PROJECT		
NORTH PARIS FIRE STATION		
TITLE		
POST-DEVELOPMENT CATCHMENTS AREA		
Drawn	GLC	Scale 1:500
Checked	WAM	Project No. 55275-200
Date (yyyy-mm-dd)	2025-02-05	Rev No. 0

Figure 3.0

In order to achieve the stormwater management requirements for the Site, runoff generated from the controlled areas, Catchment Areas 201, 202, and 203, will be conveyed to a dry pond. The dry pond will control the flow with an on-line 50mm diameter orifice plate which will be installed within DI10's outlet pipe, and a 2.0m wide weir at the south end of the dry pond, parallel to Scott Avenue. Storage volume for the orifice and weir will be provided by the storm system's pipe network, storm structures, and dry pond.

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/Weir Flow (m <sup>3</sup> /s)	Volume (m <sup>3</sup> )	Remarks
250.577	0.00	0.0000	0.0	50mm Orifice Plate Invert
251.930	1.353	0.0063	0.8	Top of Grate DI10 (Low Side)
252.130	1.553	0.0068	8.2	Contour
252.330	1.753	0.0072	21.3	Contour
252.530	1.953	0.0076	41.4	Contour
252.730	2.153	0.0080	85.9	Contour
252.930	2.353	0.0084	159.2	Contour
253.130	2.553	0.0087	238.3	Contour
253.330	2.753	0.0090	299.6	Contour
253.530	2.953	0.0094	374.5	Contour
253.650	3.073	0.0096	426.5	Contour
253.750	3.173	0.0097	473.2	2.0m Wide Weir

The following table summarizes the flows generated by the whole Site.

**Table 4.3 – Summary of Flows**

Modelling Condition	2-Year Storm Event (m <sup>3</sup> /s)	5-Year Storm Event (m <sup>3</sup> /s)	10-Year Storm Event (m <sup>3</sup> /s)	25-Year Storm Event (m <sup>3</sup> /s)	50-Year Storm Event (m <sup>3</sup> /s)	100-Year Storm Event (m <sup>3</sup> /s)
Pre-Development	0.004	0.013	0.025	0.041	0.058	0.080
Post-Development	0.008	0.008	0.009	0.009	0.009	0.010

Table 4.3 demonstrates that the post-development flows for the 5- to 100-year storm events have been maintained to the pre-development levels meeting the quantity control criteria; however, the post-development flow rate for the 2-year storm exceeds the pre-development flow rate by 0.004m<sup>3</sup>/s. In order to control the post-development 2-year storm to the pre-development flow rate a smaller orifice plate would be required which would overcontrol the larger storm events requiring more storage volume and be more prone to clogging. Therefore, using best management practices, a minimum 50mm orifice plate is recommended.

The ponding elevation within the dry pond for the 5-year storm event is 252.945m. This represents a maximum depth of 1.02m within the dry pond. For the 100-year storm event, the maximum ponding elevation within the dry pond is 253.716m. This represents a maximum depth of 1.79m within the dry pond. The weir does not overflow during any of the storm events. The 100-year storm event is contained within the Site. There is no surface ponding within the parking lot expected on-site during any of these storm events.

### 4.3 Water Quality Control

An OGS unit is proposed as part of the proposed storm sewer system of the Scott Avenue reconstruction. The unit is expected to provide Enhanced (Level 1) water quality controls for the Site and all other upstream properties which will drain to the new storm sewer. Therefore, an OGS unit is not proposed on-site.

An impermeable liner is to be installed within the ponding limits of the dry pond to prevent any “salty” runoff from the sidewalk and parking areas from infiltrating when stored within the dry pond. In addition, all the storm structures will have a 600mm sump.

### 4.4 Yearly Water Balance Analysis

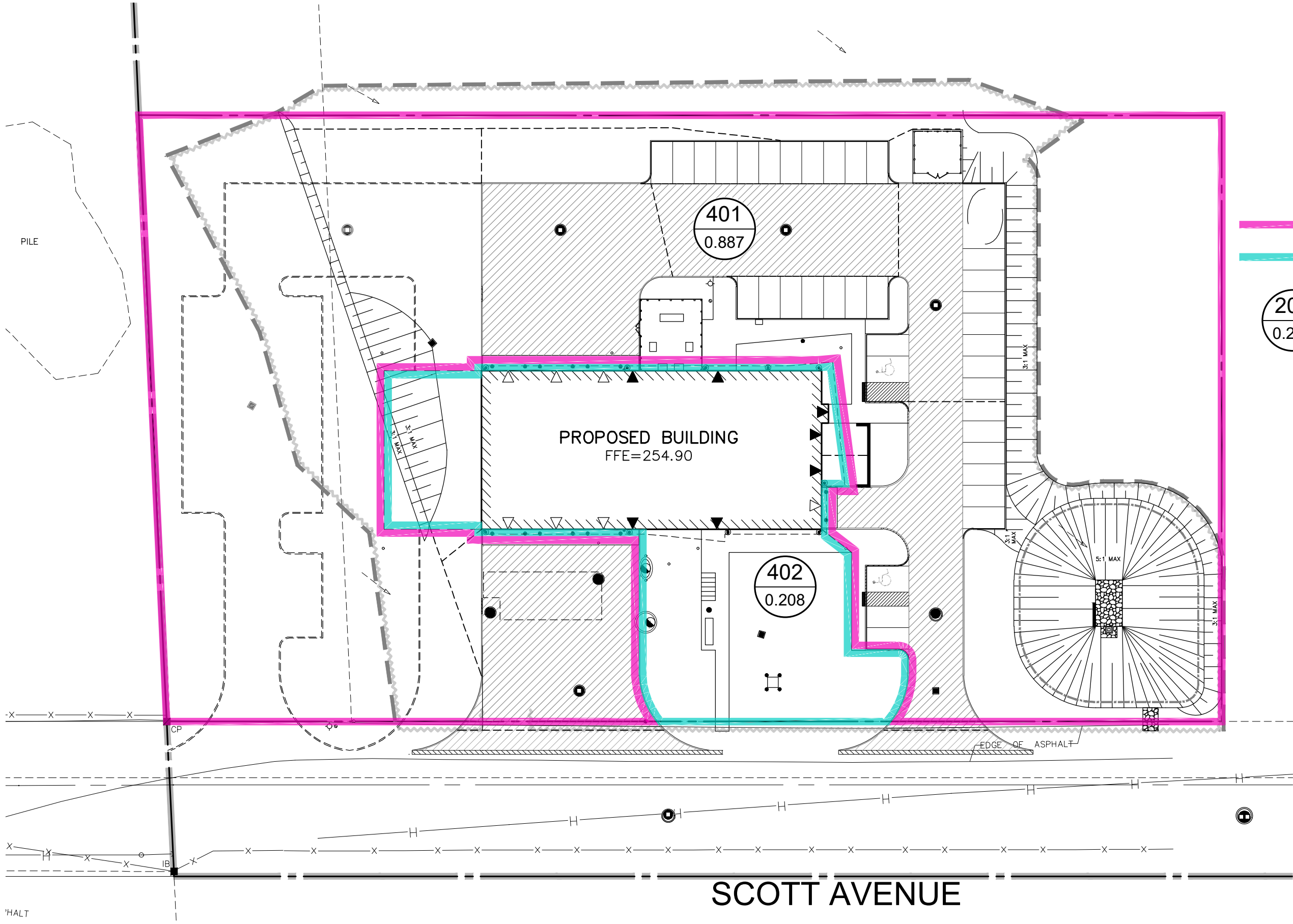
A yearly water balance analysis has been completed to examine the impacts of the proposed development compared to what is detailed in the *Gilbert Wellfield in Paris Ontario Preliminary Master Drainage Plan and Preliminary Hydrogeological Assessment* (Stantec March 2024). The objective of the analysis is to sustain the wellfield and health of Gilbert Creek across the Site. The annual precipitation estimate for the lands within the Gilbert Wellfield’s recharge area will experience an estimate of 919mm/yr as outlined in Stantec’s report.

As detailed in the Gilbert Wellfield’s Preliminary Master Drainage Plan, an infiltration rate of 435mm/yr is required for all currently proposed and future developments within the Gilbert Wellfield’s recharge area. To provide infiltration for the Site, an infiltration gallery is proposed and is sized to collect the 25mm of runoff from areas directed to it. These areas include the proposed rooftop as well as the landscape area along the frontage of the Site. The proposed gallery is capable of infiltrating the entirety of the 2-year and 5-year storms, approximately 87% of the 10-year storm, approximately 71% of the 25-year storm, approximately 61% of the 50-year storm, and approximately 54% of the 100-year storm.

Refer to Figure 4.0 for an illustration of the post-development catchment areas. Catchment 401 represents the parking area, driveway entrances, and surrounding landscaping of the Site. Catchment 402 represents the area directed towards the infiltration gallery. All runoff directed to the gallery is considered ‘clean’ water as it comes primarily from roof and landscape areas. The impervious areas being infiltrated will not have vehicular traffic nor are they expected to be salted in the winter. All landscaped areas throughout the Site are expected to provide a level of passive infiltration.

The following table summarizes the required infiltration volume based on the required infiltration rate of 435mm/yr and the post-development runoff, infiltration, and evapotranspiration volumes from the whole Site. Please refer to Appendix F for detailed calculations.





LEGEND

- CATCHMENT 401
- CATCHMENT 402

201 SUB-CATCHMENT NUMBER  
0.208 AREA (ha.)



PROJECT  
**NORTH PARIS FIRE STATION**  
TITLE  
**POST-DEVELOPMENT WATER  
BALANCE CATCHMENTS AREA**

Drawn	GLC	Scale	1:500	Figure
Checked	WAM	Project No.	55275-200	<b>4.0</b>
Date (yyyy-mm-dd)	2025-02-05	Rev No.	0	

**Table 4.4 – Yearly Water Balance Summary**

	Requirement	Post-Development	Volume Difference	Percentage Difference
Runoff Volume (m³/yr)	N/A	4,788		
Infiltration Volume (m³/yr)	4,763	2,510	2,253	-47%
Evapotranspiration Volume (m³/yr)	N/A	2,765		

While the infiltration volume in the post-development condition is less than what is required based on what is detailed in the Gilbert Wellfield's Preliminary Master Drainage Plan, the proposed development is infiltrating as much 'clean' runoff as is feasible. While a 435mm/yr infiltration requirement is required by all future developments within the Gilbert Creek, meeting this infiltration rate is not feasible as it will require almost the entirety of runoff to be captured and infiltrated across the Site when accounting for evapotranspiration due to the native soils of the Site. To infiltrate the entirety of runoff across the Site, runoff from impervious areas that experience vehicular traffic will need to be infiltrated; however, runoff from these areas will be salted during the winter and it is not recommended to infiltrate these areas per the Master Drainage Plan. Due to these constraints, the infiltration volume requirement detailed in the Gilbert Wellfield's Preliminary Master Drainage Plan cannot be achieved.

## **4.5 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.
- v) Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction, within 60-days of rough grading.
- vi) 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 and respect existing grades along the north, east, and west property lines.
- ii) Existing municipal infrastructure for water and sanitary is available along Scott Avenue.
- iii) A municipal storm sewer is to be installed as part of the Scott Avenue Reconstruction.
- iv) The SWM criteria can be satisfied with the implementation of onsite controls for water quantity. Water quality controls are to be provided as part of the Scott Avenue Reconstruction.
- v) An infiltration gallery will be installed to infiltrate roof runoff and a portion of the landscaped area. Due to site constraints, the infiltration volume requirement per Stantec's Master Drainage Plan for the Site cannot be achieved.

All of which is respectfully submitted,

**MTE Consultants Inc.**

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WAM:dlb

[https://mte85.sharepoint.com/sites/55275-200/Shared Documents/Reports/FSSWM/rpt\\_2025-06-06\\_FSSWM.docx](https://mte85.sharepoint.com/sites/55275-200/Shared Documents/Reports/FSSWM/rpt_2025-06-06_FSSWM.docx)

# Appendix A

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## Calculations

## CALCULATIONS

### ***Orifice Equation (MIDUSS NET)***

$$Q = C_c \pi/4 D^2 \sqrt{2g(H-2/3D)}$$

where

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

### ***Weir Equation (MIDUSS NET)***

$$Q_{cr} = B \sqrt{g} y_{cr}^{3/2} \quad \text{where } y_{cr} = 2/3 (H-Z)$$

Where

- $B$  weir breadth
- $g$  gravitational acceleration
- $H$  head relative to the invert of the weir
- $Z$  weir sill elevation

## Appendix B

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# Fire Flow Demand and Analysis





## New North Paris Fire Station Civil Works

### FIRE FLOW DEMANDS

Paris, Ontario

Project #: 55275-200

Date: January 23, 2025

Date Printed: 2/7/2025

By: WAM

Development Information <sup>1</sup>							Fire Flow <sup>2</sup>													Domestic Flow <sup>3,4</sup>							
							Ontario Building Code						Fire Underwriters Survey														
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	Site Area	Bldg Area (1 <sup>st</sup> Floor)	Total Bldg Area	Building Volume	K	V	S <sub>tot</sub>	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
			ha	m <sup>2</sup>	m <sup>2</sup>	m <sup>3</sup>				m <sup>3</sup>	L	L/min	L/s	m <sup>2</sup>	L/min				L/min	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
	254.90	Fire Station	1.09	1,175	1,175	11,750	28	11,750	1.00	329,000	9,000	150	1.00	1,175	7,541	0%	0%	2%	8,000	133	150	0.353	0.353	0.971	0.706	0.141	150.97
TOTALS FOR SITE			1.09	1175	1175	11750	Max Fire Flow = 150						Max Fire Flow = 133						150	0.35	0.35	0.97	0.71	0.14	150.97		
Sum of Maximum Day Flows + Largest Fire Flow (L/s) = 150.97																											

