STORMWATER MANAGEMENT IMPLEMENTATION REPORT

NOTTAWA DEVELOPMENT

PREPARED FOR:

GEORGIAN COMMUNITIES

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. has been retained by Georgian Communities to complete a Stormwater Management Implementation Report and accompanying design drawings to support the detailed design for Phase 1 of the proposed development located at 3977 and 4013 County Road 124 in the Community of Nottawa. The proposed development will herein be referred to as the Subject Development/Subject Lands.

The Subject Lands are approximately 89 ha and are located in the southern quadrant of the existing Community of Nottawa. The Subject Lands are bound by County Road 124 to the west, the existing McKean Subdivision and Nottawa Elementary School to the north and agricultural fields to the east and south. The property is legally described as Part of Lots 34 and 35, Concession 8 (Geographic Township of Nottawasaga), Township of Clearview, County of Simcoe.

Please refer to **Figure 1** for the Site Location Plan.

The Subject Lands were Draft Plan Approved in April of 2011. The elements of the Draft Plan (MHBC, March 2011) include single detached, condominium and mixed-use residential units, as well as a series of interconnected roadways, open space and park blocks, a stormwater management facility and a greenway drainage system featuring a network of trails. Phase 1 of the proposed development includes 118 single detached units, the stormwater management facility, and a portion of the greenway drainage system. It should be noted that of the 89 ha, approximately 52 ha are located within the existing urban settlement area boundary for Nottawa. The remaining lands (approximately 37 ha) are located east of the settlement area boundary. Save and except for a portion of the stormwater management block, no development has been proposed outside of the settlement boundary.

The proposed Draft Plan has been included as **Figure 2**.

The civil works of the Subject Development have been designed with consideration given to the servicing and stormwater management requirements of future phases. As such, infrastructure has been designed to accommodate subsequent phases of the development.

C.F. Crozier & Associates is part of a team of consultants providing support for this development. Other members of the consulting team include:

- Celeste Phillips Planning Inc. (Planning)
- Azimuth Environmental Consulting (Ecology and Natural Heritage)
- Cambium (Geotechnical)
- Crozier (Civil, Transportation, Hydrogeological)

These consultants have prepared studies/ plans to support the planning application. This report prepared by Crozier should be read in conjunction with the work of the other team members.

2.0 SITE DESCRIPTION

The urban settlement area boundary for the Village of Nottawa is located approximately 125 m east of the eastern limits of the McKean Subdivision and divides the site into two parcels. East (outside) of the settlement boundary is a mixture of agricultural fields and vegetated areas (approximately 37 ha). As mentioned above, no development is proposed outside of the settlement boundary except for a portion of the stormwater management facility.

West (inside) of the settlement boundary is a mixture of agricultural fields (approximately 52 ha) Several hedgerows separate agricultural fields in an east-west direction. Two residences exist on the western edge of the site adjacent to County Road 124. Additionally, an existing self storage business, locally known as 'Smart's Storage' is located at the northwest corner of the site and has frontage onto County Road 124.

There are two (2) existing tributaries of the Batteaux Creek which traverse the Subject Lands in a north-easterly direction. Along the northern property line, the existing watercourse has been re-channelized into a well-defined trapezoidal channel ditch which follows along the eastern and southern limits of the McKean Subdivision. East of the McKean Subdivision, the watercourse continues northeast, eventually merging with Batteaux River, before discharging to Georgian Bay. It should also be noted that in the northwest quadrant of the site, there is an existing, offline, manmade pond.

A Geotechnical Investigation was completed by Cambium Inc. in November of 2023 for the site. The field work for the investigation was completed in April of 2022. As part of the investigation, twenty (20) boreholes were advanced across the site. Monitoring wells were installed in seven (7) of the 20 boreholes to monitor groundwater levels. The results of the investigation found that the site is underlain by interlayered deposits of silty clay to clayey silt and silty clay to clayey silt till. Localized deposits of silty sand were also found. Groundwater levels were measured on two separate occasions in May and June of 2022. Groundwater was found between 0.10 m and 1.11 m below surface. It should be noted that in the borehole/monitoring well adjacent to the stormwater management facility, groundwater was found above the existing ground surface, indicative of artesian conditions. The reader is directed to the *Geotechnical Exploration (Cambium, 2023)* provided in **Appendix A** for further information.

A Hydrogeological Assessment was completed by Crozier in April of 2024 for the site. It should be noted that Crozier's groundwater monitoring program for the site utilizes the seven (7) monitoring wells installed by Cambium in 2022. An additional three (3) monitoring wells were installed on a nearby property and monitored through this program. Groundwater levels are recorded six (6) times a year, including spring high. Based on the readings from 2022 and 2023, the groundwater is approximately 0.06 m to 2.37 m below grade and the seasonal high is experienced in March-April. It should be noted that the seasonal high groundwater level at MW120-22 located in the Stormwater Management Block, was found to be 0.74 m above grade, this is believed to be due to the fact that this area receives upgradient flows from other portions of the site. For further information regarding the groundwater conditions on-site, the reader is directed to the *Hydrogeological Investigation (Crozier, April 2024)*, provided under separate cover.

3.0 STORMWATER MANAGEMENT (SWM)

3.1 DESIGN CRITERIA

The management of stormwater and site drainage for the proposed development must comply with the policies and standards of the various agencies including the Township of Clearview, Nottawasaga Valley Conservation Authority (NVCA), and Ministry of Environment, Conservation and Parks (MECP).

The stormwater management criteria for the Subject Development includes the following:

- Development Standards
  - Urban cross section for public roadway with 5- year storm sewer system.
  - Minor and major drainage system to convey frequent and infrequent rainfall/ runoff events, respectively.
  - Lot grading 2% optimum.

- Water Quality Control
  - 80% removal efficiency of total suspended solids per MECP 'enhanced protection' requirements.

- Water Quantity Control
  - Control of the post development peak flows to pre-development levels for all storms up to and including the 100-year event.

- Erosion Control
  - 48-hour detention of the 25 mm event.

- External Drainage Management
  - The stormwater management strategy for the site must ensure that the identified external drainage areas are safely conveyed through the site, to the outlet.

3.2 SITE GRADING CRITERIA

The grading criteria that will be applied to the proposed residential development includes the following:

- All proposed residential dwellings must meet the minimum groundwater separation according to the seasonal high groundwater elevation determined by the Crozier groundwater monitoring program.
- Site grading must enable all proposed residential dwellings to be serviced by 'gravity' sanitary services, where feasible.
- Site grading must provide suitable cover over the storm sewer to prevent frost heave (i.e., 1.2 m minimum cover) and provide overland flow routes for major storm runoff.

3.2.1 Groundwater Considerations

Per Township Standards, the underside of the basement floor slab should be located a minimum of 0.4 m above the seasonal high groundwater elevation. As such, the proposed grading design was based off the seasonal high groundwater data obtained from Crozier. As outlined in the *Hydrogeological Assessment (Crozier, April 2024*), the seasonal high groundwater levels were found in March - April of 2023. The interpolated groundwater level for each lot has been identified on the Site Grading Plans.

Please refer to the **Drawings C102A-C102H** for the Site Grading Plans.

As outlined in the *Geotechnical Exploration (Cambium, November 2023)* and *Hydrogeological Assessment (Crozier, April 2024),* groundwater was found to be above existing grade in the boreholes/monitoring wells adjacent to the SWM Facility. It is believed that in most cases, the increased groundwater elevations are due to periods of increased precipitation and slow deep infiltration which holds the groundwater atop the lower confining layer. In the region of the proposed SWM Facility, the sustained groundwater elevation relative to the ground surface is believed to be caused by the area receiving upgradient flows from other portions of the Site. As such, groundwater control is a critical component of the SWM Facility design. A dewatering investigation is recommended prior to construction and following the finalization of accepted designs. *Further, to maintain infiltration and recharge to the aquifers in the area, Low Impact Development (LID) strategies should be considered where possible, except in wellhead protection areas.*

3.3 EXISTING DRAINAGE CONDITIONS

The Subject Development is located within the Batteaux Creek Subwatershed. The main branch of the Batteaux Creek is located approximately 1.5 km downstream of the Subject Lands. Drainage from the site reaches Batteaux Creek via a tributary watercourse which generally follows the alignment of Batteaux Road before reaching the confluence in the Hamlet of Batteaux.

The primary drainage outlet for the site is an existing tributary located at the northern property line of the Subject Lands. This location will herein be referred to as Point of Interest #1 (POI#1). Overall, the site generally drains in a northeasterly direction, via on-site tributaries and existing agricultural ditches. There is an approximate 5 m difference in elevation across the site. Please refer to **Figure 3A** and **Figure 3B** for the Overall Subwatershed Pre-Development Drainage Plan and Pre-Development Drainage Plan.

To accurately determine the location of drainage flow routes and existing drainage conditions, topographic survey was obtained from J.D. Barnes Limited (September 2022). Additional survey was completed by Joe Topo in March of 2024. Both surveys form the basis for the engineering drawings provided as part of this submission.

3.3.1 External Drainage

External South

As illustrated in the Pre-Development Drainage Plan, external drainage enters the site from both the south and the west. The largest portion of external drainage is located south of the site. This catchment area, approximately 121 ha, consists of agricultural fields, woodlands, and portions of the Batteaux Creek Golf Course. Drainage from south of 33/34 Nottawasaga Sideroad accumulates within the south roadside ditch before being conveyed north through an existing small diameter cross culvert. During major storm events, drainage overtops 33/34 Nottawasaga Sideroad. From here, drainage is conveyed to the site by way of overland flow and existing agricultural ditches. This external drainage enters the Subject Lands via the two existing tributaries, herein referred to as the East Draw and West Draw. The West Draw receives the majority of the external drainage.

External West

External drainage from the west side of County Road 124 and the County Road 124 right-of-way also enters the site. This catchment area, approximately 1.4 ha, consists of existing residences, agricultural lands, and road area. Drainage is conveyed under County Road 124 via an existing cross culvert.

From here, drainage is conveyed through the site via an existing agricultural ditch on the Subject Lands.

External Northwest (McKean)

External drainage from the McKean Subdivision also contributes to the Subject Lands from the west. The eastern portion of this catchment, approximately 10.6 ha, consisting of Blackburn Avenue and the rear yards on Gleason Road and McKean Boulevard, drains towards the west property line of the Subject Lands. This location has been illustrated as Point of Interest #2 (POI#2) on **Figure 3A/3B**. The remaining area, approximately 29.8 ha, contributes drainage at the most northerly portion of the site. The runoff from this area first enters the existing McKean stormwater management facility before discharging to POI#1.

Ultimately all external drainage which enters the Subject Lands contributes flow to POI#1. Please refer to the Pre-Development Drainage Plans provided as **Figure 3A/3B** for the location of these catchments and selected POI locations.

3.3.2 Internal Drainage

As mentioned previously, the majority of the Subject Lands consists of active agricultural fields. Accordingly, measures have been taken over the years to improve drainage conditions on-site. This includes an existing agricultural ditch which bisects the Subject Lands in an east/west direction. This ditch currently intercepts sheet flow from the fields located to the north and south, as well as conveys drainage from west of County Road 124. This ditch has been identified on **Figure 3B**.

Two (2) existing drainage draws also exist in the central portion of the site. The West Draw conveys sheet flow from the surrounding fields and directs runoff to the north. A confluence of the West Draw and agricultural ditch noted above occurs in the central portion of the site as illustrated in **Figure 3B**. The East Draw conveys drainage from surrounding fields in a northerly direction.

As illustrated in **Figure 3B**, the East and West Draw ultimately drain to an existing channelized ditch located along the rear lots on Blackburn Avenue. This ditch is located within a 6.0 m municipal easement and was established as part of the McKean Subdivision. The ditch, which follows the property line of the Blackburn Avenue lots, enters the Subject Lands, and eventually discharges to the existing manmade pond located in the northwest quadrant of the site. From here, the watercourse meanders off-site before reaching POI#1.

3.4 PROPOSED DRAINAGE CONDITIONS

The Subject Development will be constructed to a fully urbanized system complete with curb and gutter and storm sewers. A dual drainage approach will consist of minor and major stormwater flow routes. The minor drainage system will consist of storm sewers, catchbasins and drainage channels sized to convey the 5-year design storm event. Major drainage system flows will be conveyed to the on-site SWM Facility via the alignment of the internal road network and use of drainage channels. Both minor and major drainage systems will discharge stormwater to the proposed SWM Facility located in the northeast quadrant of the site.

A dual channel system has been proposed within the site to convey internal and external drainage. The proposed drainage channels will replace the existing features (tributaries of Batteaux Creek and agricultural ditches) to facilitate flows the proposed outlet. In addition to conveyance, the primary purpose of the dual channel system is to keep the large external catchment area south of the site, separate to internal runoff. Keeping this flow separate will help to maintain the existing characteristics (quality, temperature) of the runoff and minimize impacts to the natural features located in the

northeast quadrant of the site. The design of the dual channel system has been outlined in further detail in the sections below. The dual channel system will herein be referred to as the Northern Drainage Channel and Central Drainage Channel, respectively.

3.4.1 Internal Drainage

As illustrated in the Draft Plan, the Central Drainage Channel consisting of Block 202 and Block 215, bisects the site into two sections; east and west. The internal drainage strategy for lands located east of the Central Drainage Channel is separate to the west. The proposed drainage strategy for the two sections has been detailed below.

Minor storm flows from the east portion of the site will be captured and conveyed to the SWM Facility via a network of storm sewers. Major system flows from this portion of the site will likewise be conveyed to the SWM Facility, however, overland via the right-of-way (ROW) allowance.

Minor storm flows from the west portion of the site are captured and conveyed via a network of storm sewers. This series of storm sewers discharges to HW1-7 located at the northern terminus of Wagner Road. From here, flow is conveyed through the North Drainage Channel, eventually discharging to the SWM Facility. Major system flows from this portion of the site will also be conveyed to the North Drainage Channel, however, overland via the ROW allowance. Both minor and major flows from the western portion of the site will be contained within the North Drainage Channel. From here, flow will enter the proposed twin 900 mm x 3000 mm diameter box culverts under Street A and discharge to the SWM Facility. The North Drainage Channel consists of Block 203, Block 212, and Block 214 on the Draft Plan.

Refer to **Drawings C102A-C102H** for the Site Grading Plans and **Drawings C109A-C109C** for the Storm Drainage Plans.

3.4.2 External Drainage

As discussed in Section 3.3.1, external drainage enters the Subject Lands from both the west and south. The following sections detail the proposed drainage strategy for each of the external catchments.

External West

External drainage from the west side of County Road 124 will cross the road via the existing cross culvert, as it does under existing conditions. From here, flow is conveyed north in the eastern roadside ditch along County Road 124. External drainage is then conveyed through the Subject Lands via the North Drainage Channel. As illustrated in **Drawing C102G**, the North Drainage Channel crosses Wagner Road. Flow from the North Drainage Channel is conveyed under Wagner Road via a 600 mm diameter culvert.

Similar to internal drainage from the west portion of the site, this external drainage will be safely conveyed through the North Drainage Channel ultimately discharging to the twin 900 mm x 3000 mm diameter box culverts before entering the SWM Facility. The North Drainage Channel has been sized to accommodate the major system flows (Regional) from this catchment area.

Please refer to **Appendix B** for culvert sizing and channel capacity calculations.

External Northwest (McKean)

Under post-development conditions, external drainage from the McKean Subdivision will drain to the proposed SWM Facility. The western portion of the McKean Subdivision which previously discharged

to the drainage channel and manmade pond in the northeast quadrant of the site, will be conveyed to the proposed on-site SWM Facility's north forebay via twin 1400 mm pipe arch culverts. The eastern portion of the McKean subdivision will be conveyed to the proposed on-site SWM Facility's west forebay via twin 825 mm culverts. The existing ditches will need to be re-graded in order to facilitate drainage to the new outlets.

As the location of the proposed SWM Facility is directly adjacent to the existing McKean SWM Facility, it is our understanding that the two facilities should be amalgamated thereby reducing the maintenance requirements to only one pond. As such, stormwater treatment for the McKean Subdivision will be provided by the proposed SWM Facility and the existing McKean SWM Facility will need to be decommissioned. It should be noted the existing manmade pond will also be amalgamated into this new pond footprint. Stormwater from the existing facility will be directed to the proposed facility via a re-aligned ditch system.

External South

External flows from south of the Subject Lands will be safely conveyed through Central Drainage Channel. The Central Drainage Channel has been designed to convey the Regional flow from Catchment 2101 (External South), as well as the Central Drainage Channel itself.

As illustrated on the Draft Plan, the Central Drainage Channel consists of Block 202 and Block 215, with Street A intersecting the channel in an east-west direction. To convey flows under Street A (at the intersection of Street A and Street B), a 1200 mm X 3000 mm diameter box culvert has been proposed.

A by-pass storm sewer system has also been designed to maintain base flows within the existing watercourse located in the northeast quadrant of the site. The proposed by-pass system commences at HW-BP1, located at the downstream terminus of the Central Drainage Channel. The by-pass system consists of a network of 900 mm diameter storm sewers located along the eastern curb line of Street A, north of Street E. The by-pass system does not discharge flow to the SWM Facility, but rather conveys flow around the SWM Facility to the existing watercourse. The by-pass system has been sized to convey 1.14 m^3/s from Catchment 2101 (External South) and the central channel itself. Flow greater than 1.14 m^3/s will be conveyed into the SWM Facility via the proposed twin 900 mm x 3000 mm box culverts.

Relevant by-pass, culvert and channel sizing calculations have been provided in **Appendix B.** Refer to **Drawing C107** for the location of the by-pass system and **Drawing 101A-101C** for the location of the proposed culverts.

3.5 HYDROLOGIC ANALYSIS

3.5.1 Quantity Control

Hydrologic modelling was prepared for the pre-development and post-development scenarios using the stormwater management hydrologic computer program Visual OTTHYMO 6.2 (VO). The purpose of the modelling was to determine the detention storage volumes required for the Subject Lands to ensure post-development peak flow rates do not exceed the pre-development target flows (i.e., quantity control).

In order to accurately assess the peak flows from the individual catchments, the NASHYD command in VO was used to model rural conditions, whereas the STANHYD command was used to model urban development conditions. 2, 5, 10, 25, 50 and 100-year rainfall was simulated using a 4-hour Chicago and 24-hour SCS Type II distribution consistent with Township Standards. Rainfall depths and intensities were based on the MTO IDF Look-up Tool, applicable to basins east of Collingwood. IDF data has been provided in **Appendix C.**

Pre-Development Model Set-Up

To establish pre-development flows from the site, a pre-development hydrologic model was created using VO. The Subject Development and external drainage areas were split into two (2) catchments based on the existing drainage conditions. It should be noted that for the pre-development model, the external McKean Subdivision catchment areas were modelled in their pre-developed state, per request of the NVCA. These catchments have been listed below.

- **Catchment 101 (186.74 ha):** This catchment area represents the Subject Lands, southern external drainage area and western external drainage area consisting of agricultural fields, a golf course, and existing residential lots. This catchment outlets at POI#1.

- **Catchment 102 (29.8 ha)**: This catchment area represents the western portion of the existing McKean Subdivision before it was developed. This catchment outlets at POI#1.

Pre-development catchment delineations have been presented in **Figure 3A/3B** and hydrologic parameter sheets have been provided in **Appendix C**.

The following table summarizes the pre-development peak flow rates obtained from the VO Model.

Table 1: Summary of Pre-Development Flow Rates

Return Period	Catchment 101 (186.74 ha)	Catchment 102 (29.80 ha)	Total Site (216.54 ha)
4-Hour Chicago			
2-year	0.455	0.058	0.513
5-year	0.856	0.110	0.966
10-year	1.170	0.152	1.323
25-year	1.621	0.213	1.833
50-year	1.981	0.262	2.243
100-year	2.366	0.314	2.680
24-Hour SCS Type II			
2-year	1.037	0.134	1.171
5-year	1.815	0.239	2.053
10-year	2.398	0.319	2.717
25-year	3.206	0.431	3.637
50-year	3.838	0.520	4.358
100-year	4.499	0.613	5.112
25mm	0.320	0.040	0.360
Timmins	8.037	1.153	9.190

Hydrologic modelling results have been provided in **Appendix D**.

Post-Development Model Set-Up

Catchment Delineation

The post-development model was prepared by replacing the pre-development catchments with the post-development catchments identified below. Post-development drainage conditions have been

illustrated in the Interim and Full Buildout Post-Development Drainage Plans provided as **Figure 4A** and **Figure 4B.** The post-development hydrologic parameter sheets have been provided in **Appendix C**.

To ensure the proposed stormwater management system functions as intended through buildout of the development, two (2) modelling scenarios were evaluated.

- **Interim Conditions** – Under interim conditions, only Phase 1 of the development is built out. The remaining development lands have been modelled as undeveloped.

- **Full Buildout Conditions** – Under full buildout conditions, all phases of development are built out.

To facilitate the post-development stormwater analysis, the following nine (9) internal catchments and five (5) external catchments have been delineated based on the proposed drainage conditions.

- **Phase 1 West (3.80 ha):** This internal catchment area represents the Phase 1 lands west of the Central Drainage Channel. Runoff from this catchment contributes to the Northern Drainage Channel, ultimately draining to the SWM Facility.

- **Phase 1 East (7.91 ha):** This internal catchment area represents the Phase 1 lands east of the Central Drainage Channel. Runoff from this catchment discharges directly to the SWM Facility.

- **Pond (6.40 ha):** This internal catchment area consists of the stormwater management block.

- **Future East 1 (8.80 ha):** This internal catchment area represents the future development lands located east of the Central Drainage Channel. Runoff from this catchment area will discharge to the Phase 1 storm sewer system into the SWM Facility. In the interim conditions model, this catchment has been represented in its undeveloped state.

- **Future West 1 (11.13 ha):** This internal catchment area represents the future development lands located west of the Central Drainage Channel, north of Street A. Runoff from this catchment area will discharge to the Northern Drainage Channel, ultimately to the SWM Facility. In the interim conditions model, this catchment has been represented in its undeveloped state.

- **Future West 2 (5.94 ha):** This internal catchment area represents the future development lands located west of the Central Drainage Channel, south of Street A. Runoff from this catchment area is captured by the Phase 1 storm sewer system on Street A and discharge to the Northern Drainage Channel, ultimately outleting at the SWM Facility. In the interim conditions model, this catchment has been represented in its undeveloped state.

- **Phase 1 Uncontrolled (2.34 ha):** This internal catchment area represents the Phase 1 lands east of the Central Drainage Channel which due to grading constraints is unable to be collected by the storm sewer system. Runoff from this catchment area flows uncontrolled to the northeast, ultimately discharging to POI#1.

- **Central Channel (5.36 ha):** This internal catchment is located in the central portion of the Subject Lands and represents Block 202 and 215 on the Draft Plan. It will consist of a drainage channel as well as green space, parks, playground, tennis courts and a multi-use trail. Runoff from this catchment discharges to the SWM Facility.

- **North Channel (1.45 ha):** This internal catchment is located in the northern portion of the Subject Lands and represents Blocks 203, 212 and 2014 on the Draft Plan. It will include consist of a drainage channel and multi-use trail. Runoff from this catchment discharges to the SWM Facility.

- **Outparcel (1.06 ha):** This external catchment area represents the outparcel located on the east side of County Road 124. This catchment area is excluded from the Draft Plan and will remain unchanged in post-development conditions. Runoff from this catchment area discharges to the Northern Drainage Channel, ultimately outletting to the SWM Facility.

- **2101 – External South (120.60 ha):** This external catchment area represents the external drainage area south of the Subject Lands. This area consists of agricultural fields, a golf course, and existing residential properties. Runoff from this catchment is conveyed through the site via the Central Drainage Channel and outlets to the by-pass storm sewer system and SWM Facility.

- **2102 - External West (1.35 ha):** This external catchment represents the external drainage area west of the Subject Lands. This area includes the residential area east of County Road 124 that is tributary to the site. Runoff from this catchment is conveyed via the North Drainage Channel and outlets to the SWM Facility.

- **2105 – External Northwest (West McKean) (29.80 ha):** This external catchment area is located north of the Subject Development and consists of the majority of the residential McKean Subdivision. Runoff from this catchment discharges to the proposed SWM Facility.

- **2104 – External Northwest (East McKean) (10.60 ha):** This external catchment area is located north of the Subject Development and consists of the south east portion of the residential McKean Subdivision. Runoff from this catchment discharges to the proposed SWM Facility.

Channel Design

As mentioned previously a dual drainage channel system has been proposed throughout the site to convey internal and external drainage.

The Northern Drainage Channel has been west of Wagner Road designed as a trapezoidal channel with a 3.5 m bottom, 0.72% longitudinal slope and 3:1 side slopes. East of Wagner Road, the channel bottom width varies from 1.5 m to 6.0 m wide, with a 0.10% longitudinal slope and 3:1 side slopes. A summary of the contributing flows to this channel has been summarized in the table below.

Table 2: Summary of Flow Contributing to Northern Drainage Channel

Catchment	Area (ha)	Design Storm Event	Uncontrolled Flow Rate (m^3/s)
2102 – External West	1.35	Regional (Timmins)	7.81
Outparcel	1.06		
North Channel	1.45		
Phase 1 West	3.80		
Future West 1	11.13		
Future West 2	5.94		
2101 – External South	120.60		
Central Channel	5.36		

The Central Drainage Channel has been designed as a trapezoidal channel with a 4.5 m bottom, 0.07% longitudinal slope and 3:1 side slopes. A summary of the contributing flows to this channel has been summarized in the table below.

Table 3: Summary of Flow Contributing to Central Drainage Channel

Catchment	Area (ha)	Design Storm Event	Uncontrolled Flow Rate (m^3/s)
2101 – External South	120.60	Regional	6.56
Central Channel	5.36		

As illustrated in **Drawing C102E**, approximately 200 m east of Wagner Road, the Northern and Central Drainage Channels align becoming a dual channel system. In the event that the Regional storm occurs, runoff in the Central Drainage Channel will overtop into the Northern Drainage Channel. Both the Regional Flows tributary to the Northern and Central Drainage Channels are contained within the Northern Drainage Channel cross-section. Please refer to **Appendix B** for channel capacity calculations.

As mentioned in Section 3.4.2, a by-pass system has been proposed to convey 1.14 m^3/s from the Central Drainage Channel around the SWM Facility. Flows greater than 1.14 m^3/s from the Central Drainage Channel and all flow from the Northern Drainage Channel are conveyed under Street A via proposed twin 900 mm X 3000 mm diameter box culverts. The culverts have been sized to accommodate 50% blockage and 100% blockage of the by-pass system in the case of an emergency. Please refer to **Appendix B** for culvert sizing calculations.

The DUALHYD command was used to account for the flow split at the by-pass in the hydrologic model. The value of the DUALHYD was set to the capacity of the by-pass storm sewer.

Using the ROUTE RESERVOIR command, the volume of detention storage required to attenuate the post-development peak flows from the site to target peak flow levels was determined based on a stage- storage – discharge (SSD) relationship.

An emergency spillway has also been included within the design to safely convey water to POI#1. Should a rainfall event occur which exceeds the 100-year event, or the outlet structure becomes blocked, the emergency spillway will convey stormwater outflow to this watercourse. The emergency spillway has been sized to convey 14.2 m^3/s. This flow rate represents the 100-year uncontrolled inflow into the SWM Facility during full buildout conditions.

The outlet structure for the proposed SWM Facility has been designed as a multi-stage outlet consisting a of a 160 mm diameter extended detention orifice and a 2.5 m rectangular weir. Relevant SWM Facility calculations have been provided in **Appendix E**.

The results of the post-development VO model are summarized in the tables below.

Table 4: SWM Facility Operating Characteristics (Full Buildout)

Event		Storage Volume (m^3)	Water Surface Elevation (m)
Chicago	2-Year	9,161	214.10
	5-Year	13,617	214.24
	10-Year	16,602	214.33
	25-Year	21,835	214.49
	50-Year	25,528	214.60
	100-Year	29,040	214.70
SCS	2-Year	16,870	214.34
	5-Year	23,665	214.54
	10-Year	28,903	214.70
	25-Year	35,145	214.87
	50-Year	39,564	215.00
	100-Year	43,860	215.12
25mm		7,269	214.04
Regional		54,162	215.40

As demonstrated in **Table 4**, the SWM Facility has sufficient storage to accommodate the 100-year SCS design storm event.

Table 5: Summary of Post-Development Flow Rates at POI#1 (Interim Conditions)

Event		Pre-Development (m^3/s)	Post-Development (m^3/s)
Chicago	2-Year	0.513	0.483
	5-Year	0.966	0.890
	10-Year	1.323	1.195
	25-Year	1.833	1.356
	50-Year	2.243	1.705
	100-Year	2.680	2.114
SCS	2-Year	1.171	1.119
	5-Year	2.053	1.547
	10-Year	2.717	2.130
	25-Year	3.637	2.980
	50-Year	4.358	3.662
	100-Year	5.112	4.379
25mm		0.360	0.356
Regional		9.190	10.706

Table 6: Summary of Post-Development Flow Rates at POI#1 (Full Buildout Conditions)

Event		Pre-Development (m^3/s)	Post-Development (m^3/s)
Chicago	2-Year	0.513	0.489
	5-Year	0.966	0.894
	10-Year	1.323	1.212
	25-Year	1.833	1.574
	50-Year	2.243	1.948
	100-Year	2.680	2.370
SCS	2-Year	1.171	1.124
	5-Year	2.053	1.762
	10-Year	2.717	2.358
	25-Year	3.637	3.226
	50-Year	4.358	3.913
	100-Year	5.112	4.635
25mm		0.360	0.363
Regional		9.190	10.857

As demonstrated in **Table 5** and **Table 6**, post-to-pre peak flow quantity control has been met at POI#1 for all storm events up to and including the 100-year.

VO modelling files have been provided in **Appendix D**.

3.5.2 Quality Control

Stormwater quality to an Enhanced Protection level (*Stormwater Management Planning and Design Manual*, *Ministry of the Environment, 2003)* will be provided by the SWM Facility.

To help meet erosion control requirements, an extended detention orifice has been incorporated within the outlet structure design. Sizing of this structure was based on providing 48-hour detention of the runoff volume produced during the 25 mm event, per NVCA requirements.

The drainage area contributing to the SWM Facility is approximately 41% impervious and 88.24 ha. As such, the minimum water quality volume for a stormwater wet pond is 155 m^3/ha (*Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003)*. The total water quality volume consists of 115 m^3/ha for permanent pool and 40 m^3/ha for extended detention. The required and provided extended detention values have been summarized in **Table 7.** Refer to **Appendix E** for the extended detention calculations.

Table 7: SWM Facility Quality Control Characteristics (Full Buildout)

	SWM Facility	
	Required Volume (m^3)	**Provided Volume (m^3)**
Permanent Pool	10,189	32,810
MOE Extended Detention	3,530	12,248
Erosion Control	7,625	12,248

As demonstrated in **Table 7**, the proposed SWM Facility provides sufficient water quality storage.

4.0 EROSION & SEDIMENT CONTROLS

Sediment and erosion controls will be installed prior to the commencement of any earthworks and maintained throughout until the site is stabilized or as directed by the Engineer, NVCA and/or Township. Controls are to be inspected regularly, after each significant rainfall, and maintained in proper working condition.

The proposed erosion and sediment controls for the Subject Development are illustrated on the Erosion and Sediment Control Plans (**Drawings C140A-C140B**) and outlined below.

- Stone Mud Mat

A mud mat will be installed at the main access point to the site (County Road 124) to reduce the amount of mud tracking onto exiting paved roadways during site servicing operations.

- Dust Suppression

During earthwork activities, the Contractor will ensure that measures for dust suppression are provided as required, such as the application of water or lime.

- Silt Fencing

Heavy Duty Silt fence will be installed where required to intercept sheet flow. Heavy duty silt fence will be located around the perimeter of the site and phasing limits. It should be noted that additional silt fencing may be added based on field decisions by the Site Engineer and Owner prior to, during and following construction.

- Temporary Sediment Basin

The SWM Facility will be graded to its ultimate design and act as a temporary sediment basin. Once topsoil has been stripped, runoff generated from the disturbed areas will drain to the sediment basin. Runoff from this sediment basin, after pre-treatment, will discharge via a hickenbottom structure.

- Interceptor Ditches

Swales and interceptor ditches are proposed to be constructed within the site prior to topsoil removal to intercept and convey flow to the sediment basins. Please note interceptor ditches will not interfere with existing drainage conditions. Interceptor ditches will be finished complete with topsoil and hydroseed to reduce potential erosion and reduce flow velocities.

5.0 CONCLUSIONS AND RECCOMENDATIONS

Based on the foregoing, we conclude that the proposed development can be adequately serviced from a stormwater management perspective, as follows.

1. An end-of-pipe, offline, stormwater management facility has been proposed to provide quantity, quality, and erosion control for the site.

2. The SWM Facility has been adequately sized to accommodate up to and including the 100-year design storm event.

3. Stormwater quantity control up to and including the 100-year storm event will be provided to meet the post-to-pre peak flow objectives.

4. Water quality to an enhanced protection level will be provided by the SWM Facility.

5. Erosion control will be met by providing 48-hour drawdown of the 25 mm event.

6. The primary outlet for the Subject Development is an existing tributary of Batteaux Creek located in the northeast quadrant of the site.

7. It has been assumed that the existing McKean Subdivision SWM Facility will be decommissioned and stormwater treatment for the McKean development will be provided via the proposed SWM Facility.

8. A dual drainage channel system has been designed through the central portion of the site to safely convey the Regional flows from external drainage areas through the site.

9. A by-pass system has been designed to re-route low flows from the southern external drainage area in order to maintain base flows within the existing on-site tributary of Batteaux Creek.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Haley Birrell, P.Eng.
Project Engineer

C.F. CROZIER & ASSOCIATES INC.

Hailey Reynolds
Engineering Intern

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APPENDIX A

Geotechnical Investigation

Geotechnical Exploration - Nottawa Lands - 3977 4013 County Road 124 & Parts of Lots 34 & 35, Concession 8, Nottawa, Township of Clearview

November 13, 2023

Prepared for:
Georgian Communities

Cambium Reference: 14768-001

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1.0 Introduction

Cambium Inc. (Cambium) has been retained by Georgian Communities (the "Client"/ "Georgian") to provide geotechnical consulting services in support of the design of the proposed residential development to be located at 3977 & 4013 County Road 124 and Parts of Lots 34 & 35, Concession 8 (the "Site") in Nottawa, Township of Clearview, Ontario. The location of the project is shown on the Site Location Plan, Figure 1 attached. The terms of reference for the geotechnical consulting services were included in Cambium's proposal No. 14768-P, dated March 14, 2022. Authorization to proceed with the investigation was received in the form of the signed proposal from the Client on March 15, 2022.

The purpose of the field work and testing was to obtain information on the general subsurface soil and groundwater conditions at the site by means of a limited number of boreholes and laboratory tests. Based on an interpretation of the data available for this site, this report provides engineering comments, recommendations, and parameters for the geotechnical design aspects of the project, including selected construction considerations which could influence design decisions. It should be noted that this report addresses only the geotechnical (physical) aspects of the subsurface conditions at the site. The geo-environmental (chemical) aspects, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, are beyond the terms of reference for this assignment and are not addressed herein.

This report provides the results of the geotechnical exploration and testing and should be read in conjunction with the *"Standard Limitations"* in Section 9.0 which forms an integral part of this document. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report. The data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location, or elevation, or if the project is not initiated within eighteen months of the date of the report, Cambium should be given an opportunity to confirm that the recommendations in this report are still valid.

It is noted that Crozier Consulting Engineers (Crozier) were retained by the Client to carry out a hydrogeological assessment concurrently with our geotechnical study. It is recommended that Cambium review the final Crozier hydrogeological assessment report to make sure our report and recommendations are still relevant based on Crozier's findings.

2.0 Site and Project Description

The site is located northeast of Sideroad 33 & 34 Nottawasaga and County Road 124 at 3977 & 4013 County Road 124 and Parts of Lots 34 & 35, Concession 8 in Nottawa, Township of Clearview, Ontario, as shown on the Borehole Location Plan, Figure 2 attached. The site is bordered by County Road 124 on the west, residential houses on the north, agriculture lands to the south and agricultural and forested areas on the east side. The L-shaped 90-hectare site is currently occupied by a single storey commercial building located in the northwest corner of the site. The remainder of the site is used for agricultural purposes with wooded areas along the eastern boundary. The topographic survey of the site provided by the client generally indicates that the site is flat with elevations ranging from about 219 metres above sea level (masl) to 217 masl from east to west. The northeastern section of the site, east of the existing residential area, has elevations ranging from about 214 masl to 217 masl.

At the time of preparing this report, the conceptual information available for the proposed development indicated that the northwestern corner of the site will be a farmer's market and retail / commercial buildings. The majority of the site will be occupied by townhouse, semi-detached and detached houses with a park in the central area.

The eastern portion of the site, east of the existing residential area, will be divided into two distinct areas. The southern portion will be occupied by larger rural detached lots with the central area dedicated to open space. The northern portion will be used for a stormwater management facility with the stormwater management pond located along the west boundary, but the majority of the area will be open space.

3.0 Methodology

The geotechnical field investigation for this current assignment was carried out from April 4 to 8, 2022, during which time twenty boreholes (designated as BH101-22 to BH120-22) were advanced at the site. The boreholes for the investigation were drilled using standard track-mounted drill rig supplied and operated by Walker Drilling of Utopia, Ontario, subcontracted to Cambium.

A summary of the current geotechnical drilling program is presented below in Table 1. The approximate borehole locations are shown on the Borehole Location Plan, Figure 2, attached. The results of the subsurface investigation are presented on the Log of Borehole sheets in Appendix A and the results of geotechnical laboratory testing in Appendix B.

Table 1 Drilling Program

Borehole ID	Ground Surface Elevation (mRel)	Borehole Depth (mbgs*)	Elevation (mRel)	Notes
BH101-22	101.9	6.7	95.2	
BH102-22	102.0	5.0	97.0	
BH103-22	102.4	5.0	97.4	50-mm monitoring well
BH104-22	102.6	6.7	95.9	
BH105-22	102.5	5.2	97.3	
BH106-22	102.3	6.4	95.9	50-mm monitoring well
BH107-22	100.4	6.5	93.9	50-mm monitoring well
BH108-22	101.4	5.2	96.2	
BH109-22	101.4	5.2	96.2	
BH110-22	101.9	6.7	95.2	50-mm monitoring well
BH111-22	103.4	6.4	97.0	50-mm monitoring well
BH112-22	103.5	4.9	98.6	
BH113-22	102.6	6.7	95.9	
BH114-22	102.7	5.2	97.5	
BH115-22	102.5	5.2	97.3	
BH116-22	102.3	5.2	97.1	
BH117-22	102.6	6.7	95.9	50-mm monitoring well
BH118-22	101.8	5.2	96.6	
BH119-22	102.4	5.2	97.2	
BH120-22	99.3	6.7	92.6	50-mm monitoring well

**metres below ground surface*
**elevations provided are relative elevations*

Standard Penetration Testing (SPT) and sampling were carried out at regular intervals of depth in the geotechnical boreholes using conventional 38-millimetre (mm) internal diameter split spoon sampling equipment driven by an automatic hammer in accordance with the SPT procedures outlined in ASTM International standard D1586: “Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils”. The split-spoon samplers used in the investigation limit the maximum particle size that can be sampled and tested to about 40 mm. Therefore, particles or objects that may exist within the soils that are larger than this dimension were not sampled and are not represented in the grain size distributions contained herein. The results of the field tests (i.e., SPT “N” -values) as presented on the Record of Borehole sheets and in subsequent sections of this report are the values measured directly in the field and are unfactored.

