



Functional Servicing Report

River's Edge Subdivision Town of Grand Valley Draft Plan of Subdivision #22T-12001

GMBP File: 104104

October 2023



650 WOODLAWN RD. W., BLOCK C, UNIT 2, GUELPH ON N1K 1B8 P: 519-824-8150 www.GMBLUEPLAN.CA



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- B Groundwater Measurements by GM BluePlan Engineering Limited
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FUNCTIONAL SERVICING REPORT RIVER'S EDGE SUBDIVISION TOWN OF GRAND VALLEY DRAFT PLAN #22T-12001 OCTOBER 2023 GMBP FILE: 104104

1.0 INTRODUCTION

GM Blue Plan Engineering Limited has prepared this Functional Servicing Report to address the site servicing and stormwater management requirements for the site in support of the Draft Plan of Subdivision prepared by GSP Group.

The proposed development is located in the northeast end of Grand Valley, adjacent to the Grand River. **Figure 1** shows the location of the proposed development and the surrounding area. The boundaries of the development include the Grand River to the north and east, an existing wetland to the southeast, Highway No. 25 and existing residential development to the west, and Scott Street and residential lands to the south. The applicant owns additional lands on the north side of the Grand River, which are not included in the current development.

2.0 EXISTING CONDITIONS

3.1 Land Use

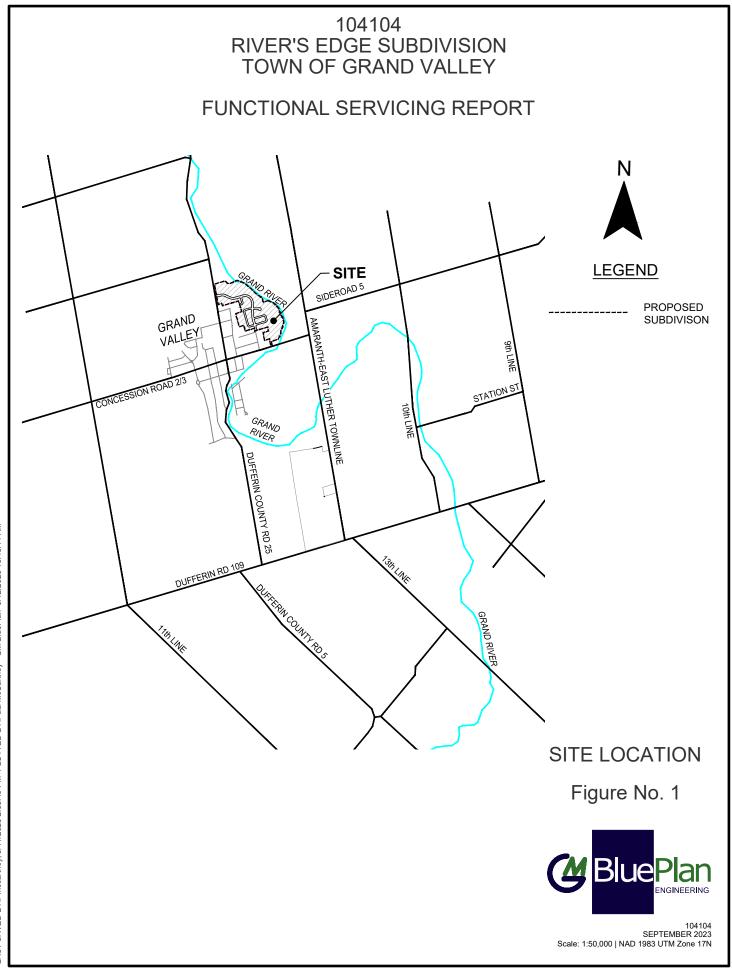
Under existing conditions, the northerly portion of the site is used for agricultural purposes while the southerly portion was used for aggregate extraction. The areas formerly used for aggregate extraction are no longer in production. The easterly portion of the site consists mainly of wooded areas and slope towards the Grand River.

The lands to the west and south of the site have been developed as residential lands consisting of mostly single family housing. An existing townhome condominium block is located southeast of the site. The Grand River borders the site at the westerly property boundary followed by additional wooded areas and agricultural lands further west of the Grand River.

3.2 Topography

Topography across the site varies, with grades ranging from 4% to in excess of 15% along the banks adjacent to the Grand River. There is approximately 25m of fall across the site in the northwest to southeast direction. The site elevation ranges from approximately 481m at the northwest end of the site then falls to about 455m towards the easterly and southeasterly portions of the site.

The majority of the site drains overland in the easterly direction towards the Grand River. The central portion of the site drains in the easterly direction to an existing wetland located at the southeast portion of the site ultimately discharging to the Grand River. Flows exceeding the capacity of the wetland will then sheetflow in the easterly direction to the Grand River.





3.3 Soils

Peto MacCallum Ltd. completed a geotechnical investigation of the property in April 2009 followed by a slope assessment report in 2012. Based on the 2009 geotechnical investigation, there appears to be between 600 and 800mm of topsoil at the north and west portions of the site and close to 200mm thick topsoil towards the easterly portion of the site. The subsurface site soils consist of a mix of clayey silt till, sand and gravely sand deposits. The clayey silt till materials are found predominantly at the north end of the property while the sands and gravels are found towards the southerly end.

JLP Services Inc. completed a follow-up geotechnical investigation at the southerly end of the site in 2022. Based on the JLP report, the topsoil layer at the southernly end of the site ranges between 50 to 900mm at boreholes MW1, MW2 and MW3. Subsurface topsoil buried at a depth of 2.4m and 0.3m was encountered at boreholes MW3 and MW4 respectively. Deposits of loose to compacted fill have also been encountered at boreholes MW1, MW3 and MW4. The fill consists of sandy silts, some gravel, trace clay and some organics. It is recommended that the areas of buried topsoil be removed and replaced with engineered fill and the areas of loose fill be excavated, placed and compacted.

Both the Peto MacCallum and JLP geotechnical investigations recommend an impermeable liner for the proposed stormwater management facility construction due to the high permeability of the site soils at the proposed stormwater management facility location. The JLP investigation recommends a minimum 1m thick clay liner or approved equivalent synthetic liner. Furthermore it is noted that the clay liner could be constructed form some of the clayey till material on site.

Copies of the slope assessment report by Peto MacCallum (2012) and geotechnical investigations by Peto MacCallum (2009) and JLP Services Inc. (2022) are included in **Appendix A**.

3.4 Groundwater

As a component of the geotechnical investigation, Peto MacCallum Ltd. installed groundwater monitoring wells in three of the nine boreholes.

Initial readings taken from the three monitoring wells showed groundwater measurements below the bottom of the well (>5.05m below ground surface) at Borehole 3 located at the north end of the site, groundwater approximately 4.8 metres below ground surface at Borehole 4 located at the center of the site and groundwater approximately 1.1 metres below ground surface at Borehole 9 located at the southeasterly portion of the site.

JLP Services installed monitoring wells in each of the four boreholes as part of the 2022 geotechnical investigation. MW4 located at the southeast portion of the site, south of Scott Street was dry (groundwater level >3.1m below ground surface), while MW1, MW2 and MW3 located north of Scott Street showed groundwater water levels at 6m, 3m and 6m below ground surface, respectively.

Additional details regarding groundwater elevations are included in the geotechnical investigations by Peto MacCallum (2009) and JLP Services Inc. (2022) in **Appendix A.**

GM BluePlan Engineering Limited has been recording groundwater elevations to capture the seasonal high groundwater levels across the site. From 2009 to 2015, manual groundwater readings have been recorded at BH 3, 4 and 9. In 2022, dataloggers have been installed to record the groundwater elevations at BH 3, 4 and 9 as well as MW 1 to 4 and MH 101 to 103. Hydrographs showing the groundwater readings as of Fall 2023 are included in **Appendix B**.



3.0 PROPOSED DEVELOPMENT

The proposed development generally consists of single family and semi-detached lots, a townhome block, apartment block, two park blocks, open space areas, internal roadways and a stormwater management block. **Figure 2**, illustrates the proposed Draft Plan of Subdivision prepared by GSP Group.

An extension of Bielby Street from Scott Street to Highway No. 25 will form the main connection for this development. A third road connection to the existing road network will be provided by extending Luther Road from the existing cul-de-sac to the Bielby Street extension.

As illustrated on the Draft Plan of Subdivision, a pedestrian walkway connection has been provided from Crozier Street to the proposed park block.

3.1 Site Grading

The site grading for the proposed residential lots, open spaces, internal roads and stormwater management facilities is shown on the Preliminary Grading Plans. The grade and elevation of the internal streets is controlled by the elevation of the sanitary sewer outlet and existing roadway elevations at Main Street, Scott Street and Luther Road.

The proposed site grading will match the existing elevations along the west, north and southerly property limits. At the easterly portions of the site, the proposed development will match the existing elevations along the existing woodlot and Grand River Floodplain.

Internal roadways are graded with slopes ranging from 0.5% to 5%, while lots are generally graded with slopes ranging from 2% to 6% per the Town of Grand Valley Engineering Standards. 3:1 transition slopes are proposed in rear yard areas of deeper lots to accommodate the grade relief across the site. Due to the high elevation differential across the site, retaining walls are proposed in areas where transition slopes into existing ground elevations would exceed the maximum allowable grade of 3:1.

It is noted that some of the walkout lots located along the easterly site perimeter may have basements taller than the standard 2.43m (8') to provide larger elevation differential across the lots and mitigate the height and locations of 3:1 transition slopes and retaining walls.

3.2 Streets

The internal roadways will be constructed as an urban cross section complete with concrete curb and gutter. The Luther Road extension, Street A, B and C are considered local roads and will be constructed using the Town of Grand Valley standard 20m wide urban cross section, while Bielby Street is considered a collector road and will constructed using a 26m wide urban cross section.

Concrete sidewalks, with a 1.5 metre width, will be constructed per Town of Grand Valley standard cross-section.

3.3 Water Supply

The proposed development will be serviced with three watermain connections to the existing municipal watermain system. Connections will be made at the following locations; existing 200mm diameter watermain on Bielby Street at Scott Street, 150mm diameter watermain at the Luther Road Cul-de-sac and 300mm diameter watermain on Highway 25. It is anticipated that the existing 300mm diameter watermain on Highway 25 will be extended in the northerly direction from its current terminus at the existing water tower to the Highway 25 and Bielby Street intersection.

A 200mm diameter watermain will be extended through the site along Bielby Street from Scott Street to Highway 25. The remainder of the watermain sizes on internal roadways will be 150mm in diameter.



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DRAFT PLAN OF SUBDIVISION

Figure No. 2



104104 SEPTEMBER 2023 Scale: N.T.S. | NAD 1983 UTM Zone 17N



A 25mm diameter water service lateral will be provided for each dwelling. Fire hydrants are proposed to be placed at a minimum distance of 100m to provide fire protection, in accordance with Town Standards.

RJ Burnside and Associated Ltd. prepared a Master Servicing Plan update for the Town of Grand Valley in 2014. The Master Servicing Plan update identified water distribution system improvements required by the projected 2031 buildout. It is noted that flows from the subject property and other greenfield developments within the Town's urban boundary are included in this study along with proposed intensification to the existing developed areas. It is anticipated that the Town will grow from the 2011 population of 1,482 persons to 6,145 persons by 2031.

The following items are identified to be upgraded by the projected 2031 buildout:

- The current water tower has a capacity of 1,600m³ and would need to be expanded by 1,732m³ for a total volume of 3,332m³ to meet the additional storage demands. A 0.047ha block has been allocated on the Draft Plan of Subdivision to accommodate the water tower expansion.
- Upgrades to the existing water supply system to increase the firm capacity (well supply capacity with the largest well out of service) from 1,963m³/d to 3,792m³/d.

The Master Servicing Plan recommends commencing the upgrades when the current needs exceed 80% of the water distribution system capacity (population reaches 2,900 people). The Class EA for the water supply and storage expansions should be initiated sooner, roughly when the population reaches 2,300 people to allow for processing time.

3.4 Sanitary Sewer

The proposed development will be serviced by a gravity sanitary sewer system connecting to the existing 200 mm diameter sanitary sewer on Bielby Street at the Scott Street intersection. Preliminary sizing indicates that a 200 mm diameter sanitary sewer will provide sufficient capacity for the River's Edge Subdivision. Each dwelling will be serviced via a proposed 125mm diameter sanitary lateral per Town of Grand Valley Standards.

As noted in the section above, RJ Burnside and Associated Ltd. prepared a Master Servicing Plan update for the Town of Grand Valley in 2014. The Master Servicing Plan update identified wastewater collection and treatment system improvements required by the projected 2031 buildout.

The following items are identified to be upgraded by the projected 2031 buildout.

- The Existing Water Pollution Control Plant (WPCP) has been designed for an average flow of 1,244m³/d to service an average population of 2,950 persons. It is anticipated that by the 2031 buildout, the total WPCP capacity could be expanded to 2,547m³/d to service a population of 6,050 people.
- Sewers on Emma Street, Mill Street, Ponsford Street, Amaranth Street and Leeson Street are generally identified to be increased in diameter by one pipe size. The existing sewers are noted to be over capacity by less than 8%. It is noted that the upsizing of the sanitary sewer on Emma Street is currently under construction.
- The Emma Street sanitary pumping station peak flow is estimated to be 106L/s which exceeds the current capacity of 89L/s/

The above noted upgrades would require a Scheduled EA. The Master Servicing Plan recommends assessing the capacity of the wastewater system on an annual basis and initiating the required EA processes well in advance of need just in case if there are any delays.



3.5 Storm Sewer

The storm sewer system on the internal local roads (20m right-of-way) will be sized to convey the 5-year design storm while the storm sewers on collector roads (i.e. Bielby Street – 26m right-of-way) will be sized to convey the 10-year design storm to the stormwater management facility. Major storm events will be conveyed overland through the municipal right of ways to the stormwater management facility.

The stormwater management facility will outlet to the Grand River.

A 150mm diameter storm service is proposed to be installed to each residential unit to provide gravity foundation drainage for the proposed development. Sump pumps are proposed for lots where a gravity foundation connection is not possible – the sump pump will pump the foundation drainage to the storm sewer service lateral. Lots requiring sump pumps will be identified on the preliminary grading and servicing drawings.

150mm diameter subdrains are proposed to be constructed under the curb for the full length of the roadway per Town of Grand Valley Engineering Standards.



4.0 STORMWATER MANAGEMENT CRITERIA

The studies, policies and guidelines used to develop the stormwater management plan are as follows:

- 1) The Stormwater Management Practices Planning and Design Manual, 1994
- 2) Stormwater Management Planning and Design Manual, 2003
- 3) The Interim Stormwater Quality Control Guidelines, 1991
- 4) The Stormwater Quality Best Management Practices Manual, 1991
- 5) The MTO Drainage Management Technical Guidelines, 1989
- 6) The Ontario Urban Drainage Design Guidelines, 1987

The stormwater management criteria for the River's Edge Subdivision, are as follows:

- 1) Post-development runoff generated from site is to be directed to the Grand River. Due to the proximity of the site to the Grand River and to limit the impact of coincidental peak flows from upstream developments, stormwater management quantity controls for the subject property are not required.
- 2) Provide Enhanced level of quality control (80% Total Suspended Solids (TSS) removal) from all runoff discharging from the site.
- 3) Major storm flows are to be routed overland to an appropriate outlet.

The method used to evaluate and design the stormwater management plan is as follows:

A three-hour duration rainfall event was used to generate the mass rainfall data required to model the 2, 5 and 100-year design storms. The Fergus Shand Dam Chicago parameters and the total depth of rainfall for each storm are shown below in **Table 1**.

	2 Year	5 Year	100 Year
a =	695.047	1459.072	6933.019
b =	6.387	13.690	34.699
C =	0.793	0.850	0.998
r =	0.380	0.380	0.380
t _d =	180.00	180.00	180.00
Rainfall depth (mm)	33.01	49.79	97.92

Table 1: Fergus Shand Dam - Chicago Storm Parameters

The Regional Storm (Hurricane Hazel) was also modelled.



The Horton infiltration method was used in the runoff calculations summarized in Table 2.

From the Ontario Soil Surveys, Report No. 38, Dufferin County, the soils on site are described as Huron Loam and Burford Loam. The hydrologic soil classifications for these soils are BC and AB, respectively.

The Geotechnical Investigation completed by Peto MacCallum Ltd. (2009) classified the surficial soils as consisting primarily of clayey silt tills with sand and gravel deposits. Due to the relatively poor drainage capacity of clayey silt tills, the Horton Infiltration parameters for a Type D soil have been used in the analysis of the stormwater management system. The typical maximum infiltration rate for a hydrologic Type D soil is 75 mm/hour, as per the MTO Drainage Management Manual.

Table No. 2: MIDUSS Horton Parameters

	Impervious Areas	Pervious Areas
Maximum Infiltration	0.0 mm/hr	75.0 mm/hr
Minimum Infiltration	0.0 mm/hr	5.0 mm/hr
Lag Constant	0.05 hr	0.25 hr
Depression Storage	1.5 mm	5.0 mm

The hydrologic model MIDUSS was used to create the runoff hydrographs and to route the flows through the storage structure.



5.0 STORMWATER MANAGEMENT PLAN

5.1 **Pre-Development Conditions**

For pre-development conditions analysis purposes, the site was modelled as eight (8) drainage catchments. Four (4) out of the eight (8) drainage catchments represent the subject site while the remaining four (4) represent external areas draining through the site. The pre-development condition drainage catchments are shown on **Figure 3** and described below. The existing conditions MIDUSS computer modelling is attached in **Appendix C**.

Internal Catchments:

Catchment 100 (4.92 hectares, 0% impervious) represents the north-westerly portion of the site. Runoff generated from Catchment 100 sheetflows overland in the northerly direction to the Grand River.

Catchment 101 (8.49 hectares, 0% impervious) represents the north-easterly portion of the site. Runoff generated from Catchment 101 sheetflows overland in the easterly direction to the Grand River.

Catchment 102 (8.68 hectares, 1% impervious) represents the central portion of the site. Runoff generated from Catchment 102 sheetflows overland to an existing wetland located in the southeast corner of the site then ultimately to the Grand River.

Catchment 103 (6.33 hectares, 0% impervious) represents the southern portion of the site. Runoff generated from Catchment 103 sheetflows overland to the Grand River.

External Catchments:

Catchment 104 (2.60 hectares, 55% impervious) represents the existing development on Scott Street. The storm sewer on Scott Street discharges into the site, north of Bielby Street. Runoff from Catchment 104 discharges overland through the site to the Grand River.

Catchment 105 (0.67 hectares, 55% impervious) represents rear yard areas from the existing residential lots located along the north side of Luther Road and the existing water tower site. Runoff generated from Catchment 105 sheetflows overland through the site to the Grand River.

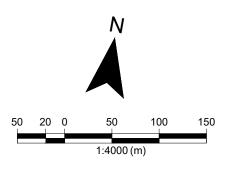
Catchment 106 (1.09 hectares, 55% impervious) represents existing Mary Court and easterly part of Luther Road. The existing storm sewer on Luther Road conveys runoff from the eastern half of Luther Road and Mary Court and discharges to the site at the east end of Luther Road. The drainage area contributing to the storm sewer has been included in Catchment 106. Runoff generated from Catchment 106 sheetflows overland through Catchment 102 to an existing wetland located in the southeast corner of the site then ultimately to the Grand River.

Catchment 107 (3.55 hectares, 55% impervious) represents the existing drainage from the lots on Crozier Street and Baker Court. Runoff generated from Catchment 107 is being discharged overland through the site, to the Grand River.

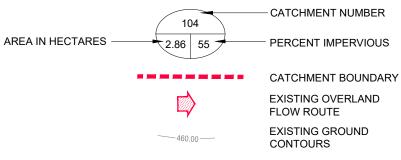


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LEGEND



PRE DEVELOPMENT DRAINAGE PLAN

Figure No. 3



104104 SEPTEMBER 2023 Scale: 1:5000 | NAD 1983 UTM Zone 17N



Table 3 lists the flow rates discharging from each catchment under pre-development conditions.

	2-Year	5-Year	100-Year	Regional Storm
Catchment 100	0.042	0.294	1.192	0.538
Catchment 101	0.093	0.610	2.442	0.896
Catchment 102	0.061	0.439	1.891	0.950
Catchment 103	0.059	0.404	1.633	0.686
Catchment 104	0.300	0.405	0.730	0.282
Catchment 105	0.072	0.104	0.233	0.078
Catchment 106	0.125	0.169	0.301	0.117
Catchment 107	0.397	0.544	0.948	0.371
Total Flow Rate	0.935	2.172	8.805	3.839

Table 3: Pre-Development Condition Flow Rates



5.2 Post-Development Conditions

For post-development analysis purposes, the site was modelled as eleven (11) drainage catchments. The proposed stormwater management facility is designed to have three (3) inlets. Inlet 1 is located at the south portion of the facility accepting flows from Bielby Street, Inlet 2 is located midway though the facility accepting flows from Bielby Street at the northerly end of the facility accepting flows from Street B and Inlet 3 is located at the northerly end of the facility accepting flows from Street C. The post-development drainage catchments are shown on **Figure 4** and described below. The post-development MIDUSS computer modelling is attached in **Appendix D**.

Catchments discharging to Inlet 1 (Bielby Street):

Catchment 204 (2.09 hectares, 10% impervious) represents the proposed park block fronting Street A. Runoff generated from Catchment 204 will be directed to the proposed stormwater management facility Inlet 1.

Catchment 205 (4.32 hectares, 65% impervious) represents the southwestern portion of the proposed development. Runoff generated from Catchment 205 will be directed to the proposed stormwater management facility Inlet 1.

Catchment 301 (2.60 hectares, 55% impervious) represents the existing development on Scott Street. The storm sewer on Scott Street discharges to the proposed stormwater management facility at the Inlet 1 location.

Catchment 303 (3.55 hectares, 55% impervious) represents the existing drainage from the lots on Crozier Street and Baker Court. Runoff will be conveyed through the site to the proposed stormwater management facility Inlet 1.

Catchments discharging to Inlet 2 (Street B):

Catchment 203 (2.76 hectares, 60% impervious) represents the southeastern portion of the proposed development. Runoff generated from Catchment 203 will be directed to the proposed stormwater management facility Inlet 2.

Catchments discharging to Inlet 3 (Street C):

Catchment 201 (4.28 hectares, 90% impervious) represents the townhome and apartment blocks located at northwestern portion of the proposed development. Runoff generated from Catchment 201 will be directed to the proposed stormwater management facility Inlet 3.

Catchment 202 (4.15 hectares, 60% impervious) represents the northeast portion of the proposed development. Runoff generated from Catchment 202 will be directed to the proposed stormwater management facility Inlet 3.

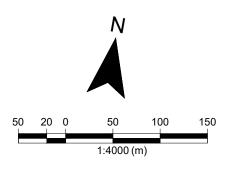
Catchment 302 (0.67 hectares, 55% impervious) represents rear yard areas from the existing residential lots located along the north side of Luther Road and the existing water tower site. Runoff generated from Catchment 202 will sheetflow to the apartment block followed from which it will be directed to the proposed stormwater management facility Inlet 3 via the proposed storm sewer system and roadway network.

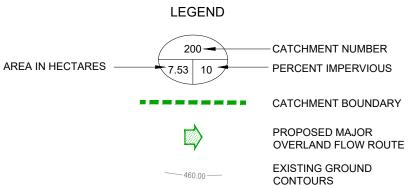
Catchment 304 (1.09 hectares, 55% impervious) represents existing Mary Court and parts of Luther Road. The existing storm sewer on Luther Road will be connected to the proposed storm sewer system on site. Runoff generated from Catchment 304 will be directed to the proposed stormwater management facility Inlet 3.



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POST DEVELOPMENT DRAINAGE PLAN

Figure No. 4



104104 SEPTEMBER 2023 Scale: 1:4000 | NAD 1983 UTM Zone 17N



Catchments discharging directly to the Grand River:

Catchment 200 (7.53 hectares, 10% impervious) represents the proposed open space block and rear yard areas of the lots fronting onto Bielby Street. Runoff generated from Catchment 200 will be sheetflow to the Grand River. Runoff generated form this catchment is considered clean water as the catchment area consists of building rooftops and vegetated areas.

Catchment 206 (3.29 hectares, 80% impervious) represents the proposed stormwater management facility and rear yard areas from Streets B and C. The proposed stormwater management facility is designed to provide the required Enhanced level of protection prior to discharging to the Grand River. The stormwater management facility will outlet to a linear dispersion trench which will spread the flows over a wide area, preventing a point source discharge, and will direct a portion of the flow to the existing wetland while directing the remaining flows to the Grand River.

Table 4 lists the post-development uncontrolled flow rates for each catchment under the 2, 5 and 100-year design storms.

	2-Year	5-Year	100-Year	Regional Storm
Catchment 200	0.162 m³/s	0.437 m³/s	1.746 m³/s	0.809 m³/s
Catchment 201	0.783 m³/s	1.019 m³/s	1.688 m³/s	0.512 m³/s
Catchment 202	0.511 m³/s	0.695 m³/s	1.195 m³/s	0.447 m³/s
Catchment 203	0.323 m³/s	0.462 m³/s	0.979 m³/s	0.325 m³/s
Catchment 204	0.043 m³/s	0.103 m³/s	0.433 m³/s	0.225 m³/s
Catchment 205	0.587 m³/s	0.788 m³/s	1.353 m³/s	0.485 m³/s
Catchment 206	0.550 m³/s	0.732 m³/s	1.198 m³/s	0.389 m³/s
Catchment 301	0.300 m³/s	0.405 m³/s	0.730 m³/s	0.282 m³/s
Catchment 302	0.072 m³/s	0.104 m³/s	0.233 m³/s	0.078 m³/s
Catchment 303	0.397 m³/s	0.544 m³/s	0.948 m³/s	0.371 m³/s
Catchment 304	0.125 m³/s	0.169 m³/s	0.301 m³/s	0.117 m³/s
Total Flow Rate	3.852 m³/s	5.256 m³/s	9.788 m³/s	3.853 m³/s

Table 4: Post-Development Uncontrolled Flow Rates



5.3 Stormwater Management Overview

In line with current practices and guidelines, the stormwater management approach for the River's Edge Subdivision is designed as a "treatment train" to remove sediments and any absorbed contaminants prior to the discharge of runoff from the development to the receiving outlets. The "treatment train" approach will include a combination of lot level, conveyance and end-of-pipe best management practices and is proposed to filter and remove sediments from stormwater runoff prior to discharging to the Grand River and existing wetland.

Due to the proximity of the Grand River, the stormwater management facility is designed to route runoff volumes that exceed the water quality volumes through the pond as quickly as possible. This will ensure the peak flows from the development are discharged and routed along the Grand River prior to peak flows from upstream lands.

Lot Level Controls

Stormwater management practices recommended for providing lot level controls on this site are as follows:

a) Roof Drainage to Ground Surface

The lots will drain to the street. The roof runoff will be filtered across the grassed surface. The runoff for any event large enough to generate flow to the swale system will be adequately filtered by the grass.

b) Rear Yard Swales

The grading of the lots will be to current Town of Grand Valley standards. Where practical, the length of the rear lot swales between catch basins will be increased to extend the contact time with the grassed surfaces.

To promote more infiltration on the lots and in the swales, it is recommended that the average depth of graded topsoil be 300 mm.

c) Foundation Drainage

Gravity connections from the foundation drainage to the storm sewer system are recommended wherever possible per Town of Grand Valley standards. Inlet restrictions will ensure that during the full range of design events, flows in the storm sewer system will not surcharge to the elevation of the foundation drains. Sump pumps are proposed for lots where a gravity foundation connection is not possible – the sump pump will pump the foundation drainage to the storm sewer lateral. Lots requiring sump pumps will be identified on the preliminary grading and servicing drawings.

Conveyance Controls

Conveyance controls will be achieved through municipal maintenance of the storm sewer system. The regular cleanout of the manholes, catch basins and oil/grit structures will remove the heavier sediments deposited from the runoff during storm events.

Oil/grit separators have been designed and sized to pre-treat the runoff from the proposed development prior to discharging to the stormwater management facility. Oil/grit separators will be installed within the proposed development at each of the three pond inlets (Inlet 1 - Bielby Street, Inlet 2 - Street B and Inlet 3 - Street C). The pre-treatment of stormwater runoff will remove larger particles and reduce the frequency with which the facility requires remediation due to sediment build-up.



End of Pipe Facilities

The end-of-pipe component consists of the proposed stormwater management facility located near the south-easterly edge of the property adjacent to the Grand River. The stormwater management facility will outlet to a linear dispersion trench which will spread the flows over a wide area preventing a point source discharge and will direct a portion of the flow to the existing wetland while directing the remaining flows to the Grand River. The proposed stormwater management facility has been designed as wetland type facility complete with three forebays and a 0.3m deep permanent pool to provide the required water quality controls. The proposed outlet structure is designed to provide extended detention of the required water quality storage volumes as per the Ministry of Environment 2003 Stormwater Management Planning and Design Manual.

5.4 Proposed Stormwater Management Facility

Water Quality

The proposed stormwater management facility has been designed to function as a wetland. From Table 3.2, Stormwater Management Planning and Design Manual, 2003, in order to provide Enhanced water quality treatment, a wetland facility requires 115 m³/ha of storage volume for a contributing drainage area that is 65% impervious. 40 m³/ha of the required storage volume is extended detention volume, while the remaining 75 m³/ha is permanent pool.

The quality control drainage area was sized based on the development areas provided in the Draft Plan of Subdivision. The table below summarizes the development areas which contribute flows to the proposed stormwater management facility.

Land Use	Area (ha)	% Impervious
Single Detached Lots	9.271	60.0%
Semi Detached	0.373	70.0%
Townhomes	2.125	90.0%
Apartment	1.268	90.0%
Park	2.532	10.0%
Stormwater Management	2.321	50.0%
To be added to Water Tower	0.047	50.0%
Roads	4.425	80.0%
Total	22.362	62.0%

Table 5: Development Areas Contributing Flow to the Stormwater Management Facility

Please note that Open Space Block 187 and Future Development Block 189 are not included in the above calculation as the open space area drains directly to the Grand River and the future development block is located downstream of the stormwater management facility and is assumed to have it's own stormwater management system at the time of development.

Based on a contributing site area of 22.362 hectares and a requirement for 75m³/ha of permanent pool storage volume to achieve Enhanced treatment, the required permanent pool storage is 1,677m³.

The external drainage areas that discharge to the site such as existing developments on Luther Road, Mary Court, Baker Court, Crozier Street and Scott Street are not included in the water quality calculations for the proposed stormwater management facility and will be conveyed through the facility to the Grand River.



The proposed stormwater management facility has been designed with a 0.3 metre deep permanent pool, which provides 1,788m³ of permanent pool volume. Additional permanent pool volume of 962m³ will be provided in the three (3) sediment forebays created at each pond inlet for a total permanent pool volume of 2,750m³.

Oil/grit separators located upstream of the pond inlets have been sized to pre-treat runoff prior to entering the proposed stormwater management facility. A Stormceptor EF08 will pre-treat runoff prior to reaching Inlet 1, providing 64% Total Suspended Solid removal. For Inlet 2, a Stormceptor EF04 will pre-treat runoff providing 61% Total Suspended Solid reduction. AT Inlet 3, a Stormceptor EF08 is proposed to pre-treat runoff providing 60% Total Suspended Solid reduction. The pre-treatment of the stormwater runoff from the development will reduce the frequency in which the stormwater management facility needs to be remediated due to sediment buildup. Pre-treatment will remove larger sediments before they are deposited within the stormwater management facility. Oil/grit separator sizing is included in **Appendix E**.

Extended Detention

Extended detention volume is calculated based on the runoff volume generated by the 4-hour 25mm design storm event. The outlet structure has been designed to provide a 24.7-hour detention of the required extended detention volume, which corresponds to a release rate of 0.060m³/s.

From the design of the stormwater management pond, a storage volume of 3,749m³ corresponds to a ponding depth of approximately 0.50 metres. The outlet structure has been designed with a 215mm diameter orifice, which will control the extended detention volume for the 24.7 hour detention time.

Pond Routing

Table 6 compares the routing results through the stormwater management facility with the available stage/storage/ discharge capacities.

	Ava	ilable Capa	city	Actu			
Control	Peak Flow m³/s	Storage Volume m ³	Storage Elevation m	Peak Flow m³/s	Storage Volume m ³	Storage Elevation m	Drawdown Time hr.
Bottom of Pond	0	0	456.00				
25 mm Storm				0.060	3,749	456.50	24.7
DICB Lip	0.060	3,760	456.50				
2 Year Storm				0.264	4,552	456.59	25.1
5 Year Storm				1.235	6,160	456.77	25.5
Weir (3 weirs)	2.490	8,552	457.00				
Regional Storm				2.808	8,684	457.01	26.0
100 Year Storm				5.771	9,570	457.09	25.8
Top of Pond	31.960	13,276	457.40				
Overflow	44.189	14,711	457.50				

Table 6: Stormwater Management Facility – Stage/Storage/Discharge Comparison



The pond outlet will comprise of three (3) ditch inlet structures per OPSD 702.050, each connected to a 600mm diameter outlet pipe at a slope of 0.50%, outleting to a linear dispersion trench located at the east side of the pond block at an elevation of 455.36m, above the river's 100-year storm flooding elevation of 455.13m. The linear dispersion trench will spread the flows over a wide area, preventing a point source discharge. Additional details for the linear dispersion trench are provided in **Section 5.6**.

Three (3) major overland flow weirs are proposed at an elevation of 457.00m, above the Grand River Regional flooding elevation of 456.84m. The intent of the three weirs is to provide an unrestricted outlet for the major flow events so that the peak flows from the development are discharged and routed along the Grand River prior to peak flows from upstream lands.

The flooding elevations for the Grand River have been provided by the Grand River Conservation Authority (GRCA) in Canadian Geodetic Vertical Datum 1928 (CGVD28) format.

Sediment Forebay Design

The proposed stormwater management facility has been designed with three (3) sediment forebays at the main pipe inlet locations. The sediment forebays are 1.0 m deep and have been designed per the Ministry of Environment Stormwater Management Planning and Design Manual guidelines. The full sediment forebay sizing information has been included in **Appendix D**.

Table No. 7 summarizes the required and provided parameters within the sediment forebay design.

		Forebay at Inlet 1	Forebay at Inlet 2	Forebay at Inlet 3
	Dispersion Length (m)	28.9	7.4	31.8
	Settling Length (m)	24.9	25.1	23
Required	Flow Velocity (m/s)	0.15	0.15	0.15
	Length to Width Ratio	2:1	2:1	2:1
	Settling Velocity (m/s)	0.0003	0.0003	0.0003
	Forebay Length (m)	34	33	38.5
Provided	Flow Velocity (m/s)	0.15	0.04	0.12
	Length to Width Ratio	3.1:1	3.1:1	2.7:1

Table No. 7: Sediment Forebay Design Details

Therefore, the sediment forebays have been designed to provide the required dispersion and flow lengths.



Sediment Loading and Cleanout Frequency

Table No. 8 illustrates sediment loading to the oil/grit separator systems and sediment forebays as well as the subsequent cleanout frequency required to maintain these systems. The oil/grit separator structures are designed to filter out large sediments before reaching the stormwater management facility. The oil/grit separators are proposed to be flushed out and cleaned on a yearly basis.

						T OICDUYS				
System Component	Treatment Train Component	Catchment Area	Imp. (%)	Annual Sediment Loading	TSS Removal	Annual TSS Reduction	Storage Volume	Cleanout Frequency		
	OGS (Stormceptor EFO8)	9.96 ha	50%	15.9m³ (based on	64%	10.1 m ³	8.8 m ³	~ 10 months		
Forebay at Pond Inlet 1	Forebay			1.6m ³ /ha)	80%	4.6 m ³	91 m ³			
	Forebay	2.60 ha	55%	4.9m ³ (based on 1.9m ³ /ha)	80%	4.0 m ³	(1/3 of forebay)	~ 10 years		
	(Scott St Pipe Outlet)					Total Inlet 1 = 8.6m ³				
Forebay at	OGS (Stormceptor EFO4)	2.76 ha	60%	60%	60%	6.1m³ (based	61%	3.7 m ³	1.2 m ³	~4 months
Pond Inlet 2	Forebay	2.70 Ha				on 2.2m³/ha)	80%	1.9 m ³	82 m ³ (1/3 of forebay)	~ 43 years
Forebay at	OGS (Stormceptor EFO8)	40.40 hz	700/	31.6m³ (based	60%	19.0 m ³	8.8 m ³	~6 months		
Pond Inlet 3	Forebay	10.19 ha	na 72%	on 3.1m³/ha)	80%	10.1 m ³	148 m ³ (1/3 of forebay)	~ 14 years		

Table No. 8: Sediment Loading and Cleanout Frequency – Sediment Forebays

Sediment loadings obtained from Table 6.3 of the MOE Stormwater Management Planning and Design Manual, 2003 and prorated based on catchment percent impervious.

The above noted Stormceptor storage volumes are manufacturer specified minimums. As part of the detail design stage, the Stormceptor sump can be increased to provide additional volume to accommodate the annual TSS reduction volume and require a cleanout frequency of one (1) year.



5.6 Stormwater Management Facility Outlet / Linear Dispersion Trench

The stormwater management facility outlet pipes will discharge to the proposed linear dispersion trench located at the east side of the pond between the existing woodlot and wetland.

The 15m long, 8m wide, 0.5m deep linear dispersion trench will spread the flows over a wide area, preventing a point source discharge and will be constructed flat to allow the trench to fill-up gradually then spill evenly over the sides. The flows spilling from the south side of the linear dispersion trench will be directed to the existing wetland by the natural topography while the remaining flows will follow the existing topography in the easterly direction to the Grand River.

Table 9 compares the routing results through the linear dispersion trench with the available stage/storage/ discharge capacities.

	Av	ailable Capa	acity	Actual Capacity Used			
Control	Peak Flow m³/s	Storage Volume m ³	Storage Elevation m	Peak Flow m³/s	Storage Volume m ³	Storage Elevation m	
Bottom of Trench	0	0	454.86				
Top of Trench / Weir	0	20	455.36				
25 mm Storm				0.060	20	455.36	
2 Year Storm				0.264	20	455.38	
5 Year Storm				1.235	20	455.43	
Regional Storm				2.458	21	455.48	
100 Year Storm				3.056	21	455.50	

Table 9: Linear Dispersion Trench – Stage/Storage/Discharge Comparison

The linear dispersion trench will act in a similar fashion to a weir. The north, south and east portions of the trench will all spill at the same elevation causing the flows to follow the natural topography to the existing wetland and Grand River.

Table 10 interpolates the flow distribution from the linear dispersion trench to the existing wetland and Grand River which is used in the MIDUSS Model. It is assumed that the linear dispersion trench is acting as a weir with three (3) sides, north, east and south. The north and east sides of the linear dispersion trench will outlet to the Grand River via the existing topography along the bank of the river while flows exiting the south side of the trench will follow the natural topography and will outlet to the existing wetland.

The total flow length along the three sides of the linear dispersion trench is 38m (15m north portion + 8m east portion + 15m south portion). Flows directed to the wetland are split on a 39.5% split from the total flow exiting the linear dispersion trench (15m / 38m).



Design Storm	Level (m)	Flow (m³/s)	Existing Wetland (m ³ /s)	Grand River (m³/s)	
2-Year	455.38	0.264	0.104	0.160	
5-Year	455.43	1.235	0.488	0.747	
100-Year	455.50	3.056	1.207	1.849	
Regional	455.48	2.458	0.971	1.487	

Table 10: Flow Diversion to the Grand River and Existing Wetland

The MIDUSS model was used to divert the flows to the Grand River and existing wetland based on the flow rates in Table 10 above. Table 11 below compares the pre and post development flow rates and volumes to the existing wetland.

Table 11: Comparison of Pre and Post-Development Flows and Volumes to the Existing Wetland

	2 Year		5 Year		100 Year		Regional Storm	
	Flow Rate (m ³ /s)	Volume (m ³)	Flow Rate (m ³ /s)	Volume (m ³)	Flow Rate (m ³ /s)	Volume (m ³)	Flow Rate (m³/s)	Volume (m ³)
Pre-Development	0.147	428	0.497	1,869	2.116	6,413	1.056	14,804
Post-Development	0.104	2,289	0.488	4,097	1.207	8,163	0.971	24,098

Therefore, during post-development conditions, the flow rates to the existing wetland are generally in close proximity to existing flows with the exception of the 100-year design storm event where the flow rate is almost reduced in half. The runoff volumes to the existing wetland are generally higher in post-development conditions.



5.7 Comparison to Pre-Development Flows

Table 12 summarizes the comparison of pre and post-development flows from the entire development.

	2 Year	5 Year	100 Year	Regional Storm
	Flow Rate (m ³ /s)			
Pre-Development	0.935	2.172	8.805	3.839
Post-Development	0.305	1.616	10.573	6.075

Table 12: Comparison of Pre and Post-Development Flows

The post-development peak flow rates are generally lower than the pre-development peak flow rates from the site under the minor storm events. For the major storm events, the post development peak flow rates exceed the pre-development peak flow rates as both the 100-year design storm event and Regional storm event will flow over the weir structures in the stormwater management facility.

The intent is to route flows to the Grand River as quickly as possible as discussed in the sections above in order to ensure that the peak flows from the development are discharged and routed along the Grand River prior to peak flows from upstream lands. However, the stormwater management facility does provide some natural attenuation under the minor storm events as the quality storm extended detention drawdown time requirement of 24 hours limits the ability to quickly discharge minor storm events.



6.0 SEDIMENT AND EROSION CONTROL PLAN

Primary sediment control will be achieved with the installation of Type 2 sediment fence around the property boundary. The silt fence will eliminate the opportunity for water borne sediments to be transported from the site.

Temporary rock check dams will be installed in rear and side yard swales after the initial grading has been completed to slow the flow rates and promote the settlement of water borne sediments before they reach the silt fences and ponds.

Upon completion of the grading, any area not subject to active construction within 30 days will be topsoiled and seeded as per OPSS 572.

The stormwater management facility will be graded and shaped at the start of any construction or pregrading activity. A silt fence will be placed around the outlet structures to restrict the movement of sediment.

Once catch basins have been installed, the grates will be wrapped in filter cloth. This will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing and the sediment pond will start after installation is complete. These features will be inspected on a weekly basis or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the facility found to need repair.

Monthly reports on the condition of the sediment and erosion control measures will be submitted to the Town of Grand Valley and the Grand River Conservation Authority.

Once construction has been substantially completed, the silt fence will be removed from within the pond, any accumulated sediment will be removed and the landscaping and planting of the ponds will be completed.

After construction of the complete development, erosion will not occur and sediment transport will be minimal. The stormwater management facility will provide all sediment removal.



7.0 CONCLUSIONS

In summary, the features of the design for the proposed development are as follows:

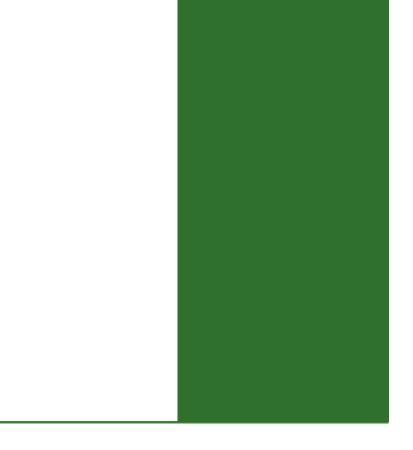
- 1. Gravity sanitary sewer for the River's Edge Subdivision will be provided by connecting to the existing municipal sanitary sewer on Bielby Street. It is noted that some improvements could be required downstream of the subject lands to support the ultimate Town buildout as discussed in Section 4.4 of this report.
- 2. Water servicing will be provided by connection to the existing municipal watermains on Bielby Street, Luther Road and proposed watermain extension on Highway 25. It is noted that some improvements could be required to the Town's water storage and supply system as discussed in Section 4.3 of this report.
- 3. Storm sewers will be sized at the detail design stage to convey the 5-year design storm event to the proposed stormwater management facility. It is noted that storm sewers on collector roads, i.e. Bielby Street will be required to convey the 10-year design storm event as per Town of Grand Valley Engineering Standards. Major overland flows will be directed towards the municipal right of ways to the proposed stormwater management facility.
- 4. The proposed stormwater management facility is designed to function as a wetland with 0.3m deep permanent pool and forebays to provide an Enhanced level of quality control (80% Total Suspended Solid removal).
- 5. Stormwater quality pre-treatment will be provided by oil/grit separators located upstream of the stormwater management facility.
- 6. Due to proximity to the Grand River, quantity control targets are not required for the proposed stormwater management facility. However, the facility does provide natural attenuation of runoff prior to outleting to the Grand River.
- 7. The proposed development will continue to discharge flows to the existing wetland located at the south easterly portion of the site. Under post-development conditions, the flow rates to the existing wetland are generally reduced while the runoff volumes are generally increased from predevelopment conditions.
- 8. Flows discharged from the proposed stormwater management facility will be routed through a linear dispersion trench to spread the flows over a wide area, avoiding a point source discharge.
- 9. The stormwater management systems meet the current Provincial and Municipal guidelines.
- 10. The principles of "Stormwater Management Practices", the Ministry of Environment Stormwater Management Planning and Design Manual 2003 have been used in the design of the stormwater management system.

All of which is respectfully submitted.

GM Blue Plan Engineering LIMITED Per:

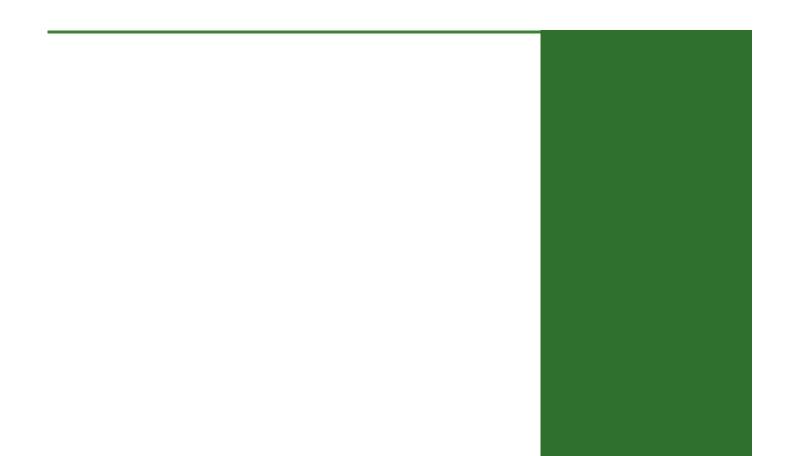
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APPENDIX A

Geotechnical Investigation, Peto MacCallum Ltd., 2009 Geotechnical Slope Assessment, Peto MacCallum Ltd., 2012 Geotechnical Investigation, JLP Services Inc., 2022





GEOTECHNICAL INVESTIGATION FIFE ROAD SUBDIVISION FIFE ROAD GRAND VALLEY, ONTARIO for

GAMSBY AND MANNEROW LIMITED

PETO MacCALLUM LTD. 16 FRANKLIN STREET SOUTH KITCHENER, ONTARIO N2C 1R4 PHONE: (519) 893-7500 FAX: (519) 893-0654 EMAIL: kitchener@petomaccallum.com

Distribution: 4 cc: Gamsby and Mannerow Limited 1 cc: PML Kitchener 1 cc: PML Toronto

PML Ref.: 09KF021 Report: 1 June 3, 2009



June 3, 2009

PML Ref.: 09KF021 Report: 1

Ms. Sarah Austin, P.Eng. Gamsby and Mannerow Limited 255 Woodlawn Road West Suite 210 Guelph, Ontario N1H 8J1

Dear Ms. Austin

Geotechnical Investigation Fife Road Subdivision Fife Road Grand Valley, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the findings of the geotechnical investigation recently completed for the above noted site. Authorization was received from Mr. Paul McLennan, P. Eng of Gamsby and Mannerow Limited, in a signed Engineering Services Agreement (ESA), dated April 1, 2009.

The project involves a planned 115 lot residential subdivision, located near the existing Fife Road Subdivision, in Grand Valley, Ontario. The development will include storm water management facilities at the northwest and southeast corners of the site. Once the design is finalized, PML should be retained to check that the recommendations in this report remain applicable.

The purpose of the geotechnical investigation was to explore the subsurface soil and groundwater conditions at the site. Based on the findings, geotechnical design and construction recommendations were to be provided. Specific considerations to be addressed included:

- Site preparation, including stripping, cut and fill grading, and requirements for placement of engineered fill
- · Foundations, including bearing capacity and settlement estimates
- Excavating conditions, including safe side slopes, and groundwater control requirements



- Bedding and backfilling, including reusability of site materials
- · Structural pavement designs
- Hydraulic conductivity estimates for storm water management retention ponds

An environmental assessment of the site was not included within the terms of reference for this assignment.

Investigation Procedure

The field work for the investigation was carried out on April 16 and 17, 2009, and consisted of nine conventional sampled boreholes at locations shown on the appended Borehole Location Plan, Drawing 1. The boreholes were advanced to depths of between 2.30 and 14.00 m below grade. Boreholes 3, 4 and 9 included 50 mm observation well installations for follow-up groundwater level monitoring.

The boreholes were advanced using a Dietrich-50, track mounted drillrig equipped with continuous flight solid stem and hollow stem augers, supplied and operated by a specialist drilling contractor.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests were carried out during sampling operations using conventional split spoon equipment. Groundwater observations were made in the boreholes and observation wells during and upon completion drilling.

The field work was supervised throughout by a member of our engineering staff who directed the drilling and sampling operation, prepared stratigraphic logs, monitored groundwater conditions, and processed the recovered samples.



The borehole locations and ground surface elevations were surveyed by Gamsby and Mannerow Limited, and provided on a site grading plan.

All samples secured in the field were returned to our laboratory for detailed visual examination to confirm field soil classifications. The laboratory testing program included moisture content determinations on all recovered samples together with three particle size distribution analysis carried out on soil samples encountered in the area of the storm water management pond.

It should be noted that decommissioning of the monitoring wells as required under O.Reg 903 was not included within PML's terms of reference for this assignment and future decommissioning will be required.

Summarized Site and Subsurface Conditions

The site consisted primarily of vacant land, with agricultural land comprising the northern portion of the site. A former gravel pit was located near the southern portion of the site, but was no longer in operation. The site is hilly with a total relief of approximately 25 m from a plateau near Fife Road to the low point, above a slope to the Grand River near the southern portion of the site. From the grading plan, it appears that many lots will contain units with walkout basements.

Reference is made to the appended Log of Borehole sheets for details of the drilling work including soil descriptions, inferred stratigraphy, standard penetration N values, groundwater observations during and upon completion of drilling, and natural moisture content determination test results.

In general, the subsurface stratigraphy contacted at the site comprised surficial topsoil overlying mixed till, sand and gravelly sand deposits.



The boreholes typically encountered between 600 and 800 mm of surficial topsoil. No topsoil was penetrated in Borehole 8 and in Boreholes 6 and 9, 200 and 100 mm of topsoil were encountered respectively. The surficial topsoil was typically about plastic limit (APL) and was typically described as firm to hard clayey silt with rootlets and occasional cobbles. Surficial boulders were also present around Boreholes 6, 7 and 9.

Mixed deposits of tills, sand and gravelly sand were underlying the surficial topsoil.

Clayey silt till was contacted immediately below the surficial topsoil in Boreholes 1 through 7 and was described as firm to stiff with standard penetration N values between 7 and 77 for 150 mm of penetration. Occasional to numerous cobbles and boulders were contacted in the till layer. Isolated seams of sand and gravelly sand were contained within the till deposit at various depths, which exhibited groundwater seepage in Boreholes 1, 3 and 4. The upper till layer extended to between 3.05 and 6.30 m below grade in Boreholes 1 through 7; extending to the borehole termination depth in Boreholes 2, 3 and 7. In Borehole 5, the clayey silt till was overlying a silt till layer and a second layer of clayey silt to a depth of 9.45 m below grade. Deeper till deposits were also encountered in Boreholes 1, 4 and 9; typically consisting of hard brown or grey clayey silt.

Reference is made to Figure 1, attached, for a particle size distribution chart for the clayey silt till encountered in Borehole 3.

Various sand and gravel, gravelly sand and sand deposits were encountered in Boreholes 1, 4, 5, 6, 8 and 9. These layers were described as saturated in Boreholes 1, 4, 5 and 9. Borehole 8 was terminated in a sand layer at a depth of 2.30 m below grade, due to auger refusal on boulders.

Particle size distribution charts for the medium sand, and the sand and gravel deposits encountered in Borehole 9 are presented in Figures 2 and 3 respectively.

Groundwater observations carried out during and upon completion of drilling and in observation wells installed in Boreholes 3, 4 and 9 are summarized on the appended Log of Borehole Sheets.



Groundwater seepage was encountered in Boreholes 1 and 4 in sand seams confined in the till deposits at 1.5 m below grade in both boreholes. The seepage in these boreholes was likely attributable to perched water conditions. The groundwater table was penetrated in Boreholes 1, 3, 4 and 9. Groundwater was encountered at various depths in the boreholes, between elevation 453.80 and 477.85 (metric, geodetic).

Initial water level readings were taken in the observations wells installed in Boreholes 4 and 9 and were at elevation 472.20 and 454.23 respectively. The observation well installed at Borehole 3 was dry at the time of the initial reading.

It should be noted that groundwater levels, particularly perched groundwater levels, can vary significantly in response to seasonal weather conditions and weather events.

Discussion and Recommendations

The project involves a planned 115 lot residential subdivision located near the existing Fife Road Subdivision. The development will include storm water management ponds at the northwest and southeast corners of the site. The storm water management ponds are expected to be detention type facilities. It is understood that the proposed development will generally involve site grading, servicing, road construction and building construction.

Site Grading

The site is hilly with a total relief of approximately 25 m across the site. The site plateaus north of the existing Fife Road at an elevation of approximately 481.0 (metric, geodetic) and gradually falls off to the north, to an elevation of about 469.0 at the top of a steep embankment slope to the Grand River. From the plateau, the site grade falls steeply to an elevation of about 455.0 toward the east and southeast of the site; the grades through this portion of the site are variable, and are hillier than to the north or northwest. A former gravel pit was located near the southeast portion of the site. The Grand River is situated along the eastern portion of the site, running from northwest to southeast.



The site grading plan shows that significant cuts and fills will be required prior to construction. Grade cuts will be necessary to the east and north of the existing Fife Road (around Boreholes 1, 4 and 5). The grade cuts will typically be between 1.0 and 2.0 m with as much as 4.0 m east of Borehole 4, and east of Borehole 1. The northern portion of the site (Boreholes 2 and 3) will typically require around 0.5 to 1.5 m of fill and as much as 2.0 to 3.0 m near the top of the slope to the Grand River. The south and southeastern portion of the site will also require fill (Boreholes 6 through 9). The area around Borehole 6 and 7 typically require less than 1.0 m of fill, however between 3.0 and 5.0 m of fill is needed around Borehole 8. Approximately 5.0 m of fill is typically expected for the area around Borehole 9, with a range between 2.0 and 7.0 m.

Removal of all surficial topsoil will be required prior to the grading operations. Surficial topsoil thicknesses across the site typically ranged between 100 and 800 mm. No topsoil was present at Borehole 8, and topsoil was sporadic around Borehole 9. In calculating the approximate quantity of topsoil to be stripped, we recommend that the topsoil thickness shown on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below.

Engineered fill material used to raise grades should comprise approved inorganic material placed in maximum 300 mm thick lifts and compacted to at least 98% standard Proctor maximum dry density (SPMDD) below footings, and 95% SPMDD below floors and pavements. Further, generic recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

It is anticipated that excess materials generated from grade cuts will primarily comprise clayey silt, and silt materials which are highly susceptible to moisture content variations and not well suited for engineered fill construction. Compaction difficulties due to elevated moisture levels are expected. It is anticipated that the site material will not be suitable for compaction to 98% SPMDD. Select portions of the material may be used where compaction to 95% SPMDD is specified providing excessively wet soils are discarded (i.e material described as WTPL or wet / saturated on the borehole logs).



Settlement of on site soils due to the surcharge of additional properly compacted site grading fills is not expected to be of concern.

Building Construction

Based on the investigation findings, the native inorganic soils are suitable to support the proposed buildings on conventional footings. For preliminary design purposes, footings founded at least 0.50 m into the native deposits may be designed using the recommended values for factored resistance at ultimate limit state (ULS) and serviceability limit state (SLS) of 225 and 150 kPa, respectively.

Where grades are raised, the footings may be supported on engineered structural fill, placed in accordance with the generic recommendations for engineered fill construction provided in Appendix A. For engineered fill supporting footing loads, compaction to a minimum 98% of the materials SPMDD, should be specified, as per recommendations outlined in the preceding 'Site Grading' section of this report and in Appendix A.

Footings supported on the structural fill may then be designed using the recommended values for factored resistance at ULS and SLS of 225 and 150 kPa, respectively.

Full time inspection of the structural fill placement by PML personnel is recommended to approve fill materials and to verify that the specified compaction levels are being achieved.

Total settlements of footings founded on the approved engineered fill or native overburden deposits, designed as outlined above are not expected to exceed 25 mm, with differential settlements between footings being no more than 50% of this value.

All exterior footings should be provided with a minimum 1.2 m of earth cover or the thermal insulation equivalent to provide adequate insulation against potential frost damage. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.



Prior to concrete placement, all founding surfaces should be examined by PML personnel to verify the competency of the founding surfaces.

It is anticipated that the floor slabs for the proposed structures will be founded on approved structural fill or on the competent overburden deposits and conventional slab-on-grade construction is feasible. We recommend a minimum 150 mm cushion of well compacted Granular A be provided directly beneath the slab to provide uniform support. For conventional slabs, a polyethylene vapour barrier should be installed directly beneath the slab if moisture sensitive floor finishes are planned.

Following removal of any loose organic material and deleterious fill, the exposed floor slab subgrade must be proofrolled with a heavy compactor to achieve 98% SPMDD. Any additional soft areas encountered in the proofrolling process should be subexcavated and backfilled with approved granular material, compacted to 98% SPMDD.

Foundation drainage measures should be taken for units with basements. For discussion purposes, it is assumed that foundations for the proposed buildings will extend to depths of up to 2.0 m below final lot grades. Perforated drainage pipe should be laid around the outside edge of the footings, and connected to a frost free sump system. It is recommended that the drainage pipes be surrounded with a granular filter protected with filter fabric, or alternatively wrapped with filter cloth and surrounded by concrete sand.

A "free draining" granular material or an equivalent, approved drainage board product must be provided for the basement walls, in accordance with the Ontario Building Code. The onsite silty soils are not suitable for use as basement wall backfill unless a drainage board product is provided. The gravelly sand and sand and gravel materials encountered in several locations would be suitable for basement wall backfill. Backfilling should not take place until the ground floor has been constructed, in order to provide lateral support for the wall.



Excavation and Backfilling

Excavation for footings and service trenches will extend through a combination of surficial topsoil, clayey silt till and cohesionless soils. Seepage into the footing excavations should be expected due to perched groundwater within cohesionless soil layers, although this should be manageable by conventional sump pumping.

These soils are classified as Type 3 materials as defined in the Occupational Health and Safety Act (OHSA). Subject to inspection and providing adequate groundwater control is achieved, excavations within Type 3 soils that are to be entered by workers should be inclined from the base of the excavation at one horizontal to one vertical (1H:1V) or flatter.

No bearing problems are anticipated for pipes founded in the native mineral soils encountered at the site. On stable subgrade, a minimum 150 mm thick bedding course of Granular A material compacted to 95% SPMDD is recommended beneath the pipes. The Granular A material should extend around the pipe to at least 300 mm above the pipe obvert or as set out by Ontario Provincial Standards (OPS), or the local authority. Material that is too wet for compaction to a minimum of 95% SPMDD should be allocated for use in landscaped/non settlement sensitive locations, and compacted to at least 90% SPMDD.

Foundation backfill and backfill below pavements, floor slabs (interior backfill) and other settlement sensitive features, should be similarly compacted to 95% SPMDD. It should be noted that the clayey silt till and silt till site materials are frost susceptible and should not be used at locations where frost heave movement could have adverse effects such as at exterior doors and the like. In addition, it should be noted that the clayey silt till material will tend to retain a voided structure when placed as fill. It will be particularly important to ensure that sufficient compaction is applied to breakdown all lumps/clods within the fill matrix to achieve a non-voided condition. Significant post-construction settlement could otherwise result. It is anticipated that suitable site material may not be available in sufficient quantities for use as interior foundation backfill, particularly during wet weather construction periods. Imported sand and gravel will likely be required for this purpose.



For walk-out style houses, exterior grades should be maintained at least 150 mm below the finished lower floor slab level and sloped to promote drainage away from the building.

Pavement Design

Based on the proposed pavement usage, frost susceptibility, and strength of the expected subgrade soils, the following pavement component thicknesses are considered suitable for local residential and minor collector traffic categories.