#### Assumptions:

- All building areas are based on the Site Plan by Masri O Inc. Building Area includes the future paramedics station floor area.
- All buildings are classified as occupancy group F3 (Low Hazard Industrial Occupancy) and assumed to be Combustible Construction
- Average Daily Demands for each building are based on County of Brant Development and Engineering Standards, *Dated November 2018*:  
Light Industrial = 28 L/ha/day
- Peaking Factors based on "Design Guidelines for Drinking-Water Systems" (MOE, 2008) and County of Brant Development and Engineering Standards, *Dated November 2018*:  
Average Day = 1  
Maximum Day = 2.75  
Peak Hour = 2  
Minimum Hour = 0.4



## PROJECT INFORMATION

Project Name:	Grand River N/Scott Ave Flow Test	Design Project #:	2024-NSD-104
Site Address:	Grand River N/Scott Ave Paris ON	Const. Project #:	NA
City Contact:	Jordan Corner	Phone #:	226-387-1139
Flow Tester:	<b>Rob Smith</b>	Phone #:	<b>226-376-3053</b>
Technical Contact:	<b>Andy Coghlin</b>	Phone #:	<b>519-476-0761</b>

## SITE INFORMATION

### SITE MAP



Note: If the main is a dead end, the flowing hydrant shall be closest to the dead end

ITEMS TO LABEL ON MAP	HYDRANTS USED	MAIN SIZE
<input checked="" type="checkbox"/> Static / Residual & Flow Hydrants	<input checked="" type="checkbox"/> City Hydrant(s)	City: 600 pvc
<input type="checkbox"/> Flow Direction (if the main is dead end)	<input type="checkbox"/> Site Hydrant(s)	Site:

### SITE NOTES



TEST INFORMATION							
Minimum Required Flow:		NA			Min Ports:		2
Personnel Present:		Rob Smith			Test Date:		2024-10-24
City / External Company:		Brant County			Test Time:		12:00pm
TEST EQUIPMENT							
<input type="checkbox"/> Hose Monsters with built in Pitot				Hose length used:			
<input type="checkbox"/> Hand held pitot gauge				<input checked="" type="checkbox"/> Pollard diffuser elbow with built in Pitot			
<input type="checkbox"/> Other:							
TEST RESULTS							
Number of Ports	Outlet Size (IN)	Discharge Coefficient	Pitot Reading (PSI)			Total Flow (GPM)	Static / Residual Pressure (PSI)
0 Ports							70
1 Port	2.5	0.9	30			919	69
2 Ports	2.5	0.9	28	28		1,776	67
3 Ports	2.5	0.9				0	
4 Ports	2.5	0.9				0	
0 Ports	STATIC RE-CHECK						70
TEST NOTES							
HYDRAULIC ADJUSTMENTS (FOR OFFICE USE ONLY)							
ADJUSTMENTS FOR HYDRAULIC GRADE LINE (HGL)							
Reservoir HGL (m):				Site Elevation (m):			
Theoretical Static Head (PSI):		0		PSI to subtract from test pressures:		0	
OTHER HYDRAULIC ADJUSTMENTS							
Other adjustment as required by the City / AHJ:							



## New North Paris Fire Station Civil Works

### FIRE FLOW ANALYSIS - Relocated Municipal Hydrant - OBC + Max Day

Paris, Ontario

Project Number: 55275-200

Date: February 7, 2025

Design By: WAM

File: Q:\55275\200\WTM\55275-200 Site Fire Flow Analysis\_Rev5.xlsx

### CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

#### 1. Boundary Conditions (Based on Fire Flow Test Results):

	Metric	Imperial	
P0 - Starting Pressure	49.23 m	70 psi	
P1 - Pressure at Q1	47.12 m	67 psi	
Q1 - From Fire Flow Test	6723 L/min	1776 U.S. gal/min	
Q2 - Required Flow	9059 L/min	2393 U.S. gal/min	From: Water Demand calculations by MTE
P-loss 1	2.11 m	3 psi	
P-loss 2	3.67 m	5 psi	
P2 - Residual Pressure	45.56 m	65 psi	Extrapolated from Fire Flow Test Results

#### 2. Friction Losses Through Water Service:

Total Loss	0.00 m	0.00 psi
------------	--------	----------

#### 3. Friction Losses Through Appurtenances:

Appurtenances	Number	K	Velocity	Head Loss	Total Loss	
Dia. (mm) Type			m/s	m	m	psi
150 Tee (Branch)	1	0.900	8.544	3.349	3.349	4.762
Total Minor Losses					3.349	4.762

#### 4. Elevation - Elevational differences from existing hydrant to proposed hydrant

	Metric	Imperial
Elevation at Boundary (i.e. Residual Hydrant):	255 m	837 ft
Elevation at Site Hydrant:	255 m	837 ft
Elevation Difference = Loss/Gain	0 m	0.0 psi

#### ANALYSIS SUMMARY

Total Losses	3.349 m		
	32.85 kPa	4.8 psi	
Residual Pressure after Losses	42.21 m		
	414 kPa	60.1 psi	PASS
Allowable Residual Pressure	140 kPa	20.3 psi	



## New North Paris Fire Station Civil Works

### FIRE FLOW ANALYSIS - Relocated Municipal Hydrant - FUS + Max Day

Paris, Ontario

Project Number: 55275-200

Date: February 7, 2025

Design By: WAM

File: Q:\55275\200\WTM\55275-200 Site Fire Flow Analysis\_Rev5.xlsx

### CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

#### 1. Boundary Conditions (Based on Fire Flow Test Results):

	Metric	Imperial	
P0 - Starting Pressure	49.23 m	70 psi	
P1 - Pressure at Q1	47.12 m	67 psi	
Q1 - From Fire Flow Test	6723 L/min	1776 U.S. gal/min	
Q2 - Required Flow	8059 L/min	2129 U.S. gal/min	From: Water Demand calculations by MTE
P-loss 1	2.11 m	3 psi	
P-loss 2	2.95 m	4 psi	
<b>P2 - Residual Pressure</b>	<b>46.28 m</b>	<b>66 psi</b>	Extrapolated from Fire Flow Test Results

#### 2. Friction Losses Through Water Service:

<b>Total Loss</b>	<b>0.00 m</b>	<b>0.00 psi</b>
-------------------	---------------	-----------------

#### 3. Friction Losses Through Appurtenances:

Appurtenances	Number	K	Velocity	Head Loss	Total Loss	
Dia. (mm)	Type		m/s	m	m	psi
150 Tee (Branch)	1	0.900	7.601	2.650	2.650	3.768
<b>Total Minor Losses</b>					<b>2.650</b>	<b>3.768</b>

#### 4. Elevation - Elevational differences from existing hydrant to proposed hydrant

	Metric	Imperial
Elevation at Boundary (i.e. Residual Hydrant):	255 m	837 ft
Elevation at Site Hydrant:	255 m	837 ft
<b>Elevation Difference = Loss/Gain</b>	<b>0 m</b>	<b>0.0 psi</b>

#### ANALYSIS SUMMARY

<b>Total Losses</b>	<b>2.650 m</b>	
	<b>26.00 kPa</b>	<b>3.8 psi</b>
<b>Residual Pressure after Losses</b>	<b>43.63 m</b>	
	<b>428 kPa</b>	<b>62.1 psi</b>
		<b>PASS</b>
<i>Allowable Residual Pressure</i>	<i>140 kPa</i>	<i>20.3 psi</i>


## Appendix C

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# Sanitary Sewer Design Sheet





<b>New North Paris Fire Station Civil Works</b> <b>Paris, Ontario</b>				<b>SANITARY SEWER DESIGN SHEET</b> <b>Scenario #1 - County of Brant Industrial Flow Rate</b> <b>ENGINEERING AND PUBLIC WORKS</b>								<b>Design Parameters</b>																						
Project Number: 55275-200 Date: April 3, 2025 Design By: WAM Checked By: CXM File: Q:\55275\200\SAN\55275-200 Sanitary Sewer Design Sheet.xls												Average Daily Flow Industrial (Including Peaking Factor) 0.648 L/s/ha Based on an Industrial Flow Rate of 28 m³/ha/day Industrial Peaking Factor = 2 Infiltration Rate 0.23 L/s/ha																Mannings "n" 0.013 Min. Velocity 0.6 m/sec Max. Velocity 3.0 m/sec						
				<b>LOCATION</b>				<b>RESIDENTIAL AREAS and POPULATION</b>				<b>SCHOOL, INSTITUTIONAL</b>		<b>COMMERCIAL</b>		<b>INDUSTRIAL</b>			<b>INFILTRATION</b>									<b>DESIGN</b>						
<b>STREET</b>		<b>AREA NO.</b>		<b>MANHOLE LOCATION</b>  FROM MH TO MH		<b>PROP. DENSITY</b>		<b>POPUL.</b>	<b>CUMMULATIVE</b>		<b>PEAK FACTOR "F"</b>	<b>PEAK RES. FLOW</b>	<b>HECTARES AND FLOW OF EACH ZONING</b>						<b>TOTALS- C-I FLOW</b>	<b>AREA</b>	<b>CUMUL AREA</b>	<b>INFIL FLOW</b>	<b>TOTAL VOLUME FLOW</b>	<b>LENGTH</b>	<b>SLOPE</b>	<b>PIPE SIZE</b>	<b>CAPACITY</b>	<b>FULL FLOW VELOCITY</b>	<b>ACTUAL VELOCITY</b>					
						<b>AREA</b>	<b>UNITS</b>		<b>ZONE</b>	<b>0.00</b>			<b>0.00</b>	<b>1000s</b>	<b>ha</b>	<b>1000s</b>	<b>L/sec</b>	<b>L/s/ha</b>												<b>0.648 L/s/ha</b>				
																		<b>ha</b>												<b>ha</b>	<b>L/sec</b>	<b>ha</b>	<b>ha</b>	<b>L/sec</b>
Scott Avenue				Oil Int MH1A									1.09 1.09 0.7065			0.7065		1.09 1.09 0.2507	0.9572	4.2	2.00	150	21.5267	1.219	0.612									




<b>New North Paris Fire Station Civil Works</b> <b>Paris, Ontario</b>				<b>SANITARY SEWER DESIGN SHEET</b> <b>Scenario #2 - Revised Industrial Flow Rate</b> <b>ENGINEERING AND PUBLIC WORKS</b>				<b>Design Parameters</b>																							
Project Number: 55275-200 Date: April 2, 2025 Design By: WAM Checked By: CXM File: Q:\55275\200\SAN\55275-200 Sanitary Sewer Design Sheet.xls								<b>Average Daily Flow</b> Industrial (Including Peaking Factor) 0.046 L/s/ha Based on an Industrial Flow Rate of 2 m³/ha/day Industrial Peaking Factor = 2 Infiltration Rate 0.23 L/s/ha  Mannings "n" 0.013 Min. Velocity 0.6 m/sec Max. Velocity 3.0 m/sec																							
<b>LOCATION</b>				<b>RESIDENTIAL AREAS and POPULATION</b>				<b>SCHOOL, INSTITUTIONAL</b>			<b>COMMERCIAL</b>			<b>INDUSTRIAL</b>				<b>INFILTRATION</b>			<b>DESIGN</b>										
STREET	AREA NO.	MANHOLE LOCATION		AREA ZONE	PROP. DENSITY UNITS 0.00 0.00		POPUL. 1000s	CUMMULATIVE		PEAK FACTOR "F"	PEAK RES. FLOW	HECTARES AND FLOW OF EACH ZONING						TOTALS- C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY			
		FROM MH	TO MH		AREA	POPUL.		AREA	POPUL.			AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW												AREA	CUMUL AREA	PEAK FLOW
		ha	p/unit		p/unit	1000s		ha	1000s			L/sec	ha	ha	L/sec	ha	ha												L/sec	ha	ha
Scott Avenue		Oil Int	MH1A													1.09	1.09	0.0505	0.0505		1.09	1.09	0.2507	0.3012	4.2	2.00	150	21.5267	1.219	0.429	

## Appendix D

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# Storm Sewer Design Sheet

<b>New North Paris Fire Station Civil Works</b> Paris, Ontario				<b>5 Year Storm</b> <b>STORM SEWER DESIGN SHEET</b>				<b>Design Parameters</b> <b>5 YEAR STORM</b>									
Project Number: 55275-200 Date: April 10, 2025 Design By: WAM Checked By: CXM File: Q:\55275\200\55275-200 - Paris North Fire Station - Storm Sewer Design Sheet - 2024-11-26.xlsx				<b>ENGINEERING AND PUBLIC WORKS</b>				Q=kAIC, k=0.00278      Manning's "n"      0.013 Intensity (I) = a/(tc+b) <sup>c</sup> Min. Velocity      0.800 m/s a = 1593      Max. Velocity      6.000 m/s b = 11 c = 0.8789									
<b>LOCATION</b>				<b>STORMWATER FLOW</b>								<b>DESIGN</b>					
STREET	AREA NUMBER	MANHOLE LOCATION		AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION		RAIN INTENSITY (I)	FLOW* (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL	
		FROM MH	TO MH					TOTAL	IN PIPE							FLOW VELOCITY	PIPE FULL
								<i>ha</i>	<i>ha</i>	<i>mm/hr</i>	<i>L/s</i>	<i>mm</i>	<i>m</i>	<i>%</i>	<i>L/s</i>	<i>m/s</i>	<i>%</i>
Scott Avenue		DI10	Pro STM MH								8.00000	250	29.9	1.00	59.46753	1.2115	13.45

\*Note: The flow (Q) was inputted based on the 5-Year peak flow rates from MIDUSS.