The SPT N values are used in this report to assess consistency of cohesive soils and relative density of non-cohesive materials. Soil samples were collected at approximately 0.75 m intervals up to a depth of 3.0 mbgs and at 1.5 m intervals thereafter.

Groundwater conditions were noted in the open boreholes during and upon completion of drilling and monitoring wells were installed in seven boreholes in this investigation (see Table 1, above) following the completion of drilling to allow for subsequent groundwater measurements and hydrogeological testing by Crozier. The monitoring wells consisted of a 50-mm diameter PVC riser pipe, with a slotted screen sealed at a selected depth within the borehole. A sand filter pack surrounded the screen, and above the screen the borehole and annulus surrounding the riser pipe were backfilled to the surface with bentonite. The well installation details, and groundwater level readings are presented on the Record of Borehole sheets in Appendix A. Boreholes without monitoring wells were backfilled with bentonite and cuttings upon completion in accordance with the requirements of the Revised Regulations of Ontario (R.R.O.) 1990, Regulation 903 (as amended) of the Ontario Water Resources Act.

The field work for this investigation was observed by members of Cambium's technical staff, who located the boreholes in the field, arranged for the clearance of underground utilities, observed the borehole drilling, sampling and in situ testing operations, logged the boreholes as well as examined and took custody of the recovered soil samples. The samples were identified in the field, placed in appropriate containers, labelled, and transported to our geotechnical laboratory for further visual examination by the project engineer and for laboratory testing.

Index and classification tests, consisting of water content determinations, gradation analyses and Atterberg Limits testing, were carried out on selected soil samples and the results are presented in Appendix B and also on the Log of Borehole sheets in Appendix A.

The ground surface elevations at the borehole locations were measured using a Topcon RTK unit using a temporary benchmark. The benchmark used was the southeast corner of the electrical transformer (1783) slab located at 54 Donald Avenue and it was assigned a relative elevation of 100 m. As such, the elevations given on the Log of Borehole sheets and referred to herein should be considered to be approximate. The borehole locations were referenced to existing prominent

site features and plotted on the plan provided in the preparation of Figure 2, Borehole Location Plan. As such, the borehole locations shown on Figure 2 attached should also be considered to be approximate.

Once a detailed topographic survey is carried out by the Client, the elevations included herein can be updated based on a geodetic benchmark.

4.0 Site Geology and Stratigraphy

4.1 Regional Geology

The surficial geology aspects of the general site area were reviewed from the following publications:

- Chapman, L.J., and Putnam, D.F., 2007, “The Physiography of Southern Ontario”; 4th Edition, Ontario Geological Survey; and

- The Ontario Geological Survey. 2003. Surficial Geology of Southern Ontario.

Physiographic mapping in the area according to the above-noted reference indicates that the site lies within the physiographic region of southern Ontario known as the Simcoe Lowlands. The Simcoe Lowlands occupy an area of about 2,850 square kilometres and consist of the lowlands bordering the Georgian Bay and Lake Simcoe. The site is within the are of the Simcoe Lowlands called the Nottawasaga Basin and the lowlands surrounding Lake Simcoe is referred to as the Lake Simcoe Basin. These two basins are connected at Barrie by a flat-floored valley and by similar valleys among the upland plateaux farther north. Both the lowlands and transverse valleys were flooded by Lake Algonquin and are bordered by shorecliffs, beaches and bouldery terraces. Thus, they are floored by sand, silt, and clay.

The surficial geology mapping indicates that the site lies within a region of coarse-textured glaciolacustrine deposits of sand, gravel, minor silt, and clay which are foreshore and basinal deposits. Areas of stone-poor, sandy silt to silty sand-textured till are present along the west and south boundaries of the site.

The subsurface conditions encountered during the investigation were generally consistent with the physiographic and surficial geological mapping.

4.2 Subsurface Conditions

The detailed soil profiles encountered in the boreholes are shown on the attached borehole logs in Appendix A. Conditions indicated on the borehole logs are for specific locations only and can vary between and beyond the borehole locations. The soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones and should not be interpreted as exact planes of geological change. In addition, the descriptions provided on the borehole logs are inferred from a variety of factors, including visual observations of the soil samples retrieved, laboratory testing, measurements prior to and after drilling, and the drilling process itself (such as drilling speed and shaking/grinding of the augers).

Based on the results of the borehole investigation, subsurface conditions at the Site generally consist of topsoil overlying near surface disturbed native material (likely from agricultural activities). The near surface disturbed soil is underlain by interlayered non-cohesive deposits of varying constituents followed by cohesive deposits silty clay to clayey silty and silty clay to clayey silt till. Localized deposits of silty sand to sandy silt till were also encountered underlying the non-cohesive deposits. The non-cohesive deposits consisted of silt to sandy silt, sand to silty sand, sand, and gravel to gravelly sand. The relative density and consistency of the subsurface conditions on site are variable and the measured SPT “N”-values do not generally increase with depth but fluctuates depending on the stratigraphy.

Assessments of organic matter content or other topsoil quality tests were beyond the scope of this study.

The subsurface soil and groundwater conditions encountered in the boreholes drilled at the site are described in the following sections.

Please note that:

- Depths given in the table describing the subsurface conditions are measured from ground surface;

- The SPT "N"-values given are blows for 0.3 m of penetration unless otherwise indicated; and

- In some boreholes, the presence of cobbles and boulders was inferred within the glacial till deposits due to rock fragments in the split spoon samples or due to bouncing of the split spoon during sampling.

A summary of the encountered soil conditions in the northwestern area of the site where the farmer's market and retail buildings are proposed is presented below in Table 2. The relevant boreholes in this area are BH103-22, BH104-22, BH105-22, and BH111-22.

Table 2 Summary of Soil Properties for Northwestern Area of Site

Stratigraphy	Depth (mbgs)		Elevation (mRel)		SPT "N" Values	Relative Density / Consistency	Approximate Water Content (%)	Notes
	From	To	From	To				
Topsoil	0	50mm to 100mm	-	-	-	-	-	All boreholes
Non-cohesive Fill / Disturbed Native	0.1	0.7	102.3 to 103.3	101.7 to 102.7	1 to 5	Very loose to loose	20 to 38	
Non-cohesive Deposits	0.7	3.0 to 5.6	101.7 to 102.7	97.0 to 101.9	11 to 38	Compact to dense	14 to 23	Encountered in all boreholes
Silt	3.0	4.1	99.4	98.3	14	Compact	19	BH103-22 only
Silty Clay Till	4.1	5.0*	98.3 &101.9	97.4 & 97.0	25 to 50/180mm	Very stiff to hard	8 to 15	BH103-22 and BH111-22
Silty Clay to Clayey Silt	5.6 and 4.2	6.7* and 5.2*	97.0 & 98.3	95.9 & 97.3	14	Stiff	13 to 18	BH104-22 and BH105-22, respectively

Mbgs = metres below ground surface
**Borehole termination depth*

A summary of the encountered soil conditions in the central area of the site where the residential buildings are proposed is presented below in Table 3. The relevant boreholes in this area are BH101-22, BH102-22, BH106-22 to BH108-22, and BH110-22 to BH119-22.

Table 3 Summary of Soil Properties for Central Area of Site

Stratigraphy	Depth (mbgs)		Elevation (mRel)		SPT "N" Values	Relative Density / Consistency	Approximate Water Content (%)	Notes
	From	To	From	To				
Topsoil	0	25mm to 450mm	-	-	-	-	-	-
Disturbed native (Silty Sand)	0.1 to 0.5	0.7 to 1.7	100.2 to 103.5	99.6 to 102.7	2 to 14	Very loose to compact	12 to 30	Encountered in all boreholes
Non-cohesive deposits	0.7 to 2.2	1.5 to 6.7*	99.6 to 102.7	95.9 to 101.9	12 to 47	Compact to dense but generally compact	9 to 22	Encountered in all boreholes except BH115-22
Sandy Silt to Silt	1.5 to 3.0	2.2 to 4.1	97.4 to 101.2	96.3 to 100.5	8 to 44	Loose to dense but generally compact	14 to 22	Encountered in BH106-22, BH107-22, BH114-22, and BH117-22
Silty Clay to Clayey Silt	0.8 to 4.1	1.5 to 5.2*	97.4 to 101.2	96.2 to 100.5	11 to 23	Stiff to very stiff but generally very stiff	8 to 20	Encountered in BH102-22, BH106-22, BH108-22, BH115-22, BH118-22, and BH119-22
Silty Clay to Clayey Silt Till	1.5 to 4.1	2.2 to 6.7*	96.3 to 102.7	93.9 to 102.7	9 to 50/0.2	Stiff to hard	7 to 24	Encountered in BH106-22, BH107-22, BH110-22, BH111-22, BH112-22 BH115-22 to BH117-22
Silty Sand to Sandy Silt Till	0.7 to 5.6	2.1 to 6.7*	96.3 to 101.9	95.2 to 100.5	12 to 50	Compact to very dense	7 to 13	Encountered in BH101-22, BH113-22, BH115-22, BH116-22, and BH119-22

Mbgs = metres below ground surface
**Borehole termination depth*

Please note:

The non-cohesive deposits consist of silty sand to sandy silt, sand, gravelly sand to sand and gravel. The gravelly silty sand, and sand and gravel deposits were encountered in BH102-22 and BH115-22.

A summary of the encountered soil conditions in the northeastern area of the site where the stormwater management pond is proposed is presented below in Table 4. The relevant boreholes in this area are BH109-22 and BH120-22.

Table 4 Summary of Soil Properties for Northeastern Area of Site

Stratigraphy	Depth (mbgs)		Elevation (mRel)		SPT "N" Values	Relative Density / Consistency	Approximate Water Content (%)	Notes
	From	To	From	To				
Topsoil	0	38mm and 75mm	-	-	-	-	-	-
Disturbed native Silty Sand	0.1	0.7	99.3 & 101.3	98.6 & 100.7	1 & 15	Very loose to compact	17 to 28	
Silty Clay	4.1	5.2*	97.3	94.7	26	Very stiff	16	BH109-22
Silty Clay Till	4.1	6.7*	95.2	94.1	13 & 14	Stiff	11 &14	BH120-22

Mbgs = metres below ground surface
**Borehole termination depth*

4.3 Geotechnical Laboratory Testing

The results of Atterberg limits tests carried out on selected soil samples are presented in Appendix B. A summary of the results is presented below in Table 5

Table 5 Results of Atterberg Limits Testing

Borehole ID	Sample Number	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH106-22	5	22.3	15.8	6.5
BH110-22	5	13.9	10.5	3.4
BH112-22	5	21.6	13.9	7.6

The gradation curves of selected samples are also included in Appendix B.

4.4 Groundwater Conditions

Groundwater level measurements for the current investigation were collected at the Site on May 5 and June 8, 2022. Groundwater level was measured at each well with an electronic water level tape, which was cleaned between well locations. Table 6, below, summarizes the groundwater level measurements collected to date.

Table 6 Groundwater Level Measurements

Borehole ID	Measurement Date	Water Level	
		Depth (mbgs)	Elevation (m)
BH103-22	May 5, 2022	0.35	102.01
	June 8, 2022	0.80	101.56
BH106-22	May 5, 2022	1.11	101.20
	June 8, 2022	0.32	101.99
BH107-22	May 5, 2022	0.10	100.26
	June 8, 2022	0.69	99.67
BH110-22	May 5, 2022	0.54	101.39
	June 8, 2022	0.89	101.04
BH111-22	May 5, 2022	0.17	103.19
	June 8, 2022	0.68	102.68
BH117-22	May 5, 2022	0.40	102.18
	June 8, 2022	0.71	101.87
BH120-22	May 5, 2022	-0.74*	100.06
	June 8, 2022	-0.40*	99.72

It is noted that water levels in the groundwater monitor in BH120-22 were above the existing ground surface when measured on May 5 and June 8, 2022, indication artesian conditions. The monitoring well is located immediately west of the existing stormwater management pond.

The measured groundwater levels reflect the groundwater conditions in the boreholes at the time of the field work as indicated in the table above. Groundwater levels at the site are anticipated to vary between and beyond the borehole locations and to fluctuate on a seasonal basis and in response to significant precipitation or snowmelt events.

As part of Crozier's hydrogeological assessment, it is understood that the monitoring wells will be measured frequently as part of a long term groundwater monitoring program, it is recommended

that Cambium review the final groundwater monitoring data collected by Crozier prior to finalizing this report as some of our recommendations included within this report may need to be reassessed.

5.0 Geotechnical Design Considerations

This section of the report provides engineering information and recommendations for the geotechnical design aspects of the project based on our interpretation of the borehole information, the laboratory test data and on our understanding of the project requirements. The following recommendations are provided to assist designers. It is possible that subsurface conditions beyond the borehole locations may vary from those observed. Recommendations should not be construed as providing instructions to contractors, who should form their own opinions about site conditions. Contractors bidding on or undertaking any work at the Site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like. If significant variations are found before or during construction, Cambium should be contacted so that we can reassess our findings, if necessary.

Cambium will not assume any responsibility for construction-related decisions made by contractors on the basis of this report.

5.1 General Considerations

At the time of preparing this report, final grading plans and details of the proposed site services were not available. In addition, it was not known if the proposed commercial buildings, residential houses, and townhouses will have a basement level. The groundwater conditions at the site varied from about 0.1 m to 1.1 m below the existing ground surface with groundwater measured above ground surface in the BH120-22 monitoring well, possibly indicative of artesian groundwater conditions adjacent to the existing stormwater management pond. Based on these conditions, the following should be considered:

Conventional spread or strip footings are feasible, but the bearing capacity depends on the founding depth and location on site. Once grading plans are available, recommendations can be provided for the founding depths and where higher bearing capacity, if required, is available. In

addition, excavations for footings, utilities, and basements (if any) will extend below the water table and may require advance dewatering.

For more heavily loaded structures such as the commercial buildings, higher bearing capacity may be available depending on the founding depths. Other foundation options besides conventional footings may also considered if higher bearing capacity than available is required.

If a basement level is being proposed for the buildings, foundation and under slab drainage will have to be installed and/or the buildings can be designed as fully waterproof/ tanked basements.

5.2 Topsoil Stripping and Reuse

The following geotechnical comments are provided regarding organic and topsoil stripping and reuse at the site:

Surficial vegetation and topsoil should be stripped from the proposed development area.

Consideration may be given to selective stripping operations, consisting of road allowances, and building footprints (including driveways).

Outside of road allowances and building footprints, topsoil, if encountered, may be buried and/or reused as general lot fill to raise grades. The primary factor controlling methane generation is the organic carbon content of the topsoil. The loss on ignition (LOI) test provides an indication of the organic carbon content of the sample. If topsoil is to be reused as general lot fill to raise grades, then LOI testing should be carried out and further recommendations provided by the geotechnical engineer in regard to the reuse of topsoil and the potential for methane generation. Stripping of organically stained layers would not be required in any site area from a geotechnical perspective. However, from a construction viewpoint, it may not be practical (or possible) for the contractor to distinguish between this zone and the overlying topsoil, if encountered, especially if cuts of less than 150 mm are required.

Where low organic content topsoil is used as general lot fill, its thickness should be limited to about 1.5 m. The topsoil fill should be placed in maximum 300-mm thick loose lifts and uniformly

compacted to at least 95% of standard Proctor maximum dry density (SPMDD). To have any success in placing topsoil as lot grading fill, it must be placed at or very close to its optimum water content to achieve workability and adequate compaction, in order to reduce post-construction settlements and/or lateral movements (e.g. of fences, etc.).

5.3 Site Preparation

We understand that, while final design grades are not yet available, some minor cut and fill site grading operations will be required to establish final grade levels throughout the site. Fill (mainly surficial soils disturbed by agricultural activity) soil and materials containing organics were encountered at most of the borehole locations; topsoil and fill materials are not considered suitable to provide foundation support for the proposed building foundations, floor slabs, other settlement-sensitive structures, or engineered fill materials that may be subsequently used to support these structures. To reduce the potential for differential settlements, all existing topsoil (where present) and fill materials within the proposed building footprints and paved areas, should be completely sub-excavated and replaced with approved engineered fill materials, as required (subject to inspection in the field during construction by Cambium, as discussed later). Any topsoil and materials with significant quantities of organics and deleterious materials (i.e., construction debris, etc.) are not appropriate for use as fill.

The exposed subgrades should be proof-rolled and inspected by a qualified geotechnical engineer prior to placement of any granular fill. Any loose/soft soils identified at the time of proof-rolling that are unable to uniformly be compacted should be sub-excavated and removed. The excavations created through the removal of these materials should be backfilled with approved engineered fill consistent with the recommendations provided below.

Complete removal of any existing septic systems, wells, old foundations, etc. would also be required as part of the Site redevelopment. The zone of influence of the proposed footings can be defined as any line drawn from the underside edge of the footing down and away at 45˚ angles to the horizontal.

Proposed building foundations, floor slabs, pavements or other settlement-sensitive structures may be supported on approved native undisturbed compact soils that are free of organics and other deleterious materials or on approved engineered fill materials.

The near surface silty sand to sandy silt soils can become unstable if they are wet or saturated. Such conditions are common in the spring and late fall. Under these conditions, temporary use of granular fill, and possible reinforcing geotextiles, may be required to prevent severe rutting on construction access routes.

5.4 Engineered Fill

Engineered fill may be required to support structural elements such as foundations and / or floor slabs depending on the extent of existing fill removal or removal of the existing structures on site. The following is recommended for the construction of engineered fill:

1. Remove any and all existing vegetation, surficial topsoil / organics, organic fills or fills and any loose/disturbed soils to a competent subgrade for a suitable envelope.
2. The area of the engineered fill should extend horizontally 1 m beyond the outside edge of the foundations then extend downward at an imaginary 1 horizontal to 1 vertical (H:V) slope to the competent approved native soil. The exposed edges of the engineered fill should be sloped at a maximum of 3H:1V to avoid weakening of the engineered fill edges due to slope movement. If fill is required adjacent to sloped banks (i.e., slope steeper than 3H:1V), the fill shall be placed in stepped planes to avoid a plane weakness.
3. The subgrade or base of the engineered fill area must be approved by Cambium prior to placement of any new fill, to ensure that suitability of subgrade condition. The area(s) should then be proof-rolled in conjunction with an inspection by Cambium to confirm that the exposed soils are native, undisturbed, and competent, and have been adequately cleaned of ponded water and all disturbed, loosened, softened, organic and other deleterious material. Some of the localized near-surface loose/soft soils will also likely need to be removed prior to placement of engineered fill as directed by Cambium during proof-rolling.
4. Materials for reuse as engineered fill must be approved by Cambium prior to placement. In this regard, approved disturbed native or the native soil which are near their optimum water contents

and do not contain topsoil or organics or any other deleterious materials can be reused on Site as engineered fill. The fill materials disturbed by agricultural activity may contain organic inclusions and as such must be assessed by Cambium for their suitability for reuse as engineered fill. Should the fill contain significant organics, these materials should be wasted or reused for landscaping purposes. The materials for use as engineered fill must be maintained within about 2% of optimum water content for compaction. Based on the measured natural water contents, most of the native sandy soils are generally moist to wet and may require drying during engineered fill construction. Their actual water content will need to be assessed in comparison to the laboratory optimum water contents for compaction at the time of construction.

5. If native soils from the site are not used as engineered fill, imported material for engineered fill should consist of clean, non-organic soils, free of chemical contamination or deleterious material. Imported materials to be used for engineered fill must be approved by Cambium at the source(s), prior to hauling to the Site. In this regard, imported sandy materials which meet the requirements for OPSS 1010.MUNI SSM or Granular B material at a moisture content at or near optimum moisture would be suitable for use as engineered fill. In any event, the approved materials for engineered fill should be placed in maximum 300 mm thick loose lifts and uniformly compacted to 100% of SPMDD throughout. Any frost penetration into the fill material must be removed prior to placement of subsequent lifts of fill and reviewed by Cambium.
6. The engineered fill should be placed at least 600 mm above the elevation of the proposed underside of footing. The final surface of the engineered fill should be protected as necessary from construction traffic, ponded water and freezing, and should be sloped to provide positive drainage for surface water during and following the construction period. During periods of freezing weather, additional soil cover should be placed above final subgrade to provide frost protection.
7. Due to the potential negative effects of differential settlement between the engineered fill and the native soils, it is generally not recommended that individual footings be supported on both engineered fill and on native soils. In addition, differential settlement may occur between different footings if some of the footings are on native soils and some are on engineered fill.
8. Full time testing and inspection of the engineered fill will be required for it to be used as a founding material, as outlined in Section 4.2.2.2 of the Ontario Building Code.

5.5 Frost Penetration

Based on OPSD3090.101, the maximum frost penetration depth below the surface at the site is estimated at 1.4 mbgs. Exterior footings for the proposed structures should be situated at or below this depth for frost penetration or should be appropriately protected.

It is assumed that the pavement structure thickness will be less than 1.4 m, and as a result grading and drainage are important for good pavement performance and life expectancy. Any services should be located below this depth or be appropriately insulated.

5.6 Temporary Excavation and Support

As the depths of the proposed underground services have not been finalized at this time, for the purposes of this report, we have assumed that the service inverts will be up to about 4 m below the existing surface after grading. Once the actual service invert depths are finalized, the following comments and recommendations should be reviewed and revised as necessary.

Based on the results of this investigation, the founding soils for the services below frost depth are likely to be highly variable consisting of compact to dense non-cohesive deposits or stiff to hard cohesive deposits. The compact to dense non-cohesive deposits or stiff to hard cohesive deposits are generally considered to be suitable for supporting the pipes, provided the integrity of the base can be maintained during construction. Where loose non-cohesive deposits are encountered such as at BH117-22, a thicker bedding layer will be required to support the pipe.

All excavations should be carried out in accordance with the Occupational Health and Safety Act (OHSA) and Ontario Health and Safety Regulations for Construction Projects (O. Reg 213). Excavation at this site will extend through the very loose to compact disturbed native soils and into the underlying loose to dense native deposits. Excavation into the underlying cohesive deposits which includes the till may occur depending on the excavation depth.

It is anticipated that temporary excavations above the groundwater table level will consist of conventional temporary open cuts with side slopes not steeper than 3H:1V for Type 4 soils (very

loose disturbed native) and 1H:1V for Type 3 soils (loose to compact disturbed native), as provisionally classified by Ontario Health and Safety Act and Regulations for Construction Projects (OHSA). For Type 3 soils, the slope should be from the base of the excavation. If excavations will extend below the measured groundwater elevations, adequate dewatering will be required to achieve a Type 3 soil classification. Please note that if the excavation extends below the groundwater table without adequate dewatering, the soil at the face of the excavation would be classified as Type 4 and a maximum side slope inclination of 3H:1V would be required for OHSA compliance. Where the side slopes consist of more than one soil type, the soil shall be classified as the type with the highest number among the types present. Please note that the soil type classifications indicated above are provisional and are subject to change based on field observations of the actual conditions at the time of exposure.

Depending upon the construction procedures adopted by the contractor, actual groundwater seepage conditions, the success of the contractor's groundwater control methods and weather conditions at the time of construction, some flattening and/or blanketing of the slopes may be required. Care should be taken to direct surface runoff away from the open excavations. Stockpiles of excavated materials should be kept at least the same horizontal distance from the top edge of the excavation as the depth to not negatively impact excavation slope stability, subject to confirmation by a geotechnical engineer in the field during construction. Care should also be taken to avoid overloading of any underground services / structures by stockpiles. Boulders larger than 0.3 m in diameter, if encountered, should be removed from the excavation side slopes for worker safety.

Where side slopes of excavations are required to be steepened to limit the extent of the excavation, then some form of trench support system may be required. It must be emphasized that a trench liner box provides protection for construction personnel but does not provide any lateral support for the adjacent excavation walls, underground services, or existing structures; trench liner boxes should only be used after consultation with Cambium. It is imperative that any underground services or existing structures adjacent to the excavations be accurately located prior to construction and adequate support provided where required. In addition, steepened excavations should be left open for as short a duration as possible and completely backfilled at the end of each working day.

Conventional hydraulic excavation equipment would be expected to be suitable for excavation in the overburden soils. The glacial till soils at this site below the non-cohesive deposits are glacially derived and as such should be expected to contain cobbles and boulders, which could affect excavations for the buildings and site services. The contractor should be made aware of the potential presence of cobbles and/or boulders within the overburden soils.

The subsoils (fill and native materials) are generally susceptible to disturbance due to construction activities, ponded water, potential groundwater seepage and heavy precipitation. Groundwater seepage into the excavations may also occur from perched groundwater or surface water flow, particularly following significant periods of precipitation.

5.7 Temporary Groundwater Control

As excavations for the sewers or watermain and structures are expected to extend below the water table**,** provisions will be required to maintain sufficiently dry excavations to permit safe working conditions. In this context, the groundwater level should be drawn down to at least 1 m below the base of the excavation, prior to the excavations reaching the base level, to reduce the potential for loosening of the excavation base due to seepage pressures. Further, care should be taken to direct surface water away from the open excavations. Excavations extending below the groundwater table through, or in, saturated non-cohesive deposits will require the use of positive dewatering in the form of perimeter trenching with sumps and pumps, and/or well points, and/or eductors.

Water takings in excess of 50 m^3/day are regulated by the (Ministry of the Environment, Conservation and Parks (MECP). Certain takings of groundwater and storm water for construction site dewatering purposes with a combined total less than 400 m^3/day qualify for self-registration on the MECP's Environmental Activity and Sector Registry ("EASR"). Registry on the EASR replaces the need to obtain a PTTW and a Section 53 approval. A Category 3 PTTW is required where the proposed water taking is greater than 400 m^3/day.

The dewatering system is the Contractor's responsibility and the rate and volume required for dewatering is dependent on the construction methods and staging chosen by the contractor.

Further, the contractor will be responsible for obtaining any required discharge approvals. The hydrogeological assessment is being carried out by others.

5.8 Pipe Bedding and Cover

The bedding for the site servicing pipes should be compatible with the type and class of pipe, the surrounding subsoil and anticipated loading conditions and should be designed in accordance with Township of Clearview Engineering Standards. The Township of Clearview guideline dated March 22, 2017, and entitled, *"Township of Clearview Engineering Standards"* references OPSD 802.010, 802.030 and 802.031 for pipe bedding. Where granular bedding is deemed to be acceptable, it should consist of at least 150 mm of Granular A or 19-mm crusher run limestone material. From the springline to 300 mm above the pipe obvert, sand cover may be used. All bedding and cover materials should be placed in maximum 150-mm thick loose lifts in non-saturated conditions and should be uniformly compacted to at least 100% of SPMDD. Clear stone bedding material should not be used in any case for pipe bedding or to stabilize the base since fine particles from the native deposits could potentially migrate into the voids in the clear stone and cause loss of pipe support and settlement.

In some areas where poor subgrade soils are encountered, we recommend increasing the bedding layer thickness, up to 450 mm or more, to provide a flat and stable base for pipe placement. Where unavoidable disturbance to the subgrade surface does occur, it may be necessary to place a sub-bedding layer of compacted Granular B, Type II beneath the Granular A. The requirements for additional bedding thickness should be determined during construction by the geotechnical engineer.

5.9 Trench Backfill

The excavated materials from the site will be variable, primarily consisting of silty clay to clayey silt and silty sand to sandy silt soils. The soils are generally wet of the optimum water content for compaction. The excavated subsoils at suitable water contents (materials no wetter than about 4% above the optimum water content for compaction) may be reused as backfill provided they are free of significant amounts of topsoil, organics or other deleterious material and are placed and compacted as outlined below. All topsoil, if encountered, and organic materials should be wasted or

used for landscaping purposes. All oversized cobbles and boulders (i.e. greater than 150 mm in size) should be removed from the backfill. The Township's engineering standards recommends Granular B, Type I for backfill of road crossings.

All trench backfill, from the top of the cover material to 1 m below subgrade elevation, should be placed in maximum 450-mm thick loose lifts and uniformly compacted to at least 98% of the material's SPMDD. From 1 m below subgrade to subgrade elevation, the materials should be placed in maximum 300 mm thick loose lifts and uniformly compacted to at least 98% of the material's SPMDD.

Alternatively, if placement water contents at the time of construction are too high, or if there is a shortage of suitable in situ material, then an approved imported sandy material which meets the requirements for SSM or Granular B, Type I could be used. It should be placed in loose lift thicknesses as indicated above and uniformly compacted to at least 98% of SPMDD. Backfilling operations during cold weather must avoid inclusions of frozen lumps of material, snow, and ice.

Normal post-construction settlement of the compacted trench backfill should be anticipated, with the majority of such settlement taking place within about 6 months following the completion of trench backfilling operations. This settlement will be reflected at the ground surface and in pavement construction areas; it may be compensated for, where necessary, by placing additional granular material prior to asphalt paving. However, since it is anticipated that the asphalt binder course will be placed shortly following the completion of trench backfilling operations, any settlement that may be reflected by subsidence of the surface of the binder asphalt should be compensated for by placing an additional thickness of binder asphalt or by padding. In any event, it is recommended that the surface course asphalt should not be placed over the binder course asphalt for at least 12 months. Post-construction settlement of the restored ground surface in off-road trench areas is also expected and should be topped-up and re-landscaped, as required.

It should be noted that in some cases, even though the compaction requirements have been met, the subgrade strength in the trench backfill areas may not be adequate to support heavy construction loading, especially during wet weather or where backfill materials wet of optimum have been placed. In any event, the subgrade should be proof-rolled and inspected by qualified

geotechnical personnel prior to placing the Granular B subbase and additional subbase material placed as required, being consistent with the prevailing weather conditions and anticipated use by construction traffic.

5.9.1 Trench Cut-Offs

Where the invert levels of the services are located below the measured groundwater levels, consideration should be given to installation of low hydraulic conductivity water-stops or cut-offs (trench plugs) at strategic locations in accordance with OPSD 802.095. This should be done, as appropriate, to reduce the potential for preferential groundwater flow through the granular bedding. For this site, trench cut-offs would be more effective in the cohesive silty clay to clayey silt deposits. However, they would be less effective where the pipeline is installed in the non-cohesive deposits unless the trench plugs can be extended and keyed into underlying low hydraulic conductivity cohesive soils. The need and frequency of trench plugs must be evaluated in the field during construction. The spacing is largely dependent on the grades established at the ground surface and in the trench base; however, spacings on the order of 50 m to 100 m are common. As such, it should be included in the contract as a provisional item.

5.10 Foundation Design

The recommendations given below should be reviewed once the grading plans and founding depths are available.

5.10.1 Residential House Foundations

Based on the results of this investigation, in most areas, residential houses with or without basements may be founded on conventional shallow spread and/or continuous strip footings bearing in the native, undisturbed soils (compact to dense non-cohesive or stiff to very stiff cohesive deposits) or on approved engineered fill at least 1.4 m below finished grades. Due to groundwater levels at the site, excavations for shallow footings and/or basements will likely require advance dewatering as described in Section 5.7 to achieve stable excavation bases and sidewalls. Such footings may be designed using a factored geotechnical resistance at ultimate limit states (ULS) of 200 kPa and a geotechnical reaction at serviceability limit states (SLS) of 150 kPa (for a

total settlement of 25 m). These bearing resistances are for strip footings 0.45 m to 1.0 m wide and spread footings varying from 1 m x 1 m to 2 m to 2 m in size. The ULS resistance and SLS reaction values should be confirmed/refined during final design based on the actual final grades and bearing elevations.

In general, for any houses placed wholly or in part on engineered fill, it is recommended that the foundations be provided with nominal reinforcement, consisting of reinforcing steel (two 15M bars) at the top and bottom of the foundation walls. However, once the final thicknesses and extent of engineered fill are known, the need for and design of any reinforcement can be determined on a lot-by-lot basis by the builder's structural engineer, in consultation with Cambium.

The perimeter house basement walls should be backfilled with a free draining, non-frost susceptible granular material carefully placed and compacted in lifts and should be designed using the methodology presented below in subsection 5.12. Alternatively, where site excavated material is to be reused for backfill, an approved geo-composite drainage system should be used directly against the wall.

5.10.2 Commercial Buildings Foundations

The relevant boreholes advanced for the commercial buildings along the western boundary of the site are BH103-22 to BH105-22 and BH111-22. Consideration may be given to supporting the proposed building on conventional spread/strip footings founded in the competent, native, and undisturbed deposits as described below in Table 7. As noted above, advance dewatering may be required to achieve undisturbed conditions at the footing depths noted below.

Table 7 Anticipated Founding Soils for Shallow Foundations

Borehole ID	Minimum Footing Base Depth (m)	Maximum Footing Base Elevation (mRel*)	Anticipated Founding Materials
BH103-22	1.5	100.9	Compact to dense sand to silty sand
BH104-22	1.5	101.1	
BH105-22	1.5	101.0	
BH111-22	1.0	102.4	Compact silty sand to very stiff silty clay till
**relative elevation*			

The spread/strip footings bearing at the depths/elevations provided above may be designed using the factored geotechnical resistance at Ultimate Limit States (ULS) and the geotechnical reaction at Serviceability Limit States (SLS), for 25 mm of total settlement and 19 mm of differential settlement, provided below in Table 8.

Table 8 Preliminary Recommended ULS and SLS for Spread/Strip Footing Foundations

Spread or Strip Footing Dimensions	Factored Geotechnical Resistance at ULS (kPa)	Geotechnical Reaction at SLS (for 25 mm of settlement) kPa
0.5 m Strip footing	200	150
1.0 m Strip footing		
1 m x 1 m Spread	250	200
2 m x 2 m Spread		

5.10.3 General Foundation Comments

As the actual soil bearing resistances are related to the actual footing sizes and founding depths, the foundation recommendations must be reviewed by Cambium once the building details are finalized and, as such, the recommendation provided above should be considered preliminary.

All foundation excavations at the site should be carried out in accordance with the current OHSA requirements (see excavation side slope comments and geometry requirements in Section 5.6).

All fill, old foundations, other structures organics, and any deleterious materials should be stripped/removed from the proposed development area.

If stepped spread footings are constructed at different founding levels, the difference in elevation between individual footings should not be greater than one half the clear distance between the

footings (2H:1V or gentler). Should this not be possible, Cambium should be consulted to provide field inspection to ensure that the footings exceeding the above requirement are stable and the bearing and lateral support for the upper footing is not compromised. In addition, the lower footings should be constructed first so that if it is necessary to construct the lower footings at a greater depth than anticipated, the elevations of the upper footings can be adjusted accordingly. Stepped strip footings, if required, should be constructed in accordance with the latest edition of the Ontario Building Code (2015 OBC), Section 9.15.3.9.

Our foundation recommendations are subject to a key assumption that no former excavation, former or existing underground utility or structure is located within or intercepts the zone of influence of the proposed footings. The zone of influence of the proposed footings can be defined as any line drawn from the underside edge of the footing down and away at a slope of 1H:1V. Complete removal of fill and any existing or remaining foundations from previous structures or any underground utilities, if present, or lowering the founding elevation (if appropriate) may be required subject to the inspection by Cambium during the time of construction.

The founding materials are susceptible to disturbance by construction activities especially during wet weather and care should be taken to preserve the integrity of the materials as bearing strata. Prior to placing concrete for the footings, the foundation excavations must be inspected by Cambium to confirm that the footings are located in a native, undisturbed, and competent bearing stratum which has been cleaned of ponded water and loosened or softened material. If the concrete for the footings on the native soil cannot be placed immediately after excavation and inspection (i.e., within 24 hours of excavation and inspection), it is recommended that a working mat of lean concrete be placed in the excavation to protect the integrity of the bearing stratum. The bearing soil and fresh concrete must be protected from freezing during cold weather construction.

All exterior footings and footings in unheated areas should be provided with at least 1.4 m of earth cover after final grading or a thermally equivalent thickness of insulation, in order to address the potential for damage due to frost action.

5.11 Slab-on-Grade Floor

It is anticipated that the floor slab can be designed as a concrete slab-on-grade. The soils at the anticipated slab-on-grade level after removal of the topsoil or disturbed native will generally consist of compact non-cohesive and stiff to very stiff cohesive native deposits.

The existing disturbed native material is not suitable to support the slab-on-grade and sub-excavation and replacement with engineered fill will be required during slab-on-grade construction within the footprint of the proposed slab as described in the Engineered Fill section.

The exposed subgrade should be proof rolled in conjunction with an inspection by Cambium. Remedial work should be carried out on any softened, disturbed, wet or poorly performing zones as directed by Cambium. Any low areas may then be brought up to within at least 200 mm of the underside of the floor slabs, as required, using Granular B, Type I or other approved material, placed in maximum 200 mm thick loose lifts and uniformly compacted to at least 98% of SPMDD.

The final lift of granular fill beneath floor slabs should consist of a minimum thickness of 200 mm of Granular A, uniformly compacted to at least 100% of the material's SPMDD, acting as a moisture barrier. Any filling operations should be inspected and tested by Cambium. Additional Granular A material may be needed to provide adequate pipe bedding and cover, depending on the requirements for an under-slab drainage system (see below).

The floor slabs should be structurally separate from the foundation walls and columns. Sawcut control joints should be provided at regular intervals and along column lines to control shrinkage cracking and to allow for differential settlement of the floor slabs.

5.12 Backfill and Lateral Earth Pressure for Basement Walls

Excavated topsoil from the Site is not appropriate for use as fill below grading areas. Excavated non-cohesive soils not containing organics or significant deposits of clay may be appropriate for use as fill below grading areas, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities. Some moisture content

adjustments may be required depending upon seasonal conditions. All existing vegetation, topsoil, organic and non-organic fills, and any loose soils shall be removed down to a competent base. Backfill areas must be approved by a qualified geotechnical engineer prior to placement of any new fill, to ensure the suitability of subgrade conditions.