PAVEMENT COMPONENT	THICKNESS (mm)
HL 3 Surface Course	40
HL 4 Binder Course	40
Granular A Base	150
Granular B Subbase	350

The flexible pavement designs provided above consider that construction will be carried out during the drier time of the year and the subgrade is stable, as determined by proofrolling inspected by PML personnel. If the subgrade is wet and unstable, additional granular subbase will be required.

The pavement materials should conform to current OPS specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and compacted to a minimum of 100% SPMDD, and asphaltic concrete should be placed and compacted to between 92% and 96.5% of the material's maximum relative density (MRD). Reference is made to OPS Specification 310, revised April 2008.



During construction, testing should be conducted to confirm the gradation and compactibility characteristics of the granular base and subbase materials and the mix design properties of the asphaltic concrete.

Proofrolling procedures and the placement and compaction of all the fill and granular materials and asphaltic concrete for the pavement construction and backfilling at the site should be inspected on a continuous basis by PML technicians.

Since relatively impermeable clayey silt till material will be present at shallow depth beneath the pavement structure in several areas, pavement subdrains should be provided to prevent water accumulation on the pavement subgrade surface. The subgrade should be graded so that water is directed to the catch basin structures or to the pavement edge. Subdrains should be discharged in to the catch basins. The subdrains may consist of 3 m long stubs of filter wrapped, 100 mm diameter perforated plastic pipe, set within the subbase layer at the subgrade surface. At the pavement edge, suitable pavement drainage should be provided by means of subdrains or side ditches.

Storm Water Management

Two storm water management (SWM) ponds are depicted on the Gamsby and Mannerow Limited site grading plan. The ponds are located at Block 165, near the northwest corner (Borehole 3) and Block 166, near the southeast corner (Borehole 9) of the site. It is understood that the SWM ponds will be detention ponds.

Minor grade cuts and fills (typically less than 2.0 m) are planned for the Block 165 SWM pond. The site material in the area of this pond consists primarily of clayey silt till material of very low permeability; typically less than 1×10^{-6} cm/sec. Therefore, a detention pond in this area is considered feasible. Reference is made to Figure 1 attached, for a typical particle size distribution chart of the clayey silt till.

Large cut and fill operations will be required (up to 3.5 m) for the Block 166 SWM pond. Based on the information from Borehole 9 and the grading plan, the subgrade soil for this pond will likely be variable. In the cut areas, the subgrade soil will likely comprise sand and gravel materials of high permeability; typically greater than $5.0 \times 10^{-3} \text{ cm/sec}$. This material would not be considered suitable for a detention pond. It is therefore recommended that a minimum 1.0 m thick clay liner is constructed for the Block 166 SWM pond.

The liner may be constructed from excess clayey silt till material generated from cuts during site grading (near Boreholes 1, 4 and 5, and from the Block 165 SWM pond). The liner should be compacted to minimum 95% SPMDD during construction. In addition, it should be noted that the clayey silt till material will tend to retain a voided structure when placed as fill. It will be particularly important to ensure that sufficient compaction is applied to breakdown all lumps/clods within the fill matrix to achieve a non-voided condition. Significant post-construction settlement and leakage could otherwise result.

Both SWM ponds should be inspected by PML personnel during construction to verify the presence of clayey silt subgrade materials for the Block 165 SWM pond, and to inspect construction of the clay liner for the Block 166 SWM pond.

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We trust this report has been completed within our terms of reference, and is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

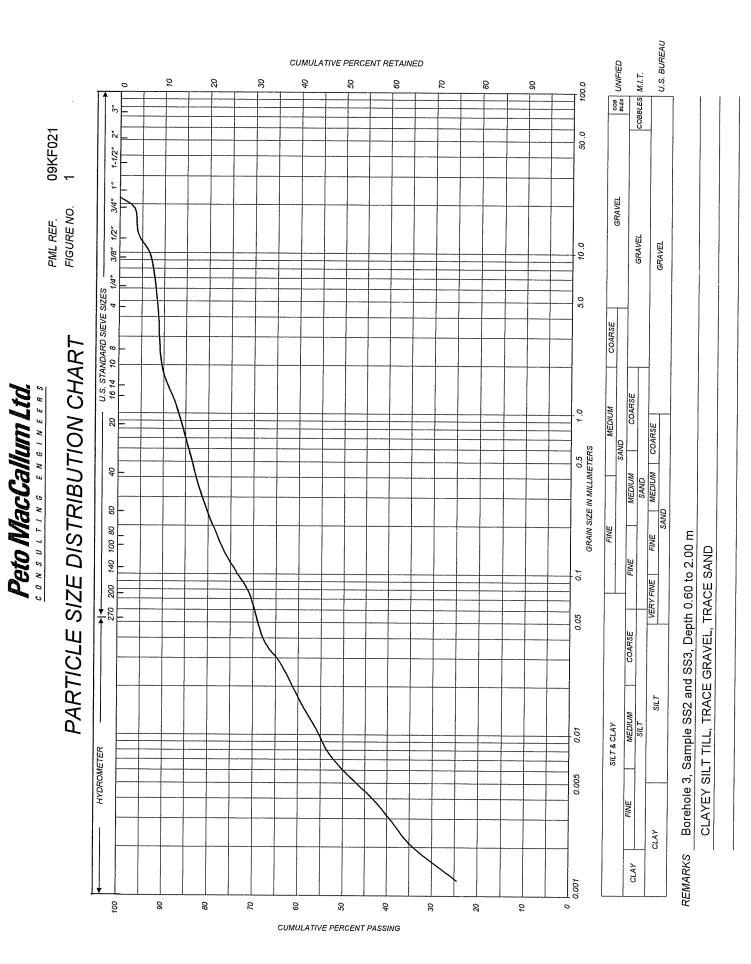
Ken Hanes, BASc Project Supervisor

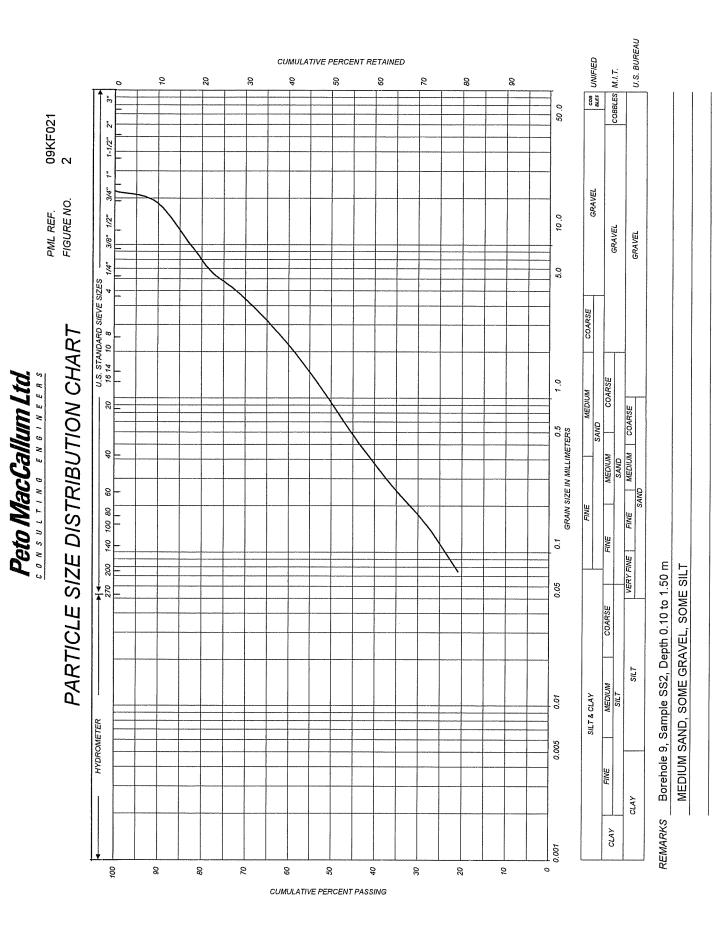


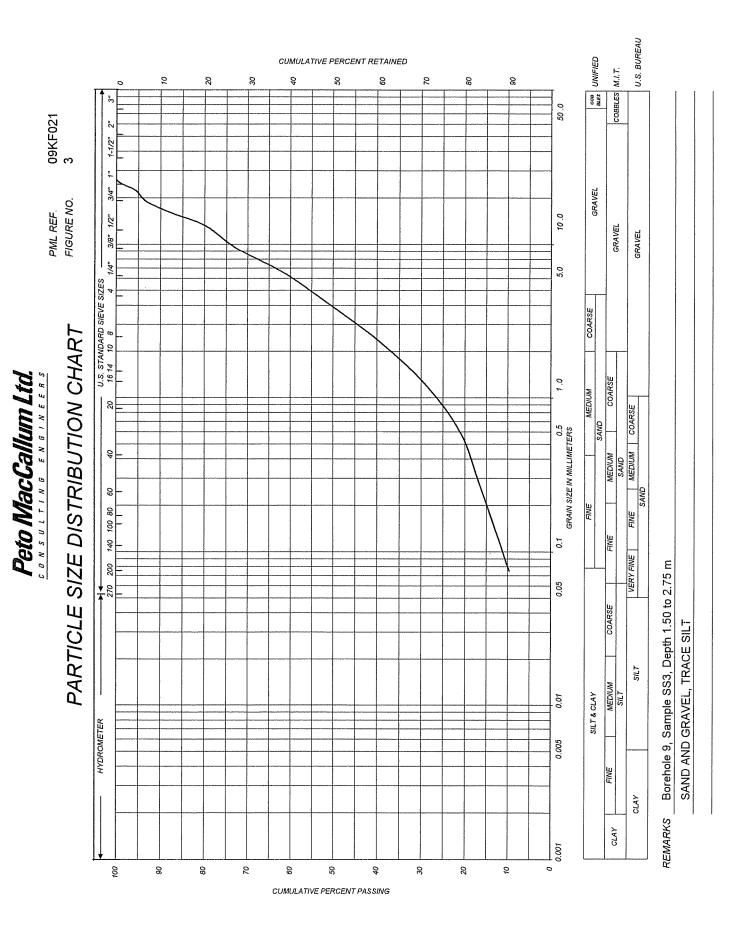
Marian S. Molodecki, P.Eng. Senior Consultant Geotechnical and Geoenvironmental Services

KH:sh

Enclosures: Figures 1-3 – Particle Size Distribution Analysis List of Abbreviations Log of Borehole 1 to 9 Drawing 1 - Borehole Location Plan Appendix A - Engineered Fill









PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

<u>CONSISTE</u>	<u>NCY N (blows/0.3 m)</u>	<u>c (kPa)</u>	DENSENESS	<u>N (blows/0.3 m)</u>
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		
WTPL	Wetter Than Plastic Limit			
APL	About Plastic Limit			
DTPL	Drier Than Plastic Limit			

TYPE OF SAMPLE

- SS Split Spoon
- WS Washed Sample
- SB Scraper Bucket Sample
- AS Auger Sample
- ΤW Thinwall Open
- TΡ **Thinwall Piston**
- OS **Oesterberg Sample**
- FS Chunk Sample
 - Foil Sample RC Rock Core
- ST Slotted Tube Sample
 - PH Sample Advanced Hydraulically
 - PM Sample Advanced Manually

SOIL TESTS

CS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	С	Consolidation
Qd	Drained Triaxial		

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0.60	TOPSOIL: Dark brown clayey silt, trace gravel, occasional cobbles, rootlets, APL/WTPL	~~~~ \$	479	1	AS											
1.50	CLAYEY SILT TILL: Firm to stiff		478	2	SS	7.							9			
2.30	numerous saturated gravelly sand seams		477	3	SS	16						/	Þ			Sampler wet from 1.5 m.
	becoming hard, DTPL	le/		4	SS	66				•		ø				
0 3.05	GRAVELLY SAND: Very dense brown	ЦĿ	476	5	SS	50 fo	100	nm								
	gravelly sand, saturated	00°	1			1										
	-	00	1													
4.55	CLAYEY SILT TILL: Hard grey clayey		475	6	SS	50.6-	50 n									
5.05	silt, trace gravel, DTPL BOREHOLE TERMINATED AT	μ£Λ.										0				Upon completion of drilling, borehole wet caved at 1 05 m.
NOTE	s															

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во	RING METHOD Continuous Flight Solid Ste	m Auge	ers		044404		0.15	- oro								HNICIAN K. Hanes
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BOI	RING METHOD Continuous Flight Solid Ste	m Auge	ers	т			1								HNICIAN R. Halles
DEPTH in METRES	SOIL PROFILE DESCRIPTION	LEGEND	EVATION		SAMPL HALL		1	MIC CO DARD P	00 1 NE PEN ENETRA	ETRATI		WATER W,	CLIMIT CONTEN W 	I	GROUND WATER OBSERVATIONS AND REMARKS
1	GROUND ELEVATION 471.02 TOPSOIL: Firm to stiff dark brown clayey silt, trace gravel, occasional cobbles, rootlets, APL CLAYEY SILT TILL: Very stiff to hard brown clayey silt, trace gravel, loccasional cobbles and boulders, APL/DTPL		469 469 468 466 466	1 2 3 4 5 6 6	SS SS SS SS SS	шгоумота 8 22 30 28 32 13		MIC CO DARD P BL	NE PEN ENETRA OWS/0	ETRATI ATION T 3M	ON X	WATER W, WATE 10	CONTEN W O R CONTE	rw l	OBSERVATIONS
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LOG OF BOREHOLE 09KF021 LOGS GPJ PETOMAC GDT 2009 06 02

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DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m	1 6	MIC CO. DARD P	00 1 NE PEN ENETRJ	50 20 ETRATIC ATION TE	N X	PLAS WATE Wp	ID LIMI TIC LIN ER CON V	AIT NTENT_ V	<i>₩</i> ,		GROUND WATER OBSERVATIONS AND REMARKS
MEIRES	GROUND ELEVATION 477.00		EL						OWS/0	.3M 50 BL)	11 11	·····			Л=	- 1.0 m Stick up will Plug and Steel Ca
0.60	TOPSOIL: Stiff dark brown clayey silt, trace sand, trace gravel, occasional cobbles, rootlets, APL	[~~~ FJ	476	1	SS	10							<i>°</i>			3 8	- Concrete
1.50	CLAYEY SILT TILL: Very stiff brown clayey silt, trace gravel, numerous (cobbles, occasional boulders, APL/			2	SS SS	16 40			•			0 0					 Groundwater seep at 1.5 m.
	becoming hard with occasional saturated medium sand seams	0	475														
3.05	becoming DTPL, no sand seams		474	4	SS	44			•		•	0					
			473														- 50 mm PVC stand
			472	5	SS	50 fo	100 1	nm			•						- Bentonite Seal
			471														
6.30	GRAVELLY SAND: Brown gravelly sand, numerous cobbles, occasional			6	SS AS	50 fo	100 1	nm			•	6					- Groundwater seet at 6.3 m.
7.00	boulders, saturated CLAYEY SILT TILL: Brownish grey clayey silt, trace gravel, occasional	FIL.	470														
	cobbles and boulders, APL	ŀ	469	8	AS												
		e	468														- Groundwater belo
9.50	SAND: Grey sand, some gravel, saturated		467														9.5 m. - Filter Sand
			400														
			466														•
			465														- Slotted Screen
			464														
14.00	BOREHOLE TERMINATED AT		463														
	14 00 m																<u>Level Reading:</u> 2009: 4 8 m

	CATION Fife Road, Grand Valley, Ontario RING METHOD Continuous Flight Solid Ster	m Auge	ers												TECH	INICIAN K. Hanes
	SOIL PROFILE	r			SAMPL				ENGTH		▲ 00		ID LIMI STIC LII		W W_p	
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0.60	TOPSOIL: Firm dark brown clayey silt, occasional cobbles, rootlets, APL		471	1	SS	7	1									
	CLAYEY SILT TILL: Firm to stiff clayey silt, trace gravel, occasional cobbles and boulders, APL		470	2	SS	10						e	R			
				3	SS	6							$\overline{)}$			
		6	469													
3.05	becoming hard, DTPL		468	4	SS	77			\vdash							
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4.55			467													
	SILT TILL: Very dense brown silt, trace fine sand, trace gravel,	D D		5	SS	50 fo	150 i	hm				0				
	occasional cobbles and boulders, damp	0	466													
6.10	some fine sand, some gravel	Þ	465	6	SS	50 fo	150	nm				0				
		0														
			464	7	SS	52										
		p	463			02						Ĭ				
8.60	CLAYEY SILT: Hard clayey silt, trace	°							$ \rangle$							
9.45	gravel, DTPL SAND: Very dense light brown fine	ľ.ľ.	462	8	SS	62					•					
10.10	sand, trace silt, damp		461													
	becoming websaturated		401	9	SS	50 fo	150 1	nm						>		
11_15_	BOREHOLE TERMINATED AT															Upon completion of drilling, borehole open with
	11.15 m															groundwater seepage below 10 1 m

				LO	G (OF E	3 <i>0</i> F	REH	OL	EN	0.	6					
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1.5 3.0 4.5 6.0	0.20 1.50 2.75 3.05 4.00	GROUND ELEVATION 467.13 TOPSOIL: Soft dark brown clayey silt, trace gravel, high organics, APL CLAYEY SILT TILL: Stiff clayey silt, trace gravel, numerous cobbles, occasional boulders, APL/WTPL becoming APL with occasional dry brown sand seams becoming very stiff with occasional wet gravelly sand seams becoming hard, DTPL SILT: Very dense brown silt, trace fine sand, moist to wet SAND: Very dense light brown fine sand, moist BOREHOLE TERMINATED AT 6.55 m		<u>466</u> 465 463 463 461		SS SS	3 12 8 17 44 50 fc	150	nm							0	Upon completion of drilling, borehole open with no free water.
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0.10	SILT TOPSOIL: Dark brown silt, trace gravel, occasional cobbles and		455	1	SS	50*						9				8	Plug and Steel Ca Concrete
	boulders, moist					1											- Bentonite Seal
	SAND: Dark brown medium sand, some gravel, some silt, numerous		454	2	SS	50*						•					- 50 mm PVC
1.50	cobbles, occasional boulders, damp	6.0.0		3	SS	50*											Standpipe
	SAND AND GRAVEL: Brown sand	• O°]									Í					
	and gravel, trace silt, numerous cobbles and boulders, saturated	0.0	453]										· * • *	- Filter Sand
2.75	CLAYEY SILT TILL: Hard brown	- Ka															Filler Sand
	clayey silt, trace gravel, occasional	III.	452	4	SS	37		•				ę					- Slotted Screen
	cobbles and boulders, APL	ſΨ														· H	Cloued Boreen
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	becoming grey, DTPL	Hel	451														
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Fife Road Subdivision PML Ref.: 09KF021, Report: 1 June 3, 2009



APPENDIX A

ENGINEERED FILL



The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. <u>Purpose</u>

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.



4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.



8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.



Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

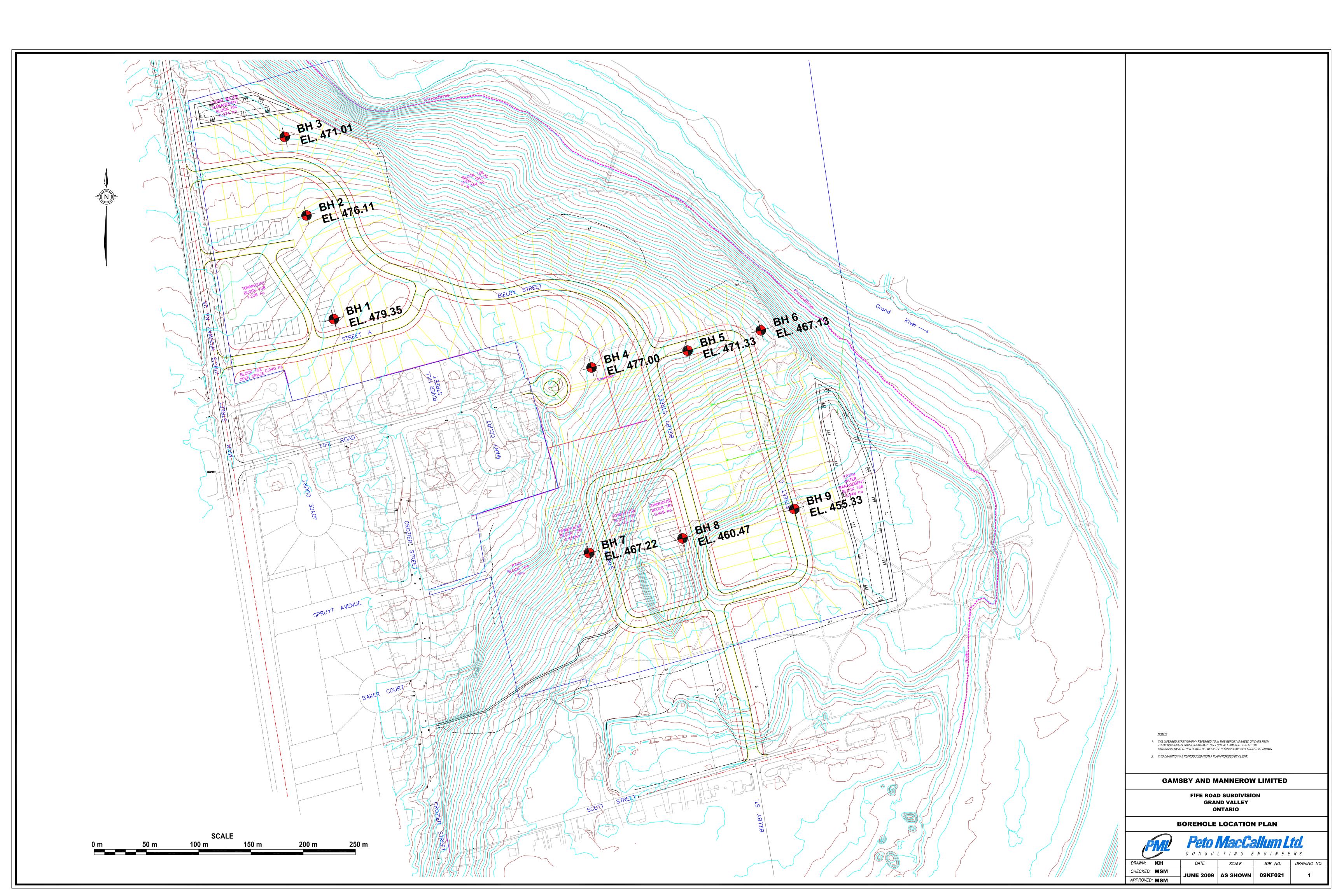
When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.





GEOTECHNICAL SLOPE ASSESSMENT FIFE ROAD SUBDIVISION GRAND VALLEY, ONTARIO

for GAMSBY AND MANNEROW LIMITED

PETO MacCALLUM LTD. 16 FRANKLIN STREET SOUTH KITCHENER, ONTARIO N2C 1R4 PHONE: (519) 893-7500 FAX: (519) 893-0654 EMAIL: kitchener@petomaccallum.com

Distribution: 4 cc: Gamsby and Mannerow Limited 1 cc: PML Kitchener 1 cc: PML Toronto

PML Ref.: 09KF021A Report: 1 February 9, 2012



February 9, 2012

PML Ref.: 09KF021A Report: 1

Mr. Grant Campbell, BASc, EIT Gamsby and Mannerow Limited 650 Woodlawn Road West Block C, Unit 2 Guelph, Ontario N1K 1B8

Dear Mr. Campbell

Geotechnical Slope Hazard Assessment Fife Road Subdivision <u>Grand Valley, Ontario</u>

We are pleased to present our report on the geotechnical site assessment recently carried out at the above referenced site. This work was authorized by Mr. Grant Campbell in an email received January 18, 2012.

The project involves a planned 115 lot residential subdivision extending to the north and east of the existing Fife Road Subdivision in Grand Valley, Ontario. Peto MacCallum Ltd. has completed a prior geotechnical investigation for the development, with the findings presented in our Geotechnical Investigation, PML Ref.: 09KF021, Report 1, dated June 3, 2009.

The lot layout has now been completed. The purpose of the slope hazard assessment was to determine the safe set-back distance for lots backing onto the west bank of the Grand River, in accordance with Grand Valley Conservation Authority (GRCA) published policy document titled "Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" dated November 30, 2007, made under O.Reg. 150/06 of the Conservation Authorities Act.



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<u>Methodology</u>

The scope of work for this assignment included the following:

- A review of lot plans and site topography as shown on Gamsby and Mannerow 'Preliminary Grading Plan, Drawings A and B', for Fife Subdivision, dated June, 2009;
- A review of the geotechnical report including Borehole 3 and 6 specifically, where there was some potential that the safe building setback could encroach close to or into the proximal lots as identified from the topographic contours;
- A site visit completed on January 21, 2012, to conduct a visual slope assessment at the two potential hazard locations; and
- A review of the local geology and historical aerial photography and topographic mapping over a 41 year time period, as tabulated below:

TABLE I

AERIAL PHOTOGRAPHS, TOPOGRAPHIC MAPS, GEOLOGIC MAPS

TIME PERIOD	SCALE	SOURCE
2000	1:10,000	GRCA Website
2010	1:10,000	GRCA Website
2. Geologic I	Vlaps	
1971	1:50,000	Ontario Division of Mines, Preliminary Map P. 848, 'Quaternary Geology of the Orangeville Area' published 1973.
3. Topograp	hic Maps	
1976	1:50,000	Department of Energy, Mine and Resources, Surveys and Mapping Branch, National Topographic System Map Index 40 P/16 'Orangeville' Edition 3
1980	1:50,000	Energy, Mine and Resources Canada, Surveys and Mapping Branch, National Topographic System Map Index 40 P/16



Findings and Observations

Site Description and Topography

The overall subdivision development, including the lot layout and site topography at 0.5 m contour intervals, is shown on the appended Hazard Limits drawing. PML has identified two locations adjacent to the west bank of the Grand River, where the slope hazard limit line could potentially encroach into or close to the proximal building lots. The site reconnaissance and detailed research for this assignment was focused on these two areas. Both locations feature riverbank slopes with local inclinations approaching two horizontal to one vertical (2H:1V), as based on the topographic contours and site observations.

The cross sectional geometry was calculated at the steepest section of each area as illustrated on the appended drawing.

At Area 1, located near Borehole 3, the average slope inclination is 2.3H:1V. The slope height from toe to crest is about 15 to 15.5 m. The toe of the slope at the river's edge exhibits evidence of slow, ongoing toe erosion as evidenced by a 0.5 to 1.0 m high cut standing at a near vertical inclination. The eroded face at the toe consists of silt till-like material with a dense mat of exposed tree roots. The slope itself is densely wooded with mixed hardwoods and stands of cedar. Numerous cedar of up 200 mm diameter were inclined at about 45° within the bottom 1 m of the tree trunk, gradually curving to a near vertical posture at a height of about 0.5 to 1.0 m above grade. The tree trunk curvature is indicative of ongoing solifluction movement of the slope surface.

Area 2 in the vicinity of Borehole 6 exhibits a 13 m high riverbank slope with an average toe to crest inclination of 3.9H:1V, and with a maximum inclination of 2.4H:1V near the top 4 m of the slope face. The toe of slope at the water's edge exhibited similar erosional features as Area 1, with an eroded face of up to 1.5 m in height. The overall slope face was fully wooded with cedar tree vegetation, with no overt evidence of solifluction movement.



There were no signs found of slope failure, active erosional gullies, springs or seepage in either area examined.

Subsurface Conditions

The soil stratigraphy in Borehole 3 (Area 1) comprises very stiff to hard clayey silt till to a depth of 4.05 m, underlain by stiff clayey silt till to the borehole termination depth of 5.05 m.

Borehole 6 near Area 2, disclosed stiff to hard clayey silt till to a depth of 4.00 m, underlain by very dense silt to a depth of 6.15 m, underlain by dense sand to the borehole termination at a depth of 6.55 m.

Groundwater was not contacted within the depth explored at either borehole.

The remaining boreholes within the subdivision disclosed similar high strength soils to a lowest explored elevation of 450.28.

The site geology shown on Ontario Division of Mines, Preliminary Map P. 848, 'Quaternary Geology of the Orangeville Area', indicates that the riverbank at both locations is comprised of silt till of the Georgian Bay Lobe.

A copy of each log for Boreholes 3 and 6 is appended for ease of reference.

Discussions and Recommendations

The angle of internal friction of the predominant clayey silt till deposit is estimated to be between 35 and 38°. The factor of safety against deep seated failure of the slope is estimated at 1.6 to 1.8.

The long term regression of these slopes will be dictated by solifluction movement being mobilized by ongoing erosion at the toe.



The riverbank slope at both locations is classified as a confined system with active toe erosion. The regulated development limit for this setting is established based on a toe erosion allowance, a stable slope angle, plus a 15 m allowance beyond the Erosion Hazard Limit. This is illustrated in the sketch below, excerpted from the GRCA policy document.

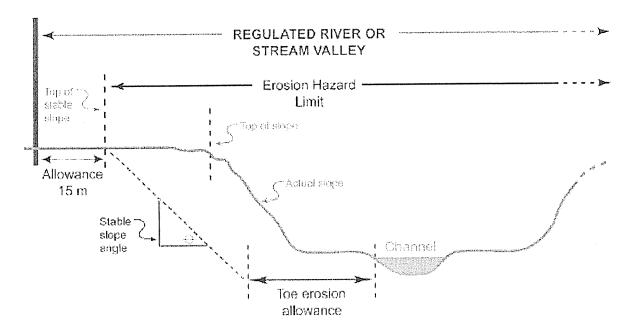


Figure 6. Riverine Erosion Hazard - Regulated Area for Apparent Oversteepened Valleys with Active Toe Erosion

Area 1 is located on the outside of a local meander loop, positioned about 70 m from the project path of a straight river alignment. Assuming that 70 m of movement has occurred over a 10,000 year time period since the recession of the Wisconsinan glaciation, an average erosion rate of 0.7 m per 100 years is inferred. The typical toe erosion allowance in dense, silt till subsoil setting is in the order of 1 m per 100 years. Although there was no erosion evident on the mapping and aerial photography researched, a Toe Erosion Allowance of 2 m per 100 years is estimated based on the observed scour at the toe and evidence of solifluction movement. The stable slope angle is conservatively estimated at 2.3H:1V, equivalent to the current average inclination at the steepest cross section in Area 1. For purposes of graphing the Hazard Limit line, the eroded toe of slope was taken as Elevation 454.0. The Hazard Limit thus established is illustrated on Drawing 1, appended.



Where a geotechnical study has been completed, Section 8.2.3 of the GRCA policy generally permits building construction to within the Erosion Hazard Allowance, providing the lots are set back a minimum of 6 m from the Hazard Limit. The permissible property line limit thus established for the lots is also illustrated on Drawing 1. Beyond the two areas studied in detail, the lot limit may be taken as 6 m from the crest of the slope, which is generally defined by the existing tree line.

It is noted that a storm water management pond will be located near the crest of the slope in Area 1. In accordance with Section 8.1.20 of the GRCA policy document, this will be permissible providing it is a dug pond and it does not encroach within the Hazard Limit. However, a portion of the perimeter fill berm along the north side of the pond encroaches beyond the Hazard Limit, which contravenes GRCA policy with regard to fill placement on slopes. The pond layout and grading plans will need to be revised accordingly.

Significant storm runoff discharged over the slope in unprotected channels will result in erosional problems. We therefore recommend that any storm discharge over the slope should generally be in controlled channels.

Along the crest of the existing slope, the existing ground surface should be maintained, as is, and vegetation cover should be maintained. During construction, fill and/or construction materials should be kept away from this area. As well, material should not be dumped over the crest of the slopes.

In addition, erosion control measures should be observed for the entire slope. Typically this would require maintenance of a healthy vegetation cover.

Geotechnical Slope Assessment PML Ref.: 09KF021A, Report: 1 February 9, 2012, Page 7



We trust this report has been completed within our terms of reference, and is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.



Marian S. Molodecki, P.Eng. Senior Consultant, Geotechnical and Geoenvironmental Services



Gerry Mitchell, MEng, P.Eng. Director Branch Manager

MSM:sh

Enclosures: List of Abbreviations Log of Boreholes 3 and 6 from 09KF021 Drawing 1 – Hazard Limits



PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. - Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTE	NCY N (blows/0.3 m)	<u>c (kPa)</u>	DENSENESS	<u>N (blows/0.3 m)</u>
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		
WTPL	Wetter Than Plastic Limit			
APL	About Plastic Limit			
DTPL	Drier Than Plastic Limit			

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample	USS	Undisturbed Shear Strength
PH	Sample Advanced Hydraulically	RSS	Remoulded Shear Strength
PM	Sample Advanced Manually		

SOIL TESTS

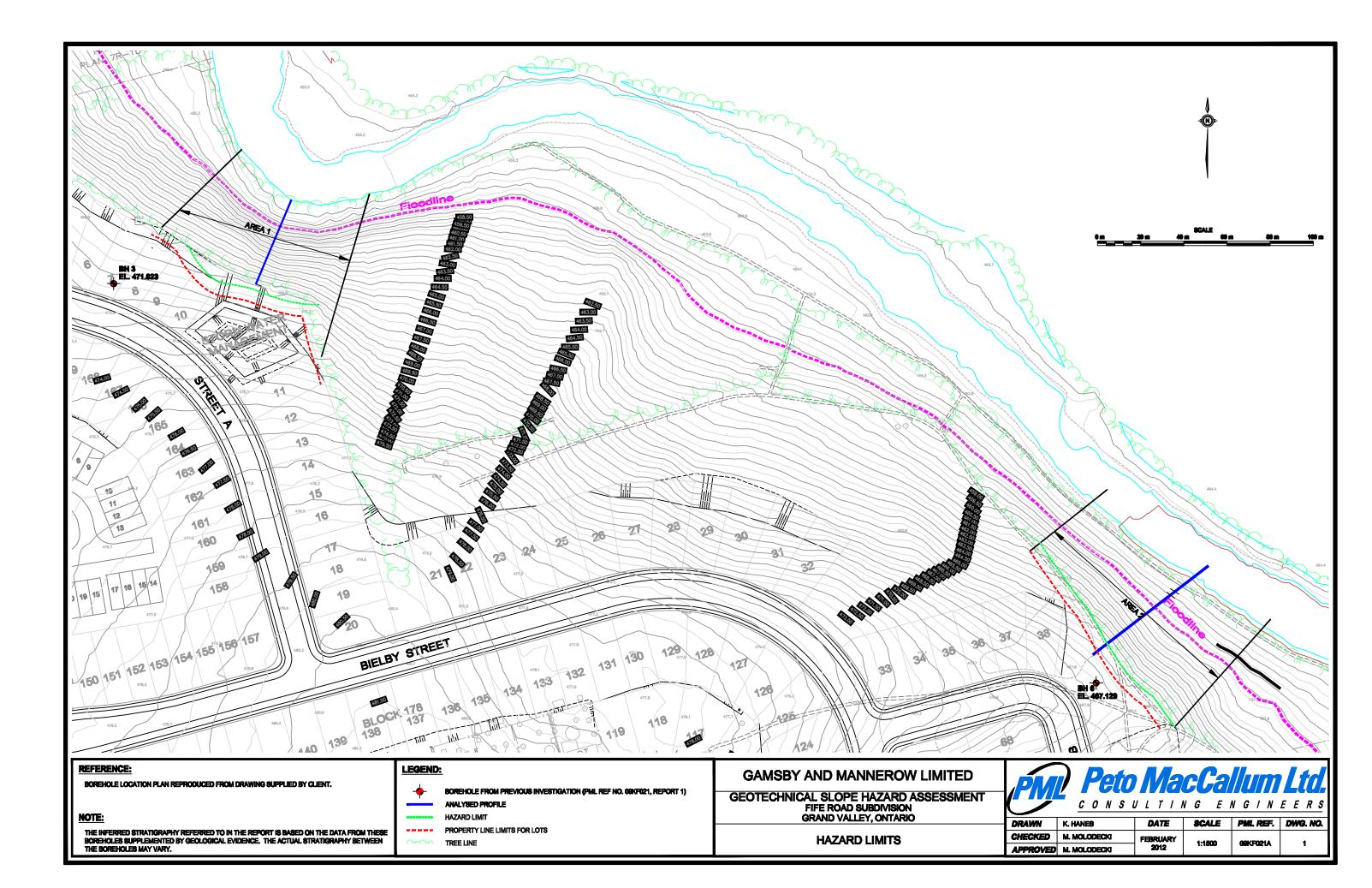
Qu	Unconfined Compression	LV	Laboratory Vane
0	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	С	Consolidation
Qd	Drained Triaxial		



LOG OF BOREHOLE NO. 3																											
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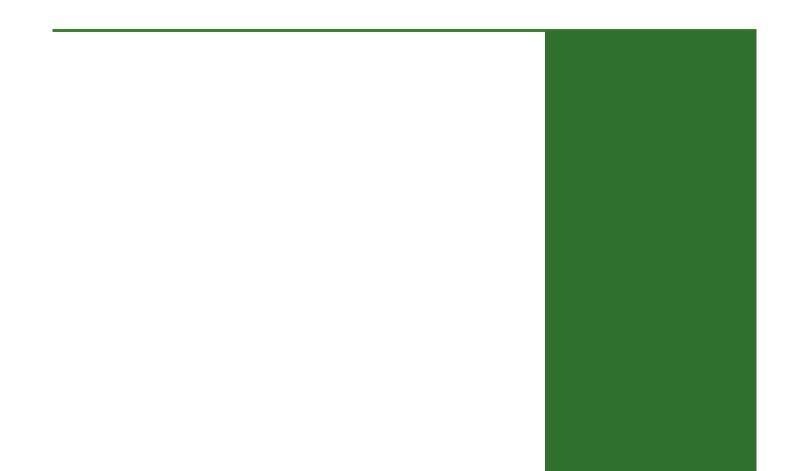
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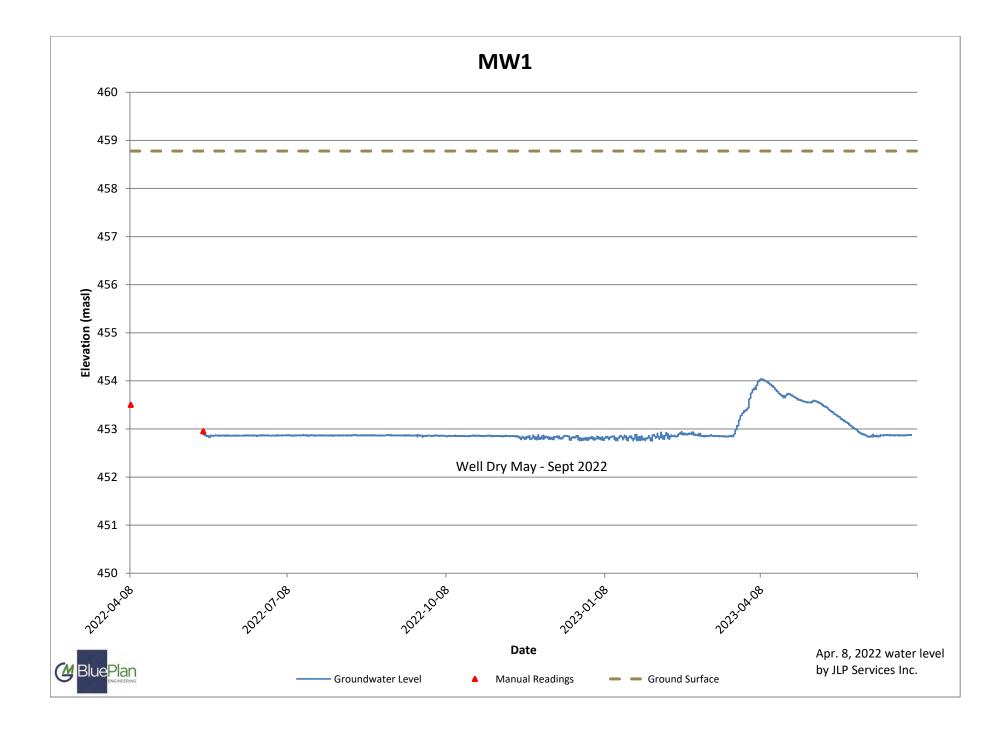


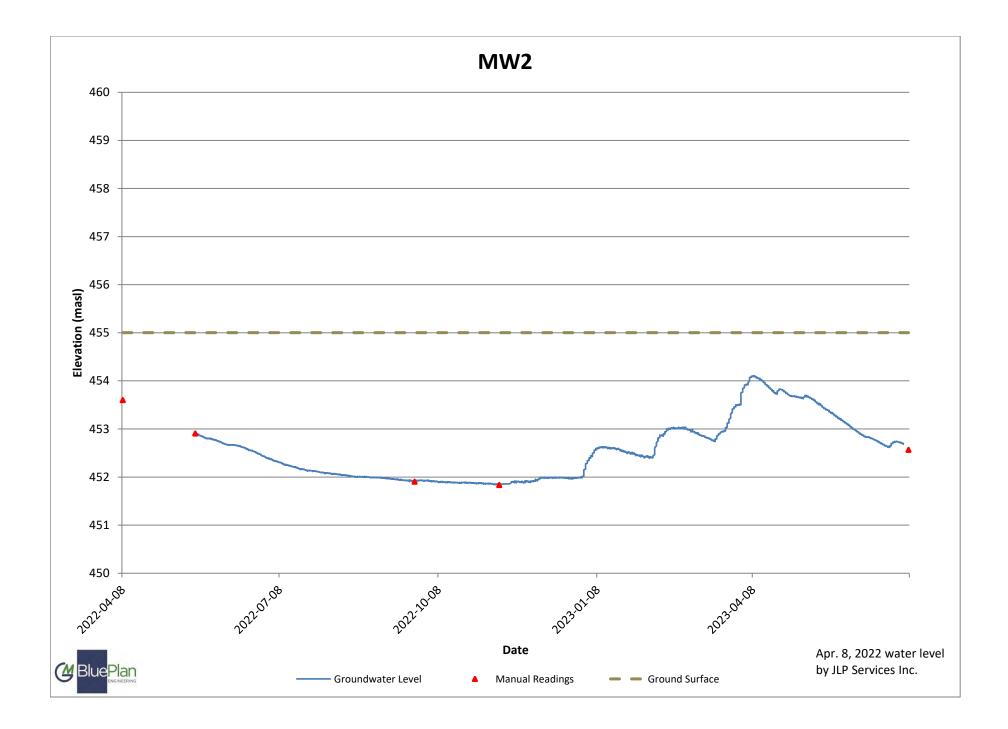


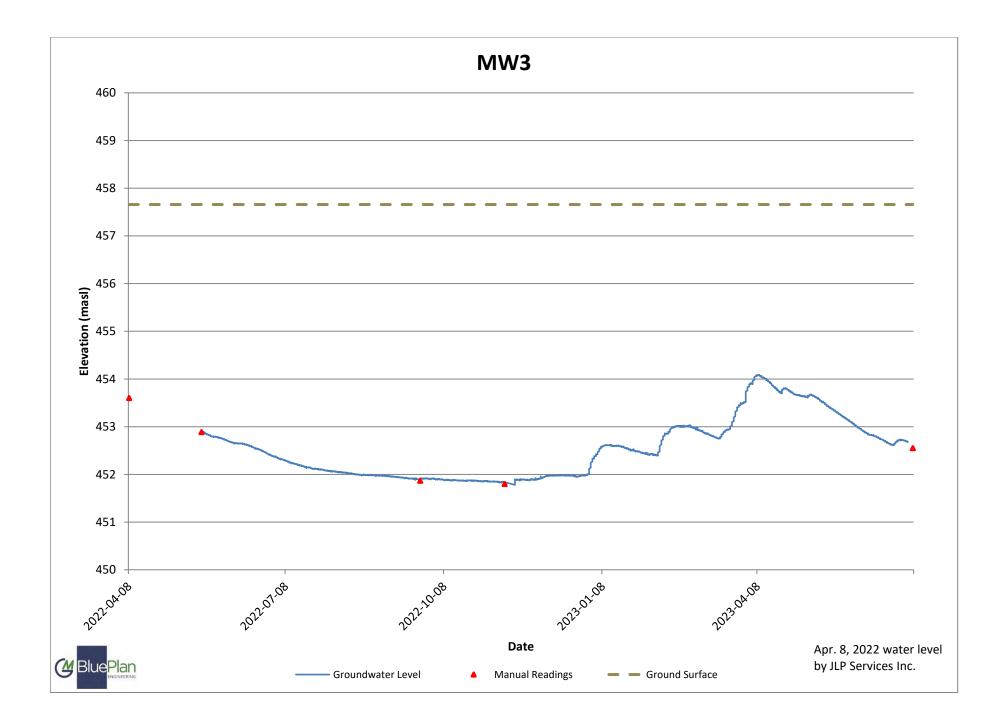
APPENDIX B

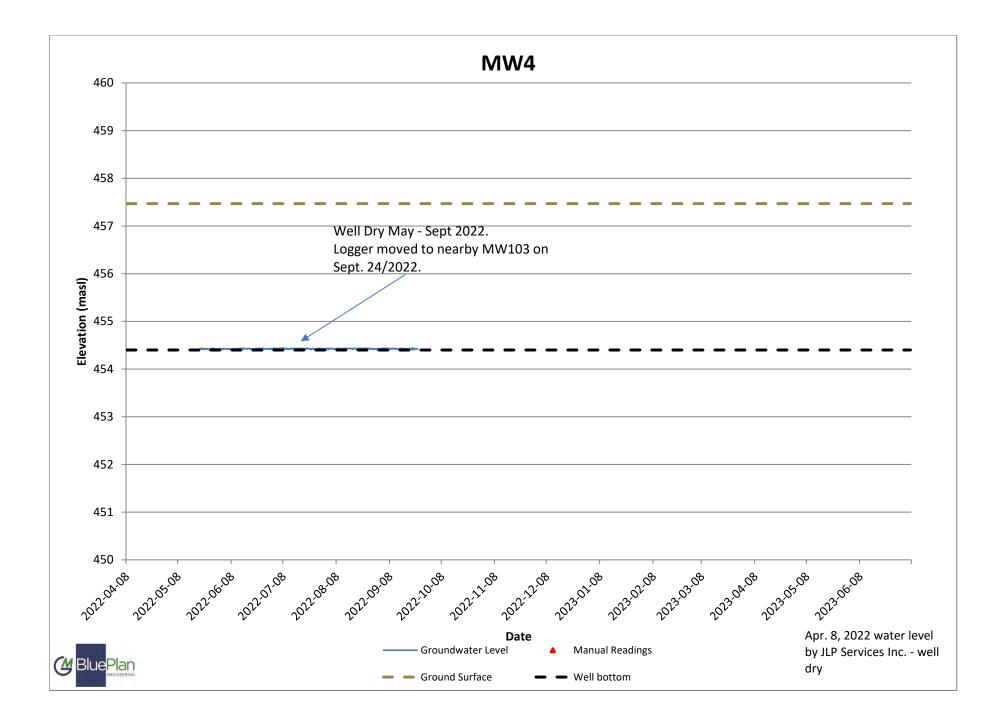
Groundwater Measurements by GM BluePlan Engineering Limited

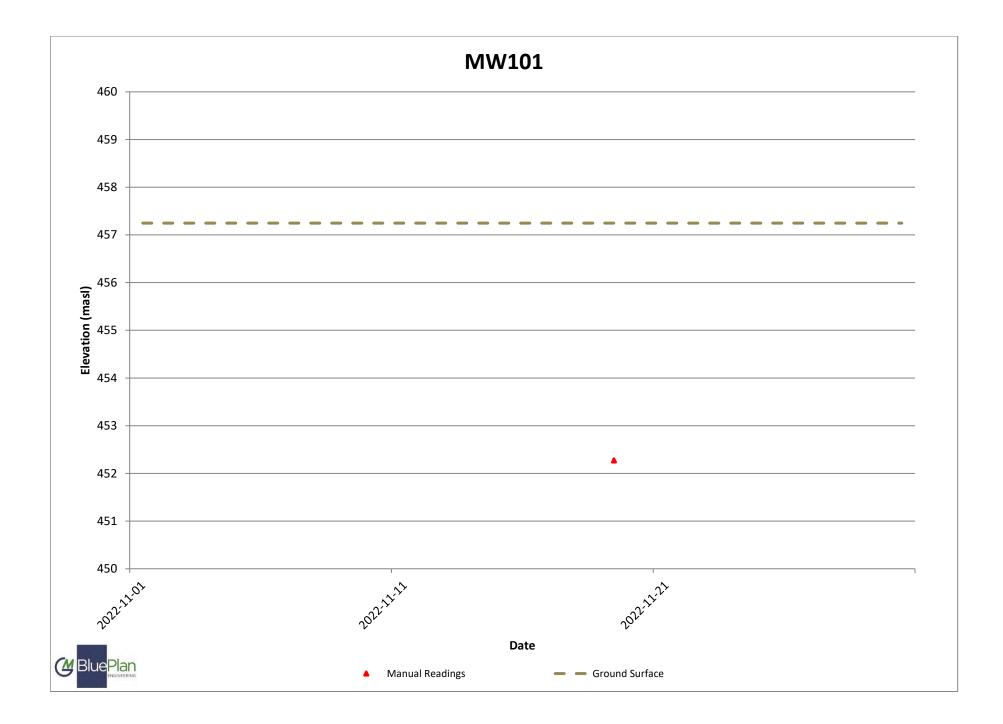


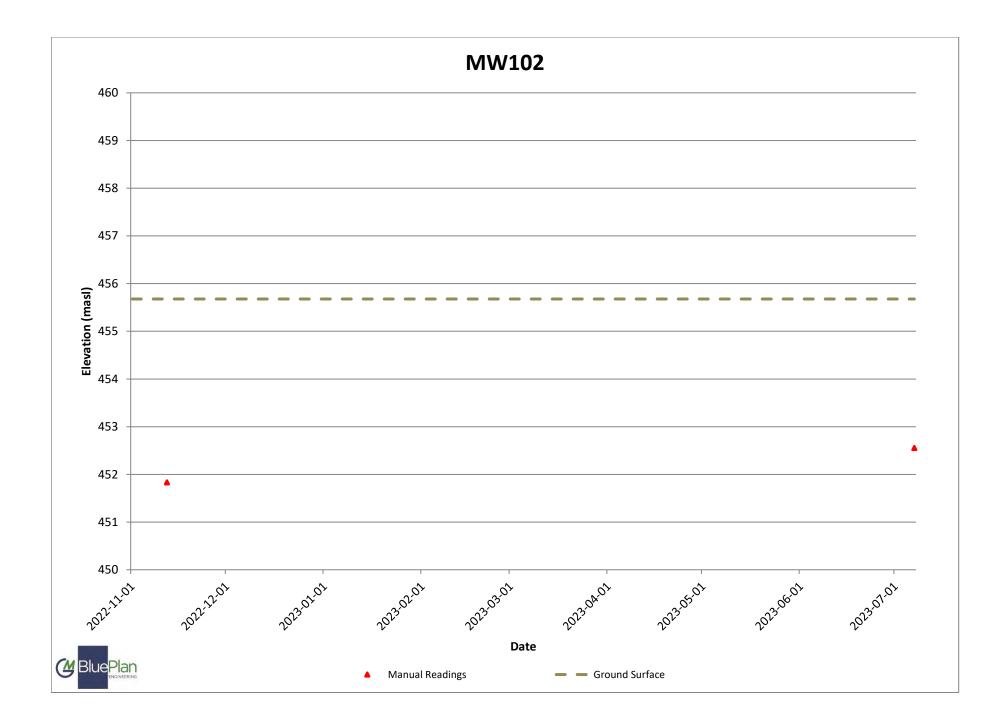


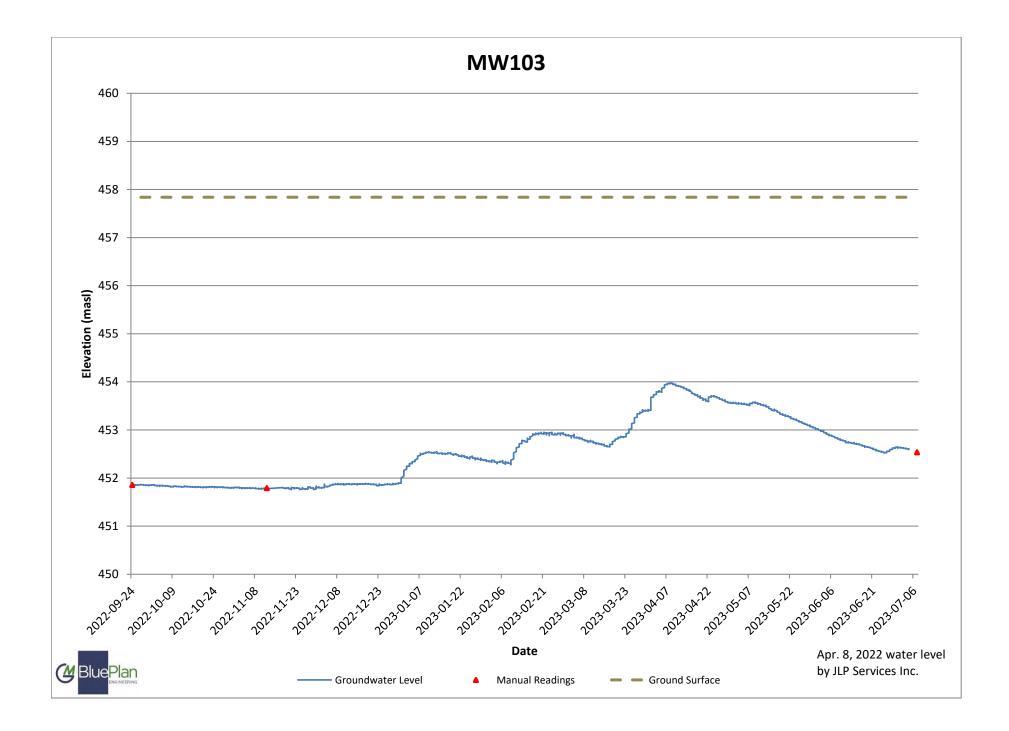


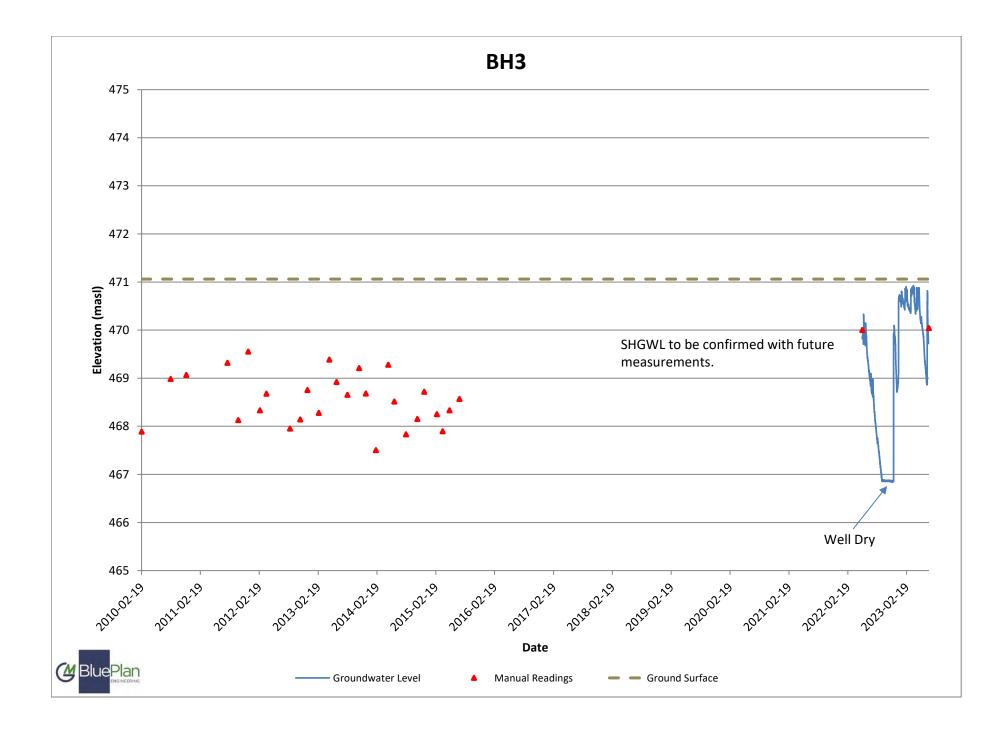


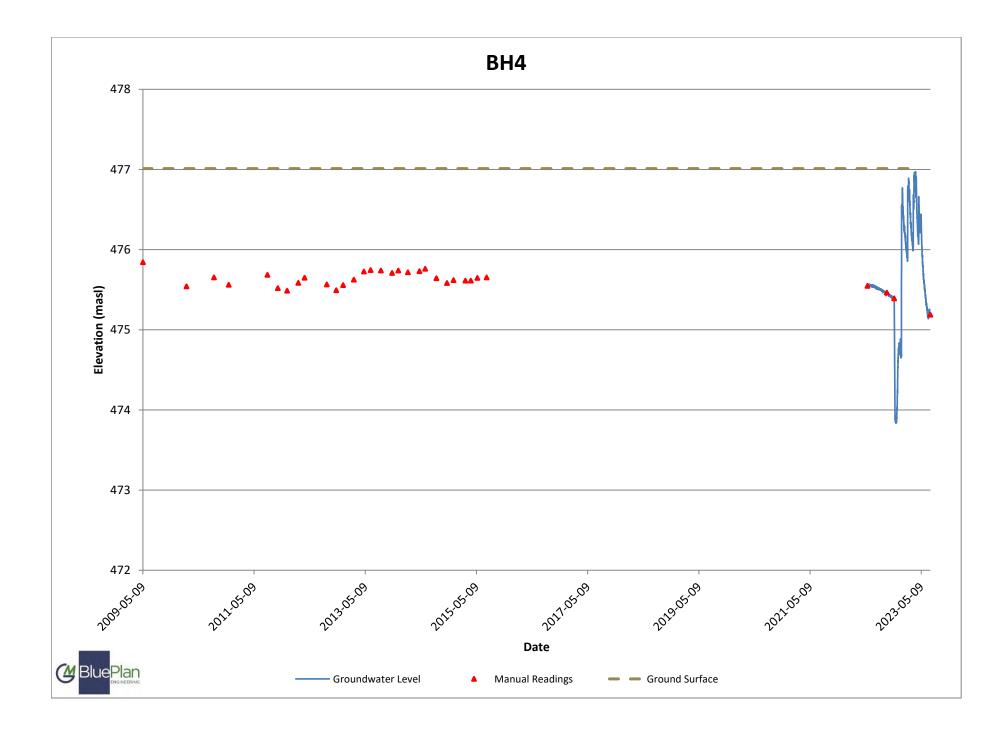


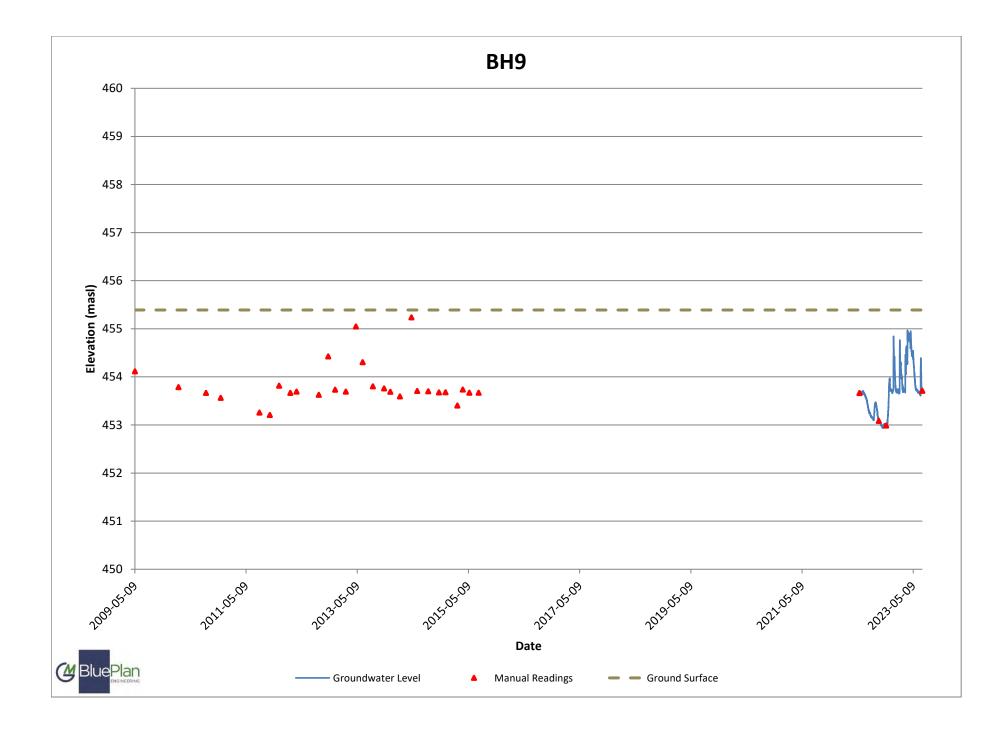








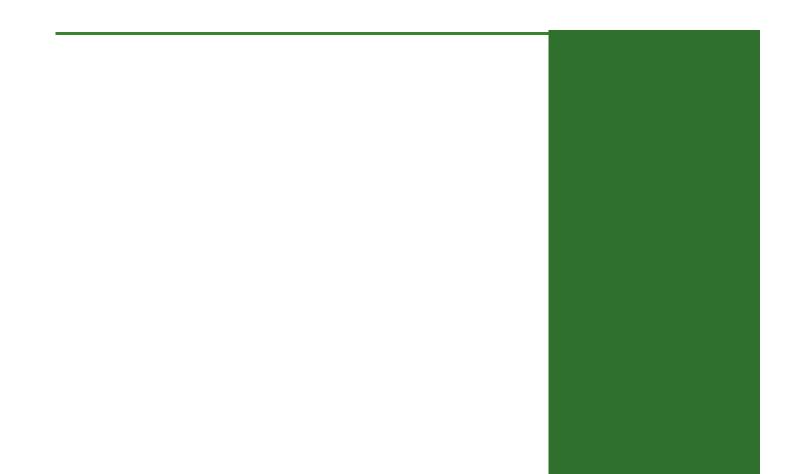






APPENDIX C

Pre-Development Conditions Stormwater Management Analysis



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		0.050		•)"		
		1.500	• •	•	0 000		
			0.042 0.0 Catchment 100	72 0.000 Pervious		c.m/sec" Total Area	п
			Surface Area	4.920	0.000	4.920	hectare"
			Time of concentration		4.335	41.920	minutes"
			Time to Centroid	114.284	89.957	114.283	minutes"
п			Rainfall depth	33.014	33.014	33.014	mm"
"			Rainfall volume	1624.29	0.00	1624.29	c.m"
"			Rainfall losses	30.670	1.796	30.669	mm"
"			Runoff depth	2.344	31.218	2.344	mm"
"			Runoff volume	115.35	0.00	115.35	c.m"
"			Runoff coefficient	0.071	0.000	0.071	u –