# Appendix E

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## MIDUSS Outputs

## Pre-Development



```
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:\55275\200\SWM"
6 " Output filename: 2YearPre.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:19:21 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 " 743.000 Coefficient A"
17 " 6.000 Constant B"
18 " 0.799 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 109.374 mm/hr"
23 " Total depth 34.259 mm"
24 " 6 002hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 101"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 101 Pre-Development Area"
30 " 0.000 % Impervious"
31 " 0.945 Total Area"
32 " 120.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.945 Pervious Area"
35 " 120.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.000 Impervious Area"
38 " 120.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.111 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.000 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.004 0.000 0.000 0.000 c.m/sec"
51 " Catchment 101 Pervious Impervious Total Area "
52 " Surface Area 0.945 0.000 0.945 hectare"
53 " Time of concentration 80.403 5.076 80.402 minutes"
54 " Time to Centroid 196.747 95.639 196.746 minutes"
55 " Rainfall depth 34.259 34.259 mm"
56 " Rainfall volume 323.74 0.00 323.74 c.m"
57 " Rainfall losses 30.448 5.143 30.448 mm"
58 " Runoff depth 3.811 29.116 3.811 mm"
59 " Runoff volume 36.01 0.00 36.01 c.m"
60 " Runoff coefficient 0.111 0.000 0.111 "
61 " Maximum flow 0.004 0.000 0.004 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.004 0.004 0.000 0.000"
65 " 38 START/RE-START TOTALS 101"
66 " 3 Runoff Totals on EXIT"
67 " Total Catchment area 0.945 hectare"
68 " Total Impervious area 0.000 hectare"
69 " Total % impervious 0.000"
70 " 19 EXIT"
```

```

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:\55275\200\SWM"
6 "          Output filename:              5YearPre.out"
7 "          Licensee name:                A"
8 "          Company                       "
9 "          Date & Time last used:        5/30/2025 at 1:20:17 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              139.250 mm/hr"
23 "          Total depth                    47.240 mm"
24 "          6 005hyd Hydrograph extension used in this file"
25 " 33          CATCHMENT 101"
26 "          1 Triangular SCS"
27 "          1 Equal length"
28 "          1 SCS method"
29 "          101 Pre-Development Area"
30 "          0.000 % Impervious"
31 "          0.945 Total Area"
32 "          120.000 Flow length"
33 "          2.000 Overland Slope"
34 "          0.945 Pervious Area"
35 "          120.000 Pervious length"
36 "          2.000 Pervious slope"
37 "          0.000 Impervious Area"
38 "          120.000 Impervious length"
39 "          2.000 Impervious slope"
40 "          0.250 Pervious Manning 'n'"
41 "          69.000 Pervious SCS Curve No."
42 "          0.181 Pervious Runoff coefficient"
43 "          0.100 Pervious Ia/S coefficient"
44 "          11.412 Pervious Initial abstraction"
45 "          0.015 Impervious Manning 'n'"
46 "          98.000 Impervious SCS Curve No."
47 "          0.000 Impervious Runoff coefficient"
48 "          0.100 Impervious Ia/S coefficient"
49 "          0.518 Impervious Initial abstraction"
50 "          0.013 0.000 0.000 0.000 c.m/sec"
51 "          Catchment 101 Pervious Impervious Total Area "
52 "          Surface Area 0.945 0.000 0.945 hectare"
53 "          Time of concentration 53.962 4.550 53.962 minutes"
54 "          Time to Centroid 163.557 92.605 163.557 minutes"
55 "          Rainfall depth 47.240 47.240 mm"
56 "          Rainfall volume 446.42 0.00 446.42 c.m"
57 "          Rainfall losses 38.681 5.535 38.681 mm"
58 "          Runoff depth 8.559 41.705 8.559 mm"
59 "          Runoff volume 80.88 0.00 80.88 c.m"
60 "          Runoff coefficient 0.181 0.000 0.181 "
61 "          Maximum flow 0.013 0.000 0.013 c.m/sec"
62 " 40          HYDROGRAPH Add Runoff "
63 "          4 Add Runoff "
64 "          0.013 0.013 0.000 0.000"
65 " 38          START/RE-START TOTALS 101"
66 "          3 Runoff Totals on EXIT"
67 "          Total Catchment area 0.945 hectare"
68 "          Total Impervious area 0.000 hectare"
69 "          Total % impervious 0.000"
70 " 19          EXIT"

```

```

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:\55275\200\SWM"
6 "          Output filename:            10YearPre.out"
7 "          Licensee name:              A"
8 "          Company                      "
9 "          Date & Time last used:      5/30/2025 at 1:20:53 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 "          2221.000 Coefficient A"
17 "          12.000 Constant B"
18 "          0.905 Exponent C"
19 "          0.400 Fraction R"
20 "          180.000 Duration"
21 "          1.000 Time step multiplier"
22 "          Maximum intensity            170.999 mm/hr"
23 "          Total depth                  57.185 mm"
24 "          6 010hyd Hydrograph extension used in this file"
25 " 33          CATCHMENT 101"
26 "          1 Triangular SCS"
27 "          1 Equal length"
28 "          1 SCS method"
29 "          101 Pre-Development Area"
30 "          0.000 % Impervious"
31 "          0.945 Total Area"
32 "          120.000 Flow length"
33 "          2.000 Overland Slope"
34 "          0.945 Pervious Area"
35 "          120.000 Pervious length"
36 "          2.000 Pervious slope"
37 "          0.000 Impervious Area"
38 "          120.000 Impervious length"
39 "          2.000 Impervious slope"
40 "          0.250 Pervious Manning 'n'"
41 "          69.000 Pervious SCS Curve No."
42 "          0.229 Pervious Runoff coefficient"
43 "          0.100 Pervious Ia/S coefficient"
44 "          11.412 Pervious Initial abstraction"
45 "          0.015 Impervious Manning 'n'"
46 "          98.000 Impervious SCS Curve No."
47 "          0.000 Impervious Runoff coefficient"
48 "          0.100 Impervious Ia/S coefficient"
49 "          0.518 Impervious Initial abstraction"
50 "          0.025 0.000 0.000 0.000 c.m/sec"
51 "          Catchment 101 Pervious Impervious Total Area "
52 "          Surface Area 0.945 0.000 0.945 hectare"
53 "          Time of concentration 43.210 4.170 43.210 minutes"
54 "          Time to Centroid 150.134 91.128 150.134 minutes"
55 "          Rainfall depth 57.185 57.185 mm"
56 "          Rainfall volume 540.40 0.00 540.40 c.m"
57 "          Rainfall losses 44.083 5.856 44.083 mm"
58 "          Runoff depth 13.102 51.329 13.102 mm"
59 "          Runoff volume 123.82 0.00 123.82 c.m"
60 "          Runoff coefficient 0.229 0.000 0.229 "
61 "          Maximum flow 0.025 0.000 0.025 c.m/sec"
62 " 40          HYDROGRAPH Add Runoff "
63 "          4 Add Runoff "
64 "          0.025 0.025 0.000 0.000"
65 " 38          START/RE-START TOTALS 101"
66 "          3 Runoff Totals on EXIT"
67 "          Total Catchment area 0.945 hectare"
68 "          Total Impervious area 0.000 hectare"
69 "          Total % impervious 0.000"
70 " 19          EXIT"

```

```
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:\55275\200\SWM"
6 " Output filename: 25YearPre.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:21:33 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 " 3158.000 Coefficient A"
17 " 15.000 Constant B"
18 " 0.936 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 191.271 mm/hr"
23 " Total depth 68.087 mm"
24 " 6 025hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 101"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 101 Pre-Development Area"
30 " 0.000 % Impervious"
31 " 0.945 Total Area"
32 " 120.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.945 Pervious Area"
35 " 120.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.000 Impervious Area"
38 " 120.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.276 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.000 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.041 0.000 0.000 0.000 c.m/sec"
51 " Catchment 101 Pervious Impervious Total Area "
52 " Surface Area 0.945 0.000 0.945 hectare"
53 " Time of concentration 37.359 3.973 37.359 minutes"
54 " Time to Centroid 141.523 90.229 141.523 minutes"
55 " Rainfall depth 68.087 68.087 68.087 mm"
56 " Rainfall volume 643.42 0.00 643.42 c.m"
57 " Rainfall losses 49.288 6.157 49.287 mm"
58 " Runoff depth 18.799 61.929 18.799 mm"
59 " Runoff volume 177.65 0.00 177.65 c.m"
60 " Runoff coefficient 0.276 0.000 0.276 "
61 " Maximum flow 0.041 0.000 0.041 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.041 0.041 0.000 0.000"
65 " 38 START/RE-START TOTALS 101"
66 " 3 Runoff Totals on EXIT"
67 " Total Catchment area 0.945 hectare"
68 " Total Impervious area 0.000 hectare"
69 " Total % impervious 0.000"
70 " 19 EXIT"
```

```
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:\55275\200\SWM"
6 " Output filename: 50YearPre.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:22:16 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 " 3886.000 Coefficient A"
17 " 16.000 Constant B"
18 " 0.950 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 215.474 mm/hr"
23 " Total depth 77.443 mm"
24 " 6 050hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 101"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 101 Pre-Development Area"
30 " 0.000 % Impervious"
31 " 0.945 Total Area"
32 " 120.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.945 Pervious Area"
35 " 120.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.000 Impervious Area"
38 " 120.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.313 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.000 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.058 0.000 0.000 0.000 c.m/sec"
51 " Catchment 101 Pervious Impervious Total Area "
52 " Surface Area 0.945 0.000 0.945 hectare"
53 " Time of concentration 33.393 3.780 33.393 minutes"
54 " Time to Centroid 135.947 89.565 135.947 minutes"
55 " Rainfall depth 77.443 77.443 77.443 mm"
56 " Rainfall volume 731.83 0.00 731.83 c.m"
57 " Rainfall losses 53.241 6.680 53.241 mm"
58 " Runoff depth 24.201 70.763 24.202 mm"
59 " Runoff volume 228.70 0.00 228.70 c.m"
60 " Runoff coefficient 0.313 0.000 0.313 "
61 " Maximum flow 0.058 0.000 0.058 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.058 0.058 0.000 0.000"
65 " 38 START/RE-START TOTALS 101"
66 " 3 Runoff Totals on EXIT"
67 " Total Catchment area 0.945 hectare"
68 " Total Impervious area 0.000 hectare"
69 " Total % impervious 0.000"
70 " 19 EXIT"
```

```

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:\55275\200\SWM"
6 "          Output filename:           100YearPre.out"
7 "          Licensee name:              A"
8 "          Company                     "
9 "          Date & Time last used:      5/30/2025 at 1:22:50 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 "          4688.000 Coefficient A"
17 "          17.000 Constant B"
18 "          0.962 Exponent C"
19 "          0.400 Fraction R"
20 "          180.000 Duration"
21 "          1.000 Time step multiplier"
22 "          Maximum intensity            239.650 mm/hr"
23 "          Total depth                  87.263 mm"
24 "          6 100hyd Hydrograph extension used in this file"
25 " 33          CATCHMENT 101"
26 "          1 Triangular SCS"
27 "          1 Equal length"
28 "          1 SCS method"
29 "          101 Pre-Development Area"
30 "          0.000 % Impervious"
31 "          0.945 Total Area"
32 "          120.000 Flow length"
33 "          2.000 Overland Slope"
34 "          0.945 Pervious Area"
35 "          120.000 Pervious length"
36 "          2.000 Pervious slope"
37 "          0.000 Impervious Area"
38 "          120.000 Impervious length"
39 "          2.000 Impervious slope"
40 "          0.250 Pervious Manning 'n'"
41 "          69.000 Pervious SCS Curve No."
42 "          0.347 Pervious Runoff coefficient"
43 "          0.100 Pervious Ia/S coefficient"
44 "          11.412 Pervious Initial abstraction"
45 "          0.015 Impervious Manning 'n'"
46 "          98.000 Impervious SCS Curve No."
47 "          0.000 Impervious Runoff coefficient"
48 "          0.100 Impervious Ia/S coefficient"
49 "          0.518 Impervious Initial abstraction"
50 "          0.080 0.000 0.000 0.000 c.m/sec"
51 "          Catchment 101 Pervious Impervious Total Area "
52 "          Surface Area 0.945 0.000 0.945 hectare"
53 "          Time of concentration 30.338 3.617 30.338 minutes"
54 "          Time to Centroid 131.519 89.023 131.519 minutes"
55 "          Rainfall depth 87.263 87.263 mm"
56 "          Rainfall volume 824.64 0.00 824.64 c.m"
57 "          Rainfall losses 56.983 7.150 56.983 mm"
58 "          Runoff depth 30.280 80.113 30.280 mm"
59 "          Runoff volume 286.15 0.00 286.15 c.m"
60 "          Runoff coefficient 0.347 0.000 0.347 "
61 "          Maximum flow 0.080 0.000 0.080 c.m/sec"
62 " 40          HYDROGRAPH Add Runoff "
63 "          4 Add Runoff "
64 "          0.080 0.080 0.000 0.000"
65 " 38          START/RE-START TOTALS 101"
66 "          3 Runoff Totals on EXIT"
67 "          Total Catchment area 0.945 hectare"
68 "          Total Impervious area 0.000 hectare"
69 "          Total % impervious 0.000"
70 " 19          EXIT"