The soils at this site containing more than about 15% silt are frost susceptible and should not be used as backfill against exterior or unheated foundation elements or below settlement sensitive structures. To avoid problems with frost adhesion and heaving, these foundation elements should be backfilled with non-frost susceptible sand or sand and gravel conforming to the requirements of Granular B, Type I material.

Backfill adjacent to the structural elements (i.e., foundation walls) should be placed evenly in lifts not exceeding 200 mm loose thickness and should be compacted to 95% of SPMDD taking care not to damage the adjacent structures. Light compaction equipment should be used immediately adjacent to the wall; otherwise compaction stresses on the wall may be greater than that imposed by the backfill material. The backfill material in the upper 0.3 m below the pavement subgrade elevation should be compacted to 100% of SPMDD in all areas. The upper 0.3 metres of backfill should consist of clayey material (where appropriate) to provide a relatively low-permeability cap and the exterior grade should also be shaped to slope away from the building.

In areas where pavement or other hard surfacing will abut the building, differential frost heaving could occur between the granular fill immediately adjacent to the building and the more frost susceptible native materials which exist beyond the wall backfill. To reduce the severity of this differential heaving, the backfill adjacent to the wall should be placed to form a frost taper. The frost taper should be brought up to pavement subgrade level from 1.4 m below finished exterior grade at a slope of 3H:1V, or flatter, away from the wall.

The design of the foundation walls for the permanent basement level should take into account the horizontal soil loads, hydrostatic pressure, as well as surcharge loads that may occur during or after construction. The permanent below-grade wall is considered to be a rigid structure and should be designed to resist at-rest lateral earth pressures calculated as follows:

$$p = K(\gamma h + q)$$

where:

p	=	lateral earth pressure acting depth z, kilopascals
$K = K_o$	=	at rest earth pressure coefficient, use 0.5 for the foundation wall
γ	=	unit weight of retained soil/backfill, a value of 21 kilonewtons/cubic metre may be assumed
h	=	depth to point of interest in soil, metres
q	=	equivalent value of surcharge on the ground surface, kilopascals.

The above expression assumes that the perimeter drainage system prevents the build-up of any hydrostatic pressure behind the wall. Should hydrostatic pressures be considered to build-up behind the walls (such as in the case of a fully waterproofed or “tanked” basement), they must be included in calculating the lateral earth pressures and other measures to address possible buoyancy and waterproofing may need to be considered. The lateral earth pressures acting on the below-grade walls will depend on the type and method of placement of the backfill materials, the nature of the soils behind the wall, the magnitude of surcharge including construction loadings from equipment or materials, the freedom of lateral movement of the structure, and the drainage conditions behind the walls. Surcharge pressures from any adjacent road should also be included in the design as indicated.

5.13 Site Classification for Seismic Site Response

Seismic hazard is defined in the 2012 Ontario Building Code (OBC) by uniform hazard spectra (UHS) at spectral coordinates of 0.2 second, 0.5 second, 1.0 second and 2.0 seconds and a probability of exceedance of 2% in 50 years. The OBC method uses a site classification system defined by the average soil/bedrock properties (e.g., shear wave velocity, Standard Penetration Test (SPT) resistance, undrained soil shear strength, etc.) in the 30 m of the soil profile extending below the foundation level. There are 6 site classes from A to F, decreasing in ground stiffness from A, hard rock, to E, soft soil; with site class F used to denote problematic soils (e.g., sites underlain by thick peat deposits and/or liquefiable/collapsible soils). the site class is then used to obtain acceleration and velocity-based site coefficients F_a and F_v, respectively, used to modify the UHS to account for the effects of site-specific soil conditions in design.

The results of the borehole investigation indicate the average SPT “N”-value below the recommended founding depths (as discussed in Section 5.10) is generally less than 50 blows per 0.3 m of penetration. Based on these results, Site Class D may be used for design. The site classification may be improved by site-specific testing such as multi-channel analysis of surface waves (MASW) testing.

5.14 Storm Water Management Ponds

A stormwater management pond (SWMP) is proposed for the northeastern area of the site. Borehole BH109-22 and BH120-22 were advanced in this area and the subsurface conditions are described in Section 4.4.

The SWMPs should be constructed in accordance with the relevant municipal standards, such as the Township of Clearview, “Engineering Standards,” dated March 2017. Details of the permanent water level and whether the ponds will be designed as wet or dry ponds were not available at time of writing this report and the following comments are preliminary and should be revised once additional details are available.

BH109-22 and BH120-22 indicate that the subsurface conditions consist of the topsoil overlying deposits of non-cohesive soils followed by cohesive silty clay or silty clay till deposits. The groundwater level was measured in the monitoring well at BH120-22 at 0.7 m ***above*** the ground surface indicating artesian conditions adjacent to the existing stormwater management pond.

- Considering that the side slopes of the proposed pond will most likely consist of deposits of sand to silty sand, in order to address groundwater and stormwater interaction via permeable zones encountered along the pond excavation and slopes, the base and slopes should be lined with a low hydraulic conductivity liner, such as a Geosynthetic clay liner (GCL). The GCL will require soil ballast to resist uplift pressures.

- Any constructed berms around the pond should be constructed in accordance with the municipal standards. The material used to construct the berms should be approved by the geotechnical engineer prior to placement. The approved material used to construct berms

should be placed in maximum 300 mm thick loose lifts and uniformly compacted to at least 98% of the SPMDD. Strict control over placement water content of the material will be necessary. Care should be taken to ensure homogeneity of the constructed berm (i.e. no erodible layers). The prepared foundation for the berm should be inspected by the geotechnical engineer prior to placement of berm fill material.

- Pond side slopes above the permanent water level in the pond should be no steeper than 3H:1V; side slopes below the permanent water table should be 4H:1V or flatter. If soft or loose soils are encountered during construction the slopes may need to be constructed at slopes flatter than 3H:1V. Once the pond design is more advanced, slope stability analysis of the required slopes should be carried out to ensure the stability of the constructed slopes.

- The pond base soils are susceptible to disturbance by heavy construction equipment which could affect access by construction traffic, especially during wet weather or where seepage is encountered.

- The ponds should be equipped with an emergency spillway or similar structure(s) designed to eliminate the possibility of over-topping of the berms.

- Where pipes enter or exit the pond, they should be provided with anti-seepage collars to preclude preferential flow through the pipe bedding and backfill and possible loss of ground. The exposed end of the riser portion should be provided with protective grates or the like to prevent unauthorized access (e.g. by children or animals).

- Regular inspection by the geotechnical engineer should be carried out during the pond construction. The final pond side slopes should be sodded or otherwise treated to reduce erosion. Maintenance will be required over the first several years until the vegetative mat has taken root.

Further comments on the design and construction of the pond will be provided once the design details are finalized. Additional boreholes and / or test pits may be required in order to finalize the

design of the pond and provide appropriate geotechnical engineering recommendations for the design and construction of the proposed pond.

5.15 Pavement Design

To develop an appropriate pavement design strategy, we have reviewed Drawing STD-R1 to STD-R4 of Township of Clearview Engineering Standards dated March 2017. The design manual states that the minimum pavement element thicknesses for roads should be as follows:

- 40 mm - HL3 surface course asphalt
- 40 mm – HL3 base course asphalt
- 150 mm – Granular A
- 300 mm – Granular B (min) or as per geotechnical recommendations

In general, the above minimum design criteria may be used for the proposed development. However, Cambium has recommended the following pavement structures for two traffic loading scenarios: light duty and heavy duty. The heavy-duty design is appropriate for areas where heavy traffic is anticipated while the light duty design is appropriate for areas where light traffic is anticipated. As traffic information was not available, it is anticipated that the light duty pavement will be used by lightly loaded passenger cars and the heavy-duty access roads and driveways will be designed to support fire trucks and waste collection equipment but will not be subject to regular heavy vehicle loading such as daily deliveries. Repair and maintenance work (i.e., crack infilling, asphalt sealing, etc.) will need to be carried out on an as-needed basis to limit pavement degradation and extend the service life of the pavement.

Table 9 Recommended Minimum Pavement Structure

Pavement Layer	Light Duty	Heavy Duty
Surface Course Asphalt[1]	40 mm HL3 or HL4	40 mm HL3 or HL4
Binder Course Asphalt[1]	50 mm HL8	70 mm HL8
Granular Base[2]	150 mm Granular A	150 mm Granular A
Granular Subbase[2]	300 mm Granular B, Type I	400 mm Granular B, Type I

Notes:
1 Asphaltic Material shall be in accordance with OPSS 1150 (November 2010)
2 Granular Materials shall be in accordance with OPSS.MUNI 1010 (September 2017)

Material and thickness substitutions must be approved by the Design Engineer.

5.15.1 Compaction Requirements

The table below provides the minimum compaction requirements for different pavement layers.

Table 10 Minimum Compaction Requirements

Material	Required Compaction (% of Marshal Maximum Relative Density or Standard Proctor Density)
HL3 Surface Course	Minimum 92% to 96.5%
HL8 Binder Course	Minimum 92% to 96.5%
Granular A Base	Minimum 100%
Granular B Type I Subbase	Minimum 100%
Subgrade	Minimum 98% - Prepared and Approved Subgrade

Granular and stone materials are to be spread and compacted in layers with a maximum depth of 150 mm. Compaction of the granular materials and subgrade soils should be carried out at a moisture content that is between optimum moisture content and 2% of the optimum.

Compaction of the granular base and subbase materials should be carried out at a moisture content that is within ±1% of the optimum moisture content.

The subgrade or engineered fill must be compacted to a minimum of 98% SPMDD at a moisture content of ±2% of optimum.

Asphalt and granular materials; and placement requirements should be in accordance with OPSS 310 and OPSS 314, as amended by the applicable Municipal standards.

5.15.2 Drainage

Adequate surface and subsurface drainage are critical if the pavement is to provide satisfactory service over the design life. The drainage system could consist of a system of catchbasins connected to subdrains draining to a permanent storm water outlet. In this regard, the asphalt surface should be graded to drain towards the catchbasins, and the subgrade should be carefully

proof-rolled to a smooth surface and sloped towards the catchbasins to prevent ponding or entrapment of water in the subbase which would lead to weakened sections.

Subdrains shall be installed under all curbs. The subdrains should consist of 150 mm diameter wrapped perforated pipes, placed inside 300 mm by 300 mm trenches, and surrounded by clean free draining sand, such as concrete sand. The drain inverts should be at approximately 300 mm below the bottom of the granular subbase and should be sloped to drain towards the catchbasins.

5.15.3 Performance graded Asphalt Cement (PGAC)

It is recommended that PG 58-28 asphalt cement be used for the HL 3 and HL 8 asphalt on this project.

5.15.4 Tack Coat

Tack coat should be applied between all lifts of the hot mix asphalt and at all but joints and milled surfaces. Tack coat should satisfy the requirements listed in OPSS.PROV 308.

5.15.5 General Notes

Topsoil, organic matter, or any other deleterious materials within the footprint of the proposed roadway should be removed. Prior to placing granular subbase material, subgrade should be proof-rolled and inspected by a qualified geotechnical engineer from Cambium. All the remedial work (i.e., sub-excavation and replacement) should be carried out on any disturbed, softened or poorly performing areas, as directed by the geotechnical engineer. The subgrade should be graded at a minimum 3% crossfall towards subdrains.

The subgrade should be proof-rolled and inspected by a qualified geotechnical engineer prior to placing the subbase and additional material placed as required to address the subgrade soil conditions and the anticipated construction traffic. Remedial work (i.e., further sub-excavation and replacement) should be carried out on any disturbed, softened or poorly performing areas, as directed by the geotechnical engineer.

Where the new pavement abuts the existing pavement (e.g., at tie-ins to existing pavement), proper longitudinal lap joints should be constructed to key the new asphalt surface course into the existing pavement. The existing asphalt should be sawcut to provide a vertical face prior to keying-in the new asphalt surface course. Any undermined or broken edges resulting from the construction activities should be removed by the sawcut. All laps, but joints and milled surfaces should be appropriately tack coated.

It should be noted that in some cases, even though the compaction requirements have been met, the subgrade strength may not be adequate to support heavy construction loading especially during wet weather or where subgrade soils are wet of optimum. In this regard, the design subbase thickness may not be sufficient for a construction haul road and additional granular materials (in the order of 150 mm to 300 mm) may be required as determined during construction by the geotechnical engineer.

The thickness of the subbase layer could be increased at the discretion of the Engineer, to accommodate site conditions at the time of construction, including soft or weak subgrade soil replacement.

All granular fill materials (Granular A, Granular B, SSM, etc.) referenced within this report, should meet the requirements stipulated in OPSS.MUNI 1010.

6.0 Monitoring Well Decommissioning

As previously indicated, monitoring wells were installed in the boreholes to permit monitoring of groundwater levels. Ontario Regulation (O.Reg.) 903 as amended, of the Ontario Water Resources Act, requires that wells be properly abandoned / decommissioned by qualified and licensed personnel. It is recommended that the decommissioning of the wells be carried out as part of the construction activities at the site so that additional water level measurements can be taken leading up to, and immediately prior to, construction and/or so that the wells can be potentially used to evaluate the effectiveness of the dewatering system during construction. If requested, Cambium could provide assistance to the owner in arranging for the decommissioning of the wells by a MECP-licensed water well drilling contractor.

7.0 Inspections and Testing

At the time of writing this report, the final grading plans and founding elevations of the proposed structures and facilities on site were not available. Once these details are available, the recommendations in this report should be updated especially for the recommendations related to excavations and foundations. Cambium should be retained to review the geotechnical aspects of the final design drawings and specifications prior to tendering and construction to confirm that the intent of this report has been met.

It would be prudent to carry out a "public digging" (i.e., test pitting) during the tender stage, to allow prospective bidders to assess the subsurface conditions and determine the type and location of groundwater control required, consistent with their equipment capabilities and the actual groundwater conditions at that time. The locations of the test pits should be determined in consultation with Cambium.

During construction, a sufficient degree of foundation inspections, subgrade inspections, and an adequate number of in situ density tests and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications. Concrete testing should be carried out on both the plastic material in the field and of set cylinder samples in a CSA certified laboratory.

The soils at this site are sensitive to disturbance from ponded water, construction traffic and frost. All bearing surfaces must be inspected by Cambium prior to filling or concreting to ensure that strata having adequate bearing capacity have been reached and that the bearing surfaces have been properly prepared.

8.0 Closing

Please note that this work program and report are governed by the attached Qualifications and Limitations. If you have questions or comments regarding the contents of this report or require additional information, please do not hesitate to contact this office.

Respectfully submitted,

Cambium Inc.

Rafael Abdulla, M.Eng., P.Eng., PMP
Senior Geotechnical Engineer

Rob Gethin, P.Eng.
Group Manager – Geotechnical

Stuart Baird, M.Eng., P.Eng.
Director – Geotechnical & Construction Quality Verification Services

RG/SEB/ra
P:\14700 to 14799\14768-001 Georgian Communities - Geo - Nottawa Lands\Deliverables\REPORT - Site 1 Nottawa\Final\2023-11-13 14768-001 RPT Geo Nottawa_final.docx

9.0 Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer, and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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The findings and results presented in reports prepared by Cambium are based on the materials and information provided by the client to Cambium and on the facts, conditions and circumstances encountered by Cambium during the performance of the work requested by the client. In formulating its findings and results into a report, Cambium assumes that the information and materials provided by the client or obtained by Cambium from the client or otherwise are factual, accurate and represent a true depiction of the circumstances that exist. Cambium relies on its client to inform Cambium if there are changes to any such information and materials. Cambium does not review, analyze, or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Cambium will not be responsible for matters arising from incomplete, incorrect, or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Cambium during the provision of services, work, or reports.

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When preparing reports, Cambium considers applicable legislation, regulations, governmental guidelines, and policies to the extent they are within its knowledge, but Cambium is not qualified to advise with respect to legal matters. The presentation of information regarding applicable legislation, regulations, governmental guidelines, and policies is for information only and is not intended to and should not be interpreted as constituting a legal opinion concerning the work completed or conditions outlined in a report. All legal matters should be reviewed and considered by an appropriately qualified legal practitioner.

Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

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Cambium's services, work and reports may be relied on by the client and its corporate directors and officers, employees, and professional advisors. Cambium is not responsible for the use of its work or reports by any other party, or for the reliance on, or for any decision which is made by any party using the services or work performed by or a report prepared by Cambium without Cambium's express written consent. Any party that relies on services or work performed by Cambium or a report prepared by Cambium without Cambium's express written consent, does so at its own risk. No report of Cambium may be disclosed or referred to in any public document without Cambium's express prior written consent. Cambium specifically disclaims any liability or responsibility to any such party for any loss, damage, expense, fine, penalty or other such thing which may arise or result from the use of any information, recommendation or other matter arising from the services, work or reports provided by Cambium.

Limitation of Liability

Potential liability to the client arising out of the report is limited to the amount of Cambium's professional liability insurance coverage. Cambium shall only be liable for direct damages to the extent caused by Cambium's negligence and/or breach of contract. Cambium shall not be liable for consequential damages.

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The client expressly agrees that Cambium employees shall have no personal liability to the client with respect to a claim, whether in contract, tort and/or other cause of action in law. Furthermore, the client agrees that it will bring no proceedings nor take any action in any court of law against Cambium employees in their personal capacity.

Appended Figures

GEOTECHNICAL EXPLORATION

GEORGIAN COMMUNITIES
Nottawa Lands Development
Nottawa, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Watercourse
- Water Area
- Provincial Park
- Wooded Area
- Built Up Area

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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SITE LOCATION MAP

Project No.: 14768-001		Date: May 2022	Rev.:
Scale: 1:150,000		Projection: NAD 1983 UTM Zone 17N	
Created by: TLC	Checked by: RG	Figure: 1	

O:\GIS\MXDs\14700-14799\14768-001 Georgian Communities - Geo - Nottawa Lands\2022-04-24 FIG 1- Site Location Plan - Nottawa.mxd

GEOTECHNICAL EXPLORATION

GEORGIAN COMMUNITIES
Nottawa Lands Development
Nottawa, Ontario

LEGEND

- Borehole
- Monitoring Well
- Site (approximate)
- Ownership Parcel Fabric

Notes:
- Ownership Parcel Fabric was obtained from the County of Simcoe online GIS.
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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BOREHOLE LOCATION PLAN

Project No.:	14768-001	Date:	May 2022
		Rev.:	
Scale:	1:10,000	Projection:	NAD 1983 UTM Zone 17N
Created by:	TLC	Checked by:	RG
Figure:	2		

O:\GIS\MXDs\14700-14799\14768-001 Georgian Communities - Geo - Nottawa Lands\2022-04-24 FIG 2- Borehole Location Plan - Nottawa.mxd

Appendix A

Log of Boreholes

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Log of Borehole: BH101-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Solid Stem Auger
Date Completed: April 4, 2022
Location: Nottawa, ON
UTM: 17T, 4922597 m N, 563582 m E
Elevation: 101.88 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
101 / 0–1		TOPSOIL: (~ 100 mm thick)	1A							
		SILTY SAND: trace sand, trace gravel; dark brown, oxidation stains, disturbed native: non-cohesive, moist, loose, (SM)	1B	SS	75	5				
100 / 1–2		SILTY SAND: trace to some gravel; grey; non-cohesive, moist, dense to compact, (SM)	2A							
			2B	SS	90	31				
			3	SS	85	38				
99 / 3			4	SS	70	25				
			5	SS	85	18				
98 / 4		SILTY SAND to sandy SILT: grey; non-cohesive, wet, dense, (SM/ML)								
97 / 5			6	SS	20	32				
96 / 6		SILTY SAND to sandy SILT: trace gravel; grey (TILL), non-cohesive, moist, very dense, (SM/ML)								
			7	SS	55	50				
95 / 7		Borehole terminated at 6.7 mbgs due to exploration depth achieved								Borehole caved to a depth of about 0.9 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 0.6 mbgs upon completion of drilling.
94 / 8										
93 / 9										

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Input By: CM

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Log of Borehole: BH102-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 4, 2022
Location: Nottawa, ON
UTM: 17T, 4922526 m N, 563342 m E
Elevation: 101.95 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
0		TOPSOIL: (~ 100 mm thick)	1A							
		SILTY SAND: trace gravel; dark brown, oxidation stains, disturbed native: non-cohesive, moist, loose, (SM)	1B	SS	80	6				
101 — 1		SILTY CLAY to CLAYEY SILT: some sand; brown, oxidation stains, cohesive, w < PL, very stiff, (CL-ML)	2	SS	75	17				
		SAND: medium to coarse, some fines; brown; non-cohesive, wet, compact, (SP)	3	SS	70	24				
100 — 2		SAND and GRAVEL: grey; non-cohesive, wet, dense, (SP/GP)	4	SS	85	42				
99 — 3		gravelly SAND: medium to coarse; grey; non-cohesive, wet, compact to dense, (SP)	5	SS	90	28				
98 — 4										
			6	SS	75	45				
97 — 5		Borehole terminated at 5.0 mbgs in due to exploration depth achieved								Borehole caved to a depth of about 0.6 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 0.5 mbgs upon completion of drilling.
96 — 6										
95 — 7										
94 — 8										
93 — 9										

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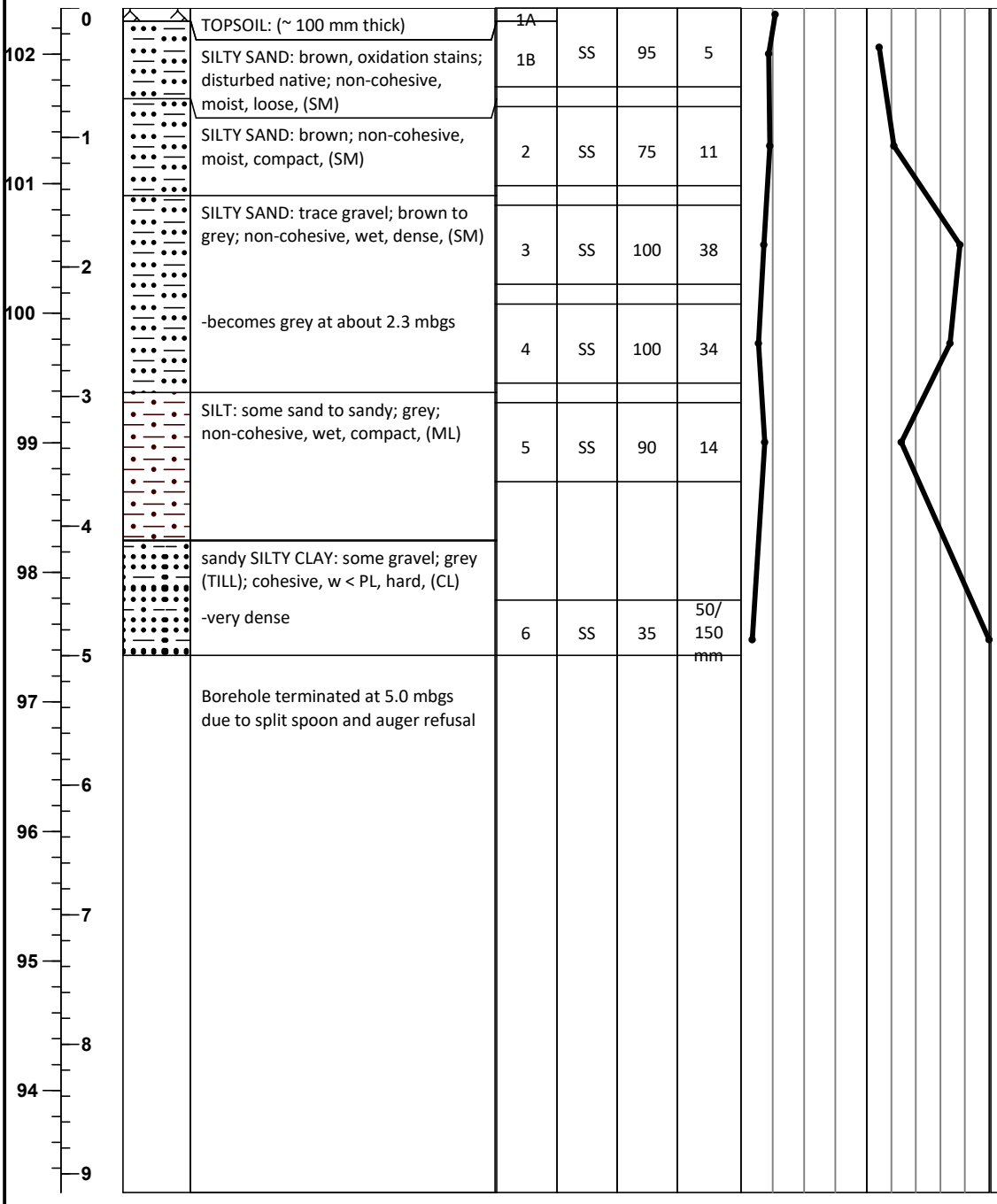
Log of Borehole: BH103-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 4, 2022
Location: Nottawa, ON
UTM: 17T, 4922543 m N, 563214 m E
Elevation: 102.36 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
0 / 102	TOPSOIL: (~ 100 mm thick)	1A				Monument	50 mm Diameter Monitoring Well with a 1.8 m screen. Groundwater level measured in monitoring well at a depth of about 0.35 mbgs on May 5 and 0.80 mbgs on June 8, 2022
	SILTY SAND: brown, oxidation stains; disturbed native; non-cohesive, moist, loose, (SM)	1B	SS	95	5	Cap	
1 / 101	SILTY SAND: brown; non-cohesive, moist, compact, (SM)	2	SS	75	11	Bentonite Plug	
2 / 100	SILTY SAND: trace gravel; brown to grey; non-cohesive, wet, dense, (SM)	3	SS	100	38	PVC Standpipe	
	-becomes grey at about 2.3 mbgs	4	SS	100	34		GSA SS4: 4% Gravel 78% Sand 14% Silt 4% Clay
3 / 99	SILT: some sand to sandy; grey; non-cohesive, wet, compact, (ML)	5	SS	90	14		
4 / 98	sandy SILTY CLAY: some gravel; grey (TILL); cohesive, w < PL, hard, (CL)					Sand Pack	
	-very dense	6	SS	35	50/ 150 mm	PVC Screen	
5 / 97	Borehole terminated at 5.0 mbgs due to split spoon and auger refusal					Cap	
6 / 96							
7 / 95							
8 / 94							
9							



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Log of Borehole: BH104-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 4, 2022
Location: Nottawa, ON
UTM: 17T, 4922467 m N, 563214 m E
Elevation: 102.59 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0	TOPSOIL: (~ 50 mm thick)	1A							
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, very loose, (SM)	1B	SS	65	0				
101 / 1	SILTY SAND to medium SAND: brown to grey; non-cohesive, wet, compact, (SM/SP)	2	SS	85	12				
		3	SS	90	16				
100 / 2		4A	SS	100	18				
		4B							
99 / 3		5	SS	95	18				
	-becomes grey at about 3.5 mbgs								
98 / 4	SILTY SAND to sandy SILT: grey; non-cohesive, wet, compact, (SM/ML)								
		6	SS	100	17				
97 / 5									
	CLAYEY SILT: some sand; grey; cohesive, w > PL, stiff, (ML)								
96 / 6		7	SS	100	14				
	Borehole terminated at 6.7 mbgs due to exploration depth achieved								
95 / 7									Borehole caved to a depth of about 2.6 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 2.1 mbgs upon completion of drilling.
94 / 8									
9									

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Log of Borehole: BH105-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 4, 2022
Location: Nottawa, ON
UTM: 17T, 4922412 m N, 563152 m E
Elevation: 102.46 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0	TOPSOIL: (~ 75mm thick)	1A							
	SILTY SAND: trace gravel; brown; non-cohesive, moist, very loose, FILL, (SM)	1B	SS	80	1				
101 / 1	SILTY SAND to SAND: fine to medium, trace gravel; brown to grey; non-cohesive, wet, compact, (SM/SP)	2	SS	100	22				
	-becomes grey at about 1.8 mbgs	3	SS	100	23				
100 / 2		4	SS	100	13				
99 / 3	SILTY SAND to sandy SILT: grey; non-cohesive, wet, compact, (SM/ML)	5	SS	90	15				
98 / 4	SILTY CLAY to CLAYEY SILT: trace sand; grey; cohesive, wet, stiff, (CL-ML)	6	SS	70	14				
97 / 5	Borehole terminated at 5.2 mbgs due to exploration depth achieved								Borehole caved to a depth of about 1.8 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.1 mbgs upon completion of drilling.
96 / 6									
95 / 7									
94 / 8									
9									

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Log of Borehole: BH106-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 5, 2022
Location: Nottawa, ON
UTM: 17T, 4922528 m N, 564483 m E
Elevation: 102.31 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0		TOPSOIL: (~ 75mm thick)	1A						Monument	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about 1.12 mbgs on May 5 and 0.32 mbgs on June 8, 2022
		SILTY SAND: brown; disturbed native; non-cohesive, moist, loose to very loose, (SM)	1B	SS	70	4			Cap	
1			2	SS	75	3			Bentonite Plug	
101									PVC Standpipe	
2		SAND: medium; brown; non-cohesive, wet, compact, (SP)	3	SS	90	23				
100			4A	SS	100	28				
		SANDY SILT: grey; non-cohesive, wet, compact, (ML)	4B							
3		SILTY CLAY to CLAYEY SILT: grey; cohesive, w > PL, stiff, (CL-ML)	5	SS	50	11				Atterberg SS5: LL: 22.3% PL: 15.8% PI: 6.5%
99										
4		SILTY CLAY: some gravel; grey (TILL); cohesive, W > PL to W ~ PL, stiff to hard, (CL)							Sand Pack	
98									PVC Screen	
5			6	SS	75	12				
97										
6										
96			7	SS	25	50/150 mm			Cap	
		Borehole terminated at 6.4 mbgs due to exploration depth achieved								
7										
95										
8										
94										
9										

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Input By: CM

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Log of Borehole: BH107-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 5, 2022
Location: Nottawa, ON
UTM: 17T, 4922852 m N, 564366 m E
Elevation: 100.36 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
100 / 0		TOPSOIL: (~ 125 mm thick)	1A				Monument Cap	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about 0.10 mbgs on May 5 and 0.69 mbgs on June 8, 2022
		SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist to loose, (SM)	1B	SS	75	6		
99 / 1		SILTY SAND: trace gravel; brown to grey; non-cohesive, wet, compact, (SM)	2	SS	90	12		
		-becomes grey at about 1.5 mbgs	3	SS	80	15	Bentonite Plug PVC Standpipe	
98 / 2			4	SS	100	17		
97 / 3		SILT: some sand; grey; non-cohesive, wet, dense, (ML)	5	SS	100	44		
96 / 4		SILTY CLAY: trace sand, trace gravel; grey (TILL), cohesive, w > PL to W < PL, very stiff to hard, (CL)	6	SS	100	20	Sand Pack PVC Screen	
95 / 5								
94 / 6			7	SS	35	50/ 205 mm	Cap	
93 / 7		Borehole terminated at 6.5 mbgs due to exploration depth achieved						
92 / 8								
9								

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

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Log of Borehole: BH108-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 5, 2022
Location: Nottawa, ON
UTM: 17T, 4922738 m N, 564072 m E
Elevation: 101.36 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
101 / 0		TOPSOIL: (~ 25 mm thick)	1A	SS	80	2				
		SILTY SAND: trace organic matter; brown, disturbed native; non-cohesive, moist, very loose, (SM)	1B							
100 / 1		SILTY SAND to fine to medium SAND: trace gravel; brown; non-cohesive, wet, compact, (SM/SP)	2	SS	90	13				
99 / 2			3	SS	100	23				
			4	SS	100	16				
98 / 3			5	SS	95	27				
97 / 4		CLAYEY SILT: brown; cohesive, w > PL, very stiff, (ML)	6	SS	45	21				
96 / 5		Borehole terminated at 5.2 mbgs due to exploration depth achieved								
95 / 6										
94 / 7										Borehole caved to a depth of about 1.2 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 0.9 mbgs upon completion of drilling.
93 / 8										
9										

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Log of Borehole: BH109-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 5, 2022
Location: Nottawa, ON
UTM: 17T, 4922869 m N, 563994 m E
Elevation: 101.40 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
101 / 0	TOPSOIL: (~ 38 mm thick)	1A					
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, compact, (SM)	1B	SS	85	15		
100 / 1	SILTY SAND: brown; non-cohesive, moist, compact, (SM)	2	SS	50	12		
	SAND: fine to medium some fines; brown; non-cohesive, wet, compact, (SP)	3	SS	75	20		GSA SS3: 3% Gravel 87% Sand 11% Silt and Clay
99 / 2	SANDY SILT: brown, silty sand seams; non-cohesive, wet, compact, (ML)	4	SS	75	24		
98 / 3	SILTY SAND: grey; non-cohesive, wet, dense, (SM)	5	SS	80	34		
97 / 4	SILTY CLAY: trace sand, trace gravel; grey; cohesive, w > PL, very stiff, (CL)	6	SS	80	26		
96 / 5	Borehole terminated at 5.2 mbgs due to exploration depth achieved						Borehole caved to a depth of about 2.0 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.5 mbgs upon completion of drilling.
95 / 6							
94 / 7							
93 / 8							
9							

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

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Log of Borehole: BH110-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 6, 2022
Location: Nottawa, ON
UTM: 17T, 4922645 m N, 563763 m E
Elevation: 101.93 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
101 / 0	TOPSOIL: (~ 125 mm thick)	1A				Monument	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about 0.54 mbgs on May 5 and 0.89 mbgs on June 8, 2022
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, loose, (SM)	1B	SS	95	5	Cap	
101 / 1	SILTY SAND: brown; non-cohesive, wet, compact, (SM)	2	SS	90	19	Bentonite Plug	
100 / 2		3	SS	95	20	PVC Standpipe	
		4A	SS	100	13		
99 / 3	CLAYEY SILT: some sand, trace to some gravel; grey (TILL); cohesive, w ~ PL to w <PL, very stiff to hard, (ML)	4B					Atterberg SS5: LL: 13.9% PL: 10.5% PI: 3.4%
		5	SS	90	17		
98 / 4						Sand Pack	
						PVC Screen	
97 / 5		6	SS	55	41		
96 / 6							
		7	SS	75	18	Cap	
95 / 7	Borehole terminated at 6.7 mbgs due to exploration depth achieved						
94 / 8							
93 / 9							

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

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Log of Borehole: BH111-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 6, 2022
Location: Nottawa, ON
UTM: 17T, 4922140 m N, 563203 m E
Elevation: 103.36 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
103 / 0	TOPSOIL: (~ 75 mm thick)	1A				Monument	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about 0.17 mbgs on May 5 and 0.68 mbgs on June 8,2 022
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, very loose, (SM)	1B	SS	70	2	Cap	
102 / 1	SILTY SAND: brown; non-cohesive, wet, compact, (SM)	2	SS	20	23	Bentonite Plug	
	SILTY CLAY: trace to some sand, trace to some gravel; grey (TILL); cohesive, w ~ PL to w < PL, very stiff to hard, (CL)	3	SS	65	20	PVC Standpipe	
101 / 2		4	SS	75	32		
100 / 3		5	SS	75	50/ 280 mm		
99 / 4						Sand Pack	
		6	SS	70	50	PVC Screen	
98 / 5							
97 / 6		7	SS	25	50/ 180 mm	Cap	
	Borehole terminated at 6.4 mbgs due to exploration depth achieved						
96 / 7							
95 / 8							
9							

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

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Log of Borehole: BH112-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 6, 2022
Location: Nottawa, ON
UTM: 17T, 4922204 m N, 563303 m E
Elevation: 103.52 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
103 / 0		TOPSOIL: (~ 38 mm thick)	1A	SS	100	3				
		SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, very loose to loose, (SM)	1B							
102 / 1			2	SS	100	6				
		SILTY SAND: brown; non-cohesive, wet, compact, (SM)	3	SS	75	23				
101 / 2		SILTY CLAY: trace to some sand, trace gravel; grey (TILL); cohesive, w> PL to w < PL, stiff to hard, (CL)	4	SS	70	14				
100 / 3			5	SS	55	14				Atterberg SS5: LL: 21.6% PL: 13.9% PI: 7.6%
99 / 4			6	SS	30	50/ 150 mm				
98 / 5		Borehole terminated at 4.9 mbgs due to exploration depth achieved								
97 / 6										
96 / 7										Borehole caved to a depth of about 1.5 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.4 mbgs upon completion of drilling.
95 / 8										
9										

Logged By: CM
Input By: CM

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Log of Borehole: BH113-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 6, 2022
Location: Nottawa, ON
UTM: 17T, 4922238 m N, 563452 m E
Elevation: 102.61 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0	TOPSOIL: (~ 200 mm thick)	1A							
	SILTY SAND: brown, disturbed native; non-cohesive, moist, loose, (SM)	1B	SS	80	5				
102 / 1	SANDY SILT: some sand; brown to grey (TILL), oxidation stains; non-cohesive, moist, compact, (ML)	2	SS	80	17				
101 / 2		3	SS	25	16				
100 / 3	SAND: fine to medium, some fines; grey; non-cohesive, wet, compact, (SP)	4	SS	55	12				
		5	SS	85	17				
99 / 4									
98 / 5		6	SS	100	16				
97 / 6									
96 / 7		7	SS	40	21				
95 / 8	Borehole terminated at 6.7 mbgs due to exploration depth achieved								Borehole caved to a depth of about 2.4 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.5 mbgs upon completion of drilling.
94 / 9									

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Log of Borehole: BH114-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 6, 2022
Location: Nottawa, ON
UTM: 17T, 4922448 m N, 563498 m E
Elevation: 102.70 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0		TOPSOIL: (~ 75 mm thick)	1A							
		SILTY SAND: trace gravel; dark brown, trace organic matter; disturbed native; non-cohesive, moist, very loose to compact, (SM)	1B	SS	90	3				
1			2	SS	90	14				
101 / 2		sandy SILT: grey; non-cohesive, wet, dense, (ML)	3	SS	30	44				
100 / 3		SILTY SAND: grey; non-cohesive, wet, compact to dense, (SM)	4	SS	30	34				
			5	SS	50	19				
99 / 4										
98 / 5			6	SS	100	47				
		Borehole terminated at 5.2 mbgs due to exploration depth achieved								Borehole caved to a depth of about 3.0 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.8 mbgs upon completion of drilling.
97 / 6										
96 / 7										
95 / 8										
94 / 9										

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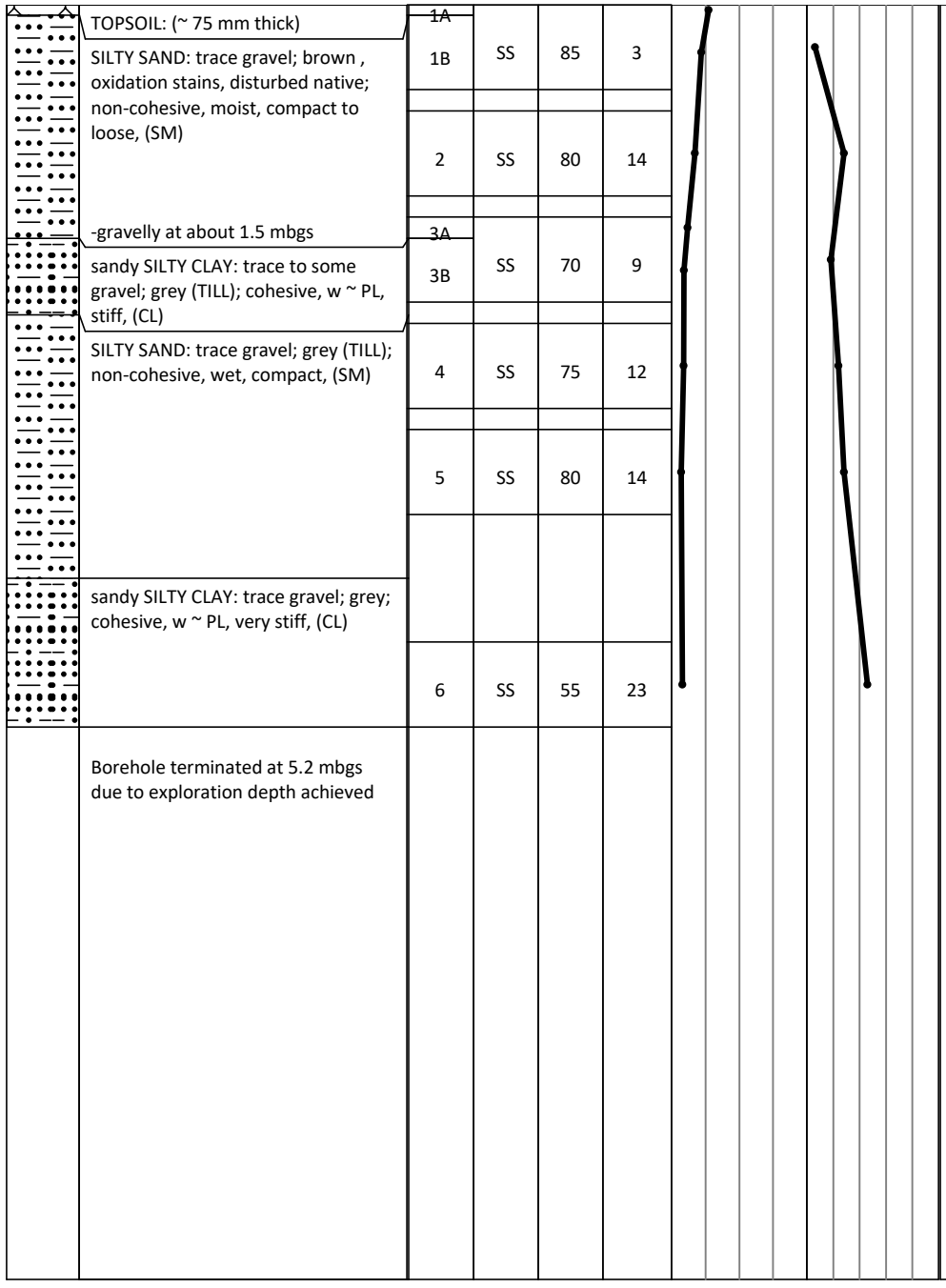
Log of Borehole: BH115-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 7, 2022
Location: Nottawa, ON
UTM: 17T, 4922423 m N, 563707 m E
Elevation: 102.54 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
102 / 0	TOPSOIL: (~ 75 mm thick)	1A					
	SILTY SAND: trace gravel; brown , oxidation stains, disturbed native; non-cohesive, moist, compact to loose, (SM)	1B	SS	85	3		
1		2	SS	80	14		
101	-gravelly at about 1.5 mbgs	3A					
2	sandy SILTY CLAY: trace to some gravel; grey (TILL); cohesive, w ~ PL, stiff, (CL)	3B	SS	70	9		
100	SILTY SAND: trace gravel; grey (TILL); non-cohesive, wet, compact, (SM)	4	SS	75	12		
3		5	SS	80	14		
99							
4							
98	sandy SILTY CLAY: trace gravel; grey; cohesive, w ~ PL, very stiff, (CL)	6	SS	55	23		
5							
97	Borehole terminated at 5.2 mbgs due to exploration depth achieved						
6							
96							
7							
95							Borehole caved to a depth of about 1.4 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 0.9 mbgs upon completion of drilling.
8							
94							
9							



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Log of Borehole: BH116-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 7, 2022
Location: Nottawa, ON
UTM: 17T, 4922281 m N, 563694 m E
Elevation: 102.31 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0		TOPSOIL: (~ 450 mm thick)	1A	SS	85	4				
			1B							
101 / 1		SILTY SAND: trace gravel; brown, disturbed native, non-cohesive, moist, loose to compact, (SM)	2	SS	75	12				
100 / 2		SILTY SAND: grey; non-cohesive, wet, compact, (SM)	3	SS	70	19				
		SANDY SILT: some gravel; grey (TILL), silty sand seams; non-cohesive, moist, dense, (ML)	4	SS	100	43				
99 / 3		sandy SILTY CLAY: trace gravel; grey (TILL); cohesive, w < PL, hard, (CL)	5	SS	50	44				
98 / 4										
97 / 5			6	SS	25	50				
		Borehole terminated at 5.2 mbgs due to exploration depth achieved								Borehole caved to a depth of about 3.4 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.4 mbgs upon completion of drilling.
96 / 6										
95 / 7										
94 / 8										
9										

Logged By: CM
Input By: CM

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Log of Borehole: BH117-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 7, 2022
Location: Nottawa, ON
UTM: 17T, 4922352 m N, 563876 m E
Elevation: 102.58 m Rel. El.

