350 Wellington Road 7

Functional Servicing and Stormwater Management Report

Project Location:
350 Wellington Road 7, Elora, ON

Prepared for:
Elora 7 OP Inc.

Prepared by:
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October 20, 2022

MTE File No.: 51060-100

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1.0 Introduction

MTE Consultants Inc. was retained by the property owner to complete a Functional Servicing and Stormwater Management (FS-SWM) Report for a new residential development to be constructed at 350 Wellington Road 7 (herein referred to as 'the Site') in the Town of Elora, located in the Township of Centre Wellington.

The purpose of this study is to support the Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) Applications. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property.

1.1 Site Description and Official Plan/Zoning Designations

The Site comprises of approximately 4.46ha of agricultural land and is located on Wellington Road 7 between Wellington Road 18/Woolwich Street West and Middlebrook Road/ David Street West, approximately 490m north of the Grand River. The Site is bounded to the east by Wellington Road 7 and bounded to the north, south and west by existing agricultural land. Existing residential properties and the Elora municipal cemetery are located on the other side of Wellington Road 7, fronting the Site. In addition, there are four Grand River Conservation Authority (GRCA) regulated wetlands adjacent to the Site; three to the northwest and one to the southwest. The southwest wetland regulation limit extends into the southwest portion of the Site. For the exact location of the Site refer to Figure 1.0.

The current Official Plan designation of the Site is Highway Commercial. The current zoning of the Site is Highway Commercial Zone, C2. The Official Plan and Zoning By-Law Amendment Applications are proposed to re-designate and re-zone the Site to allow for the development as outlined in the accompanying planning justification report.

1.2 Proposed Development

The proposed development for the Site is the construction of 34 townhome blocks complete with common drive aisles, surface parking, landscape and amenity areas. The proposed development is intended to create a 273 unit townhome community consisting of conventional, back to backs and double front live/work style townhomes. To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 along the frontage of the Site. Given the size of the proposed development, it is expected to be constructed in two phases from south to north. In order to service the development, the existing municipal sanitary sewer and watermain will be extended from the Wellington Road 7 and David Street West intersection to the Site. A municipal storm sewer will also be installed to allow for the urbanization of the southbound lane of Wellington Road 7 along the frontage of the Site.

1.3 Reviewing Agencies

Functional grading, servicing and stormwater management designs as well as this FS-SWM Report will be required for submission to the Township of Centre Wellington in support of the Official Plan Amendment and the Zoning By-Law Amendment Applications. The Township will also be responsible for the review and approval of site plans, lighting and landscape designs and ultimately issuing building permits.

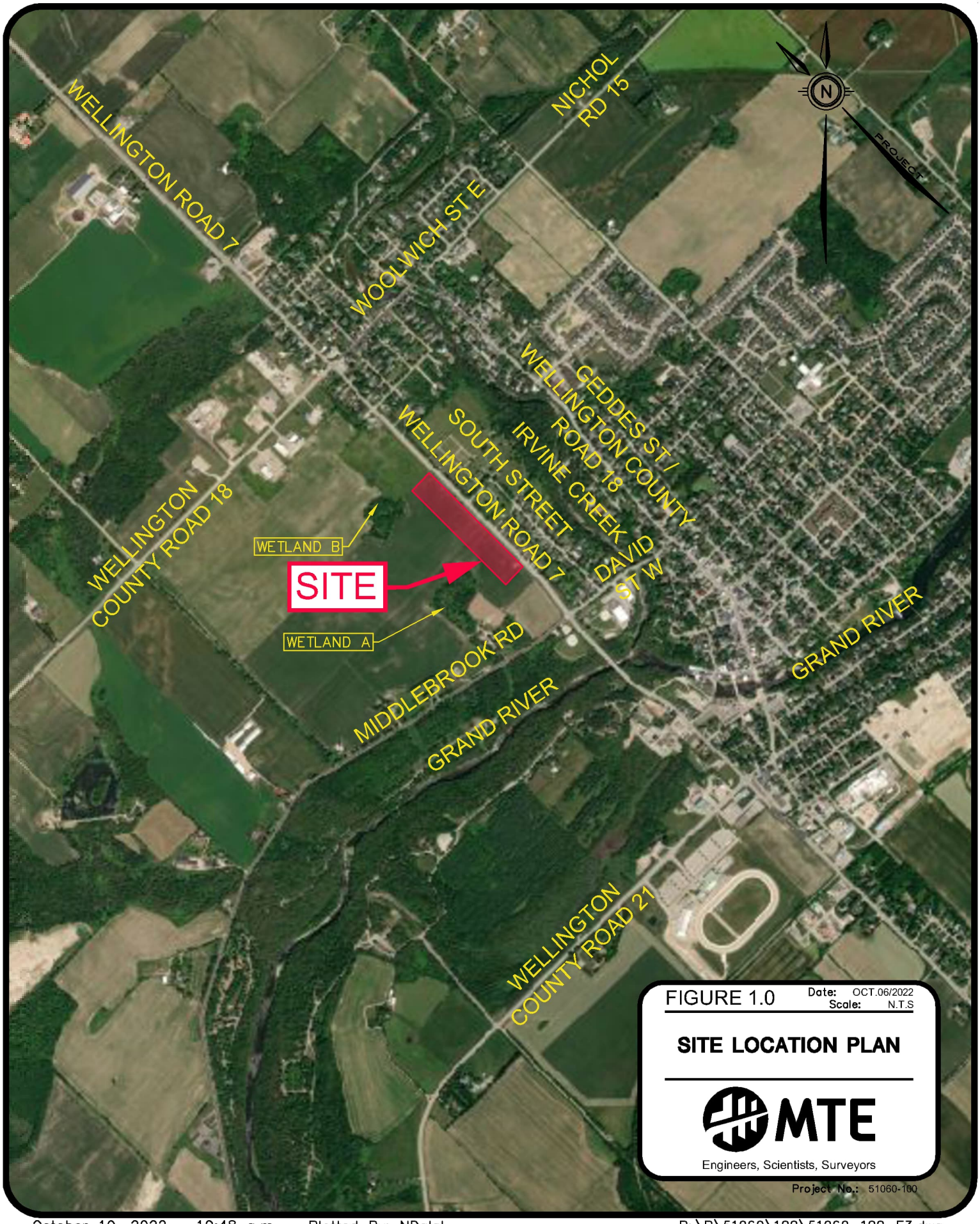

FIGURE 1.0

Date: OCT.06/2022
Scale: N.T.S

SITE LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 51060-100

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As the southwest portion of the Site falls within the GRCA Regulation limit, the site engineering design will also be submitted to the GRCA for their review and approval. A 'Fill Permit' will be required.

Wellington Road 7 is a County Road. As such, the Wellington County will be circulated on the Official Plan Amendment and the Zoning By-Law Amendment Applications and will need to approve the functional site grading, servicing and stormwater management design as well as this FS-SWM Report.

2.0 Grading

2.1 Existing Topography

The Site is agricultural land with two driveway entrances off Wellington Road 7. In the existing condition, the Site drains via broad sheet flow to four main drainage paths based on the existing contours; to the southwest towards Wetland A, to the southeast towards the neighbouring agricultural lands, to the northeast towards Wellington Road 7 and to the northwest towards Wetland B. Fronting the Site, Wellington Road 7 has a rural cross-section with roadside ditches and no pedestrian walkways. There is an elevation difference of approximately 7.7m between the highpoint in Wellington Road 7 along the frontage of the Site and the low point at the southwest corner of the Site. The elevation difference occurs over the length of the Site at a gradual slope. The Site is fully pervious in the existing condition.

2.2 Existing Soils Information

A geotechnical investigation and hydrogeological assessment were undertaken by Grounded Engineering Inc. Their findings are documented in the Geotechnical Engineering Report, dated October 17, 2022 and in the Hydrogeological Assessment dated October 17, 2022, which are included with this submission.

The subsurface stratigraphy is generally comprised of topsoil underlain by disturbed soil consisting of sands and silts with trace to some clay and trace gravel. Beneath the disturbed soils, a sandy silt till with trace to some clay and trace gravel was encountered, followed by sands, underlain by a silt to clayey silt till with trace gravel. The sand deposit is of moderate permeability and will provide moderate recharge capability and groundwater movement, while the tills and disturbed soil deposits are of moderate to low permeability based on the in-situ testing and grain size analyses.

Based on the measured groundwater levels in the monitoring wells on May 17, 2022, the design groundwater table for engineering purposes is at Elev. 403.2 m at the north end of the Site decreasing to Elev. 397.7m at the south end of the Site. The groundwater depth below existing grade varies from 3.7mBGS at the north end of the Site to 0.8mBGS at the middle of the Site to 2.6mBGS at the south end of the Site. There is also perched water in the disturbed soils, which is flowing down towards the groundwater table. It is noted that the observed groundwater table will fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

Refer to the Geotechnical Engineering Report and the Hydrogeological Assessment by Grounded for more information.

2.3 Proposed Grading

The preliminary grading strategy for the proposed development was developed based on the topographic survey and Conceptual Site Plan prepared by We Merchandise Space Inc. Refer to the separately appended MTE Drawings, C2.1, C2.2 and C2.3, for the functional grading design for the Site.

The proposed development has 34 townhome blocks complete common drive aisles, surface parking, landscape and amenity areas. The common drive aisles will be connected to Wellington Road 7 through three proposed driveway entrances; one at the north, middle and south end of the Site. The proposed townhome blocks finished floor elevations (FFE) vary from 408.60 at the north end of the Site to 403.35 at the south end of the Site. The finished floor elevations were set to follow the profile of Wellington Road 7, while ensuring at least 1.0m of separation was maintained between the underside of the footings to the groundwater elevations noted in Section 2.2. The proposed development is intended to create a 273 unit townhome community consisting of conventional, back to backs and double front live/work style townhomes. To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 along the frontage of the Site. This will include filling in the existing roadside ditch, installing storm sewers, concrete sidewalk and curb and gutter. Refer to the proposed road cross-section detail on the functional grading plans for illustration. On-site, the proposed grading strategy will respect the existing grades along the north, south and west property lines. Regrading will involve raising the east property line to accommodate the proposed urban road cross-section along with raising the majority of the Site to ensure groundwater separation is maintained and to direct the major overland flow route for the Site to the Wellington Road 7 right-of-way.

3.0 Servicing

The preliminary servicing strategy for the proposed development was developed based on the topographic survey, plan and profile information, Municipal Servicing Assessment by Triton Engineering Services Limited and Conceptual Site Plan prepared by We Merchandise Space Inc. Refer to the separately appended MTE Drawings, C2.4, C2.5 and C2.6, for the functional servicing design for the Site and the preliminary watermain and sanitary sewer plan by Triton for the functional municipal service extension design from the Wellington Road 7 and David Street West intersection to the Site. The proposed servicing strategy has been developed to accommodate the potential for a phase build out of the Site from south to north.

3.1 Water

There is an existing 100mm diameter municipal watermain along Wellington Road 7, from #321 Wellington Road 7 (the south end of the Site) connecting to an existing 300mm diameter municipal watermain along the David Street West, located east of Wellington Road 7. There is also an existing 300mm diameter watermain along Wellington Road 7 south of David Street West, which connects to the 300mm watermain on David Street West at the intersection of Wellington Road 7, David Street West, and Middlebrook Road. The closest municipal fire hydrant is located on the east side of Wellington Road 7 in front of 311 Wellington Road 7. The hydrant connects to the 100mm diameter watermain along Wellington Road 7. The Site is not currently serviced by municipal water.

A new connection to the existing 300mm diameter municipal watermain at the intersection of David Street West and Wellington Road 7 will be required in order to service the proposed development, and future developments along Wellington Road 7. The existing 300mm diameter

municipal watermain will be extended from the intersection to the south end of the Site, where a private water service connection will be made and extended into the Site. The required private water service size will be determined during detailed design, but will likely be 300mm diameter. Each townhome will be serviced with a minimum 25mm diameter domestic connection off the private water service. Given the length of the Site, it is anticipated that seven new private hydrants will be required to service the proposed townhome blocks.

A municipal servicing assessment was undertaken by Triton Engineering Services Limited. Their findings are documented in the 350 Wellington Road 7 Municipal Servicing Assessment, dated July 11, 2022, included in Appendix A. Based on their assessment, the Centre Wellington Water system is expected to have sufficient capacity and pressure to supply the development for domestic and fire flows once the services discussed above are extended to the Site. The maximum day domestic demand for the Site was determined to be 6.1L/s. In addition to the domestic demands, the pressures and flows in the extended system must be sufficient for firefighting conditions as established by the Ontario Building Code (2012). The minimum residual pressure under firefighting conditions is 140kPa (20.3psi) per OBC 2012 A-3.2.5.7 3(b). Preliminary calculations indicate that the required minimum water supply rate based on OBC is 150L/s (9,000L/min) for the worst-case block. Therefore, the the total water demand for the Site is expected to be 156.1L/s. Refer to Appendix B for water demand calculations. Fire flow demand for the worst case block, and associated firefighting capacity within the expected main will be verified at detailed design.

3.2 Sanitary

There is no existing municipal sanitary sewer along Wellington Road 7; therefore, the Site is not currently serviced. There is an existing 200mm diameter municipal sanitary sewer on David Street West draining east. There is an existing 200mm diameter municipal sanitary sewer stub at the intersection of David Street West and Wellington Road 7.

Based on available topographical information from the GRCA mapping tool, there appears to be a 14.5m elevation difference between the south end of the Site and the location of the existing sanitary stub at the intersection of David Street West and Wellington Road 7. Therefore, there is adequate elevation change to extend the sanitary sewer along Wellington Road 7 in order to service the proposed development, and future developments along Wellington Road 7, with a gravity sewer. The existing 200mm diameter municipal sanitary sewer will be extended from the intersection to the south end of the Site, where a private sanitary service connection will be made and extended into the Site. It is proposed that the Site will be serviced by a new 200mm diameter sanitary sewer complete with a new manhole at the extended municipal sewer on Wellington Road 7. The private sanitary sewer will be installed at a slope that provides depth for the servicing of each townhome while maintaining adequate capacity. The service sizes and inverts will be confirmed at detailed design.

Based on Triton's municipal servicing assessment, the existing David Street Sanitary Pumping Station (SPS) has sufficient capacity to service the proposed development. In addition, the Elora Waste Water Treatment Facility (WWTF) is also expected to have sufficient capacity to treat the estimated flows produced by the proposed development. Municipal sanitary sewers will need to be extended to the Site as discussed above, but the existing downstream municipal sanitary sewers are also expected to have adequate capacity based on the current SPS configuration/pump rates.

A sanitary flow analysis has been prepared to determine the flows anticipated to be generated by the proposed development. Based on the RCC, the anticipated average sanitary flow generation rate is 297L/d/capita and the average density is 3.09 persons/unit. With the proposed townhome blocks having a total of 273 units and a Site area of 4.46ha, the resulting

peak flow including infiltration is expected to be 9.16L/s from the Site. Refer to Appendix C for sanitary flow rate calculations.

3.3 Storm

Wellington Road 7 has a rural road cross-section along the front of the Site; therefore, there are no existing municipal storm sewers. However, there are roadside ditches along both sides of Wellington Road 7. The roadside ditches north of the highpoint in Wellington Road 7 drain toward Woolwich Street West, while the roadside ditches south of the highpoint in Wellington Road 7 drain toward David Street West/Middlebrook Road. The roadside ditch along the northbound lane drains across the road to the west side of Wellington Road 7 via an existing 600mm CSP culvert at the intersection of Wellington Road 7 and David Street West/Middlebrook Road. From there runoff collected from both roadside ditches drains west along Middlebrook Road where it eventually discharges to a Grand River tributary, and ultimately to the Grand River. Surface runoff from a majority of the Site is currently conveyed overland to the southwest of the Site where it enters Wetland A, which eventually discharges to a Grand River tributary and ultimately to the Grand River.

To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 along the frontage of the Site. It is proposed that a new 450mm diameter municipal storm sewer will be installed along the frontage of the Site with manholes and catchbasins spaced every 90 metres. The diameter of the municipal storm sewer will increase where the private storm sewer system connects. The proposed municipal storm sewer system will discharge runoff to the existing ditch approximately 62m past the south property line, to tie into the existing ditch at an elevation of 397.5m. The sewer sizes and inverts will be confirmed at detailed design and an analysis of downstream culverts along Wellington Road 7 will be completed. Any culverts or ditches determined to be undersized along Wellington Road 7 will be upsized and regraded, respectively, during the right-of-way works required to extend the municipal watermain and sanitary sewer.

A private storm sewer system will be installed on-site to collect rooftop runoff from the townhome blocks and runoff from the common driveway and parking areas. The runoff collected in the storm sewers will be directed to the OGS unit located in the south entrance to the Site and on to the proposed municipal storm sewer system in the Wellington Road 7 right-of-way, complete with new manhole. Runoff from the frontage of the property will sheet flow towards the Wellington Road 7 right-of-way. A separate storm network, including rain leader piping and rear yard swales, will be installed to convey runoff from the roof of the outer perimeter townhome blocks towards Wetland A and B to maintain a surface water balance to each Wetland, respectively. All townhomes with basements will require sump pumps.

4.0 Preliminary Stormwater Management Design

4.1 SWM Criteria

The stormwater management design criteria for the subject Site, as proposed to Triton in the SWM Criteria Brief by MTE dated September 12, 2022, to initiate discussion with Wellington County and the Township of Centre Wellington staff, are as follows:

i) Establish a legal outlet(s) for the Site;

ii) Maintain an annual surface runoff water balance to Wetland A and Wetland B;

iii) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the allowable flow rate using a C value of 0.75;

iv) Implementation of water quality controls; and,

v) Provide erosion and sediment controls.

Refer to the SWM Criteria Brief in Appendix D for rationale as to why the Township's general stormwater management design criteria is not feasible for the subject Site and how the proposed criteria was established. At the time this report was published, Triton and municipal staff had yet to respond to the SWM Criteria Brief.

4.2 Legal Outlet

In the existing condition, the majority of the runoff from the Site is directed across the neighbouring property via broad sheet flow to Wetland A and B. Generally, there is no right of drainage for surface water. Therefore, the only legal outlet for the Site in the existing condition is to the municipal right-of-way (Wellington Road 7).

In the post-development condition, it is proposed that the Site's private storm sewer system will outlet to the existing roadside ditch within the Wellington Road 7 right-of-way at the southeast corner of the Site. Through the Site grading design, the major overland flow route will also be directed to the Wellington Road 7 right-of-way. However, given the need to maintain a surface runoff water balance to Wetland A and B, an easement is currently being pursued with the neighbouring property owner to the west to legally allow surface drainage across the adjacent property to these wetlands.

It should be noted that even if an easement is obtained, the primary legal outlet for the Site should still be to Wellington Road 7.

4.3 Water Balance

An annual surface runoff water balance to Wetland A and Wetland B will be achieved in the post-development condition by directing runoff from rooftop and landscape areas adjacent the west property line to the neighbouring property. From there, runoff will continue to sheet flow across the neighbouring property and into each wetland as it does in the existing condition. A preliminary annual surface runoff water balance analysis was completed for Wetland A and Wetland B resulting in a 13m^3/yr and 10m^3/yr net gain of runoff, respectively. Refer to Appendix E for the preliminary annual surface runoff water balance analysis calculations. The required catchment area to be directed to Wetland A and B is illustrated on the post-development catchment areas Figure 3.0 (Catchment 204 & 205, respectively).

It should be noted that being able to achieve a surface runoff water balance to Wetland A and B is conditional on obtaining an easement to allow surface drainage across the neighbouring property to the west.