```

## Post-Development

```

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:\55275\200\SWM"
6 "          Output filename:                     2YearPost.out"
7 "          Licensee name:                      A"
8 "          Company                             "
9 "          Date & Time last used:               5/30/2025 at 1:52:45 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 "          743.000 Coefficient A"
17 "          6.000  Constant B"
18 "          0.799  Exponent C"
19 "          0.400  Fraction R"
20 "          180.000 Duration"
21 "          1.000  Time step multiplier"
22 "          Maximum intensity          109.374  mm/hr"
23 "          Total depth                34.259  mm"
24 "          6  002hyd  Hydrograph extension used in this file"
25 " 33      CATCHMENT 201"
26 "          1  Triangular SCS"
27 "          1  Equal length"
28 "          1  SCS method"
29 "          201  Infiltration Gallery Area"
30 "          69.000  % Impervious"
31 "          0.208  Total Area"
32 "          20.000  Flow length"
33 "          2.000  Overland Slope"
34 "          0.064  Pervious Area"
35 "          20.000  Pervious length"
36 "          2.000  Pervious slope"
37 "          0.144  Impervious Area"
38 "          20.000  Impervious length"
39 "          2.000  Impervious slope"
40 "          0.250  Pervious Manning 'n'"
41 "          69.000  Pervious SCS Curve No."
42 "          0.111  Pervious Runoff coefficient"
43 "          0.100  Pervious Ia/S coefficient"
44 "          11.412  Pervious Initial abstraction"
45 "          0.015  Impervious Manning 'n'"
46 "          98.000  Impervious SCS Curve No."
47 "          0.841  Impervious Runoff coefficient"
48 "          0.100  Impervious Ia/S coefficient"
49 "          0.518  Impervious Initial abstraction"
50 "          0.032  0.000  0.000  0.000 c.m/sec"
51 "          Catchment 201          Pervious  Impervious  Total Area  "
52 "          Surface Area          0.064  0.144  0.208  hectare"
53 "          Time of concentration  27.440  1.732  3.173  minutes"
54 "          Time to Centroid      137.680  90.428  93.076  minutes"
55 "          Rainfall depth        34.259  34.259  34.259  mm"
56 "          Rainfall volume        22.09  49.17  71.26  c.m"
57 "          Rainfall losses        30.450  5.434  13.189  mm"
58 "          Runoff depth           3.809  28.825  21.070  mm"
59 "          Runoff volume           2.46  41.37  43.83  c.m"
60 "          Runoff coefficient      0.111  0.841  0.615  "
61 "          Maximum flow           0.001  0.032  0.032  c.m/sec"
62 " 40      HYDROGRAPH Add Runoff  "
63 "          4  Add Runoff  "
64 "          0.032  0.032  0.000  0.000"
65 " 57      TRENCH Design d/s of 201"
66 "          0.032  Peak inflow"
67 "          43.825  Hydrograph volume"
68 "          253.890  Ground elevation"
69 "          252.500  Downstream trench invert"
70 "          1.140  Trench height"
71 "          251.500  Water table elevation"

```



72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "	252.500	0.000	0.0"		
82 "	252.699	0.000	10.4"		
83 "	252.897	0.000	20.9"		
84 "	253.096	0.000	31.3"		
85 "	253.294	0.000	41.7"		
86 "	253.493	0.000	52.2"		
87 "	253.640	0.100	60.0"		
88 "	253.890	1.000	60.2"		
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.000	c.m/sec"	
94 "		Outflow volume	0.002	c.m"	
95 "		Peak exfiltration	0.002	c.m/sec"	
96 "		Exfiltration volume	43.847	c.m"	
97 "		Maximum level	253.071	metre"	
98 "		Maximum storage	29.990	c.m"	
99 "		Centroidal lag	4.433	hours"	
100 "		Infiltration area 2 sides	18.839	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.032 0.032 0.000	0.002	c.m/sec"	
103 "	40	HYDROGRAPH Next link "			
104 "		5 Next link "			
105 "		0.032 0.000 0.000	0.002"		
106 "	33	CATCHMENT 202"			
107 "		1 Triangular SCS"			
108 "		1 Equal length"			
109 "		1 SCS method"			
110 "		202 Parking Lot and Landscaping Area"			
111 "	82.000	% Impervious"			
112 "	0.436	Total Area"			
113 "	15.000	Flow length"			
114 "	2.000	Overland Slope"			
115 "	0.078	Pervious Area"			
116 "	15.000	Pervious length"			
117 "	2.000	Pervious slope"			
118 "	0.358	Impervious Area"			
119 "	15.000	Impervious length"			
120 "	2.000	Impervious slope"			
121 "	0.250	Pervious Manning 'n' "			
122 "	69.000	Pervious SCS Curve No. "			
123 "	0.111	Pervious Runoff coefficient"			
124 "	0.100	Pervious Ia/S coefficient"			
125 "	11.412	Pervious Initial abstraction"			
126 "	0.015	Impervious Manning 'n' "			
127 "	98.000	Impervious SCS Curve No. "			
128 "	0.840	Impervious Runoff coefficient"			
129 "	0.100	Impervious Ia/S coefficient"			
130 "	0.518	Impervious Initial abstraction"			
131 "		0.083 0.000 0.000	0.002	c.m/sec"	
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	23.090	1.458	2.069 minutes"
135 "		Time to Centroid	132.838	90.077	91.284 minutes"
136 "		Rainfall depth	34.259	34.259	34.259 mm"
137 "		Rainfall volume	26.89	122.48	149.37 c.m"
138 "		Rainfall losses	30.450	5.483	9.977 mm"
139 "		Runoff depth	3.809	28.775	24.281 mm"
140 "		Runoff volume	2.99	102.88	105.87 c.m"
141 "		Runoff coefficient	0.111	0.840	0.709 "
142 "		Maximum flow	0.001	0.083	0.083 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "				
144	"		4	Add Runoff "			
145	"			0.083	0.083	0.000	0.002"
146	"	40	HYDROGRAPH Copy to Outflow"				
147	"		8	Copy to Outflow"			
148	"			0.083	0.083	0.083	0.002"
149	"	40	HYDROGRAPH Next link "				
150	"		5	Next link "			
151	"			0.083	0.083	0.083	0.002"
152	"	33	CATCHMENT 203"				
153	"		1	Triangular SCS"			
154	"		1	Equal length"			
155	"		1	SCS method"			
156	"		203	Paramedic Addition"			
157	"		51.000	% Impervious"			
158	"		0.301	Total Area"			
159	"		23.000	Flow length"			
160	"		2.000	Overland Slope"			
161	"		0.147	Pervious Area"			
162	"		23.000	Pervious length"			
163	"		2.000	Pervious slope"			
164	"		0.154	Impervious Area"			
165	"		23.000	Impervious length"			
166	"		2.000	Impervious slope"			
167	"		0.250	Pervious Manning 'n' "			
168	"		69.000	Pervious SCS Curve No. "			
169	"		0.111	Pervious Runoff coefficient"			
170	"		0.100	Pervious Ia/S coefficient"			
171	"		11.412	Pervious Initial abstraction"			
172	"		0.015	Impervious Manning 'n' "			
173	"		98.000	Impervious SCS Curve No. "			
174	"		0.842	Impervious Runoff coefficient"			
175	"		0.100	Impervious Ia/S coefficient"			
176	"		0.518	Impervious Initial abstraction"			
177	"			0.034	0.083	0.083	0.002 c.m/sec"
178	"		Catchment 203	Pervious	Impervious	Total Area	"
179	"		Surface Area	0.147	0.154	0.301	hectare"
180	"		Time of concentration	29.840	1.884	5.029	minutes"
181	"		Time to Centroid	140.360	90.708	96.294	minutes"
182	"		Rainfall depth	34.259	34.259	34.259	mm"
183	"		Rainfall volume	50.53	52.59	103.12	c.m"
184	"		Rainfall losses	30.450	5.398	17.674	mm"
185	"		Runoff depth	3.808	28.860	16.585	mm"
186	"		Runoff volume	5.62	44.30	49.92	c.m"
187	"		Runoff coefficient	0.111	0.842	0.484	"
188	"		Maximum flow	0.001	0.034	0.034	c.m/sec"
189	"	40	HYDROGRAPH Add Runoff "				
190	"		4	Add Runoff "			
191	"			0.034	0.117	0.083	0.002"
192	"	54	POND DESIGN"				
193	"		0.117	Current peak flow c.m/sec"			
194	"		0.137	Target outflow c.m/sec"			
195	"		155.8	Hydrograph volume c.m"			
196	"		12.	Number of stages"			
197	"		250.577	Minimum water level metre"			
198	"		253.750	Maximum water level metre"			
199	"		251.930	Starting water level metre"			
200	"		0	Keep Design Data: 1 = True; 0 = False"			
201	"		Level Discharge	Volume"			
202	"		250.577	0.000	0.000"		
203	"		251.930	0.00629	0.8000"		
204	"		252.130	0.00675	8.200"		
205	"		252.330	0.00719	21.300"		
206	"		252.530	0.00759	41.400"		
207	"		252.730	0.00798	85.900"		
208	"		252.930	0.00835	159.200"		
209	"		253.130	0.00870	238.300"		
210	"		253.330	0.00904	299.600"		
211	"		253.530	0.00936	374.500"		
212	"		253.650	0.00955	426.500"		
213	"		253.750	0.00971	473.200"		

214 "	1.	WEIRS"				
215 "		Crest	Weir	Crest	Left	Right"
216 "		elevation	coefficie	breadth	sideslope	sideslope"
217 "		253.750	0.900	2.000	0.000	0.000"
218 "	1.	ORIFICES"				
219 "		Orifice	Orifice	Orifice	Number of"	
220 "		invert	coefficie	diameter	orifices"	
221 "		250.577	0.630	0.0500	1.000"	
222 "		Peak outflow		0.008	c.m/sec"	
223 "		Maximum level		252.760	metre"	
224 "		Maximum storage		96.781	c.m"	
225 "		Centroidal lag		3.568	hours"	
226 "		0.034	0.117	0.008	0.002 c.m/sec"	
227 " 40		HYDROGRAPH Next link "				
228 "	5	Next link "				
229 "		0.034	0.008	0.008	0.002"	
230 " 38		START/RE-START TOTALS 203"				
231 "	3	Runoff Totals on EXIT"				
232 "		Total Catchment area		0.945	hectare"	
233 "		Total Impervious area		0.655	hectare"	
234 "		Total % impervious		69.265	"	
235 " 19		EXIT"				