"			aximum flow		.042	0.000	0.042	c.m/sec"
	40	_	YDROGRAPH Add Run	0†† "				
		4	Add Runoff "	0 076	0 000	0.000		
	22			0.076	0.000	0.000"		
	33		ATCHMENT 101"					
		1 1	Triangular SCS"					
		2	Equal length"					
		101	Horton equation Catchment 101"					
		0.000	% Impervious"					
		8.490	Total Area"					
		130.000	Flow length"					
		10.000	Overland Slope"					
		8.490	Pervious Area"					
		130.000	Pervious length					
		10.000	Pervious slope"					
п		0.000	Impervious Area					
		130.000	Impervious leng					
		10.000	Impervious slop					
		0.250	Pervious Mannin					
		75.000	Pervious Max.in	•	tion"			
"		5.000	Pervious Min.in					
"		0.250	Pervious Lag co					
"		5.000	Pervious Depres					
		0.015	Impervious Mann		-			
"		0.000	Impervious Max.	infiltr	ration"			
"		0.000	Impervious Min.	infiltr	ration"			
"		0.050	Impervious Lag	constar	nt (hours)	"		
"		1.500	Impervious Depr	ession	storage"			
"			0.093	0.076	0.000	0.000 (.m/sec"	
"			atchment 101	P€	ervious	Impervious	Total Area	
"			urface Area			0.000	8.490	hectare"
"			ime of concentrat		2.814	3.392	32.813	minutes"
"			ime to Centroid			88.635	106.157	minutes"
			ainfall depth		3.014	33.014	33.014	mm"
			ainfall volume			0.00	2802.89	c.m"
			ainfall losses		0.669	2.144	30.669	mm"
			unoff depth		.345	30.870	2.345	mm"
			unoff volume			0.00	199.06	c.m"
			unoff coefficient			0.000	0.071	
	40		aximum flow		.093	0.000	0.093	c.m/sec"
	40		YDROGRAPH Add Run Add Runoff "	ΟΤΤ				
		4		0 111	0.000	0 000"		
	40	Ц	0.093 YDROGRAPH Copy to	0.144		0.000"		
	40	8	Copy to Outflow		JW			
п		U		0.144	0.144	0.000"		
п	40	н	YDROGRAPH Combi		1000"	0.000		
п		6	Combine "					
п		1000	Node #"					

п			Grand River"					
п		Ma	ximum flow	c	0.144	c.m/se	۵ ۲	
			drograph volume		5.741	c.m"		
		iiy	0.093 0.1			0.144"		
	40	цv	DROGRAPH Start - Ne			0.144		
п	40	2	Start - New Tribut		у			
п		Z	0.093 0.0	-	111	0.144"		
п	33	C A	TCHMENT 106"	00 0.1	L-4-4	0.144		
п		1	Triangular SCS"					
		1	Equal length"					
		2	Horton equation"					
		106	Catchment 106"					
		55.000	% Impervious"					
п		1.090	Total Area"					
п	1	10.000	Flow length"					
п	-	2.000	Overland Slope"					
п		0.491	Pervious Area"					
"	1	10.000	Pervious length"					
"	-	2.000	Pervious slope"					
		0.600	Impervious Area"					
"	1	10.000	Impervious length"					
"	-	2.000	Impervious slope"					
"		0.250	Pervious Manning '	n'"				
"		75.000	Pervious Max.infil					
"		5.000	Pervious Min.infil	tration"				
"		0.250	Pervious Lag const	ant (hours	5)"			
u.		5.000	Pervious Depressio	•				
"		0.015	Impervious Manning	-				
"		0.000	Impervious Max.inf	iltration'	•			
"		0.000	Impervious Min.inf	iltration'	•			
"		0.050	Impervious Lag con	stant (hou	ırs)"			
"		1.500	Impervious Depress	ion storag	ge"			
"			0.125 0.0	00 0.1	L44	0.144 0	.m/sec"	
"			tchment 106	Pervious			Total Area	
"		Su	rface Area	0.491	0.6	00	1.090	hectare"
"			me of concentration		4.9		7.458	minutes"
"			me to Centroid	119.816	90.3		92.512	minutes"
"			infall depth	33.014	33.0		33.014	mm"
"			infall volume	161.93	197		359.85	c.m"
"			infall losses	30.669	1.6		14.697	mm"
"			noff depth	2.345	31.		18.317	mm"
			noff volume	11.50	188		199.65	c.m"
			noff coefficient	0.071	0.9		0.555	
			ximum flow	.0.004	0.1	24	0.125	c.m/sec"
	40		DROGRAPH Add Runoff					
		4	Add Runoff "					
	22	~	0.125 0.1	25 0.1	L44	0.144"		
	33		TCHMENT 102"					
		1	Triangular SCS"					
		1	Equal length"					

	2					
	2	Horton equation"				
	102	Catchment 102"				
	1.000	% Impervious"				
	8.680	Total Area"				
"	220.000	Flow length"				
"	6.000	Overland Slope"				
"	8.593	Pervious Area"				
"	220.000	Pervious length"				
"	6.000	Pervious slope"				
"	0.087	Impervious Area"				
"	220.000	Impervious length"				
"	6.000	Impervious slope"				
"	0.250	Pervious Manning 'n'				
"	75.000	Pervious Max.infiltr	ration"			
"	5.000	Pervious Min.infiltr	ration"			
"	0.250	Pervious Lag constar	nt (hours)"			
"	5.000	Pervious Depression				
	0.015	Impervious Manning '	•			
"	0.000	Impervious Max.infil				
"	0.000	Impervious Min.infil				
"	0.050	Impervious Lag const) "		
"	1.500	Impervious Depressio		, ,		
"		0.061 0.125	0	0.144 0	.m/sec"	
	Ca	tchment 102	Pervious		Total Area	"
		rface Area	8.593	0.087	8.680	hectare"
		me of concentration	52.444	5.422	46.855	minutes"
		me to Centroid	123.693	91.446	119.860	minutes"
		infall depth	33.014	33.014	33.014	mm"
		infall volume	2836.96	28.66	2865.61	c.m"
		infall losses	30.669	1.692	30.379	mm"
		noff depth	2.345	31.322	2.635	mm"
		noff volume	201.54	27.19	228.73	c.m"
		noff coefficient	0.071	0.949	0.080	"
		ximum flow	0.059	0.018	0.061	c.m/sec"
		DROGRAPH Add Runoff '		0.010	0.001	c.,,, 5cc
	4	Add Runoff "				
		0.061 0.147	7 0.144	0.144"		
	40 HY	DROGRAPH Copy to Outf		0.144		
	8	Copy to Outflow"	1100			
	0	0.061 0.147	7 0.147	0.144"		
	40 HY	DROGRAPH Combine	2000"	0.144		
		Combine "	2000			
	2000	Node #"				
	2000	Wetland"				
	Ma	ximum flow	0 1/	17 c.m/se	ac"	
		drograph volume	428.38			
	пу	0.061 0.147		0.147"		
	40 HY			0.14/		
	_	DROGRAPH Confluence Confluence "	2000			
	7					
	2000	Node #"				

п	Wetl	and"				
п	Maximum		0.14	17 c.m/se	<u>م</u> ر"	
		aph volume	428.38			
	11901 061	0.061 0.147		0.000"		
	33 CATCHME		0.11	0.000		
		ngular SCS"				
		l length"				
п		on equation"				
"		hment 107"				
"		pervious"				
п		l Area"				
"		length"				
"		land Slope"				
"		ious Area"				
"		ious length"				
"		ious slope"				
"		rvious Area"				
"	140.000 Impe	rvious length"				
"	2.000 Impe	rvious slope"				
"	0.250 Perv	ious Manning 'n'				
"	75.000 Perv	ious Max.infiltr	ration"			
"	5.000 Perv	ious Min.infiltr	ration"			
"	0.250 Perv	ious Lag constar	nt (hours)"			
"	5.000 Perv	ious Depression	storage"			
"	•	rvious Manning '				
"	•	rvious Max.infil				
"	•	rvious Min.infil				
		rvious Lag const)"		
	1.500 Impe	rvious Depressio	-		<i>,</i>	
		0.397 0.147			.m/sec"	
	Catchme		Pervious	•	Total Area	и 1 . И
	Surface		1.597	1.952	3.550	hectare"
		concentration	55.598	5.748	8.629	minutes"
		Centroid	126.518	91.941	93.939	minutes" mm"
		l depth l volume	33.014 527.40	33.014 644.60	33.014 1172.00	c.m"
п		l losses	30.669	1.730	11/2.00	mm"
	Runoff		2.345	31.284	14.755	mm"
п	Runoff	•	37.47	610.81	648.28	c.m"
		coefficient	0.071	0.948	0.553	"
п	Maximum		0.011	0.397	0.397	c.m/sec"
		APH Add Runoff '		0.337	0.337	c · my See
		Runoff "				
п	1 /100	0.397 0.544	0.147	0.000"		
"	33 CATCHME					
п		ngular SCS"				
"		l length"				
"	•	on equation"				
"		hment 103"				
"	0.000 % Im	pervious"				

... 6.330 Total Area" ... Flow length" 160.000 н 9.000 Overland Slope" ... 6.330 Pervious Area" ... 160.000 Pervious length" ... 9.000 Pervious slope" ... 0.000 Impervious Area" ... Impervious length" 160.000 ... 9.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.059 0.544 0.000 c.m/sec" 0.147 ... Impervious Total Area " Catchment 103 Pervious ... Surface Area 6.330 0.000 6.330 hectare" . Time of concentration 38.361 3.966 38.360 minutes" ... Time to Centroid 89.459 111.070 111.070 minutes" ... mm" Rainfall depth 33.014 33.014 33.014 н 2089.78 c.m" Rainfall volume 0.00 2089.78 ... Rainfall losses 30.671 1.977 30.671 mm" ... Runoff depth 31.037 mm" 2.343 2.343 Runoff volume 148.30 0.00 148.30 c.m" ... н Runoff coefficient 0.071 0.000 0.071 ... Maximum flow 0.059 0.000 0.059 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.059 0.550 0.147 0.000" .. CATCHMENT 104" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... Scott Street External" 104 ... 55.000 % Impervious" ... 2.600 Total Area" ... Flow length" 95.000 ... 2.000 Overland Slope" ... 1.170 Pervious Area" ... 95.000 Pervious length" ... 2.000 Pervious slope" ... 1.430 Impervious Area" ... 95.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

		75.000 5.000 0.250 5.000 0.015 0.000 0.000 0.050	Pervious Max Pervious Min Pervious Lag Pervious Dep Impervious M Impervious M Impervious L	infilt constauression anning ax.infi in.infi ag cons	ration" nt (hours)' storage" 'n'" ltration" ltration" tant (hours	s)"			
		1.500	Impervious D	•	•		000 a m/		
		<i>.</i>	0.300 Catchment 104	0.550	0.14 Pervious		.000 c.m/		
			Surface Area		1.170	1.430	vious Tot 2.6		hectare"
			ime of concent	ration		4.555			minutes"
			ime to Centroi		116.160	90.239		735	minutes"
			Rainfall depth	u	33.014	33.014		014	mm"
"			Rainfall volume		386.26	472.10		.36	c.m"
"			Rainfall losses		30.671	1.703		738	mm"
"			Runoff depth		2.343	31.31		276	mm"
"			Runoff volume		27.41	447.7		.16	c.m"
"		F	Runoff coeffici	ent	0.071	0.948	0.5	54	"
"			laximum flow		0.009	0.299	0.3	00	c.m/sec"
"	40	F	IYDROGRAPH Add	Runoff					
		4	Add Runoff "						
	<i>с</i> л		0.300	0.850	0.14	/ 0	.000"		
	64	-	HOW TABLE	onh"					
		2 4	Flow hydrogr Inflow Hydro	-					
			laximum flow	graph	9	850 (c.m/sec"		
"			lydrograph volu	me	1700.2		c.m"		
"	40		IYDROGRAPH Copy						
"		8	Copy to Outf						
"			0.300	0.850	0.85	0 0	.000"		
"	40	F		mbine	1000"				
"		6	Combine "						
		1000							
			Grand River"				, "		
			Naximum flow	m 0			c.m/sec"		
		F	lydrograph volu 0.300	me 0.850	2135.8 0 0.850		c.m" .935"		
	40	F		nfluence		0 0	• • • • • •		
"	40	7	Confluence "	in fuches	1000				
"		, 1000	Node #"						
"			Grand River"						
"		Μ	laximum flow		0.9	935 (c.m/sec"		
"		F	lydrograph volu	me	2135.8	870 (c.m"		
"			0.300	0.93		0 0	.000"		
"	38	_	TART/RE-START						
		3			IT"		26.222		6 a II
			otal Catchment				36.330		tare" tare"
		I	otal Imperviou	s area			4.437	nec	tare"

11	Total %	impervious
" 19	EXIT"	

12.214"

			MIDUSS Output>"
			MIDUSS Output/ MIDUSS version Version 2.25 rev. 473"
п			MIDUSS version 2.25 rev. 475 MIDUSS created Sunday, February 07, 2010"
		10	Units used: ie METRIC"
		10	Job folder: C:\Users\szaga\Documents\MIDUSS\104104"
			Output filename: 104-104 existing 005 year.out"
			Licensee name: IO4 IO4 CXISting OOS year.out
п			Company "
			Date & Time last used: 2/21/2023 at 1:50:18 PM"
	31	T.	IME PARAMETERS"
	51	5.000	Time Step"
		180.000	Max. Storm length"
		3600.000	Max. Hydrograph"
	32		TORM Chicago storm"
	52	1	Chicago storm"
		1459.072	Coefficient A"
		13.690	
		0.850	
			Fraction R"
		180.000	Duration"
		1.000	Time step multiplier"
			aximum intensity 113.586 mm/hr"
			otal depth 49.792 mm"
		6	005hyd Hydrograph extension used in this file"
	33	C	ATCHMENT 105"
"		1	Triangular SCS"
"		1	Equal length"
		2	Horton equation"
		105	Catchment 105"
"		55.000	% Impervious"
"		0.670	Total Area"
"		30.000	Flow length"
"		2.000	Overland Slope"
"		0.302	Pervious Area"
"		30.000	Pervious length"
"		2.000	Pervious slope"
"		0.368	Impervious Area"
		30.000	Impervious length"
		2.000	Impervious slope"
		0.250	Pervious Manning 'n'"
"		75.000	Pervious Max.infiltration"
		5.000	Pervious Min.infiltration"
"		0.250	Pervious Lag constant (hours)"
"		5.000	Pervious Depression storage"
"		0.015	Impervious Manning 'n'"
"		0.000	Impervious Max.infiltration"
"		0.000	Impervious Min.infiltration"
		0.050	Impervious Lag constant (hours)"
"		1.500	Impervious Depression storage"
"			0.104 0.000 0.000 0.000 c.m/sec"

	40		Catchment 105 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff volume Runoff coefficient Maximum flow HYDROGRAPH Add Runoff	Pervious 0.302 14.420 100.204 49.792 150.12 32.852 16.939 51.07 0.340 0.028	Impervious 0.368 2.108 85.724 49.792 183.48 2.224 47.568 175.29 0.955 0.095	Total Area 0.670 4.886 88.991 49.792 333.60 16.007 33.785 226.36 0.679 0.104	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
"		4	Add Runoff "				
"			0.104 0.10	4 0.000	0.000"		
"	33	(CATCHMENT 100"				
"		1	Triangular SCS"				
"		1	Equal length"				
		2	Horton equation"				
		100					
		0.000	% Impervious"				
		4.920	Total Area"				
		175.000 8.000	Flow length" Overland Slope"				
		4.920	Pervious Area"				
		175.000	Pervious length"				
		8.000	Pervious slope"				
		0.000	Impervious Area"				
"		175.000	Impervious length"				
"		8.000	Impervious slope"				
"		0.250	Pervious Manning 'n				
"		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt	ration"			
"		0.250	Pervious Lag consta	nt (hours)"			
"		5.000	Pervious Depression				
"		0.015					
		0.000	Impervious Max.infi				
		0.000	Impervious Min.infi		、		
		0.050	Impervious Lag cons)"		
		1.500	Impervious Depressi 0.294 0.10	•	0 000		
			0.294 0.10 Catchment 100	Pervious		c.m/sec" Total Area	
п			Surface Area	4.920	0.000	4.920	hectare"
			Time of concentration	27.409	4.007	27.409	minutes"
			Time to Centroid	115.162	88.415	115.162	minutes"
			Rainfall depth	49.792	49.792	49.792	mm"
			Rainfall volume	2449.75	0.00	2449.75	c.m"
"			Rainfall losses	32.839	2.133	32.839	mm"
"		ļ	Runoff depth	16.953	47.659	16.953	mm"
"		I	Runoff volume	834.06	0.00	834.07	c.m"
"		I	Runoff coefficient	0.340	0.000	0.340	"

" "	40		aximum flow	0.294	0	.000	0.294	c.m/sec"
	40	_	/DROGRAPH Add Runo [.] Add Runoff "	ГТ				
		4		.334 0	.000	0.000"		
п	33	C/	ATCHMENT 101"	.554 0	.000	0.000		
	رر	1	Triangular SCS"					
		1	Equal length"					
		2	Horton equation"					
		101	Catchment 101"					
		0.000	% Impervious"					
"		8.490	Total Area"					
		130.000	Flow length"					
"		10.000	Overland Slope"					
"		8.490	Pervious Area"					
"		130.000	Pervious length"					
"		10.000	Pervious slope"					
"		0.000	Impervious Area"					
"		130.000	Impervious lengt	า"				
"		10.000	Impervious slope					
"		0.250	Pervious Manning					
		75.000	Pervious Max.inf:					
		5.000	Pervious Min.inf:		N II			
		0.250	Pervious Lag cons	-	-			
		5.000	Pervious Depress:	-	5			
		0.015	Impervious Mannin	•	• "			
		0.000 0.000	Impervious Max.in Impervious Min.in					
п		0.050	Impervious Lag co					
		1.500	Impervious Depres					
п		1.900			.000	0.000	.m/sec"	
		Ca	atchment 101	Pervio			Total Area	
"			urface Area	8.490		.000	8.490	hectare"
n			ime of concentration			.135	21.447	minutes"
"			ime to Centroid	108.28		7.231	108.288	minutes"
"		Ra	ainfall depth	49.792	4	9,792	49.792	mm"
"		Ra	ainfall volume	4227.3	1 0	.00	4227.31	c.m"
"		Ra	ainfall losses	32.850	2	.512	32.850	mm"
"		Ru	unoff depth	16.942	4	7.279	16.942	mm"
"			unoff volume	1438.3	70	.00	1438.38	c.m"
"			unoff coefficient	0.340		.000	0.340	
"			aximum flow	0.610	0	.000	0.610	c.m/sec"
	40		DROGRAPH Add Runo	ff "				
"		4	Add Runoff "					
"					.000	0.000"		
	40		DROGRAPH Copy to (Jut+low"				
		8	Copy to Outflow"	042 0	042	0.000"		
п	40	11	0.610 0. DROGRAPH Combine		.943	0.000"		
	40	6	Combine "	= 1000				
п		1000	Node #"					
		1000						

п			Grand River"				
		Ma	ximum flow	0.9	43 c.m/s	ec"	
			drograph volume	2498.8			
			0.610 0.94		0.943"		
	40	HY	DROGRAPH Start - New		0.015		
	10	2	Start - New Tributa	-			
		-	0.610 0.00	•	0.943"		
	33	CA	TCHMENT 106"				
"		1	Triangular SCS"				
"		1	Equal length"				
		2	Horton equation"				
"		106	Catchment 106"				
"	55.	.000	% Impervious"				
"	1.	.090	Total Area"				
"	110	.000	Flow length"				
"	2.	.000	Overland Slope"				
"	0.	.491	Pervious Area"				
"	110.	.000	Pervious length"				
"	2.	.000	Pervious slope"				
"	0.	.600	Impervious Area"				
"		.000	Impervious length"				
"		.000	Impervious slope"				
		.250	Pervious Manning '				
		.000	Pervious Max.infil				
		.000	Pervious Min.infil				
		.250	Pervious Lag const				
		.000	Pervious Depression	-			
		.015	Impervious Manning				
п		.000 .000	Impervious Max.inf: Impervious Min.inf:				
п		.050	Impervious Lag con		\ "		
		.500	Impervious Depress)		
п	±.	. 500	0.169 0.00	-	0 943	c.m/sec"	
п		Ca	tchment 106	Pervious		Total Area	н
			rface Area	0.491	0.600	1.090	hectare"
"			me of concentration		4.597	10.620	minutes"
n			me to Centroid	119.805	89.191	96.060	minutes"
"			infall depth	49.792	49.792	49.792	mm''
"			infall volume	244.23	298.50	542.73	c.m"
"		Ra	infall losses	32.853	1.876	15.816	mm"
"		Ru	noff depth	16.939	47.916	33.976	mm"
"		Ru	noff volume	83.09	287.25	370.34	c.m"
"		Ru	noff coefficient	0.340	0.962	0.682	11
"			ximum flow	0.027	0.165	0.169	c.m/sec"
"	40	HY	DROGRAPH Add Runoff				
"		4	Add Runoff "				
			0.169 0.1	69 0.943	0.943"		
	33		TCHMENT 102"				
		1	Triangular SCS"				
		1	Equal length"				

 1.000 % Impervious" 1.000 % Impervious" 2.000 Flow length" 6.000 Overland Slope" 2.000 Pervious Area" 2.000 Pervious length" 6.000 Pervious length" 6.000 Impervious length" 6.000 Impervious slope" 0.887 Impervious length" 6.000 Pervious slope" 0.250 Pervious Man.infiltration" 7.5.000 Pervious Max.infiltration" 8.593 Pervious Max.infiltration" 6.000 Pervious Max.infiltration" 6.000 Pervious Max.infiltration" 6.000 Impervious Acraa" 8.680 Pervious Max.infiltration" 6.000 Impervious Max.infiltration" 8.690 Pervious Max.infiltration" 8.690 Pervious Max.infiltration" 8.690 Pervious Max.infiltration" 8.690 Impervious Depression storage" 8.691 Impervious Depression storage" 8.692 Impervious Depression storage" 8.680 hectare" 1.500 Impervious Depression storage" 6.439 0.169 0.943 0.943 c.m/sec" 8.680 hectare" 1.500 Impervious Depression storage" 8.680 hectare" 8.680 hectare" 1.500 Impervious 128 constant (hours)" 1.500 Impervious 129 Constant (hours)" 1.500 Impervious 129 Constant (hours)" 1.500 Impervious 128 Constant (hours)" 1.500 Impervious 128 Constant (hours)" 8.680 hectare" 8.680 hectare" 8.680 hectare" 9.043 0.169 0.943 0.943 c.m/sec" 8.680 hectare" 8.680 hectare" 9.738 122.149 minutes" 8.611 depth 49.792 49.792 mm" 8.611 losses 32.841 1.787 32.531 mm" 8.6161 losses 32.841 1.787 32.531 mm" 8.607 dought 40.430 0.947 0.943" 40 HYDROGRAPH Add Runoff " 4 Add Runoff " <		2					
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0.439 0.169 0.943 0.943 c.m/sec" Catchment 102 Pervious Impervious Total Area " Surface Area 8.593 0.087 8.680 hectare" Time of concentration 34.277 5.011 33.463 minutes" Time to Centroid 123.076 89.738 122.149 minutes" Rainfall depth 49.792 49.792 49.792 m" Rainfall volume 4278.70 43.22 4321.92 c.m" Rainfall losses 32.841 1.787 32.531 mm" Runoff depth 16.950 48.005 17.261 mm" Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff<"			_)		
Catchment 102 Pervious Impervious Total Area " Surface Area 8.593 0.087 8.680 hectare" Time of concentration 34.277 5.011 33.463 minutes" Time to Centroid 123.076 89.738 122.149 minutes" Rainfall depth 49.792 49.792 49.792 minutes" Rainfall volume 4278.70 43.22 4321.92 c.m" Rainfall losses 32.841 1.787 32.531 mm" Runoff depth 16.950 48.005 17.261 mm" Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff " " 4.404 Runoff " "40 HYDROGRAPH Copy to Outflow" 0.943" 0.943" " ' "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943" ' ' "40 HYDROGRAPH Combine 2000" ' ' ' ' '		1.500		•	0 9/3 0		
Surface Area 8.593 0.087 8.680 hectare" Time of concentration 34.277 5.011 33.463 minutes" Time to Centroid 123.076 89.738 122.149 minutes" Rainfall depth 49.792 49.792 49.792 minutes" Rainfall volume 4278.70 43.22 4321.92 c.m" Rainfall losses 32.841 1.787 32.531 mm" Runoff depth 16.950 48.005 17.261 mm" Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" 40 HYDROGRAPH Add Runoff " 0.439 0.497 0.943 0.943" * 40 HYDROGRAPH Copy to Outflow" 8 Copy to Outflow" 0.439 0.497 0.943" * 40 HYDROGRAPH Combine 2000" 6 Combine " 2000" 5 * 40 HYDROGRAPH Combine 2000" 0.943" 5 5 5 * 40 HYDROGRAPH Combine 200		C					п
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Time to Centroid 123.076 89.738 122.149 minutes" Rainfall depth 49.792 49.792 49.792 mm" Rainfall volume 4278.70 43.22 4321.92 c.m" Rainfall losses 32.841 1.787 32.531 mm" "Runoff depth 16.950 48.005 17.261 mm" "Runoff volume 1456.58 41.67 1498.25 c.m" "Runoff coefficient 0.340 0.964 0.347 " "Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff "							
Rainfall depth 49.792 49.792 49.792 mm" Rainfall volume 4278.70 43.22 4321.92 c.m" Rainfall losses 32.841 1.787 32.531 mm" Runoff depth 16.950 48.005 17.261 mm" Runoff volume 1456.58 41.67 1498.25 c.m" Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff " 0.439 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943" 0.943" "40 HYDROGRAPH Combine 2000" 0.943" 1.943 1.943 1.943 "40 HYDROGRAPH Combine 2000" 0.943" 1.943 1.943 1.943 "40 HYDROGRAPH Combine 2000" 1.943 1.943 1.943 "40 HYDROGRAPH Combine							
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" Rainfall losses 32.841 1.787 32.531 mm" " Runoff depth 16.950 48.005 17.261 mm" " Runoff volume 1456.58 41.67 1498.25 c.m" " Runoff coefficient 0.340 0.964 0.347 " " Maximum flow 0.434 0.024 0.439 c.m/sec" " 4 Add Runoff<"			-				
Runoff depth 16.950 48.005 17.261 mm" Runoff volume 1456.58 41.67 1498.25 c.m" Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" 40 HYDROGRAPH Add Runoff " 0.439 0.497 0.943 0.943" " 0.439 0.497 0.943 0.943" " " 40 HYDROGRAPH Copy to Outflow" " 0.439 0.497 0.943 0.943" " 0.439 0.497 0.497 0.943" " " 40 HYDROGRAPH Copy to Outflow" " 0.439 0.497 0.943" " 0.439 0.497 0.497 0.943" " " " 0.439 0.497 0.497 0.943" " " 0.439 0.497 0.943" " " " 0.439 0.497 0.943" " " " 0.439 0.497 0.943" "							
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Runoff volume 1456.58 41.67 1498.25 C.m Runoff coefficient 0.340 0.964 0.347 " Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff " 0.439 0.497 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943" "40 HYDROGRAPH Copy to Outflow" 0.439 0.497 0.943" "40 HYDROGRAPH Combine 2000" 6 Combine 2000" "40 HYDROGRAPH Combine 2000" 1498 1498 1498 "40 HYDROGRAPH Combine 2000" 1497 1498 1498 "40 HYDROGRAPH Combine 2000" 1497 1498 1498 "40 HYDROGRAPH Combine 2000" 1497 1497 1498 "40 HYDROGRAPH 1497 1497 1498 1498 1498 1498 1			•				
<pre>" Maximum flow 0.434 0.024 0.439 c.m/sec" "40 HYDROGRAPH Add Runoff" " 4 Add Runoff " " 0.439 0.497 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" " 0.439 0.497 0.497 0.943" "40 HYDROGRAPH Combine 2000" " 6 Combine " " 2000 Node #"</pre>							
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<pre>" 4 Add Runoff " " 0.439 0.497 0.943 0.943" "40 HYDROGRAPH Copy to Outflow" " 8 Copy to Outflow" " 0.439 0.497 0.497 0.943" "40 HYDROGRAPH Combine 2000" " 6 Combine " " 2000 Node #"</pre>					0.024	0.439	c.m/sec"
" 0.439 0.497 0.943 0.943" " 40 HYDROGRAPH Copy to Outflow" " 0.439 0.497 0.497 0.943" " 40 HYDROGRAPH Combine 2000" " 6 Combine" " 2000 Node #"		_					
"40 HYDROGRAPH Copy to Outflow" "8 Copy to Outflow" "0.439 0.497 0.497 0.943" "40 HYDROGRAPH Combine 2000" "6 Combine " "2000 Node #"		4					
" 8 Copy to Outflow" " 0.439 0.497 0.497 0.943" "40 HYDROGRAPH Combine 2000" " 6 Combine " " 2000 Node #"					0.943"		
" 0.439 0.497 0.497 0.943" "40 HYDROGRAPH Combine 2000" " 6 Combine " " 2000 Node #"				flow"			
"40 HYDROGRAPH Combine 2000" "6 Combine" 2000 Node #"		8					
" 6 Combine " " 2000 Node #"					0.943"		
" 2000 Node #"		40 HY		2000"			
2000 NOUE #		-					
		2000					
" Wetland"							
" Maximum flow 0.497 c.m/sec"		Ma	aximum flow	0.49		e	
"Hydrograph volume 1868.590 c.m"		Ну	•				
" 0.439 0.497 0.497 0.497"	"		0.439 0.497		0.497"		
" 40 HYDROGRAPH Confluence 2000"		40 HY		e 2000"			
" 7 Confluence "		7					
" 2000 Node #"	"	2000	Node #"				

	Wetland					
"	Maximum flo		0.49	7 c.m/se	c"	
	Hydrograph		1868.59			
"		439 0.497	0.497	0.000"		
	33 CATCHMENT		01157	0.000		
п		lar SCS"				
п	1 Equal l					
	•	equation"				
	107 Catchme	-				
п	55.000 % Imper					
"	3.550 Total A					
"	140.000 Flow le					
"		d Slope"				
"	1.597 Perviou					
"		s length"				
"		s slope"				
"		ous Area"				
u.	-	ous length"				
"	2.000 Impervi	ous slope"				
"	0.250 Perviou	s Manning 'n'"				
"	75.000 Perviou	s Max.infiltrat	ion"			
"	5.000 Perviou	s Min.infiltrat	ion"			
"	0.250 Perviou	s Lag constant	(hours)"			
"	5.000 Perviou	s Depression st	orage"			
"	0.015 Impervi	ous Manning 'n'	"			
"	0.000 Impervi	ous Max.infiltr	ation"			
"	-	ous Min.infiltr				
"	0.050 Impervi	ous Lag constan	t (hours)			
"	-	ous Depression	•			
"		544 0.497	0.497		.m/sec"	
	Catchment			Impervious		
	Surface Ar			1.952	3.550	hectare"
				5.313	12.264	minutes"
	Time to Ce				98.045	minutes"
	Rainfall d					mm"
	Rainfall v			972.18	1767.60	c.m"
	Rainfall 1			1.757		mm"
	Runoff dep			48.035	34.048	mm"
	Runoff vol			937.88	1208.71	c.m"
	Runoff coe				0.684	
	Maximum fl		078	0.534	0.544	c.m/sec"
		Add Runoff "				
	4 Add Run		0.497	0.000"		
	33 CATCHMENT	544 0.796	0.497	0.000		
	1 Triangu 1 Equal l	lar SCS"				
п	•	equation"				
п	103 Catchme					
п	0.000 % Imper					
		• 1003				

... 6.330 Total Area" ... Flow length" 160.000 н 9.000 Overland Slope" ... 6.330 Pervious Area" ... 160.000 Pervious length" ... 9.000 Pervious slope" ... 0.000 Impervious Area" ... Impervious length" 160.000 ... 9.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.404 0.796 0.497 0.000 c.m/sec" ... Impervious Total Area " Catchment 103 Pervious ... Surface Area 6.330 0.000 6.330 hectare" . 25.072 Time of concentration 25.072 3.666 minutes" ... Time to Centroid 87.991 112.469 112.469 minutes" ... mm" Rainfall depth 49.792 49.792 49.792 н Rainfall volume 0.00 c.m" 3151.81 3151.81 ... Rainfall losses 32.853 2.512 32.853 mm" ... Runoff depth 16.939 47.280 16.939 mm" ... Runoff volume 1072.25 0.00 1072.25 c.m" ... н Runoff coefficient 0.340 0.000 0.340 ... Maximum flow 0.404 0.000 0.404 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.404 1.092 0.497 0.000" .. CATCHMENT 104" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... Scott Street External" 104 ... 55.000 % Impervious" ... 2.600 Total Area" ... Flow length" 95.000 ... 2.000 Overland Slope" ... 1.170 Pervious Area" ... 95.000 Pervious length" ... 2.000 Pervious slope" ... 1.430 Impervious Area" ... 95.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

	75.000 5.000 0.250 5.000 0.015 0.000 0.000 0.050	Pervious Min.inf Pervious Lag con Pervious Depress Impervious Manni Impervious Max.i Impervious Min.i	iltra stant ion s ng 'n nfilt nfilt	tion" (hours)" torage" " ration" ration") "		
"	1.500	• •	ssion	-			
"			.092	0.497		.m/sec"	
		Catchment 104		ervious	Impervious		
		Surface Area		.170	1.430	2.600	hectare"
		Time of concentrati		8.795	4.210	9.735	minutes"
		Time to Centroid		16.746	88.669	94.978	minutes"
		Rainfall depth		9.792	49.792	49.792	mm"
		Rainfall volume Rainfall losses		82.56	712.02	1294.58	c.m" mm"
		Runoff depth		2.859 6.933	1.996 47.796	15.884 33.908	mm"
		Runoff volume		.98.12	683.48	881.60	с.m"
п		Runoff coefficient		.340	0.960	0.681	"
п		Maximum flow		.068	0.395	0.405	c.m/sec"
"		HYDROGRAPH Add Runo					,
"	4	Add Runoff "					
"		0.405 1	.276	0.497	0.000"		
"	64	SHOW TABLE"					
"	2	, , , ,					
	4	· /···	h"		_		
		Maximum flow		1.27	-	ec"	
		Hydrograph volume	0	5031.14	45 c.m"		
		HYDROGRAPH Copy to	Οuτ+ι	.OW ^a			
п	8	12	.276	1.276	0.000"		
	40	HYDROGRAPH Combin		1000"	0.000		
п	6		C	1000			
п	1000						
"		Grand River"					
"		Maximum flow		2.17	72 c.m/se	ec"	
"		Hydrograph volume		7529.94	47 c.m"		
"			.276	1.276	2.172"		
"	40	HYDROGRAPH Conflu	ence	1000"			
"	7						
	1000						
		Grand River"		2 1-	70	!!	
п		Maximum flow Hydrograph volume		2.17 7529.94		ec.	
			.172	1.276	•/ C.m 0.000"		
	38	START/RE-START TOTA			0.000		
	3						
	-	Total Catchment are			36.	.330 he	ctare"
"		Total Impervious ar					ctare"

11	Total %	impervious
" 19	EXIT"	

12.214"

			MIDUSS Output>"
			MIDUSS version Version 2.25 rev. 473"
			MIDUSS created Sunday, February 07, 2010"
		10	Units used: ie METRIC"
п		10	Job folder: C:\Users\szaga\Documents\MIDUSS\104104"
п			Output filename: 104-104 existing 100 year.out"
			Licensee name: Iby 104 104 existing 100 year.out
			Company "
п			Date & Time last used: 2/21/2023 at 1:50:53 PM"
п	31	Т	IME PARAMETERS"
п	5-	5.000	Time Step"
		180.000	Max. Storm length"
		3600.000	Max. Hydrograph"
"	32		TORM Chicago storm"
п		1	Chicago storm"
"		6933.020	Coefficient A"
"		34.699	Constant B"
"		0.998	Exponent C"
"		0.380	Fraction R"
"		180.000	Duration"
"		1.000	Time step multiplier"
"		Ma	aximum intensity 168.777 mm/hr"
"		Тс	otal depth 97.921 mm"
"		6	100hyd Hydrograph extension used in this file"
"	33	CA	ATCHMENT 105"
"		1	Triangular SCS"
"		1	Equal length"
"		2	Horton equation"
"		105	Catchment 105"
"		55.000	% Impervious"
"		0.670	Total Area"
		30.000	Flow length"
		2.000	Overland Slope"
"		0.302	Pervious Area"
		30.000	Pervious length"
		2.000	Pervious slope"
		0.368	Impervious Area"
		30.000	Impervious length"
		2.000	Impervious slope"
		0.250	Pervious Manning 'n'" Denvious May infiltration"
		75.000	Pervious Max.infiltration" Pervious Min.infiltration"
		5.000	
		0.250 5.000	Pervious Lag constant (hours)" Pervious Depression storage"
		0.015	Impervious Manning 'n'"
		0.000	Impervious Max.infiltration"
		0.000	Impervious Min.infiltration"
		0.050	Impervious Lag constant (hours)"
п		1.500	Impervious Depression storage"
			0.233 0.000 0.000 0.000 c.m/sec"

	40		Catchment 105 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff volume Runoff coefficient Maximum flow HYDROGRAPH Add Runoff	Pervious 0.302 10.076 97.792 97.921 295.23 34.803 63.119 190.30 0.645 0.099	Impervious 0.368 1.799 84.352 97.921 360.84 2.791 95.130 350.55 0.971 0.153	Total Area 0.670 4.711 89.081 97.921 656.07 17.197 80.725 540.86 0.824 0.233	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
"		4	Add Runoff "				
"			0.233 0.23	0.000	0.000"		
"	33		CATCHMENT 100"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
		100	Catchment 100"				
		0.000	% Impervious"				
		4.920	Total Area"				
		175.000	Flow length"				
		8.000	Overland Slope"				
		4.920 175.000	Pervious Area"				
		8.000	Pervious length" Pervious slope"				
		0.000	Impervious Area"				
		175.000	Impervious length"				
		8.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
"		5.000	Pervious Depression				
"		0.015					
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi	ltration"			
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	on storage"			
"			1.192 0.23			c.m/sec"	
"			Catchment 100	Pervious	-	Total Area	
"			Surface Area	4.920	0.000	4.920	hectare"
"			Time of concentration	19.152	3.420	19.152	minutes"
"			Time to Centroid	108.129	86.591	108.129	minutes"
"			Rainfall depth	97.921	97.921	97.921	mm"
			Rainfall volume	4817.72	0.00	4817.73	c.m"
			Rainfall losses	34.540	3.750	34.540	mm''
			Runoff depth	63.381	94.172	63.381	mm"
			Runoff volume	3118.34	0.00	3118.35	c.m"
			Runoff coefficient	0.647	0.000	0.647	

"	10	Maximum flow	1.19	2	0.000	1.192	c.m/sec"
	40	HYDROGRAPH Add Ru	unott				
		4 Add Runoff "	1 264	0 000	0.000"		
п	22	1.192	1.364	0.000	0.000"		
	33	CATCHMENT 101"	- "				
		1 Triangular SC 1 Equal length"	5				
		1 0	on"				
	10						
	0.00 8.49	•					
	130.00	0	~ "				
	10.00	•					
	8.49						
	130.00	0					
	10.00						
	0.00						
	130.00		•				
	10.00						
	0.25		0	ю ¹¹			
	75.00						
	5.00 0.25						
	5.00	0					
	0.01			age			
	0.00		•	ion"			
	0.00						
	0.05				\ "		
	1.50		-)		
	1.50	2.442	1.364	0.000	0 000	.m/sec"	
		Catchment 101		ious		Total Area	
		Surface Area	8.49		0.000	8.490	hectare"
		Time of concentra			2.676	14.986	minutes"
		Time to Centroid	103.		85.567	103.392	minutes"
		Rainfall depth	97.9		97.921	97.921	mm"
		Rainfall volume	8313		0.01	8313.52	c.m"
		Rainfall losses	34.5		3.577	34.574	mm"
		Runoff depth	63.3		94.344	63.347	mm"
		Runoff volume	5378		0.01	5378.17	c.m"
		Runoff coefficier			0.000	0.647	"
		Maximum flow	2.44		0.000	2.442	c.m/sec"
	40	HYDROGRAPH Add Ru		2	0.000	2,772	
	-	4 Add Runoff "					
		2.442	3.805	0.000	0.000"		
	40	HYDROGRAPH Copy			0.000		
		8 Copy to Outflo					
"		2.442	3.805	3.805	0.000"		
	40		bine 100		0.000		
п		6 Combine "		-			
"	100						

п			Grand River"				
п		M	aximum flow	3.80	05 c.m/s	ec"	
			ydrograph volume	9037.3		20	
			2.442 3.80		3.805"		
	40	н	YDROGRAPH Start - New		5.005		
	10	2	Start - New Tributa	•			
		-	2.442 0.00	-	3.805"		
	33	C	ATCHMENT 106"	5.005	51005		
п	55	1	Triangular SCS"				
"		1	Equal length"				
		2	Horton equation"				
п		106	Catchment 106"				
"		55.000	% Impervious"				
"		1.090	Total Area"				
"		110.000	Flow length"				
"		2.000	Overland Slope"				
"		0.491	Pervious Area"				
"		110.000	Pervious length"				
"		2.000	Pervious slope"				
"		0.600	Impervious Area"				
"		110.000	Impervious length"				
"		2.000	Impervious slope"				
"		0.250	Pervious Manning 'n				
"		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta	• •			
		5.000	Pervious Depression	-			
		0.015	Impervious Manning				
		0.000	Impervious Max.infi				
		0.000	Impervious Min.infi		N II		
		0.050	Impervious Lag cons)		
		1.500	Impervious Depressi 0.301 0.00	-	2 905	c m/coc"	
		C	atchment 106	Pervious		c.m/sec" Total Area	
			urface Area	0.491	0.600	1.090	hectare"
			ime of concentration	21.971	3.923	10.297	minutes"
п			ime to Centroid	111.333	87.214	95.731	minutes"
			ainfall depth	97.921	97.921	97.921	mm"
"			ainfall volume	480.30	587.04	1067.34	c.m"
"			ainfall losses	34.507	2.882	17.113	mm"
n			unoff depth	63.414	95.039	80.808	mm"
"			unoff volume	311.04	569.76	880.81	c.m"
"			unoff coefficient	0.648	0.971	0.825	п
"		Ma	aximum flow	0.114	0.260	0.301	c.m/sec"
"	40	H	YDROGRAPH Add Runoff				
"		4	Add Runoff "				
"			0.301 0.30	1 3.805	3.805"		
"	33		ATCHMENT 102"				
"		1	Triangular SCS"				
"		1	Equal length"				

	n	llenten egustien"				
	2	Horton equation"				
	102	Catchment 102"				
	1.000	% Impervious"				
"	8.680	Total Area"				
"	220.000	Flow length"				
"	6.000	Overland Slope"				
"	8.593	Pervious Area"				
"	220.000	Pervious length"				
"	6.000	Pervious slope"				
	0.087	Impervious Area"				
	220.000	Impervious length"				
	6.000	Impervious slope"				
	0.250	Pervious Manning 'n				
	75.000	Pervious Max.infilt				
п	5.000	Pervious Min.infilt				
	0.250	Pervious Lag constar				
	5.000	Pervious Depression				
	0.015	Impervious Manning	-			
	0.000	Impervious Max.infi				
		Impervious Max.infi				
	0.000	•		\ II		
	0.050	Impervious Lag const)		
	1.500	Impervious Depression	•	2 005		
	6	1.891 0.303			.m/sec"	п
		atchment 102	Pervious		Total Area	
		urface Area	8.593	0.087	8.680	hectare"
		ime of concentration	23.951	4.277	23.656	minutes"
"		ime to Centroid	113.589	87.628	113.200	minutes"
"		ainfall depth	97.921	97.921	97.921	mm"
"		ainfall volume	8414.58	85.00	8499.57	c.m"
		ainfall losses	34.508	2.400	34.187	mm"
"	Ru	unoff depth	63.413	95.522	63.734	mm"
"	Ru	unoff volume	5449.21	82.91	5532.12	c.m"
"	Ru	unoff coefficient	0.648	0.975	0.651	"
"	Ma	aximum flow	1.874	0.038	1.891	c.m/sec"
"	40 HY	/DROGRAPH Add Runoff '				
"	4	Add Runoff "				
		1.891 2.116	6 3.805	3.805"		
"	40 HY	/DROGRAPH Copy to Out	flow"			
	8	Copy to Outflow"				
		1.891 2.116	5 2.116	3.805"		
	40 H)	YDROGRAPH Combine	2000"			
п	6	Combine "				
	2000	Node #"				
	2000	Wetland"				
	Ma	aximum flow	2.11	16 c.m/se	<u>،</u> د"	
		/drograph volume	6412.92			
	ц	1.891 2.116		2.116"		
	40 H)	/DROGRAPH Confluence		2.110		
	40 ni 7	Confluence "	2000			
	2000	Node #"				

	Wetland"				
"	Maximum flow	2.1	16 c.m/se	יכ"	
	Hydrograph volume	6412.92			
	1.891 2.1		0.000"		
"	33 CATCHMENT 107"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	107 Catchment 107"				
"	55.000 % Impervious"				
"	3.550 Total Area"				
"	140.000 Flow length"				
"	2.000 Overland Slope"				
"	1.597 Pervious Area"				
"	140.000 Pervious length"				
"	2.000 Pervious slope"				
"	1.952 Impervious Area"				
"	140.000 Impervious length"				
	2.000 Impervious slope"				
	0.250 Pervious Manning				
	75.000 Pervious Max.infil				
	5.000 Pervious Min.infil				
	0.250 Pervious Lag const				
	5.000 Pervious Depression	-			
	0.015 Impervious Manning 0.000 Impervious Max.inf				
	0.000 Impervious Max.inf				
п	0.050 Impervious Lag con) "		
п	1.500 Impervious Depress		/		
"	0.948 2.1	•	0.000 0	.m/sec"	
"	Catchment 107	Pervious		Total Area	
"	Surface Area	1.597	1.952	3.550	hectare"
"	Time of concentration	25.391	4.534	11.868	minutes"
"	Time to Centroid	115.220	87.952	97.540	minutes"
"	Rainfall depth	97.921	97.921	97.921	mm"
"	Rainfall volume	1564.29	1911.91	3476.21	c.m"
"	Rainfall losses	34.527	2.269	16.785	mm"
"	Runoff depth	63.395	95.653	81.137	mm"
"	Runoff volume	1012.73	1867.62	2880.35	c.m"
"	Runoff coefficient	0.647	0.977	0.829	
	Maximum flow	0.333	0.843	0.948	c.m/sec"
	40 HYDROGRAPH Add Runoff	"			
	4 Add Runoff "	24 2 446	0.000		
	0.948 2.8	24 2.116	0.000"		
	33 CATCHMENT 103"				
	1 Triangular SCS" 1 Equal length"				
п	2 Horton equation"				
	103 Catchment 103"				
	0.000 % Impervious"				

... 6.330 Total Area" ... Flow length" 160.000 н 9.000 Overland Slope" ... 6.330 Pervious Area" ... 160.000 Pervious length" ... 9.000 Pervious slope" ... 0.000 Impervious Area" ... Impervious length" 160.000 ... 9.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 1.633 2.824 0.000 c.m/sec" 2.116... Impervious Total Area " Catchment 103 Pervious ... Surface Area 6.330 0.000 6.330 hectare" . Time of concentration 17.519 3.129 17.519 minutes" ... Time to Centroid 86.212 106.265 106.265 minutes" ... mm" Rainfall depth 97.921 97.921 97.921 н 6198.42 Rainfall volume 0.01 c.m" 6198.41 ... Rainfall losses 34.499 3.700 34.499 mm" ... Runoff depth 94.221 63.423 mm" 63.423 ... Runoff volume 4014.64 0.01 4014.65 c.m" ... н Runoff coefficient 0.648 0.000 0.648 ... Maximum flow 1.633 0.000 1.633 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 1.633 4.411 2.116 0.000" .. CATCHMENT 104" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... Scott Street External" 104 ... 55.000 % Impervious" ... 2.600 Total Area" ... Flow length" 95.000 ... 2.000 Overland Slope" ... 1.170 Pervious Area" ... 95.000 Pervious length" ... 2.000 Pervious slope" ... 1.430 Impervious Area" ... 95.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

	5.000 Pervi 0.250 Pervi 5.000 Pervi 0.015 Imper 0.000 Imper 0.000 Imper	ious Max.infilt ious Min.infilt ious Lag constan ious Depression rvious Manning rvious Max.infi rvious Min.infi rvious Lag cons	ration" nt (hours)" storage" 'n'" ltration" ltration")"		
п	1.500 Imper	rvious Depressi	•			
"		0.730 4.41			c.m/sec"	
"	Catchmer		Pervious	Impervious		
	Surface		1.170	1.430	2.600	hectare"
		concentration	20.121	3.593	9.455	minutes"
		Centroid	109.215	86.819	94.762	minutes"
	Rainfall	l depth L volume	97.921 1145.68	97.921	97.921 2545.95	mm" c.m"
п		l losses	34.520	1400.27 3.529	17.475	mm"
п	Runoff c		63.401	94.392	80.446	mm"
	Runoff v	•	741.80	1349.81	2091.61	c.m"
"		coefficient	0.647	0.964	0.822	"
"	Maximum	flow	0.277	0.616	0.730	c.m/sec"
"	40 HYDROGRA	APH Add Runoff				
п	4 Add F	Runoff "				
"		0.730 4.99	9 2.116	0.000"		
	64 SHOW TAE					
		hydrograph"				
		w Hydrograph"	4 00			
	Maximum	aph volume	4.99 15399.52	-	20	
		APH Copy to Out [.]		29 0.111		
		to Outflow"	TIOW			
п	0 COPJ	0.730 4.99	9 4.999	0.000"		
"	40 HYDROGRA		1000"			
"	6 Combi	ine "				
"	1000 Node					
"		d River"				
	Maximum		8.80		ec"	
	Hydrogra	aph volume	24436.93			
п	40 HYDROGRA	0.730 4.999 APH Confluence		8.805"		
п		Luence "	E 1000			
	1000 Node					
"		d River"				
"	Maximum		8.80	05 c.m/se	ec"	
"	Hydrogra	aph volume	24436.93	10 c.m"		
"		0.730 8.80		0.000"		
"		E-START TOTALS				
		ff Totals on EX	IT"	_		
		atchment area				tare"
	Total In	npervious area		4	.437 heo	tare"

11	Total %	impervious
" 19	EXIT"	

12.214"

			MTDUSS OU	+nut				>"
			MIDUSS VU	-				.25 rev. 473"
п						c		
		10	MIDUSS cr			2	sunday, Febr	uary 07, 2010"
		10	Units use					ie METRIC"
			Job folde		C:\Use	rs\szaga		MIDUSS\104104"
			Output fi				104-104 exi	sting Reg.out"
			Licensee	name:				gmbp"
			Company	_				"
"				me last use	d:		2/21/2023	at 1:51:38 PM"
"	31		ME PARAMET					
"		60.000	Time Step					
"		2880.000	Max. Stor	m length"				
"		3600.000	Max. Hydr	ograph"				
"	32	ST	ORM Histor	ic"				
"		5	Historic"					
"		2880.000	Duration"					
"		48.000	Rainfall	intensity v	alues"			
"			2.028	2.028	2.028	2.028	2.028"	
"			2.028	2.028	2.028	2.028	2.028"	
"			2.028	2.028	2.028	2.028	2.028"	
"			2.028	2.028	2.028	2.028	2.028"	
"			2.028	2.028		2.028	2.028"	
"			2.028	2.028		2.028	2.028"	
"			2.028	2.026	2.026	2.026		
"			2.026	6.000	4.000	6.000		
"			17.000	13.000	23.000	13.000	13.000"	
"			53.000	38.000	13.000"			
"		Ма	ximum inte		53.0	00 mr	ı/hr"	
п			tal depth		285.0			
п		7	9999hyd	Hydrograph			this file"	
п	33		TCHMENT 10					
п		1	Triangula					
		- 1	Equal len					
п		2	Horton eq	-				
п		105	Catchment					
		55.000	% Impervi					
		0.670	Total Are					
		30.000	Flow leng					
		2.000	Overland					
п		0.302	Pervious	-				
п		30.000	Pervious					
				•				
		2.000 0.368	Pervious					
			Imperviou					
		30.000	Imperviou	0				
		2.000	Imperviou	•				
		0.250		Manning 'n' May infilte				
		75.000		Max.infiltra				
		5.000		Min.infiltr				
		0.250		Lag constan	• •			
		5.000	Pervious	Depression :	sconage			

	0.015	Tura and i and Manadara				
	0.015	Impervious Manning				
	0.000	Impervious Max.infi				
	0.000	Impervious Min.infi				
	0.050	Impervious Lag cons)"		
	1.500	Impervious Depressi	•			
"		0.078 0.00			c.m/sec"	
		atchment 105	Pervious		Total Area	
		furface Area	0.302	0.368	0.670	hectare"
"		ime of concentration	16.093	2.860	7.181	minutes"
"		ime to Centroid	2720.207	2251.465	2404.533	minutes"
"		ainfall depth	285.000	285.000	285.000	mm"
"		ainfall volume	859.28	1050.22	1909.50	c.m"
"	F	ainfall losses	139.563	39.596	84.581	mm"
"	F	lunoff depth	145.437	245.404	200.419	mm"
"	F	lunoff volume	438.49	904.31	1342.81	c.m"
"	F	unoff coefficient	0.510	0.861	0.703	"
"	Μ	laximum flow	0.031	0.047	0.078	c.m/sec"
"	40 H	IYDROGRAPH Add Runoff	п			
"	4	Add Runoff "				
"		0.078 0.07	8 0.000	0.000"		
"	33 0	ATCHMENT 100"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	100	Catchment 100"				
"	0.000	% Impervious"				
"	4.920	Total Area"				
"	175.000	Flow length"				
"	8.000	Overland Slope"				
"	4.920	Pervious Area"				
"	175.000	Pervious length"				
"	8.000	Pervious slope"				
"	0.000	Impervious Area"				
"	175.000	Impervious length"				
"	8.000	Impervious slope"				
"	0.250	Pervious Manning 'n				
"	75.000	Pervious Max.infilt	ration"			
"	5.000	Pervious Min.infilt	ration"			
"	0.250	Pervious Lag consta	nt (hours)"			
"	5.000	Pervious Depression	storage"			
"	0.015	Impervious Manning	'n'"			
"	0.000	Impervious Max.infi	ltration"			
"	0.000	Impervious Min.infi				
"	0.050	Impervious Lag cons)"		
"	1.500	Impervious Depressi				
"		0.538 0.07	0	0.000 (c.m/sec"	
"	C	atchment 100	Pervious		Total Area	"
"	9	urface Area	4.920	0.000	4.920	hectare"
"		ime of concentration		5.436	30.590	minutes"
"		ime to Centroid	2736.207	2231.294	2736.206	minutes"