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0		TOPSOIL: (~ 175 mm thick)	1A						Monument	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about 0.40 mbgs on May 5 and 0.71 mbgs on June 8, 2022
		SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, very loose to loose, (SM)	1B	SS	70	4			Cap	
101 / 1		SILTY SAND: fine to medium, trace gravel; brown to grey; non-cohesive, wet, compact, (SM)	2	SS	70	18			Bentonite Plug	
		-becomes grey and gravelly at about 1.5 mbgs	3	SS	95	26			PVC Standpipe	
100 / 2		SILT to sandy SILT: grey; non-cohesive, wet, compact to loose, (ML)	4A							
			4B	SS	100	20				
99 / 3			5	SS	80	8				GSA SS5: 2% Gravel 2% Sand 74% Silt 22% Clay
98 / 4		SILTY CLAY: some sand to sandy, trace to some gravel; grey (TILL); cohesive, w > PL, stiff to very stiff (CL)							Sand Pack	
			6	SS	95	13			PVC Screen	
97 / 5										
96 / 6			7	SS	100	15			Cap	
		Borehole terminated at 6.7 mbgs due to exploration depth achieved								
95 / 7										
94 / 8										
9										

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Log of Borehole: BH118-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 7, 2022
Location: Nottawa, ON
UTM: 17T, 4922527 m N, 563928 m E
Elevation: 101.83 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
101 / 0	TOPSOIL: (~ 100 mm thick)	1A							
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, loose, (SM)	1B	SS	80	5				
1	SILTY SAND: trace gravel, brown to grey; non-cohesive, wet, compact, (SM)	2	SS	75	24				
100 / 2		3	SS	85	19				
		4A	SS	90	17				
99 / 3	CLAYEY SILT to SILTY CLAY: trace sand, trace gravel; grey; cohesive, w> PL, stiff to very stiff, (ML/CL)	4B							
		5	SS	100	11				
98 / 4									
97 / 5		6	SS	70	16				
	Borehole terminated at 5.2 mbgs due to exploration depth achieved								
96 / 6									
95 / 7									
94 / 8									Borehole caved to a depth of about 1.2 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 0.8 mbgs upon completion of drilling.
93 / 9									

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Log of Borehole: BH119-22

Client: Georgian Communities
Project Name: Nottawa Lands Development
Project No.: 14768-001
Contractor: Walker Drilling
Method: Hollow Stem Auger
Date Completed: April 7, 2022
Location: Nottawa, ON
UTM: 17T, 4922440 m N, 564191 m E
Elevation: 102.40 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
102 / 0	TOPSOIL: (~ 100 mm thick)	1A							
	SILTY SAND: trace gravel; brown, disturbed native; non-cohesive, moist, very loose to loose, (SM)	1B	SS	65	4				
101 / 1	SILTY SAND to SAND: fine to medium; brown to grey; non-cohesive, wet, compact, (SM/SP)	2	SS	80	21				
100 / 2		3	SS	80	23				
	-becomes grey at about 2.3 mbgs	4	SS	100	16				
99 / 3	SILTY CLAY to CLAYEY SILT: trace sand; grey; cohesive, w ~ PL, very stiff, (CL-ML)	5	SS	55	19				
98 / 4	sandy SILT: some gravel; grey (TILL); non-cohesive, moist, compact, (ML)	6	SS	25	19				
97 / 5	Borehole terminated at 5.2 mbgs due to exploration depth achieved								Borehole caved to a depth of about 1.2 mbgs on completion of drilling. Groundwater level measured in borehole at a depth of about 1.1 mbgs upon completion of drilling.
96 / 6									
95 / 7									
94 / 8									
9									

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Input By: CM

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Log of Borehole: BH120-22

Client:	Georgian Communities	**Project Name:**	Nottawa Lands Development	**Project No.:**	14768-001
Contractor:	Walker Drilling	**Method:**	Hollow Stem Auger	**Date Completed:**	April 8, 2022
Location:	Nottawa, ON	**UTM:**	17T, 4923110 m N, 563906 m E	**Elevation:**	99.32 m Rel. El.

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
99 / 0	TOPSOIL: (~ 75 mm thick)	1A				Monument	50 mm Diameter Monitoring Well with a 3.0 m screen. Groundwater level measured in monitoring well at a depth of about -0.74 mbgs on May 5 and -0.4 mbgs on June 8. Water levels measured were above ground surface indicating artesian conditions.
	SILTY SAND: brown, disturbed native; non-cohesive, moist; very loose, (SM)	1B	SS	50	1	Cap	
98 / 1	SILTY SAND: brown; non-cohesive, wet, compact, (SM)	2	SS	75	17	Bentonite Plug	
	sandy SILT: grey; non-cohesive, wet, compact, (ML)	3	SS	80	28	PVC Standpipe	
97 / 2		4	SS	50	23		
96 / 3		5	SS	45	28		GSA SS4: 0% Gravel 31% Sand 63% Silt 6% Clay
95 / 4	SILTY CLAY: some sand, trace gravel; grey (TILL), silty sand seams; cohesive, w ~ PL to w > PL, stiff, (CL)					Sand Pack	
94 / 5		6	SS	60	13	PVC Screen	
93 / 6		7	SS	30	14	Cap	
92 / 7	Borehole terminated at 6.7 mbgs due to exploration depth achieved						
91 / 8							
9							

% Moisture: 25 50 75

SPT (N) / DCPT: 10 20 30 40

Logged By: CM **Input By:** CM

Appendix B

Physical Laboratory Testing Results

Grain Size Distribution Chart

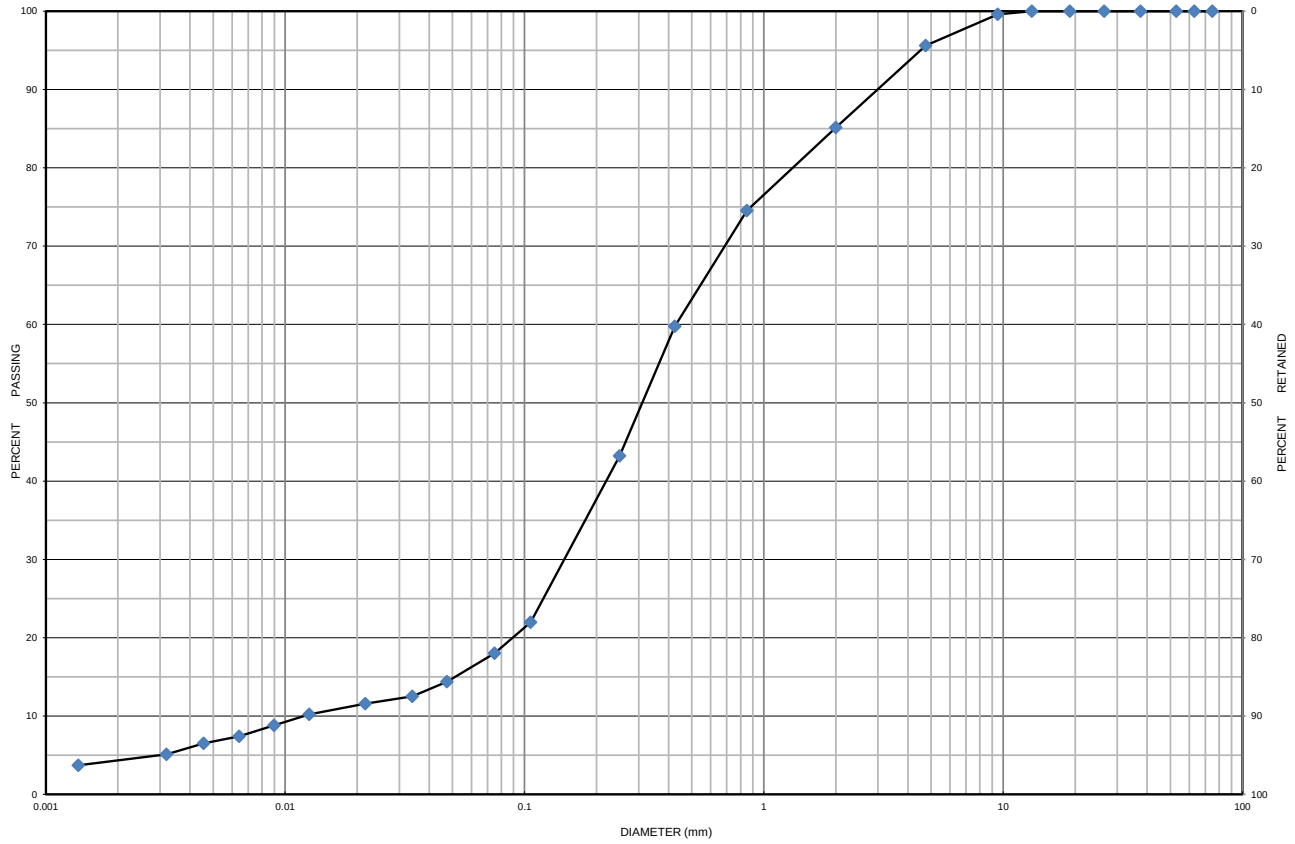
Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sample Date: *March 2022* **Sampled By:** *Chris Malliaros - Cambium Inc.*

Location: *BH 103-22 SS 4* **Depth:** *2.3 m to 2.9 m* **Lab Sample No:** *S-22-0655*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 103-22	SS 4	2.3 m to 2.9 m	4	78	14	4	13.7

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
SILTY SAND trace gravel	SM	0.430	0.155	0.013	33.08	4.30

Additional information available upon request

Issued By: _____ *Date Issued:* *May 12, 2022*

(Senior Project Manager)

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Grain Size Distribution Chart

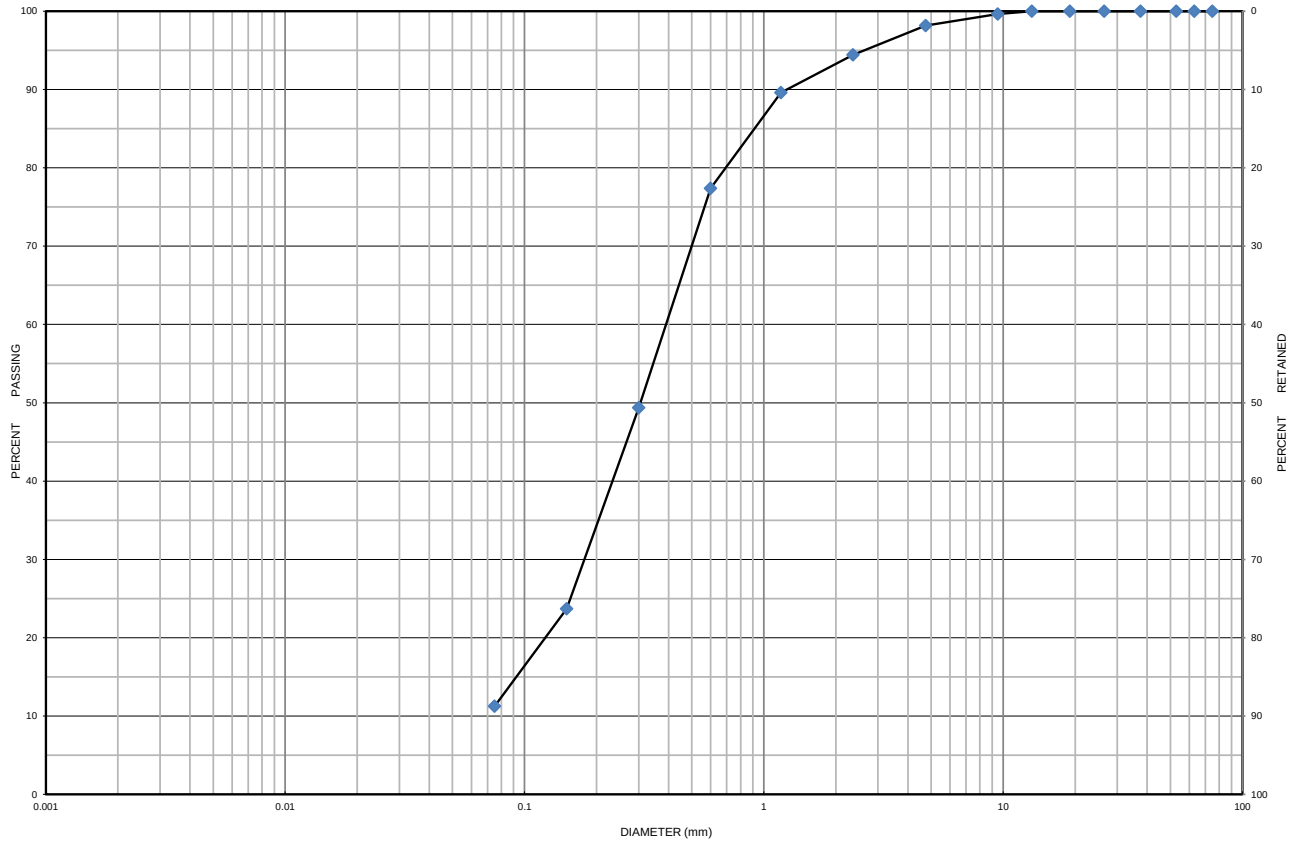
Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sample Date: *March 2022* **Sampled By:** *Chris Malliaros - Cambium Inc.*

Location: *BH 109-22 SS 3* **Depth:** *1.5 m to 2.1 m* **Lab Sample No:** *S-22-0657*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 109-22	SS 3	1.5 m to 2.1 m	2	87	11		16.9

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
SAND some fines trace gravel	SP	0.395	0.180	-	-	-

Additional information available upon request

Issued By: _____ *Date Issued:* *May 10, 2022*

(Senior Project Manager)

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Grain Size Distribution Chart

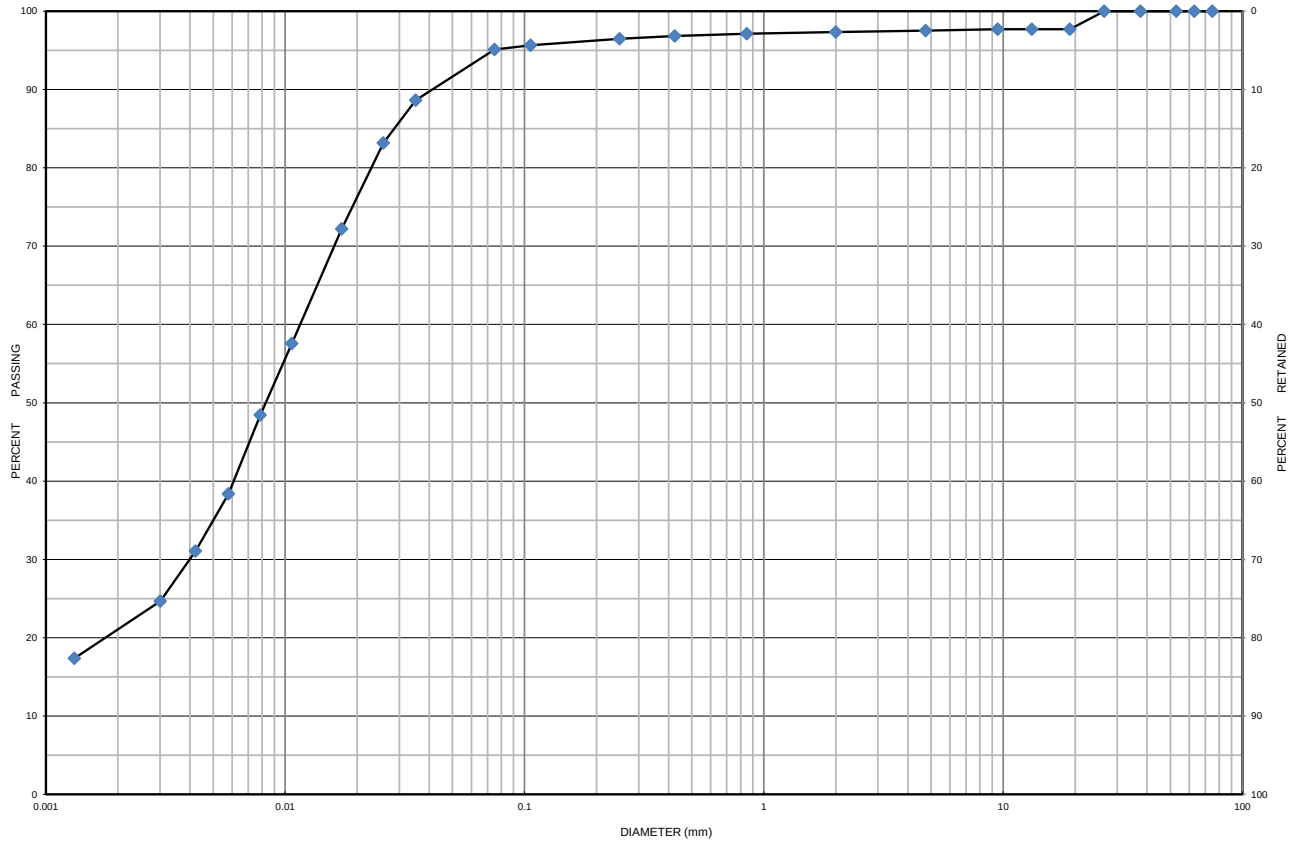
Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sample Date: *March 2022* **Sampled By:** *Chris Malliaros - Cambium Inc.*

Location: *BH 117-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-0661*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 117-22	SS 5	3 m to 3.7 m	2	2	74	22	22.0

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
SILT trace sand trace gravel	ML	0.013	0.004	-	-	-

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Grain Size Distribution Chart

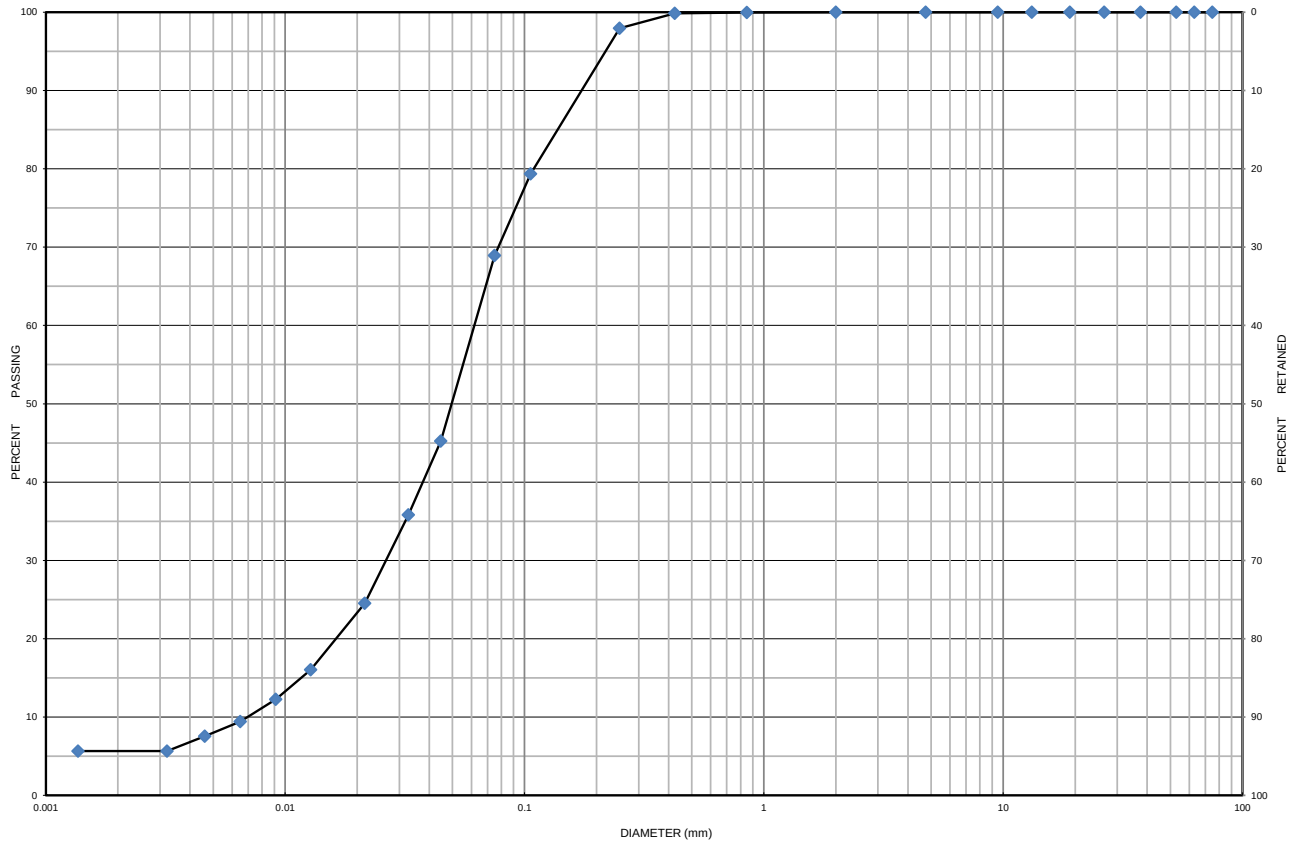
Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sample Date: *March 2022* **Sampled By:** *Chris Malliaros - Cambium Inc.*

Location: *BH 120-22 SS 4* **Depth:** *2.3 m to 2.9 m* **Lab Sample No:** *S-22-0660*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 120-22	SS 4	2.3 m to 2.9 m	0	31	63	6	17.5

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sandy SILT	ML	0.061	0.016	0.007	8.71	0.60

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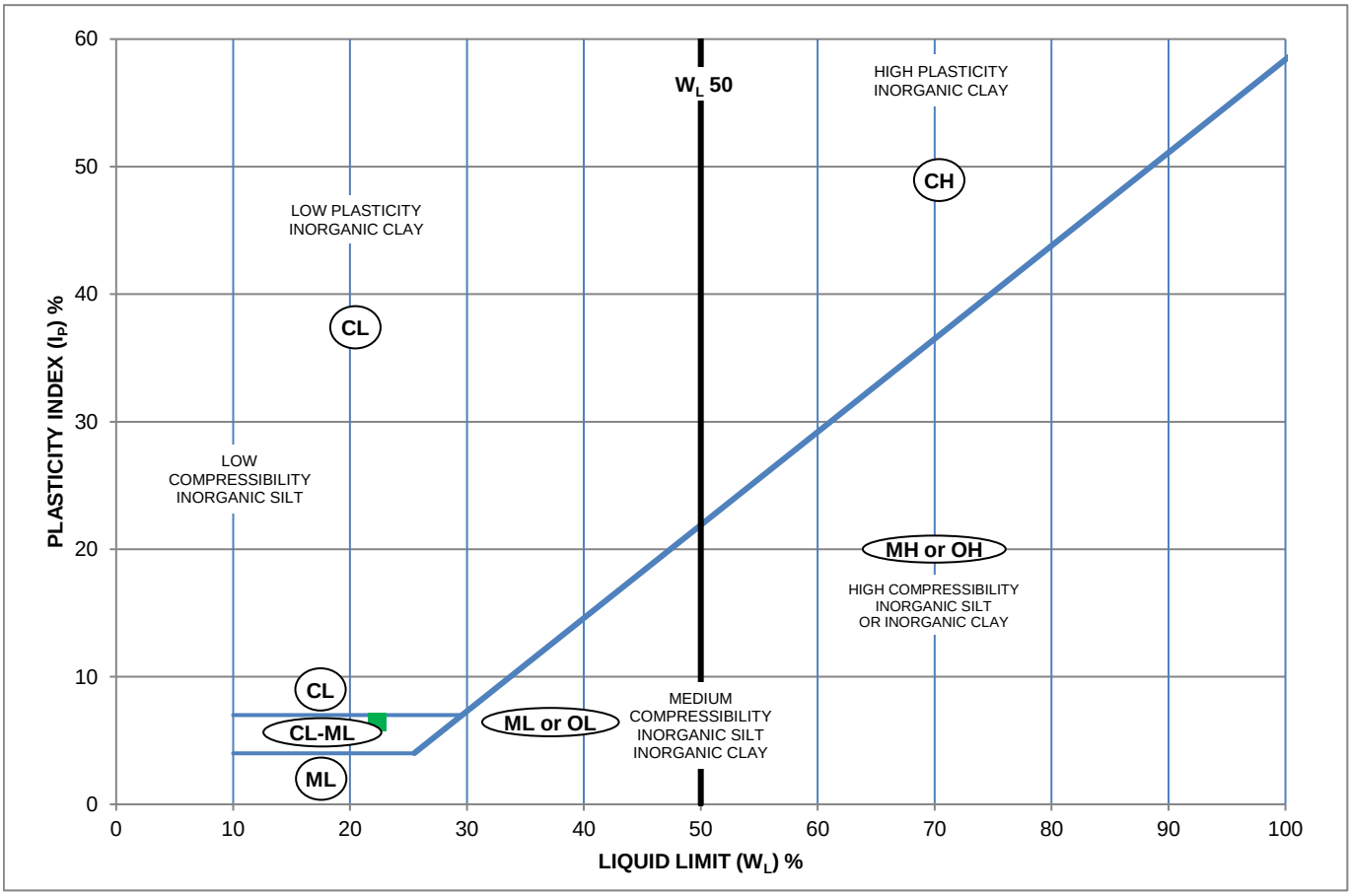
Plasticity Chart

Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sampled By: *Chris Malliaros - Cambium Inc.* **Sample Date:** *March 2022*

Hole No.: *BH 106-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-0656*



Symbol	Borehole	Sample	Depth	Description
■	BH 106-22	SS 5	3 m to 3.7 m	CL-ML

Liquid Limit (%)	Plastic Limit	Plasticity Index (%)
22.3	***15.8***	***6.5***

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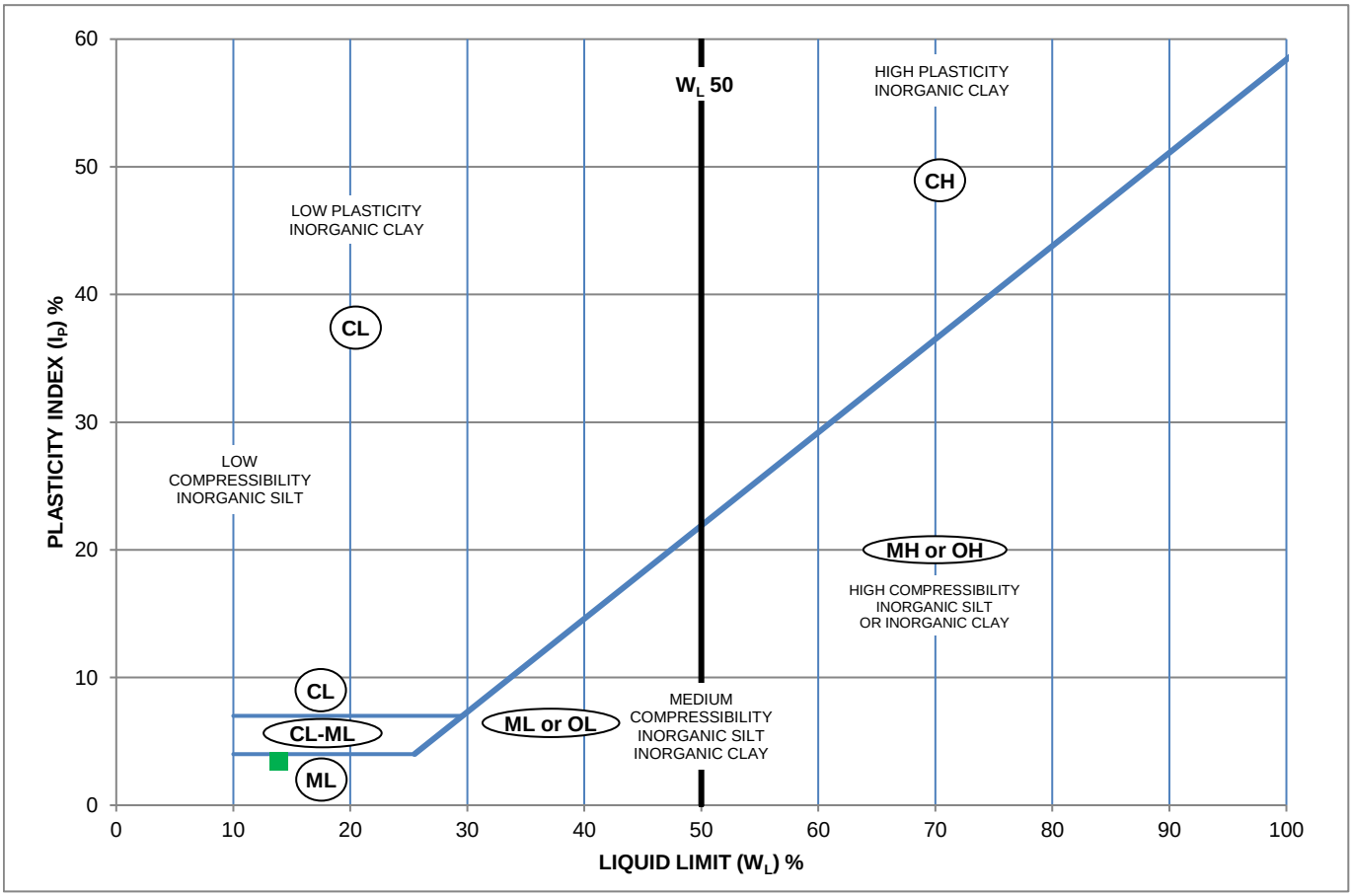
Plasticity Chart

Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sampled By: *Chris Malliaros - Cambium Inc.* **Sample Date:** *March 2022*

Hole No.: *BH 110-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-0658*



Symbol	Borehole	Sample	Depth	Description
■	BH 110-22	SS 5	3 m to 3.7 m	ML

Liquid Limit (%)	Plastic Limit	Plasticity Index (%)
13.9	***10.5***	***3.4***

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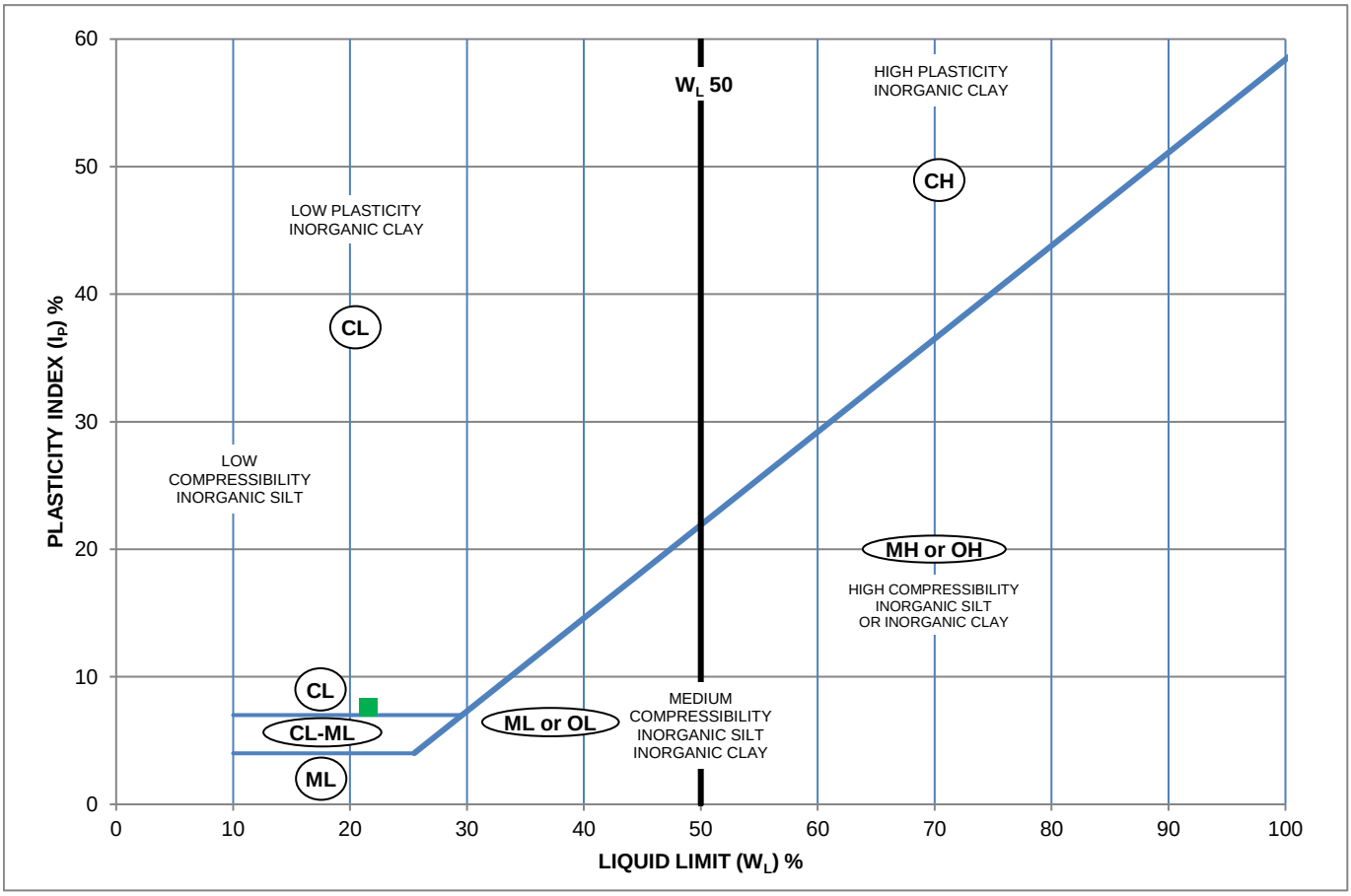
Plasticity Chart