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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:\55275\200\SWM"
6 "          Output filename:                     5YearPost.out"
7 "          Licensee name:                       A"
8 "          Company                             "
9 "          Date & Time last used:               5/30/2025 at 1:54:01 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          139.250  mm/hr"
23 "          Total depth                47.240  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  Infiltration Gallery Area"
30 "          69.000  % Impervious"
31 "          0.208  Total Area"
32 "          20.000  Flow length"
33 "          2.000  Overland Slope"
34 "          0.064  Pervious Area"
35 "          20.000  Pervious length"
36 "          2.000  Pervious slope"
37 "          0.144  Impervious Area"
38 "          20.000  Impervious length"
39 "          2.000  Impervious slope"
40 "          0.250  Pervious Manning 'n'"
41 "          69.000  Pervious SCS Curve No."
42 "          0.181  Pervious Runoff coefficient"
43 "          0.100  Pervious Ia/S coefficient"
44 "          11.412  Pervious Initial abstraction"
45 "          0.015  Impervious Manning 'n'"
46 "          98.000  Impervious SCS Curve No."
47 "          0.878  Impervious Runoff coefficient"
48 "          0.100  Impervious Ia/S coefficient"
49 "          0.518  Impervious Initial abstraction"
50 "          0.045  0.000  0.000  0.000 c.m/sec"
51 "          Catchment 201          Pervious  Impervious  Total Area  "
52 "          Surface Area          0.064      0.144      0.208      hectare"
53 "          Time of concentration  18.416      1.553      2.982      minutes"
54 "          Time to Centroid      122.112     88.105     90.986     minutes"
55 "          Rainfall depth        47.240     47.240     47.240     mm"
56 "          Rainfall volume        30.46      67.80     98.26      c.m"
57 "          Rainfall losses        38.698     5.780     15.985     mm"
58 "          Runoff depth           8.542     41.459     31.255     mm"
59 "          Runoff volume          5.51      59.50     65.01      c.m"
60 "          Runoff coefficient      0.181     0.878     0.662      "
61 "          Maximum flow           0.002     0.045     0.045      c.m/sec"
62 " 40      HYDROGRAPH Add Runoff "
63 "          4  Add Runoff "
64 "          0.045  0.045  0.000  0.000"
65 " 57      TRENCH Design d/s of 201"
66 "          0.045  Peak inflow"
67 "          65.011  Hydrograph volume"
68 "          253.890  Ground elevation"
69 "          252.500  Downstream trench invert"
70 "          1.140  Trench height"
71 "          251.500  Water table elevation"

```

72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "		252.500	0.000	0.0"	
82 "		252.699	0.000	10.4"	
83 "		252.897	0.000	20.9"	
84 "		253.096	0.000	31.3"	
85 "		253.294	0.000	41.7"	
86 "		253.493	0.000	52.2"	
87 "		253.640	0.100	60.0"	
88 "		253.890	1.000	60.2"	
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.000	c.m/sec"	
94 "		Outflow volume	0.003	c.m"	
95 "		Peak exfiltration	0.003	c.m/sec"	
96 "		Exfiltration volume	64.993	c.m"	
97 "		Maximum level	253.415	metre"	
98 "		Maximum storage	48.062	c.m"	
99 "		Centroidal lag	5.344	hours"	
100 "		Infiltration area 2 sides	30.180	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.045	0.045	0.000	0.003 c.m/sec"
103 "	40	HYDROGRAPH Next link "			
104 "		5	Next link "		
105 "		0.045	0.000	0.000	0.003"
106 "	33	CATCHMENT 202"			
107 "		1	Triangular SCS"		
108 "		1	Equal length"		
109 "		1	SCS method"		
110 "		202	Parking Lot and Landscaping Area"		
111 "		82.000	% Impervious"		
112 "		0.436	Total Area"		
113 "		15.000	Flow length"		
114 "		2.000	Overland Slope"		
115 "		0.078	Pervious Area"		
116 "		15.000	Pervious length"		
117 "		2.000	Pervious slope"		
118 "		0.358	Impervious Area"		
119 "		15.000	Impervious length"		
120 "		2.000	Impervious slope"		
121 "		0.250	Pervious Manning 'n' "		
122 "		69.000	Pervious SCS Curve No. "		
123 "		0.181	Pervious Runoff coefficient"		
124 "		0.100	Pervious Ia/S coefficient"		
125 "		11.412	Pervious Initial abstraction"		
126 "		0.015	Impervious Manning 'n' "		
127 "		98.000	Impervious SCS Curve No. "		
128 "		0.874	Impervious Runoff coefficient"		
129 "		0.100	Impervious Ia/S coefficient"		
130 "		0.518	Impervious Initial abstraction"		
131 "		0.114	0.000	0.000	0.003 c.m/sec"
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	15.497	1.307	1.923 minutes"
135 "		Time to Centroid	118.752	87.817	89.161 minutes"
136 "		Rainfall depth	47.240	47.240	47.240 mm"
137 "		Rainfall volume	37.07	168.89	205.97 c.m"
138 "		Rainfall losses	38.702	5.949	11.844 mm"
139 "		Runoff depth	8.538	41.291	35.396 mm"
140 "		Runoff volume	6.70	147.62	154.32 c.m"
141 "		Runoff coefficient	0.181	0.874	0.749 "
142 "		Maximum flow	0.003	0.113	0.114 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "			
144	"		4	Add Runoff "		
145	"			0.114	0.114	0.000 0.003"
146	"	40	HYDROGRAPH Copy to Outflow"			
147	"		8	Copy to Outflow"		
148	"			0.114	0.114	0.114 0.003"
149	"	40	HYDROGRAPH Next link "			
150	"		5	Next link "		
151	"			0.114	0.114	0.114 0.003"
152	"	33	CATCHMENT 203"			
153	"		1	Triangular SCS"		
154	"		1	Equal length"		
155	"		1	SCS method"		
156	"		203	Paramedic Addition"		
157	"		51.000	% Impervious"		
158	"		0.301	Total Area"		
159	"		23.000	Flow length"		
160	"		2.000	Overland Slope"		
161	"		0.147	Pervious Area"		
162	"		23.000	Pervious length"		
163	"		2.000	Pervious slope"		
164	"		0.154	Impervious Area"		
165	"		23.000	Impervious length"		
166	"		2.000	Impervious slope"		
167	"		0.250	Pervious Manning 'n' "		
168	"		69.000	Pervious SCS Curve No. "		
169	"		0.181	Pervious Runoff coefficient"		
170	"		0.100	Pervious Ia/S coefficient"		
171	"		11.412	Pervious Initial abstraction"		
172	"		0.015	Impervious Manning 'n' "		
173	"		98.000	Impervious SCS Curve No. "		
174	"		0.878	Impervious Runoff coefficient"		
175	"		0.100	Impervious Ia/S coefficient"		
176	"		0.518	Impervious Initial abstraction"		
177	"			0.048	0.114	0.114 0.003 c.m/sec"
178	"		Catchment 203	Pervious	Impervious	Total Area "
179	"		Surface Area	0.147	0.154	0.301 hectare"
180	"		Time of concentration	20.027	1.689	4.721 minutes"
181	"		Time to Centroid	124.001	88.321	94.221 minutes"
182	"		Rainfall depth	47.240	47.240	47.240 mm"
183	"		Rainfall volume	69.67	72.52	142.19 c.m"
184	"		Rainfall losses	38.684	5.750	21.887 mm"
185	"		Runoff depth	8.556	41.490	25.352 mm"
186	"		Runoff volume	12.62	63.69	76.31 c.m"
187	"		Runoff coefficient	0.181	0.878	0.537 "
188	"		Maximum flow	0.004	0.047	0.048 c.m/sec"
189	"	40	HYDROGRAPH Add Runoff "			
190	"		4	Add Runoff "		
191	"			0.048	0.161	0.114 0.003"
192	"	54	POND DESIGN"			
193	"		0.161	Current peak flow c.m/sec"		
194	"		0.137	Target outflow c.m/sec"		
195	"		230.6	Hydrograph volume c.m"		
196	"		12.	Number of stages"		
197	"		250.577	Minimum water level metre"		
198	"		253.750	Maximum water level metre"		
199	"		251.930	Starting water level metre"		
200	"		0	Keep Design Data: 1 = True; 0 = False"		
201	"		Level Discharge	Volume"		
202	"		250.577	0.000	0.000"	
203	"		251.930	0.00629	0.8000"	
204	"		252.130	0.00675	8.200"	
205	"		252.330	0.00719	21.300"	
206	"		252.530	0.00759	41.400"	
207	"		252.730	0.00798	85.900"	
208	"		252.930	0.00835	159.200"	
209	"		253.130	0.00870	238.300"	
210	"		253.330	0.00904	299.600"	
211	"		253.530	0.00936	374.500"	
212	"		253.650	0.00955	426.500"	
213	"		253.750	0.00971	473.200"	

214 "	1.	WEIRS"				
215 "		Crest	Weir	Crest	Left	Right"
216 "		elevation	coefficie	breadth	sideslope	sideslope"
217 "		253.750	0.900	2.000	0.000	0.000"
218 "	1.	ORIFICES"				
219 "		Orifice	Orifice	Orifice	Number of"	
220 "		invert	coefficie	diameter	orifices"	
221 "		250.577	0.630	0.0500	1.000"	
222 "		Peak outflow		0.008	c.m/sec"	
223 "		Maximum level		252.945	metre"	
224 "		Maximum storage		165.052	c.m"	
225 "		Centroidal lag		4.701	hours"	
226 "		0.048	0.161	0.008	0.003 c.m/sec"	
227 " 40		HYDROGRAPH Next link "				
228 "	5	Next link "				
229 "		0.048	0.008	0.008	0.003"	
230 " 38		START/RE-START TOTALS 203"				
231 "	3	Runoff Totals on EXIT"				
232 "		Total Catchment area		0.945	hectare"	
233 "		Total Impervious area		0.655	hectare"	
234 "		Total % impervious		69.265"		
235 " 19		EXIT"				

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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:\55275\200\SWM"
6 " Output filename: 10YearPost.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:57:26 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 " 2221.000 Coefficient A"
17 " 12.000 Constant B"
18 " 0.905 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 170.999 mm/hr"
23 " Total depth 57.185 mm"
24 " 6 010hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 201"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 201 Infiltration Gallery Area"
30 " 69.000 % Impervious"
31 " 0.208 Total Area"
32 " 20.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.064 Pervious Area"
35 " 20.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.144 Impervious Area"
38 " 20.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.229 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.894 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.057 0.000 0.000 0.000 c.m/sec"
51 " Catchment 201 Pervious Impervious Total Area "
52 " Surface Area 0.064 0.144 0.208 hectare"
53 " Time of concentration 14.747 1.423 2.797 minutes"
54 " Time to Centroid 115.744 87.012 89.976 minutes"
55 " Rainfall depth 57.185 57.185 57.185 mm"
56 " Rainfall volume 36.87 82.07 118.94 c.m"
57 " Rainfall losses 44.104 6.089 17.874 mm"
58 " Runoff depth 13.081 51.096 39.311 mm"
59 " Runoff volume 8.43 73.33 81.77 c.m"
60 " Runoff coefficient 0.229 0.894 0.687 "
61 " Maximum flow 0.003 0.056 0.057 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.057 0.057 0.000 0.000"
65 " 57 TRENCH Design d/s of 201"
66 " 0.057 Peak inflow"
67 " 81.768 Hydrograph volume"
68 " 253.890 Ground elevation"
69 " 252.500 Downstream trench invert"
70 " 1.140 Trench height"
71 " 251.500 Water table elevation"
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Printed at 14:06 on 30 May 2025

72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "		252.500	0.000	0.0"	
82 "		252.699	0.000	10.4"	
83 "		252.897	0.000	20.9"	
84 "		253.096	0.000	31.3"	
85 "		253.294	0.000	41.7"	
86 "		253.493	0.000	52.2"	
87 "		253.640	0.100	60.0"	
88 "		253.890	1.000	60.2"	
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.011	c.m/sec"	
94 "		Outflow volume	10.356	c.m"	
95 "		Peak exfiltration	0.003	c.m/sec"	
96 "		Exfiltration volume	70.985	c.m"	
97 "		Maximum level	253.510	metre"	
98 "		Maximum storage	53.061	c.m"	
99 "		Centroidal lag	1.739	hours"	
100 "		Infiltration area 2 sides	33.317	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.057	0.057	0.011	0.003 c.m/sec"
103 "	40	HYDROGRAPH Next link "			
104 "		5	Next link "		
105 "		0.057	0.011	0.011	0.003"
106 "	33	CATCHMENT 202"			
107 "		1	Triangular SCS"		
108 "		1	Equal length"		
109 "		1	SCS method"		
110 "		202	Parking Lot and Landscaping Area"		
111 "		82.000	% Impervious"		
112 "		0.436	Total Area"		
113 "		15.000	Flow length"		
114 "		2.000	Overland Slope"		
115 "		0.078	Pervious Area"		
116 "		15.000	Pervious length"		
117 "		2.000	Pervious slope"		
118 "		0.358	Impervious Area"		
119 "		15.000	Impervious length"		
120 "		2.000	Impervious slope"		
121 "		0.250	Pervious Manning 'n' "		
122 "		69.000	Pervious SCS Curve No. "		
123 "		0.228	Pervious Runoff coefficient"		
124 "		0.100	Pervious Ia/S coefficient"		
125 "		11.412	Pervious Initial abstraction"		
126 "		0.015	Impervious Manning 'n' "		
127 "		98.000	Impervious SCS Curve No. "		
128 "		0.888	Impervious Runoff coefficient"		
129 "		0.100	Impervious Ia/S coefficient"		
130 "		0.518	Impervious Initial abstraction"		
131 "		0.143	0.011	0.011	0.003 c.m/sec"
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	12.409	1.197	1.796 minutes"
135 "		Time to Centroid	112.920	86.759	88.156 minutes"
136 "		Rainfall depth	57.185	57.185	57.185 mm"
137 "		Rainfall volume	44.88	204.45	249.33 c.m"
138 "		Rainfall losses	44.133	6.401	13.193 mm"
139 "		Runoff depth	13.052	50.784	43.992 mm"
140 "		Runoff volume	10.24	181.56	191.81 c.m"
141 "		Runoff coefficient	0.228	0.888	0.769 "
142 "		Maximum flow	0.004	0.142	0.143 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "			
144	"		4	Add Runoff "		
145	"			0.143	0.143	0.011 0.003"
146	"	40	HYDROGRAPH Copy to Outflow"			
147	"		8	Copy to Outflow"		
148	"			0.143	0.143	0.143 0.003"
149	"	40	HYDROGRAPH Next link "			
150	"		5	Next link "		
151	"			0.143	0.143	0.143 0.003"
152	"	33	CATCHMENT 203"			
153	"		1	Triangular SCS"		
154	"		1	Equal length"		
155	"		1	SCS method"		
156	"		203	Paramedic Addition"		
157	"		51.000	% Impervious"		
158	"		0.301	Total Area"		
159	"		23.000	Flow length"		
160	"		2.000	Overland Slope"		
161	"		0.147	Pervious Area"		
162	"		23.000	Pervious length"		
163	"		2.000	Pervious slope"		
164	"		0.154	Impervious Area"		
165	"		23.000	Impervious length"		
166	"		2.000	Impervious slope"		
167	"		0.250	Pervious Manning 'n' "		
168	"		69.000	Pervious SCS Curve No. "		
169	"		0.229	Pervious Runoff coefficient"		
170	"		0.100	Pervious Ia/S coefficient"		
171	"		11.412	Pervious Initial abstraction"		
172	"		0.015	Impervious Manning 'n' "		
173	"		98.000	Impervious SCS Curve No. "		
174	"		0.895	Impervious Runoff coefficient"		
175	"		0.100	Impervious Ia/S coefficient"		
176	"		0.518	Impervious Initial abstraction"		
177	"			0.061	0.143	0.143 0.003 c.m/sec"
178	"		Catchment 203	Pervious	Impervious	Total Area "
179	"		Surface Area	0.147	0.154	0.301 hectare"
180	"		Time of concentration	16.037	1.547	4.402 minutes"
181	"		Time to Centroid	117.316	87.191	93.126 minutes"
182	"		Rainfall depth	57.185	57.185	57.185 mm"
183	"		Rainfall volume	84.34	87.78	172.13 c.m"
184	"		Rainfall losses	44.113	5.991	24.671 mm"
185	"		Runoff depth	13.072	51.194	32.514 mm"
186	"		Runoff volume	19.28	78.59	97.87 c.m"
187	"		Runoff coefficient	0.229	0.895	0.569 "
188	"		Maximum flow	0.007	0.060	0.061 c.m/sec"
189	"	40	HYDROGRAPH Add Runoff "			
190	"		4	Add Runoff "		
191	"			0.061	0.203	0.143 0.003"
192	"	54	POND DESIGN"			
193	"		0.203	Current peak flow c.m/sec"		
194	"		0.137	Target outflow c.m/sec"		
195	"		300.0	Hydrograph volume c.m"		
196	"		12.	Number of stages"		
197	"		250.577	Minimum water level metre"		
198	"		253.750	Maximum water level metre"		
199	"		251.930	Starting water level metre"		
200	"		0	Keep Design Data: 1 = True; 0 = False"		
201	"		Level Discharge	Volume"		
202	"		250.577	0.000	0.000"	
203	"		251.930	0.00629	0.8000"	
204	"		252.130	0.00675	8.200"	
205	"		252.330	0.00719	21.300"	
206	"		252.530	0.00759	41.400"	
207	"		252.730	0.00798	85.900"	
208	"		252.930	0.00835	159.200"	
209	"		253.130	0.00870	238.300"	
210	"		253.330	0.00904	299.600"	
211	"		253.530	0.00936	374.500"	
212	"		253.650	0.00955	426.500"	
213	"		253.750	0.00971	473.200"	

214 "	1.	WEIRS"				
215 "		Crest	Weir	Crest	Left	Right"
216 "		elevation	coefficie	breadth	sideslope	sideslope"
217 "		253.750	0.900	2.000	0.000	0.000"
218 "	1.	ORIFICES"				
219 "		Orifice	Orifice	Orifice	Number of"	
220 "		invert	coefficie	diameter	orifices"	
221 "		250.577	0.630	0.0500	1.000"	
222 "		Peak outflow		0.009	c.m/sec"	
223 "		Maximum level		253.109	metre"	
224 "		Maximum storage		230.132	c.m"	
225 "		Centroidal lag		5.724	hours"	
226 "		0.061	0.203	0.009	0.003 c.m/sec"	
227 " 40		HYDROGRAPH Next link "				
228 "	5	Next link "				
229 "		0.061	0.009	0.009	0.003"	
230 " 38		START/RE-START TOTALS 203"				
231 "	3	Runoff Totals on EXIT"				
232 "		Total Catchment area		0.945	hectare"	
233 "		Total Impervious area		0.655	hectare"	
234 "		Total % impervious		69.265	"	
235 " 38		START/RE-START TOTALS 203"				
236 "	3	Runoff Totals on EXIT"				
237 "		Total Catchment area		0.945	hectare"	
238 "		Total Impervious area		0.655	hectare"	
239 "		Total % impervious		69.265	"	
240 " 19		EXIT"				

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1 " MIDUSS Output ----->"
2 " MIDUSS version Version 2.25 rev. 473"
3 " MIDUSS created Sunday, February 7, 2010"
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5 " Job folder: Q:\55275\200\SWM"
6 " Output filename: 25YearPost.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:58:35 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 " 3158.000 Coefficient A"
17 " 15.000 Constant B"
18 " 0.936 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 191.271 mm/hr"
23 " Total depth 68.087 mm"
24 " 6 025hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 201"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 201 Infiltration Gallery Area"
30 " 69.000 % Impervious"
31 " 0.208 Total Area"
32 " 20.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.064 Pervious Area"
35 " 20.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.144 Impervious Area"
38 " 20.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.275 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.906 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.066 0.000 0.000 0.000 c.m/sec"
51 " Catchment 201 Pervious Impervious Total Area "
52 " Surface Area 0.064 0.144 0.208 hectare"
53 " Time of concentration 12.750 1.356 2.723 minutes"
54 " Time to Centroid 111.816 86.402 89.451 minutes"
55 " Rainfall depth 68.087 68.087 68.087 mm"
56 " Rainfall volume 43.90 97.72 141.62 c.m"
57 " Rainfall losses 49.362 6.379 19.704 mm"
58 " Runoff depth 18.724 61.708 48.383 mm"
59 " Runoff volume 12.07 88.56 100.64 c.m"
60 " Runoff coefficient 0.275 0.906 0.711 "
61 " Maximum flow 0.005 0.065 0.066 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.066 0.066 0.000 0.000"
65 " 57 TRENCH Design d/s of 201"
66 " 0.066 Peak inflow"
67 " 100.636 Hydrograph volume"
68 " 253.890 Ground elevation"
69 " 252.500 Downstream trench invert"
70 " 1.140 Trench height"
71 " 251.500 Water table elevation"
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Printed at 14:06 on 30 May 2025

72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "		252.500	0.000	0.0"	
82 "		252.699	0.000	10.4"	
83 "		252.897	0.000	20.9"	
84 "		253.096	0.000	31.3"	
85 "		253.294	0.000	41.7"	
86 "		253.493	0.000	52.2"	
87 "		253.640	0.100	60.0"	
88 "		253.890	1.000	60.2"	
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.024	c.m/sec"	
94 "		Outflow volume	29.903	c.m"	
95 "		Peak exfiltration	0.003	c.m/sec"	
96 "		Exfiltration volume	72.285	c.m"	
97 "		Maximum level	253.533	metre"	
98 "		Maximum storage	54.328	c.m"	
99 "		Centroidal lag	1.616	hours"	
100 "		Infiltration area 2 sides	34.103	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.066	0.066	0.024	0.003 c.m/sec"
103 "	40	HYDROGRAPH Next link "			
104 "		5	Next link "		
105 "		0.066	0.024	0.024	0.003"
106 "	33	CATCHMENT 202"			
107 "		1	Triangular SCS"		
108 "		1	Equal length"		
109 "		1	SCS method"		
110 "		202	Parking Lot and Landscaping Area"		
111 "		82.000	% Impervious"		
112 "		0.436	Total Area"		
113 "		15.000	Flow length"		
114 "		2.000	Overland Slope"		
115 "		0.078	Pervious Area"		
116 "		15.000	Pervious length"		
117 "		2.000	Pervious slope"		
118 "		0.358	Impervious Area"		
119 "		15.000	Impervious length"		
120 "		2.000	Impervious slope"		
121 "		0.250	Pervious Manning 'n' "		
122 "		69.000	Pervious SCS Curve No. "		
123 "		0.276	Pervious Runoff coefficient"		
124 "		0.100	Pervious Ia/S coefficient"		
125 "		11.412	Pervious Initial abstraction"		
126 "		0.015	Impervious Manning 'n' "		
127 "		98.000	Impervious SCS Curve No. "		
128 "		0.899	Impervious Runoff coefficient"		
129 "		0.100	Impervious Ia/S coefficient"		
130 "		0.518	Impervious Initial abstraction"		
131 "		0.164	0.024	0.024	0.003 c.m/sec"
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	10.728	1.141	1.745 minutes"
135 "		Time to Centroid	109.338	86.165	87.625 minutes"
136 "		Rainfall depth	68.087	68.087	68.087 mm"
137 "		Rainfall volume	53.43	243.42	296.86 c.m"
138 "		Rainfall losses	49.326	6.843	14.490 mm"
139 "		Runoff depth	18.760	61.244	53.597 mm"
140 "		Runoff volume	14.72	218.96	233.68 c.m"
141 "		Runoff coefficient	0.276	0.899	0.787 "
142 "		Maximum flow	0.007	0.162	0.164 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "				
144	"		4	Add Runoff "			
145	"			0.164	0.164	0.024	0.003"
146	"	40	HYDROGRAPH Copy to Outflow"				
147	"		8	Copy to Outflow"			
148	"			0.164	0.164	0.164	0.003"
149	"	40	HYDROGRAPH Next link "				
150	"		5	Next link "			
151	"			0.164	0.164	0.164	0.003"
152	"	33	CATCHMENT 203"				
153	"		1	Triangular SCS"			
154	"		1	Equal length"			
155	"		1	SCS method"			
156	"		203	Paramedic Addition"			
157	"		51.000	% Impervious"			
158	"		0.301	Total Area"			
159	"		23.000	Flow length"			
160	"		2.000	Overland Slope"			
161	"		0.147	Pervious Area"			
162	"		23.000	Pervious length"			
163	"		2.000	Pervious slope"			
164	"		0.154	Impervious Area"			
165	"		23.000	Impervious length"			
166	"		2.000	Impervious slope"			
167	"		0.250	Pervious Manning 'n' "			
168	"		69.000	Pervious SCS Curve No. "			
169	"		0.276	Pervious Runoff coefficient"			
170	"		0.100	Pervious Ia/S coefficient"			
171	"		11.412	Pervious Initial abstraction"			
172	"		0.015	Impervious Manning 'n' "			
173	"		98.000	Impervious SCS Curve No. "			
174	"		0.908	Impervious Runoff coefficient"			
175	"		0.100	Impervious Ia/S coefficient"			
176	"		0.518	Impervious Initial abstraction"			
177	"			0.071	0.164	0.164	0.003 c.m/sec"
178	"		Catchment 203		Pervious	Impervious	Total Area "
179	"		Surface Area		0.147	0.154	0.301 hectare"
180	"		Time of concentration		13.865	1.474	4.273 minutes"
181	"		Time to Centroid		113.147	86.555	92.562 minutes"
182	"		Rainfall depth		68.087	68.087	68.087 mm"
183	"		Rainfall volume		100.42	104.52	204.94 c.m"
184	"		Rainfall losses		49.304	6.241	27.342 mm"
185	"		Runoff depth		18.783	61.846	40.745 mm"
186	"		Runoff volume		27.70	94.94	122.64 c.m"
187	"		Runoff coefficient		0.276	0.908	0.598 "
188	"		Maximum flow		0.012	0.069	0.071 c.m/sec"
189	"	40	HYDROGRAPH Add Runoff "				
190	"		4	Add Runoff "			
191	"			0.071	0.234	0.164	0.003"
192	"	54	POND DESIGN"				
193	"		0.234	Current peak flow		c.m/sec"	
194	"		0.137	Target outflow		c.m/sec"	
195	"		386.2	Hydrograph volume		c.m"	
196	"		12.	Number of stages"			
197	"		250.577	Minimum water level		metre"	
198	"		253.750	Maximum water level		metre"	
199	"		251.930	Starting water level		metre"	
200	"		0	Keep Design Data: 1 = True; 0 = False"			
201	"		Level Discharge		Volume"		
202	"		250.577	0.000	0.000"		
203	"		251.930	0.00629	0.8000"		
204	"		252.130	0.00675	8.200"		
205	"		252.330	0.00719	21.300"		
206	"		252.530	0.00759	41.400"		
207	"		252.730	0.00798	85.900"		
208	"		252.930	0.00835	159.200"		
209	"		253.130	0.00870	238.300"		
210	"		253.330	0.00904	299.600"		
211	"		253.530	0.00936	374.500"		
212	"		253.650	0.00955	426.500"		
213	"		253.750	0.00971	473.200"		