<pre>" 4 Add Runoff " " 0.538 0.601 0.000 0.000" " 33 CATCHMENT 101" " 1 Triangular SCS" " 1 Equal length" 2 Horton equation" " 101 Catchment 101" " 0.000 % Impervious" " 8.490 Total Area" " 130.000 Flow length" " 10.000 Overland Slope" " 8.490 Pervious Area" " 130.000 Pervious length" " 10.000 Impervious Area" " 130.000 Impervious length" " 10.000 Impervious length" " 0.600 Impervious length" " 0.600 Impervious length" " 0.600 Pervious slope" " 0.550 Pervious Manning 'n'" " 5.000 Pervious Manning 'n'" " 5.000 Pervious Manning 'n'" " 5.000 Pervious Manning 'n'" " 5.000 Pervious Manning 'n'" " 6.250 Pervious Manning 'n'" " 5.000 Pervious Manning 'n'" " 6.601 Impervious Lag constant (hours)" " 5.000 Pervious Manning 'n'" " 0.650 Impervious Manninfiltration" " 0.896 0.601 0.000 0.000 c.m/sec" " 0.896 0.601 0.000 0.000 c.m/sec" " Catchment 101 Pervious Impervious Total Area " " Surface Area 8.490 0.000 8.490 hectare" " Time of concentration 23.936 4.253 23.936 minutes" " Time to Centroid 2730.043 232.872 2730.043 minutes"</pre>
<pre>" 33 CATCHMENT 101" " 1 Triangular SCS" " 1 Equal length" " 2 Horton equation" " 101 Catchment 101" " 0.000 % Impervious" " 8.490 Total Area" " 130.000 Flow length" " 10.000 Overland Slope" " 8.490 Pervious Area" " 130.000 Pervious length" " 10.000 Impervious length" " 10.000 Impervious Area" " 130.000 Impervious slope" " 0.250 Pervious Manning 'n'" " 0.250 Pervious Manning 'n'" " 5.000 Pervious Lag constant (hours)" " 0.015 Impervious Man.infiltration" " 0.050 Impervious Man.infiltration" " 0.015 Impervious Man.infiltration" " 0.000 Impervious Area" " 0.015 Impervious Manning 'n'" " 0.000 Impervious Area" " 0.015 Impervious Manning 'n'" " 0.000 Impervious Manning 'n'" " 0.000 Impervious Manning 'n'" " 0.000 Impervious Manning 'n'" " 0.015 Impervious Manning 'n'" " 0.000 Impervious</pre>
<pre>" 1 Triangular SCS" " 1 Equal length" 2 Horton equation" 3 0.000 % Impervious" 8.490 Total Area" 130.000 Flow length" 10.000 Overland Slope" 8.490 Pervious Area" 130.000 Pervious length" 10.000 Pervious length" 10.000 Impervious Area" 130.000 Impervious Area" 130.000 Impervious length" 10.000 Impervious length" 10.000 Pervious Manning 'n'" 10.000 Pervious Manning 'n'" 5.000 Pervious Lag constant (hours)" 5.000 Pervious Manning 'n'' 0.250 Pervious Manning 'n'' 0.050 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Areage" 0.015 Impervious Max.infiltration" 0.000 Impervious Area * 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area * " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes" </pre>
<pre>1 Equal length" 2 Horton equation" 101 Catchment 101" 0.000 % Impervious" 3.490 Total Area" 130.000 Flow length" 10.000 Overland Slope" 3.490 Pervious Area" 130.000 Pervious length" 10.000 Impervious length" 0.000 Impervious length" 10.000 Impervious length" 10.000 Impervious length" 10.000 Impervious length" 10.000 Pervious Manning 'n'" 5.000 Pervious Manning 'n'" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Man.infiltration" 0.015 Impervious Max.infiltration" 0.000 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)" 0.000 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Ax.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Ax.infiltration" 0.000 Impervi</pre>
2 Horton equation" 101 Catchment 101" 0.000 % Impervious" 8.490 Total Area" 130.000 Flow length" 10.000 Overland Slope" 8.490 Pervious Area" 130.000 Pervious Area" 130.000 Pervious Slope" 0.000 Impervious Area" 130.000 Pervious Slope" 0.000 Impervious Area" 130.000 Impervious Area" 130.000 Impervious Slope" 0.250 Pervious Manning 'n'" 10.000 Impervious Slope" 0.250 Pervious Manning 'n'" 5.000 Pervious Manninfiltration" * 5.000 Pervious Manning 'n'" 0.015 Impervious Max.infiltration" * 0.000 Impervious Max.infiltration" * 0.000 Impervious Lag constant (hours)" * 0.000 Impervious Depression storage" * 0.896 0.601 0.000 c.m/sec" * 0.896 0.601 0.000 0.000 c.m/sec" <
<pre>101 Catchment 101" 0.000 % Impervious" 8.490 Total Area" 130.000 Flow length" 10.000 Overland Slope" 8.490 Pervious Area" 130.000 Pervious length" 10.000 Impervious Area" 130.000 Impervious length" 10.000 Impervious length" 10.000 Impervious length" 10.000 Impervious slope" 0.250 Pervious Manning 'n'" 75.000 Pervious Max.infiltration" 5.000 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Man.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.050 Pervious Manning 'n'" 0.060 Impervious Lag constant (hours)" 5.000 Pervious Max.infiltration" 0.050 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.086 0.601 0.000 0.000 c.m/sec"</pre>
8.490 Total Area" 130.000 Flow length" 10.000 Overland Slope" 8.490 Pervious Area" 130.000 Pervious length" 10.000 Pervious length" 10.000 Pervious length" 10.000 Pervious slope" 0.000 Impervious Area" 130.000 Impervious length" 10.000 Impervious Slope" 0.000 Impervious Slope" 0.250 Pervious Manning 'n'" 75.000 Pervious Max.infiltration" 5.000 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Man.infiltration" 0.0250 Pervious Max.infiltration" 0.0250 Pervious Max.infiltration" 0.015 Impervious Max.infiltration" 0.0260 Impervious Max.infiltration" 0.027 Deprevious Max.infiltration" 0.028 Impervious Constant (hours)" 1.500 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)"
<pre>130.000 Flow length 130.000 Flow length" 10.000 Overland Slope" 8.490 Pervious Area" 130.000 Pervious length" 10.000 Impervious length" 10.000 Impervious length" 10.000 Impervious length" 10.000 Impervious slope" 0.250 Pervious Manning 'n'" 5.000 Pervious Max.infiltration" 5.000 Pervious Max.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Depression storage" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.050 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"</pre>
<pre>130.000 From From From From From From From From</pre>
<pre>10.000 Overland Stope " 8.490 Pervious Area" 130.000 Pervious length" 10.000 Impervious slope" 0.000 Impervious length" 10.000 Impervious length" 10.000 Impervious slope" 0.250 Pervious Manning 'n'" 75.000 Pervious Max.infiltration" 0.250 Pervious Max.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Manning 'n'" 0.000 Impervious Man.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Manning 'n'" 0.000 Impervious Manning 'n'" 0.000 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Lag constant (hours)" 1.500 Impervious Advectore</pre>
<pre>130.000 Pervious Area 130.000 Pervious length" 10.000 Impervious slope" 10.000 Impervious length" 10.000 Impervious length" 10.000 Impervious slope" 10.250 Pervious Manning 'n'" 10.250 Pervious Max.infiltration" 10.250 Pervious Lag constant (hours)" 15.000 Pervious Depression storage" 10.015 Impervious Manning 'n'" 10.000 Impervious Max.infiltration" 10.000 Impervious Advect Advect Advect Advect Max.infiltration" 10.000 Impervious Advect Advec</pre>
130.000Pervious length10.000Impervious slope"0.000Impervious length"130.000Impervious slope"0.250Pervious Manning 'n'"75.000Pervious Max.infiltration"5.000Pervious Min.infiltration"0.250Pervious Lag constant (hours)"5.000Pervious Depression storage"0.015Impervious Max.infiltration"0.000Impervious Max.infiltration"0.000Impervious Max.infiltration"0.000Impervious Max.infiltration"0.000Impervious Max.infiltration"0.000Impervious Lag constant (hours)"1.500Impervious Depression storage"0.8960.6010.0000.8960.6010.000 c.m/sec""Catchment 101Pervious Impervious Total Area ""Surface Area8.4900.000"Time of concentration 23.9364.25323.936
<pre>10.000 Fervious Stope 0.000 Impervious Area" 130.000 Impervious length" 10.000 Impervious slope" 0.250 Pervious Manning 'n'" 5.000 Pervious Max.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.050 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"</pre>
<pre>130.000 Impervious Area 130.000 Impervious length" 10.000 Impervious slope" 0.250 Pervious Manning 'n'" 75.000 Pervious Max.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Min.infiltration" 0.000 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)" 1.500 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"</pre>
130.000Impervious length"10.000Impervious slope""0.250Pervious Manning 'n'""5.000Pervious Max.infiltration""0.250Pervious Lag constant (hours)""0.250Pervious Depression storage""0.015Impervious Manning 'n'""0.000Impervious Max.infiltration""0.000Impervious Max.infiltration""0.000Impervious Max.infiltration""0.050Impervious Min.infiltration""0.050Impervious Lag constant (hours)"1.500Impervious Depression storage""0.8960.6010.8960.6010.8960.6010.8960.0000.8960.0000.8960.0000.8960.0001.500Impervious Impervious Impervious Total Area ""Surface Area8.4900.0008.4901.503Pervious Impervious Total Area "
<pre>" 0.250 Pervious Manning 'n'" " 75.000 Pervious Max.infiltration" " 5.000 Pervious Min.infiltration" " 0.250 Pervious Lag constant (hours)" " 5.000 Pervious Depression storage" " 0.015 Impervious Manning 'n'" " 0.000 Impervious Max.infiltration" " 0.000 Impervious Min.infiltration" " 0.050 Impervious Lag constant (hours)" " 1.500 Impervious Lag constant (hours)" " 0.896 0.601 0.000 0.000 c.m/sec" " Catchment 101 Pervious Impervious Total Area " " Surface Area 8.490 0.000 8.490 hectare" " Time of concentration 23.936 4.253 23.936 minutes"</pre>
<pre>" 75.000 Pervious Max.infiltration" " 5.000 Pervious Min.infiltration" " 0.250 Pervious Lag constant (hours)" " 5.000 Pervious Depression storage" " 0.015 Impervious Manning 'n'" " 0.000 Impervious Max.infiltration" " 0.000 Impervious Max.infiltration" " 0.000 Impervious Min.infiltration" " 0.050 Impervious Lag constant (hours)" " 1.500 Impervious Lag constant (hours)" " 1.500 Impervious Depression storage" " 0.896 0.601 0.000 0.000 c.m/sec" " Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" " Time of concentration 23.936 4.253 23.936 minutes"</pre>
<pre>"5.000 Pervious Min.infiltration" "0.250 Pervious Lag constant (hours)" "5.000 Pervious Depression storage" "0.015 Impervious Manning 'n'" "0.000 Impervious Max.infiltration" "0.000 Impervious Min.infiltration" "0.050 Impervious Lag constant (hours)" "1.500 Impervious Depression storage" "0.896 0.601 0.000 0.000 c.m/sec" "0.896 0.601 0.000 0.000 c.m/sec" "Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" "Time of concentration 23.936 4.253 23.936 minutes"</pre>
 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Min.infiltration" 0.050 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"
<pre>" 5.000 Pervious Depression storage" " 0.015 Impervious Manning 'n'" " 0.000 Impervious Max.infiltration" " 0.000 Impervious Min.infiltration" " 0.050 Impervious Lag constant (hours)" " 1.500 Impervious Depression storage" " 0.896 0.601 0.000 0.000 c.m/sec" " 0.896 0.601 0.000 0.000 c.m/sec" " Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" " Time of concentration 23.936 4.253 23.936 minutes"</pre>
 0.015 Impervious Manning 'n'" 0.000 Impervious Max.infiltration" 0.000 Impervious Min.infiltration" 0.050 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"
 0.000 Impervious Max.infiltration" 0.000 Impervious Min.infiltration" 0.050 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"
 0.000 Impervious Min.infiltration" 0.050 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"
 0.050 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.896 0.601 0.000 0.000 c.m/sec" Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" Time of concentration 23.936 4.253 23.936 minutes"
" 1.500 Impervious Depression storage" " 0.896 0.601 0.000 c.m/sec" " Catchment 101 Pervious Impervious Total Area " Surface Area 8.490 0.000 8.490 hectare" " Time of concentration 23.936 4.253 23.936 minutes"
"Catchment 101PerviousImperviousTotal Area"Surface Area8.4900.0008.490hectare""Time of concentration23.9364.25323.936minutes"
Catchment 101PerviousImperviousTotal Area"Surface Area8.4900.0008.490hectare""Time of concentration23.9364.25323.936minutes"
" Time of concentration 23.936 4.253 23.936 minutes"
" Time to Centroid 2730 043 2232 872 2730 043 minutes"
Rainfail depth 285.000 285.000 285.000 mm
Raintall 105565 139.107 35.924 139.107 mm
" Runoff depth 145.893 249.076 145.893 mm" " Runoff volume 1.2386 0.0000 1.2386 ha-m"
" Runoff coefficient 0.512 0.000 0.512 "
"Maximum flow 0.896 0.000 0.896 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.896 1.497 0.000 0.000"

" "	40	H\ 8	/DROGRAPH Copy to Out Copy to Outflow"	flow"			
		•	0.896 1.49	7 1.497	0.000"		
	40	н	/DROGRAPH Combine	1000"			
"		6	Combine "				
		1000	Node #"				
			Grand River"				
		Ma	aximum flow	1.49	97 c.m/s	ec"	
			/drograph volume	20895.0			
"			0.896 1.49		1.497"		
"	40	H	/DROGRAPH Start - New	Tributary"			
"		2	Start - New Tributa	ry"			
"			0.896 0.00	0 1.497	1.497"		
"	33	CA	ATCHMENT 106"				
"		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
		106	Catchment 106"				
"		55.000	% Impervious"				
"		1.090	Total Area"				
"		110.000	Flow length"				
		2.000	Overland Slope"				
		0.491	Pervious Area"				
"		110.000	Pervious length"				
"		2.000	Pervious slope"				
		0.600	Impervious Area"				
		110.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag constan				
		5.000	Pervious Depression	•			
		0.015	Impervious Manning Impervious Max.infi				
		0.000 0.000	Impervious Min.infi				
		0.050	Impervious Lag cons		\ "		
		1.500	Impervious Depression	•)		
		1.500	0.117 0.00	•	1.497	c.m/sec"	
		Ca	atchment 106	Pervious		Total Area	п
			urface Area	0.491	0.600	1.090	hectare"
			ime of concentration	35.092	6.236	15.325	minutes"
			ime to Centroid	2739.025	2235.505	2394.105	minutes"
"			ainfall depth	285.000	285.000	285.000	mm"
			ainfall volume	1397.93	1708.57	3106.50	c.m"
"			ainfall losses	140.362	27.637	78.363	mm"
п		Ru	unoff depth	144.638	257.363	206.637	mm"
u.			unoff volume	709.45	1542.89	2252.34	c.m"
"		Ru	unoff coefficient	0.508	0.903	0.725	
"		Ма	aximum flow	0.054	0.076	0.117	c.m/sec"

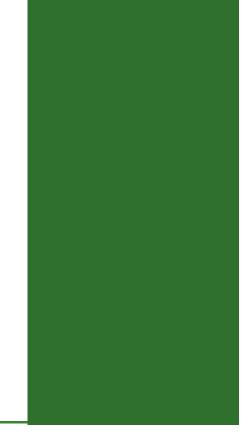
"	40	H	DROGRAPH Add Rur	noff '	ı			
"		4	Add Runoff "					
"			0.117	0.117	7 1.497	1.497"		
"	33	CA	ATCHMENT 102"					
"		1	Triangular SCS'	•				
"		1	Equal length"					
"		2	Horton equation	า"				
"		102	Catchment 102"					
"		1.000	% Impervious"					
"		8.680	Total Area"					
"		220.000	Flow length"					
"		6.000	Overland Slope'					
"		8.593	Pervious Area"					
"		220.000	Pervious length	า"				
"		6.000	Pervious slope'					
"		0.087	Impervious Area					
		220.000	Impervious leng					
		6.000	Impervious slop	-				
		0.250	Pervious Mannir					
"		75.000	Pervious Max.ir	0				
		5.000	Pervious Min.ir					
		0.250	Pervious Lag co					
		5.000	Pervious Depres					
		0.015	Impervious Manr		-			
"		0.000	Impervious Max.	-				
"		0.000	Impervious Min.					
"		0.050	Impervious Lag)"		
"		1.500	Impervious Depr		•	/		
			0.950	0.117	•	1.497	c.m/sec"	
"		Ca	atchment 102		Pervious		Total Area	н
			urface Area		8.593	0.087	8.680	hectare"
"		Ti	me of concentrat	ion	38.255	6.798	37.689	minutes"
			lme to Centroid		2741.159	2241.450	2732.164	minutes"
			ainfall depth		285.000	285.000	285.000	mm"
			ainfall volume		2.4491	0.0247	2.4738	ha-m"
			ainfall losses		141.565	24.677	140.396	mm"
"			unoff depth		143.435	260.323	144.604	mm"
"			noff volume		1.2326	0.0226	1.2552	ha-m"
"			noff coefficient	-	0.503	0.913	0.507	"
"			aximum flow	-	0.943	0.011	0.950	c.m/sec"
"	40		DROGRAPH Add Rur	off '				,
		4	Add Runoff "					
			0.950	1.056	5 1.497	1.497"		
"	40	НΥ	DROGRAPH Copy to					
"		8	Copy to Outflow					
n		-	0.950	1.056	5 1.056	1.497"		
n	40	HV	/DROGRAPH Combi		2000"	,		
n	. •	6	Combine "					
"		2000	Node #"					
n			Wetland"					

			aximum flow /drograph volume 0.950 1	056	1.05 14803.96			
	40		/DROGRAPH Conflu	.056	1.056 2000"	1.050		
	40	7	Confluence "	ence	2000			
		2000	Node #"					
		2000	Wetland"					
		Ma	aximum flow		1.0	56 c.m/	sec"	
"			/drograph volume		14803.96		500	
				.056	1.056	0.000	п	
"	33	CA	ATCHMENT 107"					
"		1	Triangular SCS"					
"		1	Equal length"					
"		2	Horton equation"					
"		107	Catchment 107"					
"		55.000	% Impervious"					
"		3.550	Total Area"					
"		140.000	Flow length"					
"		2.000	Overland Slope"					
"		1.597	Pervious Area"					
"		140.000	Pervious length"					
"		2.000	Pervious slope"					
"		1.952	Impervious Area"					
"		140.000	Impervious lengt					
		2.000	Impervious slope					
		0.250	Pervious Manning					
		75.000	Pervious Max.inf:					
		5.000	Pervious Min.inf:					
		0.250	Pervious Lag con					
		5.000	Pervious Depress		-			
		0.015	Impervious Manni					
		0.000	Impervious Max.i					
		0.000	Impervious Min.i			\ ''		
		0.050 1.500	Impervious Lag co Impervious Depres)		
		1.300	• •	.056	1.056	9 999	c.m/sec"	
		C	atchment 107		ervious		s Total Area	
			urface Area		.597	1.952	3.550	hectare"
			ime of concentration). 556	7.207	17.519	minutes"
"			ime to Centroid		744.076	2245.793	2399.878	minutes"
"			ainfall depth		35.000	285.000	285.000	mm"
"			ainfall volume		4553	0.5565	1.0117	ha-m"
"			ainfall losses		41.525	22.773	76.211	mm"
"		Ru	unoff depth		43.475	262.227	208.789	mm"
"		Ru	unoff volume	22	292.02	5119.98	7412.00	c.m"
"		Ru	unoff coefficient	0.	. 503	0.920	0.733	п
"			aximum flow		.175	0.247	0.371	c.m/sec"
"	40	H	YDROGRAPH Add Runo [.]	ff "				
"		4	Add Runoff "					
"			0.371 1	.405	1.056	0.000	"	

```
...
  33
                CATCHMENT 103"
...
              1
                   Triangular SCS"
н
              1
                   Equal length"
.
               2
                   Horton equation"
...
            103
                   Catchment 103"
...
          0.000
                   % Impervious"
...
          6.330
                   Total Area"
...
                   Flow length"
        160.000
...
                   Overland Slope"
          9.000
...
          6.330
                   Pervious Area"
...
        160.000
                   Pervious length"
...
          9.000
                   Pervious slope"
...
                   Impervious Area"
          0.000
...
        160.000
                   Impervious length"
...
          9.000
                   Impervious slope"
...
          0.250
                   Pervious Manning 'n'"
...
         75.000
                   Pervious Max.infiltration"
...
                   Pervious Min.infiltration"
          5.000
...
          0.250
                   Pervious Lag constant (hours)"
...
          5.000
                   Pervious Depression storage"
...
          0.015
                   Impervious Manning 'n'"
...
          0.000
                   Impervious Max.infiltration"
...
          0.000
                   Impervious Min.infiltration"
...
          0.050
                   Impervious Lag constant (hours)"
...
          1.500
                   Impervious Depression storage"
н
                         0.686
                                    1.405
                                                1.056
                                                            0.000 c.m/sec"
...
                                                                                 н
                Catchment 103
                                          Pervious
                                                       Impervious Total Area
...
                Surface Area
                                          6.330
                                                       0.000
                                                                                 hectare"
                                                                    6.330
                Time of concentration
                                          27.982
                                                       4.972
                                                                    27.982
                                                                                 minutes"
...
                Time to Centroid
                                          2734.145
                                                       2231.264
                                                                    2734.144
                                                                                 minutes"
...
                                                                                 mm"
                Rainfall depth
                                          285.000
                                                       285.000
                                                                    285.000
н
                                                                                 ha-m"
                Rainfall volume
                                          1.8040
                                                       0.0000
                                                                    1.8041
...
                                                                                 mm"
                Rainfall losses
                                                       32.769
                                          138.998
                                                                    138.998
...
                Runoff depth
                                          146.002
                                                       252.231
                                                                    146.002
                                                                                 mm"
...
                Runoff volume
                                          9241.89
                                                       0.02
                                                                    9241.91
                                                                                 c.m"
...
                Runoff coefficient
                                          0.512
                                                       0.000
                                                                    0.512
...
               Maximum flow
                                          0.686
                                                       0.000
                                                                    0.686
                                                                                 c.m/sec"
...
               HYDROGRAPH Add Runoff "
  40
...
                   Add Runoff "
              4
...
                                    2.091
                                                1.056
                                                            0.000"
                         0.686
н
  33
                CATCHMENT 104"
...
                   Triangular SCS"
              1
...
              1
                   Equal length"
...
                   Horton equation"
               2
...
                   Scott Street External"
            104
...
         55.000
                   % Impervious"
...
          2.600
                   Total Area"
...
         95.000
                   Flow length"
...
          2.000
                   Overland Slope"
...
          1.170
                   Pervious Area"
```

	95.000 2.000 1.430 95.000 2.000 0.250 75.000 5.000 0.250 5.000 0.015 0.000	Pervious length" Pervious slope" Impervious Area" Impervious length" Impervious slope" Pervious Manning 'n Pervious Max.infilt Pervious Lag constan Pervious Lag constan Pervious Depression Impervious Manning Impervious Max.infil	ration" ration" nt (hours)" storage" 'n'" ltration"			
п	0.000 0.050	Impervious Min.infi Impervious Lag const) "		
n	1.500	Impervious Depression		/		
п		0.282 2.093		0.000	c.m/sec"	
п	Ca	atchment 104	Pervious	Impervious	Total Area	
"		urface Area	1.170	1.430	2.600	hectare"
		ime of concentration	32.137	5.711	14.115	minutes"
		ime to Centroid	2737.280	2232.538	2393.050	minutes"
		ainfall depth ainfall volume	285.000 3334.50	285.000 4075.50	285.000 7410.00	mm" c.m"
		ainfall losses	139.558	29.801	79.192	mm"
"		unoff depth	145.442	255.199	205.808	mm''
		unoff volume	1701.67	3649.34	5351.01	c.m"
"	R	unoff coefficient	0.510	0.895	0.722	п
"		aximum flow	0.128	0.181	0.282	c.m/sec"
"	40 H	YDROGRAPH Add Runoff				
	4	Add Runoff "				
	C A C I	0.282 2.343	3 1.056	0.000"		
	64 SI 2	HOW TABLE" Flow hydrograph"				
	4	Inflow Hydrograph"				
"		aximum flow	2.34	43 c.m/s	ec"	
"		ydrograph volume	36808.88			
"		YDROGRAPH Copy to Out	flow"			
"	8	Copy to Outflow"				
		0.282 2.343		0.000"		
		YDROGRAPH Combine	1000"			
	6	Combine "				
	1000	Node #" Grand River"				
п	M	aximum flow	3.83	39 c.m/s	ec"	
		ydrograph volume	57703.93	•		
"		0.282 2.34		3.839"		
"	40 H	YDROGRAPH Confluence	e 1000"			
"	7	Confluence "				
"	1000	Node #"				
		Grand River"		,		
"	Ma	aximum flow	3.83	39 c.m/s	ec"	

	Hydrograph volume		57703.930	c.m"	
п	0.282	3.839	2.343	0.000"	
" 38	START/RE-START TO	TALS 1000	9"		
п	3 Runoff Totals	on EXIT"			
п	Total Catchment a	rea		36.330	hectare"
н	Total Impervious	area		4.437	hectare"
н	Total % imperviou	S		12.214"	
" 19	EXIT"				



APPENDIX D

Post-Development Conditions Stormwater Management Analysis



Active Storage Volume Calculations Wetland SWM Facility

Elevation (m)	Depth (m)	Pond Surface Area (m ²)	Perm. Pool (P.P) Volume (m ³)	Accum. P.P. Volume (m ³)	Pond Active Volume (m ³)	Accum. Active Volume (m ³)	_
455.70 455.80 455.90	0.00 0.10 0.20	4,716.0 5,931.0 6,277.0	0.0 532.4 610.4	0.0 532.4 1,142.7			P.P. Bottom
456.00	0.00	6,626.0	645.2	1,787.9	0.0	0.0	P.P. Top/Bottom of Storage
456.10	0.10	6,979.0			680.3	680.3	
456.20	0.20	7,335.0			715.7	1,395.9	
456.30	0.30	7,696.0			751.6	2,147.5	
456.40	0.40	8,063.0			787.9	2,935.4	
456.48	0.48	8,361.0			657.0	3,592.4	
456.50	0.50	8,436.0			168.0	3,760.4	DICB Lip
456.60	0.60	8,904.0			867.0	4,627.4	
456.70	0.70	9,344.0			912.4	5,539.8	
456.80	0.80	9,798.0			957.1	6,496.9	
456.90	0.90	10,270.0			1,003.4	7,500.3	
457.00	1.00	10,756.0			1,051.3	8,551.6	Weir Control
457.10	1.10	11,253.0			1,100.5	9,652.0	
457.20	1.20	11,769.0			1,151.1	10,803.1	
457.30	1.30	12,298.0			1,203.4	12,006.5	
457.40	1.40	13,083.0			1,269.0	13,275.5	Top of Pond
457.50	1.50	15,629.0			1,435.6	14,711.1	Overflow

	Knockout		600 mm Diameter Orifice					
INV	456.00	m	INV	455.48	m			
Q =	0.114	m³/s	Q =	0.986	m³/s			
Cd =	0.600		Cd =	0.600				
H =	1.3925	m	H =	1.72	m			
2g =	19.620		2g =	19.620				
A =	0.036	m²	A =	0.283	m²			
D =	0.215	m	D =	0.600	m			
200		FO0/	I dia da a una flavora fue					

3-600mm dia. pipes @ 0.50% will discharge flows from the stormwater management pond. Orifice flows will be multiplied by 3.

1200 mm x 1200 mm Ditch Inlet Outlet Structure Weir Flow OPSD 702.050

Elev	d1	h	н	2g	L	Qfront	Qback	Qsides	Qtotal	Q for 3 Structures
m	m	m	m		m	m³/s	m³/s	m³/s	m³/s	m³/s
456.50	0.50	0.50	0.00	19.62	1.20	0.000	0.000	0.000	0.000	0.000
456.60	0.60	0.50	0.10	19.62	1.20	0.054	0.000	0.018	0.072	0.217
456.70	0.70	0.50	0.20	19.62	1.20	0.157	0.000	0.072	0.230	0.689
456.80	0.80	0.50	0.30	19.62	1.20	0.297	0.000	0.174	0.470	1.411
456.90	0.90	0.50	0.40	19.62	1.20	0.467	0.053	0.367	0.834	2.501
457.00	1.00	0.50	0.50	19.62	1.20	0.664	0.153	0.639	1.304	3.911

These are the flows over the DICB Lip - once flows are equal to or exceed orifice flow, the SSD table switches to orifice flow.

Overflow Weir No. 1

d1	h	н	2g	L	Q
m	m	m		m	m³/s
1.00	1.00	0.00	19.62	47.50	0.00
1.10	1.00	0.10	19.62	47.50	2.09
1.20	1.00	0.20	19.62	47.50	6.02
1.30	1.00	0.30	19.62	47.50	11.25
1.40	1.00	0.40	19.62	47.50	17.60
1.50	1.00	0.50	19.62	47.50	24.95
	m 1.00 1.10 1.20 1.30 1.40	m m 1.00 1.00 1.10 1.00 1.20 1.00 1.30 1.00 1.40 1.00	m m 1.00 1.00 0.00 1.10 1.00 0.10 1.20 1.00 0.20 1.30 1.00 0.30 1.40 1.00 0.40	m m m 1.00 1.00 0.00 19.62 1.10 1.00 0.10 19.62 1.20 1.00 0.20 19.62 1.30 1.00 0.30 19.62 1.40 1.00 0.40 19.62	m m m 1.00 1.00 0.00 19.62 47.50 1.10 1.00 0.10 19.62 47.50 1.20 1.00 0.20 19.62 47.50 1.30 1.00 0.30 19.62 47.50 1.40 1.00 0.40 19.62 47.50

Overflow Weir No. 2

Elev	d1	h	н	2g	L	Q
m	m	m	m		m	m³/s
457.00	1.00	1.00	0.00	19.62	19.00	0.00
457.10	1.10	1.00	0.10	19.62	19.00	0.83
457.20	1.20	1.00	0.20	19.62	19.00	2.41
457.30	1.30	1.00	0.30	19.62	19.00	4.50
457.40	1.40	1.00	0.40	19.62	19.00	7.04
457.50	1.50	1.00	0.50	19.62	19.00	9.98

Overflow Weir No. 3

Elev	d1	h	н	2g	L	Q
m	m	m	m		m	m³/s
457.00	1.00	1.00	0.00	19.62	12.00	0.00
457.10	1.10	1.00	0.10	19.62	12.00	0.53
457.20	1.20	1.00	0.20	19.62	12.00	1.52
457.30	1.30	1.00	0.30	19.62	12.00	2.84
457.40	1.40	1.00	0.40	19.62	12.00	4.45
457.50	1.50	1.00	0.50	19.62	12.00	6.30

	Stage-Storage-Discharge Table										
Elevation	Stage	Storage	Knockout Control	Ditch Inlet	600mm Orifice Control	600mm Pipe Discharge	Overflow Weir No. 1	Overflow Weir No. 2	Overflow Weir No. 3	Actual Discharge	
(m)	(m)	(m ³)	210mm (m ³ /s)	3-Total (m ³ /s)	3-Total (m ³ /s)	3-Total (m ³ /s)	(m ³ /s)	(m³/s)	(m³/s)	(m ³ /s)	
456.00	0.00	0.0	0.000		0.000	0.000	0.000	0.000	0.000	0.000	Bottom of Storage
456.10	0.10	680.3	0.015		0.000	0.000	0.000	0.000	0.000	0.015	
456.20	0.20	1,395.9	0.029		0.000	0.000	0.000	0.000	0.000	0.029	
456.30	0.30	2,147.5	0.042		0.000	0.000	0.000	0.000	0.000	0.042	
456.40	0.40	2,935.4	0.052		0.000	0.000	0.000	0.000	0.000	0.052	
456.48	0.48	3,592.4	0.059		0.000	0.000	0.000	0.000	0.000	0.059	
456.50	0.50	3,760.4	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.060	DICB Lip
456.60	0.60	4,627.4	0.068	0.217	2.041	2.978	0.000	0.000	0.000	0.284	
456.70	0.70	5,539.8	0.074	0.689	2.162	3.201	0.000	0.000	0.000	0.763	
456.80	0.80	6,496.9	0.080	1.411	2.277	3.410	0.000	0.000	0.000	1.491	
456.90	0.90	7,500.3	0.086	2.501	2.386	3.607	0.000	0.000	0.000	2.386	
457.00	1.00	8,551.6	0.091	3.911	2.490	3.793	0.000	0.000	0.000	2.490	Weir
457.10	1.10	9,652.0	0.096		2.590	3.971	2.085	0.834	0.527	6.036	
457.20	1.20	10,803.1	0.101		2.686	4.141	6.018	2.407	1.520	12.632	
457.30	1.30	12,006.5	0.105		2.779	4.304	11.254	4.502	2.843	21.379	
457.40	1.40	13,275.5	0.110		2.869	4.461	17.603	7.041	4.447	31.960	Top of Pond
457.50	1.50	14,711.1	0.114		2.957	4.613	24.949	9.980	6.303	44.189	Overflow

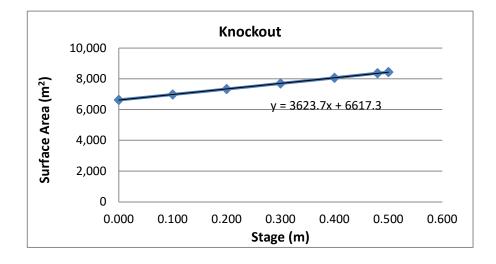
Notes:

1. The minimum of ditch inlet + knockout, orifice control and pipe discharge flow rate is used in the actual discharge calculation

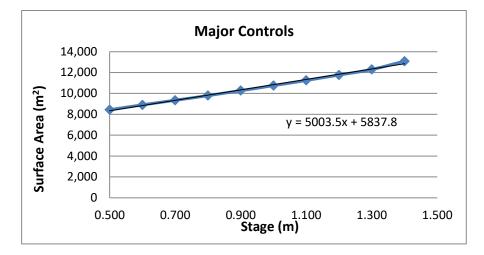
Design Storm	Level (m)	Flow	Weir No. 1 Flow (m ³ /s)	Weir No. 2 Flow (m³/s)	Total Weir Flow 1 and 2 (m ³ /s)	Remaining Flow to Linear Dispersion Trench (m ³ /s)
100-Year	457.093	5.771	1.939	0.776	2.715	3.056
Regional	457.012	2.808	0.250	0.100	0.350	2.458

Stormwater Management Pond Drawdown Calculations

Elevation	Stage	Surface area	
(m)	(m)	(m²)	
456.00	0.000	6,626	Knockout Invert
456.10	0.100	6,979	
456.20	0.200	7,335	
456.30	0.300	7,696	
456.40	0.400	8,063	
456.48	0.480	8,361	
456.50	0.500	8,436	DICB Lip
456.60	0.600	8,904	
456.70	0.700	9,344	
456.80	0.800	9,798	
456.90	0.900	10,270	
457.00	1.000	10,756	Weir Control
457.10	1.100	11,253	
457.20	1.200	11,769	
457.30	1.300	12,298	
457.40	1.400	13,083	Top of Pond
457.50	1.500	15,629	Overflow



Stormwater Management Pond Drawdown Calculations



 $t = \frac{0.66C_2h^{1.5} + 2C_3h^{0.5}}{2.75A_0}$

Eq. 4.11 (MOE, 2003)

I	Knockou	t	Ма	Major Controls			
Given: d =	0.215	m	Given: d =	0.600	m x 3		
A _o =	0.036	m	A _o =	0.848	m		
C ₂ =	3624		C ₂ =	5004			
C ₃ =	6617		C ₃ =	5838			

Storm	Ponding Elevation (m)	Knockout h (m)	Knockout Drawdown (hr)	Major Controls h (m)	Major Controls Drawdown (hr)	Total Drawdown (hr)
25mm	456.50	0.39	24.7	0.00	0.0	24.7
2-Year	456.59	0.39	24.7	0.09	0.4	25.1
5-Year	456.77	0.39	24.7	0.26	0.8	25.5
100-Year	457.09	0.39	24.7	0.59	1.3	26.0
Regional	457.01	0.39	24.7	0.51	1.1	25.8

Stormwater Management Facility

Forebay at Inlet 1 Sizing

Forebay Length =	34.0 m	(Dist)
Forebay Top Width =	11.0 m	
Active Forebay Depth =	1.0 m	(d)
Active Forebay Bottom Width =	5.0 m	
Approximate Permanent Forebay Pool Volume =	272 m ³	
Length Width Ratio =	3.1 :1	(r)
25 mm Storm Peak Flowrate =	0.060 m ³ /s	(Q25mm)
5 Year Storm Inflow Rate =	1.806 m ³ /s	(Q5)
		(40)
Desired Forebay Velocity =	0.500 m/s	(Vf)
Desired Settling Velocity (recommended) =	0.0003 m/s	(Vs)
Desired Settling Velocity (recommended) -	0.0003 11/5	(VS)
Settling Length		
Dist = ((r x Q25mm)/Vs)^.5 =	24.9 m	25mm
Forebay length (34 m) exceeds the settling length (24.9 m)	
Dispersion Length		
Dist = $(8 \times Q5)/(d \times Vf)$ =	28.9 m	5 Year
$Dist = (0 \times Q3)/(0 \times V1) =$	20.9 111	JTEar
Forebox longth (24 m) exceede dispersion longth (20.0 m)		
Forebay length (34 m) exceeds dispersion length (28.9 m)		
Elever Mala a Maria Elevelaria		
Flow Velocity in Forebay		
	8 m ²	
Cross-sectional Area =	-	
Cross-sectional Area (With Permanent Pool) =	11.75 m ²	A
Q5 =	1.806 m ³ /s	
Velocity = Q5/A =	0.15 m/s	5 Year

The average flow velocity through the forebay meets the allowable velocity of 0.15 m/s.

Stormwater Management Facility

Forebay at Inlet 2 Sizing

Forebay Length =	33.0 m	(Dist)
Forebay Top Width =	10.5 m	
Active Forebay Depth =	1.0 m	(d)
Active Forebay Bottom Width =	4.5 m	
Approximate Permanent Forebay Pool Volume =	247.5 m ³	
Length Width Ratio =	3.1 :1	(r)
25 mm Storm Peak Flowrate =	0.060 m ³ /s	(Q25mm)
5 Year Storm Inflow Rate =	0.462 m ³ /s	(Q5)
Desired Forebay Velocity =	0.500 m/s	(Vf)
Desired Settling Velocity (recommended) =	0.0003 m/s	(Vs)
Settling Length		
Dist = ((r x Q25mm)/Vs)^.5 =	25.1 m	25mm
Forebay length (33 m) exceeds the settling length (25.1 m).	
Dispersion Length		
Dist = $(8 \times Q5)/(d \times Vf)$ =	7.4 m	5 Year
Forebay length (33 m) exceeds dispersion length (7.4 m).		
Flow Velocity in Forebay		
Cross-sectional Area =	7.5 m ²	
Cross-sectional Area (With Permanent Pool) =	11.1 m ²	А
Q5 =	0.462 m ³ /s	
Velocity = Q5/A =	0.04 m/s	5 Year

The average flow velocity through the forebay meets the allowable velocity of 0.15 m/s.

Stormwater Management Facility

Forebay at Inlet 3 Sizing

Forebay Length =	38.5 m	(Dist)
Forebay Top Width =	14.5 m	
Active Forebay Depth =	1.0 m	(d)
Active Forebay Bottom Width =	8.5 m	
Approximate Permanent Forebay Pool Volume =	442.75 m ³	
Length Width Ratio =	2.7 :1	(r)
25 mm Storm Peak Flowrate =	0.060 m ³ /s	(Q25mm)
5 Year Storm Inflow Rate =	1.988 m ³ /s	(Q201111) (Q5)
	1.000 11/0	(00)
Desired Forebay Velocity =	0.500 m/s	(∨f)
Desired Settling Velocity (recommended) =	0.0003 m/s	(VI) (Vs)
Desired Setting Velocity (recommended) -	0.0003 11/5	(VS)
Settling Length		
Dist = ((r x Q25mm)/Vs)^.5 =	23.0 m	25mm
Forebay length (38.5 m) exceeds the settling length (23 m)		
Dispersion Length		
Dist = $(8 \times Q5)/(d \times Vf) =$	31.8 m	5 Year
Forebay length (38.5 m) exceeds dispersion length (31.8 m	n).	
Flow Velocity in Forebay		
Cross-sectional Area =	11.5 m ²	
Cross-sectional Area (With Permanent Pool) =	16.3 m ²	А
Q5 =	1.988 m ³ /s	
<u> </u>	1.300 11 /3	
Velocity = Q5/A =	0.12 m/s	5 Year
	0.12 11/3	01001

The average flow velocity through the forebay meets the allowable velocity of 0.15 m/s.

River's Edge Subdivision Town of Grand Valley File No. 104-104 Equalizing Pipe Calculation

Flow at Pond Inlets 1, 2 and 3

	Regional Storm (m ³ /s)	100 Year Storm (m ³ /s)	5 Year Storm (m ³ /s)	2 Year Storm (m ³ /s)	25mm Storm (m ³ /s)
Inlet 1	1.310	3.244	1.806	1.328	1.185
Inlet 2	0.325	0.979	0.462	0.323	0.334
Total 1 and 2	1.635	4.223	2.268	1.651	1.519
Inlet 3	1.153	3.416	1.988	1.490	1.375

Ponding Elevation (m) 457.01

	•
Regional Storm	457.01
100 Year Storm	457.09
5 Year Storm	456.77
2 Year Storm	456.59
25 mm Storm	456.5

1. Assume that the equalizing pipes act as an orifice, equalizing the flow between the two portions of the pond. The equalizing pipes must convey the greater of Inlet 1+2 flows or Inlet 3 flows.

2. Assume 3-900 mm diameter equalizing pipes installed in parallel at the bottom of permanent pool elevation.

Orifice	Regional St	orm		
INV	455.70	m		
			Q for 3 pipes	Greather than
Q =	1.568	m³/s	(m³/s)	(m³/s)
Cd =	0.600		4.704	1.635
H =	0.86	m		
2g =	19.620			
		0		
A =	0.636	m²		
D =	0.900	m		
0.10	400.34			
	e 100 Year St	orm		
	455 70			
INV	455.70	m		One of the are the are
			Q for 3 pipes	Greather than
Q =	1.639	m m ³ /s	(m ³ /s)	(m³/s)
Q = Cd =	1.639 0.600			
Q = Cd = H =	1.639 0.600 0.94		(m ³ /s)	(m³/s)
Q = Cd =	1.639 0.600	m ³ /s	(m ³ /s)	(m³/s)
Q = Cd = H = 2g =	1.639 0.600 0.94 19.620	m ³ /s m	(m ³ /s)	(m³/s)
Q = Cd = H =	1.639 0.600 0.94	m ³ /s	(m ³ /s)	(m³/s)

River's Edge Subdivision Town of Grand Valley File No. 104-104 Equalizing Pipe Calculation

Orifice 5 Year Storm INV 455.70 m

Q = Cd = H = 2g =	1.331 0.600 0.62 19.620	m ³ /s m	Q for 3 pipes (m³/s) 3.994	Greather than (m ³ /s) 2.268
A = D =	0.636 0.900	m² m		

Orifice 2 Year Storm

INV	455.70	m		
Q =	1.122	m ³ /s	Q for 3 pipes (m ³ /s)	Greather than (m ³ /s)
Cd =	0.600	111 / 5	3.365	1.651
H = 2g =	0.44 19.620	m		
A =	0.636	m ²		

Orifice 25mm Storm

0.900

m

D =

/s

Q for 3 pipes	Greather than
(m³/s)	(m³/s)
3.001	1.519

River's Edge Subdivision Town of Grand Valley File No: 104-104 Linear Dispersion Trench

Elevation	Depth	Surface	e Calculations Increase	Increase	Accum.	
(m)	(m)	Area (m²)	Stone Volume (m ³)	Storage Volume (m ³)	Storage Volume (m ³)	_
454.86	0.00	120.00	0.00	0.00	0.00	Bottom of Stone
454.96	0.10	120.00	12.00	4.00	4.00	
455.06	0.20	120.00	12.00	4.00	8.00	
455.16	0.30	120.00	12.00	4.00	12.00	
455.26	0.40	120.00	12.00	4.00	16.00	
455.36	0.50	120.00	12.00	4.00	20.00	Top of Stone/Weir
455.46	0.60	0.00	0.00	0.50	20.50	
455.56	0.70	0.00	0.00	0.50	21.00	
455.66	0.80	0.00	0.00	0.50	21.50	
			Overflow Weir			
Elev	d1	h	н	2g	L	Q
m	m	m	m	m/s ²	m	m³/s
455.36	0.50	0.50	0.00	19.62	38.00	0.00
455.46	0.60	0.50	0.10	19.62	38.00	1.70
455.56	0.70	0.50	0.20	19.62	38.00	4.98
455.66	0.80	0.50	0.30	19.62	38.00	9.39
E	оттом			SIDES		
L(dw) =	15.00	m	L(dw) =	15.00	m	

L(dw) =	15.00	m	L(dw) =	15.00	m
W(dw) =	8.00	m			
D(dw) =	0.50	m	D(dw) =	0.50	m
		2			
A(c) =	120.0	m²	A(c) =	15.0	sq m (both sides)
K -	1.00E-05	cm/s			
N -	1.000-00	011/5			

River's Edge Subdivision Town of Grand Valley File No: 104-104 Linear Dispersion Trench

Stage/Storage/Discharge Table

Stage (m)	Storage (m³)	Infiltration Discharge (m³/s)	Overflow Weir Discharge (m ³ /s)	Total Discharge (m³/s)	_
454.860	0.00	0.00000	0.00	0.000	Bottom of Stone
454.960	4.00	0.00001	0.00	0.000	
455.060	8.00	0.00001	0.00	0.000	
455.160	12.00	0.00001	0.00	0.000	
455.260	16.00	0.00001	0.00	0.000	
455.360	20.00	0.00001	0.00	0.000	Top of Stone/Weir
455.460	20.50	0.00001	1.70	1.702	
455.560	21.00	0.00001	4.98	4.979	
455.660	21.50	0.00001	9.39	9.395	

Interpolate for Flow to Wetland and Grand River

	Linear Dispersion Trench	Wetland	Grand River
Design Storm	Flow (m ³ /s)	Flow (m ³ /s)	Flow (m ³ /s)
25mm	0.060	0.024	0.036
2-Year	0.264	0.104	0.160
5-Year	1.235	0.488	0.747
100-Year	3.056	1.207	1.849
Regional	2.458	0.971	1.487

Notes:

1. Assumes that linear dispersion trench is flat and overflow is acting like a weir with three (3) sides (north, south and east)

2. Assumes that south side of linear dispersion trench discharges to the existing wetland. Wetland flow split is (15m / 38m = 39.5%)

п			MIDUSS Output>"
п			MIDUSS Version Version 2.25 rev. 473"
п			MIDUSS created Sunday, February 07, 2010"
п		10	Units used: ie METRIC"
п		10	Job folder: C:\Users\szaga\Documents\MIDUSS\104104"
п			Output filename: 104-104 post 002 year-Uncontrolled.out"
п			Licensee name: gmbp"
п			Company "
п			Date & Time last used: 2/21/2023 at 1:57:01 PM"
п	31	TI	IME PARAMETERS"
п	5-	5.000	Time Step"
п		180.000	Max. Storm length"
п		3600.000	Max. Hydrograph"
"	32		TORM Chicago storm"
п		1	Chicago storm"
		695.047	Coefficient A"
п		6.387	Constant B"
		0.793	Exponent C"
"			Fraction R"
п		180.000	Duration"
п		1.000	Time step multiplier"
"		Ma	aximum intensity 93.292 mm/hr"
"		Тс	otal depth 33.014 mm"
п		6	002hyd Hydrograph extension used in this file"
"	33	CA	ATCHMENT 302"
"		1	Triangular SCS"
п		1	Equal length"
		2	Horton equation"
		302	External lands and water tower"
"		55.000	% Impervious"
"		0.670	Total Area"
		30.000	Flow length"
		2.000	Overland Slope"
		0.302	Pervious Area"
		30.000	Pervious length"
		2.000	Pervious slope"
		0.368	Impervious Area"
		30.000	Impervious length"
		2.000	Impervious slope"
		0.250	Pervious Manning 'n'"
		75.000	Pervious Max.infiltration"
		5.000	Pervious Min.infiltration"
		0.250	Pervious Lag constant (hours)"
		5.000	Pervious Depression storage"
		0.015	Impervious Manning 'n'"
		0.000	Impervious Max.infiltration"
п		0.000 0.050	Impervious Min.infiltration" Impervious Lag constant (hours)"
		1.500	Impervious Depression storage"
		T. 200	0.072 0.000 0.000 0.000 c.m/sec"
			0.072 0.000 0.000 0.000 c.m/ sec

	40	5 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Catchment 302 Surface Area Time of concentration Time to Centroid Cainfall depth Cainfall volume Cainfall losses Cunoff depth Cunoff volume Cunoff coefficient Caximum flow MYDROGRAPH Add Runoff	Pervious 0.302 22.063 96.472 33.014 99.54 30.676 2.338 7.05 0.071 0.004	Impervious 0.368 2.281 86.938 33.014 121.66 2.000 31.014 114.28 0.939 0.072	Total Area 0.670 3.430 87.492 33.014 221.19 14.904 18.110 121.33 0.549 0.072	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
		4	Add Runoff "		0.000		
	22	<i>(</i>	0.072 0.07	2 0.000	0.000"		
	33	1	ATCHMENT 201" Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious"				
"		4.280	Total Area"				
"		200.000	Flow length"				
"		4.000	Overland Slope"				
"		0.428	Pervious Area"				
"		200.000	Pervious length"				
"		2.000	Pervious slope"				
		3.852	Impervious Area"				
		200.000	Impervious length"				
		2.000 0.250	Impervious slope" Pervious Manning 'n				
п		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
		5.000	Pervious Depression				
		0.015	Impervious Manning				
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi	ltration"			
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	•			
"			0.783 0.07			c.m/sec"	
"			atchment 201	Pervious		Total Area	
			Surface Area	0.428	3.852	4.280	hectare"
			ime of concentration	68.866	7.119	7.629	minutes"
			ime to Centroid	138.361	93.923	94.289	minutes"
			ainfall depth ainfall volume	33.014	33.014 1271.69	33.014 1412.99	mm"
			ainfall losses	141.30 30.669	12/1.69	4.580	c.m" mm"
			Runoff depth	2.345	31.333	28.434	mm"
"			Runoff volume	10.04	1206.95	1216.98	c.m"
			Runoff coefficient	0.071	0.949	0.861	"
		•					

... Maximum flow 0.002 0.782 0.783 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.783 0.855 0.000 0.000" н CATCHMENT 304" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... 304 External - Luther Rd." ... 55.000 % Impervious" ... 1.090 Total Area" ... Flow length" 110.000 ... Overland Slope" 2.000 ... 0.491 Pervious Area" ... Pervious length" 110.000 ... 2.000 Pervious slope" ... Impervious Area" 0.600 ... Impervious length" 110.000 ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'" ... 75.000 Pervious Max.infiltration" ... Pervious Min.infiltration" 5.000 ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... Impervious Min.infiltration" 0.000 ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.000 c.m/sec" 0.125 0.855 0.000 ... Catchment 304 п Pervious Impervious Total Area ... Surface Area 0.491 0.600 1.090 hectare" ... Time of concentration 48.109 4.973 7.458 minutes" Time to Centroid 119.817 90.843 92.512 minutes" ... Rainfall depth 33.014 33.014 33.014 mm" ... c.m" Rainfall volume 197.92 359.85 161.93 н Rainfall losses mm" 30.669 1.629 14.697 . Runoff depth 2.345 31.385 18.317 mm" ... Runoff volume 11.50 188.15 199.65 c.m" ... Runoff coefficient 0.071 0.951 0.555 ... Maximum flow 0.004 0.124 0.125 c.m/sec" ... HYDROGRAPH Add Runoff " 40 11 Add Runoff " 4 ... 0.000" 0.125 0.979 0.000 ... CATCHMENT 202" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 3" 202 ... 60.000 % Impervious"

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.511 0.979 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" . Time of concentration 53.181 5.498 7.765 minutes" ... Time to Centroid 91.560 93.119 124.334 minutes" ... mm" Rainfall depth 33.014 33.014 33.014 н c.m" Rainfall volume 822.04 548.03 1370.07 ... Rainfall losses 30.670 1.714 13.296 mm" ... 31.300 Runoff depth mm" 2.344 19.718 ... Runoff volume 38.92 779.36 818.28 c.m" ... н Runoff coefficient 0.071 0.948 0.597 ... Maximum flow 0.011 0.510 0.511 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.511 1.490 0.000 0.000" .. CATCHMENT 203" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... 203 Internal to Pond Inet 2" ... 60.000 % Impervious" ... 2.760 Total Area" ... Flow length" 30.000 ... 4.000 Overland Slope" ... 1.104 Pervious Area" ... 30.000 Pervious length" ... 2.000 Pervious slope" ... 1.656 Impervious Area" ... 30.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

 		75.000 5.000	Pervious Max.infilt Pervious Min.infilt						
		0.250	Pervious Lag consta						
п		5.000							
"		0.015	· •						
		0.000	Impervious Max.infi						
		0.000	Impervious Min.infi						
"		0.050	Impervious Lag cons)"				
"		1.500	Impervious Depressi		,				
"			0.323 1.49	-	0.000	c.m/sec"			
"		Ca	atchment 203	Pervious	Impervious	Total Area	п		
"		Su	ırface Area	1.104	1.656	2.760	hectare"		
"		Ti	me of concentration	22.063	2.281	3.227	minutes"		
"		Ti	me to Centroid	96.472	86.938	87.394	minutes"		
"		Ra	ainfall depth	33.014	33.014	33.014	mm"		
"		Ra	ainfall volume	364.47	546.71	911.18	c.m"		
"		Ra	ainfall losses	30.676	2.000	13.471	mm"		
"			noff depth	2.338	31.014	19.543	mm"		
"			inoff volume	25.81	513.58	539.40	c.m"		
"			noff coefficient	0.071	0.939	0.592	"		
"			aximum flow	0.016	0.322	0.323	c.m/sec"		
	40		DROGRAPH Add Runoff	"					
		4	Add Runoff "						
			0.323 1.81	3 0.000	0.000"				
	33		ATCHMENT 303"						
		1	Triangular SCS"						
		1	Equal length"						
		2	Horton equation"						
		303 55.000	External" % Impervious"						
п		3.550	Total Area"						
		140.000	Flow length"						
		2.000	Overland Slope"						
		1.597	Pervious Area"						
п		140.000	Pervious length"						
"		2.000	Pervious slope"						
"		1.952	Impervious Area"						
"		140.000	Impervious length"						
"		2.000	Impervious slope"						
"		0.250	Pervious Manning 'n	1.11					
"		75.000	Pervious Max.infilt	ration"					
"		5.000	Pervious Min.infilt	ration"					
"		0.250	Pervious Lag consta	nt (hours)"					
"		5.000	Pervious Depression	storage"					
"		0.015	Impervious Manning						
"		0.000	Impervious Max.infi						
"		0.000	Impervious Min.infi						
		0.050	Impervious Lag cons	•)"				
		1.500	Impervious Depressi	-					
"			0.397 1.81	3 0.000	0.000	c.m/sec"			

	40		Catchment 303 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff volume Runoff coefficient Maximum flow HYDROGRAPH Add Runoff	Pervious 1.597 55.599 126.518 33.014 527.40 30.669 2.345 37.47 0.071 0.011	Impervious 1.952 5.748 91.941 33.014 644.59 1.730 31.284 610.81 0.948 0.397	Total Area 3.550 8.629 93.939 33.014 1171.99 14.752 18.261 648.28 0.553 0.397	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
"		4					
"	~ ~		0.397 2.21	0 0.000	0.000"		
	33		CATCHMENT 204"				
		1	Triangular SCS"				
		1 2	Equal length" Horton equation"				
		204	Park"				
"		10.000	% Impervious"				
"		2.090	Total Area"				
"		140.000	Flow length"				
"		2.000	Overland Slope"				
"		1.881	Pervious Area"				
"		140.000	Pervious length"				
"		2.000	Pervious slope"				
"		0.209	Impervious Area"				
"		140.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta Pervious Depression				
		5.000 0.015	-	•			
		0.000	Impervious Max.infi				
		0.000	Impervious Min.infi				
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depressi				
"			0.043 2.21	•	0.000	c.m/sec"	
"			Catchment 204	Pervious		Total Area	"
"			Surface Area	1.881	0.209	2.090	hectare"
"		·	Time of concentration	55.599	5.748	25.832	minutes"
"			Time to Centroid	126.518	91.941	105.871	minutes"
"			Rainfall depth	33.014	33.014	33.014	mm"
"			Rainfall volume	620.99	69.00	689.99	c.m"
"			Rainfall losses	30.669	1.730	27.775	mm"
			Runoff depth	2.345	31.284	5.239	mm"
			Runoff volume	44.12	65.38	109.50	c.m"
			Runoff coefficient	0.071	0.948	0.159	

"			ximum flow	0.013	0.042	0.043	c.m/sec"
	40	HY	DROGRAPH Add Runoff	п			
"		4	Add Runoff "				
			0.043 2.2	54 0.000	0.000"		
	33		TCHMENT 301"				
		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
		301	Scott Street Exter	nal"			
		55.000	% Impervious"				
		2.600	Total Area"				
		95.000	Flow length"				
		2.000	Overland Slope"				
		1.170	Pervious Area"				
		95.000 2.000	Pervious length"				
		1.430	Pervious slope" Impervious Area"				
		95.000	Impervious Area Impervious length"				
п		2.000	Impervious slope"				
		0.250	Pervious Manning '	n'"			
		75.000	Pervious Max.infil				
п		5.000	Pervious Min.infil				
		0.250	Pervious Lag const				
		5.000	Pervious Depressio				
		0.015	Impervious Manning	-			
"		0.000	Impervious Max.inf				
		0.000	Impervious Min.inf				
		0.050	Impervious Lag con)"		
		1.500	Impervious Depress				
"			0.300 2.2	54 0.000	0.000	c.m/sec"	
		Ca	tchment 301	Pervious	Impervious	Total Area	
"		Su	rface Area	1.170	1.430	2.600	hectare"
		Ti	me of concentration	44.058	4.555	6.834	minutes"
		Ti	me to Centroid	116.161	90.239	91.735	minutes"
			infall depth	33.014	33.014	33.014	mm"
"			infall volume	386.26	472.10	858.36	c.m"
"			infall losses	30.671	1.703	14.738	mm"
"			noff depth	2.343	31.311	18.275	mm"
"			noff volume	27.41	447.75	475.16	c.m"
			noff coefficient	0.071	0.948	0.554	
			ximum flow	0.009	0.299	0.300	c.m/sec"
	40		DROGRAPH Add Runoff				
		4	Add Runoff "				
	22	C 1	0.300 2.5	54 0.000	0.000"		
	33		TCHMENT 205"				
		1	Triangular SCS"				
		1 2	Equal length"				
		2 205	Horton equation" Internal to Pond I	not 1"			
		65.000	% Impervious"				
		00.000					

... 4.320 Total Area" ... Flow length" 100.000 н 4.000 Overland Slope" ... 1.512 Pervious Area" ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... Impervious length" 100.000 ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.587 2.554 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 205 Pervious ... Surface Area 1.512 2.808 4.320 hectare" . Time of concentration 45.435 4.697 6.274 minutes" ... Time to Centroid 90.442 117.422 91.487 minutes" ... mm" Rainfall depth 33.014 33.014 33.014 н 1426.20 c.m" Rainfall volume 927.03 499.17 ... Rainfall losses 30.669 1.666 11.817 mm" ... Runoff depth 31.347 21.197 mm" 2.345 ... Runoff volume 35.46 880.24 915.69 c.m" ... н Runoff coefficient 0.071 0.950 0.642 ... Maximum flow 0.012 0.586 0.587 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.587 3.141 0.000 0.000" .. CATCHMENT 206" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... Pond" 206 ... 80.000 % Impervious" ... 3.290 Total Area" ... Flow length" 100.000 ... 4.000 Overland Slope" ... 0.658 Pervious Area" п 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.632 Impervious Area" ... 100.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

		75.000 5.000 0.250 5.000 0.015 0.000	Pervious Max.infilt Pervious Min.infilt Pervious Lag consta Pervious Depression Impervious Manning Impervious Max.infi	ration" nt (hours)" storage" 'n'" ltration"			
		0.000	Impervious Min.infi		\ II		
		0.050	Impervious Lag cons				
		1.500	Impervious Depressi	-		c	
		C -	0.550 3.14 tchment 206	1 0.000 Pervious		c.m/sec" Total Area	
			irface Area	0.658	2.632	3.290	hectare"
			me of concentration		4.697	5.445	minutes"
			me to Centroid	117.422	90.442	90.937	minutes"
			infall depth	33.014	33.014	33.014	mm"
			infall volume	217.23	868.92	1086.15	c.m"
"			infall losses	30.669	1.666	7.467	mm"
"		Ru	noff depth	2.345	31.347	25.547	mm"
"		Ru	noff volume	15.43	825.06	840.49	c.m"
"		Ru	noff coefficient	0.071	0.950	0.774	
"		-	ximum flow	0.005	0.549	0.550	c.m/sec"
"	40	HY	DROGRAPH Add Runoff				
"		4	Add Runoff "				
"			0.550 3.69	1 0.000	0.000"		
	33		TCHMENT 200"				
		1	Triangular SCS"				
		1 2	Equal length"				
		200	Horton equation" Rear yard and Open	Space to Cp	and Pivon"		
		10.000	% Impervious"	space to di	and KIVEP		
		7.530	Total Area"				
		100.000	Flow length"				
"		5.000	Overland Slope"				
"		6.777	Pervious Area"				
"		100.000	Pervious length"				
"		2.000	Pervious slope"				
"		0.753	Impervious Area"				
"		100.000	Impervious length"				
"		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
п		5.000	Pervious Depression	-			
		0.015 0.000	Impervious Manning Impervious Max.infi				
п		0.000	Impervious Max.Infi Impervious Min.infi				
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depressi	•	•		
п			0.162 3.69	-		c.m/sec"	

п	Catchment 200	Pervious	Impervious	Total An	rea "
н	Surface Area	6.777	0.753	7.530	hectare"
u –	Time of concentration	45.435	4.697	21.089	minutes"
u –	Time to Centroid	117.422	90.442	101.298	minutes"
п	Rainfall depth	33.014	33.014	33.014	mm"
п	Rainfall volume	2237.35	248.59	2485.94	c.m"
"	Rainfall losses	30.669	1.666	27.769	mm"
"	Runoff depth	2.345	31.347	5.245	mm"
"	Runoff volume	158.93	236.05	394.97	c.m"
	Runoff coefficient	0.071	0.950	0.159	п
	Maximum flow	0.053	0.157	0.162	c.m/sec"
" 40	HYDROGRAPH Add Runoff	11			
	4 Add Runoff "				
"	0.162 3.852	2 0.000	0.000"		
" 38	START/RE-START TOTALS	200"			
п	3 Runoff Totals on EX	IT"			
п	Total Catchment area		36	.330 ł	hectare"
п	Total Impervious area		18	.751 ł	hectare"
п	Total % impervious		51	.612"	
" 19	EXIT"				