4.4 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 pre-development runoff rates using MIDUSS NET and the allowable runoff rates using the Rational Method;

ii) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSSS modeling; and,

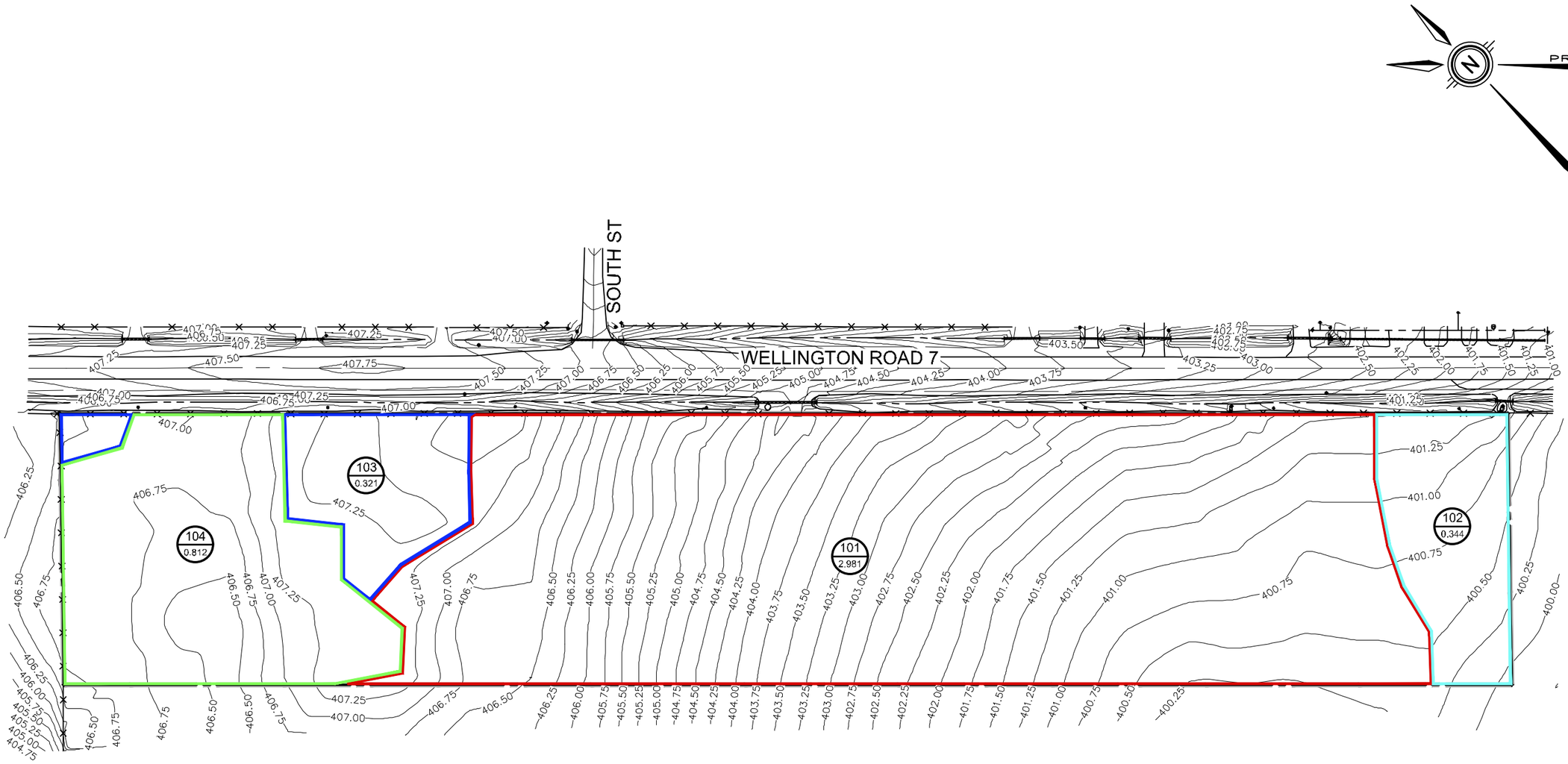
iii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modeling of the Site. The pre-development condition was separated into four catchment areas based on the existing drainage paths for the Site. The post-development condition was separated into five catchment areas; the controlled area and the uncontrolled areas. Figure 2.0 illustrates the limits of the pre-development catchment area. Figure 3.0 illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (ha)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Pre-Development Catchment Areas							
101	To Wetland A (Southwest)	2.981	0.0	75	98	3.5	200.0
102	To adjacent property (South)	0.344	0.0	75	98	2.0	100.0
103	To Wellington Road 7 (Northeast)	0.321	0.0	75	98	1.5	50.0
104	To Wetland B (Northwest)	0.812	0.0	75	98	2.5	80.0
Post-Development Catchment Areas							
201	Controlled Area to Wellington Road 7 (Southeast)	3.101	79.0	75	98	2.0	30.0
202	Uncontrolled Area to Wellington Road 7 (Southeast)	0.189	62.9	75	98	2.0	5.0
203	Uncontrolled Area to Wellington Road 7 (Northeast)	0.180	49.8	75	98	2.0	5.0
204	Uncontrolled Area to Wetland A (Southwest)	0.769	47.7	75	98	4.0	20.0
205	Uncontrolled Area to Wetland B (Northwest)	0.219	45.1	75	98	4.0	20.0

Based on the findings from the geotechnical investigation by Grounded, as detailed in Section 2.2, a pervious CN of 75 for grass areas is appropriate.



LEGEND

- CATCHMENT 101
- CATCHMENT 102
- CATCHMENT 103
- CATCHMENT 104

101 — SUB-CATCHMENT NUMBER

2.981 — AREA (ha.)

406.50 — EXISTING CONTOURS

FIGURE 2.0

Date: SEPT. 06/22

Scale: 1:1500

PRE-DEVELOPMENT CATCHMENT AREAS

MTE

Engineers, Scientists, Surveyors

Project No.: 51060-100

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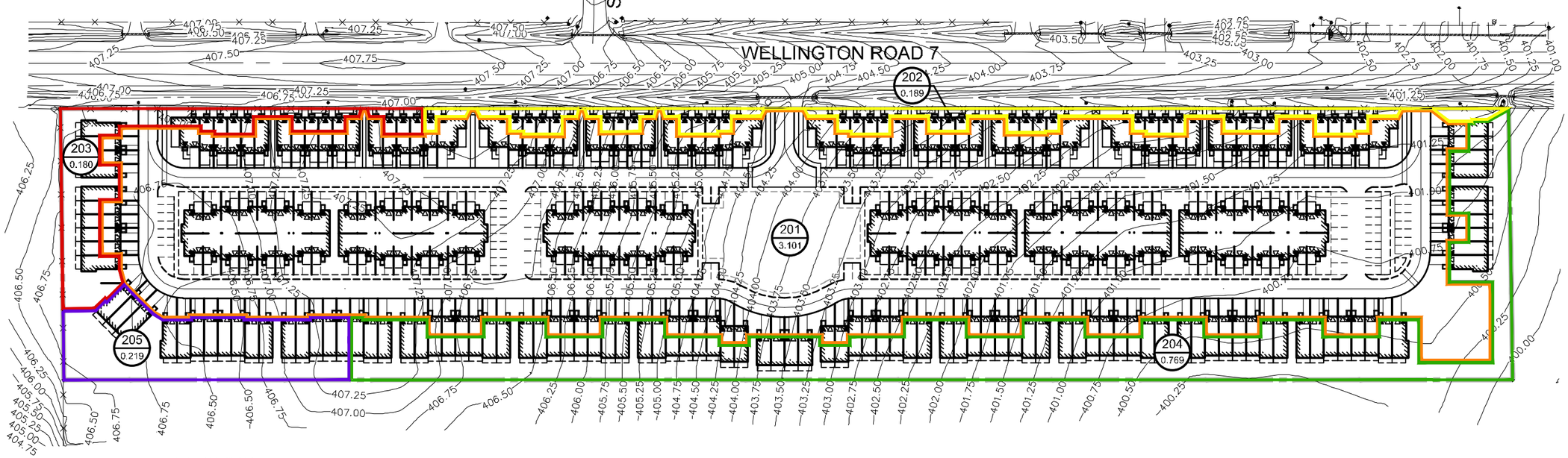
PROJECT

SOUTH ST

WELLINGTON ROAD 7



LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204
- CATCHMENT 205

201 / 3.101 — SUB-CATCHMENT NUMBER / AREA (ha.)

401.50 — EXISTING CONTOURS

PROPOSED BUILDING

FIGURE 3.0 Date: SEPT. 06/22 Scale: 1:1500

POST-DEVELOPMENT CATCHMENT AREAS

MTE
Engineers, Scientists, Surveyors

Project No.: 51060-100

October 19, 2022 10:42 a.m. Plotted By: NDalal

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In order to achieve the stormwater management requirements for the Site, runoff generated from the interior rooftops, landscape, drive aisles and parking areas will be controlled with a properly sized outlet pipe. Storage volume for the control outlet pipe will be provided in underground storm tanks located at the south end of the Site. The following table summarizes the expected flows that will be generated by the whole Site. Refer to Appendix F for the MIDUSS NET output, but please note that these flows are subject to change at the detailed design stage.

Table 4.2 – Summary of Flows

Modelling Condition	2-Year Storm Event (m^3/s)	5-Year Storm Event (m^3/s)	10-Year Storm Event (m^3/s)	25-Year Storm Event (m^3/s)	50-Year Storm Event (m^3/s)	100-Year Storm Event (m^3/s)
Pre-Development – Total Site	0.036	0.102	0.171	0.277	0.377	0.491
Allowable (C=0.75) – Total Site	0.511	0.724	0.887	1.055	1.202	1.349
Post-Development – Total Site	0.292	0.428	0.539	0.669	0.791	0.909
Pre-Development – to Wetland A	0.022	0.064	0.107	0.174	0.237	0.308
Post-Development – to Wetland A	0.086	0.120	0.153	0.182	0.207	0.204
Pre-Development – to Wetland B	0.009	0.024	0.040	0.064	0.089	0.112
Post-Development – to Wetland B	0.023	0.033	0.041	0.049	0.056	0.065
Pre-Development – to Wellington Road 7	0.004	0.010	0.017	0.028	0.037	0.048
Post-Development – to Wellington Road 7	0.230	0.335	0.415	0.506	0.584	0.662

Note: Time of Concentration (Tc) of 20 mins was used in the rational method calculations to determine the allowable flow rates.

With the addition of the outlet control pipe, the post-development runoff from the Site is controlled well below the allowable peak flow rates based on a runoff coefficient of 0.75 requested in the SWM Criteria Brief. This results in reduced storm pipe sizes on- and off-site, reduces the additional peak flow rate to Wellington Road 7 while still avoiding over controlling the Site given the proximity to the Grand River. This helps allow the peak flow from the Site to occur in advance of the peak flow from the upstream drainage area.

Peak flows to Wetland A and Wetland B are increased in the smaller storm events but are reduced in the larger storm events. This is a result of the increase in impervious area directed to the wetlands but the reduction in catchment area. It should be noted that the proposed wetland catchments are dictated based on the water balance discussed in Section 4.3.

4.5 Water Quality Control

A Stormceptor EFO10 will be installed on the private storm sewer system to provide water quality control for the Site (Catchment 201). The chosen unit is expected to provide Enhanced Level water quality control. Refer to Appendix G for the sizing output from the Stormceptor Expert program. The Stormceptor will require regular annual maintenance to ensure it is operating properly. The owner may be required to enter into a maintenance agreement with a suitable contractor to complete this work. In addition, all the storm structures will have a 600mm sump.

Runoff from the frontage of the property and towards the wetlands will be from rooftop and landscape areas which are considered “clean”, therefore no quality controls are required for those catchment areas (Catchment 202, 203, 204 and 205).

4.6 Erosion & 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) Construction of temporary swales to direct runoff to a sedimentation basin, with rock check dams as required to control velocities;

v) Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas;

vi) Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction, within 60 days of rough grading; and,

vii) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

4.7 Low Impact Development (LID)

Based on the findings of the geotechnical investigation and hydrogeological assessment by Grounded, as detailed in Section 2.2, there is only 3.7 m at the north end of the Site to 0.8m at the middle of the Site to 2.6m at the south end of the Site between the existing grade and the groundwater table across the Site. This shallow groundwater table is not ideal for the installation of a traditional on-site infiltration gallery given the required 1m vertical separation between the bottom of the gallery and the seasonal high groundwater table. In addition, the soils above the observed groundwater table were noted to be moist to wet, further indicating the Site may not be suitable for an infiltration gallery. However, this will be reviewed further during detailed design given the majority of the Site is being raised. Other LID methods such as amended topsoil will also be explored during detailed design to help promote at-surface infiltration.

5.0 Conclusions

Based on the foregoing analysis, it is concluded that:

- The proposed grading design will match into existing grades along the north, south and west property boundaries, and will raise the grade along the east property boundary and the majority of the Site to achieve an overland flow route to the municipal right-of-way;
- The proposed development will include urbanizing the southbound land of Wellington Road 7 along the frontage of the Site to create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community;
- Existing municipal infrastructure for water and sanitary servicing is available at the intersection of Wellington Road 7 and David Street West and will be extended along Wellington Road 7 to service the Site;
- Existing roadside ditches along Wellington Road 7 provide for storm servicing to the Site, with the installation of municipal storm sewers required to urbanize the southbound land of Wellington Road 7;
- The existing municipal infrastructure, Elora WWTF and Centre Wellington Water system are expected to have sufficient capacity to support the proposed development. The expected water demand for the Site is 156.1L/s (max day domestic + OBC Fire Flow). The water demand for the Site will be confirmed during detailed design. The expected peak sanitary flow rate is 9.16L/s. These flow rates are provided to the Township for inclusion in their model; and,
- The SWM criteria, established in the SWM Criteria Brief, can be satisfied with the implementation of on-site controls for water quantity and water quality. A surface water runoff balance can be maintained to Wetland A and Wetland B through grading and will result in a small net gain in annual runoff over pre-development conditions on the Site, given an easement with the neighboring property owner to the west can be obtained. LID methods will be explored during detailed design.

Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

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Appendix A

350 Wellington Road 7 Municipal Servicing Assessment & Preliminary Watermain and Sanitary Sewer Plan

TRITON ENGINEERING SERVICES LIMITED
Consulting Engineers

Memorandum

DATE:	July 11, 2022
TO:	Chantalle Pellizzari
FROM:	Dustin Lyttle & Ray Kirtz
RE:	350 Wellington Road 7 Municipal Servicing Assessment
FILE:	A6764A

Introduction:

The following memo is intended to provide insight on the expected downstream sanitary sewer capacity, water system operating conditions and available municipal water for fire fighting purposes within the proposed 350 Wellington Road 7 (W.R.7) condominium development. A concept plan was provided by the developer that outlined the proposed 280 townhouse units on the 4.45 ha development area.

Sanitary Servicing:

David Street Sewage Pumping Station:

Existing Run-Times:

The Township provided historical data indicating the hours that the pumps operated each day over the past 3-years. On average, Pump One runs for 18 minutes each day, and Pump Two runs for 13 minutes each day. The maximum time that Pump One has operated was on April 29th, 2021 for 3.9 hours. For Pump Two, this occurred on April 30th, 2021, operating for 1.4 hours. Based on historical data, the high flows do not correlate with a rain event, and therefore are expected to be the result of operation occurring at the neighbouring small community centre and curling club.

Existing Pump Rates:

There is no flow metering at the David Street SPS, therefore, Triton/Twsp staff performed a series of drawdown tests in order to estimate the pumping rate. The pumps do not have variable frequency drives, and therefore operate at full speed when running. The tests revealed that Pump One pumps at a rate of 2.55 L/s, and Pump Two at a rate of 15.7 L/s. When the pumps are run at the same time, they pump at a combined rate of 15.3 L/s. These calculations are outlined in Table 1 below.

Table 1 – Pump Drawdown Test Results

Parameter	Pump One		Pump Two	Pumps One & Two
	1st Run	2nd Run	1st Run	1st Run
Run Time (s)	90	120	120	120
Initial Depth (m)	2.45	1.64	2.40	2.00
Final Depth (m)	2.39	1.59	2.00	1.61
Change in Depth (m)	0.06	0.05	0.400	0.39
Volume of Sewage (L)	282.7	235.6	1,884.8	1,837.7
Pump Rate (L/s)	3.14	1.96	15.7	15.3

Note: the diameter on the wet well was measured as 2.45m on site.

During the pump test, it was observed that Pump One was not operating properly and causing significant turbulence, indicating that the impeller volute may be cracked or broken, which may provide explanation of the low pump rate. It was also observed that the flow was coming through the overflow check valve from the adjoining

tank into the wet well during the pump test at low liquid levels. For this reason, it is expected that both pumps may be able to operate at higher rates than noted, and that the 15.7 L/s is a conservative value. This assumes that Pump One is repaired.

Existing Flow Rates:

Using the existing run times and pump rates, the existing flow rates received by the pumping station can be calculated. The pumping station currently services 48 units, or **149 people**, as well as a small community centre and curling club. The average existing daily flow rate is **0.18 L/s** (15.2 m^3/day). The maximum existing day flow rate was calculated based off of the day where the greatest volume of sewage was pumped. This occurred on April 29th, 2021, resulting in a maximum day flow of **0.94 L/s** (81.0 m^3/day).

From this, an average existing per person flow rate of **102.0 L/capita/day** (315.1 L/unit/day) was determined. The maximum day existing per person flow rate is **543.4 L/capita/day** (1679.0 L/unit/day) Further to this, it is worth noting that the existing per person flow rates include any additional flows contributed by ICI users.

Proposed Development Loading:

The 2021 Reserve Capacity Calculations (RCC) for Centre Wellington reported that the current system has an average density of 3.09 persons/unit, a maximum day water demand of 0.92 m^3/day/unit (297 L/d/capita), and an average daily sewage flow of 0.664 m^3/day/unit (215 L/d/capita).

Based on the expected populations of the proposed development, and considering both sanitary the flow rates from the RCC (226 L/d/capita), as well as values outlined by the MOE (450 L/d/capita), the total expected peak sanitary sewage flows produced may range from **8.58 L/s** (740.9 m^3/day) to **17.07 L/s** (1475.1 m^3/day) (using a calculated Harmon peaking factor of 3.84).

Expected Flow Rates from the Combined Existing and Proposed Development:

The flows generated from this development will be directed to the David Street Sewage Pumping Station (SPS), which pumps across the David Street bridge to a manhole at the north end of Smith Street. From this manhole it flows down Victoria Street through the downtown area, ultimately discharging to the Clyde St. SPS where it is then again pumped to the Elora WWTP.

As seen in the following table, the average day flows to be directed to this SPS, including the existing users and subject development, are estimated between **2.51 L/s** and **4.62 L/s**. This will result in the pumps running between 44 and 80 times per day for approximately 5 minutes, based on the volume available between the design set points within the wet well, for a total run-time of 4 to 7 hours a day.

Table 2 – Effect of Average Flows on Pump Run Time

ADF (L/capita/day)	Expected Flow Rate (L/s)	Cycle Duration (minutes)	Frequency (times/day)	Total Hours Operating per day
226	2.23	5.35	41	3.7
450	4.62	5.35	80	7.0

The flows directed to the SPS are estimated between **8.76 L/s** and **17.255 L/s** when peaked using the Harmon formula and combined with the historic maximum day flows calculated at the SPS. Although the highest peak flow exceeds the measured capacity of the pumps, these flows are not expected to occur for a long duration, or frequently and therefore can be attenuated by the existing stations storage capacity. Further to this, due to the emergency storage contribution during the pump test, the expectation is that the pumps have greater capacity that has not been quantified.

Emergency Storage:

The SPS overflow chamber provides emergency storage (14.36 m^3) in the event that both pumps fail. Based on the RCC ADF, the time the Township has before the overflow begins discharging to the environment is over 95 hours under average day flows, and over 24 hours under peak day flows. When considering the MOE ADF, the emergency storage provides over 51 and 13 hours under average day flows and peak day flows.

Existing Sewer & Forcemain Capacity Assessment:

An existing 200mm diameter sanitary sewer is located on David Street which discharges into the David SPS. To service the subject development, a 200mm sanitary sewer needs to be extended north along W.R.7 from David Street. The existing sewer on David St. has sufficient capacity to convey flows from the subject development to the SPS.

The hydraulic capacity of the sanitary sewers downstream of the discharge point were explored using the existing and future condition SewerCAD model. The system was modelled under both the existing and developed condition scenarios with the developed condition scenario including complete build out of all current known developments and within the current urban boundary.

Conveying the specified pump rate of **15.7 L/s** during the peak day flow condition identified a number of sections of sewer that are surpassing, or close to, their theoretical capacity based on modelling. These sections are indicated in the following table.

Table 3 – Sewer Capacity

Sewer Section	Percent Full	
	Existing Condition	Future Developed Condition
MH-133 to MH-134 on Victoria Cr.	70.0%	102%
MH-140 to MH-141 on Price St.	82.4%	118%
MH-141 to MH-144 on Church St. W	68.4%	97%

The velocity of the sewage discharged from the SPS through the 100mm forcemain is 2.00 m/s, which is within MOE guidelines.

Reserve Capacity:

As indicated within the 2021 RCC for the Elora Wastewater Treatment Facility (WWTF), there are 2,774 uncommitted units remaining in treatment capacity which includes the proposed development of 280 units.

Water Servicing:

The existing water distribution system does not provide servicing to the subject site. Currently, a 100mm diameter Asbestos Cement watermain is located along the east side of W.R.7 to approximately 250m north of David Street which serves the residences fronting this section of W.R.7. This main does not meet Municipal Standards and is not adequate to convey fire flows to the subject site. Additionally, W.R.7 is intended as part of the future trunk watermain loop to service the Salem area.

As such, it is recommended that the existing 100mm watermain on W.R.7 be replaced with a 200mm watermain extended north to, at a minimum, South Street. Further, the existing 150mm watermain on South Street should be extended northerly/westerly to connect to the future W.R.7 watermain. This will increase fire flows, ensure redundancy of supply, and provide looping of the system.

Following these recommendations, an expected fire flow of 143.5 L/s will be available at the site with an expected static pressure of approximately 54PSI at an elevation of 407m

The 2021 RCC for the Centre Wellington Water System indicate that there are 1,113 uncommitted units available in water supply capacity which includes the proposed development of 280 units.

Stormwater:

The subject site slopes westerly (i.e., away from W.R.7) where runoff sheet flows onto another agricultural property. It may be necessary to investigate and secure an adequate outlet to the west. It is possible that part of the site could be graded to drain to W.R.7 where the existing ditch drains southerly to Middlebrook Road, then westerly along Middlebrook Road to an eventual outlet to the Grand River. Wellington County will need to be consulted and approve any stormwater design intended to discharge to their ROW.