Project Number: *14768-001* **Client:** *Georgian Communities*

Project Name: *Geo - Nottawa Lands*

Sampled By: *Chris Malliaros - Cambium Inc.* **Sample Date:** *March 2022*

Hole No.: *BH 112-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-0659*



Symbol	Borehole	Sample	Depth	Description
■	BH 112-22	SS 5	3 m to 3.7 m	CL

Liquid Limit (%)	Plastic Limit	Plasticity Index (%)
21.6	***13.9***	***7.6***

Additional information available upon request

Issued By: _____ *Date Issued:* *May 12, 2022*

(Senior Project Manager)

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APPENDIX B

Storm Design

CROZIER CONSULTING ENGINEERS

NOTTAWA RESIDENTIAL DEVELOPMENT
STORM SEWER DESIGN SHEET

DESIGN: HR
CHECK: RW
UPDATED: 2024.03.27
ISSUED FOR: 1st Submission Detailed Design

FREQUENCY		5 YEAR - Nottawa IDF				
5 YEARS	Coef. A=	27.2	Coef. B=	0.00	Coef. C=	-0.699

FOUNDATION SERVICES FLOW (L/sec/unit) 0.075
TIME OF CONCENTRATION 15.00
MANNINGS "n" 0.013

CATCHMENT AREA I.D.	STREET NAME	FROM MH NO	TO MH NO	AREA (A) (Ha)	RUN-OFF COEFF (C_5)	A x C	CUMMUL. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (RUNOFF) (l/sec)	NO. OF LOTS	CUMMUL. NO. OF LOTS	Q (FOUNDATION (l/sec)	Q (Total) (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	Percent Full
FUT1-1, 2-21, 2-22	STREET A	DCBMH1-22	STMH1-1	1.77	0.51	0.902	0.902	15.00	71.68	**179.75**	0	0	**0.00**	**179.75**	0.40	525	1.26	89.30	1.18	**272.00**	**66.1**
	STREET A	STMH1-1	DCBMH1-8				0.902	16.18	67.97	**170.45**	0	0	**0.00**	**170.45**	0.40	525	1.26	40.90	0.54	**272.00**	**62.7**
1-1, 1-2	STREET A	DCBMH1-8	CBMH1-14	0.13	0.63	0.082	0.984	16.73	66.42	**181.65**	2	2	**0.15**	**181.80**	0.40	525	1.26	29.30	0.39	**272.00**	**66.8**
FUT1-2		STM PLIUG-1	DCBMH1-7	3.29	0.50	1.645	1.645	15.00	71.68	**327.81**	8	8	**0.60**	**328.41**	0.40	600	1.37	5.00	0.06	**388.33**	**84.6**
1-3		DCBMH1-7	CBMH1-14	0.01	0.95	0.010	1.655	15.06	71.48	**328.77**	0	8	**0.60**	**329.37**	0.40	600	1.37	14.70	0.18	**388.33**	**84.8**
1-4	STREET A	CBMH1-14	DCBMH1-6	0.03	0.72	0.022	2.660	17.12	65.37	**483.33**	3	13	**0.98**	**484.31**	0.40	750	1.59	49.80	0.52	**704.10**	**68.8**
1-5, 1-6	STREET A	DCBMH1-6	CBMH1-13	0.22	0.60	0.133	2.792	17.64	64.01	**496.89**	2	15	**1.13**	**498.02**	0.40	750	1.59	34.20	0.36	**704.10**	**70.7**
FUT1-3		STMPLUG1-4	CBMH1-13	1.70	0.50	0.850	0.850	15.00	71.68	**169.38**	17	17	**1.28**	**170.66**	0.40	525	1.26	5.70	0.08	**272.00**	**62.7**
	STREET A	CBMH1-13	CBMH1-12				3.642	17.99	63.12	**639.12**	8	40	**3.00**	**642.12**	0.40	825	1.70	68.80	0.68	**907.85**	**70.7**
1-7, 1-8	STREET A	CBMH1-12	CBMH1-11	0.25	0.70	0.175	3.817	18.67	61.51	**652.82**	4	44	**3.30**	**656.12**	0.40	825	1.70	29.95	0.29	**907.85**	**72.3**
FUT1-4		STMPLUG1-3	CBMH1-11	2.73	0.50	1.365	1.365	15.00	71.68	**272.01**	19	19	**1.43**	**273.44**	0.40	600	1.37	5.70	0.07	**388.33**	**70.4**
1-9	STREET A	CBMH1-11	DCBMH1-5	0.03	0.72	0.022	5.204	18.96	60.85	**880.27**	5	68	**5.10**	**885.37**	0.40	900	1.80	43.90	0.41	**1144.94**	**77.3**
1-10, 1-11	STREET A	DCBMH1-5	CBMH1-10	0.33	0.73	0.242	5.446	19.37	59.95	**907.70**	6	74	**5.55**	**913.25**	0.40	900	1.80	30.00	0.28	**1144.94**	**79.8**
	STREET A	CBMH1-10	CBMH1-9				5.446	19.65	59.36	**898.71**	8	82	**6.15**	**904.86**	0.40	900	1.80	17.70	0.16	**1144.94**	**79.0**
1-12	STREET A	CBMH1-9	CBMH1-8	0.03	0.48	0.014	5.461	19.81	59.01	**895.87**	2	84	**6.30**	**902.17**	0.40	900	1.80	19.30	0.18	**1144.94**	**78.8**
1-13	STREET A	CBMH1-8	DCBMH1-4	0.09	0.72	0.065	5.526	19.99	58.64	**900.83**	1	85	**6.38**	**907.20**	0.40	900	1.80	24.70	0.23	**1144.94**	**79.2**
1-16		RLCB1-2	RLCBMH1-7	0.22	0.60	0.132	0.132	15.00	71.68	**26.30**	0	0	**0.00**	**26.30**	0.40	300	0.87	50.40	0.97	**61.16**	**43.0**
1-17		RLCBMH1-7	RLCBMH1-6	0.18	0.60	0.108	0.240	15.97	68.61	**45.77**	0	0	**0.00**	**45.77**	0.40	300	0.87	50.40	0.97	**61.16**	**74.8**
1-18		RLCBMH1-6	DCBMH1-4	0.18	0.60	0.108	0.348	16.94	65.83	**63.69**	0	0	**0.00**	**63.69**	0.40	375	1.00	26.50	0.44	**110.89**	**57.4**
1-14, 1-15	STREET A	DCBMH1-4	CBMH1-7	0.23	0.68	0.156	6.029	20.22	58.18	**975.16**	2	87	**6.53**	**981.68**	0.40	900	1.80	38.00	0.35	**1144.94**	**85.7**
	STREET F	CBMH1-13	DCBMH1-16								1	1	**0.08**	**0.08**	0.40	300	0.87	44.40	0.86	**61.16**	**0.1**
1-19, 1-20	STREET F	DCBMH1-16	STM1-4	0.25	0.64	0.161	0.161	15.00	71.68	**32.04**	3	4	**0.30**	**32.34**	0.40	300	0.87	34.40	0.66	**61.16**	**52.9**
	STREET F	STM1-4	DCBMH1-15				0.161	15.66	69.55	**31.09**	2	6	**0.45**	**31.54**	0.40	300	0.87	17.10	0.33	**61.16**	**51.6**
1-22, 1-21	STREET F	DCBMH1-15	CBMH1-18	0.40	0.72	0.289	0.450	15.99	68.54	**85.65**	8	14	**1.05**	**86.70**	0.40	375	1.00	67.10	1.11	**110.89**	**78.2**
1-23	STREET F	CBMH1-18	DCBMH1-14	0.09	0.72	0.065	0.514	17.11	65.39	**93.50**	10	24	**1.80**	**95.30**	0.40	450	1.13	89.90	1.32	**180.32**	**52.8**

CROZIER CONSULTING ENGINEERS

NOTTAWA RESIDENTIAL DEVELOPMENT
STORM SEWER DESIGN SHEET

DESIGN: HR
CHECK: RW
UPDATED: 2024.03.27
ISSUED FOR: 1st Submission Detailed Design

FREQUENCY		5 YEAR - Nottawa IDF				
5 YEARS	Coef. A=	27.2	Coef. B=	0.00	Coef. C=	-0.699

FOUNDATION SERVICES FLOW (L/sec/unit) 0.075
TIME OF CONCENTRATION 15.00
MANNINGS "n" 0.013

CATCHMENT AREA I.D.	STREET NAME	FROM MH NO	TO MH NO	RUN-OFF AREA (A) (Ha)	RUN-OFF COEFF (C_5)	A x C	CUMMUL. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (RUNOFF) (l/sec)	NO. OF LOTS	CUMMUL. NO. OF LOTS	Q (FOUNDATION (l/sec)	Q (Total) (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	Percent Full
1-25, 1-24	STREET F	DCBMH1-14	CBMH1-7	0.67	0.69	0.463	0.977	18.43	62.08	**168.57**	0	24	**1.80**	**170.37**	0.40	525	1.26	24.20	0.32	**272.00**	**62.6**
	STREET A	CBMH1-7	CBMH1-6				7.006	20.57	57.48	**1119.56**	5	116	**8.70**	**1128.26**	0.40	975	1.90	52.60	0.46	**1417.37**	**79.6**
1-26	STREET A	CBMH1-6	DCBMH1-3	0.14	0.75	0.105	7.111	21.03	56.60	**1118.84**	1	117	**8.78**	**1127.62**	0.40	975	1.90	23.00	0.20	**1417.37**	**79.6**
1-27, 1-28	STREET A	DCBMH1-3	CBMH1-5	0.29	0.71	0.206	7.317	21.23	56.22	**1143.64**	1	118	**8.85**	**1152.49**	0.40	975	1.90	18.60	0.16	**1417.37**	**81.3**
1-30	STREET E	CBMH1-17	CBMH1-16	0.04	0.60	0.024	0.024	15.00	71.68	**4.78**	3	3	**0.23**	**5.01**	0.40	300	0.87	51.10	0.98	**61.16**	**8.2**
1-29, 1-31	STREET E	CBMH1-16	DCBMH1-13	0.21	0.60	0.126	0.150	15.98	68.57	**28.59**	5	8	**0.60**	**29.19**	0.40	300	0.87	70.60	1.36	**61.16**	**47.7**
1-32, 1-33	STREET E	DCBMH1-13	STMH1-3	0.50	0.70	0.350	0.500	17.34	64.76	**90.02**	4	12	**0.90**	**90.92**	0.40	375	1.00	32.60	0.54	**110.89**	**82.0**
	STREET E	STMH1-3	STMH1-2				0.500	17.89	63.39	**88.11**	1	13	**0.98**	**89.08**	0.40	375	1.00	12.20	0.20	**110.89**	**80.3**
	STREET E	STMH1-2	DCMH1-12				0.500	18.09	62.89	**87.42**	4	17	**1.28**	**88.69**	0.40	375	1.00	42.40	0.70	**110.89**	**80.0**
1-34, 1-35	STREET E	DCMH1-12	DCMH1-11	0.54	0.73	0.395	0.895	18.79	61.23	**152.37**	10	27	**2.03**	**154.40**	0.40	450	1.13	87.10	1.28	**180.32**	**85.6**
1-36, 1-37	STREET E	DCMH1-11	DCMH1-10	0.51	0.72	0.367	1.262	20.07	58.48	**205.09**	6	33	**2.48**	**207.57**	0.40	525	1.26	62.90	0.83	**272.00**	**76.3**
1-38, 1-39	STREET E	DCMH1-10	CBMH1-15	0.35	0.73	0.256	1.517	20.91	56.84	**239.71**	4	37	**2.78**	**242.48**	0.40	600	1.37	33.90	0.41	**388.33**	**62.4**
1-40		RLCB1-1	RLCBMH1-5	0.18	0.68	0.122	0.122	15.00	71.68	**24.39**	0	0	**0.00**	**24.39**	0.40	300	0.87	70.60	1.36	**61.16**	**39.9**
1-41		RLCBMH1-5	RLCBMH1-4	0.22	0.66	0.145	0.268	16.36	67.46	**50.19**	0	0	**0.00**	**50.19**	0.40	300	0.87	38.50	0.74	**61.16**	**82.1**
1-42		RLCBMH1-4	RLCBMH1-3	0.18	0.72	0.130	0.397	17.10	65.40	**72.22**	0	0	**0.00**	**72.22**	0.40	375	1.00	44.00	0.73	**110.89**	**65.1**
1-43		RLCBMH1-3	RLCBMH1-2	0.11	0.70	0.077	0.474	17.83	63.52	**83.74**	0	0	**0.00**	**83.74**	0.40	375	1.00	56.40	0.94	**110.89**	**75.5**
1-44		RLCBMH1-2	RLCBMH1-1	0.23	0.68	0.156	0.631	18.77	61.29	**107.44**	0	0	**0.00**	**107.44**	0.40	450	1.13	51.90	0.76	**180.32**	**59.6**
1-45		RLCBMH1-1	CBMH1-15	0.09	0.72	0.065	0.695	19.53	59.60	**115.23**	0	0	**0.00**	**115.23**	0.40	450	1.13	41.30	0.61	**180.32**	**63.9**
	STREET E	CBMH1-15	DCBMH1-9				2.213	21.32	56.07	**344.85**	1	38	**2.85**	**347.70**	0.40	675	1.49	33.70	0.38	**531.63**	**65.4**
1-46, 1-47	STREET E	DCBMH1-9	CBMH1-5	0.30	0.72	0.216	2.428	21.70	55.38	**373.86**	1	39	**2.93**	**376.79**	0.40	675	1.49	26.20	0.29	**531.63**	**70.9**
	STREET A	CBMH1-5	CBMH1-4				9.746	21.99	54.86	**1486.40**	2	159	**11.93**	**1498.32**	0.40	1050	1.99	62.20	0.52	**1727.06**	**86.8**
1-48, 1-49	STREET A	CBMH1-4	CBMH1-3	0.20	0.67	0.134	9.880	22.51	53.97	**1482.46**	4	163	**12.23**	**1494.69**	0.30	1200	1.89	77.60	0.68	**2135.42**	**70.0**
1-51	STREET A	CBMH1-3	CBMH1-2	0.20	0.79	0.158	10.038	23.19	52.86	**1474.94**	1	164	**12.30**	**1487.24**	0.20	1200	1.54	15.10	0.16	**1743.57**	**85.3**
1-52	STREET A	CBMH1-2	DCBMH1-1	0.07	0.79	0.055	10.093	23.36	52.60	**1475.81**	0	164	**12.30**	**1488.11**	0.20	1200	1.54	17.80	0.19	**1743.57**	**85.3**
1-50, 1-53	STREET A	DCBMH1-1	HW1-1	0.14	0.65	0.092	10.185	23.55	52.30	**1480.69**	0	164	**12.30**	**1492.99**	0.20	1200	1.54	22.70	0.25	**1743.57**	**85.6**

CROZIER CONSULTING ENGINEERS

NOTTAWA RESIDENTIAL DEVELOPMENT
STORM SEWER DESIGN SHEET

DESIGN: HR
CHECK: RW
UPDATED: 2024.03.27
ISSUED FOR: 1st Submission Detailed Design

FREQUENCY		5 YEAR - Nottawa IDF				
5 YEARS	Coef. A=	27.2	Coef. B=	0.00	Coef. C=	-0.699

FOUNDATION SERVICES FLOW (L/sec/unit) 0.075
TIME OF CONCENTRATION 15.00
MANNINGS "n" 0.013

CATCHMENT AREA I.D.	STREET NAME	FROM MH NO	TO MH NO	RUN-OFF AREA (A) (Ha)	RUN-OFF COEFF (C_5)	RUN-OFF A x C	CUMMUL. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (RUNOFF) (l/sec)	NO. OF LOTS	CUMMUL. NO. OF LOTS	Q (FOUNDATION (l/sec)	Q (Total) (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	Percent Full
2-23, 2-24	STREET B	DCBMH1-21	CBMH1-21	0.39	0.66	0.257	0.257	15.00	71.68	**51.29**	5	5	**0.38**	**51.67**	0.40	300	0.87	67.70	1.30	**61.16**	**84.5**
	STREET B	CBMH1-21	DCBMH1-20				0.257	16.30	67.62	**48.39**	6	11	**0.83**	**49.21**	0.40	300	0.87	64.70	1.25	**61.16**	**80.5**
2-25, 2-26	STREET B	DCBMH1-20	STM1-6	0.29	0.74	0.215	0.472	17.55	64.23	**84.28**	4	15	**1.13**	**85.41**	0.40	375	1.00	36.00	0.60	**110.89**	**77.0**
	STREET B	STM1-6	STM1-5				0.472	18.15	62.74	**82.33**	2	17	**1.28**	**83.61**	0.40	375	1.00	12.20	0.20	**110.89**	**75.4**
	STREET B	STM1-5	DCBMH1-19				0.472	18.35	62.26	**81.69**	2	19	**1.43**	**83.12**	0.40	375	1.00	33.80	0.56	**110.89**	**75.0**
2-28, FUT2-12		RLCB1-3	RLCBMH1-8	0.14	0.45	0.063	0.063	15.00	71.68	**12.55**	0	0	**0.00**	**12.55**	0.40	300	0.87	87.30	1.68	**61.16**	**20.5**
2-29, FUT2-13		RLCBMH1-8	DCBMH1-19	0.32	0.41	0.130	0.193	16.68	66.55	**35.71**	0	0	**0.00**	**35.71**	0.40	300	0.87	60.10	1.16	**61.16**	**58.4**
2-27, 2-30	STREET B	DCBMH1-19	DCBMH1-18	0.44	0.73	0.320	0.985	18.91	60.96	**166.93**	4	23	**1.73**	**168.66**	0.40	525	1.26	48.70	0.65	**272.00**	**62.0**
2-33, 2-31	STREET B	DCBMH1-18	CBMH1-20	0.29	0.61	0.178	1.163	19.56	59.55	**192.56**	3	26	**1.95**	**194.51**	0.40	525	1.26	20.80	0.28	**272.00**	**71.5**
2-6A, 2-8A		DCBMH1-31	HW1-6	0.10	0.60	0.060	0.060	15.00	71.68	**11.96**	0	0	**0.00**	**11.96**	0.40	300	0.87	15.90	0.31	**61.16**	**19.5**
FUT2-10, FUT2-14, FUT2-15	STREET B	STMHPLUG1-2	DCBMH1-23	6.31	0.58	3.688	3.748	15.00	71.68	**746.78**	46	46	**3.45**	**750.23**	0.70	825	2.25	8.50	0.06	**1200.97**	**62.5**
2-36, 2-37	STREET B	DCBMH1-23	CBMH1-20	0.04	0.60	0.024	3.772	15.06	71.47	**749.37**	0	46	**3.45**	**752.82**	0.40	900	1.80	24.30	0.23	**1144.94**	**65.8**
2-32		RLCB1-4	CBMH1-23	0.11	0.70	0.077	0.077	15.00	71.68	**15.34**	0	0	**0.00**	**15.34**	0.40	300	0.87	19.80	0.38	**61.16**	**25.1**
FUT2-2, 2-2	STREET A	STMPLUG1-14	CBMH1-30	1.09	0.74	0.811	0.811	15.00	71.68	**161.51**	0	0	**0.00**	**161.51**	0.40	450	1.13	17.30	0.25	**180.32**	**89.6**
FUT2-1	STREET A	STMPLUG1-13	CBMH1-30	1.17	0.75	0.878	0.878	15.00	71.68	**174.86**	0	0	**0.00**	**174.86**	0.40	525	1.26	9.40	0.12	**272.00**	**64.3**
	STREET A	CBMH1-30	CBMH1-29				1.688	15.25	70.84	**332.45**	0	0	**0.00**	**332.45**	0.40	675	1.49	52.40	0.59	**531.63**	**62.5**
2-1	STREET A	CBMH1-29	DCBMH1-30	0.07	0.65	0.046	1.734	15.84	69.00	**332.50**	0	0	**0.00**	**332.50**	0.40	675	1.49	52.70	0.59	**531.63**	**62.5**
FUT2-3	STREET A	STMPLUG1-11	DCBMH1-30	0.99	0.50	0.495	0.495	15.00	71.68	**98.64**	0	0	**0.00**	**98.64**	0.40	450	1.13	15.10	0.22	**180.32**	**54.7**
FUT2-4	STREET A	STMPLUG1-12	DCBMH1-30	1.06	0.75	0.795	0.795	15.00	71.68	**158.42**	0	0	**0.00**	**158.42**	0.40	450	1.13	14.70	0.22	**180.32**	**87.9**
2-4, 2-3	STREET A	DCBMH1-30	CBMH1-28	0.22	0.63	0.139	3.162	16.43	67.25	**591.19**	30	30	**2.25**	**593.44**	0.40	825	1.70	38.00	0.37	**907.85**	**65.4**
	STREET A	STMPLUG1-9	CBMH1-28		0.00	0.000	0.000	15.00	71.68	**0.00**	0	0	**0.00**	**0.00**	0.70	300	1.14	11.70	0.17	**80.91**	**0.0**
FUT2-5	STREET A	STMPLUG1-10	CBMH1-28	0.87	0.75	0.653	0.653	15.00	71.68	**130.03**	0	0	**0.00**	**130.03**	0.40	450	1.13	13.70	0.20	**180.32**	**72.1**
	STREET A	CBMH1-28	DCBMH1-29				3.815	16.81	66.21	**702.08**	0	30	**2.25**	**704.33**	0.40	825	1.70	42.50	0.42	**907.85**	**77.6**
2-5, 2-6	STREET A	DCBMH1-29	CBMH1-27	0.20	0.67	0.134	3.949	17.22	65.08	**714.39**	0	30	**2.25**	**716.64**	0.40	825	1.70	34.30	0.34	**907.85**	**78.9**
FUT2-6	STREET A	STMPLUG1-8	CBMH1-27	1.21	0.50	0.605	0.605	15.00	71.68	**120.56**	30	30	**2.25**	**122.81**	0.40	450	1.13	8.70	0.13	**180.32**	**68.1**

CROZIER CONSULTING ENGINEERS

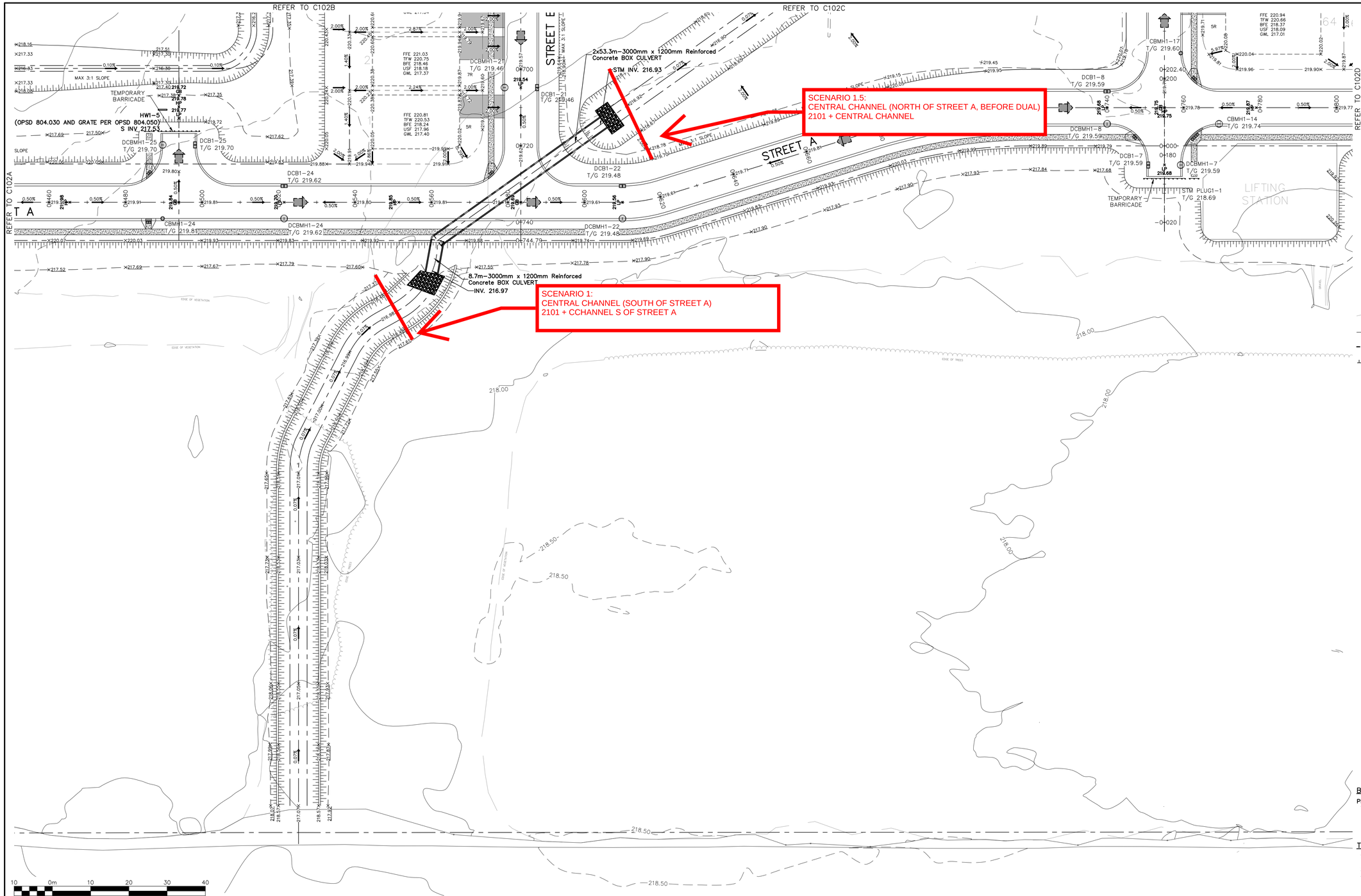
NOTTAWA RESIDENTIAL DEVELOPMENT
STORM SEWER DESIGN SHEET

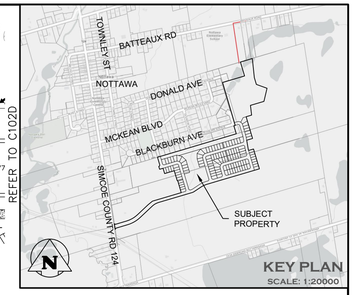
DESIGN: HR
CHECK: RW
UPDATED: 2024.03.27
ISSUED FOR: 1st Submission Detailed Design

FREQUENCY		5 YEAR - Nottawa IDF				
5 YEARS	Coef. A=	27.2	Coef. B=	0.00	Coef. C=	-0.699

FOUNDATION SERVICES FLOW (L/sec/unit) 0.075
TIME OF CONCENTRATION 15.00
MANNINGS "n" 0.013

CATCHMENT AREA I.D.	STREET NAME	FROM MH NO	TO MH NO	RUN-OFF AREA (A) (Ha)	RUN-OFF COEFF (C_5)	RUN-OFF A x C	CUMMUL. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (RUNOFF) (l/sec)	NO. OF LOTS	CUMMUL. NO. OF LOTS	Q (FOUNDATION (l/sec)	Q (Total) (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	Percent Full
	STREET A	CBMH1-27	CBMH1-26				4.554	17.56	64.21	**812.78**	0	60	**4.50**	**817.28**	0.40	900	1.80	34.70	0.32	**1144.94**	**71.4**
2-7	STREET A	CBMH1-26	DCBMH1-28	0.05	0.67	0.034	4.587	17.88	63.40	**808.45**	0	60	**4.50**	**812.95**	0.40	900	1.80	27.30	0.25	**1144.94**	**71.0**
2-8, 2-9	STREET A	DCBMH1-28	CBMH1-25	0.12	0.66	0.079	4.666	18.13	62.78	**814.34**	6	66	**4.95**	**819.29**	0.40	900	1.80	43.30	0.40	**1144.94**	**71.6**
FUT2-7	STREET A	STMPLUG1-7	CBMH1-25	1.52	0.50	0.760	0.760	15.00	71.68	**151.45**	9	9	**0.68**	**152.12**	0.40	525	1.26	8.70	0.12	**272.00**	**55.9**
2-10	STREET A	CBMH1-25	DCBMH1-27	0.02	0.60	0.012	5.438	18.54	61.83	**934.67**	0	75	**5.63**	**940.30**	0.40	900	1.80	19.20	0.18	**1144.94**	**82.1**
2-11, 2-12	STREET A	DCBMH1-27	HW1-4	0.04	0.60	0.024	5.462	18.71	61.41	**932.54**	0	75	**5.63**	**938.16**	0.40	900	1.80	5.00	0.05	**1144.94**	**81.9**
2-14, 2-13	STREET A	DCBMH1-26	CBMH1-24	0.12	0.60	0.072	0.072	15.00	71.68	**14.35**	0	0	**0.00**	**14.35**	0.40	300	0.87	54.20	1.04	**61.16**	**23.5**
FUT2-8	STREET A	STMPLUG1-6	CBMH1-24	1.05	0.50	0.525	0.525	15.00	71.68	**104.62**	4	4	**0.30**	**104.92**	0.40	450	1.13	5.70	0.08	**180.32**	**58.2**
2-18, 2-19	STREET A	DCBMH1-24	CBMH1-24	0.19	0.62	0.117	0.117	15.00	71.68	**23.38**	0	0	**0.00**	**23.38**	0.40	300	0.87	31.80	0.61	**61.16**	**38.2**
2-15	STREET A	CBMH1-24	DCBMH1-25	0.02	0.60	0.012	0.726	16.04	68.39	**138.08**	0	4	**0.30**	**138.38**	0.40	525	1.26	19.20	0.25	**272.00**	**50.9**
2-16, 2-17	STREET A	DCBMH1-25	HW1-5	0.05	0.67	0.034	0.760	16.30	67.64	**142.87**	0	4	**0.30**	**143.17**	0.40	525	1.26	5.00	0.07	**272.00**	**52.6**
FUT2-11		HW1-3	CBMH1-23	2.37	0.50	1.185	7.407	18.54	61.83	**1273.04**	33	112	**8.40**	**1281.44**	0.40	1050	1.99	5.00	0.04	**1727.06**	**74.2**
		CBMH1-23	STMH1-7				7.484	19.83	58.97	**1226.82**	0	112	**8.40**	**1235.22**	0.40	1050	1.99	35.50	0.30	**1727.06**	**71.5**
		STMH1-7	CBMH1-20				7.484	20.13	58.36	**1214.16**	0	112	**8.40**	**1222.56**	0.40	1050	1.99	6.10	0.05	**1727.06**	**70.8**
	WAGNER ROAD	CBMH1-20	CBMH1-19				12.419	20.18	58.26	**2011.19**	0	138	**10.35**	**2021.54**	0.40	1350	2.36	18.50	0.13	**3375.67**	**59.9**
	WAGNER ROAD	CBMH1-19	DCBMH1-17				12.419	20.31	57.99	**2002.13**	0	138	**10.35**	**2012.48**	0.40	1350	2.36	45.70	0.32	**3375.67**	**59.6**
2-34, 2-35	WAGNER ROAD	DCBMH1-17	HW1-7	0.15	0.60	0.090	12.509	20.63	57.36	**1994.53**	0	138	**10.35**	**2004.88**	0.20	1500	1.79	13.20	0.12	**3161.29**	**63.4**





LEGEND

515.00	CONTOUR (0.5m INTERVALS)
	PROPOSED DEVELOPMENT LOT LINES
	LOWERED FOOTING LOCATION
	3:1 MAX SLOPE
×519.26	PROPOSED GRADES
×518.95	PROPOSED GRADES TO MATCH EXISTING
×519.49	EXISTING GRADES
520.42 HP	PROPOSED GRADE HIGH POINT
519.99 LP	PROPOSED GRADE LOW POINT
520.30 GB	PROPOSED GRADE BREAK
FFE	FIRST FLOOR ELEVATION
TFW	TOP OF FOUNDATION WALL ELEVATION
BFE	BASEMENT FLOOR ELEVATION
USF	UNDERSIDE OF THE FOOTING ELEVATION
USF*	LOWERED UNDERSIDE OF THE FOOTING ELEVATION
GWL	GROUNDWATER LEVEL ELEVATION
WO	WALK-OUT CONDITION
P/WO	PARTIAL WALK-OUT CONDITION
W/UP	WALK-UP CONDITION
*	ENGINEERING FILL REQUIRED UNDER FOOTINGS
STMH#1	PROPOSED STORM SEWER MANHOLE
CBMH#1	PROPOSED CATCHBASIN MANHOLE
DCBMH#1	PROPOSED DOUBLE CATCHBASIN MANHOLE
DCB	PROPOSED DOUBLE CATCHBASIN
RLCB#1	PROPOSED REAR LOT CATCHBASIN
CB	PROPOSED CATCHBASIN
DICB	PROPOSED DITCH INLET CATCHBASIN
STMMH35A	EXISTING STORM SEWER MANHOLE
	OVERLAND FLOW ROUTE
	LOT LINE DRAINAGE

BUILDING FOOTING DEPTH REQUIREMENTS

PER CAMBIUM RECOMMENDATIONS,

1. ALL EXTERIOR FOOTINGS AND FOOTINGS IN UNHEATED AREAS SHOULD HAVE MINIMUM 1.4M OF EARTH COVER AFTER FINAL GRADING.

TOPSOIL DEPTHS

1. BETWEEN REAR LOT LINE AND REAR BUILDING SETBACK LINE, TOPSOIL DEPTH TO BE 600mm.
2. REMAINDER OF LOT TO BE 200mm DEPTH
3. TOPSOIL DEPTH WITHIN PARKS TO BE 600mm

TEMPORARY BENCHMARKS

TBM#1-
TBM#2-
TBM#3-

***ADD REFERENCE TO SURVEY/SOURCE

Town

No.	ISSUE	DATE: YYYY/MM/DD
1	ISSUED FOR 1st SUBMISSION	YYYY/MM/DD

Engineer

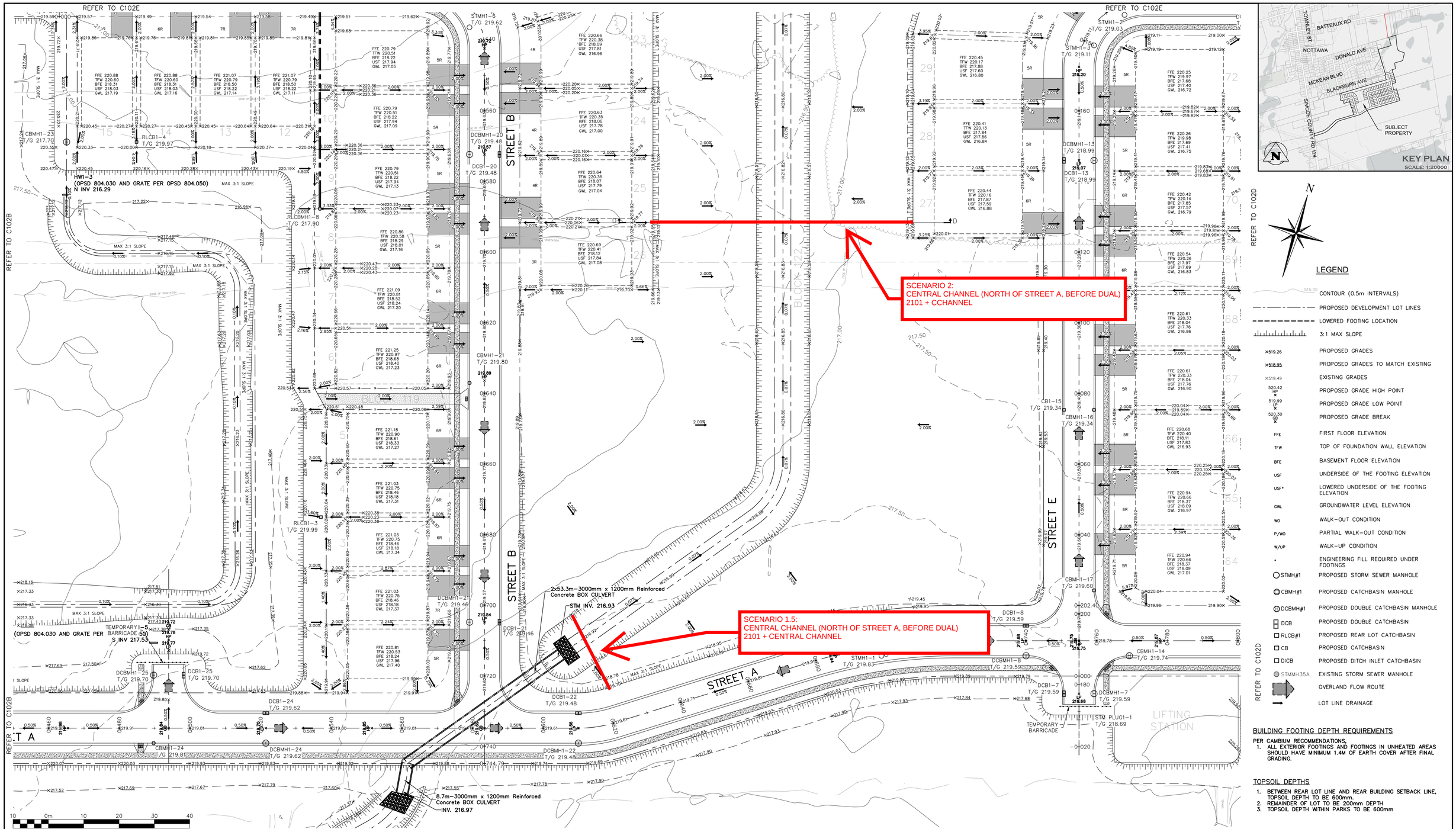
Engineer

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953-6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102H