		MIDUSS Output>"
		MIDUSS Version Version 2.25 rev. 473"
		MIDUSS created Sunday, February 07, 2010"
п	10	Units used: ie METRIC"
	10	Job folder: C:\Users\szaga\Documents\MIDUSS\104104"
п		Output filename: 104-104 post 005 year-Uncontrolled.out"
		Licensee name:gmbp"
п		Company "
п		Date & Time last used: 2/21/2023 at 1:57:33 PM"
" 31	т	IME PARAMETERS"
"	5.000	Time Step"
п	180.000	Max. Storm length"
	3600.000	Max. Hydrograph"
" 32		TORM Chicago storm"
"	1	Chicago storm"
п	1459.072	Coefficient A"
п	13.690	
н	0.850	
н		Fraction R"
п	180.000	Duration"
п	1.000	Time step multiplier"
		aximum intensity 113.586 mm/hr"
н		otal depth 49.792 mm"
н	6	005hyd Hydrograph extension used in this file"
" 33		ATCHMENT 302"
"	1	Triangular SCS"
п	1	Equal length"
п	2	Horton equation"
п	302	External lands and water tower"
н	55.000	% Impervious"
	0.670	Total Area"
	30.000	Flow length"
	2.000	Overland Slope"
"	0.302	Pervious Area"
"	30.000	Pervious length"
п	2.000	Pervious slope"
п	0.368	Impervious Area"
н	30.000	Impervious length"
н	2.000	Impervious slope"
	0.250	Pervious Manning 'n'"
	75.000	Pervious Max.infiltration"
"	5.000	Pervious Min.infiltration"
	0.250	Pervious Lag constant (hours)"
п	5.000	Pervious Depression storage"
	0.015	Impervious Manning 'n'"
	0.000	Impervious Max.infiltration"
н	0.000	Impervious Min.infiltration"
	0.050	Impervious Lag constant (hours)"
	1.500	Impervious Depression storage"
"		0.104 0.000 0.000 0.000 c.m/sec"

	40	S T R R R R R R R M	atchment 302 urface Area ime of concentration ime to Centroid ainfall depth ainfall volume ainfall losses unoff depth unoff volume unoff coefficient aximum flow YDROGRAPH Add Runoff	Pervious 0.302 14.420 100.204 49.792 150.12 32.852 16.939 51.07 0.340 0.028	Impervious 0.368 2.108 85.724 49.792 183.48 2.224 47.568 175.29 0.955 0.095	Total Area 0.670 4.886 88.991 49.792 333.60 16.007 33.785 226.36 0.679 0.104	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m" " c.m/sec"</pre>
	40	4	Add Runoff "				
"		·	0.104 0.10	4 0.000	0.000"		
"	33	C	ATCHMENT 201"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious"				
		4.280	Total Area"				
		200.000	Flow length"				
		4.000	Overland Slope"				
		0.428	Pervious Area"				
		200.000	Pervious length"				
		2.000	Pervious slope"				
		3.852 200.000	Impervious Area" Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
"		0.250	Pervious Lag consta				
"		5.000	Pervious Depression				
"		0.015	Impervious Manning	•			
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi	ltration"			
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	•			
"			1.019 0.10			c.m/sec"	
"			atchment 201	Pervious		Total Area	
		-	urface Area	0.428	3.852	4.280	hectare"
			ime of concentration	45.009	6.580	8.036	minutes"
			ime to Centroid	135.435	91.865	93.515	minutes"
			ainfall depth	49.792	49.792	49.792	mm"
			ainfall volume	213.11	1917.98	2131.08	c.m"
			ainfall losses unoff depth	32.839 16.953	1.944 47.847	5.034	mm" mm"
			unoff volume	72.56	47.847 1843.08	44.758 1915.64	mm c.m"
			unoff coefficient	72.56 0.340	0.961	0.899	C.m
		n		0.0+0	0.001	0.055	

"	40		ximum flow	0.018		1.018	1.019	c.m/sec"
п	40	_	DROGRAPH Add Runc Add Runoff "	ОТТ				
		4		1.124	0.000	0.000"		
	33	CV.	TCHMENT 304"	1.124	0.000	0.000		
		1	Triangular SCS"					
		1	Equal length"					
		2	Horton equation'					
		304	External - Luthe					
		55.000	% Impervious"	1 1.0.				
		1.090	Total Area"					
		110.000	Flow length"					
		2.000	Overland Slope"					
"		0.491	Pervious Area"					
		110.000	Pervious length'	•				
"		2.000	Pervious slope"					
"		0.600	Impervious Area'	•				
"		110.000	Impervious lengt	th"				
"		2.000	Impervious slope	≥"				
"		0.250	Pervious Manning	g 'n'"				
"		75.000	Pervious Max.inf	Filtration	"			
"		5.000	Pervious Min.in					
		0.250	Pervious Lag cor					
		5.000	Pervious Depress		ge"			
		0.015	Impervious Manni	-				
		0.000	Impervious Max.					
		0.000	Impervious Min.					
		0.050 1.500	Impervious Lag o)		
		1.300	Impervious Depre 0.169	1.124	0.000	0 000	.m/sec"	
		Ca	tchment 304	Pervi		Impervious		
			rface Area	0.491		0.600	1.090	hectare"
			me of concentrati			4.597	10.620	minutes"
			me to Centroid	119.8		89.191	96.060	minutes"
"			infall depth	49.79		49.792	49.792	mm"
"			infall volume	244.2		298.50	542.73	c.m"
"		Ra	infall losses	32.85	3	1.876	15.816	mm"
"		Ru	noff depth	16.93	9	47.916	33.976	mm"
"		Ru	noff volume	83.09	1	287.25	370.34	c.m"
"		Ru	noff coefficient	0.340)	0.962	0.682	
			ximum flow	0.027		0.165	0.169	c.m/sec"
"	40	HYI	DROGRAPH Add Rund	off "				
"		4	Add Runoff "					
"				1.293	0.000	0.000"		
	33		TCHMENT 202"					
		1	Triangular SCS"					
		1	Equal length"	1				
		2 202	Horton equation					
		202 60.000	Internal to Pond % Impervious"	THEC 2				
		00.000						

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.695 1.293 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" . Time of concentration 34.758 5.082 10.733 minutes" ... Time to Centroid 96.253 123.626 89.815 minutes" ... mm" Rainfall depth 49.792 49.792 49.792 н 1239.81 2066.36 c.m" Rainfall volume 826.54 ... Rainfall losses 32.847 1.767 14.199 mm" ... Runoff depth 16.945 48.025 35.593 mm" Runoff volume 281.29 1195.82 1477.11 c.m" ... н Runoff coefficient 0.340 0.965 0.715 ... Maximum flow 0.083 0.684 0.695 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.695 1.988 0.000 0.000" .. CATCHMENT 203" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... 203 Internal to Pond Inet 2" ... 60.000 % Impervious" ... 2.760 Total Area" ... Flow length" 30.000 ... 4.000 Overland Slope" ... 1.104 Pervious Area" ... 30.000 Pervious length" ... 2.000 Pervious slope" ... 1.656 Impervious Area" ... 30.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

 	75.00 5.00 0.2 5.00	00 50 00	Pervious Ma Pervious Mi Pervious La Pervious De	n.infiltr g constar pression	ration" nt (hours)" storage"			
	0.0	15	Impervious	Manning '	'n'"			
"	0.0		Impervious					
"	0.0		Impervious					
"	0.0		Impervious)"		
	1.50	00	Impervious		-			
		<u> </u>	0.462	1.988			c.m/sec"	
			chment 203		Pervious		Total Area	
			face Area		1.104	1.656	2.760	hectare"
			e of concen		14.420	2.108	4.470	minutes"
			e to Centro		100.204	85.724	88.502	minutes"
			nfall depth		49.792	49.792	49.792	mm"
			nfall volum nfall losse		549.70	824.55	1374.25	c.m" mm"
			off depth	5	32.852 16.939	2.224 47.568	14.475 35.316	mm"
п			off volume		187.01	787.72	974.73	c.m"
			off coeffic	iont	0.340	0.955	0.709	"
п			imum flow	ICHC	0.103	0.429	0.462	c.m/sec"
"	40		ROGRAPH Add	Runoff '		0.125	0.102	c • m/ 5cc
"			Add Runoff					
"			0.462	2.450	0.000	0.000"		
"	33	CAT	CHMENT 303"					
"		1	Triangular	SCS"				
"			Equal lengt					
"		2	Horton equa	tion"				
"	30	03	External"					
"	55.00	00	% Imperviou	s"				
"	3.5	50	Total Area"					
"	140.00		Flow length					
"	2.00		Overland Sl	-				
	1.59		Pervious Ar					
	140.00		Pervious le	-				
	2.00		Pervious sl	-				
	1.9		Impervious					
	140.00		Impervious	•				
	2.0		Impervious					
	0.2		Pervious Ma	•				
	75.00 5.00		Pervious Ma Pervious Mi					
	0.2		Pervious La					
	5.0		Pervious La	-				
	0.0		Impervious De		•			
	0.0		Impervious	-				
п	0.0		Impervious					
"	0.0		Impervious)"		
"	1.50		Impervious	-		•		
"			. 0.544	2.450	-	0.000	c.m/sec"	

<pre></pre>		40		Catchment 303 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff volume Runoff coefficient Maximum flow HYDROGRAPH Add Runoff	Pervious 1.597 36.338 125.451 49.792 795.42 32.839 16.953 270.82 0.340 0.078	Impervious 1.952 5.313 90.132 49.792 972.18 1.757 48.035 937.88 0.965 0.534	Total Area 3.550 12.264 98.045 49.792 1767.60 15.744 34.048 1208.71 0.684 0.544	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
0.344 2.595 0.000 0.000 33 CATCHMENT 204" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 204 Park" 10.000 % Impervious" 2 10.000 % Impervious" 2.990 Total Area" 40.000 140.000 Pervious length" 2.000 Overland Slope" 40.000 1.881 Pervious Area" 40.000 140.000 Impervious length" 2.000 Impervious slope" 40.250 Pervious Manning 'n'" 2.000 Impervious length" 2.000 Impervious length" 40.000 Impervious length" * 0.250 Pervious Manning 'n'" 5.000 Pervious Manning 'n'" * 0.050 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" * 0.015 Impervious Manning 'n'" 40.000 Impervious Max.infiltration" * 0.000 Impervious Max.infiltration" 40.000 Impervious Lag constant (hours)" * 0.155 Impervious Lag constant (hours)" 5.000 Pervious Lag constant (hours)" * 0.000 Impervious Min.infiltration" 6.000 c.m/sec" * 0.103 2.993 0.000 0.0000 c.m/sec" <td< td=""><td>"</td><td></td><td>4</td><td>Add Runoff "</td><td></td><td></td><td></td><td></td></td<>	"		4	Add Runoff "				
<pre>" 1 Triangular SCS" " 1 Equal length" 2 Horton equation" 204 Park" 10.000 % Impervious" 2.090 Total Area" 140.000 Flow length" 2.000 Overland Slope" 140.000 Pervious Area" 140.000 Pervious slope" 0.209 Impervious slope" 0.209 Impervious slope" 0.209 Impervious Manning 'n'" 2.000 Impervious Manning 'n'" 3.000 Pervious Depression storage" 0.151 Impervious Manning 'n'" 0.050 Impervious Manninfiltration" 0.250 Pervious Manning 'n'" 0.060 Impervious Manninfiltration" 0.153 Quervious Manninfiltration" 0.163 Quervious Intervious Intervious</pre>	"				3 0.000	0.000"		
<pre> Intrangular SCS Interpretain i</pre>		33		CATCHMENT 204"				
<pre>" 2 Horton equation" " 204 Park" " 10.000 % Impervious" " 2.090 Total Area" " 140.000 Flow length" " 2.000 Overland Slope" " 1.881 Pervious Area" " 140.000 Pervious length" " 2.000 Pervious slope" " 0.209 Impervious Area" " 140.000 Impervious length" " 2.000 Impervious Slope" " 0.209 Impervious Slope" " 0.209 Impervious Slope" " 0.209 Impervious Area" " 140.000 Impervious Slope" " 0.209 Pervious Max.infiltration" " 5.000 Pervious Max.infiltration" " 5.000 Pervious Max.infiltration" " 0.050 Pervious Max.infiltration" " 0.060 Impervious Max.infiltration" " 0.000 Impervious Max.infiltration" " 0.000 Impervious Max.infiltration" " 0.015 Impervious Max.infiltration" " 0.000 Impervious Amaxing 'n" " Runfall depth 49.792 49.792 2.090 hectare" " Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 3</pre>				-				
204 Park" 10.000 % Impervious" 2.090 Total Area" 140.000 Flow length" 2.000 Overland Slope" 1.881 Pervious Area" 140.000 Pervious Area" 140.000 Pervious Area" 140.000 Pervious Slope" 0.209 Impervious Area" 140.000 Impervious Area" 140.000 Impervious Area" 140.000 Impervious Area" 2.000 Impervious Area" 140.000 Impervious Area" 2.000 Impervious Area" 140.000 Impervious Area" 2.000 Impervious Area" 0.250 Pervious Amning 'n'" 5.000 Pervious Max.infiltration" 0.500 Pervious Max.infiltration" 0.0250 Pervious Max.infiltration" 0.0260 Impervious Max.infiltration" 0.027 0.080 Impervious Max.infiltration" 0.050 Impervious Max.infiltration" 0.060 Impervious Max.infi								
<pre> 10.000 % Impervious" 10.000 % Impervious" 2.090 Total Area" 140.000 Flow length" 2.000 Overland Slope" 1.881 Pervious Area" 140.000 Pervious length" 2.000 Pervious slope" 0.209 Impervious Area" 140.000 Impervious Area" 0.209 Impervious slope" 0.209 Pervious Manning 'n'" 2.000 Pervious Max.infiltration" 2.000 Pervious Max.infiltration" 2.000 Pervious Depression storage" 0.015 Impervious Man.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.060 Impervious Max.infiltration" 0.010 Impervious Max.infiltration" 0.020 Pervious Max.infiltration" 0.010 Impervious Max.infiltration" 0.050 Impervious Max.infiltration" 0.060 Impervious Depression storage" 0.103 2.993 0.000 0.000 c.m/sec" 0.103 2.993 0.000 0.000 c.m/sec" 1.500 Impervious Depression storage" 0.103 2.993 0.000 0.000 c.m/sec" 1.500 Impervious Depression storage 1.500 Impervious Depression s</pre>				-				
<pre>" 2.090 Total Area" " 140.000 Flow length" " 2.000 Overland Slope" " 1.881 Pervious Area" " 140.000 Pervious length" " 2.000 Pervious slope" " 0.209 Impervious Area" " 140.000 Impervious length" " 2.000 Impervious slope" " 0.250 Pervious Manning 'n'" " 75.000 Pervious Max.infiltration" " 0.250 Pervious Max.infiltration" " 0.250 Pervious Lag constant (hours)" " 5.000 Pervious Depression storage" " 0.103 2.993 0.000 0.000 c.m/sec" " 0.103 2.993 0.000 0.000 c.m/sec"" " Catchment 204 Pervious Impervious Total Area " " Surface Area 1.881 0.209 2.090 hectare" " Catchment 204 Pervious Impervious Total Area " " Surface Area 1.881 0.209 2.090 hectare" " Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm"</pre>								
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"0.050 Impervious Lag constant (hours)" "1.500 Impervious Depression storage" "0.103 2.993 0.000 0.000 c.m/sec" "Catchment 204 Pervious Impervious Total Area " "Surface Area 1.881 0.209 2.090 hectare" "Ime of concentration 36.338 5.313 28.909 minutes" "Ime to Centroid 125.451 90.132 116.994 minutes" "Rainfall depth 49.792 49.792 49.792 mm" "Rainfall volume 936.58 104.06 1040.65 c.m" "Rainfall losses 32.839 1.757 29.731 mm" "Runoff depth 16.953 48.035 20.061 mm" "Runoff volume 318.89 100.39 419.28 c.m"				-				
" 1.500 Impervious Depression storage" " 0.103 2.993 0.000 0.000 c.m/sec" " Catchment 204 Pervious Impervious Total Area " " Surface Area 1.881 0.209 2.090 hectare" " Surface Area 1.881 0.209 2.090 hectare" " Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"				•		、		
1.500 Impervious Depression storage 0.103 2.993 0.000 0.000 c.m/sec" Catchment 204 Pervious Impervious Total Area " Surface Area 1.881 0.209 2.090 hectare" Time of concentration 36.338 5.313 28.909 minutes" Time to Centroid 125.451 90.132 116.994 minutes" Rainfall depth 49.792 49.792 49.792 mm" Rainfall loepth 936.58 104.06 1040.65 c.m" Rainfall losses 32.839 1.757 29.731 mm" Runoff depth 16.953 48.035 20.061 mm" Runoff volume 318.89 100.39 419.28 c.m")		
" Catchment 204 Pervious Impervious Total Area " " Surface Area 1.881 0.209 2.090 hectare" " Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"			1.500		•	0 000	- m/coc"	
" Surface Area 1.881 0.209 2.090 hectare" " Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"								п
" Time of concentration 36.338 5.313 28.909 minutes" " Time to Centroid 125.451 90.132 116.994 minutes" " Rainfall depth 49.792 49.792 49.792 mm" " Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"						•		
"Time to Centroid125.45190.132116.994minutes""Rainfall depth49.79249.79249.792mm""Rainfall volume936.58104.061040.65c.m""Rainfall losses32.8391.75729.731mm""Runoff depth16.95348.03520.061mm""Runoff volume318.89100.39419.28c.m"								
" Rainfall depth 49.792 49.792 49.792 mm" " Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"								
" Rainfall volume 936.58 104.06 1040.65 c.m" " Rainfall losses 32.839 1.757 29.731 mm" " Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"								
Rainfall losses 32.839 1.757 29.731 mm" "Runoff depth 16.953 48.035 20.061 mm" "Runoff volume 318.89 100.39 419.28 c.m"	n			•				
" Runoff depth 16.953 48.035 20.061 mm" " Runoff volume 318.89 100.39 419.28 c.m"	n							
RUNOTT VOLUME 318.89 100.39 419.28 C.M	п			Runoff depth				
" Runoff coefficient 0.340 0.965 0.403 "	п			Runoff volume	318.89	100.39	419.28	c.m"
	"			Runoff coefficient	0.340	0.965	0.403	"

"			ximum flow	0.092	0.057	0.103	c.m/sec"
	40		DROGRAPH Add Runoff				
		4	Add Runoff "				
	22	C A	0.103 3.06	2 0.000	0.000"		
	33		TCHMENT 301"				
		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"	~ 1 "			
		301	Scott Street Extern	aī			
		55.000	% Impervious"				
		2.600	Total Area"				
		95.000	Flow length"				
		2.000 1.170	Overland Slope" Pervious Area"				
		95.000	Pervious length"				
		2.000	Pervious slope"				
		1.430	Impervious Area"				
		95.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
		5.000	Pervious Depression				
		0.015	Impervious Manning	-			
		0.000	Impervious Max.infi				
		0.000	Impervious Min.infi				
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depressi				
"			0.405 3.06	•	0.000	c.m/sec"	
"		Ca	tchment 301	Pervious		Total Area	п
"		Su	rface Area	1.170	1.430	2.600	hectare"
"		Ti	me of concentration	28.795	4.210	9.735	minutes"
"		Ti	me to Centroid	116.746	88.669	94.978	minutes"
		Ra	infall depth	49.792	49.792	49.792	mm"
"		Ra	infall volume	582.56	712.02	1294.58	c.m"
		Ra	infall losses	32.859	1.996	15.884	mm"
"		Ru	noff depth	16.933	47.796	33.908	mm"
"		Ru	noff volume	198.12	683.48	881.60	c.m"
"		Ru	noff coefficient	0.340	0.960	0.681	п
		Ма	ximum flow	0.068	0.395	0.405	c.m/sec"
	40	HY	DROGRAPH Add Runoff				
		4	Add Runoff "				
			0.405 3.46	7 0.000	0.000"		
	33	CA	TCHMENT 205"				
"		1	Triangular SCS"				
		1	Equal length"				
"		2	Horton equation"				
		205	Internal to Pond In	et 1"			
		65.000	% Impervious"				

... 4.320 Total Area" ... Flow length" 100.000 н 4.000 Overland Slope" ... 1.512 Pervious Area" ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... Impervious length" 100.000 ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.788 3.467 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 205 Pervious ... Surface Area 1.512 2.808 4.320 hectare" . Time of concentration 29.695 4.341 8.402 minutes" ... Time to Centroid 93.486 117.798 88.850 minutes" ... mm" Rainfall depth 49.792 49.792 49.792 н c.m" Rainfall volume 752.85 1398.15 2151.00 ... Rainfall losses 32.840 1.920 12.742 mm" ... Runoff depth 16.952 47.871 37.050 mm" Runoff volume 256.32 1344.23 1600.55 c.m" ... н Runoff coefficient 0.340 0.961 0.744 ... Maximum flow 0.086 0.775 0.788 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.788 4.256 0.000 0.000" .. CATCHMENT 206" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... Pond" 206 ... 80.000 % Impervious" ... 3.290 Total Area" ... Flow length" 100.000 ... 4.000 Overland Slope" ... 0.658 Pervious Area" п 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.632 Impervious Area" ... 100.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

		75.000 5.000 0.250 5.000 0.015 0.000 0.000	Pervious Max.infil Pervious Min.infil Pervious Lag const Pervious Depressio Impervious Manning Impervious Max.inf Impervious Min.inf	tration" ant (hours)" n storage" 'n'" iltration"			
		0.050	Impervious Lag con		. <i>۲</i> . ۳		
		1.500	Impervious Depress	•	•		
		1.900	0.732 4.2	-		c.m/sec"	
		Ca	atchment 206	Pervious		Total Area	н
			urface Area	0.658	2.632	3.290	hectare"
п			ime of concentration		4.341	6.403	minutes"
			ime to Centroid	117.798	88.850	91.205	minutes"
			ainfall depth	49.792	49.792	49.792	mm"
			ainfall volume	327.63	1310.52	1638.15	c.m"
			ainfall losses	32.840	1.920	8.104	mm"
			unoff depth	16.952	47.871	41.688	 mm''
			noff volume	111.55	1259.97	1371.52	c.m"
			unoff coefficient	0.340	0.961	0.837	"
			aximum flow	0.038	0.726	0.732	c.m/sec"
"	40	-	/DROGRAPH Add Runoff				,
		4	Add Runoff "				
"			0.732 4.9	88 0.000	0.000"		
"	33	CA	ATCHMENT 200"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		200	Rear yard and Open	Space to Gr	and River"		
"		10.000	% Impervious"				
		7.530	Total Area"				
		100.000	Flow length"				
		5.000	Overland Slope"				
		6.777	Pervious Area"				
		100.000	Pervious length"				
"		2.000	Pervious slope"				
		0.753	Impervious Area"				
		100.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning '				
		75.000	Pervious Max.infil				
		5.000	Pervious Min.infil				
		0.250	Pervious Lag const				
		5.000	Pervious Depressio	-			
		0.015	Impervious Manning				
		0.000 0.000	Impervious Max.inf Impervious Min.inf				
		0.000	Impervious Min.int		<u>.</u> ۲. ۳		
п		1.500	Impervious Lag con Impervious Depress	•	•		
		1.000	0.437 4.9	-		c.m/sec"	
			0.457 4.9	0.000	0.000		

"	Catchment 200	Pervious	Impervious	Total A	rea "
н	Surface Area	6.777	0.753	7.530	hectare"
"	Time of concentration	29.695	4.341	23.640	minutes"
"	Time to Centroid	117.798	88.850	110.884	minutes"
	Rainfall depth	49.792	49.792	49.792	mm"
п	Rainfall volume	3374.38	374.93	3749.31	. c.m"
п	Rainfall losses	32.840	1.920	29.748	mm"
п	Runoff depth	16.952	47.871	20.044	mm"
п	Runoff volume	1148.85	360.47	1509.32	c.m"
11	Runoff coefficient	0.340	0.961	0.403	п
"	Maximum flow	0.387	0.208	0.437	c.m/sec"
" 40	HYDROGRAPH Add Runoff '				
"	4 Add Runoff "				
"	0.437 5.256	5 0.000	0.000"		
" 38	START/RE-START TOTALS	200"			
"	3 Runoff Totals on EXI	IT"			
"	Total Catchment area		36	.330	hectare"
"	Total Impervious area		18	.751	hectare"
"	Total % impervious		51	.612"	
" 19	EXIT"				

п			MIDUSS Output>"
п			MIDUSS Version Version 2.25 rev. 473"
п			MIDUSS version 2.25 rev. 475 MIDUSS created Sunday, February 07, 2010"
п		10	Units used: ie METRIC"
		10	
			Licensee name: gmbp" Company "
			Date & Time last used: 2/21/2023 at 1:58:24 PM"
п	31	т.	IME PARAMETERS"
	71	5.000	Time Step"
п		180.000	Max. Storm length"
		3600.000	Max. Hydrograph"
	32		TORM Chicago storm"
	52	1	Chicago storm"
		6933.020	Coefficient A"
		34.699	
		0.998	Exponent C"
			Fraction R"
		180.000	Duration"
		1.000	Time step multiplier"
			aximum intensity 168.777 mm/hr"
			otal depth 97.921 mm"
"		6	100hyd Hydrograph extension used in this file"
	33	C	ATCHMENT 302"
"		1	Triangular SCS"
"		1	Equal length"
"		2	Horton equation"
"		302	External lands and water tower"
"		55.000	% Impervious"
"		0.670	Total Area"
"		30.000	Flow length"
		2.000	Overland Slope"
"		0.302	Pervious Area"
		30.000	Pervious length"
"		2.000	Pervious slope"
"		0.368	Impervious Area"
		30.000	Impervious length"
		2.000	Impervious slope"
		0.250	Pervious Manning 'n'"
		75.000	Pervious Max.infiltration"
		5.000	Pervious Min.infiltration"
		0.250	Pervious Lag constant (hours)"
		5.000	Pervious Depression storage"
		0.015	Impervious Manning 'n'"
		0.000	Impervious Max.infiltration"
		0.000 0.050	Impervious Min.infiltration"
п		1.500	Impervious Lag constant (hours)" Impervious Depression storage"
п		T. 200	0.233 0.000 0.000 0.000 c.m/sec"
			0.255 0.000 0.000 0.000 C.m/Sec

	40	2 ד ד ק ק ק א ן ן ן ן ן ן ן ן ן ן ן ן ן ן ן ן	Catchment 302 Surface Area Time of concentration Time to Centroid Cainfall depth Cainfall volume Cainfall losses Sunoff depth Cunoff volume Cunoff coefficient Caximum flow CYDROGRAPH Add Runoff	Pervious 0.302 10.076 97.792 97.921 295.23 34.803 63.119 190.30 0.645 0.099	Impervious 0.368 1.799 84.352 97.921 360.84 2.791 95.130 350.55 0.971 0.153	Total Area 0.670 4.711 89.081 97.921 656.07 17.197 80.725 540.86 0.824 0.233	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
		4	Add Runoff "	2 0.000	0.000"		
	33	C	0.233 0.23 ATCHMENT 201"	3 0.000	0.000		
	55	1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
"		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious" '				
"		4.280	Total Area"				
"		200.000	Flow length"				
"		4.000	Overland Slope"				
"		0.428	Pervious Area"				
"		200.000	Pervious length"				
		2.000	Pervious slope"				
		3.852	Impervious Area"				
		200.000	Impervious length"				
		2.000 0.250	Impervious slope" Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
		5.000	Pervious Depression				
"		0.015	Impervious Manning				
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi				
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	on storage"			
"			1.688 0.23	3 0.000		c.m/sec"	
"			atchment 201	Pervious	Impervious	Total Area	
"			urface Area	0.428	3.852	4.280	hectare"
"			ime of concentration	31.450	5.616	7.390	minutes"
			ime to Centroid	122.128	89.288	91.543	minutes"
			ainfall depth	97.921	97.921	97.921	mm"
			ainfall volume	419.10	3771.93	4191.03	C.M"
			ainfall losses	34.482	2.307	5.524	mm" mm"
			unoff depth unoff volume	63.439 271.52	95.615 3683.07	92.397 3954.59	mm" c.m"
			unoff coefficient	0.648	0.976	0.944	C.m
		Г		0.040	0.070	0.744	

... Maximum flow 0.079 c.m/sec" 1.669 1.688 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 . 1.688 1.920 0.000 0.000" н CATCHMENT 304" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... 304 External - Luther Rd." ... 55.000 % Impervious" ... 1.090 Total Area" ... Flow length" 110.000 ... Overland Slope" 2.000 ... 0.491 Pervious Area" ... 110.000 Pervious length" ... 2.000 Pervious slope" ... Impervious Area" 0.600 ... Impervious length" 110.000 ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'" ... 75.000 Pervious Max.infiltration" ... Pervious Min.infiltration" 5.000 ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... Impervious Min.infiltration" 0.000 ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.301 0.000 c.m/sec" 1.920 0.000 ... Catchment 304 ... Pervious Impervious Total Area ... Surface Area 0.491 0.600 1.090 hectare" ... Time of concentration 21.971 3.923 10.297 minutes" Time to Centroid 111.333 87.214 95.731 minutes" ... Rainfall depth 97.921 97.921 97.921 mm" ... Rainfall volume c.m" 480.30 587.04 1067.34 н Rainfall losses 2.882 mm" 34.507 17.113 . Runoff depth 63.414 95.039 80.808 mm" ... Runoff volume 311.04 569.76 880.81 c.m" ... Runoff coefficient 0.971 0.648 0.825 ... Maximum flow 0.114 0.260 0.301 c.m/sec" ... HYDROGRAPH Add Runoff " 40 11 Add Runoff " 4 ... 0.000" 2.221 0.000 0.301 ... CATCHMENT 202" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 3" 202 ... 60.000 % Impervious"

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 1.195 2.221 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" . Time of concentration 24.287 4.337 10.458 minutes" ... Time to Centroid 87.701 95.762 113.975 minutes" ... mm" Rainfall depth 97.921 97.921 97.921 2438.24 н Rainfall volume 4063.73 c.m" 1625.49 ... Rainfall losses 34.488 2.372 15.219 mm" ... Runoff depth 95.549 82.703 mm" 63.434 ... Runoff volume 1053.00 2379.17 3432.17 c.m" ... н Runoff coefficient 0.648 0.976 0.845 ... Maximum flow 0.358 1.078 1.195 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 1.195 3.416 0.000 0.000" .. CATCHMENT 203" 33 ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... 203 Internal to Pond Inet 2" ... 60.000 % Impervious" ... 2.760 Total Area" ... Flow length" 30.000 ... 4.000 Overland Slope" ... 1.104 Pervious Area" ... 30.000 Pervious length" ... 2.000 Pervious slope" ... 1.656 Impervious Area" ... 30.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

		5.000 5.000 0.250 5.000 0.015	Pervious Max.infi Pervious Min.infi Pervious Lag cons Pervious Depressi Impervious Mannin	ltration" tant (hours) on storage")"		
		0.000	Impervious Max.in	-			
"		0.000	Impervious Min.in				
"		0.050	Impervious Lag co		ר צי)"		
"		1.500	Impervious Depres				
"				416 0.00		c.m/sec"	
"		Ca	tchment 203	Pervious		Total Area	н
"			rface Area	1.104	1.656	2.760	hectare"
"			me of concentratio		1.799	4.338	minutes"
"			me to Centroid	97.792	84.352	88.474	minutes"
"		Ra	infall depth	97.921	97.921	97.921	mm"
"			infall volume	1081.05	1621.58	2702.63	c.m"
"		Ra	infall losses	34.803	2.791	15.596	mm"
"		Ru	noff depth	63.119	95.130	82.325	mm"
"		Ru	noff volume	696.83	1575.35	2272.18	c.m"
"		Ru	noff coefficient	0.645	0.971	0.841	п
"		Ma	ximum flow	0.363	0.689	0.979	c.m/sec"
"	40	HY	DROGRAPH Add Runof	f "			
"		4	Add Runoff "				
"			0.979 4.	396 0.00	0.000"		
"	33	CA	TCHMENT 303"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		303	External"				
"		5.000	% Impervious"				
		3.550	Total Area"				
		0.000	Flow length"				
		2.000	Overland Slope"				
		1.597	Pervious Area"				
		0.000	Pervious length"				
		2.000	Pervious slope"				
		1.952	Impervious Area"				
		0.000	Impervious length				
		2.000	Impervious slope" Pervious Manning				
		0.250 5.000	Pervious Max.infi				
		5.000	Pervious Min.infi				
п		0.250	Pervious Lag cons		\ "		
		5.000	Pervious Depressi		,		
		0.015	Impervious Mannin	•			
п		0.000	Impervious Max.in	-			
		0.000	Impervious Min.in				
"		0.050	Impervious Lag co		rs)"		
"		1.500	Impervious Depres	•	•		
				396 0.00		c.m/sec"	
						, -	

	40	S T T R R R R R R R R R R	Catchment 303 Surface Area Time of concentration Time to Centroid Cainfall depth Cainfall volume Cainfall losses Cunoff depth Cunoff volume Cunoff coefficient Caximum flow	Pervious 1.597 25.391 115.220 97.921 1564.29 34.527 63.395 1012.73 0.647 0.333	Impervious 1.952 4.534 87.952 97.921 1911.91 2.269 95.653 1867.62 0.977 0.843	Total Area 3.550 11.868 97.540 97.921 3476.21 16.785 81.137 2880.35 0.829 0.948	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" c.m" " c.m/sec"</pre>
		4	Add Runoff "		0.000"		
	22	~	0.948 5.34	3 0.000	0.000"		
	33	1	ATCHMENT 204" Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
"		204	Park"				
"		10.000	% Impervious"				
"		2.090	Total Area"				
"		140.000	Flow length"				
"		2.000	Overland Slope"				
"		1.881	Pervious Area"				
"		140.000	Pervious length"				
"		2.000	Pervious slope"				
		0.209	Impervious Area"				
		140.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt Pervious Min.infilt				
		5.000 0.250	Pervious Lag consta				
		5.000	Pervious Depression				
		0.015	Impervious Manning				
		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi				
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depression		·		
"			0.433 5.34	-	0.000	c.m/sec"	
"		C	atchment 204	Pervious	Impervious	Total Area	
"		S	Surface Area	1.881	0.209	2.090	hectare"
"			ime of concentration	25.391	4.534	22.397	minutes"
"			ime to Centroid	115.220	87.952	111.305	minutes"
"			ainfall depth	97.921	97.921	97.921	mm"
			ainfall volume	1841.90	204.66	2046.56	c.m"
			ainfall losses	34.527	2.269	31.301	mm"
			Runoff depth	63.395	95.653	66.620	mm"
			Runoff volume	1192.45	199.91	1392.37	c.m"
		K	unoff coefficient	0.647	0.977	0.680	

"			ximum flow	0.393	0.090	0.433	c.m/sec"
	40	_	DROGRAPH Add Runoff Add Runoff "				
		4		57 0.000	0.000"		
п	33	CA	0.433 5.5 TCHMENT 301"	57 0.000	0.000		
	55	1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
п		301	Scott Street Exter	nal"			
		55.000	% Impervious"	nui			
		2.600	Total Area"				
		95.000	Flow length"				
"		2.000	Overland Slope"				
"		1.170	Pervious Area"				
		95.000	Pervious length"				
		2.000	Pervious slope"				
		1.430	Impervious Area"				
"		95.000	Impervious length"				
"		2.000	Impervious slope"				
"		0.250	Pervious Manning '	n'"			
"		75.000	Pervious Max.infil	tration"			
"		5.000	Pervious Min.infil	tration"			
"		0.250	Pervious Lag const	ant (hours)"			
"		5.000	Pervious Depressio	n storage"			
		0.015	Impervious Manning	'n'"			
		0.000	Impervious Max.inf				
"		0.000	Impervious Min.inf				
"		0.050	Impervious Lag con)"		
		1.500	Impervious Depress	•		<i>,</i>	
		-	0.730 5.5			c.m/sec"	
			tchment 301	Pervious	•	Total Area	
			rface Area	1.170	1.430	2.600	hectare"
			me of concentration		3.593	9.455	minutes"
			me to Centroid	109.215	86.819	94.762	minutes"
			infall depth	97.921	97.921	97.921	mm"
			infall volume infall losses	1145.68	1400.27 3.529	2545.95	c.m" mm"
			noff depth	34.520 63.401	94.392	17.475 80.446	mm"
			noff volume	741.80	94.392 1349.81	2091.61	
			noff coefficient	0.647	0.964	0.822	
			ximum flow	0.277	0.616	0.730	c.m/sec"
	40		DROGRAPH Add Runoff		0.010	0.,50	com, see
	10	4	Add Runoff "				
		·	0.730 6.2	86 0.000	0.000"		
"	33	CA	TCHMENT 205"				
п		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		205	Internal to Pond I	net 1"			
"		65.000	% Impervious"				

... 4.320 Total Area" ... Flow length" 100.000 н 4.000 Overland Slope" ... 1.512 Pervious Area" ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... Impervious length" 100.000 ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 1.353 6.286 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 205 Pervious ... Surface Area 1.512 2.808 4.320 hectare" . Time of concentration 20.749 3.705 8.225 minutes" ... Time to Centroid 86.956 93.049 109.932 minutes" ... mm" Rainfall depth 97.921 97.921 97.921 н c.m" Rainfall volume 2749.63 1480.57 4230.20 ... Rainfall losses 34.536 3.348 14.264 mm" ... 83.658 Runoff depth 94.574 mm" 63.385 Runoff volume 958.39 2655.63 3614.02 c.m" ... н Runoff coefficient 0.647 0.966 0.854 ... Maximum flow 0.359 1.213 1.353 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 1.353 7.639 0.000 0.000" .. CATCHMENT 206" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... Pond" 206 ... 80.000 % Impervious" ... 3.290 Total Area" ... Flow length" 100.000 ... 4.000 Overland Slope" ... 0.658 Pervious Area" п 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.632 Impervious Area" ... 100.000 Impervious length" ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'"

	75.000 5.000 0.250 5.000 0.015 0.000	Pervious Max.infil Pervious Min.infil Pervious Lag const Pervious Depression Impervious Manning Impervious Max.inf	tration" ant (hours)" n storage" 'n'" iltration"			
"	0.000	Impervious Min.inf	iltration"			
"	0.050	Impervious Lag con	•	•		
"	1.500	Impervious Depress	-			
		1.198 7.6			c.m/sec"	
		Catchment 206	Pervious	•	Total Area	
		Surface Area	0.658	2.632	3.290	hectare"
		Time of concentration		3.705	6.151	minutes"
		Time to Centroid	109.932	86.956	90.254	minutes"
		Rainfall depth	97.921	97.921	97.921	mm"
"		Rainfall volume	644.32	2577.29	3221.61	c.m"
"		Rainfall losses	34.536	3.348	9.585	mm"
		Runoff depth	63.385	94.574	88.336	mm"
		Runoff volume	417.08	2489.18	2906.26	c.m"
		Runoff coefficient	0.647	0.966	0.902	
		Maximum flow	0.156	1.137	1.198	c.m/sec"
		HYDROGRAPH Add Runoff				
	4	Add Runoff "		0 000"		
		1.198 8.8 CATCHMENT 200"	37 0.000	0.000"		
	1	Triangular SCS" Equal length"				
	2	Horton equation"				
	200	Rear yard and Open	Snace to Gr	and River"		
	10.000	% Impervious"	Space to di			
	7.530	Total Area"				
	100.000	Flow length"				
"	5.000	Overland Slope"				
"	6.777	Pervious Area"				
"	100.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.753	Impervious Area"				
"	100.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning '	n'"			
"	75.000	Pervious Max.infil	tration"			
"	5.000	Pervious Min.infil				
"	0.250	Pervious Lag const				
	5.000	Pervious Depression	-			
	0.015	Impervious Manning				
	0.000	Impervious Max.inf				
	0.000	Impervious Min.inf		N II		
	0.050	Impervious Lag con	•	•		
	1.500	Impervious Depress	-		o m/aaa''	
		1.746 8.8	37 0.000	0.000	c.m/sec"	

II	Catchment 200	Pervious	Impervious	Total A	rea "
н	Surface Area	6.777	0.753	7.530	hectare"
"	Time of concentration	20.749	3.705	18.326	minutes"
"	Time to Centroid	109.932	86.956	106.665	minutes"
н	Rainfall depth	97.921	97.921	97.921	mm"
11	Rainfall volume	6636.13	737.35	7373.48	c.m"
11	Rainfall losses	34.536	3.348	31.417	mm''
11	Runoff depth	63.385	94.574	66.504	mm"
11	Runoff volume	4295.63	712.14	5007.77	c.m"
11	Runoff coefficient	0.647	0.966	0.679	"
11	Maximum flow	1.608	0.325	1.746	c.m/sec"
" 40	HYDROGRAPH Add Runoff '	п			
	4 Add Runoff "				
"	1.746 9.788	8 0.000	0.000"		
" 38	START/RE-START TOTALS 2	200"			
11	3 Runoff Totals on EXI	IT"			
11	Total Catchment area		36	.330	hectare"
п	Total Impervious area		18	.751	hectare"
11	Total % impervious		51	.612"	
" 19	EXIT"				

п		MTDUISS OU	+pu+				>"
п		MIDUSS ve	-				.25 rev. 473"
п		MIDUSS ve MIDUSS cr					
п	10				-	Sunuay, repri	uary 07, 2010"
	10	Units use		6	,		ie METRIC"
		Job folde			-		MIDUSS\104104"
		Output fi		16	04-104 p	ost Reg-Unco	ontrolled.out"
		Licensee	name:				gmbp"
		Company					"
п			me last use	d:		2/21/2023 a	at 1:59:03 PM"
" 3	1 T.	IME PARAMET	ERS"				
п	60.000	Time Step					
п	2880.000	Max. Stor	m length"				
п	5000.000	Max. Hydr	ograph"				
" 3	2 S ⁻	TORM Histor	ic"				
п	5	Historic"					
п	2880.000	Duration"					
п	48.000	Rainfall	intensity v	alues"			
п		2.028	2.028	2.028	2.028	2.028"	
п		2.028	2.028	2.028	2.028		
п		2.028	2.028	2.028	2.028		
п		2.028	2.028	2.028	2.028		
п		2.028	2.028		2.028		
п		2.028	2.028		2.028		
п		2.028	2.026	2.026	2.026		
п		2.026	6.000	4.000	6.000		
п		17.000	13.000	23.000	13.000		
п		53.000	38.000	13.000"	13.000	19.000	
п	M	aximum inte		53.6	100 mi	m/hr"	
п		otal depth	lisicy	285.6		m"	
п	7	9999hyd	Hydrograph			n this file"	
" 3		ATCHMENT 30		CACCHISION			
"	ری 1	Triangula					
п	1	Equal len					
п	2	Horton eq	-				
п	302		lands and wa	aton towor	, II		
п	55.000	% Impervi		ater tower			
п		Total Are					
п	0.670						
п	30.000	Flow leng					
	2.000	Overland	•				
	0.302	Pervious					
	30.000	Pervious	•				
	2.000	Pervious					
	0.368	Imperviou					
	30.000	Imperviou	-				
	2.000	Imperviou	•				
	0.250		Manning 'n'				
	75.000		Max.infiltra				
	5.000		Min.infiltra				
	0.250		Lag constan		•		
	5.000	Pervious	Depression :	storage"			

... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 н 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" 0.078 0.000 0.000 c.m/sec" 0.000 ... п Catchment 302 Pervious Impervious Total Area ... Surface Area hectare" 0.302 0.368 0.670 ... Time of concentration 16.093 2.860 7.181 minutes" ... Time to Centroid 2720.207 2251.465 2404.533 minutes" ... Rainfall depth 285.000 mm" 285.000 285.000 . Rainfall volume 859.28 1050.22 1909.50 c.m" Rainfall losses mm" 139.563 39.596 84.581 145.437 Runoff depth 245.404 200.419 mm" . Runoff volume 438.49 904.31 1342.81 c.m" Runoff coefficient 0.510 0.861 0.703 ... Maximum flow c.m/sec" 0.031 0.047 0.078 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.000 0.000" 0.078 0.078 ... CATCHMENT 201" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... 201 Townhome and Apartment Blocks" н 90.000 % Impervious" ... 4.280 Total Area" ... 200.000 Flow length" ... 4.000 Overland Slope" ... 0.428 Pervious Area" ... 200.000 Pervious length" ... 2.000 Pervious slope" ... 3.852 Impervious Area" ... 200.000 Impervious length" ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 . 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 ... Impervious Depression storage" 1.500 ... 0.512 0.078 0.000 0.000 c.m/sec" ... Catchment 201 Impervious Total Area " Pervious ... Surface Area 0.428 3.852 4.280 hectare" ... Time of concentration 50.233 8.926 11.288 minutes" ... Time to Centroid 2757.880 2264.252 2292.474 minutes"

	40	Ra Ra Ru Ru Ma	ainfall depth ainfall volume ainfall losses unoff depth unoff volume unoff coefficien aximum flow /DROGRAPH Add Run Add Runoff "		285.000 0.1220 138.714 146.286 0.0626 0.513 0.046	285.000 1.0978 16.956 268.044 1.0325 0.941 0.484	285.000 1.2198 29.132 255.868 1.0951 0.898 0.512	mm" ha-m" mm" ha-m" " c.m/sec"
		+	0.512	0.59	0.000	0.000"		
	33	CA	ATCHMENT 304"	0.55	0.000	01000		
"		1	Triangular SCS					
"		1	Equal length"					
"		2	Horton equation	n"				
"		304	External - Luth	ner Rd	."			
"		55.000	% Impervious"					
"		1.090	Total Area"					
"		110.000	Flow length"					
"		2.000	Overland Slope	"				
		0.491	Pervious Area"					
		110.000	Pervious lengt					
		2.000	Pervious slope					
		0.600 110.000	Impervious Are Impervious len					
		2.000	Impervious ien	•				
		0.250	Pervious Manni					
"		75.000	Pervious Max.i	•				
"		5.000	Pervious Min.i					
"		0.250	Pervious Lag c					
"		5.000	Pervious Depre					
"		0.015	Impervious Man	ning	'n'"			
"		0.000	Impervious Max	.infi	ltration"			
"		0.000	Impervious Min					
		0.050	Impervious Lag		•)"		
		1.500	Impervious Dep		-		/ II	
		C	0.117 atchment 304	0.59	0 0.000 Pervious		c.m/sec"	п
			urface Area		0.491	0.600	Total Area 1.090	hectare"
			ime of concentra	tion	35.092	6.236	15.325	minutes"
"			ime to Centroid	CION	2739.025	2235.505	2394.105	minutes"
"			ainfall depth		285.000	285.000	285.000	mm"
"			ainfall volume		1397.93	1708.57	3106.50	c.m"
"		Ra	ainfall losses		140.362	27.637	78.363	mm"
"		Rı	unoff depth		144.638	257.363	206.637	mm"
"		Ru	unoff volume		709.45	1542.89	2252.34	c.m"
"			unoff coefficien	t	0.508	0.903	0.725	
"			aximum flow		0.054	0.076	0.117	c.m/sec"
	40		DROGRAPH Add Ru	noff				
		4	Add Runoff "	0 70	7 0 000	0.000"		
			0.117	0.70	7 0.000	0.000"		

	33	C	ATCHMENT 202"					
п	55	1	Triangular SCS"					
п		1	Equal length"					
п		2	Horton equation"					
п		202	Internal to Pond	Tn	ot 3"			
		60.000	% Impervious"	TU				
		4.150	Total Area"					
		130.000	Flow length"					
		4.000	Overland Slope"					
		1.660	Pervious Area"					
п		130.000	Pervious length"					
		2.000	Pervious slope"					
п		2.490	Impervious Area"					
		130.000	Impervious length	יי				
		2.000	Impervious slope"					
		0.250	Pervious Manning					
п		75.000	Pervious Max.infi					
п		5.000	Pervious Min.infi					
п		0.250	Pervious Lag cons					
		5.000	Pervious Depressi					
		0.015	Impervious Mannir		•			
		0.000	Impervious Max.ir	-				
		0.000	Impervious Min.ir					
		0.050	Impervious Lag co)"		
		1.500	Impervious Depres			/		
		1.900		70	•	0,000	.m/sec"	
		C	atchment 202		Pervious		Total Area	
			urface Area		1.660	2.490	4.150	hectare"
			ime of concentratio	n	38.792	6.893	15.449	minutes"
п			ime to Centroid		2741.816	2242.481	2376.420	minutes"
п			ainfall depth		285.000	285.000	285.000	mm"
"			ainfall volume		0.4731	0.7096	1.1828	ha-m"
			ainfall losses		141.611	24.215	71.174	mm"
			unoff depth		143.389	260.785	213.826	mm"
			unoff volume		2380.25	6493.54	8873.79	c.m"
"			unoff coefficient		0.503	0.915	0.750	"
п			aximum flow		0.182	0.315	0.447	c.m/sec"
"	40		YDROGRAPH Add Runof	f				
"		4	Add Runoff "	-				
п				15	3 0.000	0.000"		
п	33	C	ATCHMENT 203"					
"		1	Triangular SCS"					
		1	Equal length"					
		2	Horton equation"					
"		203	Internal to Pond	In	et 2"			
		60.000	% Impervious"					
"		2.760	Total Area"					
"		30.000	Flow length"					
"		4.000	Overland Slope"					
"		1.104	Pervious Area"					

	30.000 2.000 1.656 30.000 2.000 0.250 75.000 5.000	Pervious length" Pervious slope" Impervious Area" Impervious length" Impervious slope" Pervious Manning 'n Pervious Max.infilt Pervious Min.infilt	ration" ration"			
	0.250	Pervious Lag consta				
	5.000	Pervious Depression	-			
	0.015	Impervious Manning				
	0.000	Impervious Max.infi				
	0.000	Impervious Min.infi		\ 11		
	0.050	Impervious Lag cons)		
	1.500	Impervious Depressi 0.325 1.15	-	0 000	c.m/sec"	
	C	atchment 203	Pervious		Total Area	п
п		urface Area	1.104	1.656	2.760	hectare"
		ime of concentration	16.093	2.860	6.608	minutes"
"		ime to Centroid	2720.207	2251.465	2384.215	minutes"
"		ainfall depth	285.000	285.000	285.000	mm"
"		ainfall volume	3146.40	4719.60	7866.00	c.m"
"	R	ainfall losses	139.563	39.596	79.583	mm"
"	R	unoff depth	145.437	245.404	205.417	mm"
"		unoff volume	1605.63	4063.89	5669.52	c.m"
"		unoff coefficient	0.510	0.861	0.721	
"		aximum flow	0.115	0.211	0.325	c.m/sec"
		YDROGRAPH Add Runoff				
	4	Add Runoff "		0 000"		
	22	0.325 1.47	9 0.000	0.000"		
	33 C 1	ATCHMENT 303"				
	1	Triangular SCS" Equal length"				
	2	Horton equation"				
	303	External"				
	55.000	% Impervious"				
"	3.550	Total Area"				
"	140.000	Flow length"				
"	2.000	Overland Slope"				
"	1.597	Pervious Area"				
"	140.000	Pervious length"				
"	2.000	Pervious slope"				
"	1.952	Impervious Area"				
"	140.000	Impervious length"				
	2.000	Impervious slope"				
	0.250	Pervious Manning 'n				
	75.000	Pervious Max.infilt				
	5.000	Pervious Min.infilt				
	0.250	Pervious Lag consta				
	5.000	Pervious Depression	storage			

... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 н Impervious Min.infiltration" 0.000 ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" 0.371 1.479 0.000 c.m/sec" 0.000 ... п Catchment 303 Pervious Impervious Total Area ... Surface Area hectare" 1.597 1.952 3.550 ... Time of concentration 7.207 40.556 17.519 minutes" ... Time to Centroid 2744.076 2245.793 2399.878 minutes" ... Rainfall depth mm" 285.000 285.000 285.000 ... Rainfall volume 0.5565 1.0117 ha-m" 0.4553 Rainfall losses mm" 141.525 22.773 76.211 143.475 Runoff depth 262.227 208.789 mm" . Runoff volume 2292.02 5119.98 7412.00 c.m" Runoff coefficient 0.733 0.503 0.920 ... Maximum flow c.m/sec" 0.175 0.247 0.371 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.000 0.000" 0.371 1.850 ... CATCHMENT 204" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Park" 204 н 10.000 % Impervious" ... 2.090 Total Area" ... 140.000 Flow length" ... 2.000 Overland Slope" ... Pervious Area" 1.881 ... 140.000 Pervious length" ... 2.000 Pervious slope" ... 0.209 Impervious Area" ... 140.000 Impervious length" ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 . 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 ... Impervious Depression storage" 1.500 ... 0.225 1.850 0.000 0.000 c.m/sec" ... Catchment 204 Impervious Total Area " Pervious ... Surface Area 1.881 0.209 2.090 hectare" ... Time of concentration 40.556 7.207 34.926 minutes" ... Time to Centroid 2744.076 2245.793 2659.968 minutes"

	40	Ra Ra Ru Ru Ma HY	infall depth infall volume infall losses noff depth noff volume noff coefficien ximum flow DROGRAPH Add Run Add Runoff "		285.000 5360.85 141.525 143.475 2698.77 0.503 0.206	285.000 595.65 22.773 262.227 548.05 0.920 0.026	285.000 5956.50 129.649 155.351 3246.83 0.545 0.225	mm" c.m" mm" c.m" " c.m/sec"
		4		2 02		0 000"		
	22	C A	0.225	2.022	2 0.000	0.000"		
	33	1 1	TCHMENT 301"					
		1	Triangular SCS Equal length"					
		2	Horton equation	n"				
п		301	Scott Street Ex		a]"			
		55.000	% Impervious"					
п		2.600	Total Area"					
"		95.000	Flow length"					
"		2.000	Overland Slope					
"		1.170	Pervious Area"					
"		95.000	Pervious lengt	h"				
"		2.000	Pervious slope					
		1.430	Impervious Area					
"		95.000	Impervious len	-				
"		2.000	Impervious slop					
		0.250	Pervious Manni	-				
		75.000	Pervious Max.i					
		5.000	Pervious Min.i					
		0.250	Pervious Lag co					
		5.000	Pervious Depres		-			
		0.015 0.000	Impervious Manı Impervious Max					
		0.000	Impervious Min					
п		0.050	Impervious Lag) "		
		1.500	Impervious Dep			/		
"			0.282	2.022	-	0.000	c.m/sec"	
"		Ca	tchment 301		Pervious		Total Area	"
"		Su	rface Area		1.170	1.430	2.600	hectare"
"		Ti	me of concentrat	tion	32.137	5.711	14.115	minutes"
"		Ti	me to Centroid		2737.280	2232.538	2393.050	minutes"
"		Ra	infall depth		285.000	285.000	285.000	mm"
"			infall volume		3334.50	4075.50	7410.00	c.m"
"			infall losses		139.558	29.801	79.192	mm"
"			noff depth		145.442	255.199	205.808	mm"
"			noff volume		1701.67	3649.34	5351.01	c.m"
			noff coefficient	t	0.510	0.895	0.722	" / "
	40		ximum flow		0.128	0.181	0.282	c.m/sec"
	40		DROGRAPH Add Ru	nott '				
		4	Add Runoff "	2 20		0.000"		
			0.282	2.304	4 0.000	0.000"		

" 33 CATCHMENT 205" " 1 Triangular SCS" " 1 Equal length"	
" 2 Horton equation"	
" 205 Internal to Pond Inet 1"	
" 65.000 % Impervious"	
" 4.320 Total Area"	
" 100.000 Flow length"	
" 4.000 Overland Slope"	
" 1.512 Pervious Area"	
" 100.000 Pervious length"	
" 2.000 Pervious slope"	
" 2.808 Impervious Area"	
" 100.000 Impervious length"	
" 2.000 Impervious slope"	
" 0.250 Pervious Manning 'n'"	
" 75.000 Pervious Max.infiltration"	
" 5.000 Pervious Min.infiltration"	
" 0.250 Pervious Lag constant (hours)"	
" 5.000 Pervious Depression storage"	
" 0.015 Impervious Manning 'n'"	
" 0.000 Impervious Max.infiltration"	
0.050 Impervious Lag constant (nours)	
1.500 Impervious Depression storage	
0.485 2.304 0.000 0.000 c.m/sec	
Catchment 205 Pervious Impervious Iotal Area	
Surface Area 1.512 2.808 4.320 he	ectare"
	inutes"
	inutes"
	a-m"
" Rainfall losses 139.790 29.018 67.788 mm	
" Runoff depth 145.210 255.982 217.212 mm	
	. m''
" Runoff coefficient 0.510 0.898 0.762 "	. 111
	.m/sec"
" 40 HYDROGRAPH Add Runoff "	iii/ Sec
" 4 Add Runoff "	
" 0.485 2.789 0.000 0.000"	
" 33 CATCHMENT 206"	
" 1 Triangular SCS"	
" 1 Equal length"	
" 2 Horton equation"	
" 206 Pond"	
" 80.000 % Impervious"	
" 3.290 Total Area"	
" 100.000 Flow length"	
" 4.000 Overland Slope"	
" 0.658 Pervious Area"	

		100.000 2.000 2.632 100.000 2.000 0.250 75.000 5.000 0.250 5.000	Pervious length" Pervious slope" Impervious Area" Impervious length" Impervious slope" Pervious Manning 'n Pervious Max.infilt Pervious Min.infilt Pervious Lag consta Pervious Depression	ration" ration" nt (hours)" storage"				
		0.015	Impervious Manning					
		0.000	Impervious Max.infi					
		0.000	Impervious Min.infi		\ II			
		0.050	Impervious Lag cons)			
		1.500	Impervious Depressi 0.389 2.78	-	0 000	c.m/sec"		
		6	1tchment 206	Pervious			п	
			irface Area		•	Total Area 3.290		
			me of concentration	0.658 33.142	2.632 5.889	9.274	hectare" minutes"	
			me to Centroid	2737.929	2233.505	2296.156	minutes"	
			infall depth	285.000	285.000	285.000	mm"	
			infall volume	1875.30	7501.20	9376.50	c.m"	
п			infall losses	139.790	29.018	51.172	mm"	
			noff depth	145.210	255.982	233.828	mm"	
		Runoff volume 955.48 6737.44 7692.93 c.m"						
			noff coefficient	0.510	0.898	0.820	"	
			iximum flow	0.072	0.333	0.389	c.m/sec"	
	40		DROGRAPH Add Runoff		0.000	0.505	etill, see	
		4	Add Runoff "					
			0.389 3.17	8 0.000	0.000"			
"	33	CA	TCHMENT 200"					
"		1	Triangular SCS"					
		1	Equal length"					
"		2	Horton equation"					
"		200	Rear yard and Open	Space to Gr	and River"			
"		10.000	% Impervious"					
"		7.530	Total Area"					
"		100.000	Flow length"					
"		5.000	Overland Slope"					
"		6.777	Pervious Area"					
"		100.000	Pervious length"					
"		2.000	Pervious slope"					
"		0.753	Impervious Area"					
"		100.000	Impervious length"					
п		2.000	Impervious slope"					
"		0.250	Pervious Manning 'n					
"		75.000	Pervious Max.infilt					
"		5.000	Pervious Min.infilt					
"		0.250	Pervious Lag consta	• •				
п		5.000	Pervious Depression	storage"				

"		0.015	Impervious	Manning	'n'"					
"		0.000	Impervious	Max.infi]	ltration"					
"		0.000 Impervious Min.infiltration"								
"		0.050 Impervious Lag constant (hours)"								
"		1.500	Impervious	•	•	•				
			0.809	3.178	•	0.000	c.m/sec'	u –		
"		Cat	tchment 200		Pervious	Impervious	s Total /	Area "		
		Sui	rface Area		6.777	0.753	7.530	hectare"		
"		Time of concentration			33.142	5.889	28.678	minutes"		
"		Time to Centroid			2737.929	2233.505	2655.33	11 minutes"		
"		Rainfall depth			285.000	285.000	285.000	0 mm"		
"		Rainfall volume			1.9314	0.2146	2.1461	ha-m"		
"		Rainfall losses			139.790	29.018	128.71	3 mm"		
"		Runoff depth			145.210	255.982	156.287	7 mm"		
"		Rur	noff volume		0.9841	0.1928	1.1768	ha-m"		
"		Runoff coefficient			0.510	0.898	0.548	п		
"		Maximum flow			0.744	0.095	0.809	c.m/sec"		
"	40	HYDROGRAPH Add Runoff "								
"		4	Add Runoff							
"			0.809	3.853	3 0.000	0.000	•			
"	38	STA	ART/RE-START	TOTALS 2	200"					
"		3 Runoff Totals on EXIT"								
"		Total Catchment area				36	5.330	hectare"		
"		Total Impervious area				18	3.751	hectare"		
"		Total % impervious				51	1.612"			
"	19	EX	[Т"							