Regardless of the outlet, it is recommended at this preliminary stage that Enhance Quality Treatment and Post-to-Pre-Peak Flow attenuation be provided. The southwest portion of the site is within a GRCA regulation limit, therefore GRCA approval of stormwater design must be obtained.

Conclusion:

David St. SPS & Reserve Capacity

As noted above the existing per person flow rates are lower than those reported in the RCC. However, as a factor of safety, we believe it is reasonable to assess the SPS using the RCC per person flow rates. This results in the existing SPS having sufficient capacity to service the development, although repairs and improvements are warranted given the current condition.

To further assess the impact of this development, we completed the assessment utilizing the MOE recommended value of 450L/capita/day which are 99% larger than the current RCC flow rates. Although considering these flows result in the current station being under sized, we do not believe these flows are realistic. Further to this, given the large overflow/emergency storage available and the opportunity to adjust float elevations, it is our opinion that the current station is adequately sized to attenuate the flows in the rare event larger flows are realized.

Additionally, the Elora WWTF is expected to have sufficient capacity to treat the estimated flows produced by the development.

Existing Sewers:

Based on the current SPS configuration/pump rates, it is expected that the downstream sewers will have adequate capacity. As a point of clarification, following development build-out the pumps will run more frequently, albeit at the same rate, resulting in no increase in flow rate directed to the existing downstream sewer system. However, it is worth noting that as Elora continues to develop there may be some areas of concern, as noted previously. These should be closely monitored moving forward to reduce the risk of surcharge events.

Sanitary sewers will need to be extended to the proposed development frontage, however the existing sewers on David Street are expected to have sufficient depth and capacity to service this development.

Water Servicing:

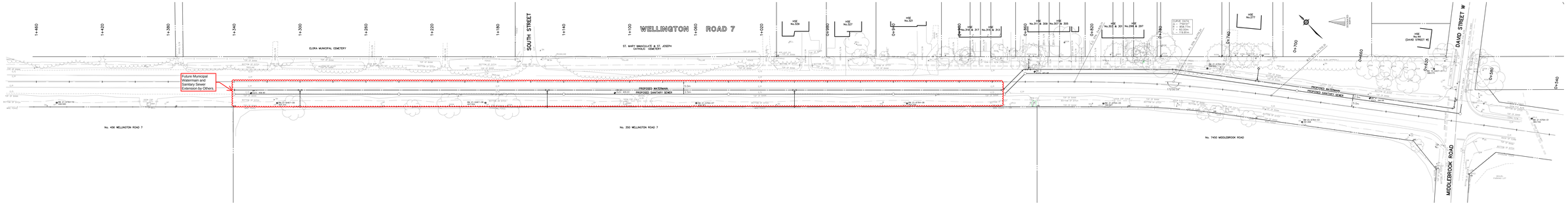
Based on the above analysis/recommendations, the expected system pressures and fire flow available in the site is expected to be acceptable for typical housing needs. However, the adequacy of the fire flows will need to be confirmed by the developer and their agents based on building specifics.

Further to this, the Centre Wellington Water system is expected to have sufficient capacity to supply the Development once services are extended to the site.

Stormwater Management:

As discussed above, an enhanced level of treatment and GRCA permitting is expected. Additionally, Wellington County approval of drainage to their ROW is required. Further, GRCA is to be consulted regarding SWM requirements to development of the site.

If you have any questions or concerns, please do not hesitate to contact us.



PRELIMINARY

TRANS ENGINEERING SERVICES LIMITED
Consulting Engineers

TOWNSHIP OF CENTRE WELLINGTON

WELLINGTON ROAD 7
STUDY PLAN

PROJECT No. A6764

DRAWN BY: A.S.B.	SCALE: 1:500
DATE: DECEMBER 2021	DWG. No. SK-01

Appendix B

Water Demand Analysis

350 Wellington Road 7
WATER FLOW DEMANDS
Elora, Ontario
Project #: 51060-100
Date: October 12, 2022
Design By: TMA
Checked By : LEI

Development Information[1,5]									Fire Flow[2,5]																	Domestic Flow[3,4]					
									Ontario Building Code							Fire Underwriters Survey														
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Units	Site Area	Population	Bldg Area (1st Floor)	Total Bldg Area	Building Volume	K	V	S_{tot}	Q	F	F		C	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F		Fire Flow (Max OBC /FUS)	2021 RCC Guidelines	Average Day	Max Day	Peak Hour	Minimum Hour	Max Day + Fire Flow
				ha	# of people	m^2	m^2	m^3		m^3		L	L/min	L/s			m^2	L/min					L/min	L/s		L/s	L/s	L/s	L/s	L/s	L/s
	Varies	Townhouse Block	273	4.46	844	948	2,844	10,238	23	10,238	2.00	470,966	9,000	150		1.50	2,844	18,000	-25%	0%	75%	24,000	400		400	2.207	2.207	6.068	9.179	0.883	406
		TOTALS FOR SITE	**273**	**4.46**	**844**	**948**	**2844**	**10238**	**Governing OBC Fire Flow =**					**150**								**Max Fire Flow =**	**400**		**400**	**2.21**	**2.21**	**6.07**	**9.18**	**0.88**	**406**
																								Sum of Maximum Day Flows + OBC Fire Flow (L/s) =						**156**
																								Sum of Maximum Day Flows + FUS Fire Flow (L/s) =						**406**

Assumptions:

1 The building area, volume and units are based on the Conceptual Site Plan by We Merchandise Space Inc. and are based on the worst case block (Block 30). Assumed 3.09 ppu based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington.

2 The building is classified as occupancy group C (Residential Occupancy) with limited combustible contents. All units The building construction type was assumes to be combustible.

3 Average Day Demand based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington:

Residential = 226 L/cap/day

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

Average Day =	1
Maximum Day =	2.75
Peak Hour =	4.16
Minimum Hour =	0.4

5 The basement was not included in the calculations given at least 50% of it is below grade. The raised deck/patio was included in the calculations.

Appendix C

Sanitary Flow Analysis

350 Wellington Road 7

Sanitary Flow Rate Analysis

Elora, Ontario

Project #: 51060-100
Date: October 7, 2022
By: TMA
Checked By: LEI

Sanitary Flow Calculations											
Land Use	**Site Area** *(ha)*	**# of units[1]**	**Equivalent Population Density[2]** *(ppu/ppha)*	**Population** *(capita)*	**Average Per Capita DWF[3]** *(L/cap/d)*	**Average Flow** *(L/s)*	**Peaking Factor[4]**	**Peak Flow** *(L/s)*	**Infiltration[5]** *(L/s)*	**Total Average Flow + Infiltration** *(L/s)*	**Total Peak Flow + Infiltration** *(L/s)*
Residential	4.46	273	3.09	843.57	226.00	2.21	3.85	8.49	0.67	2.88	9.16

Assumptions:

1 Unit count of 273 was obtained from the Site Plan prepared by We Merchandise Space Inc.
2 Based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington, a rate of 3.09 ppu was used.
3 Based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington, a sanitary average design flow of 226 L/cap/d was used.
4 Residential Harmon Peaking Factor Formula per the Township of Centre Wellington Development Manual;
F=1+(14/(4+P^0.5)) Where P = population (in thousands) F = min 2.0, max 4.0
5 Infiltration Rate of 0.15 L/s/ha was used per the Township of Centre Wellington Development Manual.

Appendix D

SWM Criteria Brief

Technical Memorandum

Project Name:	350 Wellington Road 7	**MTE File No.:**	51060-100
To:	Ray Kirtz & Dustin Lyttle Triton Engineering Services Limited	**Date:**	September 12, 2022
cc:	Bob & Colleen Forrest, We Merchandise Space Inc. Eldon Theodore, MHBC Planning Limited	**From:**	Tyler Arndt, E.I.T. Lynn Ingram, P.Eng.

RE: SWM Criteria Brief
350 Wellington Road 7, Elora ON

MTE Consultants Inc. has been retained to complete the preliminary grading, servicing, and stormwater management design for the proposed townhouse development, to be constructed at 350 Wellington Road 7 (herein referred to as 'the Site') in the Town of Elora, located in the Township of Centre Wellington.

The overall Site comprises of approximately 4.46ha of agricultural land and is located on Wellington Road 7 between Wellington Road 18/Woolwich Street West and Middlebrook Road/David Street West, approximately 490m north of the Grand River. The Site is bounded to the east by Wellington Road 7 and bounded to the north, south and west by existing agricultural land. Existing residential properties and the Elora municipal cemetery are located on the other side of Wellington Road 7, fronting the Site. In addition, there are four Grand River Conservation Authority (GRCA) regulated wetlands adjacent to the Site; three to the northwest and one to the southwest. The southwest wetland regulation limit extends into the southwest portion of the Site. Refer to the appended GRCA Web-Map figure for illustration of the exact Site location, surrounding wetlands and regulation limits.

The proposed concept for the Site is the construction of approximately 35 townhouse blocks complete with common drive aisles, surface parking, landscape and amenity areas. The development will create approximately 272 townhouse units varying from conventional, back to backs and double front live/work style units. In order to service the development, the existing municipal sanitary sewer and watermain will be extended from the Wellington Road 7 and David Street West intersection to the Site. The proposed storm servicing strategy is discussed in a following section in this memo.

The purpose of this technical memorandum is to review the Township's general requirements for stormwater management criteria, the Site specific constraints and to propose practical stormwater management design criteria for the subject Site for approval by the appropriate reviewing agencies.

Stormwater Management

General Stormwater Management Requirements

Based on the Township of Centre Wellington's draft Development Manual, and previous email correspondence with Triton Engineering Services Limited, general stormwater management design criteria is typically as follows:

i) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the pre-development (existing) peak flows;
ii) Implementation of water quality controls; and,
iii) Provide erosion and sediment controls.

We agree that the water quality control and erosion control criteria remain valid for this Site. However, it is our understanding that the Township's typical water quantity control requirement to attenuate post-development peak flows to pre-development (existing) peak flows is typically required in more urban/developed areas to mitigate capacity concerns with existing downstream municipal infrastructure. Given the rural cross-section of Wellington Road 7 (i.e., road side ditches), the Site's proximity to the Grand River and Site specific stormwater management constraints discussed below, we believe a deviation from the typical water quantity control requirement is warranted.

Existing Site Conditions/Constraints

To understand the Site constraints associated with the aforementioned wetlands, MTE has been working with Michalski Nielsen Associates Limited who has been retained to complete the Environmental Impact Assessment (EIS) for the Site. Through discussions regarding the natural functions of Wetland A and B within the area, it was determined that is necessary to maintain an annual surface runoff water balance to Wetland A and B to mimic the existing sheet flow from the Site in the post-development condition.

In the existing condition, the Site drains via broad sheet flow to four main drainage paths based on the existing contours; to the southwest towards Wetland A (Catchment 101), to the southeast towards the neighbouring agricultural lands (Catchment 102), to the north towards Wellington Road 7 (Catchment 103) and to the northwest towards Wetland B (Catchment 104). Refer to appended Figure 1.0 for illustration of the limits of the pre-development catchment areas directed to each drainage path. Based on these catchment areas, only around 7% of the Site currently drains to the Wellington Road 7 right-of-way to the north, 8% of the Site currently drains to the neighbouring agricultural lands to the southeast, while 18% and 67% (totaling to 85%) of the Site currently drains to Wetland B and A, respectively. Therefore, if the Township's typical water quantity control criterion was required for this Site, no flow would be allowed to drain to Wellington Road 7 towards the southeast (i.e., to the Grand River) and the majority of flow would need to be directed across the neighbouring property to the adjacent wetlands. Understanding the importance of establishing a legal outlet for green field developments such as this, the typical water quantity control criterion cannot be achieved.

Proposed Stormwater Management Strategy

Based on the existing Site conditions and constraints mentioned above, we propose the stormwater management design criteria for the Site be as follows:

i) Establish a legal outlet(s) for the Site;
ii) Maintain an annual surface runoff water balance to Wetland A and Wetland B;
iii) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the allowable flow rate using a C value of 0.75;
iv) Implementation of water quality controls; and,
v) Provide erosion and sediment controls.

A brief description has been provided below on how each criteria is anticipated to be met, and in some cases, justification for the proposed criteria has been provided.

Legal Outlet

In the existing condition, the majority of the runoff from the Site is directed across the neighbouring property via broad sheet flow to Wetland A and B. Generally, there is no right of drainage for surface water. Therefore, the only legal outlet for the Site in the existing condition is to the municipal right-of-way (Wellington Road 7).

In the post-development condition, it is proposed that the Site's private storm sewer system will outlet to the existing roadside ditch within the Wellington Road 7 right-of-way at the southeast corner of the Site. Through the Site grading design, the major overland flow route will also be directed to the Wellington Road 7 right-of-way. However, given the need to maintain a surface runoff water balance to Wetland A and B, an easement is currently being pursued with the neighbouring property owner to legally allow surface drainage across the adjacent property to these wetlands.

It should be noted that even if an easement is obtained, the primary legal outlet for the Site should still be to Wellington Road 7.

Water Balance

An annual surface runoff water balance to Wetland A and Wetland B will be achieved in the post-development condition by directing runoff from rooftop and landscape areas adjacent the west property line to the neighbouring property. From there, runoff will continue to sheet flow across the neighbouring property and into each wetland as it does in the existing condition. A preliminary annual surface runoff water balance analysis was completed for each wetland and the required catchment area to be directed to Wetland A and B is illustrated on the appended post-development catchment areas Figure 2.0 (Catchment 204 & 205, respectively).

It should be noted that being able to achieve a surface runoff water balance to Wetland A and B is conditional on obtaining an easement to allow surface drainage across the neighbouring property.

Water Quantity Control

In the pre-development condition, no surface runoff from the Site is directed toward the southeast to Wellington Road 7. However, it is imperative that an allowable flow rate be established to Wellington Road 7, south of the existing high point in the road, to support the appropriate legal outlet location for the Site.

Currently Wellington Road 7 has a rural cross-section with approximately four existing driveway/road crossing culverts between the Site and the Grand River. Given the limited infrastructure constraints, we believe an appropriate runoff coefficient should be utilized based on the proposed Site use, rather than the pre-development (existing) peak flows. Based on past experience, and the Region of Waterloo Design Guidelines and Supplemental Specifications for Municipal Services 2022 as a reference, typical runoff coefficients for residential row dwellings/townhouse blocks vary from 0.50 to 0.80. Considering the proximity to the Grand River, we believe a runoff coefficient of 0.75 is appropriate and would help allow the peak flow from the Site to occur in advance of the peak flow from the upstream drainage area. We understand that due to the increased flow to Wellington Road, road side ditch improvements and upsizing of any existing culverts may be required. If necessary, this could be completed during the necessary sanitary sewer and watermain extensions along Wellington Road 7 from the David Street West intersection to the Site. In the future when Wellington Road 7 is urbanized, the required storm sewers can be sized accordingly.

On-site quantity control requirements will be met through the use of an on-line orifice plate on the controlled catchment area (Catchment 201). Storage volume for the orifice plate will be provided via surface ponding in the drive aisles and parking areas, along with the implementation of underground storage tanks as required.

Water Quality Control

The quality control requirement will be met for the controlled catchment area (Catchment 201) through the installation of an oil-grit separator (OGS) unit on the private storm sewer system before outletting to the municipal ditch. Runoff from the frontage of the property and towards the wetlands will be from rooftop and landscape areas which are considered "clean", therefore no quality controls are required for those catchment areas (Catchment 202, 203, 204 and 205).

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; and,
vi) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

The exact erosion and sediment control measures will be determined during detailed design.

We trust the above provides rationale as to why the Township's general stormwater management design water quantity control criteria is not feasible for the subject Site. We respectfully request that the proposed alternate stormwater management criteria be reviewed and approved by the appropriate reviewing agencies. A functional servicing and SWM report and functional design drawings will be prepared and submitted once the stormwater management criteria is agreed upon.

Yours truly,

MTE Consultants Inc.

Tyler Arndt, E.I.T.
Designer
519-743-6500 ext.1386
tarndt@mte85.com

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

TMA:dlb
Encl.
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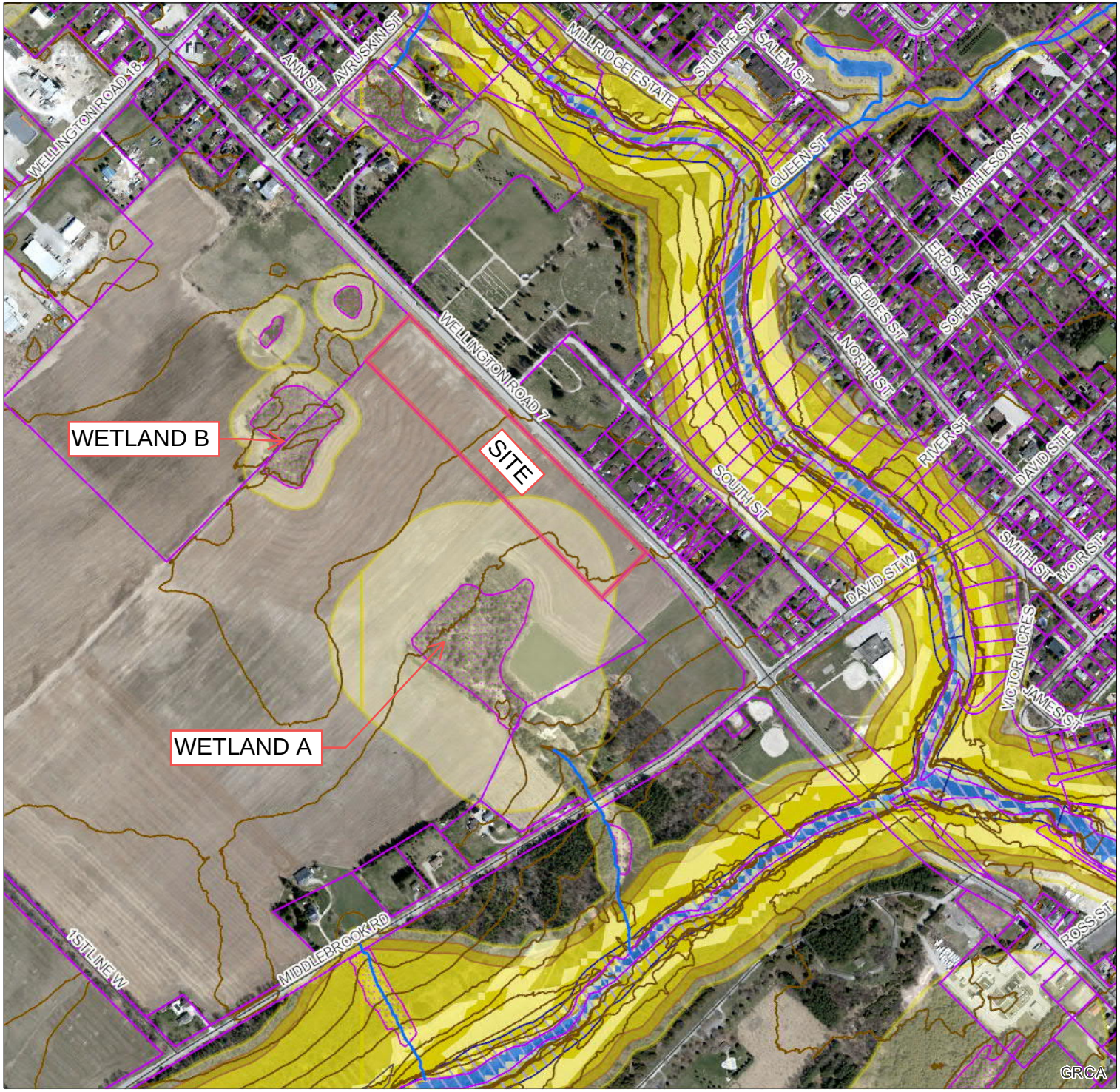


Grand River Conservation Authority

Date: Sep 08, 2022

Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

0 50 100 200 300 Metres

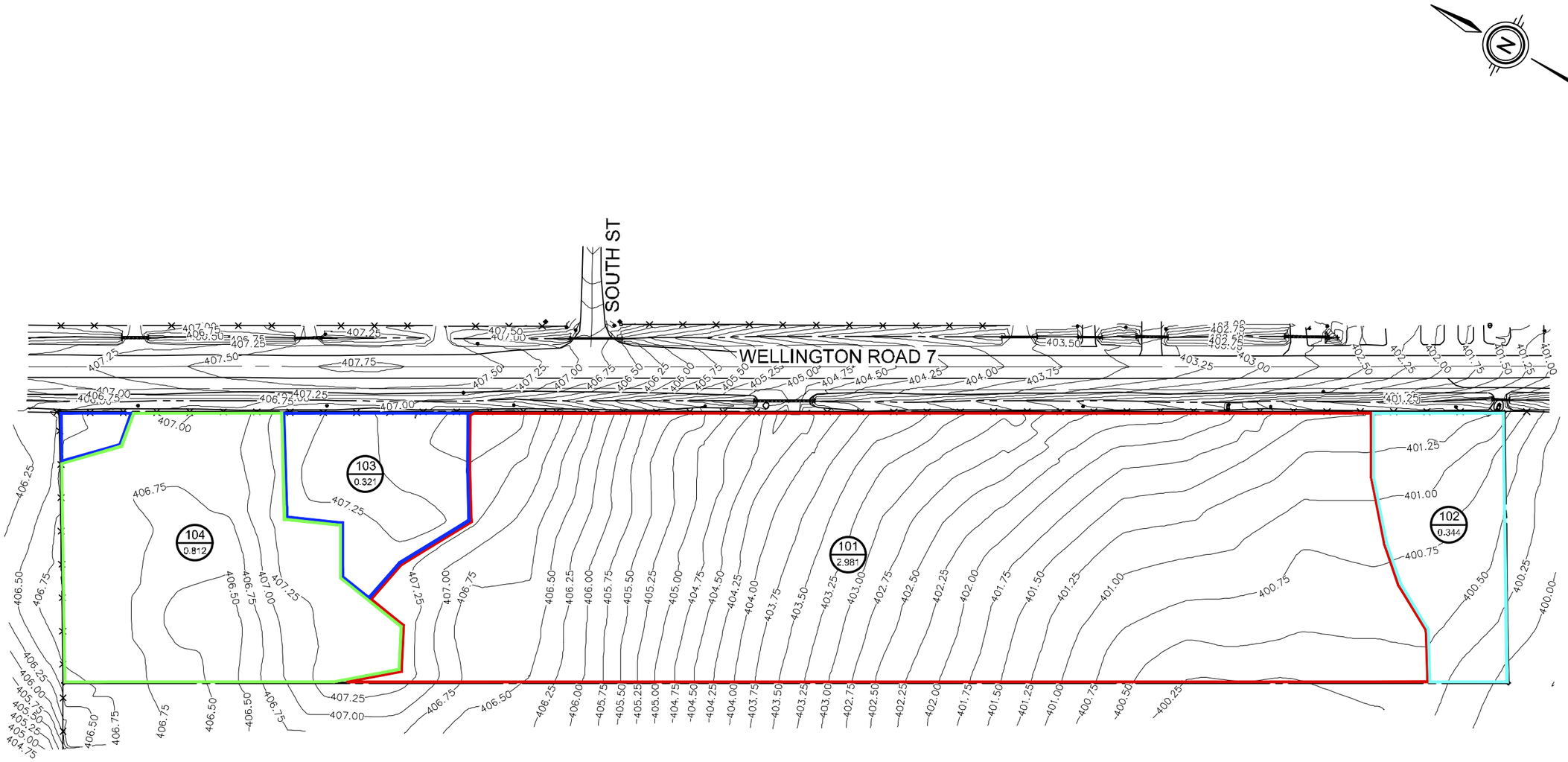
N

Map Centre (UTM NAD83 z17): 544,998.65 4,837,000.52

This map is not to be used for navigation | 2020 Ortho (ON)

NAD 1983 UTM Zone 17N

Scale: 8,174



LEGEND

- CATCHMENT 101
- CATCHMENT 102
- CATCHMENT 103
- CATCHMENT 104

101 / 2.981 — SUB-CATCHMENT NUMBER / AREA (ha.)