LEGEND

- 515.00 CONTOUR (0.5m INTERVALS)
- PROPOSED DEVELOPMENT LOT LINES
- LOWERED FOOTING LOCATION
- 3:1 MAX SLOPE
- ×519.26 PROPOSED GRADES
- ×518.95 PROPOSED GRADES TO MATCH EXISTING
- ×519.49 EXISTING GRADES
- 520.42 HP — PROPOSED GRADE HIGH POINT
- 519.99 LP — PROPOSED GRADE LOW POINT
- 520.30 GB — PROPOSED GRADE BREAK
- FFE FIRST FLOOR ELEVATION
- TFW TOP OF FOUNDATION WALL ELEVATION
- BFE BASEMENT FLOOR ELEVATION
- USF UNDERSIDE OF THE FOOTING ELEVATION
- USF* LOWERED UNDERSIDE OF THE FOOTING ELEVATION
- GWL GROUNDWATER LEVEL ELEVATION
- WO WALK-OUT CONDITION
- P/WO PARTIAL WALK-OUT CONDITION
- W/UP WALK-UP CONDITION
- * ENGINEERING FILL REQUIRED UNDER FOOTINGS
- STMH#1 PROPOSED STORM SEWER MANHOLE
- CBMH#1 PROPOSED CATCHBASIN MANHOLE
- DCBMH#1 PROPOSED DOUBLE CATCHBASIN MANHOLE
- DCB PROPOSED DOUBLE CATCHBASIN
- RLCB#1 PROPOSED REAR LOT CATCHBASIN
- CB PROPOSED CATCHBASIN
- DICB PROPOSED DITCH INLET CATCHBASIN
- STMMH35A EXISTING STORM SEWER MANHOLE
- OVERLAND FLOW ROUTE
- LOT LINE DRAINAGE

BUILDING FOOTING DEPTH REQUIREMENTS

PER CAMBIUM RECOMMENDATIONS,

1. ALL EXTERIOR FOOTINGS AND FOOTINGS IN UNHEATED AREAS SHOULD HAVE MINIMUM 1.4M OF EARTH COVER AFTER FINAL GRADING.

TOPSOIL DEPTHS

1. BETWEEN REAR LOT LINE AND REAR BUILDING SETBACK LINE, TOPSOIL DEPTH TO BE 600mm.
2. REMAINDER OF LOT TO BE 200mm DEPTH
3. TOPSOIL DEPTH WITHIN PARKS TO BE 600mm

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

***ADD REFERENCE TO SURVEY/SOURCE

Town

No.	ISSUE	DATE: YYYY/MM/DD
1	ISSUED FOR 1st SUBMISSION	YYYY/MM/DD

Engineer

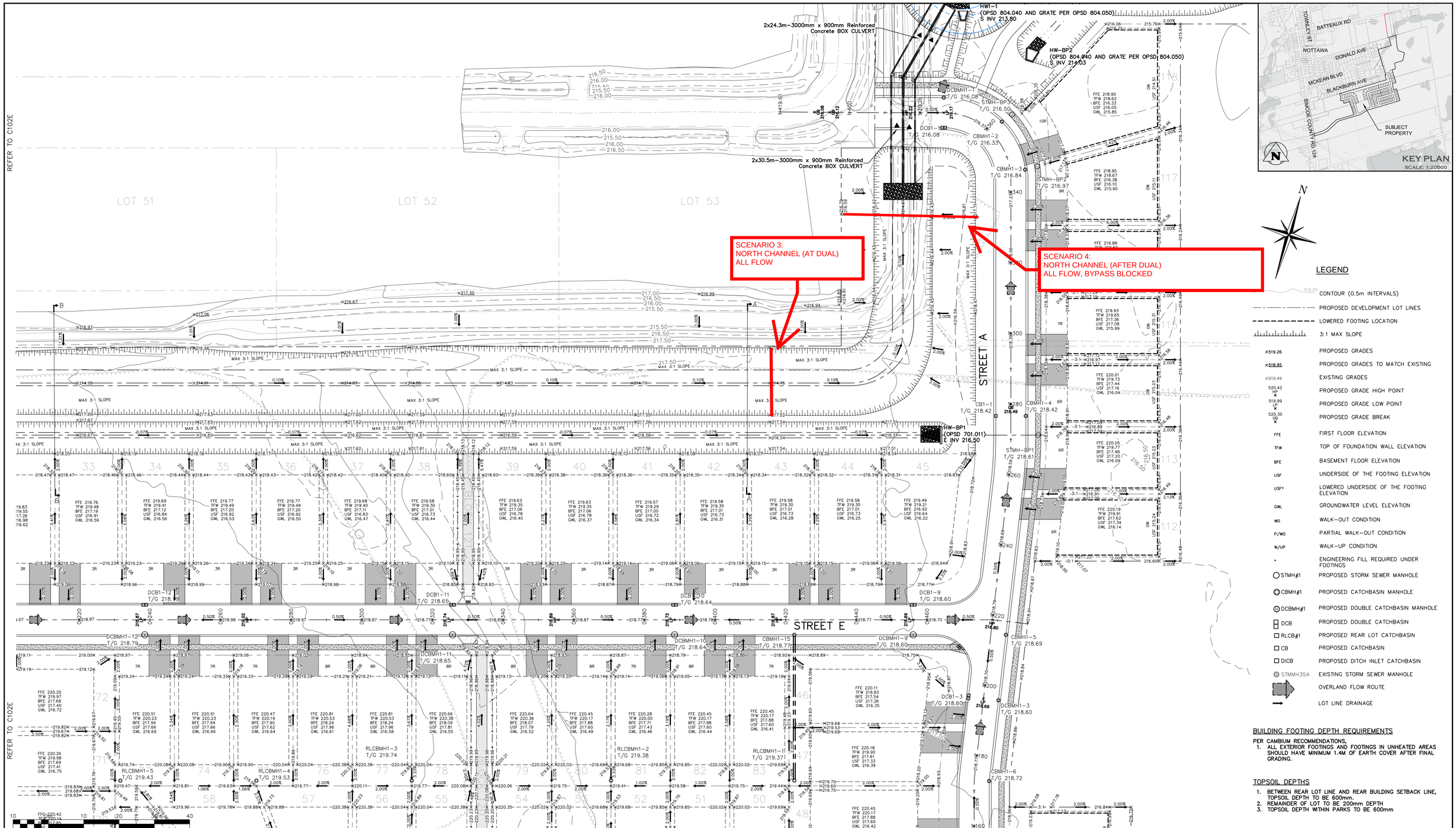
Engineer

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102C



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TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

***ADD REFERENCE TO SURVEY/SOURCE

Town

No.	ISSUE	DATE: YYYY/MM/DD
1	ISSUED FOR 1st SUBMISSION	YYYY/MM/DD

Engineer

Engineer

Project

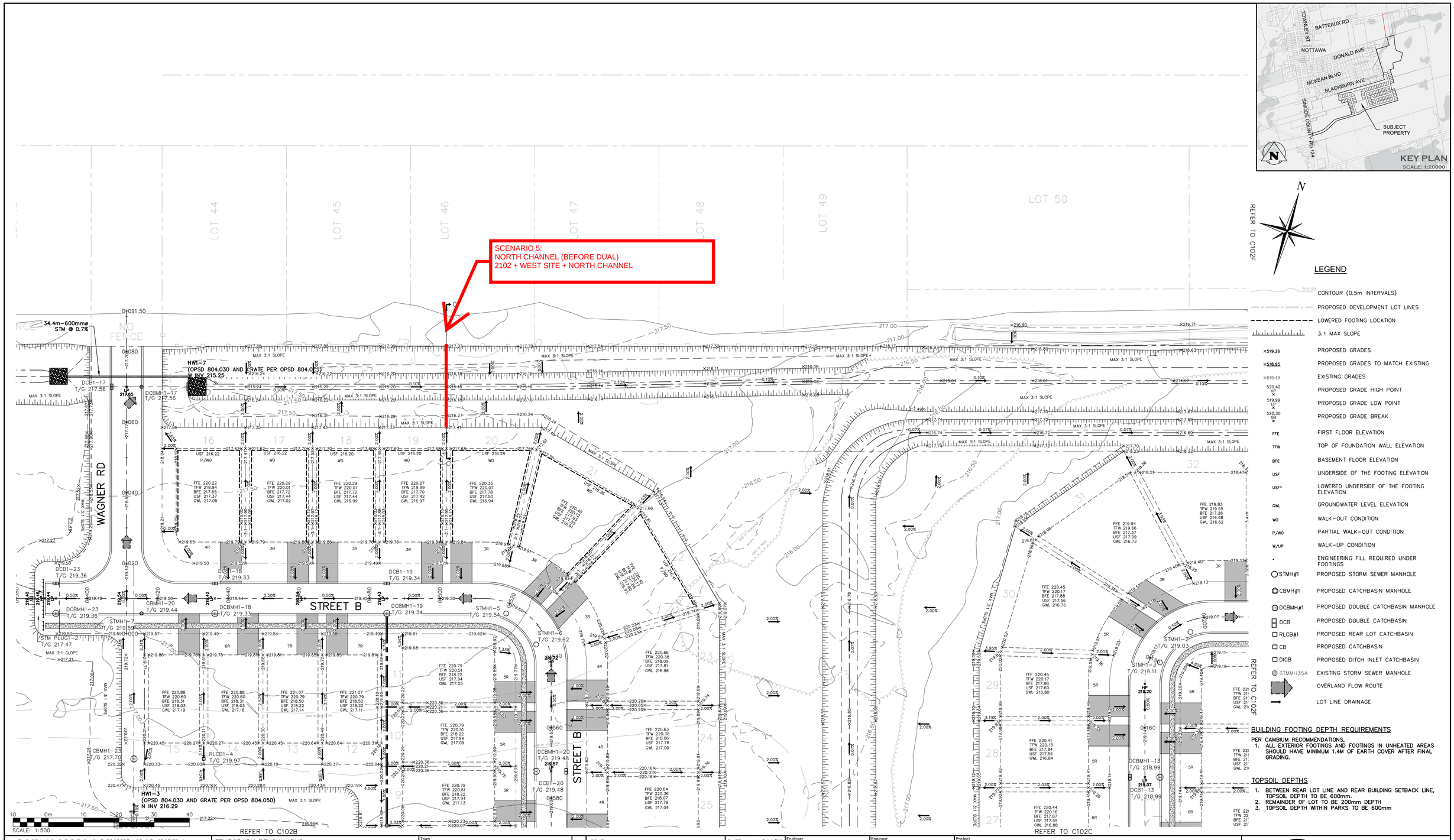
NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing

SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102F



BUILDING FOOTING DEPTH REQUIREMENTS

PER CAMBIUM RECOMMENDATIONS,

1. ALL EXTERIOR FOOTINGS AND FOOTINGS IN UNHEATED AREAS SHOULD HAVE MINIMUM 1.4M OF EARTH COVER AFTER FINAL GRADING.

TOPSOIL DEPTHS

1. BETWEEN REAR LOT LINE AND REAR BUILDING SETBACK LINE, TOPSOIL DEPTH TO BE 600mm.
2. REMAINDER OF LOT TO BE 200mm DEPTH
3. TOPSOIL DEPTH WITHIN PARKS TO BE 600mm

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

***ADD REFERENCE TO SURVEY/SOURCE

Town

No.	ISSUE	DATE: YYYY/MM/DD
1	ISSUED FOR 1st SUBMISSION	YYYY/MM/DD

Engineer

Engineer

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102E

LEGEND

- CONTOUR (0.5m INTERVALS)
- PROPOSED DEVELOPMENT LOT LINES
- LOWERED FOOTING LOCATION
- 3:1 MAX SLOPE
- ×519.26 — PROPOSED GRADES
- ×518.95 — PROPOSED GRADES TO MATCH EXISTING
- ×519.49 — EXISTING GRADES
- 520.42 HP — PROPOSED GRADE HIGH POINT
- 519.99 LP — PROPOSED GRADE LOW POINT
- 520.30 GB — PROPOSED GRADE BREAK
- FFE — FIRST FLOOR ELEVATION
- TFW — TOP OF FOUNDATION WALL ELEVATION
- BFE — BASEMENT FLOOR ELEVATION
- USF — UNDERSIDE OF THE FOOTING ELEVATION
- USF* — LOWERED UNDERSIDE OF THE FOOTING ELEVATION
- GWL — GROUNDWATER LEVEL ELEVATION
- WO — WALK-OUT CONDITION
- P/WO — PARTIAL WALK-OUT CONDITION
- W/UP — WALK-UP CONDITION
- * — ENGINEERING FILL REQUIRED UNDER FOOTINGS

- STMH#1 — PROPOSED STORM SEWER MANHOLE
- CBMH#1 — PROPOSED CATCHBASIN MANHOLE
- DCBMH#1 — PROPOSED DOUBLE CATCHBASIN MANHOLE
- DCB — PROPOSED DOUBLE CATCHBASIN
- RLCB#1 — PROPOSED REAR LOT CATCHBASIN
- CB — PROPOSED CATCHBASIN
- DICB — PROPOSED DITCH INLET CATCHBASIN
- STMMH.35A — EXISTING STORM SEWER MANHOLE
- OVERLAND FLOW ROUTE
- LOT LINE DRAINAGE

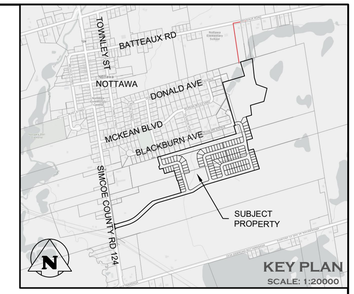
BUILDING FOOTING DEPTH REQUIREMENTS

PER CAMBIUM RECOMMENDATIONS,

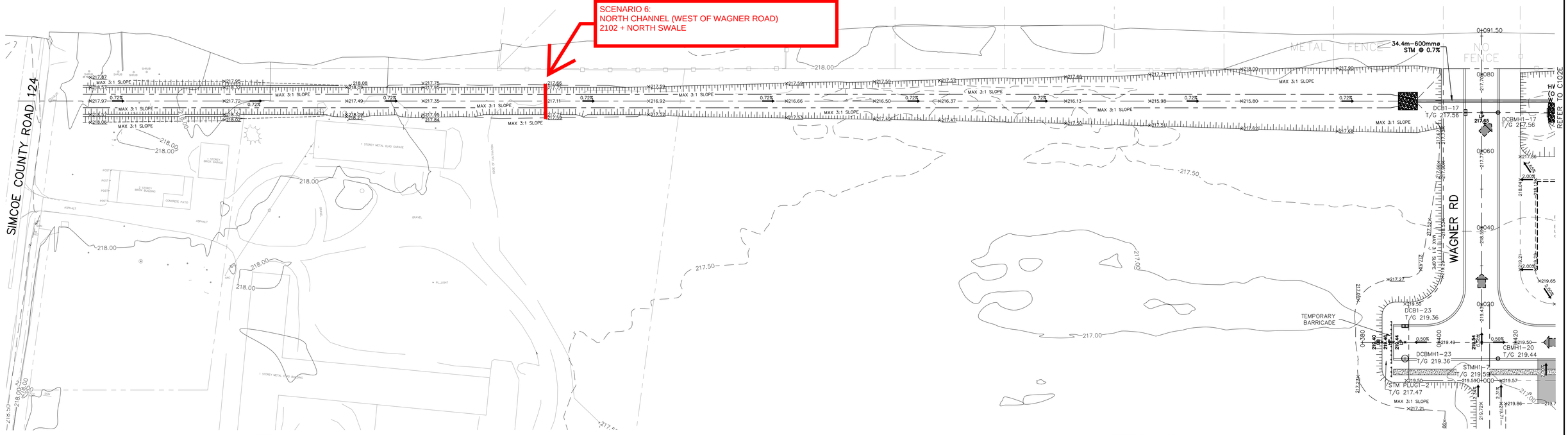
1. ALL EXTERIOR FOOTINGS AND FOOTINGS IN UNHEATED AREAS SHOULD HAVE MINIMUM 1.4M OF EARTH COVER AFTER FINAL GRADING.

TOPSOIL DEPTHS

1. BETWEEN REAR LOT LINE AND REAR BUILDING SETBACK LINE, TOPSOIL DEPTH TO BE 600mm.
2. REMAINDER OF LOT TO BE 200mm DEPTH
3. TOPSOIL DEPTH WITHIN PARKS TO BE 600mm



SCENARIO 6:
NORTH CHANNEL (WEST OF WAGNER ROAD)
2102 + NORTH SWALE



10 0m 10 20 30 40
SCALE: 1:500

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TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

***ADD REFERENCE TO SURVEY/SOURCE

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Engineer

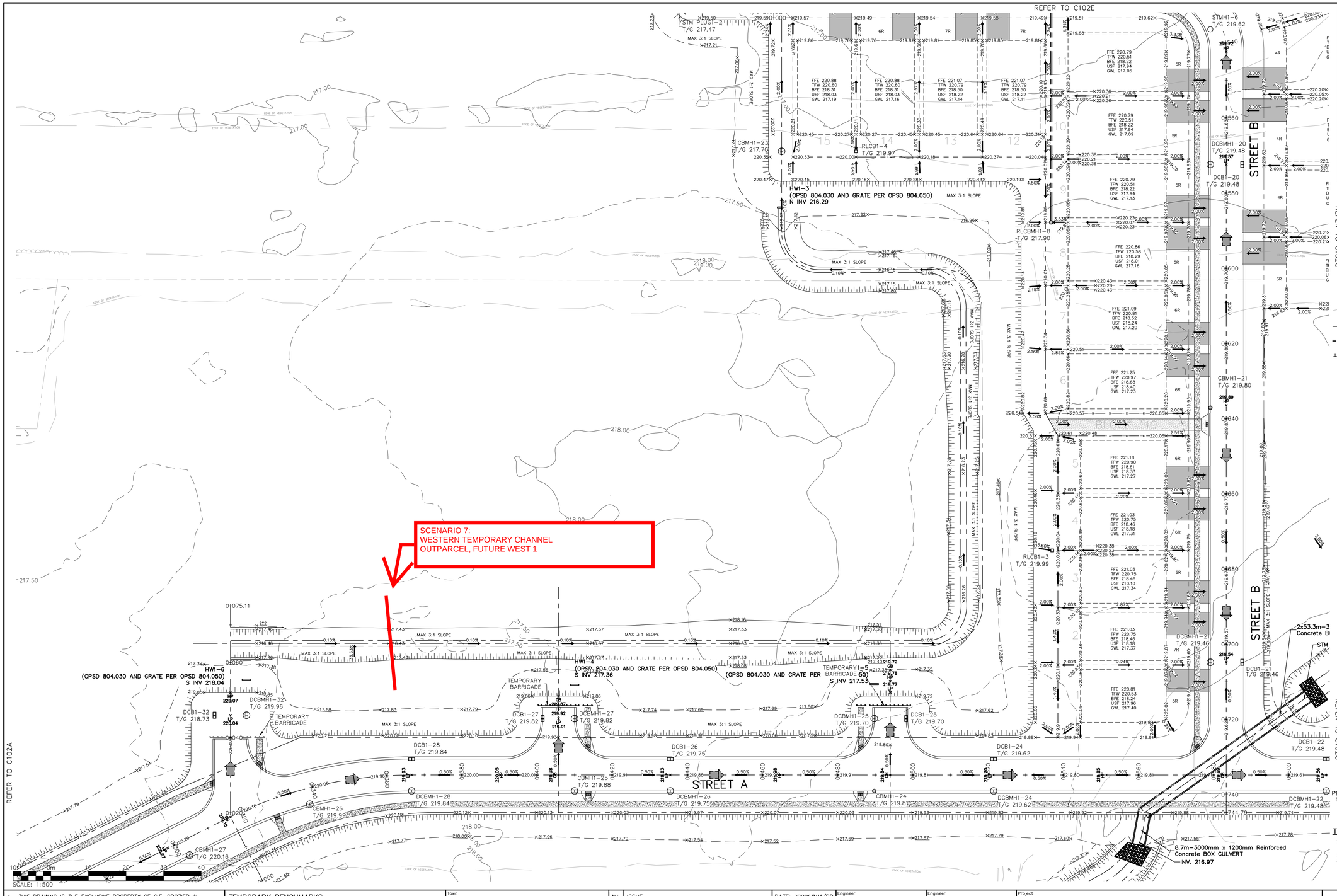
Engineer

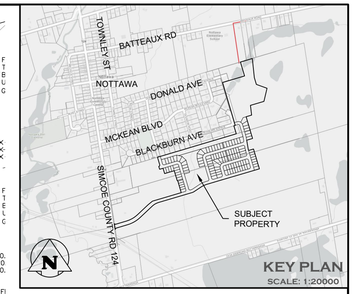
Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102G





LEGEND

- CONTOUR (0.5m INTERVALS)
- PROPOSED DEVELOPMENT LOT LINES
- LOWERED FOOTING LOCATION
- 3:1 MAX SLOPE
- ×519.26 — PROPOSED GRADES
- ×518.95 — PROPOSED GRADES TO MATCH EXISTING
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Engineer

Engineer

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SITE GRADING PLAN

CROZIER CONSULTING ENGINEERS

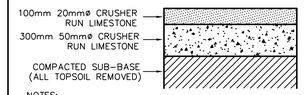
Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C102B

SCENARIO 8B:
POND BYPASS CHANNEL
2101, CENTRAL CHANNEL (LOW FLOWS)

SCENARIO 8A:
POND BYPASS CHANNEL
2101, CENTRAL CHANNEL (LOW FLOWS)

3.0m WIDE ACCESS ROAD STRUCTURE DETAIL

SCALE: N.T.S.



NOTES:

REFER TO CONSTRUCTION NOTES FOR DETAILS ON PLACEMENT OF MATERIALS.

SCALE: 1:500

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Engineer

Engineer

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: SWM FACILITY PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Drawing
B.H./R.W.	B.H./R.W.	C106A

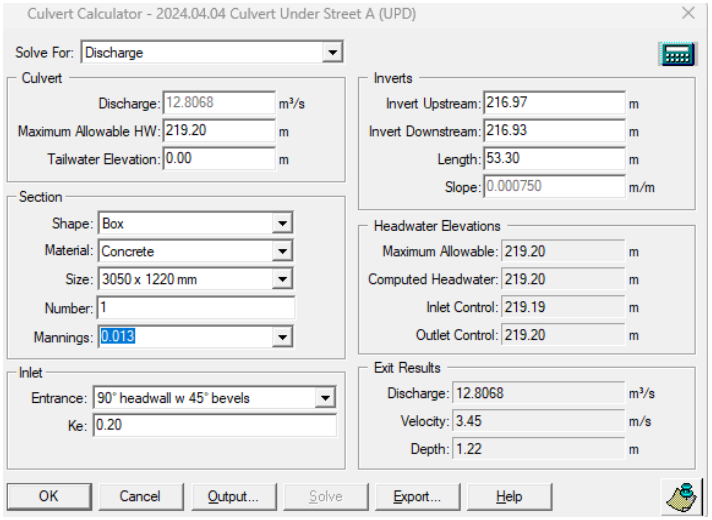
Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.09
By:	HR
Check By:	HB

Nottawa Development - Street A Culvert Sizing

Catchment	Storm	Discharge (m^3/s)
2101 External South, Central Channel (South of Street A)	100yr SCS	4.32
2101 External South, Central Channel (South of Street A)	Timmins	6.33

Size: 1220 mm x 3050 Box Culvert

Discharge Through Culvert	12.81	m^3/s
Timmins plus 50% blockage	12.67	m^3/s
% Full	99%	



Culvert Calculator Report
2024.04.09 Culvert Under Street A (UPD)

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	219.20	m	Headwater Depth/Height	1.83	
Computed Headwater Eleva	219.20	m	Discharge	12.8068	m³/s
Inlet Control HW Elev.	219.19	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	219.20	m	Control Type	Outlet Control	

Grades					
Upstream Invert	216.97	m	Downstream Invert	216.93	m
Length	53.30	m	Constructed Slope	0.000750	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.22	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	1.22	m
Velocity Downstream	3.45	m/s	Critical Slope	0.003395	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	219.20	m	Upstream Velocity Head	0.61	m
Ke	0.20		Entrance Loss	0.12	m

Inlet Control Properties					
Inlet Control HW Elev.	219.19	m	Flow Control	N/A	
Inlet Type	90° headwall w 45° bevels		Area Full	3.7	m²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.03.13
By: HR

D.A. NAME **Central Channel South of Street A**
D.A. AREA (ha) **0.44**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment Central Channel South of Street A

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A		
Edenvale Sandy Loam	EDV	B	100.0%	0.4
			0.0%	
			0.0%	
			0.0%	
Total Area				0.44

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0	98	0	98	0.00	98	0.00	98	0	98	0.00	0.00
EDV	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.00	49	0.00	62	0.00	0.00
EDV	0.00	60	0.00	65	0.44	50	0.00	59	0.00	74	0.44	22.00
0	0.00	60	0.00	65	0.00	50	0.00	59	0.00	74	0.00	0.00
0	0.00	60	0.00	65	0.00	50	0.00	59	0.00	74	0.00	0.00
0	0.00	60	0.00	65	0.00	50	0.00	59	0.00	74	0.00	0.00
Subtotal Area	0.00		0.00		0.44		0.00		0.00			

Composite Area Calculations		
	Total Pervious Area	0.44
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	50.0
	Total Area Check	0.44

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
				Tioga Sandy		Edenvale Sandy		0		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.25	0	0.25	0		0		0		0	0
Meadow	8	0	0	0.28	0	0.28	0		0		0		0	0
Wetland	16	0.44	7.04	0.05	0	0.05	0		0		0		0	0.022
Lawn	5	0	0	0.15	0	0.15	0		0		0		0	0.000
Cultivated	7	0	0	0.35	0	0.35	0		0		0		0	0.000
Impervious	2	0	0	0.95	0	0.95	0		0		0		0	0.000
Composite IA		0.44	16	Composite Runoff Coefficient										0.050

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	172.45	0.17	0.10%	2.7	0.08	0.57	0.38	0.38	0.28	0.19	1.61	1.08

Appropriate calculated time to	1.08	Appropriate Method:	Airport

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.10
By:	HR
Check:	BH

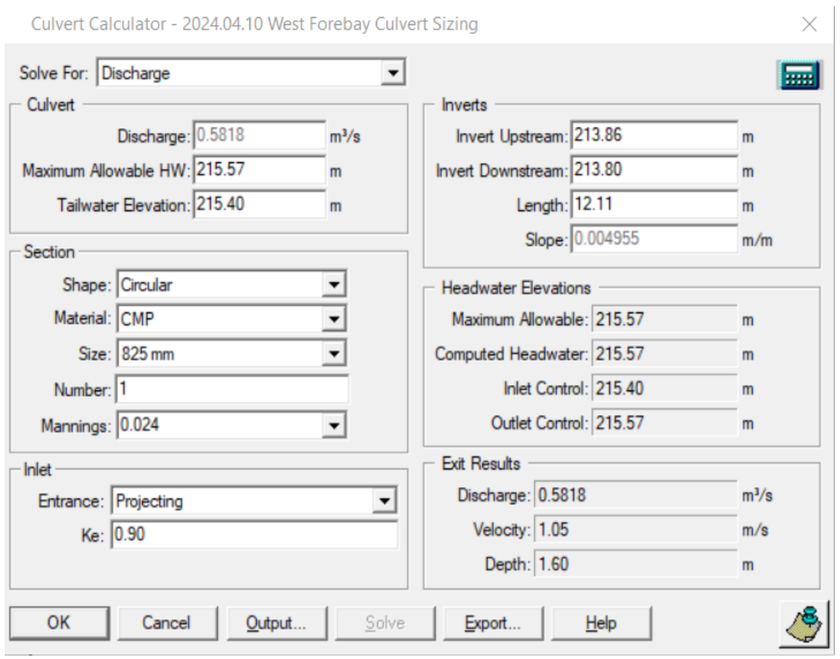
Nottawa Development - West Forebay Culvert (Into SWM Facility)

Catchments	100-Year SCS (m^3/s)	Timmins (m^3/s)
2104 (East McKean)	0.439	0.523
Timmins	Size	Twin Circular 825 mm

Size: Twin Circular 825 mm

Discharge Through Culvert	0.58	m^3/s
Timmins	0.52	m^3/s
% Full	90%	

Note: Twin culverts will allow for passage of flows during 50% blockage.



Culvert Calculator Report
2024.04.10 West Forebay Culvert Sizing

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	215.57	m	Headwater Depth/Height	2.04	
Computed Headwater Elevation	215.57	m	Discharge	0.5818	m³/s
Inlet Control HW Elev.	215.40	m	Tailwater Elevation	215.40	m
Outlet Control HW Elev.	215.57	m	Control Type	Outlet Control	

Grades					
Upstream Invert	213.86	m	Downstream Invert	213.80	m
Length	12.11	m	Constructed Slope	0.004955	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	1.60	m
Slope Type	N/A		Normal Depth	0.70	m
Flow Regime	N/A		Critical Depth	0.46	m
Velocity Downstream	1.05	m/s	Critical Slope	0.015568	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.84	m
Section Size	825 mm		Rise	0.84	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	215.57	m	Upstream Velocity Head	0.06	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	215.40	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.6	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.10
By:	HR
Check:	BH

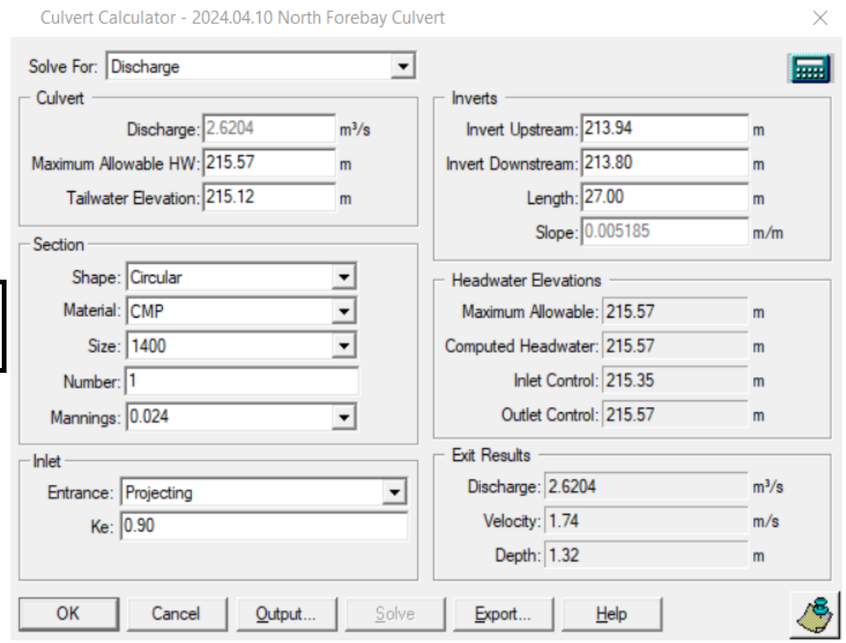
Nottawa Development - North Forebay Culvert (Into SWM Facility)

Catchments	100-Year SCS (m^3/s)	Timmins (m^3/s)
2105 (West McKean)	2.538	1.704
100-Year SCS	Size	Twin Pipe Arch 1400 mm

Size: Specificed pipe size equivilant to twin 1400 circular CSP

Discharge Through Culvert	2.62	m^3/s
100-Year SCS	2.54	m^3/s
% Full	97%	

Note: Twin culverts will allow for passage of flows during 50% blockage.



Culvert Calculator Report
2024.04.10 North Forebay Culvert

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	215.57	m	Headwater Depth/Height	1.16	
Computed Headwater Elevation	215.57	m	Discharge	2.6204	m³/s
Inlet Control HW Elev.	215.35	m	Tailwater Elevation	215.12	m
Outlet Control HW Elev.	215.57	m	Control Type	Outlet Control	

Grades					
Upstream Invert	213.94	m	Downstream Invert	213.80	m
Length	27.00	m	Constructed Slope	0.005185	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.32	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.86	m
Velocity Downstream	1.74	m/s	Critical Slope	0.014200	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.40	m
Section Size	1400		Rise	1.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	215.57	m	Upstream Velocity Head	0.15	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	215.35	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.09
By:	HR
Check:	HB

Nottawa Development - North Channel Culvert (Under Street A, into SWM Facility)

Catchments	100-Year SCS (m^3/s)[1]	Timmins (m^3/s)[1]
Outparcel	5.576	7.81
North Channel		
Phase 1 West		
Future West 1 (Full Buildout)		
Future West 2 (Full Buildout)		
Central Channel		
2101 - External South		
2102 - External West		

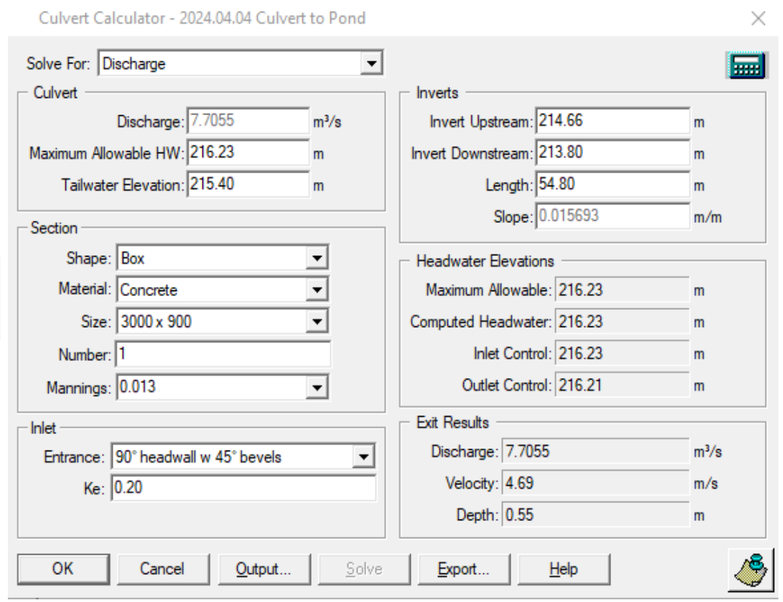
Note 1: This assumes the by-pass is 100% blocked.

Timmins	Size	Twin 3000 x 900 mm

Size: 3000 x 900 mm

Discharge Through Culvert	7.71	m^3/s
Timmins	7.81	m^3/s
% Full	101%	

Note: Twin culverts will allow for passage of flows during 50% blockage.