			MIDUSS Output>"
			MIDUSS version Version 2.25 rev. 473"
		10	MIDUSS created Sunday, February 07, 2010"
		10	Units used: ie METRIC"
			Job folder: C:\Users\szaga\Documents\MIDUSS\104104"
			Output filename: 25mm.out" Licensee name: gmbp"
			5 1
			Company " Date & Time last used: 2/22/2023 at 10:32:47 AM"
	31	т	Date & Time last used: 2/22/2023 at 10:32:47 AM" IME PARAMETERS"
	71	5.000	Time Step"
		240.000	Max. Storm length"
		3600.000	Max. Hydrograph"
	32		TORM Chicago storm"
	52	1	Chicago storm"
		1581.200	Coefficient A"
		13.000	
		1.000	Exponent C"
			Fraction R"
		240.000	Duration"
		1.000	Time step multiplier"
			aximum intensity 84.723 mm/hr"
п			otal depth 24.999 mm"
		8	00025hyd Hydrograph extension used in this file"
	33		ATCHMENT 302"
	55	1	Triangular SCS"
		1	Equal length"
		2	Horton equation"
		302	External lands and water tower"
		55.000	% Impervious"
		0.670	Total Area"
		30.000	Flow length"
		2.000	Overland Slope"
		0.302	Pervious Area"
"		30.000	Pervious length"
"		2.000	Pervious slope"
"		0.368	Impervious Area"
		30.000	Impervious length"
		2.000	Impervious slope"
		0.250	Pervious Manning 'n'"
"		75.000	Pervious Max.infiltration"
"		5.000	Pervious Min.infiltration"
"		0.250	Pervious Lag constant (hours)"
"		5.000	Pervious Depression storage"
"		0.015	Impervious Manning 'n'"
"		0.000	Impervious Max.infiltration"
"		0.000	Impervious Min.infiltration"
"		0.050	Impervious Lag constant (hours)"
"		1.500	Impervious Depression storage"
"			0.074 0.000 0.000 0.000 c.m/sec"

"				Pervious	•	Total Area	"	
	Surface Area Time of concentration			0.302	0.368 2.370	0.670 2.370	hectare" minutes"	
			ime to Centroid	0.000	110.927	110.927	minutes"	
			ainfall depth	24.999	24.999	24.999	mm"	
п			ainfall volume	75.37	92.12	167.49	c.m"	
п			ainfall losses	24.999	1.866	12.276	mm"	
п			unoff depth	0.000	23.134	12.724	mm"	
п			unoff volume	0.00	85.25	85.25	c.m"	
"		R	unoff coefficient	0.000	0.925	0.509		
"		М	aximum flow	0.000	0.074	0.074	c.m/sec"	
"	40	Н	YDROGRAPH Add Runoff	"				
"		4	Add Runoff "					
"			0.074 0.074	4 0.000	0.000"			
	33		ATCHMENT 201"					
		1	Triangular SCS"					
"		1	Equal length"					
		2	Horton equation"	. 51				
		201	Townhome and Apartm	ent Blocks"				
п		90.000	% Impervious" Total Area"					
		4.280 200.000	Flow length"					
		4.000	Overland Slope"					
п		0.428	Pervious Area"					
		200.000	Pervious length"					
"		2.000	Pervious slope"					
п		3.852 Impervious Area"						
"		200.000 Impervious length"						
"		2.000 Impervious slope"						
п		0.250	Pervious Manning 'n					
"	75.000 Pervious Max.infiltration"							
"	5.000 Pervious Min.infiltration"							
"	0.250 Pervious Lag constant (hours)"							
		5.000	Pervious Depression	•				
"	0.015 Impervious Manning 'n'"							
		0.000	Impervious Max.infi					
		0.000	Impervious Min.infi		\ II			
		0.050 1.500	Impervious Lag cons Impervious Depression)			
п		1.500	0.742 0.07	•	0 000	c.m/sec"		
		C	atchment 201	Pervious		Total Area		
			urface Area	0.428	3.852	4.280	hectare"	
п		-	ime of concentration		7.399	7.399	minutes"	
п			ime to Centroid	0.000	117.918	117.918	minutes"	
"				24.999	24.999	24.999	mm"	
"	•			107.00	962.97	1069.97	c.m"	
"				24.999	1.678	4.010	mm"	
"				0.000	23.321	20.989	mm"	
"		R	unoff volume	0.00	898.33	898.33	c.m"	
		R	unoff coefficient	0.000	0.933	0.840	п	

... Maximum flow 0.000 0.742 c.m/sec" 0.742 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 . 0.742 0.797 0.000 0.000" н CATCHMENT 304" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... 304 External - Luther Rd." ... 55.000 % Impervious" ... 1.090 Total Area" ... Flow length" 110.000 ... Overland Slope" 2.000 ... 0.491 Pervious Area" ... Pervious length" 110.000 ... 2.000 Pervious slope" ... Impervious Area" 0.600 ... Impervious length" 110.000 ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'" ... 75.000 Pervious Max.infiltration" ... Pervious Min.infiltration" 5.000 ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... Impervious Min.infiltration" 0.000 ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.797 0.000 c.m/sec" 0.112 0.000 ... Catchment 304 п Pervious Impervious Total Area ... Surface Area 0.491 0.600 1.090 hectare" ... Time of concentration 5.169 5.169 minutes" - - -Time to Centroid 0.000 114.879 114.879 minutes" ... Rainfall depth 24.999 24.999 24.999 mm" ... Rainfall volume c.m" 122.62 149.87 272.49 н Rainfall losses 24.999 mm" 1.698 12.183 . Runoff depth 0.000 23.302 12.816 mm" ... Runoff volume 0.00 139.69 139.69 c.m" ... Runoff coefficient 0.000 0.932 0.513 ... Maximum flow 0.000 0.112 0.112 c.m/sec" ... HYDROGRAPH Add Runoff " 40 11 Add Runoff " 4 ... 0.000" 0.909 0.000 0.112 ... CATCHMENT 202" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 3" 202 ... 60.000 % Impervious"

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.467 0.909 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" . Time of concentration - - -5.714 5.714 minutes" ... Time to Centroid 0.000 115.659 115.659 minutes" ... mm" Rainfall depth 24.999 24.999 24,999 ... Rainfall volume 414.99 622.48 1037.47 c.m" ... Rainfall losses 24.999 1.646 10.987 mm" ... Runoff depth 0.000 23.353 14.012 mm" Runoff volume 0.00 581.50 581.50 c.m" ... н Runoff coefficient 0.000 0.934 0.560 ... Maximum flow 0.000 0.467 0.467 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.467 1.375 0.000 0.000" ... HYDROGRAPH Copy to Outflow" 40 ... 8 Copy to Outflow" ... 0.000" 0.467 1.375 1.375 ... 3" 40 HYDROGRAPH Combine Combine " ... 6 ... 3 Node #" . Pond Inlet 3" ... Maximum flow 1.375 c.m/sec" ... Hydrograph volume 1704.772 c.m" ... 1.375" 0.467 1.375 1.375 ... HYDROGRAPH Start - New Tributary" 40 ... 2 Start - New Tributary" 1.375" н 1.375 0.467 0.000 ... 33 CATCHMENT 203" ... Triangular SCS" 1 ... 1 Equal length"

	n	llanton aquation"					
	2	Horton equation"	Tno+ 2"				
	203	Internal to Pond	inet z				
	60.000	% Impervious"					
	2.760	Total Area"					
	30.000	Flow length"					
	4.000	Overland Slope"					
	1.104	Pervious Area"					
	30.000	Pervious length"					
	2.000	Pervious slope"					
	1.656	Impervious Area"					
	30.000	Impervious length					
	2.000	Impervious slope"	1				
	0.250	Pervious Manning		• "			
	75.000	Pervious Max.infi					
	5.000	Pervious Min.infi					
	0.250	Pervious Lag cons	-	-			
	5.000	Pervious Depression		age			
	0.015 0.000	Impervious Manning Impervious Max.in	-	ion"			
п	0.000	Impervious Max.in					
п	0.050	Impervious Lag co					
п	1.500	Impervious Depres					
	1.500		000	1.375	1 375 0	.m/sec"	
	Ca	atchment 203	Pervi			Total Area	п
		urface Area	1.104		1.656	2.760	hectare"
п		ime of concentration			2.370	2.370	minutes"
п		ime to Centroid			110.927	110.927	minutes"
		ainfall depth	24.99		24.999	24.999	mm"
		ainfall volume	275.9		413.99	689.98	c.m"
"		ainfall losses	24.99		1.866	11.119	mm"
"		unoff depth	0.000		23.134	13.880	mm"
п		unoff volume	0.00		383.09	383.09	c.m"
п	Ru	unoff coefficient	0.000	9	0.925	0.555	п
"	Ma	aximum flow	0.000		0.334	0.334	c.m/sec"
"	40 HY	/DROGRAPH Add Runof	f "				
"	4	Add Runoff "					
"		0.334 0.1	334	1.375	1.375"		
п	40 HY	/DROGRAPH Copy to O	utflow"				
"	8	Copy to Outflow"					
"		0.334 0.1	334	0.334	1.375"		
"	40 HY	/DROGRAPH Combine	2"				
"	6	Combine "					
"	2	Node #"					
"		Pond Inlet 2"					
"		aximum flow		0.33		ec"	
"	Ну	/drograph volume		383.09			
		0.334 0.		0.334	0.334"		
	_	/DROGRAPH Start - No		utary"			
	2		-				
		0.334 0.0	000	0.334	0.334"		

```
...
  33
                CATCHMENT 303"
...
               1
                   Triangular SCS"
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
            303
                   External"
...
         55.000
                   % Impervious"
...
                   Total Area"
          3.550
...
                   Flow length"
        140.000
...
                   Overland Slope"
          2.000
...
          1.597
                   Pervious Area"
...
        140.000
                   Pervious length"
...
          2.000
                   Pervious slope"
...
          1.952
                   Impervious Area"
...
        140.000
                   Impervious length"
...
          2.000
                   Impervious slope"
...
          0.250
                   Pervious Manning 'n'"
...
         75.000
                   Pervious Max.infiltration"
...
                   Pervious Min.infiltration"
          5.000
...
          0.250
                   Pervious Lag constant (hours)"
...
          5.000
                   Pervious Depression storage"
...
          0.015
                   Impervious Manning 'n'"
...
          0.000
                   Impervious Max.infiltration"
...
          0.000
                   Impervious Min.infiltration"
...
          0.050
                   Impervious Lag constant (hours)"
...
          1.500
                   Impervious Depression storage"
н
                         0.366
                                     0.000
                                                 0.334
                                                             0.334 c.m/sec"
...
                                                                                  н
                Catchment 303
                                           Pervious
                                                        Impervious Total Area
...
                Surface Area
                                           1.597
                                                        1.952
                                                                     3.550
                                                                                  hectare"
...
                Time of concentration
                                                _ _ _
                                                        5.974
                                                                     5.974
                                                                                  minutes"
...
                Time to Centroid
                                           0.000
                                                        116.025
                                                                     116.025
                                                                                  minutes"
...
                                                                                  mm"
                Rainfall depth
                                           24.999
                                                        24.999
                                                                     24.999
.
                Rainfall volume
                                           399.36
                                                        488.11
                                                                     887.47
                                                                                  c.m"
...
                                                                                  mm"
                Rainfall losses
                                           24.999
                                                        1.621
                                                                     12.141
...
                Runoff depth
                                           0.000
                                                        23.379
                                                                     12.858
                                                                                  mm"
...
                Runoff volume
                                           0.00
                                                        456.47
                                                                     456.47
                                                                                  c.m"
...
                Runoff coefficient
                                           0.000
                                                        0.935
                                                                     0.514
...
                Maximum flow
                                           0.000
                                                        0.366
                                                                     0.366
                                                                                  c.m/sec"
...
                HYDROGRAPH Add Runoff "
  40
...
                   Add Runoff "
               4
...
                                     0.366
                                                 0.334
                                                             0.334"
                         0.366
...
  33
                CATCHMENT 204"
...
                   Triangular SCS"
               1
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
                   Park"
            204
...
         10.000
                   % Impervious"
...
          2.090
                   Total Area"
...
        140.000
                   Flow length"
...
          2.000
                   Overland Slope"
...
          1.881
                   Pervious Area"
```

	140 (200	Dominue longth"				
п	140.0		Pervious length" Pervious slope"				
		900 200					
		209	Impervious Area"				
	140.0		Impervious length"				
		900 200	Impervious slope"				
		250	Pervious Manning 'n				
	75.6		Pervious Max.infilt				
		900 200	Pervious Min.infilt				
		250	Pervious Lag constan				
		000 01 F	Pervious Depression	•			
		915	Impervious Manning				
		900	Impervious Max.infi				
		900	Impervious Min.infi		.		
		950	Impervious Lag const)"		
	1.5	500	Impervious Depression	0		<i>,</i>	
		_	0.039 0.360			c.m/sec"	
"			tchment 204	Pervious	•	Total Area	
"			rface Area	1.881	0.209	2.090	hectare"
"			me of concentration		5.974	5.974	minutes"
"			me to Centroid	0.000	116.025	116.025	minutes"
"			infall depth	24.999	24.999	24.999	mm"
		Ra	infall volume	470.24	52.25	522.48	c.m"
			infall losses	24.999	1.621	22.661	mm"
		Rur	noff depth	0.000	23.379	2.338	mm"
		Rur	noff volume	0.00	48.86	48.86	c.m"
"		Rur	noff coefficient	0.000	0.935	0.094	"
"		Max	ximum flow	0.000	0.039	0.039	c.m/sec"
"	40	HY	DROGRAPH Add Runoff '				
		4	Add Runoff "				
"			0.039 0.40	5 0.334	0.334"		
"	33	CA	TCHMENT 301"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		301	Scott Street Externa	al"			
"	55.0	900	% Impervious"				
"	2.6	500	Total Area"				
"	95.0	900	Flow length"				
		900	Overland Slope"				
"		170	Pervious Area"				
	95.0		Pervious length"				
		000	Pervious slope"				
		430	Impervious Area"				
п	95.0		Impervious length"				
"		300 300	Impervious slope"				
п		250	Pervious Manning 'n				
	75.0		Pervious Max.infilt				
		300 300	Pervious Min.infilt				
п		250	Pervious Lag consta				
			_				
	5.6	900	Pervious Depression	scorage			

... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 н Impervious Min.infiltration" 0.000 ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" 0.262 0.405 0.334 c.m/sec" 0.334 ... н Catchment 301 Pervious Impervious Total Area ... Surface Area hectare" 1.170 1.430 2.600 ... Time of concentration 4.734 4.734 - - minutes" ... Time to Centroid 0.000 114.243 114.243 minutes" ... Rainfall depth 24.999 24.999 24.999 mm" ... Rainfall volume 292.49 357.49 649.98 c.m" Rainfall losses mm" 24.999 1.677 12.172 Runoff depth 0.000 23.322 12.827 mm" ... Runoff volume 0.00 333.50 333.50 c.m" Runoff coefficient 0.000 0.933 0.513 ... Maximum flow c.m/sec" 0.000 0.262 0.262 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.334 0.334" 0.262 0.667 ... CATCHMENT 205" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 1" 205 н 65.000 % Impervious" ... 4.320 Total Area" ... 100.000 Flow length" ... 4.000 Overland Slope" ... Pervious Area" 1.512 ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... 100.000 Impervious length" ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 ... 1.500 Impervious Depression storage" ... 0.518 0.667 0.334 0.334 c.m/sec" ... Catchment 205 Impervious Total Area " Pervious ... Surface Area 1.512 2.808 4.320 hectare" ... Time of concentration 4.882 4.882 minutes" - - -... Time to Centroid 0.000 114.456 114.456 minutes"

 		Ra Ra Ru	ainfall depth ainfall volume ainfall losses unoff depth	24.999 377.99 24.999 0.000	24.999 701.98 1.695 23.304	24.999 1079.97 9.851 15.148	mm" c.m" mm" mm"
"			noff volume	0.00	654.38	654.38	c.m"
			noff coefficient	0.000	0.932	0.606	и / ц
			eximum flow	0.000	0.518	0.518	c.m/sec"
	40	_	DROGRAPH Add Runoff	"			
		4			0.004		
			0.518 1.18		0.334"		
	40		DROGRAPH Copy to Out	TTOW"			
		8	12	DF 1 10F	0 224		
		LIM	0.518 1.18	35 1.185 1"	0.334"		
	40		DROGRAPH Combine Combine "	T			
		6 1	Node #"				
		T	Pond Inlet 1"				
		Ma	aximum flow	1 1	.85 c.m/s	مد"	
			drograph volume	1493.2			
		, i y	0.518 1.18				
	40	НУ	DROGRAPH Confluence		1.105		
		7					
"		1					
"			Pond Inlet 1"				
"		Ма	aximum flow	1.1	.85 c.m/s	ec"	
"		Ну	drograph volume	1493.2	211 c.m"		
"		-	0.518 1.18	35 1.185	0.000"		
"	40	HY	DROGRAPH Copy to Out	flow"			
"		8	Copy to Outflow"				
"			0.518 1.18		0.000"		
"	40		DROGRAPH Combine	1000"			
"		6	Combine "				
		1000	Node #"				
			Pond"		o		
			aximum flow	1.1		ec"	
		ну	vdrograph volume	1493.2			
		LIM	0.518 1.18		1.185"		
	40	_	DROGRAPH Confluenc Confluence "	e 3			
		7	Node #"				
		5	Pond Inlet 3"				
		Ma	aximum flow	1 7	575 c.m/s	ec"	
			drograph volume	1704.7			
"			0.518 1.37				
"	40	HY	DROGRAPH Copy to Out		0.000		
"		8	Copy to Outflow"				
"		-	0.518 1.37	75 1.375	0.000"		
"	40	HY	DROGRAPH Combine	1000"			
"		6	Combine "				
"		1000	Node #"				

			Pond"		
		Ma	iximum flow	2.561	c.m/sec"
			drograph volume	3197.983	
		,	0.518 1.375	1.375	2.561"
	40	ну	DROGRAPH Confluence	2"	2.501
	10		Confluence "	-	
		, 2	Node #"		
		-	Pond Inlet 2"		
		Ma	iximum flow	0.334	c.m/sec"
			drograph volume	383.093	c.m"
			0.518 0.334	1.375	0.000"
	40	ну	DROGRAPH Copy to Outflo		0.000
	-0	8		~	
		0	0.518 0.334	0.334	0.000"
	40	ну		000"	0.000
	40	6	Combine "	000	
		1000			
		1000	Pond"		
		Ma	iximum flow	2.808	c.m/sec"
			drograph volume	3581.077	c.m"
		,	0.518 0.334		2.808"
	40	ну	DROGRAPH Confluence		2.000
	40		Confluence "	1000	
		, 1000	Node #"		
		1000	Pond"		
		Ma	iximum flow	2.808	c.m/sec"
			vdrograph volume	3581.077	c.m"
		i iy	0.518 2.808	0.334	0.000"
	40	ну	DROGRAPH Copy to Outflo		0.000
	40	8	Copy to Outflow"		
		0			
			0.518 2.808	2,808	0.000"
	40	Н٧	0.518 2.808 DROGRAPH Next link "	2.808	0.000"
	40		DROGRAPH Next link "	2.808	0.000"
 	40	HY 5	DROGRAPH Next link " Next link "		
	-	5	DROGRAPH Next link " Next link " 0.518 2.808	2.808 2.808	0.000" 0.000"
"	40 33	5 CA	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206"		
11 11	-	5 CA 1	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS"		
11 11 11	-	5 CA 1 1	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length"		
" " "	-	5 CA 1 1 2	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation"		
 	-	5 CA 1 2 206	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond"		
	-	5 CA 1 2 206 80.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious"		
	-	5 CA 1 2 206 80.000 3.290	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area"		
	-	5 CA 1 2 206 80.000 3.290 100.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000 2.632	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.632 100.000	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area" Impervious length"		
	-	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000 2.632	DROGRAPH Next link " Next link " 0.518 2.808 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"		

		75.000 5.000 0.250 5.000 0.015 0.000 0.000 0.050 1.500	Pervious Pervious Imperviou Imperviou Imperviou Imperviou	Depression s Manning s Max.infi s Min.infi s Lag cons	ration" nt (hours)" storage" 'n'" ltration")"		
		1.900	0.48		•	0,000	.m/sec"	
п		Ca	tchment 20		Pervious		Total Area	
			rface Area	-	0.658	2.632	3.290	hectare"
"			me of conc			4.882	4.882	minutes"
"			me to Cent		0.000	114.456	114.456	minutes"
"		Ra	infall dep	th	24.999	24.999	24.999	mm"
"		Ra	infall vol	ume	164.49	657.98	822.47	c.m"
"		Ra	infall los	ses	24.999	1.695	6.356	mm"
"		Ru	noff depth		0.000	23.304	18.643	mm"
"			noff volum		0.00	613.37	613.37	c.m"
"			noff coeff		0.000	0.932	0.746	
			ximum flow		0.000	0.486	0.486	c.m/sec"
	40		DROGRAPH A					
п		4	Add Runof 0.48		4 2.808	0.000"		
	54	PΩ	ND DESIGN"	0 5.25	4 2.000	0.000		
	74	3.294	Current p	eak flow	c.m/sec"			
		0.206	Target ou		.m/sec"			
п		4194.4	Hydrograp		c.m"			
"		17.	Number of					
"		456.800		ater level	metre"			
"		458.000	Maximum w	ater level	metre"			
"		456.800	Starting	water leve	l metre"			
"		0	•	•	= True; 0 =	= False"		
"			Level D	ischarge	Volume"			
"			456.000		0.000"			
			456.100	0.01500	680.300"			
			456.200	0.02900	1395.900"			
			456.300	0.04200	2147.500"			
			456.400 456.480	0.05200 0.05900	2935.400" 3592.400"			
п			456.500	0.06000	3760.400"			
			456.600	0.2840	4627.400"			
п			456.700	0.7630	5539.800"			
"			456.800	1.491	6496.900"			
"			456.900	2.386	7500.300"			
"			457.000	2.490	8551.600"			
"			457.100	6.036	9652.000"			
"			457.200	12.632	10803.10"			
"			457.300	21.379	12006.50"			
			457.400	31.960	13275.50"			

			457.500 44	189 14	4711.10"		
		Pe	ak outflow	.105 1	0.06	50 c.m/sec"	
"			ximum level		456.49		
"			ximum storage		3748.78		
п			ntroidal lag		15.75		
"			•	.294	0.060	0.000 c.m/sec"	
"	40	HY	DROGRAPH Next	link "			
"		5	Next link "				
п			0.486	0.060	0.060	0.000"	
"	54	PO	ND DESIGN"				
"		0.060	Current peak		c.m/sec"		
"		0.206	Target outflo		n/sec"		
"		4141.6	Hydrograph vo		c.m"		
		9.	Number of sta	-			
		456.800	Minimum water				
		458.000	Maximum water		metre"		
		456.800	Starting wate			- 1 "	
		0	Keep Design D		•	= False"	
			Level Disch	•	Volume"		
				.000	0.000"		
			454.960 1.20		4.000"		
			455.060 1.20 455.160 1.20		8.000" 12.000"		
			455.260 1.20		12.000"		
			455.360 1.20		20.000"		
п				.702	20.500"		
				.979	21.000"		
"				.395	21.500"		
п		Pe	ak outflow		0.06	50 c.m/sec"	
"			ximum level		455.36		
"		Ма	ximum storage		20.01		
"			ntroidal lag		16.04	13 hours"	
"			-	.060	0.060	0.000 c.m/sec"	
"	40	HY	DROGRAPH Next	link "			
"		5	Next link "				
"			0.486	0.060	0.060	0.000"	
"	56		VERSION"				
		3000	Node number"				
		0.000					
		0.399	Computed dive				
		0	Conduit type;				
			ak of diverted		0.02		
			lume of divert		1625.39	98 c.m"	
			V03000.00025hy				
		гId	jor flow at 30 0.486	0.060	0.036	0.000 c.m/sec	. 11
	81	٦٨				0.000 C.m/Sec	
	01		nes of comment				
"			verted to exis		tland on si	te"	
"	40			bine	4000"		
	-						

<pre>" 4000 Node #" " Site" " Maximum flow 0.036 c.m/sec" " Hydrograph volume 2497.057 c.m" " 0.486 0.060 0.036 0.036" " 40 HYDROGRAPH Start - New Tributary" " 0.486 0.000 0.036 0.036" " 40 AYDROGRAPH Start - New Tributary" " 0.486 0.000 0.036 0.036" " 33 CATCHMENT 200" " 1 Triangular SCS" " 1 Equal length" " 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious slope" " 0.753 Impervious length" " 2.000 Impervious length" " 2.000 Impervious slope"</pre>			~	Combine II					
Site" Maximum flow 0.036 c.m/sec" Hydrograph volume 2497.057 c.m" 0.486 0.060 0.036 0.036" 40 HYDROGRAPH Start - New Tributary" 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 0.486 0.000 0.036 0.036" * 1 Triangular SCS" * * * 1 Equal length" * * * 200 Rear yard and Open Space to Grand River" * * 100.000 Flow length" * * * 100.000 Flow length" * * * 100.000 Pervious Area"		10	6	Combine "					
<pre>Maximum flow 0.036 c.m/sec" Hydrograph volume 2497.057 c.m" 0.486 0.060 0.036 0.036" 40 HYDROGRAPH Start - New Tributary" 2 Start - New Tributary" 0.486 0.000 0.036 0.036" 33 CATCHMENT 200" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 200 Rear yard and Open Space to Grand River" 10.000 % Impervious" 7.530 Total Area" 100.000 Flow length" 5.000 Overland Slope" 6.777 Pervious Area" 100.000 Pervious length" 2.000 Pervious slope"</pre>		40	00						
Hydrograph volume 2497.057 c.m" 0.486 0.060 0.036 0.036" 40 HYDROGRAPH Start - New Tributary" 2 Start - New Tributary" 2 Start - New Tributary" 0.486 0.000 0.036 0.036" 33 CATCHMENT 200" 0.486 0.000 0.036 0.036" 33 CATCHMENT 200" 1 Triangular SCS" 1 1 Equal length" 2 Horton equation" 2 Horton equation" 200 Rear yard and Open Space to Grand River" 10.000 % Impervious" 7.530 Total Area" 100.000 Flow length" 5.000 Overland Slope" 6.777 Pervious Area" 100.000 Pervious length" 2.000 Pervious slope" 0.753 Impervious Area" 100.000 Impervious length" 2.000 Impervious length" 2.000 Impervious length" 2.000 Impervious length"			Ma			0 02			
0.486 0.060 0.036 0.036" 40 HYDROGRAPH Start - New Tributary" 2 Start - New Tributary" 0.486 0.000 0.036 0.036" 33 CATCHMENT 200" " 1 Triangular SCS" 1 Equal length" 2 Horton equation" 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" 7.530 Total Area" " 100.000 Flow length" 5.000 Overland Slope" 6.777 Pervious length" 2.000 Pervious slope" 0.753 Impervious Area" 100.000 Impervious slope" 0.753 Impervious length" 2.000 Impervious slope"					-				
<pre>" 40 HYDROGRAPH Start - New Tributary" " 2 Start - New Tributary" " 0.486 0.000 0.036 0.036" " 33 CATCHMENT 200" " 1 Triangular SCS" " 1 Equal length" " 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious length"</pre>			пу	•					
2 Start - New Tributary" 0.486 0.000 0.036 33 CATCHMENT 200" " 1 Triangular SCS" " 1 Equal length" 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious slope" " 0.753 Impervious Area" " 0.000 Impervious length" " 0.000 Impervious Area" " 0.000 Impervious Area" " 0.000 Impervious length" " 0.000 Impervious length"		10	нν				0.050		
0.486 0.000 0.036 0.036" 33 CATCHMENT 200" " 1 Triangular SCS" " 1 Equal length" 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious slope" " 0.753 Impervious Area" " 0.753 Impervious length" " 0.000 Impervious Area" " 0.000 Impervious Area" " 0.000 Impervious Area" " 0.000 Impervious length" " 2.000 Impervious length"		40	-			icary			
<pre>" 33 CATCHMENT 200" " 1 Triangular SCS" " 1 Equal length" " 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious length"</pre>	п		2		-	0 036	0 036"		
<pre>" 1 Triangular SCS" " 1 Equal length" " 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious length"</pre>		33	CA		.000	0.050	0.050		
<pre>" 1 Equal length" " 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious slope"</pre>	п	55							
<pre>" 2 Horton equation" " 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious length"</pre>				-					
<pre>" 200 Rear yard and Open Space to Grand River" " 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious slope"</pre>									
<pre>" 10.000 % Impervious" " 7.530 Total Area" " 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious slope"</pre>	"	2		-	en Space	to Gra	nd River"		
<pre>" 100.000 Flow length" " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious length"</pre>	"	10.0	00		•				
<pre>100.000 Flow length " 5.000 Overland Slope" " 6.777 Pervious Area" " 100.000 Pervious length" " 2.000 Pervious slope" " 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious slope"</pre>	"	7.5	30	Total Area"					
 S.000 Overland Slope 6.777 Pervious Area" 100.000 Pervious length" 2.000 Pervious slope" 0.753 Impervious Area" 100.000 Impervious length" 2.000 Impervious slope" 	"	100.0	00	Flow length"					
 "100.000 Pervious Area "2.000 Pervious slope" "0.753 Impervious Area" "100.000 Impervious length" "2.000 Impervious slope" 	"	5.0	00	Overland Slope"					
100.000Pervious length"2.000Pervious slope""0.753Impervious Area""100.000Impervious length""2.000Impervious slope"	"	6.7	77	Pervious Area"					
<pre>" 0.753 Impervious Area" " 100.000 Impervious length" " 2.000 Impervious slope"</pre>	"	100.0	00	Pervious length"					
" 100.000 Impervious length" " 2.000 Impervious slope"				•					
" 2.000 Impervious slope"				•					
2.000 Impervious slope									
" Q 25Q Donvious Manning 'n'"									
				Pervious Manning					
75.000 Pervious Max.Intiltration									
5.000 Pervious Min.Intillration									
" 0.250 Pervious Lag constant (hours)"				-	•	-			
" 5.000 Pervious Depression storage" " 0.015 Impervious Manning 'n'"				-		age			
" 0.000 Impervious Max.infiltration"				-	-	ion"			
" 0.000 Impervious Min.infiltration"				•					
" 0.050 Impervious Lag constant (hours)"									
" 1.500 Impervious Depression storage"	"					• •			
" 0.139 0.000 0.036 0.036 c.m/sec"	"						0.036	.m/sec"	
" Catchment 200 Pervious Impervious Total Area "	"		Ca						п
" Surface Area 6.777 0.753 7.530 hectare"	"		Su	rface Area	6.777	7	0.753	7.530	hectare"
" Time of concentration 4.882 4.882 minutes"	"		Ti	me of concentrati	on -		4.882	4.882	minutes"
" Time to Centroid 0.000 114.456 114.456 minutes"	"		Ti	me to Centroid	0.000)	114.456	114.456	minutes"
" Rainfall depth 24.999 24.999 24.999 mm"	"		Ra	infall depth	24.99	99	24.999	24.999	mm"
" Rainfall volume 1694.20 188.24 1882.44 c.m"	"		Ra	infall volume	1694.	20	188.24	1882.44	c.m"
" Rainfall losses 24.999 1.695 22.669 mm"	"				24.99	99	1.695	22.669	mm"
" Runoff depth 0.000 23.304 2.330 mm"									
" Runoff volume 0.00 175.48 175.48 c.m"									
" Runoff coefficient 0.000 0.932 0.093 "									
" Maximum flow 0.000 0.139 0.139 c.m/sec")	0.139	0.139	c.m/sec"
" 40 HYDROGRAPH Add Runoff "		40			tt "				
4 Add Runott			4		120	0.000	0.000		
0.129 0.129 0.020 0.020		40	1117			0.030	0.030"		
" 40 HYDROGRAPH Copy to Outflow"		40	пĭ	DNOURAPH COPY LO	OULITOW				

"		8	Copy to Outflow"			
"	40		0.139 0.139	0.139	0.036"	
	40			4000"		
		6	Combine "			
		4000	Node #"			
		Ma	Site" ximum flow	0.139	c.m/sec"	
			drograph volume	2672.536	c.m"	
		пу	0.139 0.139		0.139"	
п	40	н∨	DROGRAPH Start - New Ti		0.139	
п	40	2	Start - New Tributary	-		
		2	0.139 0.000	0.139	0.139"	
п	47	FT	LEI_O Read/Open DIV0300		0.155	
п	77	1				
"		2	1=rainfall; 2=hydrogra			
"		1	1=runoff; 2=inflow; 3=	-	unction"	
"			V03000.00025hyd"			
"			jor flow at 3000"			
"			tal volume	1625.398	c.m"	
u.			ximum flow		c.m/sec"	
u.			0.024 0.000		139 c.m/sec"	
"	40	HY	DROGRAPH Add Runoff "			
"		4				
"			0.024 0.024	0.139	0.139"	
"	40	HY	DROGRAPH Copy to Outflo	วพ"		
"		8	Copy to Outflow"			
"			0.024 0.024		0.139"	
"	40	HY	DROGRAPH Combine 4	4000"		
"		6	Combine "			
		4000	Node #"			
			Site"		<i>,</i>	
			ximum flow	0.139		
		Ну	drograph volume	4297.937	c.m"	
	40		0.024 0.024	0.024	0.139"	
	40	н ү 7	DROGRAPH Confluence Confluence "	4000"		
		4000	Node #"			
		4000	Site"			
		Ma	ximum flow	0.139	c.m/sec"	
п			drograph volume	4297.937	c.m"	
		i i y	0.024 0.139		0.000"	
п	81	ΔD	D COMMENT===========			"
"	01		nes of comment"			
п			tal flow to Grand River	°"		
"	38		ART/RE-START TOTALS 400			
"		3	Runoff Totals on EXIT			
"		То	tal Catchment area		36.330	hectare"
"			tal Impervious area		18.751	hectare"
"			tal % impervious		51.612"	
"	19	EX	IT"			

			MIDUSS Output>"
			MIDUSS version Version 2.25 rev. 473"
		10	MIDUSS created Sunday, February 07, 2010" Units used: ie METRIC"
п		10	
п			
п			Output filename: 104-104 post 002 year.out"
п			Licensee name: gmbp"
п			Company "
п	31	т	Date & Time last used: 2/22/2023 at 10:44:38 AM" IME PARAMETERS"
	21	5.000	Time Step"
п			•
п		180.000	Max. Storm length"
	32	3600.000	Max. Hydrograph"
п	52		TORM Chicago storm"
		1 695.050	Chicago storm" Coefficient A"
п			
п		6.387	Constant B"
		0.793	Exponent C" Fraction R"
		180.000	Duration"
		1.000	
			Time step multiplier" aximum intensity 93.293 mm/hr"
			otal depth 33.014 mm"
п		6	002hyd Hydrograph extension used in this file"
	33		ATCHMENT 302"
п	55	1	Triangular SCS"
п		1	Equal length"
п		2	Horton equation"
		302	External lands and water tower"
п		55.000	% Impervious"
		0.670	Total Area"
		30.000	Flow length"
		2.000	Overland Slope"
		0.302	Pervious Area"
		30.000	Pervious length"
		2.000	Pervious slope"
		0.368	Impervious Area"
п		30.000	Impervious length"
п		2.000	Impervious slope"
п		0.250	Pervious Manning 'n'"
		75.000	Pervious Max.infiltration"
		5.000	Pervious Min.infiltration"
"		0.250	Pervious Lag constant (hours)"
"		5.000	Pervious Depression storage"
		0.015	Impervious Manning 'n'"
"		0.000	Impervious Max.infiltration"
"		0.000	Impervious Min.infiltration"
"		0.050	Impervious Lag constant (hours)"
п		1.500	Impervious Depression storage"
п		2	0.072 0.000 0.000 0.000 c.m/sec"
			·····, ···

	40	5 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Catchment 302 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff volume Runoff coefficient Maximum flow HYDROGRAPH Add Runoff	Pervious 0.302 22.062 96.472 33.014 99.54 30.676 2.338 7.05 0.071 0.004	Impervious 0.368 2.281 86.938 33.014 121.66 2.000 31.014 114.29 0.939 0.072	Total Area 0.670 3.430 87.492 33.014 221.19 14.904 18.110 121.33 0.549 0.072	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
		4	Add Runoff "	2 0.000	0.000		
	33	(0.072 0.07 CATCHMENT 201"	2 0.000	0.000"		
	55	1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious"				
"		4.280	Total Area"				
"		200.000	Flow length"				
"		4.000	Overland Slope"				
"		0.428	Pervious Area"				
		200.000	Pervious length"				
		2.000	Pervious slope"				
		3.852	Impervious Area"				
		200.000 2.000	Impervious length" Impervious slope"				
п		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
п		0.250	Pervious Lag consta				
п		5.000	Pervious Depression				
"		0.015	Impervious Manning				
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi	ltration"			
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depressi	0			
"			0.783 0.07			c.m/sec"	
			Catchment 201	Pervious	•	Total Area	
			Surface Area	0.428	3.852	4.280	hectare"
			Time of concentration	68.865	7.119	7.629	minutes"
			Rainfall depth	138.360 33.014	93.923 33.014	94.289 33.014	minutes" mm"
п			Rainfall volume	141.30	1271.70	1413.00	c.m"
			Rainfall losses	30.669	1.681	4.580	mm"
			Runoff depth	2.345	31.333	28.434	mm"
"			Runoff volume	10.04	1206.95	1216.99	c.m"
"		F	Runoff coefficient	0.071	0.949	0.861	"

... Maximum flow 0.002 0.782 0.783 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 . 0.783 0.855 0.000 0.000" н CATCHMENT 304" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... 304 External - Luther Rd." ... 55.000 % Impervious" ... 1.090 Total Area" ... Flow length" 110.000 ... Overland Slope" 2.000 ... 0.491 Pervious Area" ... Pervious length" 110.000 ... 2.000 Pervious slope" ... Impervious Area" 0.600 ... Impervious length" 110.000 ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'" ... 75.000 Pervious Max.infiltration" ... Pervious Min.infiltration" 5.000 ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... Impervious Min.infiltration" 0.000 ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.000 c.m/sec" 0.125 0.855 0.000 ... Catchment 304 п Pervious Impervious Total Area ... Surface Area 0.491 0.600 1.090 hectare" ... Time of concentration 48.108 4.973 7.458 minutes" Time to Centroid 119.816 90.843 92.512 minutes" ... Rainfall depth 33.014 33.014 33.014 mm" ... c.m" Rainfall volume 197.92 359.85 161.93 н Rainfall losses mm" 30.669 1.629 14.697 . Runoff depth 2.345 31.385 18.317 mm" ... Runoff volume 11.50 188.15 199.65 c.m" ... Runoff coefficient 0.071 0.951 0.555 ... Maximum flow 0.004 0.124 0.125 c.m/sec" ... HYDROGRAPH Add Runoff " 40 11 Add Runoff " 4 ... 0.000" 0.125 0.979 0.000 ... CATCHMENT 202" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 3" 202 ... 60.000 % Impervious"

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.511 0.979 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" ... Time of concentration 53.180 5.498 7.765 minutes" ... Time to Centroid 91.560 93.119 124.334 minutes" ... mm" Rainfall depth 33.014 33.014 33.014 ... c.m" Rainfall volume 548.03 822.05 1370.08 ... Rainfall losses 30.670 1.714 13.296 mm" ... 31.300 Runoff depth 19.718 mm" 2.344 ... Runoff volume 38.92 779.37 818.28 c.m" ... н Runoff coefficient 0.071 0.948 0.597 ... Maximum flow 0.011 0.510 0.511 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.511 1.490 0.000 0.000" ... HYDROGRAPH Copy to Outflow" 40 ... Copy to Outflow" 8 ... 0.000" 0.511 1.490 1.490 ... 3" 40 HYDROGRAPH Combine ... Combine " 6 ... 3 Node #" . Pond Inlet 3" ... Maximum flow 1.490 c.m/sec" ... Hydrograph volume 2356.259 c.m" ... 1.490" 0.511 1.490 1.490 ... HYDROGRAPH Start - New Tributary" 40 ... 2 Start - New Tributary" 1.490" н 0.511 0.000 1.490 ... 33 CATCHMENT 203" ... Triangular SCS" 1 ... 1 Equal length"

	n	llenten equation"					
	2 203	Horton equation" Internal to Pond 1	[no+]"				
	60.000		Lilet Z				
		% Impervious" Total Area"					
	2.760						
	30.000	Flow length"					
	4.000 1.104	Overland Slope"					
		Pervious Area"					
	30.000	Pervious length"					
	2.000	Pervious slope"					
	1.656	Impervious Area"					
	30.000	Impervious length'					
	2.000	Impervious slope"	الما				
	0.250	Pervious Manning		• "			
	75.000	Pervious Max.infi					
	5.000	Pervious Min.infi					
	0.250	Pervious Lag const					
	5.000	Pervious Depressio		age			
	0.015	Impervious Manning	-	:			
	0.000	Impervious Max.inf					
	0.000	Impervious Min.inf					
	0.050	Impervious Lag cor		• •			
	1.500	Impervious Depress 0.323 0.0		1.490	1 400	~ m/coc"	
	<u> </u>	atchment 203	Pervi			.m/sec"	
					Impervious		
		urface Area	1.104		1.656	2.760	hectare"
		ime of concentration			2.281	3.227	minutes"
		ime to Centroid	96.47		86.938	87.394	minutes"
		ainfall depth	33.0		33.014	33.014	mm"
		ainfall volume ainfall losses	364.4		546.71	911.19	c.m"
			30.6		2.000	13.471	mm" mm"
		unoff depth unoff volume	2.338		31.014	19.543	
		unoff coefficient	25.81 0.071		513.59	539.40	c.m"
		aximum flow	0.07		0.939	0.592	c m/coc"
		/DROGRAPH Add Runoff		5	0.322	0.323	c.m/sec"
	40 ni 4	Add Runoff "					
	4			1 400	1 400"		
	10 LI	0.323 0.3		1.490	1.490"		
		/DROGRAPH Copy to Ou	JUTIOW				
	8	Copy to Outflow"	000	a 222	1.490"		
	40 H)	0.323 0.3 DROGRAPH Combine/	2"	0.323	1.490		
		Combine "	Z				
	6 2						
	2	Node #" Pond Inlet 2"					
	М-	aximum flow		0.22	23 c.m/se	~"	
				0.32		:C	
	ну	/drograph volume	222	539.39			
	40 H)	0.323 0.3 (DROGRADH Stant - No		0.323	0.323"		
	40 ni 2	DROGRAPH Start - Ne/ Start - New Tribut		acary			
п	Z		-	Q 272	יכרכ מ		
		0.323 0.0	000	0.323	0.323"		

```
...
  33
                CATCHMENT 303"
...
               1
                   Triangular SCS"
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
            303
                   External"
...
         55.000
                   % Impervious"
...
                   Total Area"
          3.550
...
                   Flow length"
        140.000
...
                   Overland Slope"
          2.000
...
          1.597
                   Pervious Area"
...
        140.000
                   Pervious length"
...
          2.000
                   Pervious slope"
...
          1.952
                   Impervious Area"
...
        140.000
                   Impervious length"
...
          2.000
                   Impervious slope"
...
          0.250
                   Pervious Manning 'n'"
...
         75.000
                   Pervious Max.infiltration"
...
                   Pervious Min.infiltration"
          5.000
...
          0.250
                   Pervious Lag constant (hours)"
...
          5.000
                   Pervious Depression storage"
...
          0.015
                   Impervious Manning 'n'"
...
          0.000
                   Impervious Max.infiltration"
...
          0.000
                   Impervious Min.infiltration"
...
          0.050
                   Impervious Lag constant (hours)"
...
          1.500
                   Impervious Depression storage"
н
                         0.397
                                     0.000
                                                 0.323
                                                            0.323 c.m/sec"
...
                                                                                  н
                Catchment 303
                                           Pervious
                                                        Impervious Total Area
...
                Surface Area
                                           1.597
                                                        1.952
                                                                     3.550
                                                                                  hectare"
...
                Time of concentration
                                           55.598
                                                        5.748
                                                                     8.629
                                                                                  minutes"
...
                                                        91.941
                Time to Centroid
                                           126.518
                                                                     93.939
                                                                                  minutes"
...
                                                                                  mm"
                Rainfall depth
                                           33.014
                                                        33.014
                                                                     33.014
.
                                                                     1172.00
                Rainfall volume
                                           527.40
                                                        644.60
                                                                                  c.m"
...
                                                                                  mm"
                Rainfall losses
                                                                     14.753
                                           30.669
                                                        1.730
...
                Runoff depth
                                           2.345
                                                        31.284
                                                                     18.261
                                                                                  mm"
...
                Runoff volume
                                           37.47
                                                        610.81
                                                                     648.28
                                                                                  c.m"
...
                Runoff coefficient
                                           0.071
                                                        0.948
                                                                     0.553
...
                Maximum flow
                                           0.011
                                                        0.397
                                                                     0.397
                                                                                  c.m/sec"
...
                HYDROGRAPH Add Runoff "
  40
...
                   Add Runoff "
               4
...
                         0.397
                                     0.397
                                                 0.323
                                                            0.323"
...
  33
                CATCHMENT 204"
...
                   Triangular SCS"
               1
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
                   Park"
            204
...
         10.000
                   % Impervious"
...
          2.090
                   Total Area"
...
        140.000
                   Flow length"
...
          2.000
                   Overland Slope"
...
          1.881
                   Pervious Area"
```

	$140.000 \\ 2.000 \\ 0.209 \\ 140.000 \\ 2.000 \\ 0.250 \\ 75.000 \\ 5.000 \\ 0.000 \\$	Pervious length" Pervious slope" Impervious Area" Impervious length" Impervious slope" Pervious Manning 'n Pervious Max.infilt	ration" ration"			
	0.250	Pervious Lag consta				
	5.000	Pervious Depression	-			
п	0.015 0.000	Impervious Manning Impervious Max.infi				
	0.000	Impervious Min.infi				
	0.050	Impervious Lag cons)"		
	1.500	Impervious Depressi	•	/		
"		0.043 0.39	•	0.323	c.m/sec"	
п	Ca	atchment 204	Pervious		Total Area	н
"	Si	urface Area	1.881	0.209	2.090	hectare"
"	T:	ime of concentration	55.598	5.748	25.832	minutes"
"	T:	ime to Centroid	126.517	91.941	105.871	minutes"
"		ainfall depth	33.014	33.014	33.014	mm"
"		ainfall volume	620.99	69.00	689.99	c.m"
"		ainfall losses	30.669	1.730	27.775	mm"
		unoff depth	2.345	31.284	5.239	mm"
		unoff volume	44.12	65.38	109.50	c.m"
		unoff coefficient	0.071	0.948	0.159	
		aximum flow	0.013	0.042	0.043	c.m/sec"
		YDROGRAPH Add Runoff				
	4	Add Runoff " 0.043 0.44	1 0.323	0.323"		
п	33 C/	ATCHMENT 301"	u 0.525	0.525		
	1	Triangular SCS"				
	- 1	Equal length"				
	2	Horton equation"				
	301	Scott Street Extern	al"			
п	55.000	% Impervious"				
"	2.600	Total Area"				
"	95.000	Flow length"				
"	2.000	Overland Slope"				
п	1.170	Pervious Area"				
"	95.000	Pervious length"				
"	2.000	Pervious slope"				
	1.430	Impervious Area"				
	95.000	Impervious length"				
	2.000	Impervious slope"				
	0.250	Pervious Manning 'n				
п	75.000 5.000	Pervious Max.infilt Pervious Min.infilt				
	0.250	Pervious Lag consta				
п	5.000	Pervious Depression				
	5.000		500, 450			

	0.015	Impervious Manning	'n'"			
	0.000	Impervious Manning Impervious Max.infi				
п	0.000	Impervious Min.infi				
п	0.050	Impervious Lag cons		\ "		
	1.500	Impervious Depressi)		
	1.000	0.300 0.44		0 373 0	.m/sec"	
	ſ	atchment 301	Pervious		Total Area	
п		urface Area	1.170	1.430	2.600	hectare"
		ime of concentration		4.555	6.834	minutes"
		ime to Centroid	116.160	90.239	91.735	minutes"
		ainfall depth	33.014	33.014	33.014	mm"
п		ainfall volume	386.26	472.10	858.36	c.m"
		ainfall losses	30.671	1.703	14.738	mm"
		unoff depth	2.343	31.311	18.276	mm"
"		unoff volume	27.41	447.75	475.16	c.m"
"		unoff coefficient	0.071	0.948	0.554	"
		aximum flow	0.009	0.299	0.300	c.m/sec"
"		YDROGRAPH Add Runoff				,
"	4	Add Runoff "				
"		0.300 0.74	1 0.323	0.323"		
"	33 C	ATCHMENT 205"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	205	Internal to Pond In	et 1"			
"	65.000	% Impervious"				
"	4.320	Total Area"				
"	100.000	Flow length"				
"	4.000	Overland Slope"				
	1.512	Pervious Area"				
"	100.000	Pervious length"				
"	2.000	Pervious slope"				
	2.808	Impervious Area"				
	100.000	Impervious length"				
	2.000	Impervious slope"				
	0.250	Pervious Manning 'n				
	75.000	Pervious Max.infilt				
	5.000	Pervious Min.infilt				
	0.250 5.000	Pervious Lag consta Pervious Depression	· · ·			
п	0.015	Impervious Manning				
п	0.000	Impervious Max.infi				
	0.000	Impervious Min.infi				
	0.050	Impervious Lag cons		\ "		
п	1.500	Impervious Depressi	• •)		
	1.500	0.587 0.74	•	0,222 0	.m/sec"	
	ſ	atchment 205	Pervious		Total Area	
		urface Area	1.512	2.808	4.320	hectare"
		ime of concentration		4.697	6.274	minutes"
		ime to Centroid	117.422	90.442	91.487	minutes"
	·		• · = -			

		Painfall dont		22 014	22 014	33.014	mm''
		Rainfall dept Rainfall volu		33.014 499.17	33.014 927.03	1426.20	иш с.m"
		Rainfall loss		30.669	1.666	1420.20	mm"
		Runoff depth		2.345	31.348	21.197	mm"
		Runoff volume		35.46	880.24	915.70	c.m"
		Runoff coeffi		0.071	0.950	913.70 0.642	U.III 11
		Maximum flow		0.012	0.586	0.587	c.m/sec"
	40	HYDROGRAPH Ad			0.000	0.307	C.III/ SEC
	40	4 Add Runoff					
		4 Add Rdhoff 0.587		0.323	0.323"		
	40	HYDROGRAPH Co			0.525		
	40	8 Copy to Ou	-	1011			
		0.587	1.328	1.328	0.323"		
	40		Combine	1"	0.525		
	10	6 Combine "	combine	-			
		1 Node #"					
		Pond Inlet	1"				
		Maximum flow	-	1.32	28 c.m/s	ec"	
"		Hydrograph vo	lume	2148.64			
"		0.587	1.328		1.328"		
"	40	HYDROGRAPH	Confluence				
"		7 Confluence					
"		1 Node #"					
"		Pond Inlet	1"				
"		Maximum flow		1.32	28 c.m/s	ec"	
"		Hydrograph vo	lume	2148.64	45 c.m"		
"		0.587	1.328	1.328	0.000"		
"	40	HYDROGRAPH Co	by to Outf	low"			
"		8 Copy to Ou	tflow"				
"		0.587			0.000"		
"	40		Combine	1000"			
"		6 Combine "					
"		1000 Node #"					
		Pond"					
		Maximum flow		1.32		ec"	
		Hydrograph vo		2148.64			
	40	0.587			1.328"		
	40		Confluence	3"			
		7 Confluence					
		3 Node #"	2.11				
		Pond Inlet	3	1 40	\sim	• • "	
		Maximum flow	lumo	1.49		ec	
		Hydrograph vo 0.587		2356.25	9 C.m 0.000"		
	40	HYDROGRAPH Co	1.490 av to Outf		0.000		
	-+0	8 Copy to Ou	-	TOM			
		0.587		1.490	0.000"		
	40		Combine	1000"	0.000		
	τu	6 Combine "	COMBILIC	1000			
		1000 Node #"					

п			Pond"		
		Ma	ximum flow	2.818	c.m/sec"
			drograph volume	4504.905	
		,	0.587 1.490	1.490	2.818"
	40	ну	DROGRAPH Confluence	2"	2.010
	40		Confluence "	2	
		, 2	Node #"		
		2	Pond Inlet 2"		
		Ма	iximum flow	0 222	c
				0.323	c.m/sec"
		ну	drograph volume	539.399	c.m"
	40		0.587 0.323	1.490	0.000"
	40		DROGRAPH Copy to Outflo	W	
		8	·····	0 000	0.000
			0.587 0.323	0.323	0.000"
	40	_		000"	
		6	Combine "		
		1000			
"			Pond"		
"			ximum flow	3.141	•
"		Ну	drograph volume	5044.305	c.m"
"			0.587 0.323	0.323	3.141"
"	40		DROGRAPH Confluence	1000"	
"		7	Confluence "		
"		1000	Node #"		
"			Pond"		
"			ximum flow	3.141	-
"		Ну	drograph volume	5044.305	c.m"
"			0.587 3.141	0.323	0.000"
"	40	HY	DROGRAPH Copy to Outflo	w"	
"		8	Copy to Outflow"		
"			0.587 3.141	3.141	0.000"
"	40	HY	DROGRAPH Next link "		
"		5	Next link "		
"			0.587 3.141		
"	33			3.141	0.000"
		CA	TCHMENT 206"	3.141	0.000"
"	55	CA 1		3.141	0.000"
	55		TCHMENT 206"	3.141	0.000"
		1	TCHMENT 206" Triangular SCS"	3.141	0.000"
"		1 1	TCHMENT 206" Triangular SCS" Equal length"	3.141	0.000"
н П		1 1 2	TCHMENT 206" Triangular SCS" Equal length" Horton equation"	3.141	0.000"
" "		1 1 2 206	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond"	3.141	0.000"
		1 1 206 80.000	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious"	3.141	0.000"
 		1 2 206 80.000 3.290	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area"	3.141	0.000"
 		1 2 206 80.000 3.290 100.000	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length"	3.141	0.000"
		1 2 206 80.000 3.290 100.000 4.000	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope"	3.141	0.000"
		1 2 206 80.000 3.290 100.000 4.000 0.658	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length"	3.141	0.000"
		$ \begin{array}{r}1\\1\\2\\206\\80.000\\3.290\\100.000\\4.000\\0.658\\100.000\end{array} $	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope"	3.141	0.000"
		$ \begin{array}{r} 1\\ 2\\ 206\\ 80.000\\ 3.290\\ 100.000\\ 4.000\\ 0.658\\ 100.000\\ 2.000\\ 2.632\\ \end{array} $	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"	3.141	0.000"
		$\begin{array}{c} 1\\ 2\\ 206\\ 80.000\\ 3.290\\ 100.000\\ 4.000\\ 0.658\\ 100.000\\ 2.000\\ 2.632\\ 100.000\end{array}$	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area" Impervious length"	3.141	0.000"
		$ \begin{array}{r} 1\\ 2\\ 206\\ 80.000\\ 3.290\\ 100.000\\ 4.000\\ 0.658\\ 100.000\\ 2.000\\ 2.632\\ \end{array} $	TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"	3.141	0.000"

" " "		75.000 5.000 0.250 5.000 0.015	Pervious Pervious Pervious	Max.infilt Min.infilt Lag consta Depressior s Manning	ration" nt (hours)" storage"			
"		0.000	Imperviou	s Max.infi	ltration"			
"		0.000		s Min.infi				
"		0.050			tant (hours))"		
		1.500	•	•	on storage"		<i>,</i>	
			0.55				.m/sec"	
			tchment 20		Pervious		Total Area	
			rface Area		0.658	2.632	3.290	hectare"
			me of conc			4.697	5.445	minutes"
			me to Cent		117.422	90.442	90.937	minutes" mm"
			infall dep infall vol		33.014 217.23	33.014 868.93	33.014 1086.16	
			infall los		30.669	1.666	7.467	mm"
			noff depth		2.345	31.348	25.547	mm"
			noff volum		15.43	825.07	840.50	c.m"
п			noff coeff		0.071	0.950	0.774	"
"			ximum flow		0.005	0.549	0.550	c.m/sec"
"	40	HY	DROGRAPH A	dd Runoff				•
"		4	Add Runof	f "				
"			0.55	0 3.69	3.141	0.000"		
"	54	PO	ND DESIGN"					
"		3.691	Current p		c.m/sec"			
"		0.206	Target ou		.m/sec"			
		5884.8	Hydrograp		c.m"			
		17.	Number of	•				
		456.800		ater level				
		458.000 456.800		ater level water leve				
п		430.800	•		. = True; 0 =	- Falso"		
п		0		ischarge	Volume"	- 18136		
				0.000				
п			456.100	0.01500	680.300"			
"			456.200	0.02900	1395.900"			
"			456.300	0.04200	2147.500"			
"			456.400	0.05200	2935.400"			
"			456.480	0.05900	3592.400"			
"			456.500	0.06000	3760.400"			
"			456.600	0.2840	4627.400"			
"			456.700	0.7630	5539.800"			
"			456.800	1.491	6496.900"			
			456.900	2.386	7500.300"			
			457.000	2.490	8551.600"			
			457.100	6.036	9652.000"			
п			457.200	12.632 21.379	10803.10" 12006.50"			
			457.300 457.400	31.960	13275.50"			
			407.400	21.200	77.17.70			

			457.500 44	189 14	4711.10"		
		Pe	ak outflow		0.2	64 c.m/sec"	
"			ximum level		456.5		
"			ximum storage		4551.6		
п			ntroidal lag		12.5		
"			•	.691	0.264	0.000 c.m/sec"	
"	40	HY	DROGRAPH Next	link "			
"		5	Next link "				
"			0.550	0.264	0.264	0.000"	
"	54	PO	ND DESIGN"				
"		0.264	Current peak		c.m/sec"		
"		0.206	Target outflo		n/sec"		
"		5827.4	Hydrograph vo		c.m"		
"		9.	Number of sta	-			
		456.800	Minimum water				
		458.000	Maximum water		metre"		
		456.800	Starting wate				
		0	Keep Design D			= False"	
			Level Disch	•	Volume"		
				.000	0.000"		
			454.960 1.20		4.000"		
			455.060 1.20		8.000"		
			455.160 1.20 455.260 1.20		12.000"		
			455.360 1.20		16.000" 20.000"		
				.702	20.000		
				.979	20.300		
п				.395	21.500"		
		Pe	ak outflow	• • • • •	0.2	64 c.m/sec"	
			ximum level		455.3		
"			ximum storage		20.0		
"			ntroidal lag		12.8		
"			-	.264	0.264	0.000 c.m/sec"	
"	40	HY	DROGRAPH Next				
"		5	Next link "				
"			0.550	0.264	0.264	0.000"	
"	56	DI	VERSION"				
"		3000	Node number"				
"		0.000	Overflow thre	shold"			
"		0.394					
"		0	Conduit type;	-			
			ak of diverted		0.1		
			lume of divert	ed flow	2288.7	65 c.m"	
			V03000.002hyd"	001			
		Ма	jor flow at 30		0.460		
	01	40	0.550	0.264			
	81						====="
п			nes of comment		tland on c	ito"	
	40		verted to exis [.] DROGRAPH Com	ting we bine	4000"	ILE	
	40	ПТ		DTHE	-+000		

		6	Cambrida and				
		6	Combine "				
		4000	Node #"				
			Site"	0.1			
			iximum flow	0.10	-	ec	
		Ну	drograph volume	3513.09			
			0.550 0.26		0.160"		
	40		DROGRAPH Start - New	-			
		2	Start - New Tributa	-			
	~~		0.550 0.00	0 0.160	0.160"		
	33		TCHMENT 200"				
		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"	- · · ·			
		200	Rear yard and Open	Space to Gra	and River"		
		10.000	% Impervious"				
		7.530	Total Area"				
		100.000	Flow length"				
		5.000	Overland Slope"				
		6.777 100.000	Pervious Area"				
		2.000	Pervious length" Pervious slope"				
п		0.753	Impervious Area"				
		100.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
п		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
п		0.250	Pervious Lag consta				
п		5.000	Pervious Depression				
"		0.015	Impervious Manning	-			
п		0.000	Impervious Max.infi				
"		0.000	İmpervious Min.infi				
"		0.050	Impervious Lag cons)"		
"		1.500	Impervious Depressi		·		
"			0.162 0.00	0 0.160	0.160 0	c.m/sec"	
"		Ca	tchment 200	Pervious	Impervious	Total Area	п
"		Su	irface Area	6.777	0.753	7.530	hectare"
"		Ti	me of concentration	45.434	4.697	21.089	minutes"
"		Ti	me to Centroid.	117.422	90.442	101.298	minutes"
"		Ra	infall depth	33.014	33.014	33.014	mm"
"			infall volume	2237.36	248.60	2485.95	c.m"
"			infall losses	30.669	1.666	27.769	mm"
"			noff depth	2.345	31.348	5.245	mm"
			noff volume	158.93	236.05	394.98	c.m"
"			noff coefficient	0.071	0.950	0.159	
	• -		iximum flow	0.053	0.157	0.162	c.m/sec"
	40		DROGRAPH Add Runoff				
		4	Add Runoff "	2 2 1 1 1	0.440"		
	40	,	0.162 0.16		0.160"		
-	40	HY	DROGRAPH Copy to Out	TTOM			