406.50 — EXISTING CONTOURS

FIGURE 1.0 Date: SEPT. 06/22 Scale: 1:1500

PRE-DEVELOPMENT CATCHMENT AREAS

MTE
Engineers, Scientists, Surveyors

Project No.: 51060-100

September 7, 2022 9:21 a.m. Plotted By: NDalal

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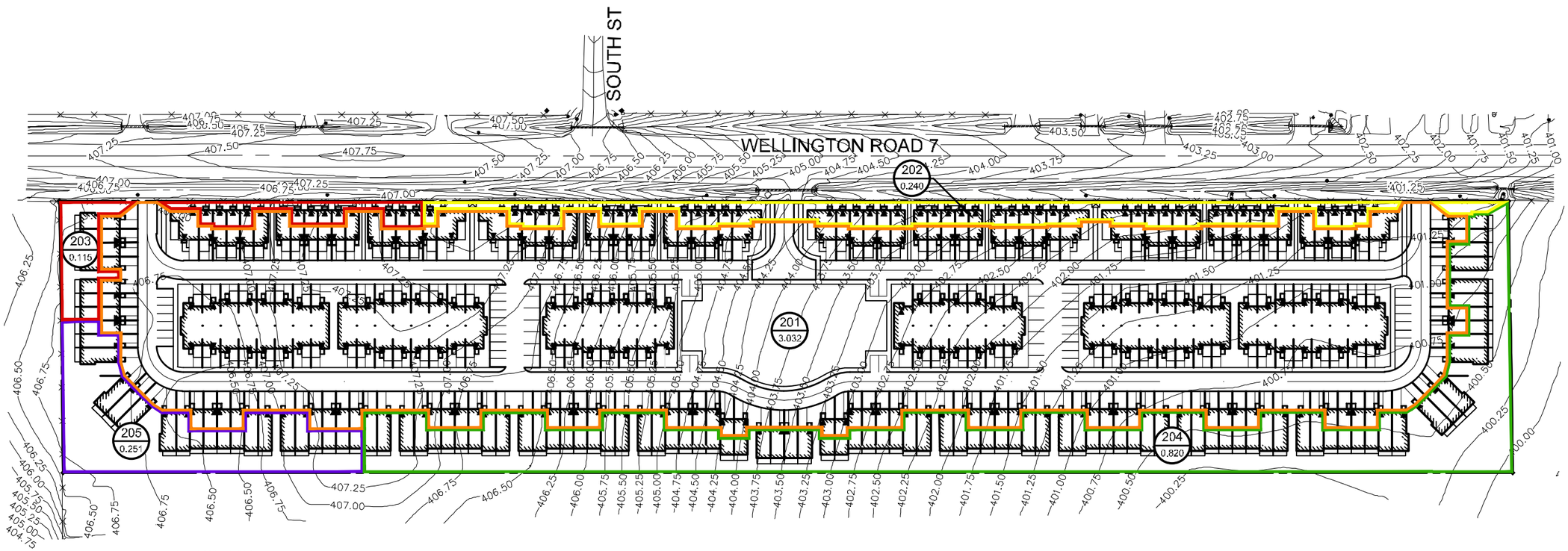

LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204
- CATCHMENT 205

201 / 3.032 — SUB-CATCHMENT NUMBER / AREA (ha.)

401.50 — EXISTING CONTOURS

PROPOSED BUILDING

FIGURE 2.0

Date: SEPT. 06/22
Scale: 1:1500

POST-DEVELOPMENT CATCHMENT AREAS

MTE
Engineers, Scientists, Surveyors

Project No.: 51060-100

September 7, 2022 9:23 a.m. Plotted By: NDalal

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Appendix E

Water Balance Analysis

350 Wellington Road 7

WATER BALANCE (SURFACE RUNOFF) ANALYSIS

Elora, Ontario

Project Number: 51060-100
Date: October 7, 2022
Design By: TMA
Checked By: LEI
File: Q:\51060\100\Preliminary Design\Water Balance\51060-100_Micro Drainage Analysis_Rev2.xlsx

Hydrologic Cycle Component Values

Annual Precipitation = 924mm

	Pre- **(Flat Lands - Moderately Rooted Crops)**	**Post-** **(Flat Lands - Urban Lawns)**	**Roof Areas**
Fine Sandy Loam	579 mm Evapo-Transpiration **104 mm Runoff** 242 mm Infiltration	564 mm Evapo-Transpiration **126 mm Runoff** 234 mm Infiltration	214 mm Evapo-Transpiration **710 mm Net Runoff from roof (Based on 30mm)** 0 mm Infiltration

SOUTHWEST WETLAND A - SURFACE RUNOFF

Location	**Pre-development**			**Post-development**						**Comments**
				Pervious			**Impervious**			
	Area Draining to Location	**Runoff Rate**	**Runoff Volume**	**Area Draining to Location**	**Runoff Rate**	**Runoff Volume**	**Area Draining to Location**	**Runoff Rate**	**Runoff Volume**	
	ha	*mm/yr/m^2*	*m^3/yr*	*ha*	*mm/yr/m^2*	*m^3/yr*	*ha*	*mm/yr/m^2*	*m^3/yr*	
Pre-Development (101)										
Landscape Area	2.981	104	3100							
Post-Development (204)										
Roof Area							0.367	710	2606	
Landscape Area				0.402	126	507				
Total	2.981	104	**3100**	0.402	126	**507**	0.367	710	**2606**	

Total Post-development Runoff	3112
Net Gain of Runoff	**12**

350 Wellington Road 7

WATER BALANCE (SURFACE RUNOFF) ANALYSIS

Elora, Ontario

Project Number: 51060-100
Date: October 7, 2022
Design By: TMA
Checked By: LEI
File: Q:\51060\100\Preliminary Design\Water Balance\51060-100_Micro Drainage Analysis_Rev2.xlsx

Hydrologic Cycle Component Values

Annual Precipitation = 924mm

	Pre- **(Flat Lands - Moderately Rooted Crops)**	**Post-** **(Flat Lands - Urban Lawns)**	**Roof Areas**
Fine Sandy Loam	579 mm Evapo-Transpiration **104 mm Runoff** 242 mm Infiltration	564 mm Evapo-Transpiration **126 mm Runoff** 234 mm Infiltration	214 mm Evapo-Transpiration **710 mm Net Runoff from roof (Based on 30mm)** 0 mm Infiltration

NORTHWEST WETLAND B - SURFACE RUNOFF

Location	**Pre-development**			**Post-development**						**Comments**
				Pervious			**Impervious**			
	Area Draining to Location	**Runoff Rate**	**Runoff Volume**	**Area Draining to Location**	**Runoff Rate**	**Runoff Volume**	**Area Draining to Location**	**Runoff Rate**	**Runoff Volume**	
	ha	*mm/yr/m²*	*m³/yr*	*ha*	*mm/yr/m²*	*m³/yr*	*ha*	*mm/yr/m²*	*m³/yr*	
Pre-Development (104)										
Landscape Area	0.812	104	844							
Post-Development (205)										
Roof Area							0.099	710	703	
Landscape Area				0.120	126	151				
Total	0.812	104	**844**	0.120	126	**151**	0.099	710	**703**	

Total Post-development Runoff	854
Net Gain of Runoff	**10**

Appendix F

MIDUSS Outputs

Pre-Development

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                                 2YR - PRE B.out"
"                Licensee name:                                               A"
"                Company                                                       "
"                Date & Time last used:                 9/12/2022 at 9:16:29 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           109.374    mm/hr"
"             Total depth                  34.259    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.022     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  69.388     5.831      69.387     minutes"
"             Time to Centroid       187.782    96.786     187.782    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        1021.25    0.00       1021.25    c.m"
"             Rainfall losses        28.237     5.140      28.237     mm"
"             Runoff depth           6.021      29.119     6.021      mm"
```

```
"             Runoff volume          179.49     0.00       179.49     c.m"
"             Runoff coefficient     0.176      0.000      0.176      "
"             Maximum flow           0.022      0.000      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.022     0.022     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.022     0.022     0.022     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.022    c.m/sec"
"             Hydrograph volume          179.489    c.m"
"                    0.022     0.022     0.022     0.022"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.022     0.000     0.022     0.022"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.003     0.000     0.022     0.022 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  54.147     4.550      54.147     minutes"
"             Time to Centroid       169.233    94.883     169.232    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        117.85     0.00       117.85     c.m"
"             Rainfall losses        28.238     5.281      28.238     mm"
"             Runoff depth           6.021      28.978     6.021      mm"
"             Runoff volume          20.71      0.00       20.71      c.m"
"             Runoff coefficient     0.176      0.000      0.176      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.003     0.022     0.022"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.003     0.003     0.003     0.022"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           200.201    c.m"
"                     0.003     0.003     0.003     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.003     0.000     0.003     0.025"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.004     0.000     0.003     0.025 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  38.944     3.273      38.944     minutes"
"             Time to Centroid       150.729    92.946     150.729    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        109.97     0.00       109.97     c.m"
"             Rainfall losses        28.237     5.510      28.237     mm"
"             Runoff depth           6.021      28.748     6.021      mm"
"             Runoff volume          19.33      0.00       19.33      c.m"
"             Runoff coefficient     0.176      0.000      0.176      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.004     0.004     0.003     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.004     0.004     0.004     0.025"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
```

```
"               Total Site"
"             Maximum flow                  0.028    c.m/sec"
"             Hydrograph volume           219.529    c.m"
"                    0.004     0.004     0.004     0.028"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.004     0.000     0.004     0.028"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.009     0.000     0.004     0.028 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  44.295     3.722      44.295     minutes"
"             Time to Centroid       157.240    93.696     157.240    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        278.18     0.00       278.18     c.m"
"             Rainfall losses        28.239     5.618      28.239     mm"
"             Runoff depth           6.020      28.641     6.020      mm"
"             Runoff volume          48.88      0.00       48.88      c.m"
"             Runoff coefficient     0.176      0.000      0.176      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.009     0.004     0.028"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.009     0.009     0.009     0.028"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"               Total Site"
"             Maximum flow                  0.036    c.m/sec"
"             Hydrograph volume           268.408    c.m"
"                    0.009     0.009     0.009     0.036"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
```

```
"             Total Catchment area                    4.458    hectare"
"             Total Impervious area                   0.000    hectare"
"             Total % impervious                      0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                                5YR - PRE B.out"
"                Licensee name:                                               A"
"                Company                                                      "
"                Date & Time last used:                9/12/2022 at 9:18:02 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          139.288    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.064     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  50.487     5.226      50.487     minutes"
"             Time to Centroid       160.521    93.566     160.521    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        1408.96    0.00       1408.96    c.m"
"             Rainfall losses        35.078     5.507      35.078     mm"
"             Runoff depth           12.187     41.758     12.187     mm"
"             Runoff volume          363.29     0.00       363.29     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.064      0.000      0.064      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.064     0.064     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.064     0.064     0.064     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.064    c.m/sec"
"             Hydrograph volume            363.289    c.m"
"                    0.064     0.064     0.064     0.064"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.064     0.000     0.064     0.064"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.009     0.000     0.064     0.064 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  39.398     4.078      39.398     minutes"
"             Time to Centroid       146.826    91.941     146.825    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        162.59     0.00       162.59     c.m"
"             Rainfall losses        35.075     5.720      35.075     mm"
"             Runoff depth           12.190     41.545     12.190     mm"
"             Runoff volume          41.93      0.00       41.93      c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.064     0.064"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.064"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.072    c.m/sec"
"             Hydrograph volume           405.221    c.m"
"                     0.009     0.009     0.009     0.072"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.009     0.000     0.009     0.072"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.010     0.000     0.009     0.072 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  28.336     2.933      28.336     minutes"
"             Time to Centroid       133.168    90.243     133.168    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        151.72     0.00       151.72     c.m"
"             Rainfall losses        35.083     5.984      35.083     mm"
"             Runoff depth           12.181     41.281     12.181     mm"
"             Runoff volume          39.10      0.00       39.10      c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.010     0.009     0.072"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.010     0.010     0.010     0.072"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.080    c.m/sec"
"             Hydrograph volume           444.323    c.m"
"                     0.010     0.010     0.010     0.080"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.010     0.000     0.010     0.080"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.010     0.080 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  32.230     3.336      32.229     minutes"
"             Time to Centroid       137.983    90.888     137.983    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        383.79     0.00       383.79     c.m"
"             Rainfall losses        35.080     5.976      35.080     mm"
"             Runoff depth           12.184     41.288     12.184     mm"
"             Runoff volume          98.94      0.00       98.94      c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.024     0.024     0.010     0.080"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.024     0.024     0.024     0.080"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.102    c.m/sec"
"             Hydrograph volume          543.261    c.m"
"                     0.024     0.024     0.024     0.102"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                                10YR - PRE B.out"
"                Licensee name:                                               A"
"                Company                                                      "
"                Date & Time last used:                9/12/2022 at 9:18:53 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          169.551    mm/hr"
"             Total depth                 56.290    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.307   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.107     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  42.571     4.808      42.571     minutes"
"             Time to Centroid       149.285    91.994     149.285    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        1678.01    0.00       1678.01    c.m"
"             Rainfall losses        39.034     5.712      39.034     mm"
"             Runoff depth           17.256     50.579     17.256     mm"
"             Runoff volume          514.40     0.00       514.41     c.m"
"             Runoff coefficient     0.307      0.000      0.307      "
"             Maximum flow           0.107      0.000      0.107      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.107     0.107     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.107     0.107     0.107     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.107    c.m/sec"
"             Hydrograph volume          514.405    c.m"
"                    0.107     0.107     0.107     0.107"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.107     0.000     0.107     0.107"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.307   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.015     0.000     0.107     0.107 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  33.220     3.752      33.220     minutes"
"             Time to Centroid       137.540    90.510     137.540    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        193.64     0.00       193.64     c.m"
"             Rainfall losses        39.032     6.201      39.032     mm"
"             Runoff depth           17.258     50.089     17.258     mm"
"             Runoff volume          59.37      0.00       59.37      c.m"
"             Runoff coefficient     0.307      0.000      0.307      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.015     0.015     0.107     0.107"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.015     0.015     0.015     0.107"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.121    c.m/sec"
"             Hydrograph volume           573.773    c.m"
"                     0.015     0.015     0.015     0.121"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.015     0.000     0.015     0.121"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.307   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.017     0.000     0.015     0.121 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  23.893     2.698      23.893     minutes"
"             Time to Centroid       125.809    88.912     125.809    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        180.69     0.00       180.69     c.m"
"             Rainfall losses        39.036     6.338      39.036     mm"
"             Runoff depth           17.254     49.953     17.254     mm"
"             Runoff volume          55.39      0.00       55.39      c.m"
"             Runoff coefficient     0.307      0.000      0.307      "
"             Maximum flow           0.017      0.000      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.017     0.017     0.015     0.121"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.017     0.017     0.017     0.121"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.134    c.m/sec"
"             Hydrograph volume           629.160    c.m"
"                     0.017     0.017     0.017     0.134"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.017     0.000     0.017     0.134"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.307   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.040     0.000     0.017     0.134 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  27.176     3.069      27.176     minutes"
"             Time to Centroid       129.929    89.471     129.929    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        457.08     0.00       457.08     c.m"
"             Rainfall losses        39.031     6.208      39.031     mm"
"             Runoff depth           17.259     50.082     17.259     mm"
"             Runoff volume          140.15     0.00       140.15     c.m"
"             Runoff coefficient     0.307      0.000      0.307      "
"             Maximum flow           0.040      0.000      0.040      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.040     0.040     0.017     0.134"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.040     0.040     0.040     0.134"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.171    c.m/sec"
"             Hydrograph volume          769.306    c.m"
"                     0.040     0.040     0.040     0.171"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
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```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                                25YR - PRE B.out"
"                Licensee name:                                               A"
"                Company                                                      "
"                Date & Time last used:                9/12/2022 at 9:19:46 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          191.557    mm/hr"
"             Total depth                 68.266    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.362   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.174     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  37.271     4.560      37.271     minutes"
"             Time to Centroid       141.084    91.030     141.084    minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        2035.01    0.00       2035.02    c.m"
"             Rainfall losses        43.524     5.797      43.524     mm"
"             Runoff depth           24.742     62.470     24.742     mm"
"             Runoff volume          737.55     0.00       737.56     c.m"
"             Runoff coefficient     0.362      0.000      0.362      "
"             Maximum flow           0.174      0.000      0.174      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.174     0.174     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.174     0.174     0.174     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.174    c.m/sec"
"             Hydrograph volume          737.555    c.m"
"                    0.174     0.174     0.174     0.174"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.174     0.000     0.174     0.174"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.362   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.174     0.174 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  29.085     3.559      29.085     minutes"
"             Time to Centroid       130.864    89.678     130.863    minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        234.84     0.00       234.84     c.m"
"             Rainfall losses        43.536     6.654      43.536     mm"
"             Runoff depth           24.730     61.613     24.730     mm"
"             Runoff volume          85.07      0.00       85.07      c.m"
"             Runoff coefficient     0.362      0.000      0.362      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.024     0.024     0.174     0.174"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.024     0.024     0.024     0.174"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.197    c.m/sec"
"             Hydrograph volume           822.626    c.m"
"                     0.024     0.024     0.024     0.197"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.024     0.000     0.024     0.197"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.362   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.028     0.000     0.024     0.197 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  20.918     2.559      20.918     minutes"
"             Time to Centroid       120.675    88.180     120.675    minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        219.13     0.00       219.13     c.m"
"             Rainfall losses        43.527     6.542      43.527     mm"
"             Runoff depth           24.740     61.724     24.740     mm"
"             Runoff volume          79.41      0.00       79.41      c.m"
"             Runoff coefficient     0.362      0.000      0.362      "
"             Maximum flow           0.028      0.000      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.028     0.028     0.024     0.197"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.028     0.028     0.028     0.197"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.219    c.m/sec"
"             Hydrograph volume           902.040    c.m"
"                     0.028     0.028     0.028     0.219"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.028     0.000     0.028     0.219"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.362   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.064     0.000     0.028     0.219 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  23.793     2.911      23.793     minutes"
"             Time to Centroid       124.266    88.716     124.266    minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        554.32     0.00       554.32     c.m"
"             Rainfall losses        43.527     6.771      43.527     mm"
"             Runoff depth           24.739     61.496     24.739     mm"
"             Runoff volume          200.88     0.00       200.88     c.m"
"             Runoff coefficient     0.362      0.000      0.362      "
"             Maximum flow           0.064      0.000      0.064      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.064     0.064     0.028     0.219"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.064     0.064     0.064     0.219"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.277    c.m/sec"
"             Hydrograph volume         1102.920    c.m"
"                     0.064     0.064     0.064     0.277"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                                50YR - PRE B.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:                  9/12/2022 at 9:20:34 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           215.802    mm/hr"
"             Total depth                  77.647    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.237     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  33.817     4.339      33.816     minutes"
"             Time to Centroid       135.954    90.329     135.954    minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        2314.67    0.00       2314.67    c.m"
"             Rainfall losses        46.553     6.059      46.553     mm"
"             Runoff depth           31.094     71.588     31.094     mm"
"             Runoff volume          926.91     0.00       926.91     c.m"
"             Runoff coefficient     0.400      0.000      0.400      "
"             Maximum flow           0.237      0.000      0.237      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.237     0.237     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.237     0.237     0.237     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.237    c.m/sec"
"             Hydrograph volume          926.913    c.m"
"                    0.237     0.237     0.237     0.237"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.237     0.000     0.237     0.237"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.032     0.000     0.237     0.237 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  26.389     3.386      26.389     minutes"
"             Time to Centroid       126.646    89.011     126.646    minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        267.11     0.00       267.11     c.m"
"             Rainfall losses        46.561     6.769      46.561     mm"
"             Runoff depth           31.086     70.878     31.086     mm"
"             Runoff volume          106.94     0.00       106.94     c.m"
"             Runoff coefficient     0.400      0.000      0.400      "
"             Maximum flow           0.032      0.000      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.032     0.032     0.237     0.237"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.032     0.032     0.032     0.237"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.267    c.m/sec"
"             Hydrograph volume          1033.849    c.m"
"                     0.032     0.032     0.032     0.267"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.032     0.000     0.032     0.267"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.037     0.000     0.032     0.267 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  18.980     2.435      18.980     minutes"
"             Time to Centroid       117.376    87.587     117.376    minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        249.25     0.00       249.25     c.m"
"             Rainfall losses        46.596     6.665      46.596     mm"
"             Runoff depth           31.052     70.982     31.052     mm"
"             Runoff volume          99.68      0.00       99.68      c.m"
"             Runoff coefficient     0.400      0.000      0.400      "
"             Maximum flow           0.037      0.000      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.037     0.037     0.032     0.267"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.037     0.037     0.037     0.267"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.295    c.m/sec"
"             Hydrograph volume          1133.525    c.m"
"                     0.037     0.037     0.037     0.295"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.037     0.000     0.037     0.295"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.089     0.000     0.037     0.295 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  21.588     2.770      21.588     minutes"
"             Time to Centroid       120.642    88.113     120.642    minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        630.50     0.00       630.50     c.m"
"             Rainfall losses        46.564     6.995      46.564     mm"
"             Runoff depth           31.083     70.652     31.083     mm"
"             Runoff volume          252.39     0.00       252.40     c.m"
"             Runoff coefficient     0.400      0.000      0.400      "
"             Maximum flow           0.089      0.000      0.089      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.089     0.089     0.037     0.295"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.089     0.089     0.089     0.295"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.377    c.m/sec"
"             Hydrograph volume         1385.919    c.m"
"                     0.089     0.089     0.089     0.377"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                      SWM Memo"
"                Output filename:                              100YR - PRE B.out"
"                Licensee name:                                               A"
"                Company                                                       "
"                Date & Time last used:                 9/12/2022 at 9:21:23 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          239.354    mm/hr"
"             Total depth                 87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   To Southwest Wetland A"
"        0.000   % Impervious"
"        2.981   Total Area"
"      200.000   Flow length"
"        3.500   Overland Slope"
"        2.981   Pervious Area"
"      200.000   Pervious length"
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"      200.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.434   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.308     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           2.981      0.000      2.981      hectare"
"             Time of concentration  31.173     4.157      31.173     minutes"
"             Time to Centroid       131.911    89.743     131.911    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        2595.83    0.00       2595.83    c.m"
"             Rainfall losses        49.263     6.252      49.263     mm"
"             Runoff depth           37.816     80.827     37.816     mm"
"             Runoff volume          1127.29    0.00       1127.29    c.m"
"             Runoff coefficient     0.434      0.000      0.434      "
"             Maximum flow           0.308      0.000      0.308      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.308     0.308     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.308     0.308     0.308     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.308    c.m/sec"
"             Hydrograph volume         1127.289    c.m"
"                    0.308     0.308     0.308     0.308"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.308     0.000     0.308     0.308"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   To the South"
"        0.000   % Impervious"
"        0.344   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.344   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.434   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.042     0.000     0.308     0.308 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.344      0.000      0.344      hectare"
"             Time of concentration  24.326     3.244      24.326     minutes"
"             Time to Centroid       123.333    88.462     123.333    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        299.55     0.00       299.55     c.m"
"             Rainfall losses        49.244     7.030      49.244     mm"
"             Runoff depth           37.835     80.049     37.835     mm"
"             Runoff volume          130.15     0.00       130.15     c.m"
"             Runoff coefficient     0.434      0.000      0.434      "
"             Maximum flow           0.042      0.000      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.042     0.042     0.308     0.308"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.042     0.042     0.042     0.308"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.349    c.m/sec"
"             Hydrograph volume          1257.443    c.m"
"                     0.042     0.042     0.042     0.349"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.042     0.000     0.042     0.349"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   To the north ROW"
"        0.000   % Impervious"
"        0.321   Total Area"
"       50.000   Flow length"
"        1.500   Overland Slope"
"        0.321   Pervious Area"
"       50.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.434   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.048     0.000     0.042     0.349 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.321      0.000      0.321      hectare"
"             Time of concentration  17.496     2.333      17.496     minutes"
"             Time to Centroid       114.753    87.102     114.753    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        279.52     0.00       279.52     c.m"
"             Rainfall losses        49.274     6.793      49.274     mm"
"             Runoff depth           37.805     80.287     37.805     mm"
"             Runoff volume          121.35     0.00       121.35     c.m"
"             Runoff coefficient     0.434      0.000      0.434      "
"             Maximum flow           0.048      0.000      0.048      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.048     0.048     0.042     0.349"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.048     0.048     0.048     0.349"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.389    c.m/sec"
"             Hydrograph volume          1378.798    c.m"
"                     0.048     0.048     0.048     0.389"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.048     0.000     0.048     0.389"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   To the NW Wetland B"
"        0.000   % Impervious"
"        0.812   Total Area"
"       80.000   Flow length"
"        2.500   Overland Slope"
"        0.812   Pervious Area"
"       80.000   Pervious length"
"        2.500   Pervious slope"
"        0.000   Impervious Area"
"       80.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.434   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.112     0.000     0.048     0.389 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.812      0.000      0.812      hectare"
"             Time of concentration  19.900     2.654      19.900     minutes"
"             Time to Centroid       117.773    87.596     117.773    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        707.08     0.00       707.08     c.m"
"             Rainfall losses        49.297     7.107      49.297     mm"
"             Runoff depth           37.782     79.972     37.782     mm"
"             Runoff volume          306.79     0.00       306.79     c.m"
"             Runoff coefficient     0.434      0.000      0.434      "
"             Maximum flow           0.112      0.000      0.112      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.112     0.112     0.048     0.389"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.112     0.112     0.112     0.389"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.491    c.m/sec"
"             Hydrograph volume         1685.582    c.m"
"                     0.112     0.112     0.112     0.491"
" 38          START/RE-START TOTALS 104"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