```

214 "      1.  WEIRS"
215 "          Crest      Weir      Crest      Left      Right"
216 "          elevation coefficie breadth sideslope sideslope"
217 "          253.750      0.900      2.000      0.000      0.000"
218 "      1.  ORIFICES"
219 "          Orifice      Orifice      Orifice Number of"
220 "          invert coefficie diameter orifices"
221 "          250.577      0.630      0.0500      1.000"
222 "          Peak outflow                      0.009      c.m/sec"
223 "          Maximum level                      253.362      metre"
224 "          Maximum storage                      311.432      c.m"
225 "          Centroidal lag                      6.922      hours"
226 "          0.071      0.234      0.009      0.003 c.m/sec"
227 " 40      HYDROGRAPH Next link "
228 "      5      Next link "
229 "          0.071      0.009      0.009      0.003"
230 " 38      START/RE-START TOTALS 203"
231 "      3      Runoff Totals on EXIT"
232 "          Total Catchment area                      0.945      hectare"
233 "          Total Impervious area                      0.655      hectare"
234 "          Total % impervious                      69.265"
235 " 38      START/RE-START TOTALS 203"
236 "      3      Runoff Totals on EXIT"
237 "          Total Catchment area                      0.945      hectare"
238 "          Total Impervious area                      0.655      hectare"
239 "          Total % impervious                      69.265"
240 " 19      EXIT"