Culvert Calculator Report
2024.04.04 Culvert to Pond

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	216.23	m	Headwater Depth/Height	1.74	
Computed Headwater Elevation	216.23	m	Discharge	7.7055	m³/s
Inlet Control HW Elev.	216.23	m	Tailwater Elevation	215.40	m
Outlet Control HW Elev.	216.21	m	Control Type	Inlet Control	

Grades					
Upstream Invert	214.66	m	Downstream Invert	213.80	m
Length	54.80	m	Constructed Slope	0.015693	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.55	m
Slope Type	N/A		Normal Depth	0.51	m
Flow Regime	N/A		Critical Depth	0.88	m
Velocity Downstream	4.69	m/s	Critical Slope	0.003198	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	m
Section Size	3000 x 900		Rise	0.90	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	216.21	m	Upstream Velocity Head	0.44	m
Ke	0.20		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	216.23	m	Flow Control	Submerged	
Inlet Type	90° headwall w 45° bevels		Area Full	2.7	m²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

CROZIER CONSULTING ENGINEERS

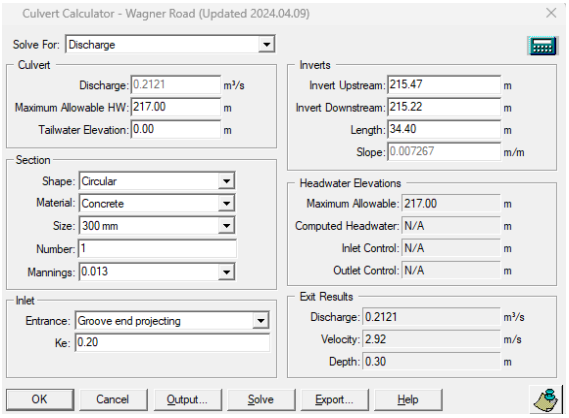
Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.04.09
By: HR

Nottawa Development - North Channel Culvert (Wagner Road)

Catchment	Storm	Discharge (m^3/s)
2102 (External West), North Channel W of Wagner Road	100yr SCS	0.299
2102 (External West), North Channel W of Wagner Road	Timmins	0.135

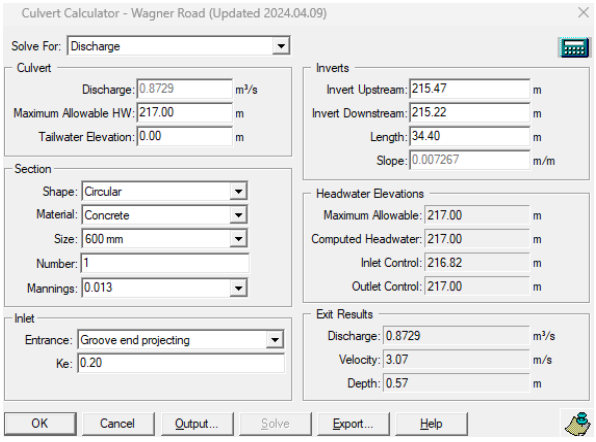
Size: 300mm Circular

Discharge Through Culvert	0.212	m^3/s
100yr SCS	0.299	m^3/s
% Full	141%	



Size: 600mm Circular

Discharge Through Culvert	0.873	m^3/s
100yr SCS	0.299	m^3/s
% Full	34%	



Culvert Calculator Report
Wagner Road (Updated 2024.04.09)

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	217.00	m	Headwater Depth/Height	2.51	
Computed Headwater Elev	217.00	m	Discharge	0.8729	m³/s
Inlet Control HW Elev.	216.82	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	217.00	m	Control Type	Outlet Control	

Grades					
Upstream Invert	215.47	m	Downstream Invert	215.22	m
Length	34.40	m	Constructed Slope	0.007267	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.57	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.57	m
Velocity Downstream	3.07	m/s	Critical Slope	0.016048	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	217.00	m	Upstream Velocity Head	0.46	m
Ke	0.20		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	216.82	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.3	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.04.05
By: HR

D.A. NAME **North Channel (West of Wagner Road)**
D.A. AREA (ha) **0.68**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment North Channel (West of Wagner Road)

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	0.68
Total Area				0.68

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0	98	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.68	49	0.00	62	0.68	33.32
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.68		0.00			

Composite Area Calculations	Total Pervious Area	0.68	
	Total Impervious Area	0.0	
	% Impervious	0.0%	
	Composite Curve Number	49.0	
	Total Area Check	0.68	

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy		0		0		0		0		
				RC	Area	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.08	0.00	0.35	0.00		0		0		0	0
Meadow	8	0	0	0.10	0.00	0.40	0.00		0		0		0	0
Wetland	16	0	0	0.05	0.00	0.05	0.00		0		0		0	0
Lawn	5	0.68	3.4	0.15	0.68	0.45	0.00		0		0		0	0.102
Cultivated	7	0	0	0.22	0.00	0.55	0.00		0		0		0	0.000
Impervious	2	0	0	0.95	0.00	0.95	0.00		0		0		0	0.000
Composite IA		0.68	5	Composite Runoff Coefficient										0.150

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	355	2.55	0.72%	2.7	0.23	0.43	0.29	0.29	0.37	0.25	1.08	0.73

Appropriate calculated time to	0.73	Appropriate Method:	Airport

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

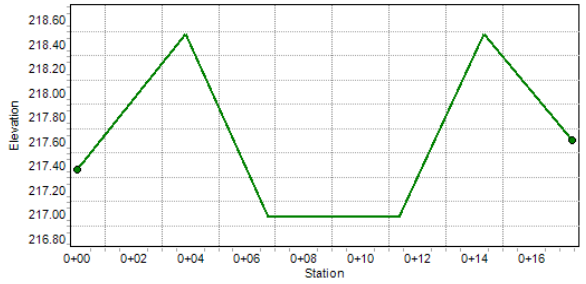
Nottawa Development - Channel Capacity Calculations - Scenario 1

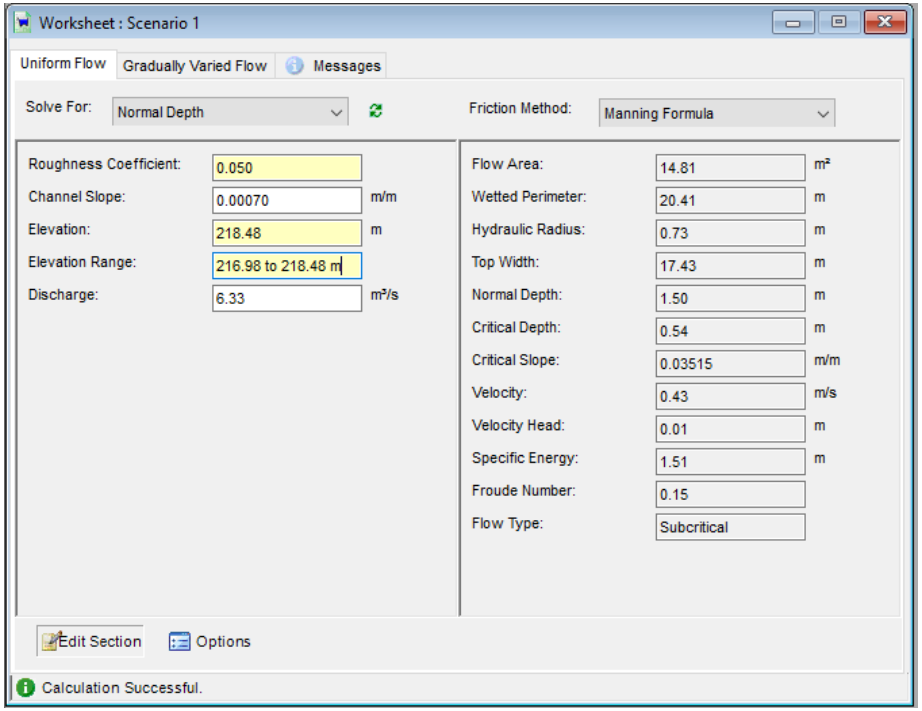
CENTRAL CHANNEL (SOUTH OF STREET A)

Catchment	Storm	Discharge (m^3/s)
2101 External South, Central Channel South of Street A	100yr SCS	4.32
2101 External South, Central Channel South of Street A	Timmins	6.33

Station (m)	Elevation (m)
0	217.37
3.82	218.48
6.74	216.98
11.34	216.98
14.32	218.48
17.43	217.61

Water Surface Elevation (m)	218.48
Channel TOB (m)	218.49





Nottawa Development - Channel Capacity - Scenario 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00070	m/m
Discharge	6.33	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	217.37
0+04	218.48
0+07	216.98
0+11	216.98
0+14	218.48
0+17	217.61

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 217.37)	(0+17, 217.61)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.50	m
Elevation Range	216.98 to 218.48 m	
Flow Area	14.81	m²
Wetted Perimeter	20.41	m
Hydraulic Radius	0.73	m
Top Width	17.43	m
Normal Depth	1.50	m

Nottawa Development - Channel Capacity - Scenario 1

Results

Critical Depth		0.54	m
Critical Slope		0.03515	m/m
Velocity		0.43	m/s
Velocity Head		0.01	m
Specific Energy		1.51	m
Froude Number		0.15	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.50	m
Critical Depth	0.54	m
Channel Slope	0.00070	m/m
Critical Slope	0.03515	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

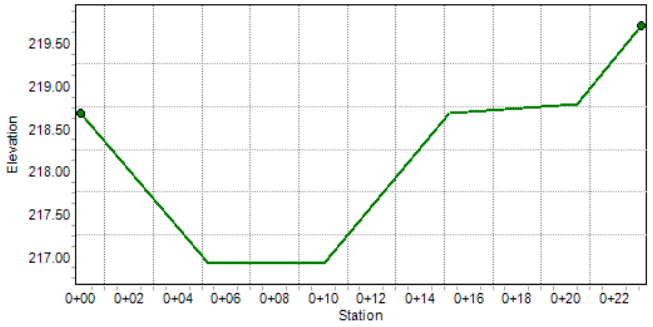
Nottawa Development - Channel Capacity Calculations - Scenario 1.5

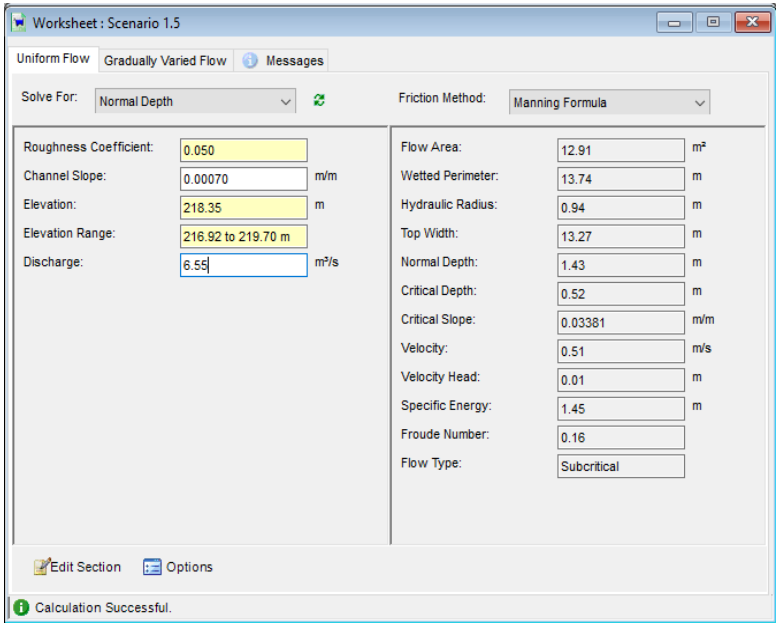
CENTRAL CHANNEL (NORTH OF STREET A, BEFORE DUAL)

Catchment	Storm	Discharge (m^3/s)
2101 External South, Central Channel	100yr SCS	4.44
2101 External South, Central Channel	Timmins	6.55

Station (m)	Elevation (m)
0.00	218.67
5.28	216.92
10.02	216.92
15.16	218.67
20.46	218.78
23.08	219.7

Water Surface Elevation (m)	218.35
Channel TOB (m)	218.67
Freeboard (m)	0.32





Nottawa Development - Channel Capacity - Scenario 1.5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00070	m/m
Discharge	6.55	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	218.67
0+05	216.92
0+10	216.92
0+15	218.67
0+20	218.78
0+23	219.70

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 218.67)	(0+23, 219.70)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.43	m
Elevation Range	216.92 to 219.70 m	
Flow Area	12.91	m²
Wetted Perimeter	13.74	m
Hydraulic Radius	0.94	m
Top Width	13.27	m
Normal Depth	1.43	m

Nottawa Development - Channel Capacity - Scenario 1.5

Results

Critical Depth		0.52	m
Critical Slope		0.03381	m/m
Velocity		0.51	m/s
Velocity Head		0.01	m
Specific Energy		1.45	m
Froude Number		0.16	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.43	m
Critical Depth	0.52	m
Channel Slope	0.00070	m/m
Critical Slope	0.03381	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

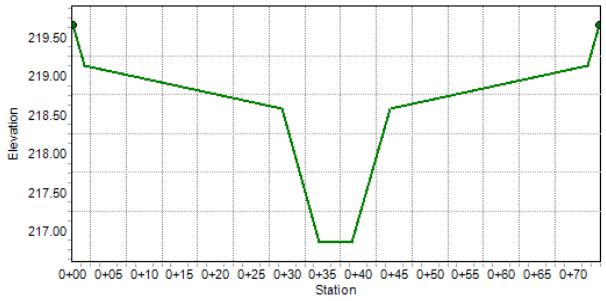
Nottawa Development - Channel Capacity Calculations - Scenario 2

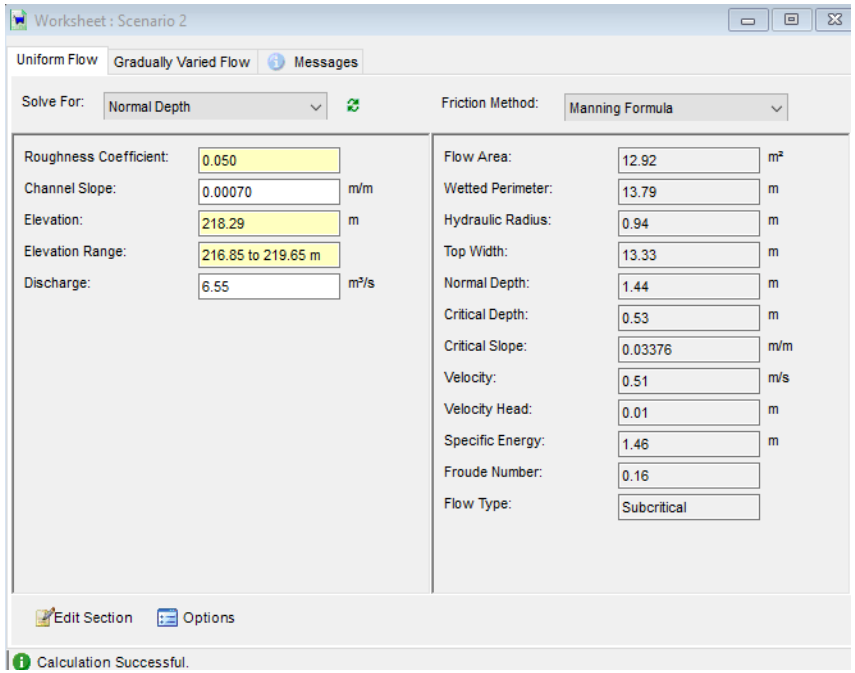
CENTRAL CHANNEL (NORTH OF STREET A, BEFORE DUAL)

Catchment	Storm	Discharge (m^3/s)
2101 External South, Central Channel	100yr SCS	4.44
2101 External South, Central Channel	Timmins	6.55

Station (m)	Elevation (m)
0.00	219.65
1.61	219.12
29.31	218.57
34.51	216.85
39.08	216.85
44.31	218.57
72.02	219.12
73.61	219.65

Water Surface Elevation (m)	218.29
Channel TOB (m)	218.57
Freeboard (m)	0.28





Nottawa Development - Channel Capacity - Scenario 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00070	m/m
Discharge	6.55	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	219.65
0+02	219.12
0+29	218.57
0+35	216.85
0+39	216.85
0+44	218.57
0+72	219.12
0+74	219.65

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 219.65)	(0+74, 219.65)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.44	m
Elevation Range	216.85 to 219.65 m		
Flow Area		12.92	m²
Wetted Perimeter		13.79	m
Hydraulic Radius		0.94	m

Nottawa Development - Channel Capacity - Scenario 2

Results

Top Width		13.33	m
Normal Depth		1.44	m
Critical Depth		0.53	m
Critical Slope		0.03376	m/m
Velocity		0.51	m/s
Velocity Head		0.01	m
Specific Energy		1.46	m
Froude Number		0.16	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	m
Length		0.00	m
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	m
Profile Description			
Profile Headloss		0.00	m
Downstream Velocity		Infinity	m/s
Upstream Velocity		Infinity	m/s
Normal Depth		1.44	m
Critical Depth		0.53	m
Channel Slope		0.00070	m/m
Critical Slope		0.03376	m/m

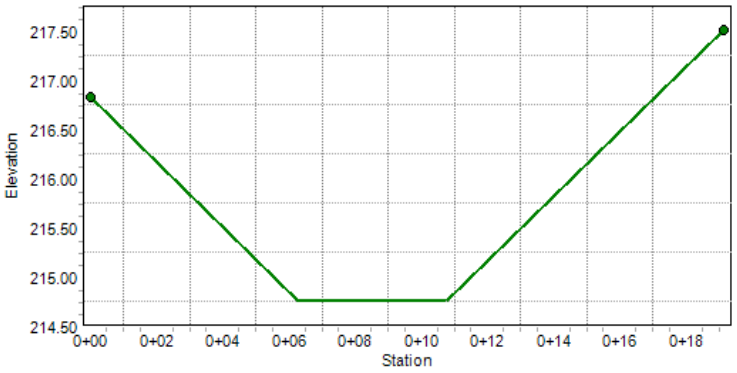
Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

Nottawa Development - Channel Capacity Calculations - Scenario 3

NORTH CHANNEL (AT DUAL)

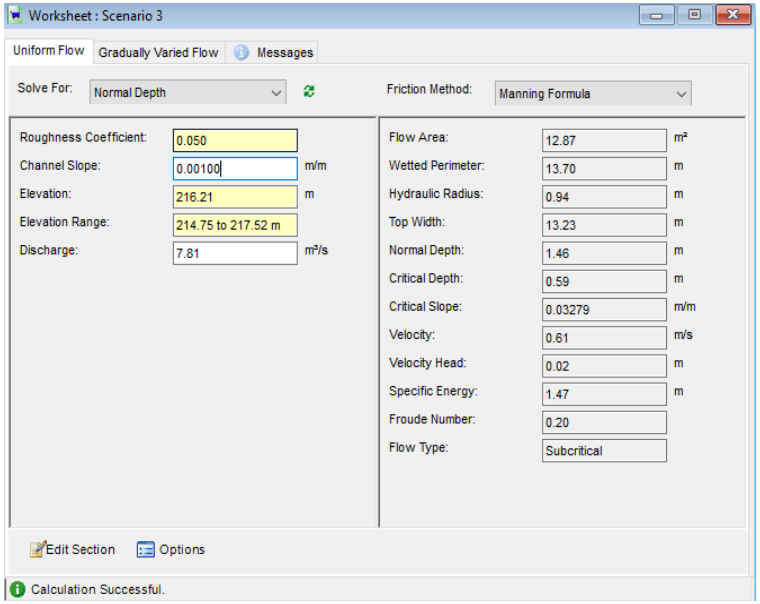
Catchment	Storm	Discharge (m^3/s)
Outparcel, 2102 (External West), 2101 (External South), North Channel, Central Channel, Phase 1 West, Future 1 West, Future West 2	100yr SCS	5.58
Outparcel, 2102 (External West), 2101 (External South), North Channel, Central Channel, Phase 1 West, Future 1 West, Future West 2	Timmins	7.81

Note: Assumes by-pass is 100% blocked.



Station (m)	Elevation (m)
0	216.84
6.27	214.75
10.72	214.75
19.11	217.52

Water Surface Elevation (m)	216.21
Channel TOB (m)	216.84
Freeboard (m)	0.63



Nottawa Development - Channel Capacity - Scenario 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	7.81	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	216.84
0+06	214.75
0+11	214.75
0+19	217.52

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 216.84)	(0+19, 217.52)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.46	m
Elevation Range	214.75 to 217.52 m	
Flow Area	12.87	m²
Wetted Perimeter	13.70	m
Hydraulic Radius	0.94	m
Top Width	13.23	m
Normal Depth	1.46	m
Critical Depth	0.59	m
Critical Slope	0.03279	m/m

Nottawa Development - Channel Capacity - Scenario 3

Results

Velocity		0.61	m/s
Velocity Head		0.02	m
Specific Energy		1.47	m
Froude Number		0.20	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.46	m
Critical Depth	0.59	m
Channel Slope	0.00100	m/m
Critical Slope	0.03279	m/m

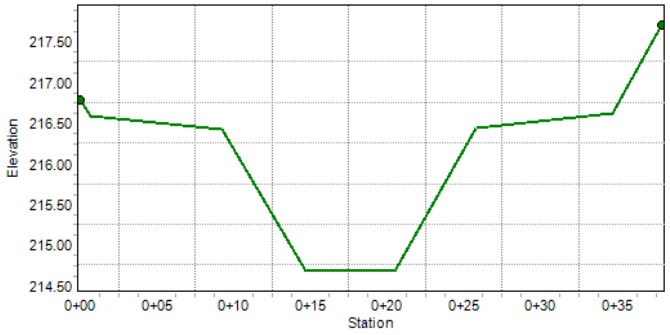
Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

Nottawa Development - Channel Capacity Calculations - Scenario 4

NORTH CHANNEL (AFTER DUAL)

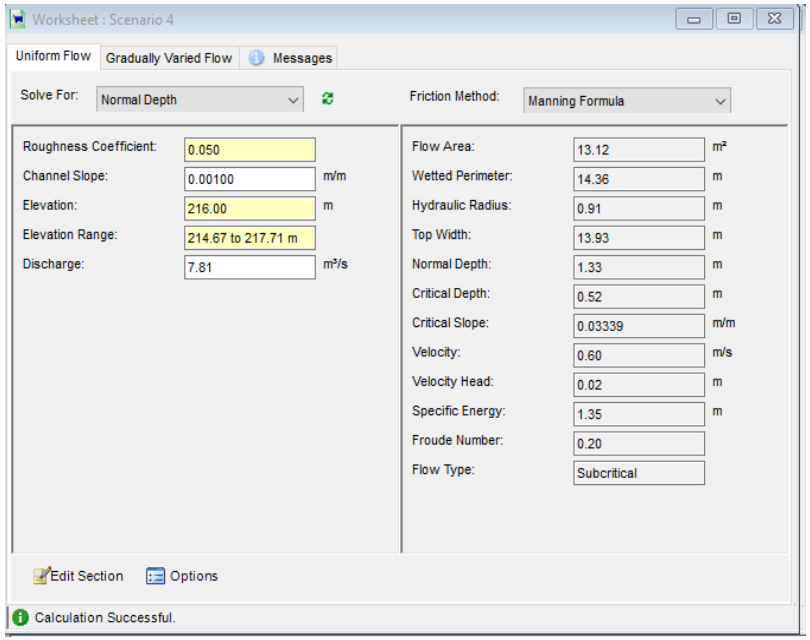
Catchment	Storm	Discharge (m^3/s)
Outparcel, 2102 (External West), 2101 (External South), North Channel, Central Channel, Phase 1 West, Future 1 West, Future West 2	100yr SCS	5.58
Outparcel, 2102 (External West), 2101 (External South), North Channel, Central Channel, Phase 1 West, Future 1 West, Future West 2	Timmins	7.81

Note: Assumes by-pass is 100% blocked.



Station (m)	Elevation (m)
0	216.79
0.6	216.59
9.24	216.42
14.68	214.67
20.5	214.67
25.78	216.43
34.69	216.61
37.86	217.71

Water Surface Elevation (m)	216
Channel TOB (m)	216.43
Freeboard (m)	0.43



Nottawa Development - Channel Capacity - Scenario 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	7.81	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	216.79
0+01	216.59
0+09	216.42
0+15	214.67
0+21	214.67
0+26	216.43
0+35	216.61
0+38	217.71

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 216.79)	(0+38, 217.71)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.33	m
Elevation Range	214.67 to 217.71 m	
Flow Area	13.12	m²
Wetted Perimeter	14.36	m
Hydraulic Radius	0.91	m

Nottawa Development - Channel Capacity - Scenario 4

Results

Top Width		13.93	m
Normal Depth		1.33	m
Critical Depth		0.52	m
Critical Slope		0.03339	m/m
Velocity		0.60	m/s
Velocity Head		0.02	m
Specific Energy		1.35	m
Froude Number		0.20	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.33	m
Critical Depth	0.52	m
Channel Slope	0.00100	m/m
Critical Slope	0.03339	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

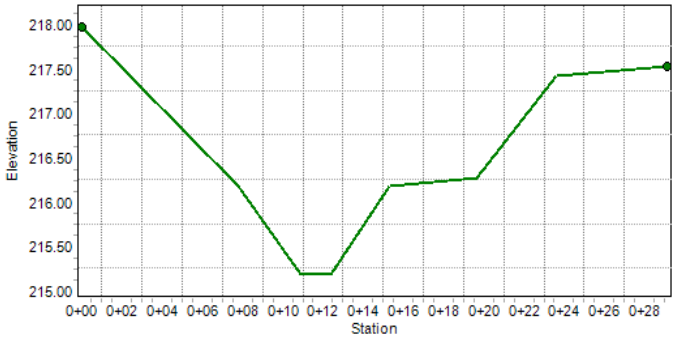
Nottawa Development - Channel Capacity Calculations - Scenario 5

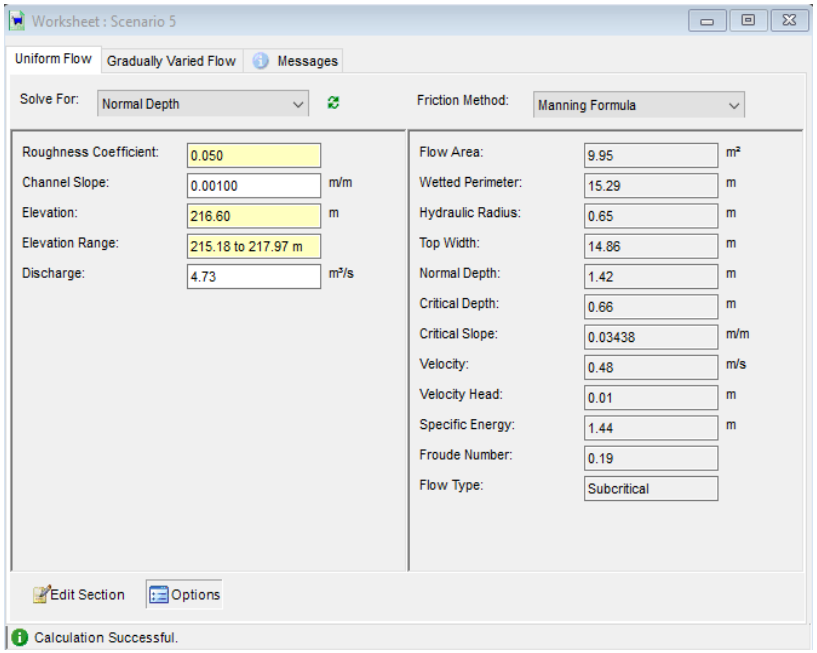
NORTH CHANNEL (EAST OF WAGNER ROAD, BEFORE DUAL)

Catchment	Storm	Discharge (m^3/s)
Outparcel, 2102 (External West), North Channel, Phase 1 West, Future 1 West, Future West 2	100yr SCS	4.73
Outparcel, 2102 (External West), North Channel, Phase 1 West, Future 1 West, Future West 2	Timmins	2.08

Station (m)	Elevation (m)
0	217.97
7.78	216.18
10.85	215.18
12.38	215.18
15.3	216.18
19.63	216.27
23.6	217.41
29.07	217.53

Water Surface Elevation (m)	216.6
Channel TOB (m)	217.41
Freeboard (m)	0.81





Nottawa Development - Channel Capacity - Scenario 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	4.73	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	217.97
0+08	216.18
0+11	215.18
0+12	215.18
0+15	216.18
0+20	216.27
0+24	217.41
0+29	217.53

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 217.97)	(0+29, 217.53)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.42	m
Elevation Range	215.18 to 217.97 m	
Flow Area	9.95	m²
Wetted Perimeter	15.29	m
Hydraulic Radius	0.65	m

Nottawa Development - Channel Capacity - Scenario 5

Results

Top Width		14.86	m
Normal Depth		1.42	m
Critical Depth		0.66	m
Critical Slope		0.03438	m/m
Velocity		0.48	m/s
Velocity Head		0.01	m
Specific Energy		1.44	m
Froude Number		0.19	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.42	m
Critical Depth	0.66	m
Channel Slope	0.00100	m/m
Critical Slope	0.03438	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

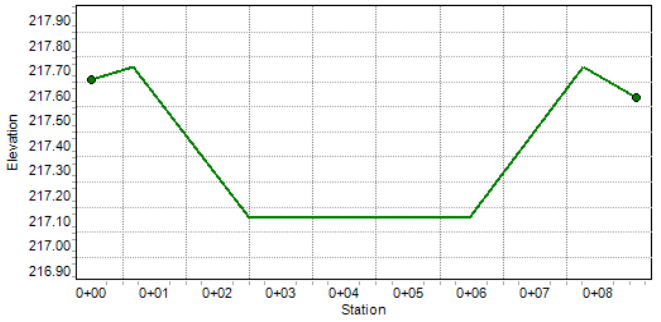
Nottawa Development - Channel Capacity Calculations - Scenario 6

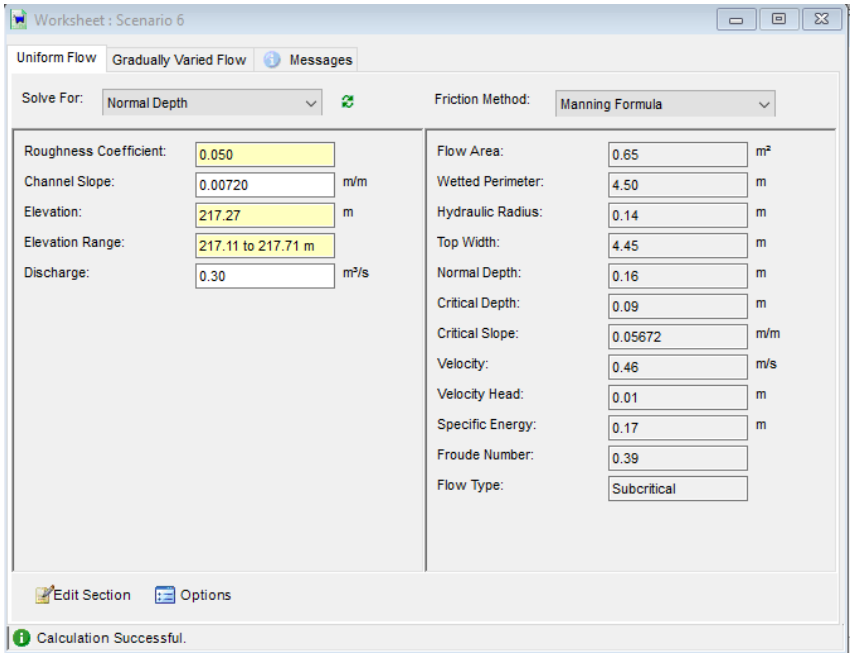
NORTH CHANNEL (WEST OF WAGNER ROAD)

Catchment	Storm	Discharge (m^3/s)
2102 (External West), North Swale	100yr SCS	0.30
2102 (External West), North Swale	Timmins	0.14

Station (m)	Elevation (m)
0	217.66
0.66	217.71
2.5	217.11
5.96	217.11
7.76	217.71
8.6	217.59

Water Surface Elevation (m)	217.27
Channel TOB (m)	217.71
Freeboard (m)	0.44





Nottawa Development - Channel Capacity - Scenario 6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00720	m/m
Discharge	0.30	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	217.66
0+01	217.71
0+03	217.11
0+06	217.11
0+08	217.71
0+09	217.59

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 217.66)	(0+09, 217.59)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.16	m
Elevation Range	217.11 to 217.71 m	
Flow Area	0.65	m²
Wetted Perimeter	4.50	m
Hydraulic Radius	0.14	m
Top Width	4.45	m
Normal Depth	0.16	m

Nottawa Development - Channel Capacity - Scenario 6

Results

Critical Depth		0.09	m
Critical Slope		0.05672	m/m
Velocity		0.46	m/s
Velocity Head		0.01	m
Specific Energy		0.17	m
Froude Number		0.39	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.16	m
Critical Depth	0.09	m
Channel Slope	0.00720	m/m
Critical Slope	0.05672	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

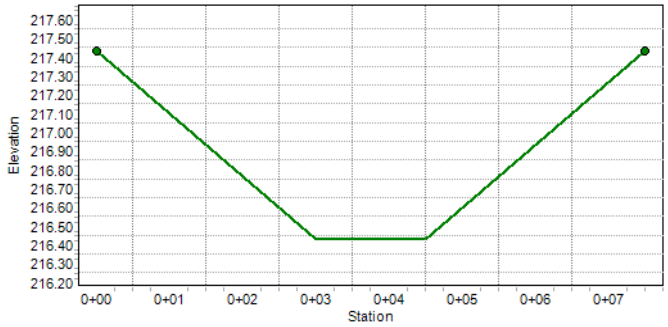
Nottawa Development - Channel Capacity Calculations - Scenario 7

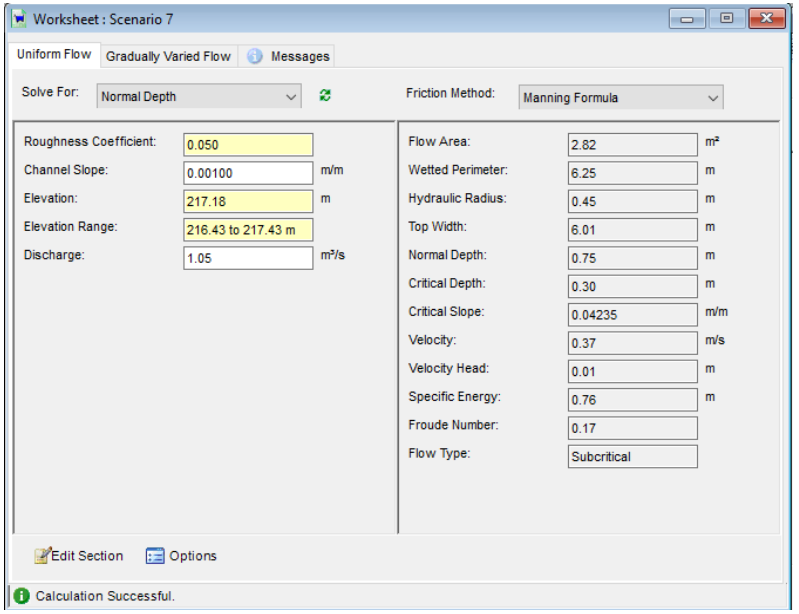
WESTERN TEMPORARY CHANNEL

Catchment	Storm	Discharge (m^3/s)
Outparcel, Future West 1	100yr SCS	1.05
Outparcel, Future West 1	Timmins	0.87

Station (m)	Elevation (m)
0	217.43
3	216.43
4.5	216.43
7.5	217.43

Water Surface Elevation (m)	217.12
Channel TOB (m)	217.43
Freeboard (m)	0.31





Nottawa Development - Channel Capacity - Scenario 7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	1.05	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	217.43
0+03	216.43
0+05	216.43
0+08	217.43

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 217.43)	(0+08, 217.43)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.75	m
Elevation Range	216.43 to 217.43 m	
Flow Area	2.82	m²
Wetted Perimeter	6.25	m
Hydraulic Radius	0.45	m
Top Width	6.01	m
Normal Depth	0.75	m
Critical Depth	0.30	m
Critical Slope	0.04235	m/m

Nottawa Development - Channel Capacity - Scenario 7

Results

Velocity		0.37	m/s
Velocity Head		0.01	m
Specific Energy		0.76	m
Froude Number		0.17	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.75	m
Critical Depth	0.30	m
Channel Slope	0.00100	m/m
Critical Slope	0.04235	m/m

Project Name:	Nottawa
Project Number:	1953-6040
Date:	2024.04.11
By:	HR
Check By:	HB

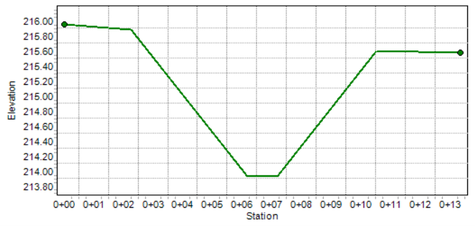
Nottawa Development - Channel Capacity Calculations - Scenario 8

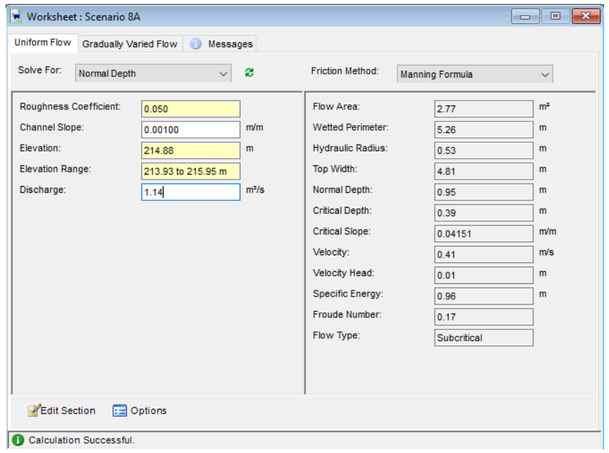
POND BY-PASS CHANNEL - X-SECTION 8A

Catchment	Discharge (m^3/s)
2101 (External South), Central Channel (Low Flows)	1.14

Station (m)	Elevation (m)
0	215.95
2.27	215.88
6.17	213.93
7.18	213.93
10.51	215.60
13.35	215.57

Water Surface Elevation (m)	214.88
Channel TOB (m)	215.03
Freeboard (m)	0.15



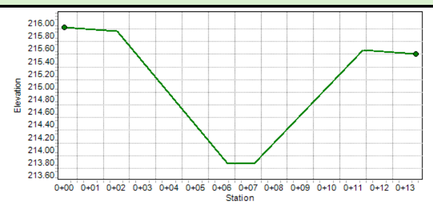


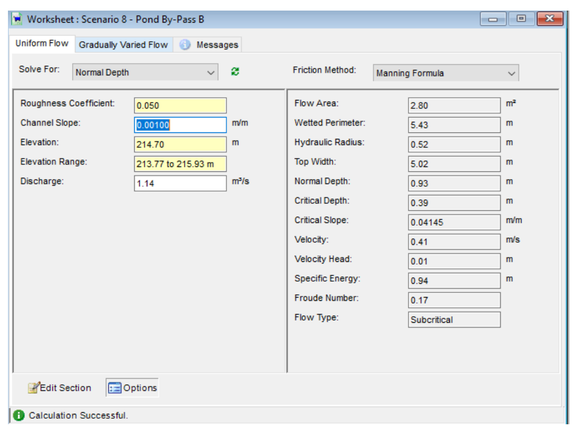
POND BY-PASS CHANNEL - X-SECTION 8B

Catchment	Discharge (m^3/s)
2101 (External South), Central Channel (Low Flows)	1.14

Station (m)	Elevation (m)
0	215.93
2.01	215.87
6.22	213.77
7.22	213.77
11.38	215.57
13.39	215.51

Water Surface Elevation (m)	214.7
Channel TOB (m)	215.57
Freeboard (m)	0.87





Worksheet for Scenario 8A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	1.14	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	215.95
0+02	215.88
0+06	213.93
0+07	213.93
0+11	215.60
0+13	215.57

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 215.95)	(0+13, 215.57)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.95	m
Elevation Range	213.93 to 215.95 m	
Flow Area	2.77	m²
Wetted Perimeter	5.26	m
Hydraulic Radius	0.53	m
Top Width	4.81	m
Normal Depth	0.95	m

Worksheet for Scenario 8A

Results

Critical Depth		0.39	m
Critical Slope		0.04151	m/m
Velocity		0.41	m/s
Velocity Head		0.01	m
Specific Energy		0.96	m
Froude Number		0.17	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	m
Length		0.00	m
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	m
Profile Description			
Profile Headloss		0.00	m
Downstream Velocity		Infinity	m/s
Upstream Velocity		Infinity	m/s
Normal Depth		0.95	m
Critical Depth		0.39	m
Channel Slope		0.00100	m/m
Critical Slope		0.04151	m/m

Nottawa Development - Channel Capacity - Scenario 8B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00100	m/m
Discharge	1.14	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00	215.93
0+02	215.87
0+06	213.77
0+07	213.77
0+11	215.57
0+13	215.51

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 215.93)	(0+13, 215.51)	0.050

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.93	m
Elevation Range	213.77 to 215.93 m	
Flow Area	2.80	m²
Wetted Perimeter	5.43	m
Hydraulic Radius	0.52	m
Top Width	5.02	m
Normal Depth	0.93	m

Nottawa Development - Channel Capacity - Scenario 8B

Results

Critical Depth		0.39	m
Critical Slope		0.04145	m/m
Velocity		0.41	m/s
Velocity Head		0.01	m
Specific Energy		0.94	m
Froude Number		0.17	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.93	m
Critical Depth	0.39	m
Channel Slope	0.00100	m/m
Critical Slope	0.04145	m/m

APPENDIX C

Hydrologic Parameter Sheets

Active coordinate

44° 27' 15" N, 80° 12' 14" W (44.454167,-80.204167)

Retrieved: Thu, 30 Nov 2023 22:21:06 GMT

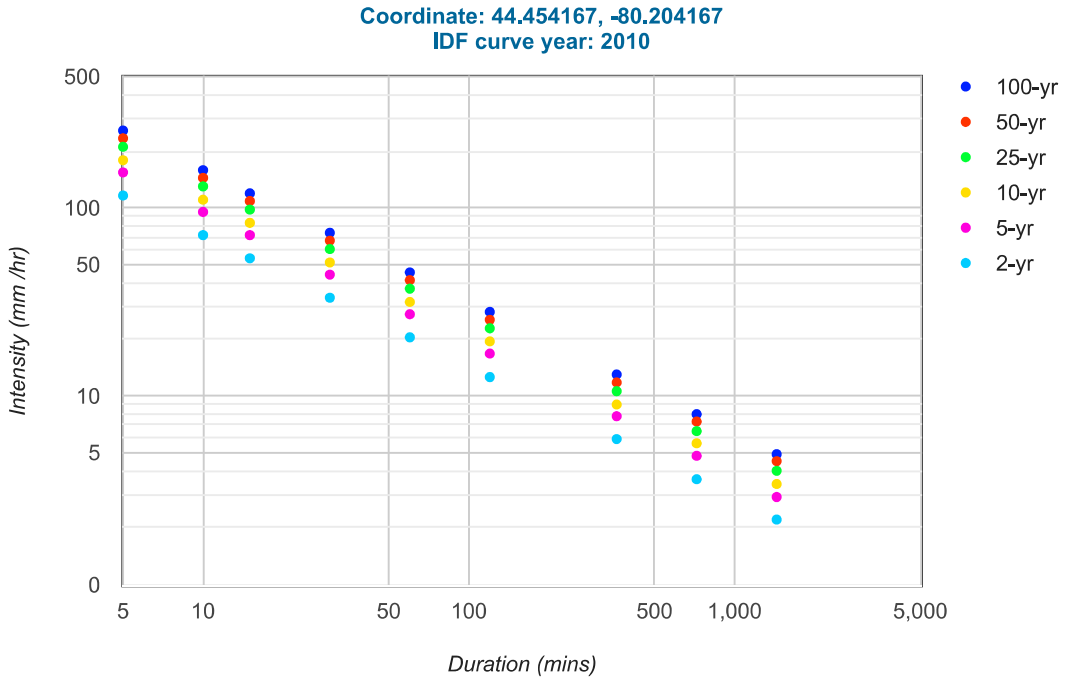
Location summary

These are the locations in the selection.