Post-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                 FS-SWM Report\Post"
"                Output filename:                                      2YR - POST.out"
"                Licensee name:                                                    A"
"                Company                                                           "
"                Date & Time last used:                10/12/2022 at 10:57:13 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           109.401    mm/hr"
"             Total depth                  34.276    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.841   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.531     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  26.279     2.209      3.476      minutes"
"             Time to Centroid       135.317    91.265     93.583     minutes"
"             Rainfall depth         34.276     34.276     34.276     mm"
"             Rainfall volume        223.21     839.70     1062.91    c.m"
"             Rainfall losses        28.252     5.448      10.237     mm"
"             Runoff depth           6.024      28.829     24.040     mm"
"             Runoff volume          39.23      706.25     745.48     c.m"
"             Runoff coefficient     0.176      0.841      0.701      "
"             Maximum flow           0.010      0.531      0.531      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.531     0.531     0.000     0.000"
" 54          POND DESIGN"
"        0.531   Current peak flow    c.m/sec"
"        0.708   Target outflow    c.m/sec"
"        745.5   Hydrograph volume    c.m"
"           4.   Number of stages"
"      399.000   Minimum water level    metre"
"      402.150   Maximum water level    metre"
"      399.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                399.000     0.000     0.000"
"                399.300   0.05873  1.01E-05"
"                401.000    0.7623  1050.000"
"                402.150     1.029  1050.000"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.212    c.m/sec"
"             Maximum level               399.670    metre"
"             Maximum storage             228.323    c.m"
"             Centroidal lag                1.749   hours"
"                  0.531     0.531     0.212     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.212    c.m/sec"
"             Hydrograph volume           743.355    c.m"
"                    0.531     0.531     0.212     0.212"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.531     0.000     0.212     0.212"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.175   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.809   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.029     0.000     0.212     0.212 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  8.969      0.754      1.684      minutes"
"             Time to Centroid       114.270    89.306     92.131     minutes"
"             Rainfall depth         34.276     34.276     34.276     mm"
"             Rainfall volume        24.03      40.75      64.78      c.m"
"             Rainfall losses        28.278     6.551      14.612     mm"
"             Runoff depth           5.998      27.725     19.664     mm"
"             Runoff volume          4.21       32.96      37.17      c.m"
"             Runoff coefficient     0.175      0.809      0.574      "
"             Maximum flow           0.002      0.029      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.029     0.029     0.212     0.212"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.029     0.029     0.029     0.212"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.222    c.m/sec"
"             Hydrograph volume          780.521    c.m"
"                     0.029     0.029     0.029     0.222"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.029     0.000     0.029     0.222"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.175   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.809   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.022     0.000     0.029     0.222 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  8.969      0.754      2.225      minutes"
"             Time to Centroid       114.270    89.306     93.776     minutes"
"             Rainfall depth         34.276     34.276     34.276     mm"
"             Rainfall volume        30.97      30.73      61.70      c.m"
"             Rainfall losses        28.278     6.551      17.458     mm"
"             Runoff depth           5.998      27.725     16.818     mm"
"             Runoff volume          5.42       24.85      30.27      c.m"
"             Runoff coefficient     0.175      0.809      0.491      "
"             Maximum flow           0.002      0.022      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.022     0.022     0.029     0.222"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.022     0.022     0.022     0.222"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.230    c.m/sec"
"             Hydrograph volume          810.794    c.m"
```

```
"                    0.022     0.022     0.022     0.230"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.022     0.000     0.022     0.230"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.839   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.086     0.000     0.022     0.230 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  16.736     1.407      4.268      minutes"
"             Time to Centroid       123.701    90.017     96.303     minutes"
"             Rainfall depth         34.276     34.276     34.276     mm"
"             Rainfall volume        137.86     125.73     263.59     c.m"
"             Rainfall losses        28.257     5.510      17.407     mm"
"             Runoff depth           6.019      28.767     16.870     mm"
"             Runoff volume          24.21      105.52     129.73     c.m"
"             Runoff coefficient     0.176      0.839      0.492      "
"             Maximum flow           0.008      0.085      0.086      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.086     0.086     0.022     0.230"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.086     0.086     0.086     0.230"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.086    c.m/sec"
"             Hydrograph volume           129.728    c.m"
"                    0.086     0.086     0.086     0.086"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.086     0.000     0.086     0.086"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.176   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.839   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.023     0.000     0.086     0.086 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  16.736     1.407      4.519      minutes"
"             Time to Centroid       123.701    90.017     96.855     minutes"
"             Rainfall depth         34.276     34.276     34.276     mm"
"             Rainfall volume        41.21      33.85      75.07      c.m"
"             Rainfall losses        28.257     5.510      17.998     mm"
"             Runoff depth           6.019      28.767     16.278     mm"
"             Runoff volume          7.24       28.41      35.65      c.m"
"             Runoff coefficient     0.176      0.839      0.475      "
"             Maximum flow           0.002      0.023      0.023      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.023     0.023     0.086     0.086"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.023     0.023     0.023     0.086"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.109    c.m/sec"
"             Hydrograph volume           165.378    c.m"
"                     0.023     0.023     0.023     0.109"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.230    c.m/sec"
"             Hydrograph volume           810.794    c.m"
"                     0.023     0.230     0.023     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.023     0.230     0.230     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.292    c.m/sec"
"             Hydrograph volume           976.172    c.m"
"                     0.023     0.230     0.230     0.292"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.458    hectare"
"             Total Impervious area                    3.124    hectare"
"             Total % impervious                      70.074"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                 FS-SWM Report\Post"
"                Output filename:                                  5YR - POST.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:               10/12/2022 at 10:59:03 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          139.288    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.879   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.742     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  19.131     1.980      3.220      minutes"
"             Time to Centroid       121.799    88.785     91.170     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        307.79     1157.89    1465.68    c.m"
"             Rainfall losses        35.099     5.742      11.907     mm"
"             Runoff depth           12.166     41.523     35.358     mm"
"             Runoff volume          79.23      1017.23    1096.46    c.m"
"             Runoff coefficient     0.257      0.879      0.748      "
"             Maximum flow           0.027      0.739      0.742      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.742     0.742     0.000     0.000"
" 54          POND DESIGN"
"         0.742   Current peak flow    c.m/sec"
"         0.708   Target outflow    c.m/sec"
"        1096.5   Hydrograph volume    c.m"
"           4.   Number of stages"
"       399.000   Minimum water level    metre"
"       402.150   Maximum water level    metre"
"       399.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 399.000     0.000     0.000"
"                 399.300   0.05873  1.01E-05"
"                 401.000    0.7623  1050.000"
"                 402.150     1.029  1050.000"
"            1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                 399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.303    c.m/sec"
"             Maximum level               399.894    metre"
"             Maximum storage             366.955    c.m"
"             Centroidal lag                1.760   hours"
"                  0.742     0.742     0.303     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.303    c.m/sec"
"             Hydrograph volume          1093.289    c.m"
"                    0.742     0.742     0.303     0.303"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.742     0.000     0.303     0.303"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.255   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.039     0.000     0.303     0.303 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  6.529      0.676      1.574      minutes"
"             Time to Centroid       106.382    87.252     90.186     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        33.14      56.19      89.33      c.m"
"             Rainfall losses        35.205     7.998      18.092     mm"
"             Runoff depth           12.059     39.266     29.172     mm"
"             Runoff volume          8.46       46.68      55.14      c.m"
"             Runoff coefficient     0.255      0.831      0.617      "
"             Maximum flow           0.005      0.038      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.039     0.039     0.303     0.303"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.039     0.039     0.039     0.303"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.320    c.m/sec"
"             Hydrograph volume          1148.425    c.m"
"                     0.039     0.039     0.039     0.320"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.039     0.000     0.039     0.320"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.255   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.031     0.000     0.039     0.320 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  6.529      0.676      2.060      minutes"
"             Time to Centroid       106.382    87.252     91.774     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        42.71      42.37      85.08      c.m"
"             Rainfall losses        35.205     7.998      21.656     mm"
"             Runoff depth           12.059     39.266     25.608     mm"
"             Runoff volume          10.90      35.20      46.10      c.m"
"             Runoff coefficient     0.255      0.831      0.542      "
"             Maximum flow           0.006      0.029      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.031     0.031     0.039     0.320"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.031     0.031     0.031     0.320"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.335    c.m/sec"
"             Hydrograph volume         1194.520    c.m"
```

```
"                    0.031     0.031     0.031     0.335"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.031     0.000     0.031     0.335"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.873   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.120     0.000     0.031     0.335 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  12.184     1.261      3.927      minutes"
"             Time to Centroid       113.230    87.763     93.979     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        190.09     173.37     363.47     c.m"
"             Rainfall losses        35.115     6.009      21.232     mm"
"             Runoff depth           12.150     41.255     26.033     mm"
"             Runoff volume          48.86      151.33     200.20     c.m"
"             Runoff coefficient     0.257      0.873      0.551      "
"             Maximum flow           0.020      0.117      0.120      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.120     0.120     0.031     0.335"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.120     0.120     0.120     0.335"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.120    c.m/sec"
"             Hydrograph volume           200.195    c.m"
"                    0.120     0.120     0.120     0.120"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.120     0.000     0.120     0.120"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.873   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.033     0.000     0.120     0.120 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  12.184     1.261      4.144      minutes"
"             Time to Centroid       113.230    87.763     94.483     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        56.83      46.68      103.51     c.m"
"             Rainfall losses        35.115     6.009      21.988     mm"
"             Runoff depth           12.150     41.255     25.276     mm"
"             Runoff volume          14.61      40.75      55.36      c.m"
"             Runoff coefficient     0.257      0.873      0.535      "
"             Maximum flow           0.006      0.031      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.033     0.033     0.120     0.120"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.033     0.033     0.033     0.120"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.153    c.m/sec"
"             Hydrograph volume           255.551    c.m"
"                     0.033     0.033     0.033     0.153"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.335    c.m/sec"
"             Hydrograph volume          1194.520    c.m"
"                     0.033     0.335     0.033     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.033     0.335     0.335     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.428    c.m/sec"
"             Hydrograph volume          1450.070    c.m"
"                     0.033     0.335     0.335     0.428"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.458    hectare"
"             Total Impervious area                    3.124    hectare"
"             Total % impervious                      70.074"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                 FS-SWM Report\Post"
"                Output filename:                                  10YR - POST.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:               10/12/2022 at 11:00:41 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          169.551    mm/hr"
"             Total depth                 56.290    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.306   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.894   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.927     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  16.132     1.822      3.014      minutes"
"             Time to Centroid       116.081    87.573     89.947     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        366.57     1378.99    1745.56    c.m"
"             Rainfall losses        39.079     5.945      12.903     mm"
"             Runoff depth           17.211     50.345     43.387     mm"
"             Runoff volume          112.08     1233.35    1345.43    c.m"
"             Runoff coefficient     0.306      0.894      0.771      "
"             Maximum flow           0.045      0.920      0.927      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.927     0.927     0.000     0.000"
" 54          POND DESIGN"
"         0.927   Current peak flow    c.m/sec"
"         0.708   Target outflow    c.m/sec"
"        1345.4   Hydrograph volume    c.m"
"           4.   Number of stages"
"       399.000   Minimum water level    metre"
"       402.150   Maximum water level    metre"
"       399.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 399.000     0.000     0.000"
"                 399.300   0.05873  1.01E-05"
"                 401.000    0.7623  1050.000"
"                 402.150     1.029  1050.000"
"            1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                 399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.374    c.m/sec"
"             Maximum level               400.070    metre"
"             Maximum storage             475.857    c.m"
"             Centroidal lag                1.768   hours"
"                  0.927     0.927     0.374     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.374    c.m/sec"
"             Hydrograph volume          1348.573    c.m"
"                    0.927     0.927     0.374     0.374"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.927     0.000     0.374     0.374"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.305   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.050     0.000     0.374     0.374 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  5.505      0.622      1.486      minutes"
"             Time to Centroid       102.737    86.219     89.143     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        39.47      66.92      106.39     c.m"
"             Rainfall losses        39.128     9.242      20.330     mm"
"             Runoff depth           17.162     47.048     35.960     mm"
"             Runoff volume          12.03      55.93      67.97      c.m"
"             Runoff coefficient     0.305      0.836      0.639      "
"             Maximum flow           0.007      0.047      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.050     0.050     0.374     0.374"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.050     0.050     0.050     0.374"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.396    c.m/sec"
"             Hydrograph volume          1416.538    c.m"
"                     0.050     0.050     0.050     0.396"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.050     0.000     0.050     0.396"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.305   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.039     0.000     0.050     0.396 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  5.505      0.622      1.935      minutes"
"             Time to Centroid       102.737    86.219     90.660     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        50.86      50.46      101.32     c.m"
"             Rainfall losses        39.128     9.242      24.245     mm"
"             Runoff depth           17.162     47.048     32.045     mm"
"             Runoff volume          15.51      42.17      57.68      c.m"
"             Runoff coefficient     0.305      0.836      0.569      "
"             Maximum flow           0.009      0.035      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.039     0.039     0.050     0.396"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.039     0.039     0.039     0.396"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.415    c.m/sec"
"             Hydrograph volume         1474.219    c.m"
```