"		8	Copy to Outflow"				
"			0.162 0.1	162	0.162	0.160"	
"	40	HY	DROGRAPH Combine	400	0"		
"		6	Combine "				
"		4000	Node #"				
"			Site"				
"			ximum flow		0.205		
"		Hy	drograph volume		3908.075	c.m"	
"				162	0.162	0.205"	
"	40	HY	DROGRAPH Start - No		utary"		
"		2	Start - New Tribu	-			
"				000	0.162	0.205"	
	47		LEI_O Read/Open DI		•		
		1	1=read/open; 2=wr				
		2	1=rainfall; 2=hyd				
		1	1=runoff; 2=inflo	w; 3=ou	t + 10w; 4 = 5	junction"	
			V03000.002hyd"				
			jor flow at 3000"		2200 765		
			tal volume		2288.765		
		ма	ximum flow	0	0.104	•	
	40		0.104 0.000		162 0.	205 c.m/sec"	
	40		DROGRAPH Add Runof	т			
		4		101	0.162	0.205"	
	40	LIV		104 u+flow"		0.205	
	40	лт 8	DROGRAPH Copy to O Copy to Outflow"	ULIIOW			
		0		104	0.104	0.205"	
	40	нν	DROGRAPH Combine			0.205	
	40	6	Combine "	400	0		
п		4000	Node #"				
		1000	Site"				
		Ма	ximum flow		0.305	c.m/sec"	
			drograph volume		6196.842	c.m"	
"		,		104	0.104	0.305"	
"	40	HY	DROGRAPH Conflue		4000"		
"		7	Confluence "				
"		4000	Node #"				
"			Site"				
"		Ма	ximum flow		0.305	c.m/sec"	
"		Hy	drograph volume		6196.842	c.m"	
"			0.104 0.1	305	0.104	0.000"	
"	81		D COMMENT=======	======	========		"
"		1 Li	nes of comment"				
"			tal flow to Grand				
"	38	ST	ART/RE-START TOTAL				
"		3	Runoff Totals on				_
			tal Catchment area			36.330	hectare"
			tal Impervious area	а		18.751	hectare"
	10		tal % impervious			51.612"	
	19	EX	IT"				

			MTDUSS Output	N ¹¹
			MIDUSS Output	<pre>'' ' Version 2.25 rev. 473''</pre>
			MIDUSS version MIDUSS created	
		10	Units used:	Sunday, February 07, 2010" ie METRIC"
п		10		:\Users\szaga\Documents\MIDUSS\104104"
			Output filename:	104-104 post 005 year.out
			Licensee name:	gmbp"
			Company	" Binob
			Date & Time last used:	2/22/2023 at 10:50:36 AM"
	31	TI	IME PARAMETERS"	2/22/2025 at 10:50:50 AM
	51	5.000	Time Step"	
		180.000	Max. Storm length"	
		3600.000	Max. Hydrograph"	
	32		TORM Chicago storm"	
п	22	1	Chicago storm"	
			Coefficient A"	
		13.690		
		0.850		
"			Fraction R"	
п		180.000	Duration"	
п		1.000	Time step multiplier"	
"		Ma	aximum intensity	113.586 mm/hr"
"			otal depth	49.792 mm"
"		6	005hyd Hydrograph exter	nsion used in this file"
"	33	CA	ATCHMENT 302"	
"		1	Triangular SCS"	
"		1	Equal length"	
"		2	Horton equation"	
"		302	External lands and water	tower"
"		55.000	% Impervious"	
"		0.670	Total Area"	
		30.000	Flow length"	
"		2.000	Overland Slope"	
"		0.302	Pervious Area"	
		30.000	Pervious length"	
		2.000	Pervious slope"	
"		0.368	Impervious Area"	
		30.000	Impervious length"	
		2.000	Impervious slope"	
		0.250	Pervious Manning 'n'"	
		75.000	Pervious Max.infiltration	
		5.000	Pervious Min.infiltration	
		0.250	Pervious Lag constant (ho	•
		5.000	Pervious Depression stora	ige
		0.015	Impervious Manning 'n'"	on"
		0.000	Impervious Max.infiltrati	
		0.000 0.050	Impervious Min.infiltrati Impervious Lag constant (
		1.500	Impervious Depression sto	
		T. 200	0.104 0.000	0.000 0.000 c.m/sec"
			0.104 0.000	

	40	S T R R R R R R R M	atchment 302 urface Area ime of concentration ime to Centroid ainfall depth ainfall volume ainfall losses unoff depth unoff volume unoff coefficient aximum flow YDROGRAPH Add Runoff	Pervious 0.302 14.420 100.204 49.792 150.12 32.852 16.939 51.07 0.340 0.028	Impervious 0.368 2.108 85.724 49.792 183.48 2.224 47.568 175.29 0.955 0.095	Total Area 0.670 4.886 88.991 49.792 333.60 16.007 33.785 226.36 0.679 0.104	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m" " c.m/sec"</pre>
	40	4	Add Runoff "				
"		·	0.104 0.10	4 0.000	0.000"		
"	33	C	ATCHMENT 201"				
"		1	Triangular SCS"				
"		1	Equal length"				
"		2	Horton equation"				
"		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious"				
		4.280	Total Area"				
		200.000	Flow length"				
		4.000	Overland Slope"				
		0.428	Pervious Area"				
		200.000	Pervious length"				
		2.000	Pervious slope"				
		3.852 200.000	Impervious Area" Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
"		0.250	Pervious Lag consta				
"		5.000	Pervious Depression				
"		0.015	Impervious Manning	•			
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi	ltration"			
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	•			
"			1.019 0.10			c.m/sec"	
"			atchment 201	Pervious		Total Area	
		-	urface Area	0.428	3.852	4.280	hectare"
			ime of concentration	45.009	6.580	8.036	minutes"
			ime to Centroid	135.435	91.865	93.515	minutes"
			ainfall depth	49.792	49.792	49.792	mm"
			ainfall volume	213.11	1917.98	2131.08	c.m"
			ainfall losses unoff depth	32.839 16.953	1.944 47.847	5.034	mm" mm"
			unoff volume	72.56	47.847 1843.08	44.758 1915.64	mm c.m"
			unoff coefficient	72.56 0.340	0.961	0.899	C.m
		n		0.0+0	0.001	0.055	

"	40		ximum flow	0.018		1.018	1.019	c.m/sec"
п	40	_	DROGRAPH Add Runc Add Runoff "	ОТТ				
		4		1.124	0.000	0.000"		
	33	CV.	TCHMENT 304"	1.124	0.000	0.000		
		1	Triangular SCS"					
		1	Equal length"					
		2	Horton equation'					
		304	External - Luthe					
		55.000	% Impervious"	1 1.0.				
		1.090	Total Area"					
		110.000	Flow length"					
		2.000	Overland Slope"					
"		0.491	Pervious Area"					
		110.000	Pervious length'	•				
"		2.000	Pervious slope"					
"		0.600	Impervious Area'	•				
"		110.000	Impervious lengt	th"				
"		2.000	Impervious slope	≥"				
"		0.250	Pervious Manning	g 'n'"				
"		75.000	Pervious Max.inf	Filtration	"			
"		5.000	Pervious Min.in					
		0.250	Pervious Lag cor					
		5.000	Pervious Depress		ge"			
		0.015	Impervious Manni	-				
		0.000	Impervious Max.					
		0.000	Impervious Min.					
		0.050 1.500	Impervious Lag o)		
		1.300	Impervious Depre 0.169	1.124	0.000	0 000	.m/sec"	
		Ca	tchment 304	Pervi		Impervious		
			rface Area	0.491		0.600	1.090	hectare"
			me of concentrati			4.597	10.620	minutes"
			me to Centroid	119.8		89.191	96.060	minutes"
"			infall depth	49.79		49.792	49.792	mm"
"			infall volume	244.2		298.50	542.73	c.m"
"		Ra	infall losses	32.85	3	1.876	15.816	mm"
"		Ru	noff depth	16.93	9	47.916	33.976	mm"
"		Ru	noff volume	83.09	1	287.25	370.34	c.m"
"		Ru	noff coefficient	0.340)	0.962	0.682	
			ximum flow	0.027		0.165	0.169	c.m/sec"
"	40	HYI	DROGRAPH Add Rund	off "				
"		4	Add Runoff "					
"				1.293	0.000	0.000"		
	33		TCHMENT 202"					
		1	Triangular SCS"					
		1	Equal length"	1				
		2 202	Horton equation					
		202 60.000	Internal to Pond % Impervious"	THEC 2				
		00.000						

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.695 1.293 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" ... Time of concentration 34.758 5.082 10.733 minutes" ... Time to Centroid 96.253 123.626 89.815 minutes" ... mm" Rainfall depth 49.792 49.792 49.792 ... 1239.81 c.m" Rainfall volume 2066.36 826.54 ... Rainfall losses 32.847 1.767 14.199 mm" ... Runoff depth 16.945 48.025 35.593 mm" Runoff volume 281.29 1195.82 1477.11 c.m" ... н Runoff coefficient 0.340 0.965 0.715 ... Maximum flow 0.083 0.684 0.695 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.695 1.988 0.000 0.000" ... HYDROGRAPH Copy to Outflow" 40 ... Copy to Outflow" 8 ... 0.000" 0.695 1.988 1.988 ... 3" 40 HYDROGRAPH Combine ... Combine " 6 ... 3 Node #" . Pond Inlet 3" ... Maximum flow 1.988 c.m/sec" ... 3989.447 Hydrograph volume c.m" ... 1.988" 0.695 1.988 1.988 ... HYDROGRAPH Start - New Tributary" 40 ... 2 Start - New Tributary" 1.988" н 0.695 0.000 1.988 ... 33 CATCHMENT 203" ... Triangular SCS" 1 ... 1 Equal length"

	n	llenten equation					
	2 203	Horton equation Internal to Pon		I			
	60.000	% Impervious"	u inet z				
	2.760	Total Area"					
	30.000	Flow length"					
	4.000	Overland Slope"					
	1.104	Pervious Area"					
	30.000	Pervious length					
	2.000	Pervious slope"					
	1.656	Impervious Area					
	30.000	Impervious leng					
	2.000	Impervious slop					
	0.250	Pervious Mannin					
	75.000	Pervious Max.in	•	" "			
	5.000	Pervious Min.in					
	0.250	Pervious Lag co					
	5.000	•	•	•			
	0.015	Pervious Depres Impervious Mann		age			
	0.000	Impervious Max.	-	ion"			
	0.000	Impervious Min.					
	0.050	Impervious Lag			п		
	1.500	Impervious Depr		• •			
	1.500		0.000	1.988	1 988 6	.m/sec"	
	Ca	atchment 203		vious	Impervious		н
п		irface Area	1.10		1.656	2.760	hectare"
		me of concentrat			2.108	4.470	minutes"
		me to Centroid	100.		85.724	88.502	minutes"
		ainfall depth	49.7		49.792	49.792	mm"
		ainfall volume	549.		824.55	1374.25	c.m"
		ainfall losses	32.8		2.224	14.475	mm"
		unoff depth	16.9		47.568	35.316	mm"
		noff volume	187.		787.72	974.73	c.m"
		noff coefficient			0.955	0.709	
		aximum flow	0.10		0.429	0.462	c.m/sec"
		DROGRAPH Add Run		-			· · · , · · · ·
	4	Add Runoff "					
			0.462	1.988	1.988"		
"	40 HY	DROGRAPH Copy to		I			
	8	Copy to Outflow					
"		0.462	0.462	0.462	1.988"		
"	40 HY	/DROGRAPH Combi	ne 2"				
	6	Combine "					
	2	Node #"					
"		Pond Inlet 2"					
"	Ma	aximum flow		0.46	2 c.m/se	e"	
"	Ну	/drograph volume		974.73	2 c.m"		
"		• •	0.462	0.462	0.462"		
"	40 HY	/DROGRAPH Start -	New Trib	utary"			
"	2	Start - New Tri	butary"	-			
"		0.462	0.000	0.462	0.462"		

```
...
  33
                CATCHMENT 303"
...
              1
                   Triangular SCS"
...
              1
                   Equal length"
...
               2
                   Horton equation"
...
            303
                   External"
...
         55.000
                   % Impervious"
...
                   Total Area"
          3.550
...
                   Flow length"
        140.000
...
                   Overland Slope"
          2.000
...
          1.597
                   Pervious Area"
...
        140.000
                   Pervious length"
...
          2.000
                   Pervious slope"
...
          1.952
                   Impervious Area"
...
        140.000
                   Impervious length"
...
          2.000
                   Impervious slope"
...
          0.250
                   Pervious Manning 'n'"
...
         75.000
                   Pervious Max.infiltration"
...
                   Pervious Min.infiltration"
          5.000
...
          0.250
                   Pervious Lag constant (hours)"
...
          5.000
                   Pervious Depression storage"
...
          0.015
                   Impervious Manning 'n'"
...
          0.000
                   Impervious Max.infiltration"
...
          0.000
                   Impervious Min.infiltration"
...
          0.050
                   Impervious Lag constant (hours)"
...
          1.500
                   Impervious Depression storage"
н
                         0.544
                                     0.000
                                                0.462
                                                            0.462 c.m/sec"
...
                                                                                 н
                Catchment 303
                                           Pervious
                                                        Impervious Total Area
...
                Surface Area
                                           1.597
                                                        1.952
                                                                     3.550
                                                                                  hectare"
...
                Time of concentration
                                           36.338
                                                        5.313
                                                                     12.264
                                                                                 minutes"
...
                Time to Centroid
                                           125.451
                                                       90.132
                                                                     98.045
                                                                                 minutes"
...
                                                                                 mm"
                Rainfall depth
                                           49.792
                                                       49.792
                                                                    49.792
.
                Rainfall volume
                                           795.42
                                                       972.18
                                                                     1767.60
                                                                                  c.m"
...
                                                                                 mm"
                Rainfall losses
                                                        1.757
                                           32.839
                                                                     15.744
...
                Runoff depth
                                           16.953
                                                       48.035
                                                                     34.048
                                                                                 mm"
...
                Runoff volume
                                           270.82
                                                       937.88
                                                                     1208.71
                                                                                 c.m"
...
                Runoff coefficient
                                           0.340
                                                        0.965
                                                                     0.684
...
                Maximum flow
                                           0.078
                                                        0.534
                                                                     0.544
                                                                                 c.m/sec"
...
                HYDROGRAPH Add Runoff "
  40
...
                   Add Runoff "
              4
...
                         0.544
                                     0.544
                                                 0.462
                                                            0.462"
...
  33
                CATCHMENT 204"
...
                   Triangular SCS"
              1
...
              1
                   Equal length"
...
               2
                   Horton equation"
...
                   Park"
            204
...
         10.000
                   % Impervious"
...
          2.090
                   Total Area"
н
        140.000
                   Flow length"
...
          2.000
                   Overland Slope"
...
          1.881
                   Pervious Area"
```

	2.000 2.000 0.209	5				
1		Pervious slope				
1	и лич	T				
1		•				
	40.000					
	2.000	• •				
	0.250	•				
	75.000					
	0.250					
	5.000	Pervious Depressior	storage"			
	0.015	Impervious Manning	'n'"			
	0.000	Impervious Max.infi	ltration"			
	0.000	Impervious Min.infi	ltration"			
	0.050	Impervious Lag cons	tant (hours)"		
	1.500	Impervious Depressi	on storage"			
		0.103 0.54	4 0.462	0.462	c.m/sec"	
	(Catchment 204	Pervious	Impervious	Total Area	
		Surface Area	1.881	•		hectare"
	-	Time of concentration				minutes"
						minutes"
						mm"
		•				c.m"
						mm"
						mm''
		•				c.m"
						"
						c.m/sec"
10				0.057	0.105	C. III/ 3CC
40						
	-		3 0 162	0 162"		
22			.5 0.402	0.402		
		8				
		1 0				
			Id⊥			
		1				
		0				
		•				
		•				
		•				
	2.000					
	0.250					
	75.000					
	5.000	Pervious Min.infilt	ration"			
	0.250	Pervious Lag consta	nt (hours)"			
	5.000	Pervious Depressior	storage"			
	40 33	5.000 0.250 5.000 0.015 0.000 0.050 1.500 1.500 1.500 40 40 40 40 433 1 1 2 301 55.000 2.600 95.000 2.000 1.170 95.000 2.000 1.430 95.000 2.000 0.250 75.000 5.000	 5.000 Pervious Min.infilt 0.250 Pervious Lag consta 5.000 Pervious Depression 0.015 Impervious Manning 0.000 Impervious Max.infi 0.000 Impervious Lag cons 1.500 Impervious Depressi 0.103 0.54 Catchment 204 Surface Area Time of concentration Time to Centroid Rainfall depth Rainfall volume Rainfall losses Runoff depth Runoff coefficient Maximum flow 40 HYDROGRAPH Add Runoff 4 Add Runoff " 0.103 0.61 CATCHMENT 301" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 301 Scott Street Extern 55.000 % Impervious" 2.600 Total Area" 95.000 Flow length" 2.000 Overland Slope" 1.170 Pervious Area" 95.000 Flow length" 2.000 Pervious length" 2.000 Pervious length" 2.000 Pervious slope" 1.430 Impervious Area" 95.000 Flow length" 2.000 Impervious slope" 0.250 Pervious Manning 'n 	<pre>5.000 Pervious Min.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Man.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Lag constant (hours 1.500 Impervious Lag constant (hours 1.500 Impervious Depression storage" 0.103 0.544 0.462 Catchment 204 Pervious Surface Area 1.881 Time of concentration 36.338 Time to Centroid 125.451 Rainfall depth 49.792 Rainfall volume 936.58 Rainfall losses 32.839 Runoff depth 16.953 Runoff coefficient 0.340 Maximum flow 0.092 40 HYDROGRAPH Add Runoff " 4 Add Runoff " 0.103 0.613 0.462 33 CATCHMENT 301" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 301 Scott Street External" 55.000 % Impervious" 2.600 Total Area" 95.000 Flow length" 2.000 Pervious Lag constant (hours)"</pre>	<pre>5.000 Pervious Min.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.103 0.544 0.462 0.</pre>	<pre>5.000 Pervious Min.infiltration" 0.250 Pervious Lag constant (hours)" 5.000 Pervious Depression storage" 0.015 Impervious Max.infiltration" 0.000 Impervious Max.infiltration" 0.000 Impervious Lag constant (hours)" 1.500 Impervious Depression storage" 0.103 0.544 0.462 0.462 c.m/sec" Catchment 204 Pervious Impervious Total Area Surface Area 1.881 0.209 2.090 Time of concentration 36.338 5.313 28.909 Time of concentration 36.338 5.313 28.909 Time to Centroid 125.451 90.132 116.994 Rainfall depth 49.792 49.792 49.792 Rainfall losses 32.839 1.757 29.731 Runoff depth 16.953 48.035 20.061 Runoff volume 318.89 100.39 419.28 Runoff coefficient 0.340 0.965 0.403 Maximum flow 0.092 0.057 0.103 40 HYDROGRAPH Add Runoff " 4 Add Runoff " 0.103 0.613 0.462 0.462" 33 CATCHMENT 301" 1 Triangular SCS" 1 Equal length" 2.600 Total Area" 95.000 % Impervious 1.770 Pervious Area" 95.000 Pervious length" 2.000 Overland Slope" 1.170 Pervious Area" 95.000 Flow length" 2.000 Impervious Area" 95.000 Impervious Lag constant (hours)"</pre>

п	0.015	Two cashi cash Manadia a	1					
	0.015	Impervious Manning						
	0.000	Impervious Max.infi						
	0.000	Impervious Min.infi						
	0.050 Impervious Lag constant (hours)"							
"	1.500	Impervious Depressi	•					
		0.405 0.61			c.m/sec"			
		Catchment 301	Pervious		Total Area			
		Surface Area	1.170	1.430	2.600	hectare"		
		Time of concentration	28.795	4.210	9.735	minutes"		
		Fime to Centroid	116.746	88.669	94.978	minutes"		
"		Rainfall depth	49.792	49.792	49.792	mm"		
		Rainfall volume	582.56	712.02	1294.58	c.m"		
		Rainfall losses	32.859	1.996	15.884	mm"		
"		Runoff depth	16.933	47.796	33.908	mm"		
"		Runoff volume	198.12	683.48	881.60	c.m"		
"		Runoff coefficient	0.340	0.960	0.681			
		Maximum flow	0.068	0.395	0.405	c.m/sec"		
"	40 H	HYDROGRAPH Add Runoff						
"	4	Add Runoff "						
"		0.405 1.01	8 0.462	0.462"				
"	33 (CATCHMENT 205"						
"	1	Triangular SCS"						
"	1	Equal length"						
"	2	Horton equation"						
"	205	Internal to Pond In	et 1"					
"	65.000	% Impervious"						
"	4.320	Total Area"						
"	100.000	Flow length"						
"	4.000	Overland Slope"						
	1.512	Pervious Area"						
"	100.000	Pervious length"						
	2.000	Pervious slope"						
	2.808	Impervious Area"						
"	100.000	Impervious length"						
	2.000	Impervious slope"						
"	0.250	Pervious Manning 'n						
	75.000	Pervious Max.infilt						
	5.000	Pervious Min.infilt						
	0.250	Pervious Lag consta						
	5.000	Pervious Depression						
	0.015	Impervious Manning						
"	0.000	Impervious Max.infi						
"	0.000	Impervious Min.infi						
"	0.050	Impervious Lag cons)"				
	1.500	Impervious Depressi	on storage"					
"		0.788 1.01	8 0.462	0.462 0	c.m/sec"			
"		Catchment 205	Pervious	Impervious	Total Area	"		
"	" Surface Area 1.512 2.808 4.320 hectare"							
"		Time of concentration		4.341	8.402	minutes"		
"	-	Time to Centroid	117.798	88.850	93.486	minutes"		

		D -	in Call daugh	40 700	40.700	40 700	
			infall depth	49.792	49.792	49.792	mm"
			infall volume	752.85	1398.15	2151.00	c.m"
			infall losses	32.840	1.920	12.742	mm"
			noff depth	16.952	47.871	37.050	mm"
			noff volume	256.32	1344.23	1600.55	c.m"
			noff coefficient	0.340	0.961	0.744	
			ximum flow	0.086	0.775	0.788	c.m/sec"
	40		DROGRAPH Add Runoff				
		4		o 463	0 462		
		LINA	0.788 1.80		0.462		
	40		DROGRAPH Copy to Out	WOLT			
		8	Copy to Outflow"	1 000	0 462		
			0.788 1.80		0.462		
	40		DROGRAPH Combine	1"			
		6	Combine "				
		1	Node #"				
		M -	Pond Inlet 1"	1 0	06	"	
			ximum flow	1.8		sec	
		ну	drograph volume	4110.1			
	40	LINA	0.788 1.80		1.806		
	40		DROGRAPH Confluenc	e I			
		7 1					
		T	Node #" Pond Inlet 1"				
		Ma	ximum flow	1 0	ac cm/		
			drograph volume	1.8 4110.1		Sec	
		пу	0.788 1.80			п	
	40	нν	DROGRAPH Copy to Out		0.000		
	40	8	Copy to Outflow"	TIOW			
		0	0.788 1.80	1.806	0.000	n	
	40	нν	DROGRAPH Combine	1000"	0.000		
		6	Combine "	1000			
		1000	Node #"				
		1000	Pond"				
		Ma	ximum flow	1.8	06 c.m/:	sec"	
			drograph volume	4110.1			
		,	0.788 1.80			n	
	40	НУ	DROGRAPH Confluence		1,000		
п	10	7	-				
п		3	Node #"				
"			Pond Inlet 3"				
"		Ма	ximum flow	1.9	88 c.m/:	sec"	
"			drograph volume	3989.4			
"		,	0.788 1.98				
"	40	HY	DROGRAPH Copy to Out				
"		8	Copy to Outflow"				
"			0.788 1.98	.988	0.000		
"	40	HY	DROGRAPH Combine	1000"			
"		6	Combine "				
"		1000	Node #"				

			Pond"		
		Ma	iximum flow	3.794	c.m/sec"
			drograph volume	8099.575	
		,	0.788 1.988	1.988	
	40	ну	DROGRAPH Confluence	2"	5.754
	40		Confluence "	2	
		, 2	Node #"		
		Z	Pond Inlet 2"		
		Ма	iximum flow	0.462	c
					c.m/sec"
		ну	drograph volume		c.m"
	40		0.788 0.462		0.000"
	40		DROGRAPH Copy to Outflo	W	
		8		0 460	0.000
			0.788 0.462	0.462	0.000"
	40	_		000"	
		6	Combine "		
		1000			
			Pond"		
			iximum flow	4.256	•
		Ну	drograph volume	9074.310	c.m"
"			0.788 0.462	0.462	4.256"
"	40		DROGRAPH Confluence	1000"	
"			Confluence "		
"		1000	Node #"		
"			Pond"		
"			iximum flow	4.256	•
"		Ну	drograph volume	9074.310	c.m"
"			0.788 4.256	0.462	0.000"
"	40	HY	DROGRAPH Copy to Outflo	w"	
"		8	Copy to Outflow"		
"			0.788 4.256	4.256	0.000"
"	40				
		HY	DROGRAPH Next link "		
		НҮ 5	DROGRAPH Next link " Next link "		
"		5	DROGRAPH Next link " Next link " 0.788 4.256	4.256	0.000"
"	33	5	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206"		
п 11	33	5 CA 1	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS"		
 	33	5 CA 1 1	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length"		
" " "	33	5 CA 1 1 2	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation"		
 	33	5 CA 1 1	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond"		
" " "	33	5 CA 1 1 2	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation"		
 	33	5 CA 1 2 206	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area"		
	33	5 CA 1 2 206 80.000	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length"		
	33	5 CA 1 2 206 80.000 3.290	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area" Impervious length"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000 2.632	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area" Impervious length"		
	33	5 CA 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.632 100.000	DROGRAPH Next link " Next link " 0.788 4.256 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area" Impervious length"		

		75.000 5.000 0.250 5.000 0.015	Pervious I	Min.infilt	ration" ant (hours)" a storage"			
		0.000	•	s Max.infi				
"		0.000		s Min.infi				
"		0.050	•		tant (hours))"		
"		1.500			on storage"			
"			0.73	2 4.25	6 4.256	0.000 (.m/sec"	
"		Ca	tchment 20	6	Pervious	Impervious	Total Area	п
"			rface Area		0.658	2.632	3.290	hectare"
"			me of conc			4.341	6.403	minutes"
"			me to Cent		117.798	88.850	91.205	minutes"
"			infall dep		49.792	49.792	49.792	mm"
			infall vol		327.63	1310.52	1638.15	c.m"
			infall los:	ses	32.840	1.920	8.104	mm"
			noff depth	_	16.952	47.871	41.688	mm"
			noff volum		111.55	1259.97	1371.52	c.m"
			noff coeff: ximum flow	ICIENC	0.340 0.038	0.961 0.726	0.837 0.732	c.m/sec"
	40		DROGRAPH A	dd Runoff		0.720	0.752	C.III/SEC
	40	4	Add Runof					
		·	0.73		4.256	0.000"		
"	54	PO	ND DESIGN"			0.000		
"		4.988	Current p	eak flow	c.m/sec"			
"		0.206	Target ou		.m/sec"			
"		10445.8	Hydrograp		c.m"			
"		17.	Number of	stages"				
"		456.800	Minimum wa	ater level	. metre"			
"		458.000	Maximum wa	ater level				
"		456.800	Starting					
		0		•	. = True; 0 =	= False"		
				ischarge	Volume"			
				0.000				
			456.100	0.01500	680.300"			
			456.200 456.300	0.02900 0.04200	1395.900" 2147.500"			
			456.400	0.05200	2935.400"			
			456.480	0.05900	3592.400"			
			456.500	0.06000	3760.400"			
			456.600	0.2840	4627.400"			
"			456.700	0.7630	5539.800"			
"			456.800	1.491	6496.900"			
"			456.900	2.386	7500.300"			
"			457.000	2.490	8551.600"			
"			457.100	6.036	9652.000"			
"			457.200	12.632	10803.10"			
"			457.300	21.379	12006.50"			
"			457.400	31.960	13275.50"			

			457.500 44	.189 14	4711.10"		
		Pe	ak outflow		1.2	35 c.m/se	c"
"			ximum level		456.7		-
"			ximum storage		6159.94		
"			ntroidal lag		8.2		
"			•	.988	1.235	0.000 c.m/	sec"
"	40	HY	DROGRAPH Next				
"		5	Next link "				
"			0.732	1.235	1.235	0.000"	
"	54	PO	ND DESIGN"				
"		1.235	Current peak	flow	c.m/sec"		
"		0.206	Target outflo		n/sec"		
		10392.8	Hydrograph vo		c.m"		
"		9.	Number of sta	•			
		456.800	Minimum water				
		458.000	Maximum water				
		456.800	Starting wate			"	
		0	Keep Design D			= False"	
			Level Disch	•	Volume"		
				.000	0.000"		
			454.960 1.20		4.000"		
			455.060 1.20		8.000"		
			455.160 1.20 455.260 1.20		12.000" 16.000"		
			455.360 1.20		20.000"		
				.702	20.500"		
п				.979	20.000"		
				.395	21.500"		
		Pe	ak outflow		1.2	35 c.m/se	c"
"			ximum level		455.4		-
"			ximum storage		20.3		
"			ntroidal lag		8.34	48 hours"	
"			0.732 1	.235	1.235	0.000 c.m/s	sec"
"	40	HY	DROGRAPH Next	link "			
"		5	Next link "				
"			0.732	1.235	1.235	0.000"	
"	56		VERSION"				
		3000	Node number"				
		0.000					
		0.395	•				
		0	Conduit type;	-			- 11
			ak of diverted		0.4		
			lume of divert V03000.005hyd"	ed TIOW	4097.4	39 c.m"	
			jor flow at 30	aa"			
		rid	0.732	1.235	0.747	0.000 c	m/sec"
	81	Δ۵					. m/ sec ====================================
"	01		nes of comment				_
"			verted to exis		tland on s	ite"	
"	40			bine	4000"		
			-				

		c	Combine II				
		6 4000	Combine "				
		4000	Node #"				
		M	Site"	0 7	47	W	
			aximum flow	0.7	•	ec	
		ну	/drograph volume	6276.4			
	40	10	0.732 1.23		0.747"		
	40		/DROGRAPH Start - New	-			
п		2	Start - New Tributa	•	0 7471		
			0.732 0.00	0.747	0.747"		
	33		ATCHMENT 200"				
		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"		and Divan"		
		200	Rear yard and Open	space to Gr	and kiver.		
		10.000	% Impervious" Total Area"				
		7.530 100.000					
		5.000	Flow length" Overland Slope"				
п		6.777	Pervious Area"				
		100.000	Pervious length"				
п		2.000	Pervious slope"				
п		0.753	Impervious Area"				
п		100.000	Impervious length"				
		2.000	Impervious slope"				
n		0.250	Pervious Manning 'r	า'"			
n		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
"		0.250	Pervious Lag consta	ant (hours)"			
п		5.000	Pervious Depression				
"		0.015	Impervious Manning	'n'"			
"		0.000	Impervious Max.inf	iltration"			
"		0.000	Impervious Min.infi	iltration"			
"		0.050	Impervious Lag cons	stant (hours)"		
"		1.500	Impervious Depress	ion storage"			
"			0.437 0.00	0.747	0.747	c.m/sec"	
"		Ca	atchment 200	Pervious	Impervious	Total Area	п
"			urface Area	6.777	0.753	7.530	hectare"
"			ime of concentration	29.695	4.341	23.640	minutes"
"			ime to Centroid	117.798	88.850	110.884	minutes"
			ainfall depth	49.792	49.792	49.792	mm"
			ainfall volume	3374.38	374.93	3749.31	c.m"
			ainfall losses	32.840	1.920	29.748	mm"
			unoff depth	16.952	47.871	20.044	mm"
			unoff volume	1148.85	360.47	1509.32	c.m"
			unoff coefficient	0.340	0.961	0.403	
	40		aximum flow	0.387 "	0.208	0.437	c.m/sec"
	40		/DROGRAPH Add Runoff				
п		4	Add Runoff " 0.437 0.43	37 0.747	0.747"		
	40	ЦЛ	DROGRAPH Copy to Out		0./4/		
	-0	11	Contraction Copy to Out				

"		8	Copy to Outflow"			
"			0.437 0.437		0.747"	
"	40	HY	DROGRAPH Combine	4000"		
"		6	Combine "			
"		4000	Node #"			
"			Site"			
"			ximum flow	1.136	c.m/sec"	
"		Hy	drograph volume	7785.801	c.m"	
			0.437 0.437		1.136"	
	40	-	DROGRAPH Start - New	-		
		2	Start - New Tributar			
			0.437 0.000		1.136"	
	47		LEI_O Read/Open DIV03			
		1	1=read/open; 2=write			
		2	1=rainfall; 2=hydrog		. • •	
		1	1=runoff; 2=inflow;	3=out+low; 4=j	unction"	
			V03000.005hyd"			
			jor flow at 3000"	4007 400		
			tal volume	4097.439		
		ма	ximum flow	0.488	•	
	10		0.488 0.000		136 c.m/sec"	
	40		DROGRAPH Add Runoff '			
		4	Add Runoff " 0.488 0.488	8 0.437	1.136"	
	40	ЦV	DROGRAPH Copy to Out		1.130	
	40	8	Copy to Outflow"	I TOM		
п		0	0.488 0.488	3 0.488	1.136"	
	40	ну	DROGRAPH Combine		1.150	
	40	6	Combine "	4000		
		4000	Node #"			
		1000	Site"			
"		Ма	ximum flow	1.616	c.m/sec"	
"			drograph volume	11883.240	c.m"	
"		,	0.488 0.488		1.616"	
"	40	HY	DROGRAPH Confluence			
"		7	Confluence "			
"		4000	Node #"			
"			Site"			
"		Ма	ximum flow	1.616	c.m/sec"	
"		Hy	drograph volume	11883.240	c.m"	
"			0.488 1.616	5 0.488	0.000"	
"	81	AD	D COMMENT========		=================	========"
"		1 Li	nes of comment"			
"		То	tal flow to Grand Riv	ver"		
"	38	ST	ART/RE-START TOTALS 4			
"		3	Runoff Totals on EXI	ΕΤ"		
			tal Catchment area		36.330	hectare"
			tal Impervious area		18.751	hectare"
	10		tal % impervious		51.612"	
	19	ΕX	IT"			

		MTDUSS Output	>"
		MIDUSS Output	Version 2.25 rev. 473"
п		MIDUSS version MIDUSS created	Sunday, February 07, 2010"
п	10	Units used:	ie METRIC"
	10		\Users\szaga\Documents\MIDUSS\104104"
		Output filename:	104-104 post 100 year.out"
		Licensee name:	gmbp"
		Company	eiiob Biiiob
п		Date & Time last used:	2/22/2023 at 11:06:09 AM"
" 31	тт	IME PARAMETERS"	2/22/2029 at 11:00:09 An
"	5.000	Time Step"	
	180.000	Max. Storm length"	
	3600.000	Max. Hydrograph"	
" 32		TORM Chicago storm"	
"	1	Chicago storm"	
н	6933.020	Coefficient A"	
н	34.699		
н	0.998	Exponent C"	
п		Fraction R"	
"	180.000	Duration"	
"	1.000	Time step multiplier"	
"			58.777 mm/hr"
		-	97.921 mm"
п	6	•	ion used in this file"
" 33	CA	ATCHMENT 302"	
"	1	Triangular SCS"	
"	1	Equal length"	
	2	Horton equation"	
	302	External lands and water to	ower"
	55.000	% Impervious"	
	0.670	Total Area"	
	30.000	Flow length"	
	2.000	Overland Slope"	
	0.302	Pervious Area"	
	30.000	Pervious length"	
	2.000	Pervious slope"	
	0.368	Impervious Area"	
	30.000	Impervious length"	
	2.000	Impervious slope"	
	0.250	Pervious Manning 'n'"	
	75.000	Pervious Max.infiltration"	
	5.000	Pervious Min.infiltration"	.
	0.250	Pervious Lag constant (hour	•
	5.000	Pervious Depression storage	2
	0.015	Impervious Manning 'n'"	- 11
	0.000	Impervious Max.infiltration	
	0.000	Impervious Min.infiltration	
	0.050	Impervious Lag constant (he	•
	1.500	Impervious Depression stora 0.233 0.000 0	-
		0.233 0.000 0	.000 0.000 c.m/sec"

	40	2 ד ד ק ק ק א ן ן ן ן ן ן ן ן ן ן ן ן ן ן ן ן	Catchment 302 Surface Area Time of concentration Time to Centroid Cainfall depth Cainfall volume Cainfall losses Sunoff depth Cunoff volume Cunoff coefficient Caximum flow CYDROGRAPH Add Runoff	Pervious 0.302 10.076 97.792 97.921 295.23 34.803 63.119 190.30 0.645 0.099	Impervious 0.368 1.799 84.352 97.921 360.84 2.791 95.130 350.55 0.971 0.153	Total Area 0.670 4.711 89.081 97.921 656.07 17.197 80.725 540.86 0.824 0.233	<pre>" hectare" minutes" minutes" mm" c.m" mm" c.m" " c.m/sec"</pre>
		4	Add Runoff "	2 0.000	0.000"		
	33	C	0.233 0.23 ATCHMENT 201"	3 0.000	0.000		
	55	1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
"		201	Townhome and Apartm	ent Blocks"			
"		90.000	% Impervious" '				
"		4.280	Total Area"				
"		200.000	Flow length"				
"		4.000	Overland Slope"				
"		0.428	Pervious Area"				
"		200.000	Pervious length"				
		2.000	Pervious slope"				
		3.852	Impervious Area"				
		200.000	Impervious length"				
		2.000 0.250	Impervious slope" Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
		5.000	Pervious Depression				
"		0.015	Impervious Manning				
"		0.000	Impervious Max.infi				
"		0.000	Impervious Min.infi				
"		0.050	Impervious Lag cons	tant (hours))"		
"		1.500	Impervious Depressi	on storage"			
"			1.688 0.23	3 0.000		c.m/sec"	
"			atchment 201	Pervious	Impervious	Total Area	
"			urface Area	0.428	3.852	4.280	hectare"
"			ime of concentration	31.450	5.616	7.390	minutes"
			ime to Centroid	122.128	89.288	91.543	minutes"
			ainfall depth	97.921	97.921	97.921	mm"
			ainfall volume	419.10	3771.93	4191.03	C.M"
			ainfall losses	34.482	2.307	5.524	mm" mm"
			unoff depth unoff volume	63.439 271.52	95.615 3683.07	92.397 3954.59	mm" c.m"
			unoff coefficient	0.648	0.976	0.944	C.m "
		Г		0.040	0.070	0.744	

... Maximum flow 0.079 c.m/sec" 1.669 1.688 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 . 1.688 1.920 0.000 0.000" н CATCHMENT 304" 33 ... Triangular SCS" 1 ... 1 Equal length" ... 2 Horton equation" ... 304 External - Luther Rd." ... 55.000 % Impervious" ... 1.090 Total Area" ... Flow length" 110.000 ... Overland Slope" 2.000 ... 0.491 Pervious Area" ... 110.000 Pervious length" ... 2.000 Pervious slope" ... Impervious Area" 0.600 ... Impervious length" 110.000 ... 2.000 Impervious slope" ... 0.250 Pervious Manning 'n'" ... 75.000 Pervious Max.infiltration" ... Pervious Min.infiltration" 5.000 ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... Impervious Min.infiltration" 0.000 ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 0.301 0.000 c.m/sec" 1.920 0.000 ... Catchment 304 ... Pervious Impervious Total Area ... Surface Area 0.491 0.600 1.090 hectare" ... Time of concentration 21.971 3.923 10.297 minutes" Time to Centroid 111.333 87.214 95.731 minutes" ... Rainfall depth 97.921 97.921 97.921 mm" ... Rainfall volume c.m" 480.30 587.04 1067.34 н Rainfall losses 2.882 mm" 34.507 17.113 . Runoff depth 63.414 95.039 80.808 mm" ... Runoff volume 311.04 569.76 880.81 c.m" ... Runoff coefficient 0.971 0.648 0.825 ... Maximum flow 0.114 0.260 0.301 c.m/sec" ... HYDROGRAPH Add Runoff " 40 11 Add Runoff " 4 ... 0.000" 2.221 0.000 0.301 ... CATCHMENT 202" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 3" 202 ... 60.000 % Impervious"

... 4.150 Total Area" ... Flow length" 130.000 н 4.000 Overland Slope" ... Pervious Area" 1.660 ... 130.000 Pervious length" ... 2.000 Pervious slope" ... 2.490 Impervious Area" ... Impervious length" 130.000 ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... 1.500 Impervious Depression storage" ... 1.195 2.221 0.000 0.000 c.m/sec" ... Impervious Total Area " Catchment 202 Pervious ... Surface Area 1.660 2.490 4.150 hectare" ... Time of concentration 24.287 4.337 10.458 minutes" ... Time to Centroid 87.701 95.762 113.975 minutes" ... mm" Rainfall depth 97.921 97.921 97.921 2438.24 ... c.m" Rainfall volume 4063.73 1625.49 ... Rainfall losses 34.488 2.372 15.219 mm" ... Runoff depth 95.549 82.703 mm" 63.434 Runoff volume 1053.00 2379.17 3432.17 c.m" ... н Runoff coefficient 0.648 0.976 0.845 ... Maximum flow 0.358 1.078 1.195 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 1.195 3.416 0.000 0.000" ... HYDROGRAPH Copy to Outflow" 40 ... Copy to Outflow" 8 ... 0.000" 1.195 3.416 3.416 ... 3" 40 HYDROGRAPH Combine ... Combine " 6 ... 3 Node #" . Pond Inlet 3" ... Maximum flow 3.416 c.m/sec" ... Hydrograph volume 8808.417 c.m" ... 1.195 3.416 3.416 3.416" ... HYDROGRAPH Start - New Tributary" 40 ... 2 Start - New Tributary" н 1.195 0.000 3.416 3.416" ... 33 CATCHMENT 203" ... Triangular SCS" 1 ... 1 Equal length"

	n					
	2	Horton equation"				
	203	Internal to Pond 1	Lnet 2			
	60.000	% Impervious"				
	2.760	Total Area"				
	30.000	Flow length"				
	4.000	Overland Slope"				
	1.104	Pervious Area"				
	30.000	Pervious length"				
	2.000	Pervious slope"				
	1.656	Impervious Area"				
	30.000	Impervious length	•			
"	2.000	Impervious slope"				
"	0.250	Pervious Manning '				
"	75.000	Pervious Max.infil				
"	5.000	Pervious Min.infil				
"	0.250	Pervious Lag const				
"	5.000	Pervious Depressio	-			
	0.015	Impervious Manning				
"	0.000	Impervious Max.inf				
"	0.000	Impervious Min.inf				
"	0.050	Impervious Lag cor	•)"		
"	1.500	Impervious Depress	•			
"		0.979 0.0			c.m/sec"	
		tchment 203	Pervious		Total Area	
"		irface Area	1.104	1.656	2.760	hectare"
		me of concentration		1.799	4.338	minutes"
		me to Centroid	97.792	84.352	88.474	minutes"
		infall depth	97.921	97.921	97.921	mm"
		ainfall volume	1081.05	1621.58	2702.63	c.m"
		infall losses	34.803	2.791	15.596	mm"
		noff depth	63.119	95.130	82.325	mm"
		noff volume	696.83	1575.35	2272.18	c.m"
		noff coefficient	0.645	0.971	0.841	
		aximum flow	0.363	0.689	0.979	c.m/sec"
		DROGRAPH Add Runoff	- "			
	4	Add Runoff "				
		0.979 0.9		3.416"		
		DROGRAPH Copy to Ou	it+low"			
	8	Copy to Outflow"		2 44 6 11		
		0.979 0.9		3.416"		
		DROGRAPH Combine	2"			
	6	Combine "				
	2	Node #"				
		Pond Inlet 2"				
		ximum flow	0.9		3C	
	Ну	drograph volume	2272.1			
	40	0.979 0.9		0.979"		
	_	DROGRAPH Start - Ne	•			
	2	Start - New Tribut	•	0.070"		
		0.979 0.0	0.979	0.979"		

```
...
  33
                CATCHMENT 303"
...
               1
                   Triangular SCS"
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
            303
                   External"
...
         55.000
                   % Impervious"
...
                   Total Area"
          3.550
...
                   Flow length"
        140.000
...
                   Overland Slope"
          2.000
...
          1.597
                   Pervious Area"
...
        140.000
                   Pervious length"
...
          2.000
                   Pervious slope"
...
          1.952
                   Impervious Area"
...
        140.000
                   Impervious length"
...
          2.000
                   Impervious slope"
...
          0.250
                   Pervious Manning 'n'"
...
         75.000
                   Pervious Max.infiltration"
...
                   Pervious Min.infiltration"
          5.000
...
          0.250
                   Pervious Lag constant (hours)"
...
          5.000
                   Pervious Depression storage"
...
          0.015
                   Impervious Manning 'n'"
...
          0.000
                   Impervious Max.infiltration"
...
          0.000
                   Impervious Min.infiltration"
...
          0.050
                   Impervious Lag constant (hours)"
...
          1.500
                   Impervious Depression storage"
н
                         0.948
                                     0.000
                                                 0.979
                                                            0.979 c.m/sec"
...
                                                                                 н
                Catchment 303
                                           Pervious
                                                        Impervious Total Area
...
                Surface Area
                                           1.597
                                                        1.952
                                                                     3.550
                                                                                  hectare"
...
                Time of concentration
                                           25.391
                                                        4.534
                                                                     11.868
                                                                                 minutes"
...
                Time to Centroid
                                           115.220
                                                        87.952
                                                                     97.540
                                                                                 minutes"
...
                                                                                 mm"
                Rainfall depth
                                           97.921
                                                        97.921
                                                                     97.921
.
                Rainfall volume
                                           1564.29
                                                        1911.91
                                                                     3476.21
                                                                                  c.m"
...
                                                                                 mm"
                Rainfall losses
                                           34.527
                                                        2.269
                                                                     16.785
...
                Runoff depth
                                           63.395
                                                        95.653
                                                                     81.137
                                                                                 mm"
...
                Runoff volume
                                           1012.73
                                                        1867.62
                                                                     2880.35
                                                                                 c.m"
...
                Runoff coefficient
                                           0.647
                                                        0.977
                                                                     0.829
...
                Maximum flow
                                           0.333
                                                        0.843
                                                                     0.948
                                                                                 c.m/sec"
...
                HYDROGRAPH Add Runoff "
  40
...
                   Add Runoff "
               4
...
                         0.948
                                     0.948
                                                 0.979
                                                            0.979"
...
  33
                CATCHMENT 204"
...
                   Triangular SCS"
               1
...
               1
                   Equal length"
...
               2
                   Horton equation"
...
                   Park"
            204
...
         10.000
                   % Impervious"
...
          2.090
                   Total Area"
...
        140.000
                   Flow length"
...
          2.000
                   Overland Slope"
...
          1.881
                   Pervious Area"
```

		140.000	Denvious leasth"				
п		140.000	Pervious length"				
п		2.000	Pervious slope"				
		0.209	Impervious Area"				
		140.000	Impervious length"				
		2.000	Impervious slope"				
п		0.250	Pervious Manning 'n				
"		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta	nt (hours)"			
		5.000	Pervious Depression	storage"			
		0.015	Impervious Manning	'n'"			
		0.000	Impervious Max.infi	ltration"			
"		0.000	Impervious Min.infi	ltration"			
п		0.050	Impervious Lag cons	tant (hours)"		
"		1.500	Impervious Depressi	on storage"	-		
"			0.433 0.94	8 0.979	0.979 (c.m/sec"	
п		Ca	atchment 204	Pervious	Impervious	Total Area	
		Su	irface Area	1.881	0.209	2.090	hectare"
п				25.391	4.534	22.397	minutes"
"			me to Centroid	115.220	87.952	111.305	minutes"
			ainfall depth	97.921	97.921	97.921	mm"
п			ainfall volume	1841.90	204.66	2046.56	c.m"
п			ainfall losses	34.527	2.269	31.301	mm"
п			noff depth	63.395	95.653	66.620	mm''
			noff volume	1192.45	199.91	1392.37	c.m"
п			noff coefficient	0.647	0.977	0.680	"
п			aximum flow	0.393	0.090	0.433	c.m/sec"
	40		DROGRAPH Add Runoff		0.050	0.455	com/ See
	40	4	Add Runoff "				
п		-	0.433 1.17	8 0.979	0.979"		
п	33	C/	ATCHMENT 301"	0.575	0.575		
п	رر	1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
п			•	~1 <i>"</i>			
п		301	Scott Street Extern	al			
		55.000	% Impervious"				
		2.600	Total Area"				
		95.000	Flow length"				
		2.000	Overland Slope"				
		1.170	Pervious Area"				
		95.000	Pervious length"				
"		2.000	Pervious slope"				
"		1.430	Impervious Area"				
"		95.000	Impervious length"				
"		2.000	Impervious slope"				
"		0.250	Pervious Manning 'n				
"		75.000	Pervious Max.infilt				
"		5.000	Pervious Min.infilt	ration"			
		0.250	Pervious Lag consta	nt (hours)"			
			0				

... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 н 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" 0.730 1.178 0.979 c.m/sec" 0.979 ... н Catchment 301 Pervious Impervious Total Area ... Surface Area hectare" 1.170 1.430 2.600 ... Time of concentration 3.593 9.455 20.121 minutes" ... Time to Centroid 109.215 86.819 94.762 minutes" ... Rainfall depth 97.921 97.921 mm" 97.921 ... Rainfall volume 1400.27 2545.95 c.m" 1145.68 Rainfall losses mm" 34.520 3.529 17.475 Runoff depth 63.401 94.392 80.446 mm" ... Runoff volume 741.80 1349.81 2091.61 c.m" Runoff coefficient 0.647 0.964 0.822 ... Maximum flow c.m/sec" 0.277 0.616 0.730 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.979 0.979" 0.730 1.891 ... CATCHMENT 205" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... Internal to Pond Inet 1" 205 н 65.000 % Impervious" ... 4.320 Total Area" ... 100.000 Flow length" ... 4.000 Overland Slope" ... Pervious Area" 1.512 ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... 100.000 Impervious length" ... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 ... 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 ... 1.500 Impervious Depression storage" ... 1.353 1.891 0.979 0.979 c.m/sec" ... Catchment 205 Impervious Total Area " Pervious ... Surface Area 1.512 2.808 4.320 hectare" ... Time of concentration 20.749 3.705 8.225 minutes" ... Time to Centroid 109.932 86.956 93.049 minutes"

		Ra	infall depth	97.921	97.921	97.921	mm''
			infall volume	1480.57	2749.63	4230.20	c.m"
			infall losses	34.536	3.348	14.264	mm"
			noff depth	63.385	94.574	83.658	mm"
			noff volume	958.39	2655.63	3614.02	c.m"
			noff coefficient	0.647	0.966	0.854	"
			iximum flow	0.359	1.213	1.353	c.m/sec"
	40		DROGRAPH Add Runoff				,
"		4					
"			1.353 3.24	4 0.979	0.979"		
"	40	HY	DROGRAPH Copy to Out	flow"			
"		8					
			1.353 3.24	4 3.244	0.979"		
"	40	HY	DROGRAPH Combine	1"			
"		6	Combine "				
		1	Node #"				
			Pond Inlet 1"				
"		Ma	ximum flow	3.2	44 c.m/s	ec"	
"		Ну	drograph volume	9978.3	32 c.m"		
			1.353 3.24		3.244"		
	40	HY	DROGRAPH Confluenc	e 1"			
"		7	Confluence "				
"		1					
"			Pond Inlet 1"				
"			iximum flow	3.2		ec"	
		Ну	drograph volume	9978.3			
			1.353 3.24		0.000"		
	40		DROGRAPH Copy to Out	TIOW"			
		8	Copy to Outflow"	4 2 244	0.000		
		LIN	1.353 3.24 DROGRAPH Combine		0.000"		
		пт 6	DROGRAPH Combine Combine "	1000"			
		1000	Node #"				
		1000	Pond"				
		Ma	iximum flow	3.2	44 c.m/s	ec"	
			vdrograph volume	9978.3		cc	
		,	1.353 3.24				
	40	НУ	DROGRAPH Confluenc		5.211		
	10	7					
		3	Node #"				
		_	Pond Inlet 3"				
		Ма	ximum flow	3.4	16 c.m/s	ec"	
"		Hy	drograph volume	8808.4			
"		,	1.353 3.41				
"	40	HY	DROGRAPH Copy to Out	flow"			
"		8	Copy to Outflow"				
"			1.353 3.41	6 3.416	0.000"		
"	40	HY	DROGRAPH Combine	1000"			
"		6	Combine "				
"		1000	Node #"				

п			Pond"		
		Ма	ximum flow	6.660	c.m/sec"
			drograph volume	18786.760	
		,	1.353 3.416		
	40	ну	DROGRAPH Confluence	2"	0.000
	40		Confluence "	2	
		2	Node #"		
		2	Pond Inlet 2"		
		Ma	ximum flow	0.979	c.m/sec"
			drograph volume	2272.181	c.m"
		iiy	1.353 0.979		0.000"
	40	ЦV	DROGRAPH Copy to Outfl		0.000
	40	8		Ow	
		0		0.979	0 000"
	10			0.979 1000"	0.000"
	40	_	DROGRAPH Combine Combine "	1000	
		6 1000			
		1000			
		Ма	Pond"	7 (20	
			ximum flow	7.639	•
		ну	0		c.m"
	40		1.353 0.979		7.639"
	40		DROGRAPH Confluence	1000"	
			Confluence "		
		1000	Node #"		
			Pond"	7 (20	/ II
		Ma	ximum flow	7.639	c.m/sec"
				21050 026	
"			drograph volume		c.m"
"	40	Ну	1.353 7.639	0.979	
וי וי	40	Ну НҮ	1.353 7.639 DROGRAPH Copy to Outfl	0.979	c.m"
" "	40	Ну	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow"	0.979 ow"	c.m" 0.000"
" " "	-	Hy HY 8	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639	0.979	c.m"
 	40 40	Ну НҮ 8 НҮ	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link "	0.979 ow"	c.m" 0.000"
	-	Hy HY 8	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link "	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639	0.979 ow"	c.m" 0.000"
	-	Hy HY 8 HY 5 CA	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Ну НҮ 8 НҮ 5 СА 1	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Ну НҮ 8 НҮ 5 СА 1 1	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 5 CA 1 2 206 80.000	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 5 CA 1 2 206 80.000 3.290	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000	<pre>1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow"</pre>	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 0.658	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.000	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 4.000 0.658 100.000 2.000 2.632	<pre>1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow"</pre>	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 0.658 100.000 2.632 100.000	1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow" 1.353 7.639 DROGRAPH Next link " Next link " 1.353 7.639 TCHMENT 206" Triangular SCS" Equal length" Horton equation" Pond" % Impervious" Total Area" Flow length" Overland Slope" Pervious Area" Pervious length" Pervious slope" Impervious Area"	0.979 ow" 7.639	c.m" 0.000" 0.000"
	40	Hy HY 8 HY 5 CA 1 1 2 206 80.000 3.290 100.000 4.000 4.000 0.658 100.000 2.000 2.632	<pre>1.353 7.639 DROGRAPH Copy to Outfl Copy to Outflow"</pre>	0.979 ow" 7.639	c.m" 0.000" 0.000"

		75.000 5.000 0.250 5.000 0.015	Pervious Pervious Pervious Imperviou	Depression s Manning	ration" nt (hours)" storage" 'n'"			
		0.000		s Max.infi				
		0.000	•	s Min.infi		, 		
		0.050			tant (hours))		
		1.500	1.19		on storage" 9 7.639	0 000	.m/sec"	
		Cat	tchment 20		Pervious		Total Area	п
			rface Area		0.658	2.632	3.290	hectare"
			me of conc			3.705	6.151	minutes"
			me to Cent		109.932	86.956	90.254	minutes"
			infall dep		97.921	97.921	97.921	mm"
"			infall vol		644.32	2577.29	3221.61	c.m"
"			infall los		34.536	3.348	9.585	mm"
"		Rui	noff depth		63.385	94.574	88.336	mm"
"			noff volum		417.08	2489.18	2906.26	c.m"
"		Rui	noff coeff	icient	0.647	0.966	0.902	н
"		-	ximum flow		0.156	1.137	1.198	c.m/sec"
"	40	HYI	DROGRAPH A		п			
"		4	Add Runof					
"			1.19	8 8.83	7.639	0.000"		
	54		ND DESIGN"		<i>,</i> "			
		8.837	Current p		c.m/sec"			
		0.206	Target ou		.m/sec"			
		23965.2 17.	Hydrograp Number of		c.m"			
		456.800		ater level	metre"			
		458.000		ater level				
п		456.800		water leve				
		0	-		= True; 0 =	= False"		
"				ischarge	Volume"			
"				0.000	0.000"			
"			456.100	0.01500	680.300"			
"			456.200	0.02900	1395.900"			
"			456.300	0.04200	2147.500"			
"			456.400	0.05200	2935.400"			
"			456.480	0.05900	3592.400"			
"			456.500	0.06000	3760.400"			
			456.600		4627.400"			
			456.700		5539.800"			
			456.800		6496.900"			
			456.900		7500.300"			
			457.000 457.100		8551.600" 9652.000"			
			457.200	12.632	9652.000 10803.10"			
			457.300	21.379	12006.50"			
			457.400	31.960	13275.50"			
				52.500				

... 457.500 44.189 14711.10" ... Peak outflow c.m/sec" 5.771 н Maximum level 457.093 metre" ... c.m" Maximum storage 9569.881 ... hours" Centroidal lag 4.769 ... 1.198 8.837 5.771 0.000 c.m/sec" HYDROGRAPH Next link " 40 ... Next link " 5 ... 0.000" 1.198 5.771 5.771 ... DIVERSION" 56 ... 2000 Node number" ... 3.056 Overflow threshold" ... 1.000 Required diverted fraction" 0 Conduit type; 1=Pipe;2=Channel" ... Peak of diverted flow 2.715 c.m/sec" ... Volume of diverted flow 3134.302 c.m" ... DIV02000.100hyd" ... Divert Weir 1 and 2 away from Dispersion Trench" ... 1.198 5.771 3.056 0.000 c.m/sec" 81 ... 1 Lines of comment" ... Divert Flow from Weirs 1 and 2 away from Dispersion Trench" ... Combine 4000" 40 HYDROGRAPH ... Combine " 6 ... 4000 Node #" н Site" ... Maximum flow 3.056 c.m/sec" ... Hydrograph volume 20685.248 c.m" 1.198 5.771 3.056 3.056" HYDROGRAPH Next link " 40 ... Next link " 5 ... 1.198 3.056 3.056 3.056" ... 54 POND DESIGN" ... 3.056 Current peak flow c.m/sec" ... c.m/sec" 0.206 Target outflow ... 20685.2 Hydrograph volume c.m" ... Number of stages" 9. ... 456.800 Minimum water level metre" ... 458.000 Maximum water level metre" ... 456.800 Starting water level metre" ... 0 Keep Design Data: 1 = True; 0 = False" ... Level Discharge Volume" ... 454.860 0.000 0.000" ... 454.960 1.20E-05 4.000" ... 8.000" 455.060 1.20E-05 ... 455.160 1.20E-05 12.000" н 455.260 1.20E-05 16.000" ... 455.360 1.20E-05 20.000" ... 20.500" 455.460 1.702 ... 455.560 4.979 21.000"

			455.660	9.395	21.500"	
		Pe	ak outflow		3.056	c.m/sec"
			ximum level		455.501	
п		-	ximum storage		20.707	
			entroidal lag		5.258	
п		Ce	0			
	40	ЦМ	DROGRAPH Next	3.056	3.056	3.056 c.m/sec"
п	40		Next link "	TTUK		
		5		2 050	2 056	2 056"
	56	та	1.198 VERSION"	3.056	3.056	3.056"
	50	3000	Node number"			
				o chold"		
			Overflow thre		at :"	
		_	Computed div			
		0	Conduit type	-		
			ak of diverte		1.207	
			lume of diver		8163.324	c.m"
			V03000.100hyd			
		Ма	ijor flow at 3		4 9 4 9	
	04		1.198	3.056		
	81					"
			nes of commen			
			verted to exis			<u>5</u>
	40			mbine	4000"	
		6	Combine "			
		4000	Node #"			
			Site"			/ "
			iximum flow		4.905	c.m/sec"
		Ну	drograph volu		33190.559	c.m"
			1.198	3.056	1.849	4.905"
"	40		DROGRAPH Star		-	
		2	Start - New	-		
			1.198	0.000	1.849	4.905"
	33		TCHMENT 200"			
"		1	Triangular S			
		1	Equal length			
		2	Horton equat			
		200	Rear yard and		bace to Grand	d River"
"		10.000	% Impervious			
		7.530	Total Area"			
		100.000	Flow length"			
"		5.000	Overland Slo			
		6.777	Pervious Area			
		100.000	Pervious len	0		
		2.000	Pervious slo			
		0.753	Impervious A			
		100.000	Impervious l	•		
"		2.000	Impervious s			
		0.250	Pervious Man	•		
		75.000	Pervious Max			
"		5.000	Pervious Min	.infiltra	ition"	

... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 н Impervious Manning 'n'" 0.015 ... 0.000 Impervious Max.infiltration" н 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)" ... Impervious Depression storage" 1.500 ... 0.000 1.746 1.849 4.905 c.m/sec" ... п Catchment 200 Pervious Impervious Total Area ... Surface Area 6.777 0.753 7.530 hectare" ... 18.326 Time of concentration 20.749 3.705 minutes" . Time to Centroid 109.932 86.956 106.665 minutes" Rainfall depth 97.921 97.921 97.921 mm" Rainfall volume 6636.13 737.35 7373.48 c.m" ... Rainfall losses 34.536 3.348 31.417 mm" ... mm" Runoff depth 94.574 66.504 63.385 ... Runoff volume c.m" 4295.63 712.14 5007.77 ... Runoff coefficient ... 0.647 0.966 0.679 ... 1.608 Maximum flow 0.325 1.746 c.m/sec" HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 1.746 1.746 1.849 4.905" ... HYDROGRAPH Copy to Outflow" 40 ... Copy to Outflow" 8 ... 4.905" 1.746 1.746 1.746 н Combine HYDROGRAPH 4000" 40 Combine " ... 6 ... 4000 Node #" Site" ... Maximum flow 6.651 c.m/sec" ... c.m" Hydrograph volume 38198.348 ... 1.746 1.746 1.746 6.651" ... HYDROGRAPH Start - New Tributary" 40 ... Start - New Tributary" 2 ... 1.746 1.746 6.651" 0.000 ... 47 FILEI_O Read/Open DIV03000.100hyd" ... 1=read/open; 2=write/save" 1 . 2 1=rainfall; 2=hydrograph" . 1=runoff; 2=inflow; 3=outflow; 4=junction" 1 ... DIV03000.100hyd" Major flow at 3000" ... c.m" Total volume 8163.322 ... Maximum flow 1.207 c.m/sec" ... 1.207 0.000 1.746 6.651 c.m/sec" ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 н 1.746 6.651" 1.207 1.207 н 40 HYDROGRAPH Copy to Outflow" ... 8 Copy to Outflow" ... 6.651" 1.207 1.207 1.207

"	40	HY	DROGRAPH Co	ombine	4000"		
"		6	Combine "				
"		4000	Node #"				
"			Site"				
"			ximum flow		7.858		
"		Hy	drograph volu		46361.719		
"			1.207	1.207		7.858"	
"	40	HY	DROGRAPH Star		-		
"		2	Start - New	-			
			1.207	0.000	1.207	7.858"	
	47		LEI_O Read/Op		-		
		1	1=read/open;				
		2	1=rainfall;				
		1	1=runoff; 2=	-	B=outflow; 4	1=junction"	
			V02000.100hyc		с р.		
				and 2 away		ersion Trench"	
		-	tal volume		3134.302		
		Ma	ximum flow	0 000		5 c.m/sec"	
п	10		2.715 DROGRAPH Add	0.000 Bupoff "	1.207	7.858 c.m/sec"	
	40	лт 4	Add Runoff "				
		4	2.715	2.715	1.207	7.858"	
	40	ну	DROGRAPH Copy			7.000	
	40	8	Copy to Outf		LOW		
		0	2.715	2.715	2.715	7.858"	
п	40	HV		ombine	4000"	7.050	
	40	6	Combine "	moine	4000		
		4000	Node #"				
"			Site"				
		Ma	ximum flow		10.574	4 c.m/sec"	
"		Hy	drograph volu	ıme	49496.012		
			2.715	2.715	2.715	10.574"	
"	40	HY	DROGRAPH Co	onfluence	4000"		
		7	Confluence "				
"		4000	Node #"				
"			Site"				
		Ma	ximum flow		10.573		
		Hy	drograph volu	ıme	49496.012	2 c.m"	
"			2.715	10.573	2.715	0.000"	
"	81						"
"			nes of commer				
"		-	tal flow to G				
	38		ART/RE-START				
		3	Runoff Total		l	26.226	h
			tal Catchment			36.330	hectare"
			tal Imperviou			18.751	hectare"
	10		tal % impervi IT"	lous		51.612"	
	19	EX	± 1				

п		MTDUSS OU	tout				
		MIDUSS ve	-				25 rev. 473"
п		MIDUSS ve					
п	10					Sunday, Februa	-
	10	Units use		C)	,		ie METRIC"
		Job folde		C:\Use	ers∖szag	ga\Documents\M	
		Output fi				104-104 p	ost Reg.out"
"		Licensee	name:				gmbp"
"		Company					"
"			me last use	d:		2/22/2023 at	11:46:29 AM"
" 3	1 T.	IME PARAMET					
"	60.000	Time Step					
"	2880.000	Max. Stor	m length"				
"	5000.000	Max. Hydr	ograph"				
" 3	2 S ⁻	TORM Histor	ic"				
п	5	Historic"					
"	2880.000	Duration"					
"	48.000	Rainfall	intensity va	alues"			
"		2.028	2.028	2.028	2.028	3 2.028"	
"		2.028	2.028	2.028	2.028	2.028"	
"		2.028	2.028	2.028	2.028		
п		2.028	2.028		2.028		
		2.028	2.028		2.028		
		2.028	2.028		2.028		
п		2.028	2.026	2.026	2.026		
п		2.026	6.000	4.000	6.000		
		17.000	13.000	23.000	13.000		
		53.000	38.000	13.000"	19.000	15:000	
	Ma	aximum inte		53.6	100 m	ım/hr"	
п		otal depth	nsicy	285.0		''''''''''''''''''''''''''''''''''''''	
	7	9999hyd	Hydrograph			.n this file"	
" 3		ATCHMENT 30		excension	i useu i		
"	ری 1	Triangula					
	1	Equal len					
	2	Horton eq	-				
п	302		lands and wa	aton towar			
п	55.000			ater tower			
		% Impervi					
	0.670	Total Are					
	30.000	Flow leng					
	2.000	Overland	•				
	0.302	Pervious					
	30.000	Pervious	•				
	2.000	Pervious					
	0.368	Imperviou					
	30.000		s length"				
	2.000	Imperviou	•				
	0.250		Manning 'n'				
	75.000		Max.infiltra				
	5.000		Min.infiltra				
	0.250		Lag constan		•		
	5.000	Pervious	Depression :	storage"			

... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 н 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" 0.078 0.000 0.000 c.m/sec" 0.000 ... п Catchment 302 Pervious Impervious Total Area ... Surface Area hectare" 0.302 0.368 0.670 ... Time of concentration 16.093 2.860 7.181 minutes" ... Time to Centroid 2720.207 2251.465 2404.533 minutes" ... Rainfall depth 285.000 mm" 285.000 285.000 . Rainfall volume 859.28 1050.22 1909.50 c.m" Rainfall losses mm" 139.563 39.596 84.581 145.437 Runoff depth 245.404 200.419 mm" . Runoff volume 438.49 904.31 1342.81 c.m" Runoff coefficient 0.510 0.861 0.703 ... Maximum flow c.m/sec" 0.031 0.047 0.078 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 ... 0.000 0.000" 0.078 0.078 ... CATCHMENT 201" 33 ... 1 Triangular SCS" ... 1 Equal length" ... 2 Horton equation" ... 201 Townhome and Apartment Blocks" н 90.000 % Impervious" ... 4.280 Total Area" ... 200.000 Flow length" ... 4.000 Overland Slope" ... 0.428 Pervious Area" ... 200.000 Pervious length" ... 2.000 Pervious slope" ... 3.852 Impervious Area" ... 200.000 Impervious length" ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... Pervious Lag constant (hours)" 0.250 ... Pervious Depression storage" 5.000 . 0.015 Impervious Manning 'n'" ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... Impervious Lag constant (hours)" 0.050 ... Impervious Depression storage" 1.500 ... 0.512 0.078 0.000 0.000 c.m/sec" ... Catchment 201 Impervious Total Area " Pervious ... Surface Area 0.428 3.852 4.280 hectare" ... Time of concentration 50.233 8.926 11.288 minutes" ... Time to Centroid 2757.880 2264.252 2292.474 minutes"

	40	Ra Ra Ru Ru Ma	ainfall depth ainfall volume ainfall losses unoff depth unoff volume unoff coefficien aximum flow /DROGRAPH Add Run Add Runoff "		285.000 0.1220 138.714 146.286 0.0626 0.513 0.046	285.000 1.0978 16.956 268.044 1.0325 0.941 0.484	285.000 1.2198 29.132 255.868 1.0951 0.898 0.512	mm" ha-m" mm" ha-m" " c.m/sec"
		+	0.512	0.59	0.000	0.000"		
	33	CA	ATCHMENT 304"	0.55	0.000	01000		
"		1	Triangular SCS					
"		1	Equal length"					
"		2	Horton equation	n"				
"		304	External - Luth	ner Rd	."			
"		55.000	% Impervious"					
"		1.090	Total Area"					
"		110.000	Flow length"					
"		2.000	Overland Slope	"				
		0.491	Pervious Area"					
		110.000	Pervious lengt					
		2.000	Pervious slope					
		0.600 110.000	Impervious Are Impervious len					
		2.000	Impervious ien	•				
		0.250	Pervious Manni					
"		75.000	Pervious Max.i	•				
"		5.000	Pervious Min.i					
"		0.250	Pervious Lag c					
"		5.000	Pervious Depre					
"		0.015	Impervious Man	ning	'n'"			
"		0.000	Impervious Max	.infi	ltration"			
"		0.000	Impervious Min					
		0.050	Impervious Lag		•)"		
		1.500	Impervious Dep		-		/ II	
		C	0.117 atchment 304	0.59	0 0.000 Pervious		c.m/sec"	п
			urface Area		0.491	0.600	Total Area 1.090	hectare"
			ime of concentra	tion	35.092	6.236	15.325	minutes"
"			ime to Centroid	CION	2739.025	2235.505	2394.105	minutes"
"			ainfall depth		285.000	285.000	285.000	mm"
"			ainfall volume		1397.93	1708.57	3106.50	c.m"
"		Ra	ainfall losses		140.362	27.637	78.363	mm"
"		Rı	unoff depth		144.638	257.363	206.637	mm"
"		Ru	unoff volume		709.45	1542.89	2252.34	c.m"
"			unoff coefficien	t	0.508	0.903	0.725	n
"			aximum flow		0.054	0.076	0.117	c.m/sec"
	40		DROGRAPH Add Ru	noff				
		4	Add Runoff "	0 70	7 0 000	0.000"		
			0.117	0.70	7 0.000	0.000"		

"	33	C	ATCHMENT 202"					
"		1	Triangular SCS					
"		1	Equal length"					
"		2	Horton equation	n"				
"		202	Internal to Por	nd Ind	et 3"			
"		60.000	% Impervious"					
"		4.150	Total Area"					
"		130.000	Flow length"					
"		4.000	Overland Slope					
"		1.660	Pervious Area"					
"		130.000	Pervious lengt	h"				
"		2.000	Pervious slope					
"		2.490	Impervious Area	a"				
"		130.000	Impervious len	gth"				
"		2.000	Impervious slop					
"		0.250	Pervious Mannin	ng 'n				
"		75.000	Pervious Max.in	nfilt	ration"			
"		5.000	Pervious Min.in					
"		0.250	Pervious Lag co					
"		5.000	Pervious Depres		-			
"		0.015	Impervious Mann	-				
		0.000	Impervious Max					
"		0.000	Impervious Min			、		
		0.050	Impervious Lag)"		
		1.500	Impervious Dep		-		<i>,</i>	
			0.447	0.70			c.m/sec"	
			atchment 202		Pervious		Total Area	
			urface Area		1.660	2.490	4.150	hectare"
			ime of concentrat	tion	38.792	6.893	15.449	minutes"
			ime to Centroid		2741.816	2242.481	2376.420	minutes"
			ainfall depth		285.000	285.000	285.000	mm" bo
			ainfall volume		0.4731	0.7096	1.1828	ha-m"
			ainfall losses		141.611	24.215	71.174	mm" mm"
			unoff depth unoff volume		143.389	260.785	213.826 8873.79	
			unoff coefficient		2380.25 0.503	6493.54 0.915	0.750	c.m"
п			aximum flow	L	0.182	0.315	0.447	c.m/sec"
	40		YDROGRAPH Add Rur	noff		0.515	0.447	C.III/ SEC
	40	4						
		4	0.447	1.15	3 0.000	0.000"		
п	40	н	YDROGRAPH Copy to			0.000		
	10	8	Copy to Outflow		1104			
		Ũ	0.447	1.15	3 1.153	0.000"		
п	40	н	YDROGRAPH Comb:		3"	0.000		
		6	Combine "		2			
"		3	Node #"					
"		-	Pond Inlet 3"					
"		Ma	aximum flow		1.1	53 c.m/s	ec"	
"			ydrograph volume		23420.0			
"		-	0.447	1.15				

"	40	HY	DROGRAPH Start - New	-			
"		2	Start - New Tributa	-			
"			0.447 0.000	a 1.153	1.153"		
	33		TCHMENT 203"				
"		1	Triangular SCS"				
		1	Equal length"				
		2	Horton equation"				
		203	Internal to Pond Ine	et 2"			
		60.000	% Impervious"				
		2.760	Total Area"				
		30.000	Flow length"				
		4.000	Overland Slope"				
		1.104	Pervious Area"				
		30.000	Pervious length"				
		2.000 1.656	Pervious slope" Impervious Area"				
		30.000	Impervious length"				
		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250					
	0.015 Impervious Manning 'n'"						
		0.000	Impervious Max.infi				
		0.000	Impervious Min.infi				
		0.050	Impervious Lag const)"		
		1.500	Impervious Depression		/		
"			0.325 0.000	-	1.153	c.m/sec"	
"		Ca	tchment 203	Pervious		Total Area	п
"		Su	rface Area	1.104	1.656	2.760	hectare"
"		Ti	me of concentration	16.093	2.860	6.608	minutes"
"		Ti	me to Centroid	2720.207	2251.465	2384.215	minutes"
"		Ra	infall depth	285.000	285.000	285.000	mm"
"		Ra	infall volume	3146.40	4719.60	7866.00	c.m"
"		Ra	infall losses	139.563	39.596	79.583	mm"
"		Ru	noff depth	145.437	245.404	205.417	mm"
"			noff volume	1605.63	4063.89	5669.52	c.m"
"			noff coefficient	0.510	0.861	0.721	
"			ximum flow	0.115	0.211	0.325	c.m/sec"
"	40	HY	DROGRAPH Add Runoff '				
"		4					
			0.325 0.325		1.153"		
"	40		DROGRAPH Copy to Out	flow"			
"		8	Copy to Outflow"				
		•	0.325 0.325		1.153"		
	40		DROGRAPH Combine	2"			
		6	Combine "				
		2	Node #"				
			Pond Inlet 2"				

"	M	aximum flow	0.32	25 c.m/se	e	
"	H	ydrograph volume	5669.51	L7 c.m"		
		0.325 0.325	5 0.325	0.325"		
	40 H	YDROGRAPH Start - New	Tributary"			
	2	Start - New Tributar	ry"			
"		0.325 0.000	0.325	0.325"		
"	33 C.	ATCHMENT 303"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	303	External"				
"	55.000	% Impervious"				
"	3.550	Total Area"				
	140.000	Flow length"				
	2.000	Overland Slope"				
	1.597	Pervious Area"				
	140.000	Pervious length"				
	2.000	Pervious slope"				
	1.952	Impervious Area"				
	140.000	Impervious length"				
п	2.000 0.250	Impervious slope" Pervious Manning 'n				
	75.000	Pervious Manning n Pervious Max.infiltr				
	5.000	Pervious Min.infilt				
	0.250	Pervious Lag constar				
	5.000	Pervious Depression				
"	0.015	Impervious Manning	-			
"	0.000	Impervious Max.infil				
n	0.000	Impervious Min.infil				
"	0.050	Impervious Lag const)"		
"	1.500	Impervious Depressio				
"		0.371 0.000	0.325	0.325 0	c.m/sec"	
"	C	atchment 303	Pervious	Impervious	Total Area	н
"		urface Area	1.597	1.952	3.550	hectare"
"		ime of concentration	40.556	7.207	17.519	minutes"
"		ime to Centroid	2744.076	2245.793	2399.878	minutes"
"		ainfall depth	285.000	285.000	285.000	mm"
		ainfall volume	0.4553	0.5565	1.0117	ha-m"
		ainfall losses	141.525	22.773	76.211	mm"
		unoff depth	143.475	262.227	208.789	mm"
		unoff volume	2292.02	5119.98	7412.00	c.m"
		unoff coefficient	0.503 0.175	0.920	0.733	
п		aximum flow YDROGRAPH Add Runoff '		0.247	0.371	c.m/sec"
	40 H	Add Runoff "				
п	+	0.371 0.371	1 0.325	0.325"		
	33 C.	ATCHMENT 204"	- 0.525	0,525		
"	1	Triangular SCS"				
"	- 1	Equal length"				
"	2	Horton equation"				
		•				

	204						
	10.000						
	2.090						
п	140.000	6					
"	2.000						
п	1.881	Pervious Area"					
п	140.000	Pervious length"	1				
	2.000	Pervious slope"					
	0.209	Impervious Area"	1				
	140.000	Impervious lengt	:h"				
п	2.000	Impervious slope					
	0.250	Pervious Manning	; 'n'"				
	75.000	Pervious Max.inf	'iltration'	•			
	5.000	Pervious Min.inf	'iltration'				
	0.250		stant (hou	urs)"			
	5.000	–					
п	0.015) -			
	0.000	•	•	on"			
	0.000	•					
п	0.050	•					
	1.500						
п	1.900	• •		0.325	0 325 c	.m/sec"	
		Catchment 204	Pervi				
		Surface Area	1.881			2.090	hectare"
		Time of concentrati				34.926	minutes"
п		Time to Centroid	2744.0			2659.968	minutes"
		Rainfall depth	285.00			285.000	mm"
п		Rainfall volume	5360.8			5956.50	c.m"
п		Rainfall losses	141.52			129.649	mm"
п		Runoff depth	143.47			155.351	mm"
		Runoff volume	2698.			3246.83	c.m"
		Runoff coefficient	0.503			0.545	
		Maximum flow	0.206			0.225	c.m/sec"
",				Ø	.020	0.225	C.III/Sec
		HYDROGRAPH Add Runo	ртт				
п	4			2 2 2 5	0 225"		
	22		.574 (9.325	0.325"		
		CATCHMENT 301"					
п	1	0					
п	1	1 0	1				
	2	•					
	301		ernal				
	55.000						
	2.600						
	95.000	0					
	2.000						
	1.170						
	95.000	0	1				
п	2.000	•					
	1.430	Impervious Area"	1				
	95.000						

... Impervious slope" 2.000 ... Pervious Manning 'n'" 0.250 н Pervious Max.infiltration" 75.000 ... 5.000 Pervious Min.infiltration" ... 0.250 Pervious Lag constant (hours)" ... 5.000 Pervious Depression storage" ... 0.015 Impervious Manning 'n'" ... Impervious Max.infiltration" 0.000 ... Impervious Min.infiltration" 0.000 ... Impervious Lag constant (hours)" 0.050 н 1.500 Impervious Depression storage" ... 0.282 0.574 0.325 0.325 c.m/sec" ... Catchment 301 п Pervious Impervious Total Area Surface Area 1.170 1.430 2.600 hectare" ... Time of concentration 32.137 5.711 14.115 minutes" ... Time to Centroid 2737.280 2232.538 2393.050 minutes" ... mm" Rainfall depth 285.000 285.000 285.000 ... Rainfall volume c.m" 3334.50 4075.50 7410.00 ... 139.558 mm" Rainfall losses 29.801 79.192 Runoff depth mm" 145.442 255.199 205.808 ... Runoff volume 1701.67 3649.34 5351.01 c.m" ... Runoff coefficient 0.510 0.895 0.722 ... c.m/sec" Maximum flow 0.128 0.181 0.282 ... HYDROGRAPH Add Runoff " 40 ... Add Runoff " 4 н 0.325 0.325" 0.282 0.826 .. 33 CATCHMENT 205" ... Triangular SCS" 1 ... 1 Equal length" ... Horton equation" 2 ... 205 Internal to Pond Inet 1" ... % Impervious" 65.000 ... 4.320 Total Area" ... 100.000 Flow length" ... 4.000 Overland Slope" ... 1.512 Pervious Area" ... 100.000 Pervious length" ... 2.000 Pervious slope" ... 2.808 Impervious Area" ... 100.000 Impervious length" ... 2.000 Impervious slope" ... Pervious Manning 'n'" 0.250 ... 75.000 Pervious Max.infiltration" ... 5.000 Pervious Min.infiltration" ... 0.250 Pervious Lag constant (hours)" ... Pervious Depression storage" 5.000 ... Impervious Manning 'n'" 0.015 ... 0.000 Impervious Max.infiltration" ... 0.000 Impervious Min.infiltration" ... 0.050 Impervious Lag constant (hours)"

		1.500	Impervious De	-	-			<i>,</i>	
		~	0.485	0.826				c.m/sec"	
			tchment 205		Pervious			Total Area	
			irface Area		1.512	2.808		4.320	hectare"
			me of concent			5.889		12.266	minutes"
			me to Centroi	1	2737.930		.505	2351.531	minutes"
			infall depth		285.000		900	285.000	mm"
			infall volume		0.4309	0.800		1.2312	ha-m"
			infall losses		139.790		18	67.788	mm"
			noff depth		145.210		982	217.212	mm"
п			noff volume		2195.58		.97	9383.55	c.m"
			noff coefficie	ent	0.510	0.898		0.762	
п	10		IXIMUM flow		0.166	0.355	2	0.485	c.m/sec"
	40		DROGRAPH Add I	KUNOTT					
		4	Add Runoff " 0.485	1 21/	0.325	(9.325"		
	40			1.31		e	0.525		
	40	8	DROGRAPH Copy Copy to Outf		TIOW				
		0	0.485	1.310	0 1.310	c.	0.325"		
	40	нν		nbine	1"	e			
	40	6		потпе	-				
		1	Node #"						
		-	Pond Inlet 1						
		Ma	ximum flow		1.3	10	c.m/s	ec"	
			drograph volu	ne	25393.3		c.m"		
		,	0.485	1.310			1.310"		
	40	НУ		nfluence		-			
"			Confluence "						
"		1	Node #"						
			Pond Inlet 1						
"		Ma	ximum flow		1.3	10	c.m/s	ec"	
"		Ну	drograph volu	ne	25393.3	83	c.m"		
"			0.485	1.310	0 1.310	6	0.000"		
"	40	HY	DROGRAPH Copy	to Out	flow"				
"		8	Copy to Outf	Low"					
"			0.485	1.310	0 1.310	6	0.000"		
"	40	HY		nbine	1000"				
		6	Combine "						
"		1000	Node #"						
			Pond"						
"			ximum flow		1.3		c.m/s	ec"	
"		Ну	drograph volu		25393.3		c.m"		
			0.485	1.310		-	1.310"		
	40			nfluence	e 3"				
		7	Confluence "						
		3	Node #"						
			Pond Inlet 3	-	- -	F 2		"	
			ximum flow		1.1		c.m/s	ec	
		Ну	drograph volu		23420.0		c.m"		
			0.485	1.153	3 1.310	(0.000"		

	40	HYDROGRAPH Copy to Outf]	low"	
		8 Copy to Outflow"	2011	
"		0.485 1.153	1.153	0.000"
п	40	HYDROGRAPH Combine		
		6 Combine "		
		1000 Node #"		
"		Pond"		
		Maximum flow	2,463	c.m/sec"
"		Hydrograph volume		
"		0.485 1.153		
"	40	HYDROGRAPH Confluence		
"		7 Confluence "		
"		2 Node #"		
"		Pond Inlet 2"		
"		Maximum flow	0.325	c.m/sec"
"			5669.517	
"		0.485 0.325		
"	40	HYDROGRAPH Copy to Outf]		
"		8 Copy to Outflow"		
"		0.485 0.325	0.325	0.000"
"	40	HYDROGRAPH Combine		
"		6 Combine "		
"		1000 Node #"		
"		Pond"		
"		Maximum flow	2.789	c.m/sec"
"		Hydrograph volume	54482.996	c.m"
"		0.485 0.325	0.325	2.789"
"	40	HYDROGRAPH Confluence	1000"	
"		7 Confluence "		
		7 Confluence "		
		1000 Node #"		
"				
 		1000 Node #" Pond" Maximum flow		c.m/sec"
		1000 Node #" Pond" Maximum flow		
"		1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789	54482.996 0.325	
 	40	1000 Node #" Pond" Maximum flow Hydrograph volume	54482.996 0.325	c.m"
" "	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789	54482.996 0.325	c.m" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789	54482.996 0.325	c.m"
	40 40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link "	54482.996 0.325 low"	c.m" 0.000"
		1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789	54482.996 0.325 low"	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789	54482.996 0.325 low"	c.m" 0.000"
		1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	<pre>1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation"</pre>	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	<pre>1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 206 Pond"</pre>	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	<pre>1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 206 Pond" 80.000 % Impervious"</pre>	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 206 Pond" 80.000 % Impervious" 3.290 Total Area"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 206 Pond" 80.000 % Impervious" 3.290 Total Area" 100.000 Flow length"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"
	40	1000 Node #" Pond" Maximum flow Hydrograph volume 0.485 2.789 HYDROGRAPH Copy to Outfl 8 Copy to Outflow" 0.485 2.789 HYDROGRAPH Next link " 5 Next link " 0.485 2.789 CATCHMENT 206" 1 Triangular SCS" 1 Equal length" 2 Horton equation" 206 Pond" 80.000 % Impervious" 3.290 Total Area"	54482.996 0.325 Low" 2.789	c.m" 0.000" 0.000"

		100.000	Pervious length"				
п		2.000	Pervious slope"				
п		2.632	Impervious Area"				
п		100.000	Impervious length"				
п		2.000	Impervious slope"				
		0.250	Pervious Manning 'n				
п		75.000	Pervious Max.infilt				
		5.000	Pervious Min.infilt				
		0.250	Pervious Lag consta				
		5.000	Pervious Depression				
		0.015	Impervious Manning	-			
		0.000	Impervious Max.infi				
п		0.000	Impervious Min.infi				
п		0.050	Impervious Lag cons) "		
п		1.500	Impervious Depressi		/		
п		1,200	0.389 2.78		0.000	c.m/sec"	
п		C	atchment 206	Pervious		Total Area	п
			urface Area	0.658	2.632	3.290	hectare"
		_	ime of concentration	33.142	5.889	9.274	minutes"
			ime to Centroid	2737.929	2233.505	2296.156	minutes"
п			ainfall depth	285.000	285.000	285.000	mm"
п			ainfall volume	1875.30	7501.20	9376.50	c.m"
п			ainfall losses	139.790	29.018	51.172	mm"
п			unoff depth	145.210	255.982	233.828	mm''
п			unoff volume	955.48	6737.44	7692.93	c.m"
п			unoff coefficient	0.510	0.898	0.820	"
п			aximum flow	0.072	0.333	0.389	c.m/sec"
	40		YDROGRAPH Add Runoff				,
п		4	Add Runoff "				
		-	0.389 3.17	8 2.789	0.000"		
	54	P	OND DESIGN"				
п	-	3.178	Current peak flow	c.m/sec"			
п		0.206	-	.m/sec"			
п		62175.9	Hydrograph volume	c.m"			
п		17.	Number of stages"				
		456.800	Minimum water level	metre"			
		458.000	Maximum water level				
		456.800	Starting water leve				
п		0	Keep Design Data: 1	= True; 0 =	= False"		
п			Level Discharge	Volume"			
п			456.000 0.000	0.000"			
			456.100 0.01500	680.300"			
				1395.900"			
				2147.500"			
				2935.400"			
"				3592.400"			
				3760.400"			
				4627.400"			
"				5539.800"			
				6496.900"			

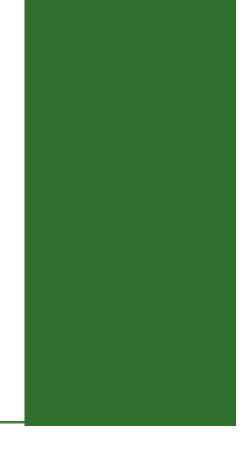
... 456.900 2.386 7500.300" ... 2.490 8551.600" 457.000 н 6.036 9652.000" 457.100 ... 457.200 12.632 10803.10" н 457.300 21.379 12006.50" 457.400 31.960 13275.50" ... 44.189 14711.10" 457.500 ... Peak outflow 2.808 c.m/sec" ... metre" Maximum level 457.012 ... c.m" Maximum storage 8684.418 ... Centroidal lag 43.065 hours" ... 0.389 3.178 2.808 0.000 c.m/sec" ... HYDROGRAPH Next link " 40 ... 5 Next link " ... 0.389 2.808 2.808 0.000" ... DIVERSION" 56 ... Node number" 2000 ... 2.458 Overflow threshold" ... Required diverted fraction" 1.000 Conduit type; 1=Pipe;2=Channel" a Peak of diverted flow 0.350 c.m/sec" ... Volume of diverted flow 1259.027 c.m" DIV02000.9999hyd" ... Divert Weir 1 and 2 away from Dispersion Trench" ... 2.808 2.458 0.000 c.m/sec" 0.389 н 81 ... 1 Lines of comment" ... Divert Flow from Weirs 1 and 2 away from Dispersion Trench" 40 HYDROGRAPH Combine 4000" ... Combine " 6 ... Node #" 4000 . Site" ... 2.458 Maximum flow c.m/sec" ... Hydrograph volume 61031.441 c.m" ... 2.808 2.458 2.458" 0.389 ... HYDROGRAPH Next link " 40 ... Next link " 5 ... 0.389 2.458 2.458 2.458" ... 54 POND DESIGN" ... 2.458 Current peak flow c.m/sec" ... 0.206 Target outflow c.m/sec" ... 61031.4 Hydrograph volume c.m" ... Number of stages" 9. ... 456.800 Minimum water level metre" п Maximum water level metre" 458.000 ... Starting water level 456.800 metre" ... Keep Design Data: 1 = True; 0 = False" 0 ... Level Discharge Volume" ... 0.000 0.000" 454.860 ... 454.960 1.20E-05 4.000"

```
...
                  455.060 1.20E-05
                                          8.000"
...
                  455.160 1.20E-05
                                         12.000"
п
                                         16.000"
                  455.260 1.20E-05
...
                  455.360 1.20E-05
                                         20.000"
н
                  455.460
                               1.702
                                         20.500"
                  455.560
                               4.979
                                         21.000"
...
                  455.660
                               9.395
                                         21.500"
...
               Peak outflow
                                                2.458
                                                         c.m/sec"
...
                                                         metre"
              Maximum level
                                             455.483
...
                                                         c.m"
              Maximum storage
                                              20.615
...
               Centroidal lag
                                              43.075
                                                        hours"
...
                    0.389
                               2.458
                                          2.458
                                                     2.458 c.m/sec"
...
              HYDROGRAPH Next link "
 40
...
              5
                  Next link "
...
                       0.389
                                  2.458
                                             2.458
                                                        2.458"
...
              DIVERSION"
  56
...
                  Node number"
          3000
...
         0.000
                  Overflow threshold"
...
         0.395
                  Computed diverted fraction"
              0
                  Conduit type; 1=Pipe;2=Channel"
               Peak of diverted flow
                                               0.971
                                                         c.m/sec"
...
              Volume of diverted flow
                                           24097.531
                                                         c.m"
              DIV03000.9999hyd"
...
              Major flow at 3000"
...
                                  2.458
                       0.389
                                             1.487
                                                        2.458 c.m/sec"
п
              81
...
           1 Lines of comment"
...
              Diverted to existing wetland on site"
  40
              HYDROGRAPH
                             Combine
                                         4000"
...
                  Combine "
              6
...
                  Node #"
          4000
н
                  Site"
...
              Maximum flow
                                                3.945
                                                         c.m/sec"
...
              Hydrograph volume
                                           97949.086
                                                         c.m"
...
                                  2.458
                                                        3.945"
                       0.389
                                             1.487
...
  40
              HYDROGRAPH Start - New Tributary"
...
              2
                  Start - New Tributary"
.
                       0.389
                                  0.000
                                             1.487
                                                        3.945"
...
              CATCHMENT 200"
  33
...
                  Triangular SCS"
              1
...
              1
                  Equal length"
...
                  Horton equation"
              2
...
           200
                  Rear yard and Open Space to Grand River"
...
                  % Impervious"
        10.000
...
                  Total Area"
         7.530
...
                  Flow length"
       100.000
н
         5.000
                  Overland Slope"
н
         6.777
                  Pervious Area"
...
                  Pervious length"
       100.000
...
         2.000
                  Pervious slope"
```

		0.753 Impervious 100.000 Impervious 2.000 Impervious 0.250 Pervious Mai 75.000 Pervious Mai 5.000 Pervious Mai 0.250 Pervious La 5.000 Pervious La 5.000 Pervious La 0.015 Impervious I 0.000 Impervious I 0.050 Impervious 1.500 Impervious I	length" slope" nning 'n' k.infiltr n.infiltr g constar pression Manning ' Max.infil Min.infil Lag const	vation" vation" nt (hours)" storage" n'" tration" tration" ant (hours)) "		
		0.809	0.000	•	3 945 6	.m/sec"	
		Catchment 200	0.000	Pervious	Impervious		
		Surface Area		6.777	0.753	7.530	hectare"
		Time of concen	tration	33.142	5.889	28.678	minutes"
		Time to Centro		2737.929	2233.505	2655.311	minutes"
		Rainfall depth	10	285.000	285.000	285.000	mm"
		Rainfall volum	2	1.9314	0.2146	2.1461	ha-m"
		Rainfall losse		139.790	29.018	128.713	mm"
"		Runoff depth	-	145.210	255.982	156.287	mm"
"		Runoff volume		0.9841	0.1928	1.1768	ha-m"
"		Runoff coeffic:	ient	0.510	0.898	0.548	"
"		Maximum flow		0.744	0.095	0.809	c.m/sec"
"	40	HYDROGRAPH Add	Runoff "	1			
"		4 Add Runoff	1				
"		0.809	0.809		3.945"		
	40	HYDROGRAPH Cop		low"			
		8 Copy to Out			2 0 4 5 1		
	40	0.809	0.809		3.945"		
	40		ombine	4000"			
		0 COMDITIC					
		4000 Node #" Site"					
		Maximum flow		4.75	54 c.m/se	۵ ۲	
		Hydrograph vol	IMA	109717.53		C	
		0.809	0.809		4.754"		
"	40	HYDROGRAPH Sta			1.751		
"		2 Start - New		-			
"		0.809	0.000	•	4.754"		
"	47	FILEI_O Read/O	oen DIV03	3000.9999hyd			
"		1 1=read/open	; 2=write	e/save"			
"		2 1=rainfall;					
"		1 1=runoff; 2:	=inflow;	3=outflow;	4=junction'	I	
"		DIV03000.9999h					
"		Major flow at 1	3000"				
"		Total volume		24097.53			
"		Maximum flow			71 c.m/se		
"		0.971	0.000	0.809	4.754 c.m/	'sec"	

п п	40	HYDROGRAPH Add Runoff 4 Add Runoff "	n	
"		0.971 0.97	1 0.809	4.754"
"	40	HYDROGRAPH Copy to Out	flow"	
"		8 Copy to Outflow"		
"		0.971 0.97	1 0.971	4.754"
"	40	HYDROGRAPH Combine	4000"	
"		6 Combine "		
"		4000 Node #"		
"		Site"		
"		Maximum flow	5.725	c.m/sec"
"		Hydrograph volume	133815.031	c.m"
"		0.971 0.97	1 0.971	5.725"
"	40	HYDROGRAPH Start - New	Tributary"	
"		2 Start - New Tributa	-	
"		0.971 0.00	-	5.725"
"	47	FILEI_O Read/Open DIV0	2000.9999hyd"	
"		1 1=read/open; 2=write	•	
"		2 1=rainfall; 2=hydro		
"		1 1=runoff; 2=inflow;		unction"
"		DIV02000.9999hyd"		
"		Divert Weir 1 and 2 aw	ay from Dispers	ion Trench"
"		Total volume	1259.027	
"		Maximum flow	0.350	c.m/sec"
"		0.350 0.000	0.971 5.	725 c.m/sec"
"	40	HYDROGRAPH Add Runoff		
"		4 Add Runoff "		
"		0.350 0.35	0.971	5.725"
"	40	HYDROGRAPH Copy to Out	flow"	
"		8 Copy to Outflow"		
"		0.350 0.350	0.350	5.725"
"	40	HYDROGRAPH Combine	4000"	
"		6 Combine "		
"		4000 Node #"		
"		Site"		
"		Maximum flow	6.075	c.m/sec"
"		Hydrograph volume	135074.063	c.m"
"		0.350 0.350	0.350	6.075"
"	40	HYDROGRAPH Confluence	e 4000"	
"		7 Confluence "		
"		4000 Node #"		
"		Site"		
"		Maximum flow	6.075	c.m/sec"
"		Hydrograph volume	135074.063	c.m"
"		0.350 6.07	5 0.350	0.000"
"	81	ADD COMMENT========		"
"		1 Lines of comment"		
"		Total flow to Grand Ri	ver"	
"	38	START/RE-START TOTALS	4000"	
"		3 Runoff Totals on EX	IT"	

п	Total Catchment area	36.330 hectare"
п	Total Impervious area	18.751 hectare"
п	Total % impervious	51.612"
" 19	EXIT"	



APPENDIX E

Oil/Grit Separator Sizing



River's Edge Subdivision Town of Grand Valley File No. 104-104

Oil/Grit Separator Drainage Area							
Inlet 1							
Catchment		Area (ha)	%lmp				
	204	2.09	10%				
	205	4.32	65%				
	303	3.55	55%				
	Total	9.96	50%				
Inlet 2							
Catchment		Area (ha)	%Imp				
outonnon	203	2.76	60%				
	Total	2.76	60%				
Inlet 3							
Catchment		Area (ha)	%lmp				
	201	4.28	90%				
	202	4.15	60%				
	302	0.67	55%				
	304	1.09	55%				
	Total	10.19	72%				



Stormceptor[®]EF Sizing Report

Province:	Ontario	Project Name:	River's Edge Subdiv	vision	
City:	Grand Valley	Project Number:	104104	104104	
Nearest Rainfall Station:	TORONTO INTL AP	Designer Name:	Sergio Zaga	Sergio Zaga	
Climate Station Id:	6158731	Designer Company:	GM BluePlan Engin	GM BluePlan Engineering Limited	
Years of Rainfall Data: 20		Designer Email:	sergio.zaga@gmblu	sergio.zaga@gmblueplan.ca	
		Designer Phone:	519-824-8150	519-824-8150	
Site Name:	Inlet 1	EOR Name:			
Drainage Area (ha):	9.96	EOR Company:			
% Imperviousness:	50.00	EOR Email:			
	oefficient 'c': 0.60	EOR Phone:			
Target TSS Removal (%):	60.0	90.00		Reduction ummary	
Required Water Quality Runoff Volume Capture (%): Estimated Water Quality Flow Rate (L/s):		90.00 185.84	Stormceptor Model	TSS Removal Provided (%)	
Oil / Fuel Spill Risk Site?		Yes	EFO4	36	
Upstream Flow Control?		No	EFO6	52	
Peak Conveyance (maximum) Flow Rate (L/s):			EFO8	64	
Site Sediment Transport Rat	e (kg/ha/yr):		EFO10	73	
			EFO12	78	
		Recommende	d Stormceptor EFO	Model: EF	
	Estima	ated Net Annual Sediment	t (TSS) Load Reduct	ion (%):	
			unoff Volume Capt		
			unon volume capt	uie (<i>7</i> 0). – –	



FORTERRA



THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

Particle 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







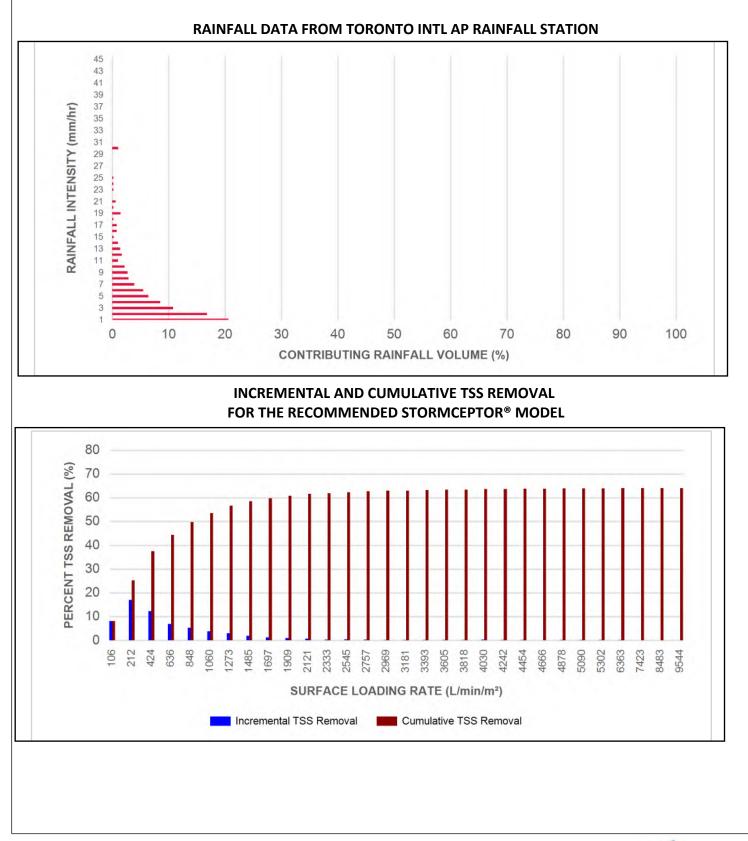
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	8.31	498.0	106.0	96	8.2	8.2
1	20.6	29.1	16.61	997.0	212.0	83	17.0	25.2
2	16.8	45.9	33.23	1994.0	424.0	73	12.3	37.5
3	10.8	56.7	49.84	2990.0	636.0	64	6.9	44.4
4	8.5	65.2	66.45	3987.0	848.0	63	5.3	49.7
5	6.4	71.6	83.07	4984.0	1060.0	60	3.9	53.5
6	5.5	77.0	99.68	5981.0	1273.0	55	3.0	56.6
7	3.9	81.0	116.29	6978.0	1485.0	49	2.0	58.5
8	2.9	83.9	132.91	7974.0	1697.0	43	1.3	59.8
9	2.7	86.5	149.52	8971.0	1909.0	39	1.0	60.8
10	2.2	88.7	166.13	9968.0	2121.0	35	0.8	61.6
11	1.0	89.7	182.75	10965.0	2333.0	31	0.3	61.9
12	1.7	91.3	199.36	11962.0	2545.0	29	0.5	62.3
13	1.4	92.8	215.97	12958.0	2757.0	27	0.4	62.7
14	1.0	93.7	232.59	13955.0	2969.0	25	0.2	63.0
15	0.3	94.0	249.20	14952.0	3181.0	24	0.1	63.0
16	0.8	94.8	265.81	15949.0	3393.0	22	0.2	63.2
17	0.8	95.7	282.43	16946.0	3605.0	20	0.2	63.4
18	0.2	95.8	299.04	17942.0	3818.0	19	0.0	63.4
19	1.5	97.3	315.65	18939.0	4030.0	18	0.3	63.7
20	0.2	97.5	332.27	19936.0	4242.0	17	0.0	63.7
21	0.6	98.2	348.88	20933.0	4454.0	17	0.1	63.8
22	0.0	98.2	365.49	21930.0	4666.0	16	0.0	63.8
23	0.2	98.4	382.11	22926.0	4878.0	15	0.0	63.9
24	0.2	98.6	398.72	23923.0	5090.0	15	0.0	63.9
25	0.2	98.9	415.33	24920.0	5302.0	14	0.0	63.9
30	1.1	100.0	498.40	29904.0	6363.0	12	0.1	64.1
35	0.0	100.0	581.46	34888.0	7423.0	10	0.0	64.1
40	0.0	100.0	664.53	39872.0	8483.0	9	0.0	64.1
45	0.0	100.0	747.60	44856.0	9544.0	8	0.0	64.1
			Es	timated Ne	t Annual Sedim	ent (TSS) Loa	d Reduction =	64 %

Climate Station ID: 6158731 Years of Rainfall Data: 20



Stormceptor*

Stormceptor[®]EF Sizing Report





FORTERRA



				Maximum Pip	Maximum Pipe Diameter / Peak Conveyance											
	mceptor - / EFO	Model Diameter		Model Diameter		Model Diameter		Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inle Diame	•	Max Out Diame	•		nveyance Rate
		(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)						
EF	4 / EFO4	1.2	4	90	609	24	609	24	425	15						
EF	6 / EFO6	1.8	6	90	914	36	914	36	990	35						
EF	8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60						
EF1	0 / EFO10	3.0	10	90	1828	72	1828	72	2830	100						
EF1	2 / 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 reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



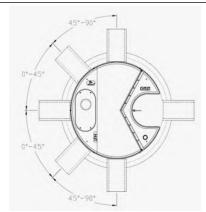












INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

					Poll	utant C	apacity							
Stormceptor EF / EFO	Model Diameter		Pipe In	Depth (Outlet Pipe Invert to Oil Sump Floor)		Oil Volume				mended ment nce Depth *	Maxiı Sediment V		Maxin Sediment	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)		
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250		
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375		
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750		
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500		
EF12 / EF012	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/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture	Proven performance for fuel/oil hotspot	
and retention for EFO version	locations	Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection 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:
6 ft (1829 mm) Diameter OGS Units:
8 ft (2438 mm) Diameter OGS Units:
10 ft (3048 mm) Diameter OGS Units:
12 ft (3657 mm) Diameter OGS Units:

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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







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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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





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

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





Province:	Ontario		Project Name:	River's Edge Subdiv	vision		
City:	Grand Valley		Project Number:	104104	104104		
Nearest Rainfall Station:	TORONTO INTL AP		Designer Name:	Sergio Zaga	Sergio Zaga		
Climate Station Id:	6158731		Designer Company:	GM BluePlan Engin	eering Limited		
Years of Rainfall Data:	20		Designer Email:	sergio.zaga@gmblu	ueplan.ca		
			Designer Phone:	519-824-8150			
Site Name:	Inlet 2		EOR Name:				
Drainage Area (ha):	2.76	-	EOR Company:				
% Imperviousness:	60.00	-	EOR Email:				
Runoff Co	Defficient 'c': 0.66	l l	EOR Phone:				
Required Water Quality Run	off Volume Capture (%):	90.00		Sizing S	ummary		
Required Water Quality Run		90.00		Sizing S Stormceptor	TSS Removal		
Estimated Water Quality Flo	w Rate (L/S).	56.65		Model	Provided (%)		
Dil / Fuel Spill Risk Site?		Yes		EFO4 61			
Jpstream Flow Control?		No		EFO6 75			
Peak Conveyance (maximum) Flow Rate (L/s):			EFO8	84		
Site Sediment Transport Rate	e (kg/ha/vr):			EFO10	89		
Site Seament Hansport Rat				EFO12	93		
			Recommended S	tormceptor FFO	Model: EF		
	Fstima	ated Net An	nual Sediment (T	-			
	Lotinit		ater Quality Run	-			
		W	ater Quality Run	ott volume Capt	ure (%): >		



FORTERRA



THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

Particle 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







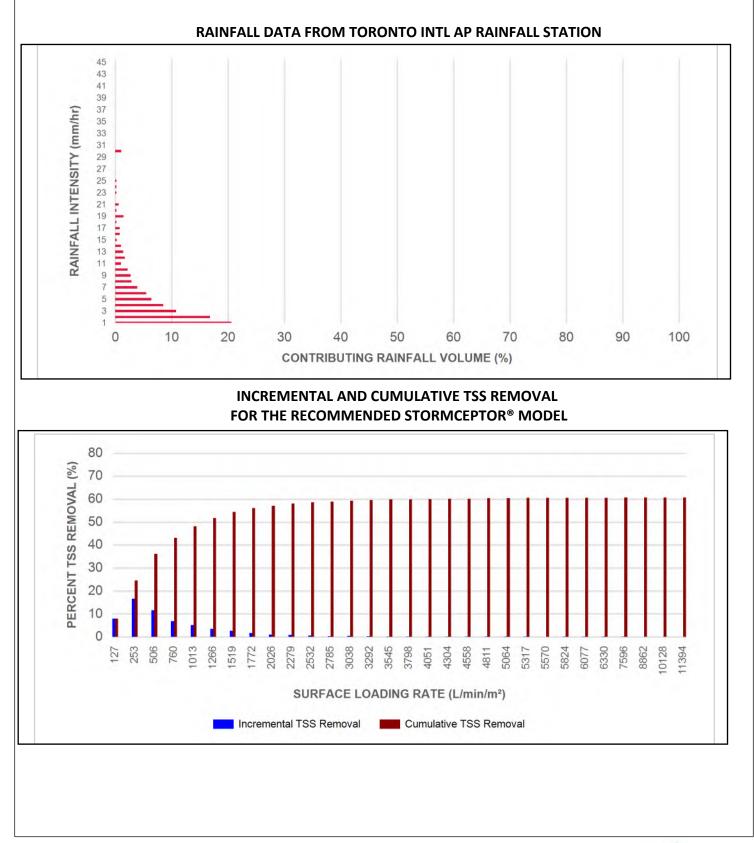
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	2.53	152.0	127.0	93	8.0	8.0
1	20.6	29.1	5.06	304.0	253.0	81	16.7	24.6
2	16.8	45.9	10.13	608.0	506.0	69	11.6	36.2
3	10.8	56.7	15.19	912.0	760.0	63	6.8	43.1
4	8.5	65.2	20.26	1215.0	1013.0	61	5.2	48.2
5	6.4	71.6	25.32	1519.0	1266.0	56	3.6	51.8
6	5.5	77.0	30.38	1823.0	1519.0	48	2.6	54.4
7	3.9	81.0	35.45	2127.0	1772.0	41	1.6	56.1
8	2.9	83.9	40.51	2431.0	2026.0	36	1.0	57.1
9	2.7	86.5	45.58	2735.0	2279.0	32	0.9	58.0
10	2.2	88.7	50.64	3038.0	2532.0	29	0.6	58.6
11	1.0	89.7	55.70	3342.0	2785.0	27	0.3	58.9
12	1.7	91.3	60.77	3646.0	3038.0	24	0.4	59.3
13	1.4	92.8	65.83	3950.0	3292.0	23	0.3	59.6
14	1.0	93.7	70.90	4254.0	3545.0	21	0.2	59.8
15	0.3	94.0	75.96	4558.0	3798.0	20	0.1	59.9
16	0.8	94.8	81.02	4861.0	4051.0	18	0.1	60.0
17	0.8	95.7	86.09	5165.0	4304.0	17	0.1	60.1
18	0.2	95.8	91.15	5469.0	4558.0	16	0.0	60.2
19	1.5	97.3	96.22	5773.0	4811.0	15	0.2	60.4
20	0.2	97.5	101.28	6077.0	5064.0	15	0.0	60.4
21	0.6	98.2	106.35	6381.0	5317.0	14	0.1	60.5
22	0.0	98.2	111.41	6685.0	5570.0	13	0.0	60.5
23	0.2	98.4	116.47	6988.0	5824.0	13	0.0	60.5
24	0.2	98.6	121.54	7292.0	6077.0	12	0.0	60.6
25	0.2	98.9	126.60	7596.0	6330.0	12	0.0	60.6
30	1.1	100.0	151.92	9115.0	7596.0	10	0.1	60.7
35	0.0	100.0	177.24	10635.0	8862.0	8	0.0	60.7
40	0.0	100.0	202.56	12154.0	10128.0	7	0.0	60.7
45	0.0	100.0	227.88	13673.0	11394.0	7	0.0	60.7
	-		Es	timated Ne	t Annual Sedim	ent (TSS) Loa	d Reduction =	61 %

Climate Station ID: 6158731 Years of Rainfall Data: 20



Stormceptor*

Stormceptor[®]EF Sizing Report





FORTERRA



				Maximum Pip	Maximum Pipe Diameter / Peak Conveyance											
	mceptor - / EFO	Model Diameter		Model Diameter		Model Diameter		Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inle Diame	•	Max Out Diame	•		nveyance Rate
		(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)						
EF	4 / EFO4	1.2	4	90	609	24	609	24	425	15						
EF	6 / EFO6	1.8	6	90	914	36	914	36	990	35						
EF	8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60						
EF1	0 / EFO10	3.0	10	90	1828	72	1828	72	2830	100						
EF1	2 / 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 reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



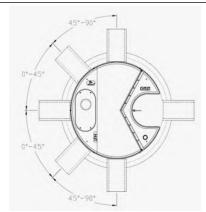












INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

					Poll	utant C	apacity							
Stormceptor EF / EFO	Model Diameter		Pipe In	Depth (Outlet Pipe Invert to Oil Sump Floor)		Oil Volume				mended ment nce Depth *	Maxiı Sediment V		Maxin Sediment	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)		
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250		
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EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750		
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EF12 / EF012	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/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture	Proven performance for fuel/oil hotspot	
and retention for EFO version	locations	Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection 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:
6 ft (1829 mm) Diameter OGS Units:
8 ft (2438 mm) Diameter OGS Units:
10 ft (3048 mm) Diameter OGS Units:
12 ft (3657 mm) Diameter OGS Units:

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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







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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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





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

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





Province:	Ontario		Project Name:	River's Edge Subdiv	vision	
City:	Grand Valley		Project Number:	104104		
Nearest Rainfall Station:	TORONTO INTL AP		Designer Name:	Sergio Zaga		
Climate Station Id:	6158731		Designer Company:	GM BluePlan Engin	eering Limited	
Years of Rainfall Data:	20		Designer Email:	sergio.zaga@gmblu	ueplan.ca	
			Designer Phone:	519-824-8150		
Site Name:	Inlet 3		EOR Name:			
Drainage Area (ha):	10.19		EOR Company:			
% Imperviousness:	72.00		EOR Email:			
	Defficient 'c': 0.73		EOR Phone:			
Particle Size Distribution:	Fine				l Sediment Reduction	
Target TSS Removal (%):	60.0				Reduction	
Required Water Quality Run	off Volume Capture (%):	90.00		Sizing S	ummary	
Estimated Water Quality Flo		182.50		Stormceptor Model	TSS Removal Provided (%)	
Oil / Fuel Spill Risk Site?		Yes		EFO4	32	
Upstream Flow Control?		No		EFO6 48		
Peak Conveyance (maximum) Flow Rate (L/s):			EFO8	60	
Site Sediment Transport Rat	e (kg/ha/yr):			EFO10	68	
				EFO12	75	
			Deserves and ad C		Na dali F	
	_		Recommended S	•		
	Estima	ated Net Ar	nnual Sediment (T	SS) Load Reduct	ion (%): 6	
		W	/ater Quality Rund	off Volume Capt	ure (%): <mark>></mark>	



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THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

Particle 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		







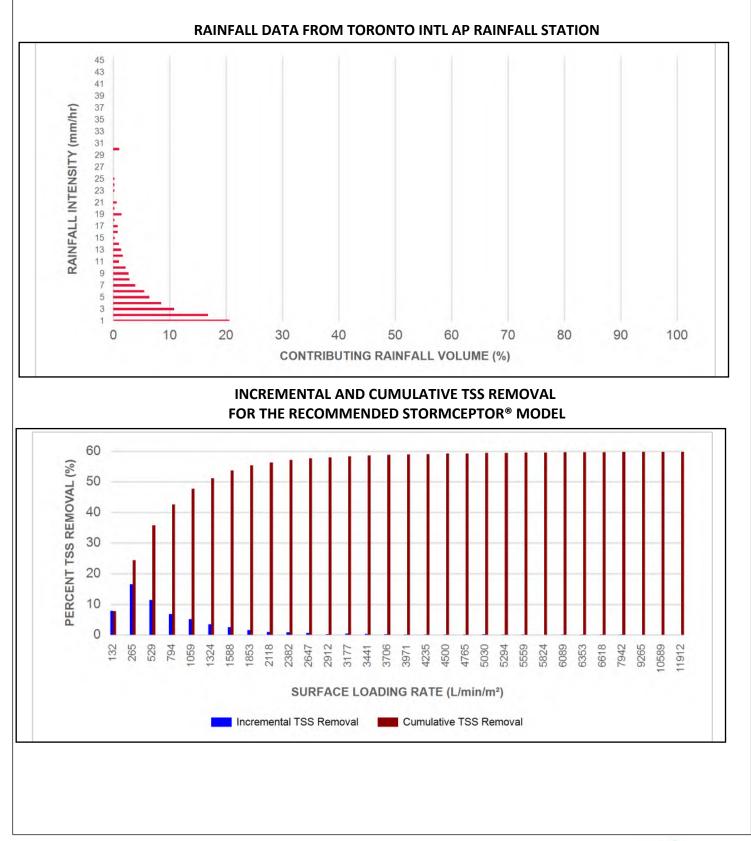
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	10.37	622.0	132.0	92	7.8	7.8
1	20.6	29.1	20.74	1244.0	265.0	80	16.6	24.4
2	16.8	45.9	41.47	2488.0	529.0	68	11.4	35.8
3	10.8	56.7	62.21	3733.0	794.0	63	6.8	42.6
4	8.5	65.2	82.94	4977.0	1059.0	60	5.1	47.7
5	6.4	71.6	103.68	6221.0	1324.0	54	3.5	51.2
6	5.5	77.0	124.42	7465.0	1588.0	46	2.5	53.7
7	3.9	81.0	145.15	8709.0	1853.0	40	1.6	55.3
8	2.9	83.9	165.89	9953.0	2118.0	35	1.0	56.3
9	2.7	86.5	186.63	11198.0	2382.0	31	0.8	57.1
10	2.2	88.7	207.36	12442.0	2647.0	28	0.6	57.7
11	1.0	89.7	228.10	13686.0	2912.0	25	0.2	58.0
12	1.7	91.3	248.83	14930.0	3177.0	24	0.4	58.3
13	1.4	92.8	269.57	16174.0	3441.0	22	0.3	58.6
14	1.0	93.7	290.31	17418.0	3706.0	20	0.2	58.8
15	0.3	94.0	311.04	18663.0	3971.0	19	0.1	58.9
16	0.8	94.8	331.78	19907.0	4235.0	17	0.1	59.0
17	0.8	95.7	352.52	21151.0	4500.0	16	0.1	59.2
18	0.2	95.8	373.25	22395.0	4765.0	16	0.0	59.2
19	1.5	97.3	393.99	23639.0	5030.0	15	0.2	59.4
20	0.2	97.5	414.72	24883.0	5294.0	14	0.0	59.4
21	0.6	98.2	435.46	26128.0	5559.0	13	0.1	59.5
22	0.0	98.2	456.20	27372.0	5824.0	13	0.0	59.5
23	0.2	98.4	476.93	28616.0	6089.0	12	0.0	59.6
24	0.2	98.6	497.67	29860.0	6353.0	12	0.0	59.6
25	0.2	98.9	518.41	31104.0	6618.0	11	0.0	59.6
30	1.1	100.0	622.09	37325.0	7942.0	9	0.1	59.7
35	0.0	100.0	725.77	43546.0	9265.0	8	0.0	59.7
40	0.0	100.0	829.45	49767.0	10589.0	7	0.0	59.7
45	0.0	100.0	933.13	55988.0	11912.0	7	0.0	59.7
	Estimated Net Annual Sediment (TSS) Load Reduction =							

Climate Station ID: 6158731 Years of Rainfall Data: 20



Stormceptor*

Stormceptor[®]EF Sizing Report





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	Maximum Pipe Diameter / Peak Conveyance									
	mceptor F / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Out Diame	•	Peak Conveyance Flow Rate	
		(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF	4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF	6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF	8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF1	0 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF1	2 / 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 reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



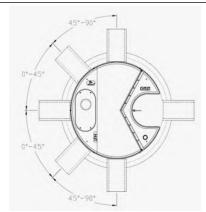












INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity												
Stormceptor EF / EFO	Moo Diam		Depth Pipe In Sump		Oil Volume Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **			
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EF012	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/ft³)

Feature	Benefit	Feature Appeals To		
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer		
Third-party verified light liquid capture	Proven performance for fuel/oil hotspot			
and retention for EFO version	locations	Site Owner		
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer		
Minimal drop between inlet and outlet	Site installation ease	Contractor		
Large diameter outlet riser for inspection 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:
6 ft (1829 mm) Diameter OGS Units:
8 ft (2438 mm) Diameter OGS Units:
10 ft (3048 mm) Diameter OGS Units:
12 ft (3657 mm) Diameter OGS Units:

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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







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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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





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

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