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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:\55275\200\SWM"
6 " Output filename: 50YearPost.out"
7 " Licensee name: A"
8 " Company "
9 " Date & Time last used: 5/30/2025 at 1:56:25 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 " 3886.000 Coefficient A"
17 " 16.000 Constant B"
18 " 0.950 Exponent C"
19 " 0.400 Fraction R"
20 " 180.000 Duration"
21 " 1.000 Time step multiplier"
22 " Maximum intensity 215.474 mm/hr"
23 " Total depth 77.443 mm"
24 " 6 050hyd Hydrograph extension used in this file"
25 " 33 CATCHMENT 201"
26 " 1 Triangular SCS"
27 " 1 Equal length"
28 " 1 SCS method"
29 " 201 Infiltration Gallery Area"
30 " 69.000 % Impervious"
31 " 0.208 Total Area"
32 " 20.000 Flow length"
33 " 2.000 Overland Slope"
34 " 0.064 Pervious Area"
35 " 20.000 Pervious length"
36 " 2.000 Pervious slope"
37 " 0.144 Impervious Area"
38 " 20.000 Impervious length"
39 " 2.000 Impervious slope"
40 " 0.250 Pervious Manning 'n'"
41 " 69.000 Pervious SCS Curve No."
42 " 0.312 Pervious Runoff coefficient"
43 " 0.100 Pervious Ia/S coefficient"
44 " 11.412 Pervious Initial abstraction"
45 " 0.015 Impervious Manning 'n'"
46 " 98.000 Impervious SCS Curve No."
47 " 0.914 Impervious Runoff coefficient"
48 " 0.100 Impervious Ia/S coefficient"
49 " 0.518 Impervious Initial abstraction"
50 " 0.075 0.000 0.000 0.000 c.m/sec"
51 " Catchment 201 Pervious Impervious Total Area "
52 " Surface Area 0.064 0.144 0.208 hectare"
53 " Time of concentration 11.396 1.290 2.634 minutes"
54 " Time to Centroid 109.137 85.940 89.026 minutes"
55 " Rainfall depth 77.443 77.443 77.443 mm"
56 " Rainfall volume 49.94 111.15 161.08 c.m"
57 " Rainfall losses 53.279 6.693 21.134 mm"
58 " Runoff depth 24.164 70.750 56.308 mm"
59 " Runoff volume 15.58 101.54 117.12 c.m"
60 " Runoff coefficient 0.312 0.914 0.727 "
61 " Maximum flow 0.007 0.074 0.075 c.m/sec"
62 " 40 HYDROGRAPH Add Runoff "
63 " 4 Add Runoff "
64 " 0.075 0.075 0.000 0.000"
65 " 57 TRENCH Design d/s of 201"
66 " 0.075 Peak inflow"
67 " 117.121 Hydrograph volume"
68 " 253.890 Ground elevation"
69 " 252.500 Downstream trench invert"
70 " 1.140 Trench height"
71 " 251.500 Water table elevation"
```



72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "	252.500	0.000	0.0"		
82 "	252.699	0.000	10.4"		
83 "	252.897	0.000	20.9"		
84 "	253.096	0.000	31.3"		
85 "	253.294	0.000	41.7"		
86 "	253.493	0.000	52.2"		
87 "	253.640	0.100	60.0"		
88 "	253.890	1.000	60.2"		
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.040	c.m/sec"	
94 "		Outflow volume	40.512	c.m"	
95 "		Peak exfiltration	0.003	c.m/sec"	
96 "		Exfiltration volume	73.163	c.m"	
97 "		Maximum level	253.555	metre"	
98 "		Maximum storage	55.485	c.m"	
99 "		Centroidal lag	1.610	hours"	
100 "		Infiltration area 2 sides	34.820	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.075 0.075 0.040	0.003	c.m/sec"	
103 "	40	HYDROGRAPH Next link "			
104 "		5 Next link "			
105 "		0.075 0.040 0.040	0.003"		
106 "	33	CATCHMENT 202"			
107 "		1 Triangular SCS"			
108 "		1 Equal length"			
109 "		1 SCS method"			
110 "		202 Parking Lot and Landscaping Area"			
111 "	82.000	% Impervious"			
112 "	0.436	Total Area"			
113 "	15.000	Flow length"			
114 "	2.000	Overland Slope"			
115 "	0.078	Pervious Area"			
116 "	15.000	Pervious length"			
117 "	2.000	Pervious slope"			
118 "	0.358	Impervious Area"			
119 "	15.000	Impervious length"			
120 "	2.000	Impervious slope"			
121 "	0.250	Pervious Manning 'n' "			
122 "	69.000	Pervious SCS Curve No. "			
123 "	0.311	Pervious Runoff coefficient"			
124 "	0.100	Pervious Ia/S coefficient"			
125 "	11.412	Pervious Initial abstraction"			
126 "	0.015	Impervious Manning 'n' "			
127 "	98.000	Impervious SCS Curve No. "			
128 "	0.906	Impervious Runoff coefficient"			
129 "	0.100	Impervious Ia/S coefficient"			
130 "	0.518	Impervious Initial abstraction"			
131 "		0.187 0.040 0.040	0.003	c.m/sec"	
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	9.590	1.085	1.681 minutes"
135 "		Time to Centroid	106.967	85.713	87.202 minutes"
136 "		Rainfall depth	77.443	77.443	77.443 mm"
137 "		Rainfall volume	60.78	276.87	337.65 c.m"
138 "		Rainfall losses	53.380	7.314	15.606 mm"
139 "		Runoff depth	24.063	70.128	61.837 mm"
140 "		Runoff volume	18.88	250.72	269.61 c.m"
141 "		Runoff coefficient	0.311	0.906	0.798 "
142 "		Maximum flow	0.010	0.185	0.187 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "				
144	"		4	Add Runoff "			
145	"			0.187	0.187	0.040	0.003"
146	"	40	HYDROGRAPH Copy to Outflow"				
147	"		8	Copy to Outflow"			
148	"			0.187	0.187	0.187	0.003"
149	"	40	HYDROGRAPH Next link "				
150	"		5	Next link "			
151	"			0.187	0.187	0.187	0.003"
152	"	33	CATCHMENT 203"				
153	"		1	Triangular SCS"			
154	"		1	Equal length"			
155	"		1	SCS method"			
156	"		203	Paramedic Addition"			
157	"		51.000	% Impervious"			
158	"		0.301	Total Area"			
159	"		23.000	Flow length"			
160	"		2.000	Overland Slope"			
161	"		0.147	Pervious Area"			
162	"		23.000	Pervious length"			
163	"		2.000	Pervious slope"			
164	"		0.154	Impervious Area"			
165	"		23.000	Impervious length"			
166	"		2.000	Impervious slope"			
167	"		0.250	Pervious Manning 'n' "			
168	"		69.000	Pervious SCS Curve No. "			
169	"		0.311	Pervious Runoff coefficient"			
170	"		0.100	Pervious Ia/S coefficient"			
171	"		11.412	Pervious Initial abstraction"			
172	"		0.015	Impervious Manning 'n' "			
173	"		98.000	Impervious SCS Curve No. "			
174	"		0.916	Impervious Runoff coefficient"			
175	"		0.100	Impervious Ia/S coefficient"			
176	"		0.518	Impervious Initial abstraction"			
177	"			0.081	0.187	0.187	0.003 c.m/sec"
178	"		Catchment 203		Pervious	Impervious	Total Area "
179	"		Surface Area		0.147	0.154	0.301 hectare"
180	"		Time of concentration		12.393	1.403	4.108 minutes"
181	"		Time to Centroid		110.377	86.074	92.057 minutes"
182	"		Rainfall depth		77.443	77.443	77.443 mm"
183	"		Rainfall volume		114.22	118.88	233.10 c.m"
184	"		Rainfall losses		53.328	6.499	29.445 mm"
185	"		Runoff depth		24.115	70.944	47.998 mm"
186	"		Runoff volume		35.57	108.91	144.47 c.m"
187	"		Runoff coefficient		0.311	0.916	0.620 "
188	"		Maximum flow		0.016	0.078	0.081 c.m/sec"
189	"	40	HYDROGRAPH Add Runoff "				
190	"		4	Add Runoff "			
191	"			0.081	0.268	0.187	0.003"
192	"	54	POND DESIGN"				
193	"		0.268	Current peak flow c.m/sec"			
194	"		0.137	Target outflow c.m/sec"			
195	"		454.6	Hydrograph volume c.m"			
196	"		12.	Number of stages"			
197	"		250.577	Minimum water level metre"			
198	"		253.750	Maximum water level metre"			
199	"		251.930	Starting water level metre"			
200	"		0	Keep Design Data: 1 = True; 0 = False"			
201	"		Level Discharge		Volume"		
202	"		250.577	0.000	0.000"		
203	"		251.930	0.00629	0.8000"		
204	"		252.130	0.00675	8.200"		
205	"		252.330	0.00719	21.300"		
206	"		252.530	0.00759	41.400"		
207	"		252.730	0.00798	85.900"		
208	"		252.930	0.00835	159.200"		
209	"		253.130	0.00870	238.300"		
210	"		253.330	0.00904	299.600"		
211	"		253.530	0.00936	374.500"		
212	"		253.650	0.00955	426.500"		
213	"		253.750	0.00971	473.200"		

214 "	1.	WEIRS"				
215 "		Crest	Weir	Crest	Left	Right"
216 "		elevation	coefficie	breadth	sideslope	sideslope"
217 "		253.750	0.900	2.000	0.000	0.000"
218 "	1.	ORIFICES"				
219 "		Orifice	Orifice	Orifice	Number of"	
220 "		invert	coefficie	diameter	orifices"	
221 "		250.577	0.630	0.0500	1.000"	
222 "		Peak outflow		0.009	c.m/sec"	
223 "		Maximum level		253.534	metre"	
224 "		Maximum storage		376.262	c.m"	
225 "		Centroidal lag		7.837	hours"	
226 "		0.081	0.268	0.009	0.003 c.m/sec"	
227 " 40		HYDROGRAPH Next link "				
228 "	5	Next link "				
229 "		0.081	0.009	0.009	0.003"	
230 " 38		START/RE-START TOTALS 203"				
231 "	3	Runoff Totals on EXIT"				
232 "		Total Catchment area		0.945	hectare"	
233 "		Total Impervious area		0.655	hectare"	
234 "		Total % impervious		69.265	"	
235 " 38		START/RE-START TOTALS 203"				
236 "	3	Runoff Totals on EXIT"				
237 "		Total Catchment area		0.945	hectare"	
238 "		Total Impervious area		0.655	hectare"	
239 "		Total % impervious		69.265	"	
240 " 19		EXIT"				

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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:\55275\200\SWM"
6 "          Output filename:             100YearPost.out"
7 "          Licensee name:               A"
8 "          Company                      "
9 "          Date & Time last used:       5/30/2025 at 1:48:00 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 "          4688.000 Coefficient A"
17 "          17.000 Constant B"
18 "          0.962 Exponent C"
19 "          0.400 Fraction R"
20 "          180.000 Duration"
21 "          1.000 Time step multiplier"
22 "          Maximum intensity            239.650 mm/hr"
23 "          Total depth                  87.263 mm"
24 "          6 100hyd Hydrograph extension used in this file"
25 " 33      CATCHMENT 201"
26 "          1 Triangular SCS"
27 "          1 Equal length"
28 "          1 SCS method"
29 "          201 Infiltration Gallery Area"
30 "          69.000 % Impervious"
31 "          0.208 Total Area"
32 "          20.000 Flow length"
33 "          2.000 Overland Slope"
34 "          0.064 Pervious Area"
35 "          20.000 Pervious length"
36 "          2.000 Pervious slope"
37 "          0.144 Impervious Area"
38 "          20.000 Impervious length"
39 "          2.000 Impervious slope"
40 "          0.250 Pervious Manning 'n'"
41 "          69.000 Pervious SCS Curve No."
42 "          0.346 Pervious Runoff coefficient"
43 "          0.100 Pervious Ia/S coefficient"
44 "          11.412 Pervious Initial abstraction"
45 "          0.015 Impervious Manning 'n'"
46 "          98.000 Impervious SCS Curve No."
47 "          0.919 Impervious Runoff coefficient"
48 "          0.100 Impervious Ia/S coefficient"
49 "          0.518 Impervious Initial abstraction"
50 "          0.085 0.000 0.000 0.000 c.m/sec"
51 "          Catchment 201 Pervious Impervious Total Area "
52 "          Surface Area 0.064 0.144 0.208 hectare"
53 "          Time of concentration 10.354 1.234 2.552 minutes"
54 "          Time to Centroid 107.062 85.583 88.688 minutes"
55 "          Rainfall depth 87.263 87.263 87.263 mm"
56 "          Rainfall volume 56.27 125.24 181.51 c.m"
57 "          Rainfall losses 57.092 7.039 22.555 mm"
58 "          Runoff depth 30.171 80.225 64.708 mm"
59 "          Runoff volume 19.45 115.14 134.59 c.m"
60 "          Runoff coefficient 0.346 0.919 0.742 "
61 "          Maximum flow 0.010 0.083 0.085 c.m/sec"
62 " 40      HYDROGRAPH Add Runoff "
63 "          4 Add Runoff "
64 "          0.085 0.085 0.000 0.000"
65 " 57      TRENCH Design d/s of 201"
66 "          0.085 Peak inflow"
67 "          134.593 Hydrograph volume"
68 "          253.890 Ground elevation"
69 "          252.500 Downstream trench invert"
70 "          1.140 Trench height"
71 "          251.500 Water table elevation"

```

Printed at 14:07 on 30 May 2025

72 "	6.500	Trench top width"			
73 "	6.500	Trench bottom width"			
74 "	49.000	Voids ratio (%)"			
75 "	50.000	Hydraulic conductivity"			
76 "	0.000	Trench gradient (%)"			
77 "	16.500	Trench length"			
78 "	1.000	Include base width"			
79 "	8.	Number of stages"			
80 "		Level Discharge	Volume"		
81 "		252.500	0.000	0.0"	
82 "		252.699	0.000	10.4"	
83 "		252.897	0.000	20.9"	
84 "		253.096	0.000	31.3"	
85 "		253.294	0.000	41.7"	
86 "		253.493	0.000	52.2"	
87 "		253.640	0.100	60.0"	
88 "		253.890	1.000	60.2"	
89 "	1.	MANHOLE"			
90 "		Access"			
91 "		diameter"			
92 "		1.200"			
93 "		Peak outflow	0.048	c.m/sec"	
94 "		Outflow volume	63.644	c.m"	
95 "		Peak exfiltration	0.003	c.m/sec"	
96 "		Exfiltration volume	73.969	c.m"	
97 "		Maximum level	253.577	metre"	
98 "		Maximum storage	56.627	c.m"	
99 "		Centroidal lag	1.554	hours"	
100 "		Infiltration area 2 sides	35.528	sq.metre"	
101 "		Infiltration Base area	107.250	sq.metre"	
102 "		0.085	0.085	0.048	0.003 c.m/sec"
103 "	40	HYDROGRAPH Next link "			
104 "		5	Next link "		
105 "		0.085	0.048	0.048	0.003"
106 "	33	CATCHMENT 202"			
107 "		1	Triangular SCS"		
108 "		1	Equal length"		
109 "		1	SCS method"		
110 "		202	Parking Lot and Landscaping Area"		
111 "		82.000	% Impervious"		
112 "		0.436	Total Area"		
113 "		15.000	Flow length"		
114 "		2.000	Overland Slope"		
115 "		0.078	Pervious Area"		
116 "		15.000	Pervious length"		
117 "		2.000	Pervious slope"		
118 "		0.358	Impervious Area"		
119 "		15.000	Impervious length"		
120 "		2.000	Impervious slope"		
121 "		0.250	Pervious Manning 'n' "		
122 "		69.000	Pervious SCS Curve No. "		
123 "		0.346	Pervious Runoff coefficient"		
124 "		0.100	Pervious Ia/S coefficient"		
125 "		11.412	Pervious Initial abstraction"		
126 "		0.015	Impervious Manning 'n' "		
127 "		98.000	Impervious SCS Curve No. "		
128 "		0.910	Impervious Runoff coefficient"		
129 "		0.100	Impervious Ia/S coefficient"		
130 "		0.518	Impervious Initial abstraction"		
131 "		0.210	0.048	0.048	0.003 c.m/sec"
132 "		Catchment 202	Pervious	Impervious	Total Area "
133 "		Surface Area	0.078	0.358	0.436 hectare"
134 "		Time of concentration	8.712	1.039	1.629 minutes"
135 "		Time to Centroid	105.033	85.361	86.875 minutes"
136 "		Rainfall depth	87.263	87.263	87.263 mm"
137 "		Rainfall volume	68.48	311.98	380.47 c.m"
138 "		Rainfall losses	57.106	7.853	16.719 mm"
139 "		Runoff depth	30.157	79.410	70.545 mm"
140 "		Runoff volume	23.67	283.91	307.58 c.m"
141 "		Runoff coefficient	0.346	0.910	0.808 "
142 "		Maximum flow	0.013	0.207	0.210 c.m/sec"