```
"                    0.039     0.039     0.039     0.415"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.039     0.000     0.039     0.415"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.305   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.153     0.000     0.039     0.415 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  10.273     1.160      3.662      minutes"
"             Time to Centroid       108.704    86.664     92.714     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        226.39     206.48     432.87     c.m"
"             Rainfall losses        39.094     6.458      23.527     mm"
"             Runoff depth           17.196     49.832     32.763     mm"
"             Runoff volume          69.16      182.79     251.95     c.m"
"             Runoff coefficient     0.305      0.885      0.582      "
"             Maximum flow           0.034      0.145      0.153      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.153     0.153     0.039     0.415"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.153     0.153     0.153     0.415"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.153    c.m/sec"
"             Hydrograph volume           251.951    c.m"
"                     0.153     0.153     0.153     0.153"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.153     0.000     0.153     0.153"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.305   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.041     0.000     0.153     0.153 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  10.273     1.160      3.856      minutes"
"             Time to Centroid       108.704    86.664     93.183     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        67.68      55.60      123.28     c.m"
"             Rainfall losses        39.094     6.458      24.375     mm"
"             Runoff depth           17.196     49.832     31.915     mm"
"             Runoff volume          20.67      49.22      69.89      c.m"
"             Runoff coefficient     0.305      0.885      0.567      "
"             Maximum flow           0.010      0.039      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.041     0.041     0.153     0.153"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.041     0.041     0.041     0.153"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.194    c.m/sec"
"             Hydrograph volume           321.845    c.m"
"                     0.041     0.041     0.041     0.194"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.415    c.m/sec"
"             Hydrograph volume          1474.219    c.m"
"                     0.041     0.415     0.041     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.041     0.415     0.415     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.539    c.m/sec"
"             Hydrograph volume          1796.064    c.m"
"                     0.041     0.415     0.415     0.539"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.458    hectare"
"             Total Impervious area                     3.124    hectare"
"             Total % impervious                       70.074"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              Q:\51060\100\Preliminary Design\SWM\"
"                                                                FS-SWM Report\Post"
"                Output filename:                                   25YR - POST.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:              10/12/2022 at 11:03:20 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          191.557    mm/hr"
"             Total depth                 68.266    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.362   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.091     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  14.123     1.728      2.913      minutes"
"             Time to Centroid       112.217    86.929     89.347     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        444.56     1672.38    2116.94    c.m"
"             Rainfall losses        43.560     6.142      14.000     mm"
"             Runoff depth           24.707     62.124     54.266     mm"
"             Runoff volume          160.89     1521.90    1682.79    c.m"
"             Runoff coefficient     0.362      0.910      0.795      "
"             Maximum flow           0.071      1.079      1.091      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.091     1.091     0.000     0.000"
" 54          POND DESIGN"
"         1.091   Current peak flow    c.m/sec"
"         0.708   Target outflow    c.m/sec"
"        1682.8   Hydrograph volume    c.m"
"           4.   Number of stages"
"       399.000   Minimum water level    metre"
"       402.150   Maximum water level    metre"
"       399.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 399.000     0.000     0.000"
"                 399.300   0.05873  1.01E-05"
"                 401.000    0.7623  1050.000"
"                 402.150     1.029  1050.000"
"            1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                 399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.458    c.m/sec"
"             Maximum level               400.271    metre"
"             Maximum storage             599.959    c.m"
"             Centroidal lag                1.774   hours"
"                  1.091     1.091     0.458     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.458    c.m/sec"
"             Hydrograph volume          1677.807    c.m"
"                    1.091     1.091     0.458     0.458"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.091     0.000     0.458     0.458"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.361   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.843   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.059     0.000     0.458     0.458 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  4.820      0.590      1.442      minutes"
"             Time to Centroid       100.624    85.735     88.735     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        47.87      81.16      129.02     c.m"
"             Rainfall losses        43.648     10.724     22.939     mm"
"             Runoff depth           24.618     57.542     45.327     mm"
"             Runoff volume          17.26      68.41      85.67      c.m"
"             Runoff coefficient     0.361      0.843      0.664      "
"             Maximum flow           0.011      0.053      0.059      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.059     0.059     0.458     0.458"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.059     0.059     0.059     0.458"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.481    c.m/sec"
"             Hydrograph volume          1763.476    c.m"
"                     0.059     0.059     0.059     0.481"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.059     0.000     0.059     0.481"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.361   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.843   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.047     0.000     0.059     0.481 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  4.820      0.590      1.864      minutes"
"             Time to Centroid       100.624    85.735     90.221     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        61.69      61.19      122.88     c.m"
"             Rainfall losses        43.648     10.724     27.252     mm"
"             Runoff depth           24.618     57.542     41.014     mm"
"             Runoff volume          22.24      51.58      73.83      c.m"
"             Runoff coefficient     0.361      0.843      0.601      "
"             Maximum flow           0.014      0.040      0.047      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.047     0.047     0.059     0.481"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.047     0.047     0.047     0.481"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.506    c.m/sec"
"             Hydrograph volume         1837.301    c.m"
```

```
"                    0.047     0.047     0.047     0.506"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.047     0.000     0.047     0.506"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.361   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.898   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.182     0.000     0.047     0.506 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  8.994      1.101      3.515      minutes"
"             Time to Centroid       105.808    86.123     92.143     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        274.56     250.41     524.97     c.m"
"             Rainfall losses        43.642     6.980      26.155     mm"
"             Runoff depth           24.624     61.286     42.112     mm"
"             Runoff volume          99.03      224.81     323.84     c.m"
"             Runoff coefficient     0.361      0.898      0.617      "
"             Maximum flow           0.052      0.167      0.182      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.182     0.182     0.047     0.506"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.182     0.182     0.182     0.506"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.182    c.m/sec"
"             Hydrograph volume           323.839    c.m"
"                    0.182     0.182     0.182     0.182"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.182     0.000     0.182     0.182"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.361   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.898   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.049     0.000     0.182     0.182 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  8.994      1.101      3.693      minutes"
"             Time to Centroid       105.808    86.123     92.589     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        82.08      67.43      149.50     c.m"
"             Rainfall losses        43.642     6.980      27.108     mm"
"             Runoff depth           24.624     61.286     41.158     mm"
"             Runoff volume          29.61      60.53      90.14      c.m"
"             Runoff coefficient     0.361      0.898      0.603      "
"             Maximum flow           0.016      0.045      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.049     0.049     0.182     0.182"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.049     0.049     0.049     0.182"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.231    c.m/sec"
"             Hydrograph volume           413.976    c.m"
"                     0.049     0.049     0.049     0.231"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.506    c.m/sec"
"             Hydrograph volume          1837.301    c.m"
"                     0.049     0.506     0.049     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.049     0.506     0.506     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.669    c.m/sec"
"             Hydrograph volume          2251.277    c.m"
"                     0.049     0.506     0.506     0.669"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.458    hectare"
"             Total Impervious area                    3.124    hectare"
"             Total % impervious                      70.074"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                 FS-SWM Report\Post"
"                Output filename:                                  50YR - POST.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:               10/12/2022 at 11:04:58 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          215.802    mm/hr"
"             Total depth                 77.647    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.919   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.255     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  12.814     1.644      2.801      minutes"
"             Time to Centroid       109.664    86.432     88.838     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        505.65     1902.20    2407.85    c.m"
"             Rainfall losses        46.643     6.306      14.777     mm"
"             Runoff depth           31.004     71.341     62.871     mm"
"             Runoff volume          201.90     1747.71    1949.61    c.m"
"             Runoff coefficient     0.399      0.919      0.810      "
"             Maximum flow           0.092      1.235      1.255      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.255     1.255     0.000     0.000"
" 54          POND DESIGN"
"         1.255   Current peak flow    c.m/sec"
"         0.708   Target outflow    c.m/sec"
"        1949.6   Hydrograph volume    c.m"
"           4.   Number of stages"
"       399.000   Minimum water level    metre"
"       402.150   Maximum water level    metre"
"       399.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 399.000     0.000     0.000"
"                 399.300   0.05873  1.01E-05"
"                 401.000    0.7623  1050.000"
"                 402.150     1.029  1050.000"
"            1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                 399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.531    c.m/sec"
"             Maximum level               400.445    metre"
"             Maximum storage             707.267    c.m"
"             Centroidal lag                1.785   hours"
"                  1.255     1.255     0.531     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.531    c.m/sec"
"             Hydrograph volume          1953.713    c.m"
"                    1.255     1.255     0.531     0.531"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.255     0.000     0.531     0.531"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.397   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.844   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.069     0.000     0.531     0.531 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  4.373      0.561      1.389      minutes"
"             Time to Centroid       99.145     85.312     88.315     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        54.45      92.31      146.75     c.m"
"             Rainfall losses        46.830     12.078     24.971     mm"
"             Runoff depth           30.817     65.569     52.676     mm"
"             Runoff volume          21.61      77.95      99.56      c.m"
"             Runoff coefficient     0.397      0.844      0.678      "
"             Maximum flow           0.014      0.060      0.069      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.069     0.069     0.531     0.531"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.069     0.069     0.069     0.531"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.555    c.m/sec"
"             Hydrograph volume          2053.271    c.m"
"                     0.069     0.069     0.069     0.555"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.069     0.000     0.069     0.555"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.397   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.844   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.056     0.000     0.069     0.555 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  4.373      0.561      1.787      minutes"
"             Time to Centroid       99.145     85.312     89.759     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        70.16      69.60      139.77     c.m"
"             Rainfall losses        46.830     12.078     29.524     mm"
"             Runoff depth           30.817     65.569     48.124     mm"
"             Runoff volume          27.85      58.78      86.62      c.m"
"             Runoff coefficient     0.397      0.844      0.620      "
"             Maximum flow           0.018      0.045      0.056      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.056     0.056     0.069     0.555"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.056     0.056     0.056     0.555"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.584    c.m/sec"
"             Hydrograph volume         2139.894    c.m"
```

```
"                    0.056     0.056     0.056     0.584"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.056     0.000     0.056     0.584"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.904   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.207     0.000     0.056     0.584 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  8.161      1.047      3.370      minutes"
"             Time to Centroid       103.878    85.672     91.617     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        312.29     284.82     597.11     c.m"
"             Rainfall losses        46.625     7.493      27.959     mm"
"             Runoff depth           31.023     70.154     49.689     mm"
"             Runoff volume          124.77     257.34     382.11     c.m"
"             Runoff coefficient     0.400      0.904      0.640      "
"             Maximum flow           0.069      0.190      0.207      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.207     0.207     0.056     0.584"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.207     0.207     0.207     0.584"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.207    c.m/sec"
"             Hydrograph volume           382.106    c.m"
"                    0.207     0.207     0.207     0.207"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.207     0.000     0.207     0.207"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.904   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.056     0.000     0.207     0.207 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  8.161      1.047      3.536      minutes"
"             Time to Centroid       103.878    85.672     92.043     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        93.36      76.69      170.05     c.m"
"             Rainfall losses        46.625     7.493      28.976     mm"
"             Runoff depth           31.023     70.154     48.671     mm"
"             Runoff volume          37.30      69.29      106.59     c.m"
"             Runoff coefficient     0.400      0.904      0.627      "
"             Maximum flow           0.021      0.051      0.056      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.056     0.056     0.207     0.207"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.056     0.056     0.056     0.207"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.263    c.m/sec"
"             Hydrograph volume           488.696    c.m"
"                     0.056     0.056     0.056     0.263"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.584    c.m/sec"
"             Hydrograph volume          2139.894    c.m"
"                     0.056     0.584     0.056     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.056     0.584     0.584     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.791    c.m/sec"
"             Hydrograph volume          2628.591    c.m"
"                     0.056     0.584     0.584     0.791"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.458    hectare"
"             Total Impervious area                    3.124    hectare"
"             Total % impervious                      70.074"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:               Q:\51060\100\Preliminary Design\SWM\"
"                                                                 FS-SWM Report\Post"
"                Output filename:                                  100YR - POST.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:                10/12/2022 at 10:15:47 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.354    mm/hr"
"             Total depth                  87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Area to W.R.7 (Southeast)"
"       79.000   % Impervious"
"        3.101   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.651   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        2.450   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.433   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.925   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.416     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.651      2.450      3.101      hectare"
"             Time of concentration  11.813     1.575      2.708      minutes"
"             Time to Centroid       107.624    86.015     88.406     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        567.07     2133.26    2700.33    c.m"
"             Rainfall losses        49.356     6.504      15.503     mm"
"             Runoff depth           37.723     80.575     71.576     mm"
"             Runoff volume          245.66     1973.92    2219.57    c.m"
"             Runoff coefficient     0.433      0.925      0.822      "
"             Maximum flow           0.117      1.387      1.416      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.416     1.416     0.000     0.000"
" 54          POND DESIGN"
"         1.416   Current peak flow    c.m/sec"
"         0.708   Target outflow    c.m/sec"
"        2219.6   Hydrograph volume    c.m"
"           4.   Number of stages"
"       399.000   Minimum water level    metre"
"       402.150   Maximum water level    metre"
"       399.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 399.000     0.000     0.000"
"                 399.300   0.05873  1.00E-07"
"                 401.000    0.7623  1050.000"
"                 402.150     1.029  1050.000"
"            1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                 399.000   398.800    20.000     0.600     0.015     0.500"
"             Peak outflow                  0.605    c.m/sec"
"             Maximum level               400.621    metre"
"             Maximum storage             816.147    c.m"
"             Centroidal lag                1.783   hours"
"                  1.416     1.416     0.605     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.605    c.m/sec"
"             Hydrograph volume          2214.934    c.m"
"                    1.416     1.416     0.605     0.605"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    1.416     0.000     0.605     0.605"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area to W.R.7 (Southeast)"
"       62.900   % Impervious"
"        0.189   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.070   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.119   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.428   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.845   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.078     0.000     0.605     0.605 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.070      0.119      0.189      hectare"
"             Time of concentration  4.031      0.538      1.342      minutes"
"             Time to Centroid       97.986     84.961     87.958     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        61.06      103.52     164.58     c.m"
"             Rainfall losses        49.787     13.501     26.963     mm"
"             Runoff depth           37.292     73.578     60.116     mm"
"             Runoff volume          26.15      87.47      113.62     c.m"
"             Runoff coefficient     0.428      0.845      0.690      "
"             Maximum flow           0.018      0.067      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.078     0.078     0.605     0.605"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.078     0.078     0.078     0.605"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.629    c.m/sec"
"             Hydrograph volume          2328.553    c.m"
"                     0.078     0.078     0.078     0.629"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.078     0.000     0.078     0.629"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled to W.R.7 (Northeast)"
"       49.800   % Impervious"
"        0.180   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.090   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.090   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.428   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.845   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.065     0.000     0.078     0.629 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.090      0.090      0.180      hectare"
"             Time of concentration  4.031      0.538      1.719      minutes"
"             Time to Centroid       97.986     84.961     89.365     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        78.68      78.06      156.74     c.m"
"             Rainfall losses        49.787     13.501     31.717     mm"
"             Runoff depth           37.292     73.578     55.362     mm"
"             Runoff volume          33.70      65.96      99.65      c.m"
"             Runoff coefficient     0.428      0.845      0.636      "
"             Maximum flow           0.023      0.050      0.065      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.065     0.065     0.078     0.629"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.065     0.065     0.065     0.629"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                 0.662    c.m/sec"
"             Hydrograph volume         2428.199    c.m"
```

```
"                    0.065     0.065     0.065     0.662"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.065     0.000     0.065     0.662"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled to Wetland A (Southwest)"
"       47.700   % Impervious"
"        0.769   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.402   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.367   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.432   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.907   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.240     0.000     0.065     0.662 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.367      0.769      hectare"
"             Time of concentration  7.523      1.003      3.241      minutes"
"             Time to Centroid       102.290    85.311     91.139     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        350.22     319.42     669.64     c.m"
"             Rainfall losses        49.418     8.064      29.692     mm"
"             Runoff depth           37.661     79.016     57.387     mm"
"             Runoff volume          151.47     289.84     441.31     c.m"
"             Runoff coefficient     0.432      0.907      0.659      "
"             Maximum flow           0.087      0.212      0.240      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.240     0.240     0.065     0.662"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.240     0.240     0.240     0.662"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
```

```
"               Total Site Area"
"             Maximum flow                  0.240    c.m/sec"
"             Hydrograph volume           441.306    c.m"
"                    0.240     0.240     0.240     0.240"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.240     0.000     0.240     0.240"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Uncontrolled Area to Wetland B (Northwest)"
"       45.100   % Impervious"
"        0.219   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.120   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.099   Impervious Area"
"       20.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.432   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.907   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.065     0.000     0.240     0.240 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.120      0.099      0.219      hectare"
"             Time of concentration  7.523      1.003      3.397      minutes"
"             Time to Centroid       102.290    85.311     91.546     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        104.70     86.01      190.70     c.m"
"             Rainfall losses        49.418     8.064      30.767     mm"
"             Runoff depth           37.661     79.016     56.312     mm"
"             Runoff volume          45.28      78.04      123.32     c.m"
"             Runoff coefficient     0.432      0.907      0.647      "
"             Maximum flow           0.026      0.057      0.065      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.065     0.065     0.240     0.240"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.065     0.065     0.065     0.240"
```

```
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.305    c.m/sec"
"             Hydrograph volume           564.629    c.m"
"                     0.065     0.065     0.065     0.305"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                To W.R.7"
"             Maximum flow                  0.662    c.m/sec"
"             Hydrograph volume          2428.199    c.m"
"                     0.065     0.662     0.065     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.065     0.662     0.662     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total Site Area"
"             Maximum flow                  0.909    c.m/sec"
"             Hydrograph volume          2992.833    c.m"
"                     0.065     0.662     0.662     0.909"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.458    hectare"
"             Total Impervious area                    3.124    hectare"
"             Total % impervious                      70.074"
" 19          EXIT"
```

Appendix G

Stormceptor Sizing Output

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

10/11/2022

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

Site Name:	Catchment 201

Drainage Area (ha):	3.101
% Imperviousness:	79.00

Runoff Coefficient 'c': 0.77

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	90.94
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	350 Wellington Road 7
Project Number:	51060-100
Designer Name:	Tyler Arndt
Designer Company:	MTE Consultants
Designer Email:	tarndt@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	52
EFO6	68
EFO8	78
EFO10	84
EFO12	88

Recommended Stormceptor EFO Model: EFO10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 84

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

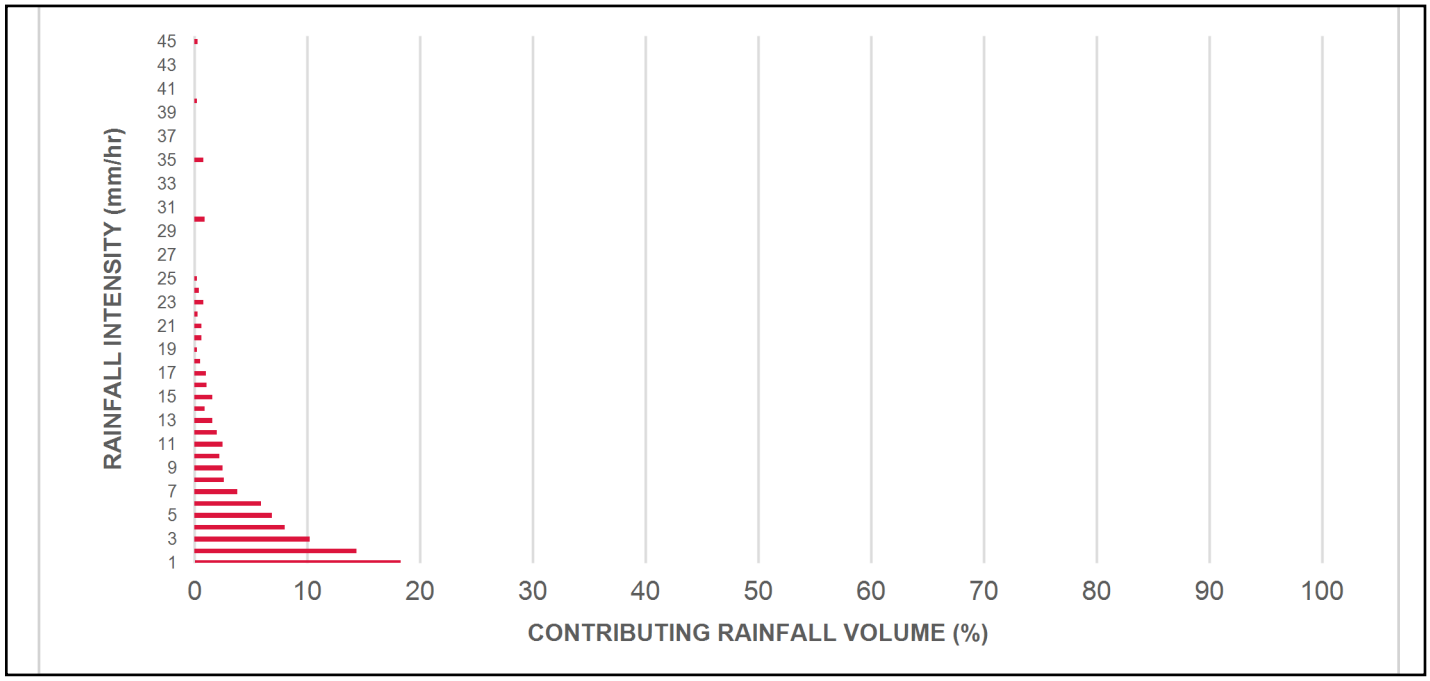
Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	3.34	200.0	27.0	100	8.5	8.5
1	18.3	26.8	6.67	400.0	55.0	100	18.3	26.8
2	14.4	41.3	13.34	801.0	110.0	95	13.7	40.5
3	10.2	51.5	20.02	1201.0	165.0	88	9.0	49.5
4	8.0	59.5	26.69	1601.0	219.0	82	6.6	56.1
5	6.9	66.4	33.36	2002.0	274.0	80	5.5	61.6
6	5.9	72.3	40.03	2402.0	329.0	77	4.5	66.1
7	3.8	76.1	46.71	2802.0	384.0	75	2.8	69.0
8	2.6	78.7	53.38	3203.0	439.0	72	1.9	70.8
9	2.5	81.1	60.05	3603.0	494.0	70	1.7	72.6
10	2.2	83.3	66.72	4003.0	548.0	67	1.5	74.0
11	2.5	85.8	73.40	4404.0	603.0	65	1.6	75.6
12	2.0	87.8	80.07	4804.0	658.0	64	1.3	76.9
13	1.6	89.4	86.74	5205.0	713.0	64	1.0	77.9
14	0.9	90.4	93.41	5605.0	768.0	63	0.6	78.5
15	1.6	91.9	100.09	6005.0	823.0	63	1.0	79.5
16	1.1	93.0	106.76	6406.0	877.0	63	0.7	80.2
17	1.0	94.0	113.43	6806.0	932.0	62	0.6	80.9
18	0.5	94.6	120.10	7206.0	987.0	62	0.3	81.2
19	0.2	94.8	126.78	7607.0	1042.0	61	0.1	81.3
20	0.6	95.4	133.45	8007.0	1097.0	59	0.4	81.7
21	0.6	96.1	140.12	8407.0	1152.0	58	0.4	82.1
22	0.3	96.4	146.79	8808.0	1207.0	57	0.2	82.2
23	0.8	97.2	153.47	9208.0	1261.0	56	0.5	82.7
24	0.4	97.6	160.14	9608.0	1316.0	54	0.2	82.9
25	0.2	97.8	166.81	10009.0	1371.0	53	0.1	83.0
30	0.9	98.7	200.17	12010.0	1645.0	45	0.4	83.4
35	0.8	99.5	233.54	14012.0	1919.0	38	0.3	83.7
40	0.2	99.7	266.90	16014.0	2194.0	33	0.1	83.8
45	0.3	100.0	300.26	18016.0	2468.0	30	0.1	83.9
Estimated Net Annual Sediment (TSS) Load Reduction =								**84 %**

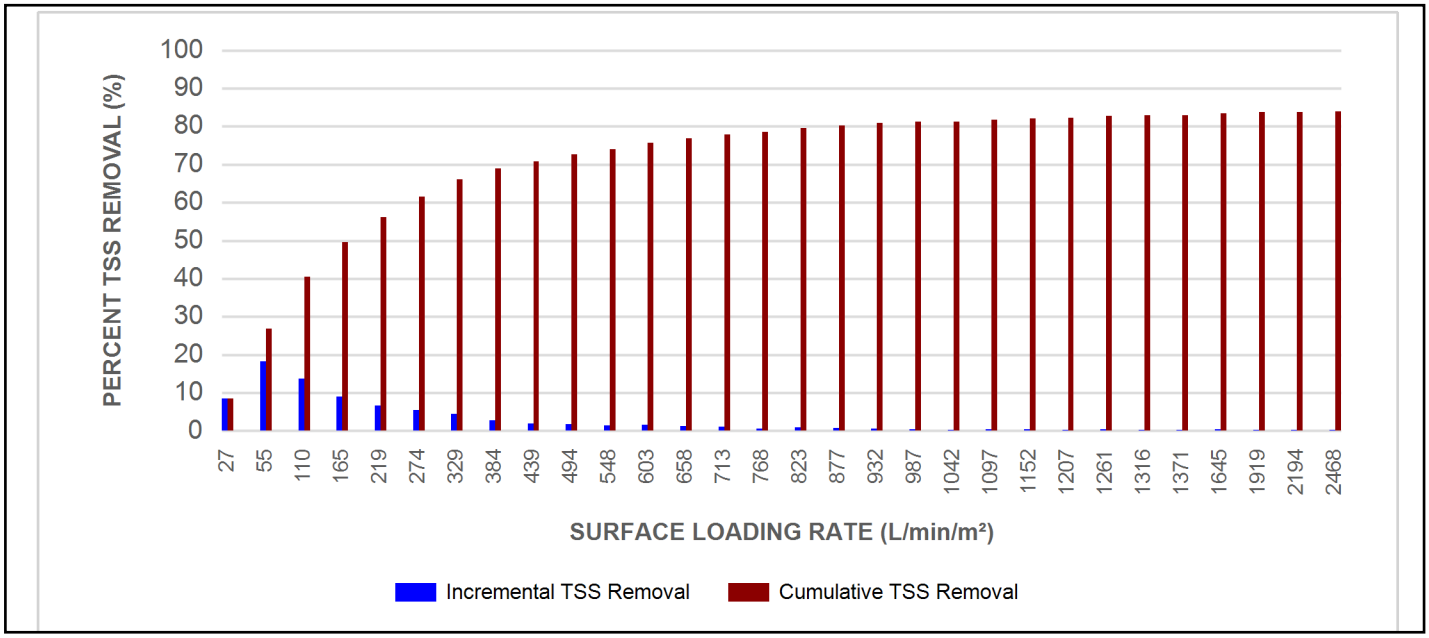
Climate Station ID: 6149387 *Years of Rainfall Data*: 34

imbrium

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

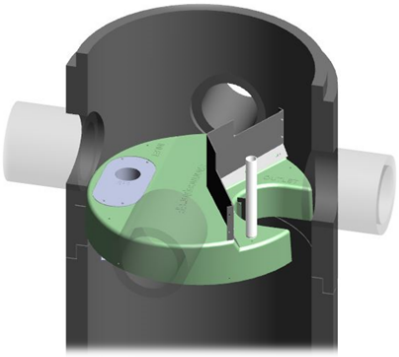
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

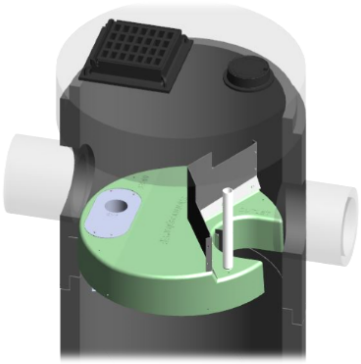
DESIGN FLEXIBILITY

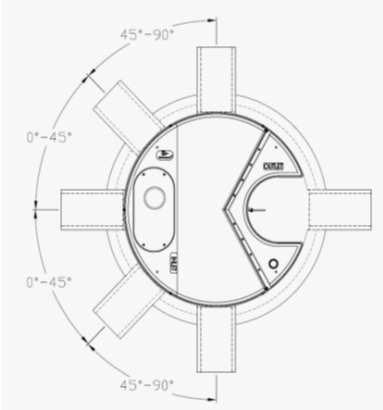
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

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

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

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

3.2 SIZING METHODOLOGY

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

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

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

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

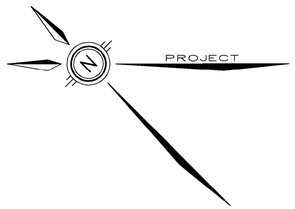
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

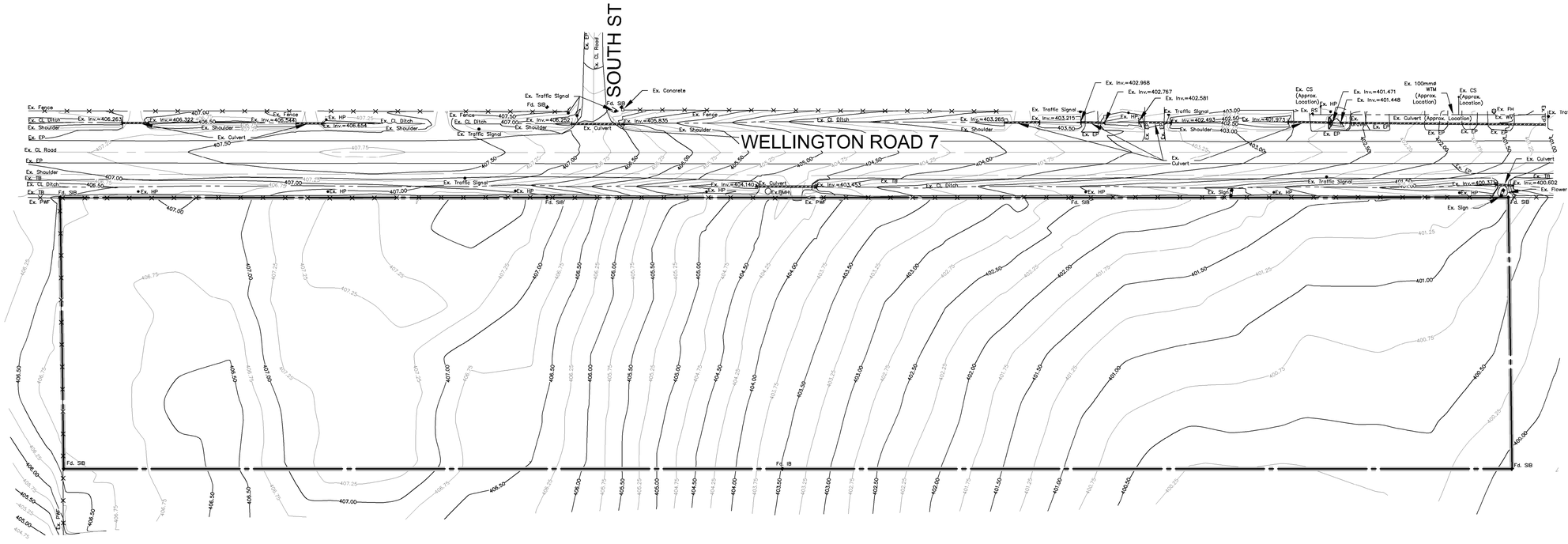
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

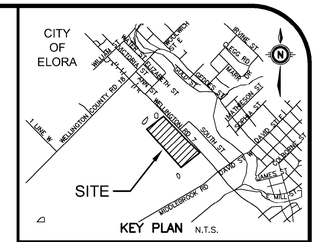




Fd. IB

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- 406.00 — EXISTING CONTOURS
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT
- Ex. 100mmø WTM — Ex. HYD. SET — EXISTING WATERMAIN



GEODETIC BM **ELEV. = 387.982m**
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK **ELEV. = m**

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

NOTE:

1. **PROPERTY–LINE IS APPROXIMATE ONLY.**
2. **EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY MTE ON APRIL 28, 2022..**
3. **THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, C2.4, C2.5 AND C2.6.**

No.	REVISION	BY	YYYY-MM-DD
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	ISSUED WITH FS-SWM REPORT	PWD	2022-10-20

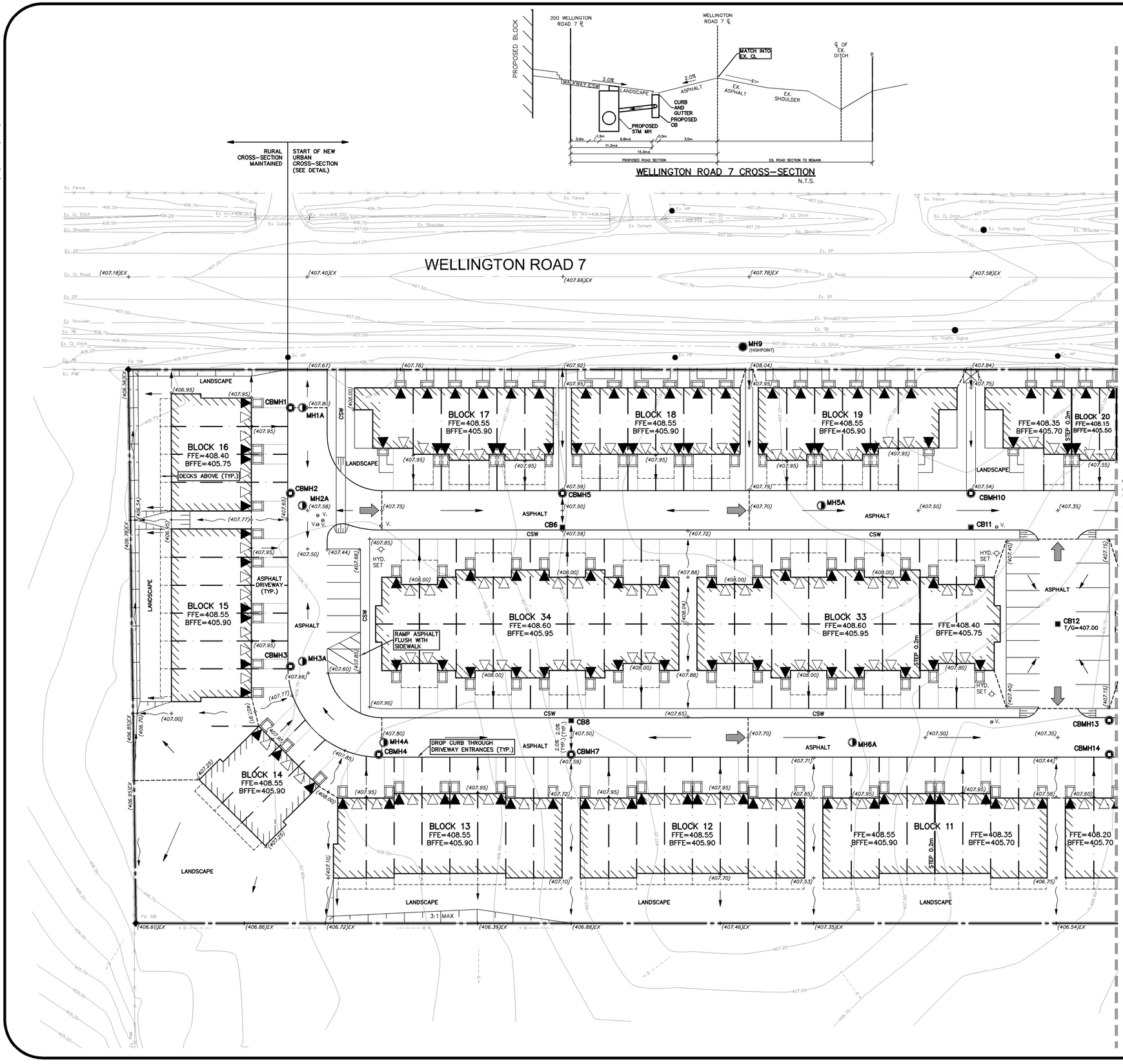
MTE
Engineers, Scientists, Surveyors
519-743-6500

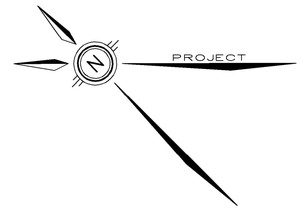
OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

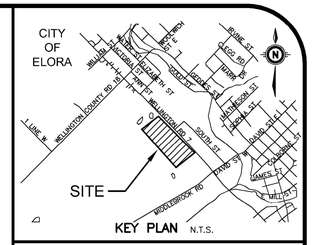
PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
EXISTING CONDITIONS PLAN

Project Manager: P. DOUGLAS	Project No.: **51060-100**
Design By:	Checked By:
Drawn By: BDW	Checked By:
Surveyed By: MTE	Drawing No.: **C1.1**
Date: Jul.12/22	
Scale: 1:750	Sheet **1** of **7**







LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING DIRECTION OF DRAINAGE
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT

LEGEND OF PROPOSED FEATURES