143	"	40	HYDROGRAPH Add Runoff "					
144	"		4	Add Runoff "				
145	"			0.210	0.210	0.048	0.003"	
146	"	40	HYDROGRAPH Copy to Outflow"					
147	"		8	Copy to Outflow"				
148	"			0.210	0.210	0.210	0.003"	
149	"	40	HYDROGRAPH Next link "					
150	"		5	Next link "				
151	"			0.210	0.210	0.210	0.003"	
152	"	33	CATCHMENT 203"					
153	"		1	Triangular SCS"				
154	"		1	Equal length"				
155	"		1	SCS method"				
156	"		203	Paramedic Addition"				
157	"		51.000	% Impervious"				
158	"		0.301	Total Area"				
159	"		23.000	Flow length"				
160	"		2.000	Overland Slope"				
161	"		0.147	Pervious Area"				
162	"		23.000	Pervious length"				
163	"		2.000	Pervious slope"				
164	"		0.154	Impervious Area"				
165	"		23.000	Impervious length"				
166	"		2.000	Impervious slope"				
167	"		0.250	Pervious Manning 'n' "				
168	"		69.000	Pervious SCS Curve No. "				
169	"		0.346	Pervious Runoff coefficient"				
170	"		0.100	Pervious Ia/S coefficient"				
171	"		11.412	Pervious Initial abstraction"				
172	"		0.015	Impervious Manning 'n' "				
173	"		98.000	Impervious SCS Curve No. "				
174	"		0.922	Impervious Runoff coefficient"				
175	"		0.100	Impervious Ia/S coefficient"				
176	"		0.518	Impervious Initial abstraction"				
177	"			0.093	0.210	0.210	0.003 c.m/sec"	
178	"		Catchment 203	Pervious	Impervious	Total Area	"	
179	"		Surface Area	0.147	0.154	0.301	hectare"	
180	"		Time of concentration	11.259	1.342	3.973	minutes"	
181	"		Time to Centroid	108.154	85.703	91.658	minutes"	
182	"		Rainfall depth	87.263	87.263	87.263	mm"	
183	"		Rainfall volume	128.70	133.96	262.66	c.m"	
184	"		Rainfall losses	57.031	6.790	31.408	mm"	
185	"		Runoff depth	30.233	80.473	55.855	mm"	
186	"		Runoff volume	44.59	123.53	168.12	c.m"	
187	"		Runoff coefficient	0.346	0.922	0.640	"	
188	"		Maximum flow	0.021	0.088	0.093	c.m/sec"	
189	"	40	HYDROGRAPH Add Runoff "					
190	"		4	Add Runoff "				
191	"			0.093	0.303	0.210	0.003"	
192	"	54	POND DESIGN"					
193	"		0.303	Current peak flow c.m/sec"				
194	"		0.137	Target outflow c.m/sec"				
195	"		539.3	Hydrograph volume c.m"				
196	"		12.	Number of stages"				
197	"		250.577	Minimum water level metre"				
198	"		253.750	Maximum water level metre"				
199	"		251.930	Starting water level metre"				
200	"		0	Keep Design Data: 1 = True; 0 = False"				
201	"		Level Discharge	Volume"				
202	"		250.577	0.000	0.000"			
203	"		251.930	0.00629	0.8000"			
204	"		252.130	0.00675	8.200"			
205	"		252.330	0.00719	21.300"			
206	"		252.530	0.00759	41.400"			
207	"		252.730	0.00798	85.900"			
208	"		252.930	0.00835	159.200"			
209	"		253.130	0.00870	238.300"			
210	"		253.330	0.00904	299.600"			
211	"		253.530	0.00936	374.500"			
212	"		253.650	0.00955	426.500"			
213	"		253.750	0.00971	473.200"			

214 "	1.	WEIRS"				
215 "		Crest	Weir	Crest	Left	Right"
216 "		elevation	coefficie	breadth	sideslope	sideslope"
217 "		253.750	0.900	2.000	0.000	0.000"
218 "	1.	ORIFICES"				
219 "		Orifice	Orifice	Orifice	Number of"	
220 "		invert	coefficie	diameter	orifices"	
221 "		250.577	0.630	0.0500	1.000"	
222 "		Peak outflow		0.010	c.m/sec"	
223 "		Maximum level		253.716	metre"	
224 "		Maximum storage		457.451	c.m"	
225 "		Centroidal lag		8.932	hours"	
226 "		0.093	0.303	0.010	0.003 c.m/sec"	
227 " 40		HYDROGRAPH Next link "				
228 "	5	Next link "				
229 "		0.093	0.010	0.010	0.003"	
230 " 38		START/RE-START TOTALS 203"				
231 "	3	Runoff Totals on EXIT"				
232 "		Total Catchment area		0.945	hectare"	
233 "		Total Impervious area		0.655	hectare"	
234 "		Total % impervious		69.265	"	
235 " 19		EXIT"				

## Appendix F

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# Water Balance Analysis



## Gilbert WellField in Paris Ontario

### 4 Characterization of Existing Wellfield Conditions

Inputs to the above expression were, as follows:

Gilbert Creek Baseflow = 12 L/s (0.012 m<sup>3</sup>/s)

Tile Drain Discharge = 29 L/s (0.029 m<sup>3</sup>/s)

Municipal Water Taking (Upper Aquifer) = 24 L/s (0.024 m<sup>3</sup>/s)

Groundwater Catchment Area = 5 km<sup>2</sup> (5,000,000 m<sup>2</sup>)

Based on the above, an infiltration rate of 397 mm/yr was calculated. This result was at the high end of the range provided by PEI (1999), which predicted infiltration rates ranging from 300 to 400 mm/yr.

The above assessment does not factor in the areas that are already developed, which is approximately 20% of the Gilbert Creek groundwater catchment area. If it were assumed that the level of infiltration in the existing developed area was about the same as the recently constructed Pinehurst Subdivision (245 mm/yr), then the infiltration rate across the remaining undeveloped land would need to be 435 mm/yr to achieve an overall average infiltration rate of 397 mm/yr across the entire catchment area.

For optimal long-term performance of the wellfield and health of Gilbert Creek, it is recommended that the target infiltration rate for undeveloped lands be 435 mm/yr.

#### 4.2.6 Infiltration Rate Summary

To sustain the wellfield and health of Gilbert Creek, an infiltration rate of 435 mm/yr for all currently proposed and future developments is required. At the time of this report, the County currently has no plans to increase water taking from the Gilbert Wellfield; however, if this changes then the target infiltration rate may need to be revisited.

### 4.3 Water Quality

History has shown that the water quality of the Upper Aquifer, from which Gilbert Wellfield draws much of its water and Gilbert Creek relies for its baseflow, is sensitive to changes occurring on the landscape. The following sections provide a brief summary of the sensitivity of these two receptors to water quality changes as well as some potential mitigation strategies to help protect groundwater quality of the Upper Aquifer.

#### 4.3.1 Gilbert Wellfield

Water quality samples are routinely collected from the Gilbert Wellfield municipal supply wells and area monitoring wells to assess groundwater quality. Parameters of concern have historically included nitrate and chloride within the upper aquifer system, as follows:

- Nitrate has historically been elevated in some of the overburden production wells, occasionally spiking over 10 mg/L; however, in recent years the nitrate concentration has been trending lower.



**Table 6.2: Well Water Takings**

<b>Aquifer System</b>	<b>Permit To Take Water</b>	<b>2022 Average Day Taking (L/s)</b>	<b>Avg. Chloride Concentration (mg/L)</b>
Overburden	35 L/s (7-day average)	24 L/s (43%)	29 – 48 mg/L
Bedrock	77.2 L/s	34 L/s (57%)	26 – 40 mg/L

The County has considerable operational flexibility in how water is taken from the Gilbert Wellfield. If chloride levels were to increase in the Overburden Aquifer System, a greater proportion of the water could be extracted from the Bedrock Aquifer to keep overall chloride concentrations manageable.

### **6.10.3 Monthly Climate Normals**

Utilizing Environment Canada's Roseville Climate Station which is located 28.0km north-northwest from the Gilbert Wellfield Area, monthly climate precipitation normals can offer insight on the feasibility of a spilt outfall structure. The use of a spit outfall structure would allow for seasonal management of stormwater to promote infiltration during the summer when chloride (salt) concentrations are significantly lower. Monthly precipitation and temperature normals from 1981 to 2010 for the area are summarized in **Table 6.3**.

**Table 6.3: Monthly Climate Normals**

<b>Month</b>	<b>Precipitation (mm)</b>	<b>Temperature (°C)</b>
Jan	68.1	-7
Feb	54.6	-6.1
Mar	55	-0.9
Apr	77.2	6.2
May	87.9	12.9
Jun	76.3	18
Jul	98.2	20.2
Aug	83.9	19.3
Sep	85.4	14.8
Oct	75.3	8.6
Nov	88.4	2.4
Dec	68.5	-4

Given the preliminary nature of this report, it has been assumed that salt will be applied when the average monthly temperature drops below 0°C; however, to be conservative the months of April (spring flush of salt applied over winter) and of November (typical start of salt application) were noted as months where the concentration of chlorides may be higher than desired for infiltration. On average, it is expected that the lands within the **Gilbert Wellfield's recharge area will experience 919 mm of annual precipitation** of which 507 mm (55% of annual precipitation) is expected to have low chloride concentrations.

Of the 507 mm of annual precipitation that is likely suitable for infiltration, 435 mm/year (86% of low chloride precipitation) of infiltration is required to sustain the wellfield and health of Gilbert Creek. Accounting for evapotranspiration, it's unlikely that an end of pipe solution infiltrating low chloride runoff



## RUNOFF

Post-Development Runoff										
Catchment <sup>1</sup>	Area	% Impervious	Pervious Area			Impervious Area			Total Runoff Volume	Comments
			Area	Runoff Rate <sup>2,3</sup>	Runoff Volume	Area	Runoff Rate <sup>2,3</sup>	Runoff Volume		
	ha		ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	m <sup>3</sup> /yr	
401	0.887	58	0.373	92	343	0.514	864	4,445	4,788	Runoff to ROW
						Sum of Post-Development Runoff			4,788	

## INFILTRATION

Post-Development Infiltration										
Catchment <sup>1</sup>	Area	% Impervious	Pervious Area			Impervious Area			Total Infiltration Volume	Comments
			Area	Infiltration Rate <sup>2,3</sup>	Infiltration Volume	Area	Infiltration Rate <sup>2,3</sup>	Infiltration Volume		
	ha		ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	m <sup>3</sup> /yr	
401	0.887	58	0.373	277	1,032	0.514	0	0	1,032	Passive infiltration
402	0.208	69	0.064	369	238	0.144	864	1,240	1,478	Active and passive infiltration
						Sum of Post-Development Infiltration			2,510	

## EVAPOTRANSPIRATION

Post-Development Evapotranspiration										
Catchment <sup>1</sup>	Area	% Impervious	Pervious Area			Impervious Area			Total ET Volume	Comments
			Area	ET Rate <sup>2</sup>	ET Volume	Area	ET Rate <sup>2</sup>	ET Volume		
	ha		ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	m <sup>3</sup> /yr	
401	0.887	58	0.373	550	2,049	0.514	55	283	2,332	
402	0.208	69	0.064	550	355	0.144	55	79	434	
						Sum of Post-Development ET			2,765	

## SUMMARY

	Post-Development	Infiltration Requirement <sup>4</sup>	% Difference
Runoff Volume (m <sup>3</sup> /yr)	4,788		
Infiltration Volume (m <sup>3</sup> /yr)	2,510	4,763	-47%
ET Volume (m <sup>3</sup> /yr)	2,765		

## NOTES

1 Refer to Figure 4.0 for Post-Development Water Balance Catchment Areas.

2 Average annual rainfall in Gilbert Creek is 919mm per Master Drainage Plan by Stantec.

Below table summarizes rates used assuming hydrologic soil group 'A' and flat lands (0-5%). Impervious Areas are based on capturing 25mm of rainfall:

	ET	Runoff	Infiltration
Urban Lawns	550	92	277
Impervious Areas	55	864	0

3 Catchment 402 experiences passive and active infiltration in pervious areas. Therefore, the infiltration rate is calculated as 92mm (runoff is collected and directed to an infiltration gallery) plus 277mm (passive infiltration) = 369mm. Since this runoff is collected and infiltrated, it is not included in the 'runoff' calculations. Runoff from impervious areas in Catchment 402 is collected and directed to the infiltration gallery.

4 Infiltration Requirement is based on the requirement outlined in "Gilbert Wellfield in Paris Ontario, Preliminary Master Drainage Plan and Preliminary Hydrogeological Assessment" by Stantec, dated March 19, 2024. Retention of 435 mm/year for the proposed Site as outlined in the master drainage plan.