- PROPOSED SPOT ELEVATIONS (326.00) / T/G=326.00 / FFE=326.00; EX =MAINTAIN EXISTING; T/G =TOP OF CASTING/GRATE; INV =INVERT ELEVATION; FFE =FINISHED FLOOR ELEVATION
- DIRECTION OF DRAINAGE/SWALE (1.0% 1.0%)
- DRAINAGE SPLIT (RIDGE)
- EMBANKMENT (SLOPE AS NOTED) (TOP) 3:1 (BOTTOM)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB (DROP CURB)
- RETAINING WALL
- OVERLAND FLOW ROUTE (MAJOR STORM)

GEODETIC BM ELEV. = 387.982m
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

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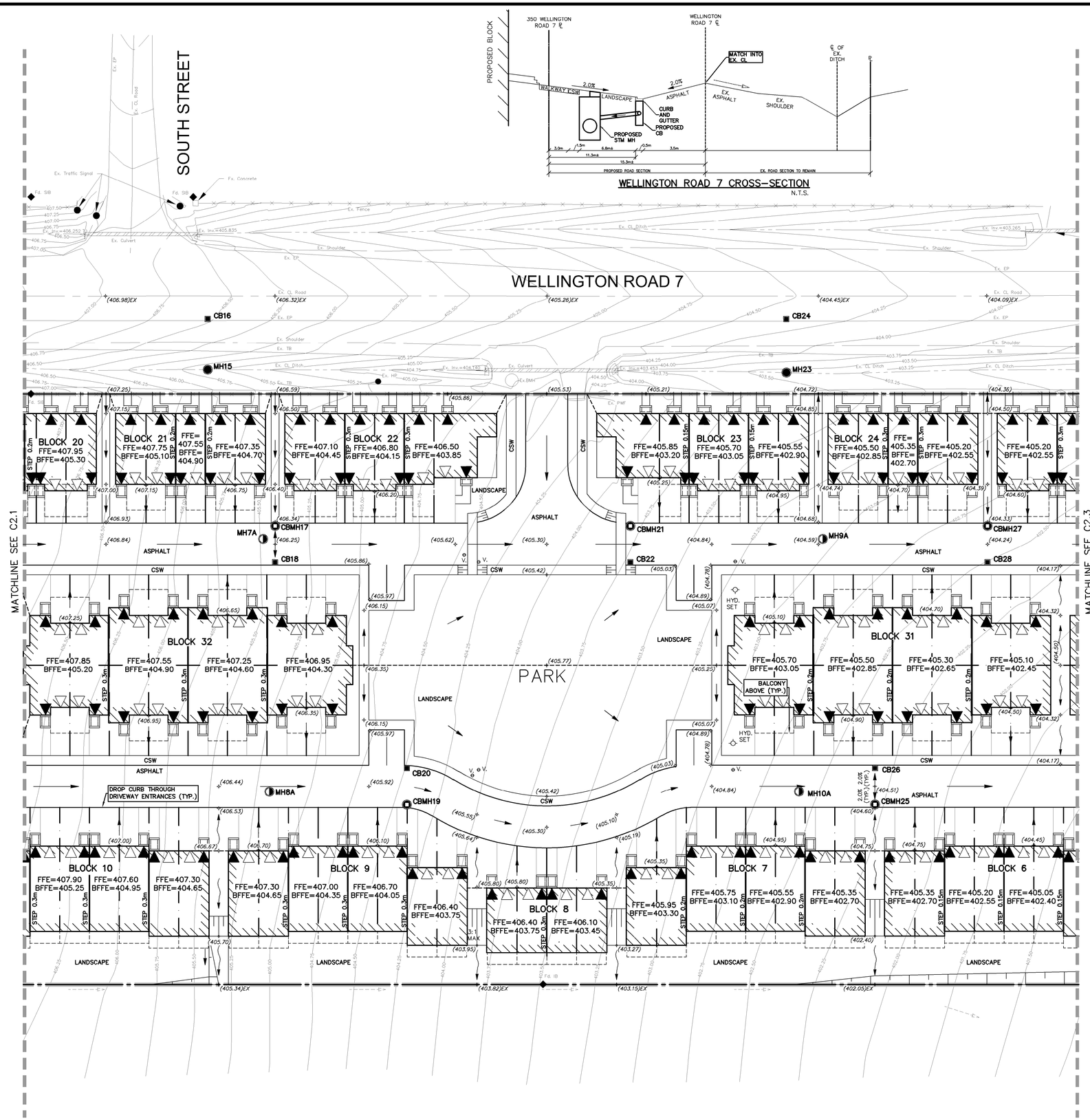
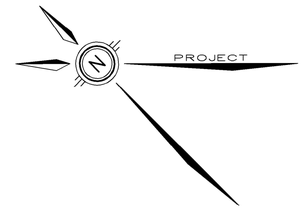
OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

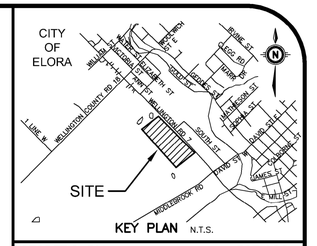
PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
FUNCTIONAL GRADING PLAN #1

Project Manager: P. DOUGLAS	Project No.: 51060-100
Design By: TMA	Checked By: LEI
Drawn By: BDW/APK	Checked By: TMA
Surveyed By: MTE	Drawing No.: C2.1
Date: Jul.14/22	
Scale: 1:300	Sheet 2 of 7







GEODETIC BM **ELEV. = 387.982m**
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

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LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS (406.00)
- EXISTING DIRECTION OF DRAINAGE
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT

LEGEND OF PROPOSED FEATURES

- (326.00) PROPOSED SPOT ELEVATIONS
- EX =MAINTAIN EXISTING
- T/G=326.00 T/G =TOP OF CASTING/GRATE
- INV =INVERT ELEVATION
- FFE=326.00 FFE =FINISHED FLOOR ELEVATION
- 1.0% 1.0% DIRECTION OF DRAINAGE/SWALE
- DRAINAGE SPLIT (RIDGE)
- (TOP) 3:1 (BOTTOM) EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- (DROP CURB) CONCRETE CURB
- RETAINING WALL
- OVERLAND FLOW ROUTE (MAJOR STORM)

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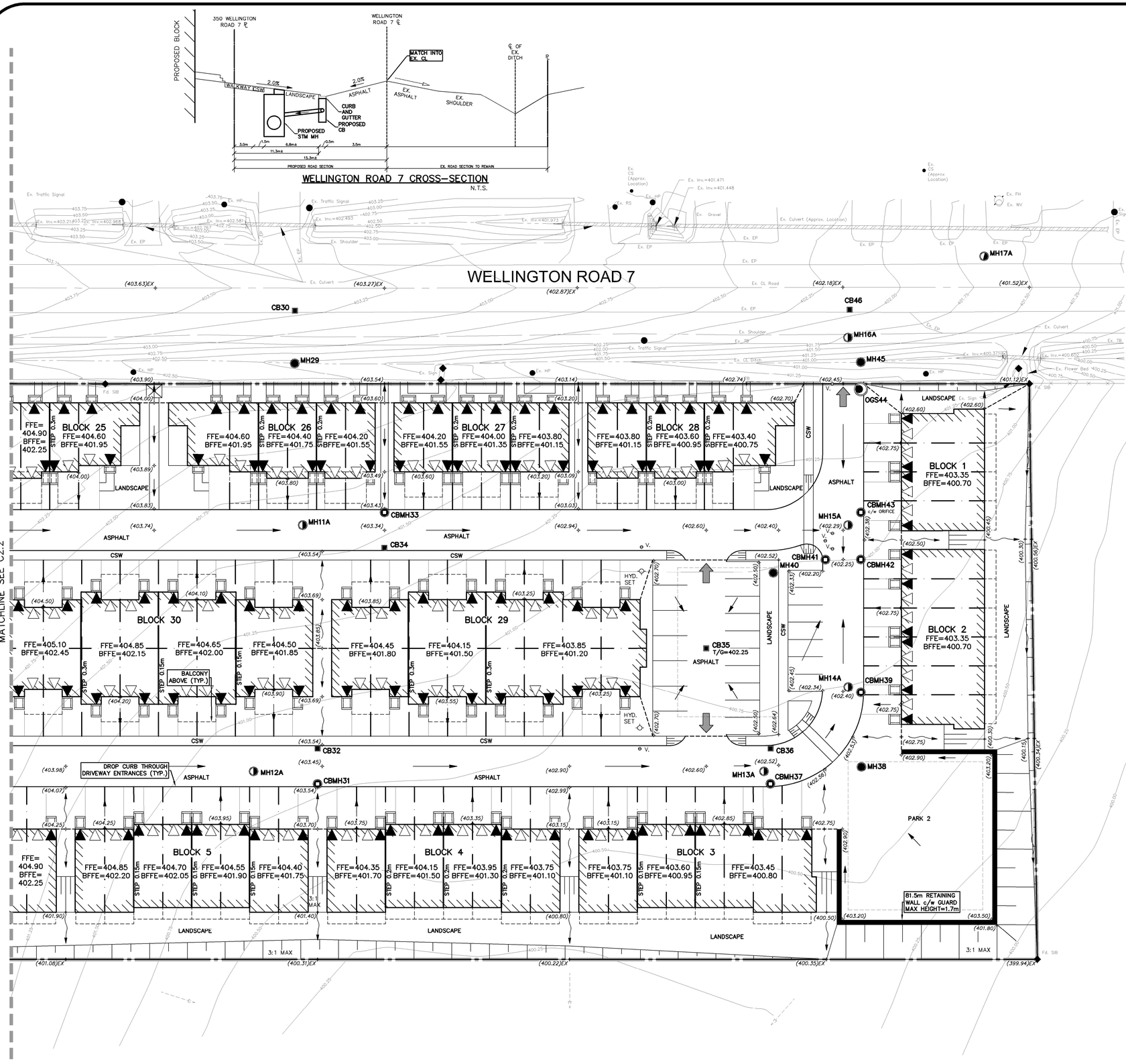
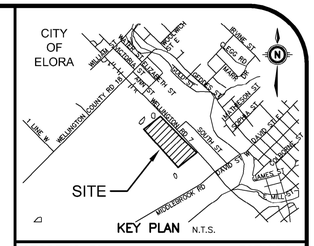
OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
FUNCTIONAL GRADING PLAN #2

Project Manager P. DOUGLAS	Project No. 51060-100
Design By TMA	Checked By LEI
Drawn By BDW/APK	Checked By TMA
Surveyed By MTE	Drawing No. C2.2
Date Jul.14/22	
Scale 1:300	Sheet 3 of 7





GEODETIC BM ELEV. = 387.982m
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

NOTE:

1. **PROPERTY-LINE IS APPROXIMATE ONLY.**
2. **EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY MTE ON APRIL 28, 2022..**
3. **THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, C2.4, C2.5 AND C2.6.**

No.	REVISION	BY	YYYY-MM-DD
8.			
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1.	ISSUED WITH FS-SWM REPORT	PWD	2022-10-20

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
FUNCTIONAL GRADING PLAN #3

Project Manager: P. DOUGLAS	Project No.: 51060-100
Design By: TMA	Checked By: LEI
Drawn By: BDW/APK	Checked By: TMA
Surveyed By: MTE	Drawing No.: C2.3
Date: Jul.14/22	
Scale: 1:300	Sheet 4 of 7

P:\P\51060\100\51060-100-C2
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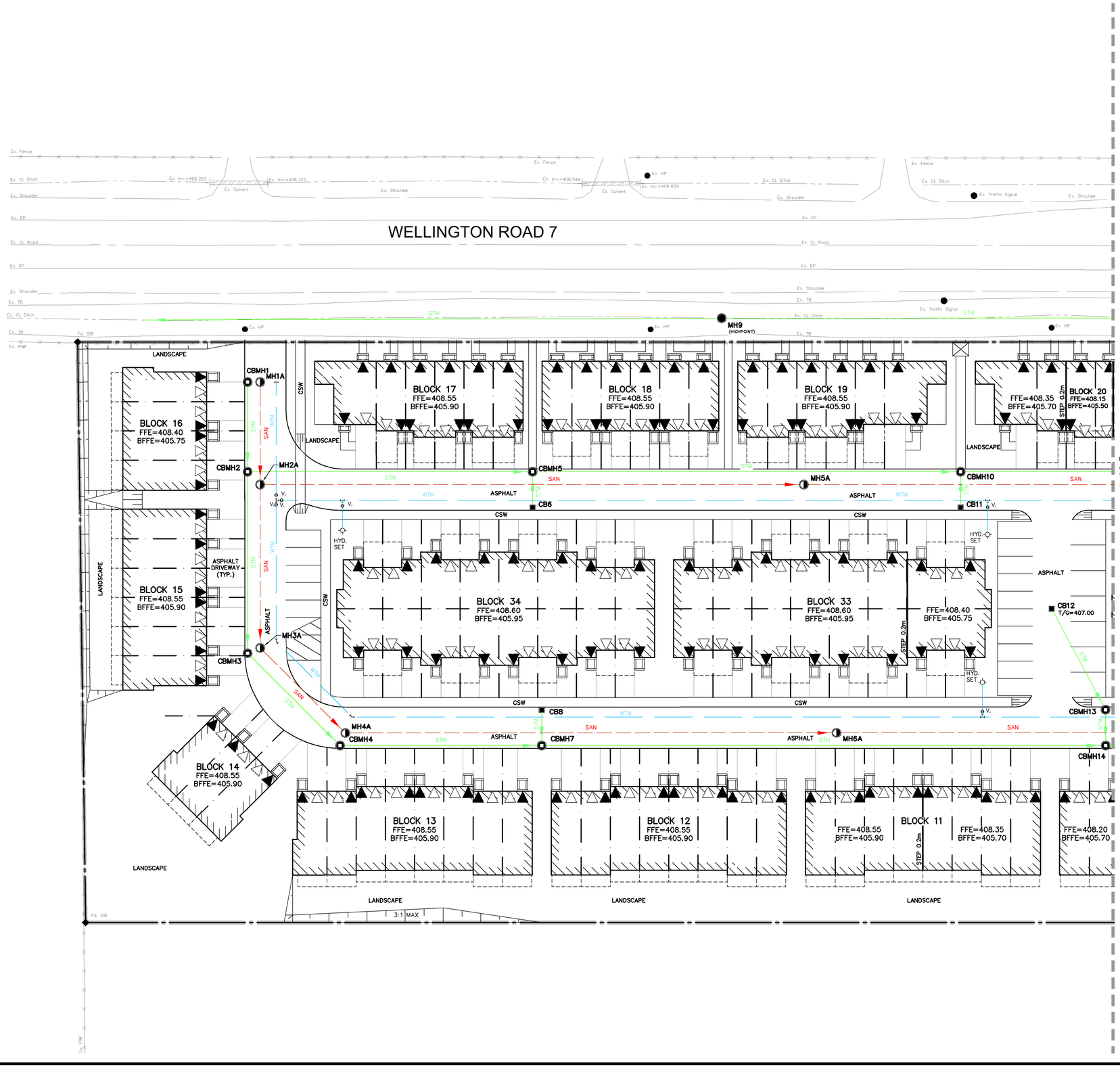
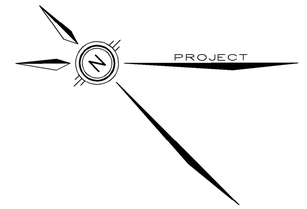
October 19, 2022 - 5:04:16 PM - Plotted By: Nishil Dalal



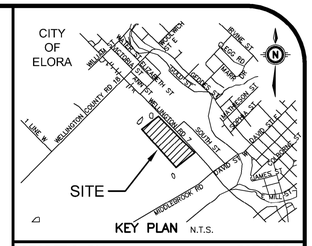


LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT
- EXISTING WATERMAIN

LEGEND OF PROPOSED FEATURES

- SANITARY SEWER
- STORM SEWER
- WATERMAIN
- EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB
- RETAINING WALL



GEODETIC BM **ELEV. = 387.982m**

ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK **ELEV. = m**

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OWNER

WE MERCHANDISE SPACE INC

590 ALDEN ROAD MARKHAM

PROJECT

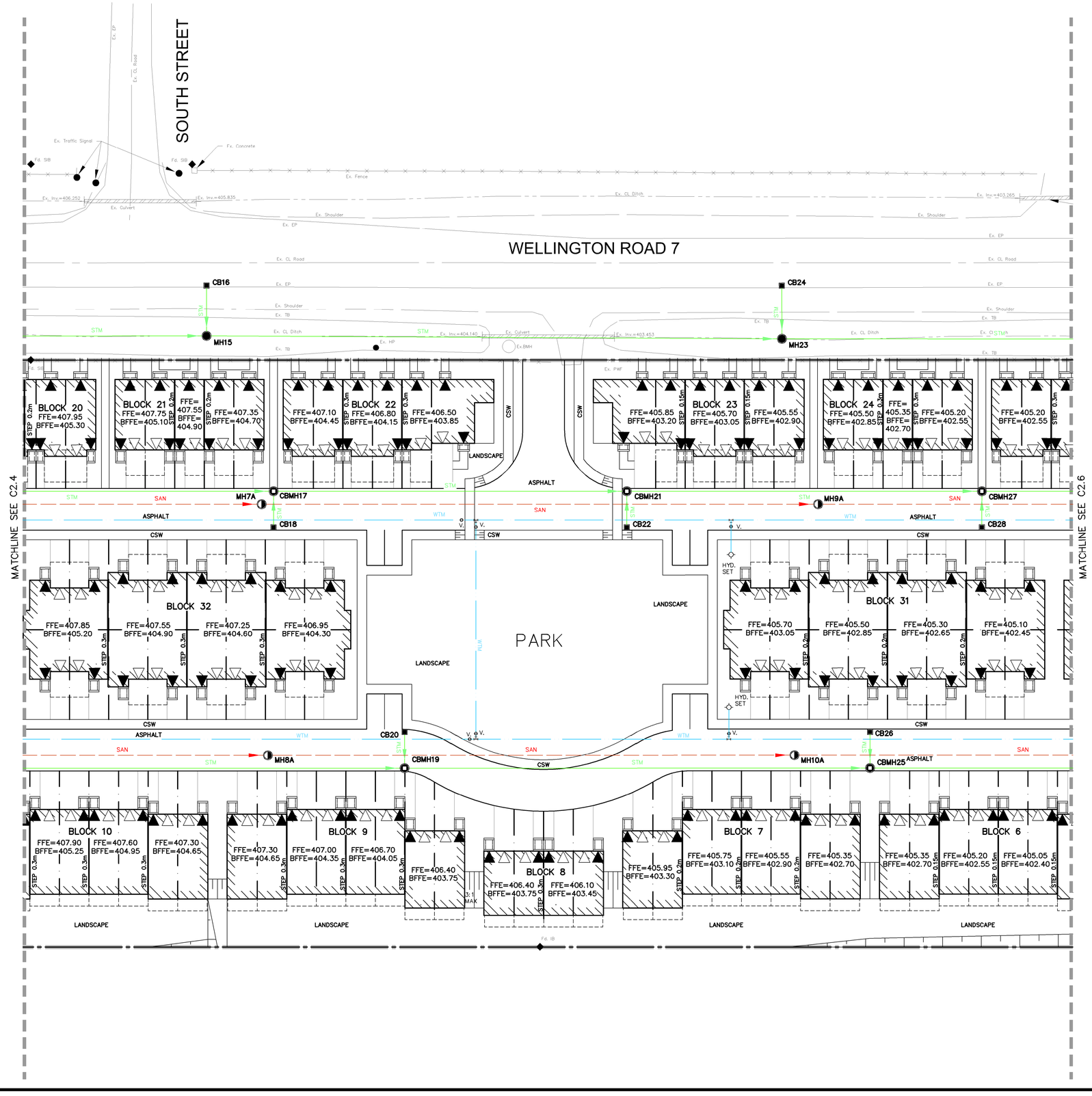
11 ACRE SITE OPA AND REZONING

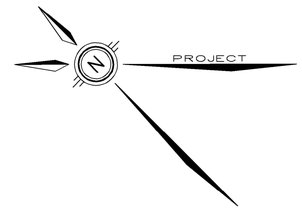
350 WELLINGTON ROAD 7 ELORA

DRAWING

FUNCTIONAL SERVICING PLAN #1

Project Manager: P. DOUGLAS	Project No.: 51060-100
Design By: TMA	Checked By: LEI
Drawn By: BDW/APK	Checked By: TMA
Surveyed By: MTE	Drawing No.: C2.4
Date: Jul.14/22	
Scale: 1:300	Sheet 5 of 7



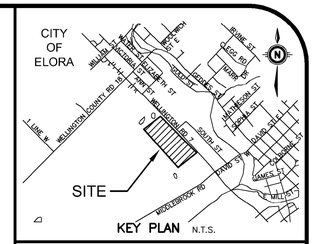


LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT
- EXISTING WATERMAIN (Ex. 100mmø WTM, Ex. HYD. SET)

LEGEND OF PROPOSED FEATURES

- SANITARY SEWER (MH, SAN)
- STORM SEWER (MH, STM)
- WATERMAIN (WTM, HYD. SET, V.)
- EMBANKMENT (SLOPE AS NOTED) (TOP, 3:1, BOTTOM)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB (DROP CURB)
- RETAINING WALL



GEODETIC BM ELEV. = 387.982m
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

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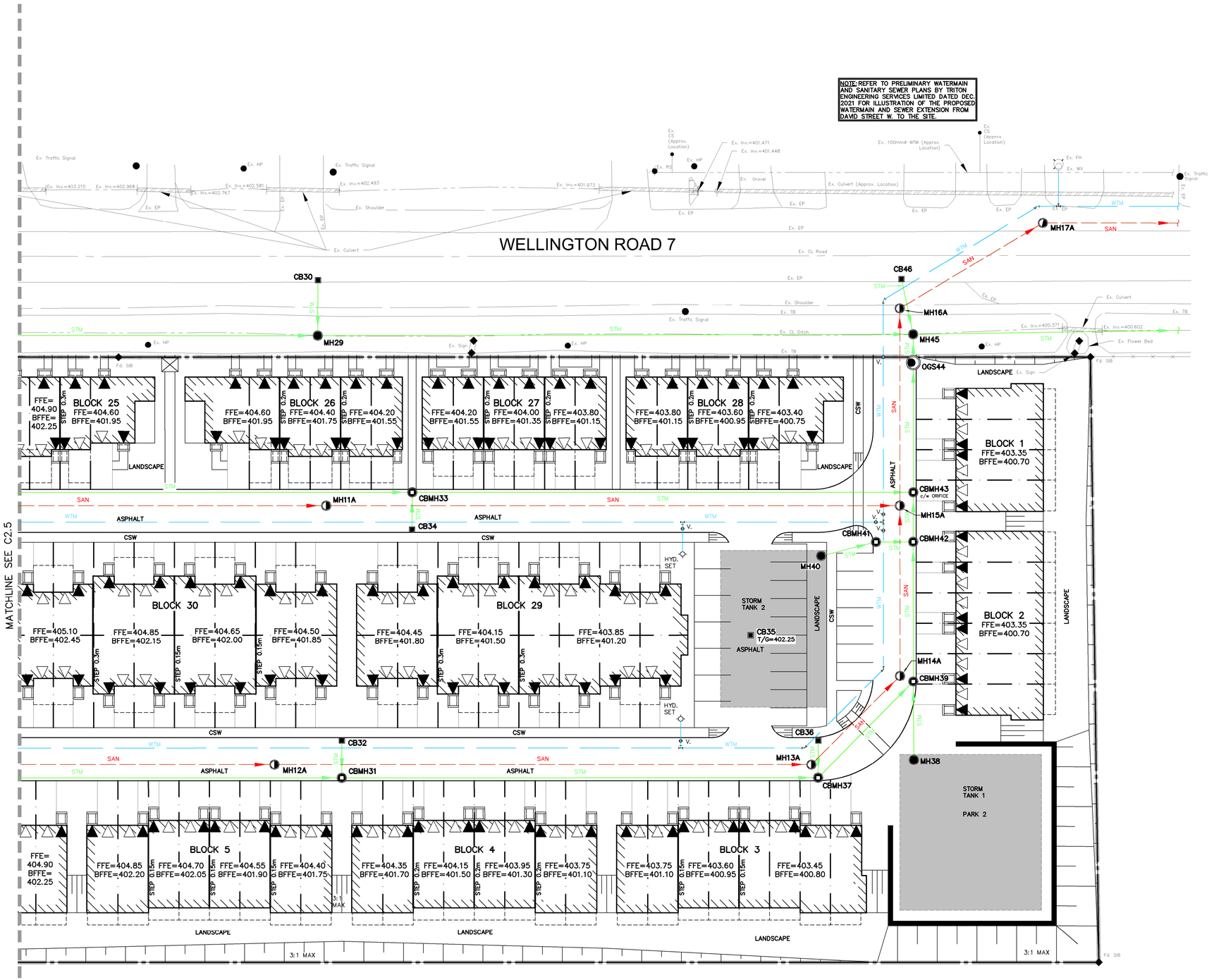
519-743-6500

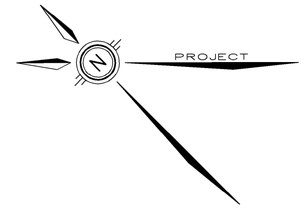
OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
FUNCTIONAL SERVICING PLAN #2

Project Manager: P. DOUGLAS	Project No.: 51060-100
Design By: TMA	Checked By: LEI
Drawn By: BDW/APK	Checked By: TMA
Surveyed By: MTE	Drawing No.: C2.5
Date: Jul.14/22	
Scale: 1:300	Sheet 6 of 7



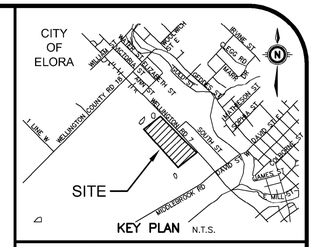


LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT
- EXISTING WATERMAIN (Ex. 100mmø WTM, Ex. HYD. SET)

LEGEND OF PROPOSED FEATURES

- SANITARY SEWER (MH, SAN)
- STORM SEWER (MH, STM)
- WATERMAIN (WTM, HYD. SET, V.)
- EMBANKMENT (SLOPE AS NOTED) (TOP, 3:1, BOTTOM)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB (DROP CURB)
- RETAINING WALL



GEODETIC BM ELEV. = 387.982m
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

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Engineers, Scientists, Surveyors
519-743-6500

OWNER
WE MERCHANDISE SPACE INC
590 ALDEN ROAD MARKHAM

PROJECT
11 ACRE SITE OPA AND REZONING
350 WELLINGTON ROAD 7 ELORA

DRAWING
FUNCTIONAL SERVICING PLAN #3

Project Manager: P. DOUGLAS	Project No.: 51060-100
Design By: TMA	Checked By: LEI
Drawn By: BDW/APK	Checked By: TMA
Surveyed By: MTE	Drawing No.: C2.6
Date: Jul.14/22	
Scale: 1:300	Sheet 7 of 7