IDF Curve: 44° 27' 15" N, 80° 12' 14" W (44.454167,-80.204167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 27' 15" N, 80° 12' 14" W (44.454167,-80.204167)

Retrieved: Thu, 30 Nov 2023 22:21:06 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.5	27.2	31.6	37.2	41.3	45.4
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	116.4	71.7	54.0	33.3	20.5	12.6	5.9	3.6	2.2
5-yr	154.5	95.2	71.7	44.2	27.2	16.8	7.8	4.8	2.9
10-yr	179.5	110.6	83.3	51.3	31.6	19.5	9.0	5.6	3.4
25-yr	211.3	130.2	98.0	60.4	37.2	22.9	10.6	6.5	4.0
50-yr	234.6	144.5	108.8	67.0	41.3	25.4	11.8	7.3	4.5
100-yr	257.9	158.8	119.6	73.7	45.4	28.0	13.0	8.0	4.9

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.7	12.0	13.5	16.6	20.5	25.3	35.2	43.3	53.4
5-yr	12.9	15.9	17.9	22.1	27.2	33.5	46.6	57.5	70.8
10-yr	15.0	18.4	20.8	25.6	31.6	38.9	54.2	66.8	82.2
25-yr	17.6	21.7	24.5	30.2	37.2	45.8	63.8	78.6	96.8
50-yr	19.5	24.1	27.2	33.5	41.3	50.9	70.8	87.3	107.5
100-yr	21.5	26.5	29.9	36.9	45.4	55.9	77.9	95.9	118.2

Terms of Use

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 04.09.2024
By: HR

D.A. NAME **101**
D.A. AREA (ha) **186.74**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 101

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	22.8%	42.5
Edenvale Sandy Loam	EDV	B	23.7%	44.3
Granby Sandy Loam	GNY	B	13.5%	25.2
Harriston Loam	HAR	B	6.1%	11.4
Wiarton Loam	WIT	B	33.9%	63.3
Total Area				186.74

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.92	98	0	98	0.38	98	0.36	98	0.77	98	2.43	238.14
EDV	0	98	0	98	0.05	98	0.04	98	0	98	0.09	8.82
GNY	0.52	98	0	98	0.07	98	0.06	98	0	98	0.65	63.7
HAR	0	98	0	98	0.58	98	0.09	98	0	98	0.67	65.66
WIT	0.27	98	0	98	1.7	98	0.46	98	0	98	2.43	238.14
Subtotal Area	1.71		0		2.78		1.01		0.77			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.83	49	39.27	62	40.10	2475.41
EDV	1.68	60	0.00	65	0.00	50	0.67	59	41.87	74	44.22	3238.71
GNY	9.19	60	0.00	65	0.00	50	0.81	59	14.59	74	24.59	1678.85
HAR	0.00	60	0.00	65	0.62	50	10.07	59	0.00	74	10.69	625.13
WIT	8.09	60	0.00	65	1.73	50	21.52	59	29.53	74	60.87	4026.80
Subtotal Area	18.96		0.00		2.35		33.90		125.26			

Composite Area Calculations		
	Total Pervious Area	180.47
	Total Impervious Area	6.3
	% Impervious	3.4%
	Composite Curve Number	67.8
	Total Area Check	186.74

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	Edenvale Sandy RC	Edenvale Sandy Area	Granby Sandy RC	Granby Sandy Area	Harriston Loam RC	Harriston Loam Area	Wiarton Loam RC	Wiarton Loam Area	A*RC
Woodland	10	18.96	189.6	0.08	0	0.25	2	0.25	9	0.25	8	0.25	0	4.74
Meadow	8	0	0	0.10	0	0.28	0	0.28	0	0.28	0	0.28	2	0
Wetland	16	2.35	37.6	0.05	0	0.05	0	0.05	0	0.05	2	0.05	22	0.0865
Lawn	5	33.9	169.5	0.15	1	0.15	1	0.15	1	0.15	22	0.15	30	3.575
Cultivated	7	125	876.82	0.22	39	0.35	42	0.35	15	0.35	30	0.35	61	38.736
Impervious	2	6.27	12.54	0.95	2	0.95	0	0.95	1	0.95	1	0.95	0	3.648
Composite IA		186.74	6.8869	Composite Runoff Coefficient										0.272

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	3350	18.63	0.56%	2.7	0.20	4.62	3.10	3.10	2.12	1.42	3.16	2.12

Appropriate calculated time to	2.12	Appropriate Method:	Airport

Project Name: Nottawa
Project Number: 1953-6040
Date: 11.10.2023
By: HR

D.A. NAME **102**
D.A. AREA (ha) **29.8**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 102

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	29.8
Total Area				29.80

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG		98		98		98		98		98	0.00	0.00
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG		32		38		50		49	29.80	62	29.80	1847.60
0		60		65		50		59		74	0.00	0.00
0		60		65		50		59		74	0.00	0.00
0		60		65		50		59		74	0.00	0.00
0		60		65		50		59		74	0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		29.80			

Composite Area Calculations		
	Total Pervious Area	29.80
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	62.0
	Total Area Check	29.80

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.08	0	0.25	0	0.25	0	0.25	0	0.25	0	0
Meadow	8	0	0	0.10	0	0.28	0	0.28	0	0.28	0	0.28	0	0
Wetland	16	0	0	0.05	0	0.05	0	0.05	0	0.05	0	0.05	0	0
Lawn	5	0	0	0.15	0	0.15	0	0.15	0	0.15	0	0.15	0	0.000
Cultivated	7	30	208.6	0.22	30	0.35	0	0.35	0	0.35	0	0.35	0	6.556
Impervious	2	0	0	0.95	0	0.95	0	0.95	0	0.95	0	0.95	0	0.000
Composite IA		29.8	7	Composite Runoff Coefficient										0.220

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	982.22	1	0.10%	2.7	0.09	3.17	2.12	2.12	1.05	0.70	3.18	2.13

Appropriate calculated time to	2.13	Appropriate Method:	Airport

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME 2101 - External South
D.A. AREA (ha) 120.6

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment 2101 - External South

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	5.7%	6.9
Edenvale Sandy Loam	EDV	C	16.0%	19.4
Granby Sandy Loam	GNY	C	16.9%	20.4
Harriston Loam	HAR	B	9.4%	11.4
Wiarton Loam	WIT	B	51.9%	62.6
Total Area				120.60

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.20	98	0.00	98	0.00	98	0.00	98	0.00	98	0.20	19.60
EDV	0.00	98	0.00	98	0.05	98	0.04	98	0.00	98	0.09	8.82
GNY	0.52	98	0.00	98	0.07	98	0.06	98	0.00	98	0.65	63.7
HAR	0.00	98	0.00	98	0.58	98	0.09	98	0.00	98	0.67	65.66
WIT	0.27	98	0.00	98	1.70	98	0.46	98	0.00	98	2.43	238.14
Subtotal Area	0.99		0		2.4		0.65		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.00	49	6.72	62	6.72	416.64
EDV	0.00	73	0.00	76	0.00	50	0.67	79	18.59	82	19.26	1577.31
GNY	9.19	73	0.00	76	0.00	50	0.81	79	9.71	82	19.71	1531.08
HAR	0.00	60	0.00	65	0.62	50	10.07	69	0.00	74	10.69	725.83
WIT	8.09	60	0.00	65	1.73	50	20.83	69	29.53	74	60.18	4194.39
Subtotal Area	17.28		0.00		2.35		32.38		64.55			

Composite Area Calculations		
	Total Pervious Area	116.56
	Total Impervious Area	4.0
	% Impervious	3.3%
	Composite Curve Number	73.3
	Total Area Check	120.60

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
				Tioga Sandy		Edenvale Sandy		Granby Sandy		Harriston Loam		Wiarton Loam		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	17.28	172.8	0.08	0	0.35	0	0.35	9	0.25	8	0.25	0	5.239
Meadow	8	0	0	0.10	0	0.40	0	0.40	0	0.28	0	0.28	2	0
Wetland	16	2.35	37.6	0.05	0	0.05	0	0.05	0	0.05	2	0.05	21	0.0865
Lawn	5	32.38	161.9	0.15	0	0.45	1	0.45	1	0.15	21	0.15	30	3.791
Cultivated	7	65	451.85	0.22	7	0.55	19	0.55	10	0.35	30	0.35	60	27.379
Impervious	2	4.04	8.08	0.95	0	0.95	0	0.95	1	0.95	1	0.95	0	1.530
Composite IA		120.6	6.90075	Composite Runoff Coefficient										0.315

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	2255	15.63	0.69%	2.7	0.22	2.79	1.87	1.87	1.43	0.96	2.28	1.53

Appropriate calculated time to	1.53	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**2102-External West**
Project Number:	1953-6040	**D.A. AREA (ha)**	**1.35**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Interim Drainage Area: Catchment 2102-External West

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	1.35
				0
				0
				0
Total Area Check				1.35

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.51	98	0.00	98	0.08	98	0.00	98	0.00	50	0.59	57.82
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0.51		0		0.08		0.00		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.76	49	0.00	62	0.760	37.24
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		0.76		0			

Pervious Area Calculations	Total Pervious Area	0.76
	Composite Pervious Curve Number	49
Impervious Area Calculations	Total Directly Connected Area	0.6
	Total Indirectly Connected Area	0.000
	Total Impervious Area	0.590
	% X imp	43.7
	% T imp	43.7
	Total Area Check	1.35

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.760	3.800
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	1.05	95	0.013

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **2104 - Ext NW (East McKean)**
D.A. AREA (ha) **10.6**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment 2104 - Ext NW (East McKean)

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	10.6
Total Area				10.60

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG	0.61	98	0	98	0.34	98	0.55	98	0.00	98	1.50	147.00
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0.61		0		0.34		0.55		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG	0.00	32	0.00	38	0.00	50	9.10	49	0.00	62	9.10	445.90
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		9.10		0.00			

Composite Area Calculations		
	Total Pervious Area	9.10
	Total Impervious Area	1.5
	% Impervious	14.2%
	Composite Curve Number	55.9
	Total Area Check	10.60

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.08	0		0		0		0		0	0
Meadow	8	0	0	0.10	0		0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0		0	0
Lawn	5	9.1	45.5	0.15	9		0		0		0		0	1.365
Cultivated	7	0	0	0.22	0		0		0		0		0	0.000
Impervious	2	1.5	3	0.95	2		0		0		0		0	1.425
Composite IA		10.6	4.57547	Composite Runoff Coefficient										0.263

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	430	3	0.70%	2.7	0.23	0.53	0.35	0.35	0.35	0.23	1.06	0.71

Appropriate calculated time to	0.71	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**2105 - Ext NW (West McKean)**
Project Number:	1953-6040	**D.A. AREA (ha)**	**29.80**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Interim Drainage Area: Catchment 2105 - Ext NW (West McKean)

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	100	29.8
				0
				0
				0
Total Area Check				29.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	2.35	98	0	98	1.83	98	2.79	98	0.49	50	7.46	707.56
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	2.35		0		1.83		2.79		0.49			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	22.34	49	0.00	62	22.340	1094.66
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		22.34		0			

Pervious Area Calculations	Total Pervious Area	22.34
	Composite Pervious Curve Number	49
Impervious Area Calculations	Total Directly Connected Area	4.67
	Total Indirectly Connected Area	2.790
	Total Impervious Area	7.460
	% X imp	15.7
	% T imp	25.0
	Total Area Check	29.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	22.340	111.700
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	90	0.25
Impervious	2.0	0.36	446	0.013

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME Future West 1
D.A. AREA (ha) 11.13

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Future West 1

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	99.2	11.04
Edenvale Sandy Loam	EDV	C	0.8	0.09
Total Area				11.13

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	98	0.00	98	0.20	98	0.32	98	0.00	98	0.52	50.96
EDV	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0.2		0.32		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.00	49	10.52	62	10.52	652.24
EDV	0.00	73	0.00	76	0.00	50	0.00	79	0.09	82	0.09	7.38
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		10.61			

Composite Area Calculations		
	Total Pervious Area	10.61
	Total Impervious Area	0.5
	% Impervious	4.7%
	Composite Curve Number	63.8
	Total Area Check	11.13

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		Edenval		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.08	0	0.35	0		0		0	0
Meadow	8	0	0	0.10	0	0.40	0		0		0	0
Wetland	16	0	0	0.05	0	0.05	0		0		0	0
Lawn	5	0	0	0.15	0	0.45	0		0		0	0.000
Cultivated	7	11	74.27	0.22	11	0.55	0		0		0	2.364
Impervious	2	0.52	1.04	0.95	1	0.95	0		0		0	0.494
Composite IA		11.13	6.7664	Comp								0.257

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	110	1	0.91%	2.7	0.26	0.12	0.08	0.08	0.08	0.06	0.50	0.33

Appropriate calculated time to	0.33	Appropriate Method:	Airport

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Future West 2**
D.A. AREA (ha) **5.94**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Future West 2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	79.8	4.74
Edenvale Sandy Loam	EDV	C	20.2	1.20
Total Area				5.94

Impervious Landuses Present:

Soils		Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG		0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
EDV		0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area		0		0		0		0		0			

Pervious Landuses Present:

Soils		Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG		0.00	32	0.00	38	0.00	50	0.00	49	4.74	62	4.74	293.88
EDV		0.00	73	0.00	76	0.00	50	0.00	79	1.20	82	1.20	98.40
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
Subtotal Area		0.00		0.00		0.00		0.00		5.94			

Composite Area Calculations		
	Total Pervious Area	5.94
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	66.0
	Total Area Check	5.94

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		Edenval		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.08	0	0.35	0		0		0	0
Meadow	8	0	0	0.10	0	0.40	0		0		0	0
Wetland	16	0	0	0.05	0	0.05	0		0		0	0
Lawn	5	0	0	0.15	0	0.45	0		0		0	0.000
Cultivated	7	6	41.58	0.22	5	0.55	1		0		0	1.703
Impervious	2	0	0	0.95	0	0.95	0		0		0	0.000
Composite IA		5.94	7	Comp								0.287

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	80	0.5	0.63%	2.7	0.21	0.10	0.07	0.07	0.07	0.05	0.46	0.31

Appropriate calculated time to	0.31	Appropriate Method:	Airport

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Outparcel**
D.A. AREA (ha) **1.06**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Outparcel

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	1.1
Total Area				1.06

Impervious Landuses Present:

Soils		Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG		0.00	98	0.00	98	0.03	98	0.07	98	0.00	98	0.10	9.80
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area		0		0		0.03		0.07		0			

Pervious Landuses Present:

Soils		Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG		0.00	32	0.00	38	0.00	50	0.99	49	0.00	62	0.99	48.51
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
Subtotal Area		0.00		0.00		0.00		0.99		0.00			

Composite Area Calculations		
	Total Pervious Area	0.99
	Total Impervious Area	0.1
	% Impervious	6.6%
	Composite Curve Number	55.0
	Total Area Check	1.06

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		0		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.08	0		0		0		0	0
Meadow	8	0	0	0.10	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	0.99	4.95	0.15	1		0		0		0	0.149
Cultivated	7	0	0	0.22	0		0		0		0	0.000
Impervious	2	0.1	0.2	0.95	0		0		0		0	0.095
Composite IA		1.09	4.724771	Comp								0.230

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	40	1	2.50%	2.7	0.43	0.03	0.02	0.02	0.03	0.02	0.22	0.15

Appropriate calculated time to	0.15	Appropriate Method:	Airport

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Future East 1**
D.A. AREA (ha) **8.8**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Future East 1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Edenvale Sandy Loam	EDV	C	70.6%	6.21
Granby Sandy Loam	GNY	C	29.4%	2.59
Total Area				8.80

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
EDV	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
GNY	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
EDV	0.00	73	0.00	76	0.00	50	0.00	79	6.21	82	6.21	509.22
GNY	0.00	73	0.00	76	0.00	50	0.00	79	2.59	82	2.59	212.38
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		8.80			

Composite Area Calculations		
	Total Pervious Area	8.80
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	82.0
	Total Area Check	8.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA	Edenv RC	Edenv Area	Granby RC	Granby Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.35	0	0.35	0		0		0	0
Meadow	8	0	0	0.40	0	0.40	0		0		0	0
Wetland	16	0	0	0.05	0	0.05	0		0		0	0
Lawn	5	0	0	0.45	0	0.45	0		0		0	0.000
Cultivated	7	9	61.6	0.55	6	0.55	3		0		0	4.840
Impervious	2	0	0	0.95	0	0.95	0		0		0	0.000
Composite IA		8.8	7	Comp								0.550

Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Uplands Tc (hr)	Uplands Tp(hr)	Uplands TOTAL Tp (hr)	Bransby Williams Tc (hr)	Bransby Williams Tp(hr)	Airport Tc (hr)	Airport Tp(hr)
Overland	110	1	0.91%	2.7	0.26	0.12	0.08	0.08	0.09	0.06	0.32	0.22

Appropriate calculated time to	0.22	Appropriate Method:	Airport

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Phase 1 UNC**
D.A. AREA (ha) **2.34**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Phase 1 UNC

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Edenvale Sandy Loam	EDV	C	100.0%	2.3
Total Area				2.34

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
EDV	0.00	98	0.00	98	0.03	98	0.30	98	0.00	98	0.33	32.34
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0.03		0.3		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
EDV	0.00	73	0.00	76	0.00	50	2.04	79	0.00	82	2.04	161.16
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		2.04		0.00			

Composite Area Calculations		
	Total Pervious Area	2.04
	Total Impervious Area	0.3
	% Impervious	12.8%
	Composite Curve Number	82.7
	Total Area Check	2.34

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
Landuse	IA (mm)	Area (ha)	A * IA	Edenv RC	Edenv Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.35	0.00		0		0		0	0
Meadow	8	0	0	0.40	0.00		0		0		0	0
Wetland	16	0	0	0.05	0.00		0		0		0	0
Lawn	5	2.04	10.2	0.45	2.04		0		0		0	0.918
Cultivated	7	0	0	0.55	0.00		0		0		0	0.000
Impervious	2	0.33	0.66	0.95	0.33		0		0		0	0.314
Composite IA		2.37	4.58228	Comp								0.526

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	72	0.5	0.69%	2.7	0.23	0.09	0.06	0.06	0.07	0.05	0.30	0.20

Appropriate calculated time to	0.20	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**Phase 1 West**
Project Number:	1953-6040	**D.A. AREA (ha)**	**3.80**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Interim Drainage Area: Catchment Phase 1 West

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	71.1	2.7
Edenvale Sandy Loam	EDV	C	28.9	1.10
				0
				0
Total Area Check				3.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.68	98	0.13	98	0.09	98	0.55	98	0.00	50	1.5	142.1
EDV	0.33	98	0.06	98	0.05	98	0.22	98	0.00	50	0.7	64.7
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	1.01		0.19		0.14		0.77		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0	32	0	38	0	50	1.25	49	0	62	1.3	61.3
EDV	0	73	0	76	0	50	0.44	79	0	82	0.4	34.8
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		1.69		0			

Pervious Area Calculations	Total Pervious Area	1.69
	Composite Pervious Curve Number	56.8
Impervious Area Calculations	Total Directly Connected Area	1.3
	Total Indirectly Connected Area	0.770
	Total Impervious Area	2.110
	% X imp	35.3
	% T imp	55.5
	Total Area Check	3.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	1.690	8.450
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	2.4	159	0.013

Project Name:	Nottawa	**D.A. NAME**	**Phase 1 East**
Project Number:	1953-6040	**D.A. AREA (ha)**	**7.91**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Interim Drainage Area: Catchment Phase 1 East

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Edenvale Sandy Loam	EDV	C	79.0%	6.25
Granby Sandy Loam	GNY	C	21.0%	1.66
				0
				0
Total Area Check				7.91

Impervious Landuses Present:

Soils	Roadway Area (ha)	Roadway CN	Sidewalk Area (ha)	Sidewalk CN	Driveway Area (ha)	Driveway CN	Building Area (ha)	Building CN	SWMF Area (ha)	SWMF CN	Subtotals Area	Subtotals A*CN
EDV	1.07	98	0.19	98	0.43	98	2.32	98	0.00	50	4.01	392.98
GNY	0.30	98	0.06	98	0.14	98	0.54	98	0.00	50	1.04	101.92
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	1.37		0.25		0.57		2.86		0			

Pervious Landuses Present:

Soils	Woodland Area (ha)	Woodland CN	Meadow Area (ha)	Meadow CN	Wetland Area (ha)	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area (ha)	Cultivated CN	Subtotals Area	Subtotals A*CN
EDV	0.00	73	0.00	76	0.00	50	2.24	79	0.00	82	2.240	176.96
GNY	0.00	73	0.00	76	0.00	50	0.62	79	0.00	82	0.62	48.98
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		2.86		0			

Pervious Area Calculations	Total Pervious Area	2.86
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	2.2
	Total Indirectly Connected Area	2.860
	Total Impervious Area	5.050
	% X imp	27.7
	% T imp	63.8
	Total Area Check	7.91

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	2.860	14.300
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	1.64	230	0.013

Project Name:	Nottawa	**D.A. NAME**	**Pond**
Project Number:	1953-6040	**D.A. AREA (ha)**	**6.40**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Interim Drainage Areaa: Catchment Pond

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Edenvale Sandy Loam	EDV	C	100	6.4
				0
				0
				0
Total Area Check				6.4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	0.00	98	0.00	98	0.00	98	0.00	98	3.20	50	3.20	160.00
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0.00		3.2			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	0.00	73	0.00	76	0.00	50	3.20	79	0.00	82	3.200	252.80
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		3.20		0			

Pervious Area Calculations	Total Pervious Area	3.20
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	3.2
	Total Indirectly Connected Area	0.000
	Total Impervious Area	3.200
	% X imp	50.0
	% T imp	50.0
	Total Area Check	6.40

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.200	16.000
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	90	0.25
Impervious	2.0	0.36	207	0.013

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Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Central Channel**
D.A. AREA (ha) **5.36**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment Central Channel

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	18.7%	1.0
Edenvale Sandy Loam	EDV	C	81.3%	4.4
			0.0%	
			0.0%	
			0.0%	
Total Area				5.36

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
EDV	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.14	50	0.86	49	0.00	62	1.00	49.14
EDV	0.00	73	0.00	76	1.07	50	3.29	79	0.00	82	4.36	313.41
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		1.21		4.15		0.00			

Composite Area Calculations	Total Pervious Area	5.36
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	67.6
	Total Area Check	5.36

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		Edenval		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.25	0.00	0.35	0.00		0		0	0
Meadow	8	0	0	0.28	0.00	0.40	0.00		0		0	0
Wetland	16	1.21	19.36	0.05	0.14	0.05	1.07		0		0	0.0605
Lawn	5	4.15	20.75	0.15	0.86	0.45	3.29		0		0	1.610
Cultivated	7	0	0	0.35	0.00	0.55	0.00		0		0	0.000
Impervious	2	0	0	0.95	0.00	0.95	0.00		0		0	0.000
Composite IA		5.36	7.48321	Comp								0.312

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	920	0.9	0.10%	2.7	0.08	3.03	2.03	2.03	1.18	0.79	2.80	1.87

Appropriate calculated time to	1.87	Appropriate Method:	Airport

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME North Channel
D.A. AREA (ha) 1.45

Hydrologic Parameters: CALIB NASHYD Command
Post Development Interim Drainage Area: Catchment North Channel

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	66.9%	0.97
Edenvale Sandy Loam	EDV	C	33.1%	0.48
Total Area				1.45

Impervious Landuses Present:

Soils		Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG		0.02	98	0.00	98	0.00	98	0.00	98	0.00	98	0.02	1.96
EDV		0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
	0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area		0.02		0		0		0		0			

Pervious Landuses Present:

Soils		Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG		0.00	32	0.00	38	0.33	50	0.69	49	0.00	62	1.02	50.31
EDV		0.00	73	0.00	76	0.17	50	0.26	79	0.00	82	0.43	29.04
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
	0	0		0		0		0		0		0.00	0.00
Subtotal Area		0.00		0.00		0.50		0.95		0.00			

Composite Area Calculations		
	Total Pervious Area	1.45
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	56.1
	Total Area Check	1.45

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	Edenvale Sandy RC	Edenvale Sandy Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.08	0.00	0.35	0.00		0		0		0	0
Meadow	8	0	0	0.10	0.00	0.40	0.00		0		0		0	0
Wetland	16	0.5	8	0.05	0.33	0.05	0.17		0		0		0	0.025
Lawn	5	0.95	4.75	0.15	0.69	0.45	0.26		0		0		0	0.221
Cultivated	7	0	0	0.22	0.00	0.55	0.00		0		0		0	0.000
Impervious	2	0.02	0.04	0.95	0.02	0.95	0.00		0		0		0	0.019
Composite IA		1.47	8.70068	Composite Runoff Coefficient										0.182

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	980	1	0.10%	2.7	0.09	3.16	2.11	2.11	1.42	0.95	3.31	2.22

Appropriate calculated time to	2.22	Appropriate Method:	Airport

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **2101 - External South**
D.A. AREA (ha) **120.6**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment 2101 - External South

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	5.7%	6.9
Edenvale Sandy Loam	EDV	C	16.0%	19.4
Granby Sandy Loam	GNY	C	16.9%	20.4
Harriston Loam	HAR	B	9.4%	11.4
Wiarton Loam	WIT	B	51.9%	62.6
Total Area				120.60

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.20	98	0.00	98	0.00	98	0.00	98	0.00	98	0.20	19.60
EDV	0.00	98	0.00	98	0.05	98	0.04	98	0.00	98	0.09	8.82
GNY	0.52	98	0.00	98	0.07	98	0.06	98	0.00	98	0.65	63.7
HAR	0.00	98	0.00	98	0.58	98	0.09	98	0.00	98	0.67	65.66
WIT	0.27	98	0.00	98	1.70	98	0.46	98	0.00	98	2.43	238.14
Subtotal Area	0.99		0		2.4		0.65		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.00	49	6.72	62	6.72	416.64
EDV	0.00	73	0.00	76	0.00	50	0.67	79	18.59	82	19.26	1577.31
GNY	9.19	73	0.00	76	0.00	50	0.81	79	9.71	82	19.71	1531.08
HAR	0.00	60	0.00	65	0.62	50	10.07	69	0.00	74	10.69	725.83
WIT	8.09	60	0.00	65	1.73	50	20.83	69	29.53	74	60.18	4194.39
Subtotal Area	17.28		0.00		2.35		32.38		64.55			

Composite Area Calculations		
	Total Pervious Area	116.56
	Total Impervious Area	4.0
	% Impervious	3.3%
	Composite Curve Number	73.3
	Total Area Check	120.60

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
				Tioga Sandy		Edenvale Sandy		Granby Sandy		Harriston Loam		Wiarton Loam		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	17.28	172.8	0.08	0	0.35	0	0.35	9	0.25	8	0.25	0	5.239
Meadow	8	0	0	0.10	0	0.40	0	0.40	0	0.28	0	0.28	2	0
Wetland	16	2.35	37.6	0.05	0	0.05	0	0.05	0	0.05	2	0.05	21	0.0865
Lawn	5	32.38	161.9	0.15	0	0.45	1	0.45	1	0.15	21	0.15	30	3.791
Cultivated	7	65	451.85	0.22	7	0.55	19	0.55	10	0.35	30	0.35	60	27.379
Impervious	2	4.04	8.08	0.95	0	0.95	0	0.95	1	0.95	1	0.95	0	1.530
Composite IA		120.6	6.90075	Composite Runoff Coefficient										0.315

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	2255	15.63	0.69%	2.7	0.22	2.79	1.87	1.87	1.43	0.96	2.28	1.53

Appropriate calculated time to	1.53	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**2102-External West**
Project Number:	1953-6040	**D.A. AREA (ha)**	**1.35**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment 2102-External West

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	1.35
				0
				0
				0
Total Area Check				1.35

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.51	98	0.00	98	0.08	98	0.00	98	0.00	50	0.59	57.82
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0.51		0		0.08		0.00		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	0.76	49	0.00	62	0.760	37.24
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		0.76		0			

Pervious Area Calculations	Total Pervious Area	0.76
	Composite Pervious Curve Number	49
Impervious Area Calculations	Total Directly Connected Area	0.6
	Total Indirectly Connected Area	0.000
	Total Impervious Area	0.590
	% X imp	43.7
	% T imp	43.7
	Total Area Check	1.35

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.760	3.800
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	1.05	95	0.013

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **2104 - Ext NW (East McKean)**
D.A. AREA (ha) **10.6**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment 2104 - Ext NW (East McKean)

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	10.6
Total Area				10.60

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG	0.61	98	0	98	0.34	98	0.55	98	0.00	98	1.50	147.00
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0.61		0		0.34		0.55		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG	0.00	32	0.00	38	0.00	50	9.10	49	0.00	62	9.10	445.90
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		9.10		0.00			

Composite Area Calculations		
	Total Pervious Area	9.10
	Total Impervious Area	1.5
	% Impervious	14.2%
	Composite Curve Number	55.9
	Total Area Check	10.60

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.08	0		0		0		0		0	0
Meadow	8	0	0	0.10	0		0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0		0	0
Lawn	5	9.1	45.5	0.15	9		0		0		0		0	1.365
Cultivated	7	0	0	0.22	0		0		0		0		0	0.000
Impervious	2	1.5	3	0.95	2		0		0		0		0	1.425
Composite IA		10.6	4.57547	Composite Runoff Coefficient										0.263

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
	430	3	0.70%	2.7	0.23	0.53	0.35	0.35	0.35	0.23	1.06	0.71

Appropriate calculated time to	0.71	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**2105 - Ext NW (West McKean)**
Project Number:	1953-6040	**D.A. AREA (ha)**	**29.80**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment 2105 - Ext NW (West McKean)

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	100	29.8
				0
				0
				0
Total Area Check				29.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	2.35	98	0	98	1.83	98	2.79	98	0.49	50	7.46	707.56
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	2.35		0		1.83		2.79		0.49			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	22.34	49	0.00	62	22.340	1094.66
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		22.34		0			

Pervious Area Calculations	Total Pervious Area	22.34
	Composite Pervious Curve Number	49
Impervious Area Calculations	Total Directly Connected Area	4.67
	Total Indirectly Connected Area	2.790
	Total Impervious Area	7.460
	% X imp	15.7
	% T imp	25.0
	Total Area Check	29.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	22.340	111.700
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	90	0.25
Impervious	2.0	0.36	446	0.013

Project Name:	Nottawa	**D.A. NAME**	**Future West 1**
Project Number:	1953-6040	**D.A. AREA (ha)**	**11.13**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Future West 1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	99.2	11.04
Edenvale Sandy Loam	EDV	C	0.8	0.09
				0
				0
Total Area Check				11.13

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	7.13	98	0.00	98	0.00	98	0.00	98	0.00	50	7.1	698.5
EDV	0.06	98	0.00	98	0.00	98	0.00	98	0.00	50	0.1	5.7
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	7.186		0		0		0.00		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	3.91	49	0.00	62	3.9	191.7
EDV	0.00	73	0.00	76	0.00	50	0.03	79	0.00	82	0.0	2.5
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		3.94		0			

Pervious Area Calculations	Total Pervious Area	3.94	
	Composite Pervious Curve Number	49.2	
Impervious Area Calculations	Total Directly Connected Area	3.6	
	Total Indirectly Connected Area	3.593	
	Total Impervious Area	7.186	
	% X imp	32.3	
	% T imp	64.6	
	Total Area Check	11.13	

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.944	19.720
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	0.36	272	0.013

Project Name:	Nottawa	**D.A. NAME**	**Future West 2**
Project Number:	1953-6040	**D.A. AREA (ha)**	**5.94**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Future West 2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	79.8	4.74
Edenvale Sandy Loam	EDV	B	20.2	1.20
				0
				0
Total Area Check				5.94

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	3.11	98	0.00	98	0.00	98	0.00	98	0.00	50	3.1	305.1
EDV	0.79	98	0.00	98	0.00	98	0.00	98	0.00	50	0.8	77.2
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	3.901		0		0		0.00		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.00	50	1.63	49	0.00	62	1.6	79.7
EDV	0.00	73	0.00	76	0.00	50	0.41	79	0.00	82	0.4	32.5
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		2.04		0			

Pervious Area Calculations	Total Pervious Area	2.04
	Composite Pervious Curve Number	55.1
Impervious Area Calculations	Total Directly Connected Area	2.0
	Total Indirectly Connected Area	1.951
	Total Impervious Area	3.901
	% X imp	32.8
	% T imp	65.7
	Total Area Check	5.94

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	2.039	10.195
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	0.36	199	0.013

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Outparcel**
D.A. AREA (ha) **1.06**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment Outparcel

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	100.0%	1.1
Total Area				1.06

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG	0.00	98	0.00	98	0.03	98	0.07	98	0.00	98	0.10	9.80
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0.03		0.07		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG	0.00	32	0.00	38	0.00	50	0.99	49	0.00	62	0.99	48.51
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.99		0.00			

Composite Area Calculations		
	Total Pervious Area	0.99
	Total Impervious Area	0.1
	% Impervious	6.6%
	Composite Curve Number	55.0
	Total Area Check	1.06

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		0		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.08	0		0		0		0	0
Meadow	8	0	0	0.10	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	0.99	4.95	0.15	1		0		0		0	0.149
Cultivated	7	0	0	0.22	0		0		0		0	0.000
Impervious	2	0.1	0.2	0.95	0		0		0		0	0.095
Composite IA		1.09	4.724771	Comp								0.230

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	40	1	2.50%	2.7	0.43	0.03	0.02	0.02	0.03	0.02	0.22	0.15

Appropriate calculated time to	0.15	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**Future East 1**
Project Number:	1953-6040	**D.A. AREA (ha)**	**8.80**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Future East 1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Edenvale Sandy Loam	EDV	C	70.6%	6.21
Granby Sandy Loam	GNY	C	29.4%	2.59
				0
				0
Total Area Check				8.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	3.73	98	0.00	98	0.00	98	0.00	98	0.00	50	3.73	365.15
GNY	1.55	98	0.00	98	0.00	98	0.00	98	0.00	50	1.554	152.292
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	5.28		0		0		0.00		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	0.00	73	0.00	76	0.00	50	2.48	79	0.00	82	2.484	196.24
GNY	0.00	73	0.00	76	0.00	50	1.04	79	0.00	82	1.036	81.844
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		3.52		0			

Pervious Area Calculations	Total Pervious Area	3.52
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	2.640
	Total Indirectly Connected Area	2.640
	Total Impervious Area	5.280
	% X imp	30.0
	% T imp	60.0
	Total Area Check	8.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.520	17.600
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	0.36	242	0.013

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Phase 1 UNC**
D.A. AREA (ha) **2.34**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment Phase 1 UNC

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Edenvale Sandy Loam	EDV	C	100.0%	2.3
Total Area				2.34

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
EDV	0.00	98	0.00	98	0.03	98	0.30	98	0.00	98	0.33	32.34
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0.03		0.3		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
EDV	0.00	73	0.00	76	0.00	50	2.04	79	0.00	82	2.04	161.16
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.00		2.04		0.00			

Composite Area Calculations		
	Total Pervious Area	2.04
	Total Impervious Area	0.3
	% Impervious	12.8%
	Composite Curve Number	82.7
	Total Area Check	2.34

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
Landuse	IA (mm)	Area (ha)	A * IA	Edenv RC	Edenv Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.35	0.00		0		0		0	0
Meadow	8	0	0	0.40	0.00		0		0		0	0
Wetland	16	0	0	0.05	0.00		0		0		0	0
Lawn	5	2.04	10.2	0.45	2.04		0		0		0	0.918
Cultivated	7	0	0	0.55	0.00		0		0		0	0.000
Impervious	2	0.33	0.66	0.95	0.33		0		0		0	0.314
Composite IA		2.37	4.58228	Comp								0.526

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	72	0.5	0.69%	2.7	0.23	0.09	0.06	0.06	0.07	0.05	0.30	0.20

Appropriate calculated time to	0.20	Appropriate Method:	Airport

Project Name:	Nottawa	**D.A. NAME**	**Phase 1 West**
Project Number:	1953-6040	**D.A. AREA (ha)**	**3.80**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Phase 1 West

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Tioga Sandy Loam	TIG	A	71.1	2.7
Edenvale Sandy Loam	EDV	C	28.9	1.10
				0
				0
Total Area Check				3.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0.68	98	0.13	98	0.09	98	0.55	98	0.00	50	1.5	142.1
EDV	0.33	98	0.06	98	0.05	98	0.22	98	0.00	50	0.7	64.7
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	1.01		0.19		0.14		0.77		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
TIG	0	32	0	38	0	50	1.25	49	0	62	1.3	61.3
EDV	0	73	0	76	0	50	0.44	79	0	82	0.4	34.8
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		1.69		0			

Pervious Area Calculations	Total Pervious Area	1.69
	Composite Pervious Curve Number	56.8
Impervious Area Calculations	Total Directly Connected Area	1.3
	Total Indirectly Connected Area	0.770
	Total Impervious Area	2.110
	% X imp	35.3
	% T imp	55.5
	Total Area Check	3.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	1.690	8.450
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	2.4	159	0.013

Project Name:	Nottawa	**D.A. NAME**	**Phase 1 East**
Project Number:	1953-6040	**D.A. AREA (ha)**	**7.91**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Phase 1 East

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Edenvale Sandy Loam	EDV	C	79.0%	6.25
Granby Sandy Loam	GNY	C	21.0%	1.66
				0
				0
Total Area Check				7.91

Impervious Landuses Present:

Soils	Roadway Area (ha)	CN	Sidewalk Area (ha)	CN	Driveway Area (ha)	CN	Building Area (ha)	CN	SWMF Area (ha)	CN	Subtotals Area	A*CN
EDV	1.07	98	0.19	98	0.43	98	2.32	98	0.00	50	4.01	392.98
GNY	0.30	98	0.06	98	0.14	98	0.54	98	0.00	50	1.04	101.92
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	1.37		0.25		0.57		2.86		0			

Pervious Landuses Present:

Soils	Woodland Area (ha)	CN	Meadow Area (ha)	CN	Wetland Area (ha)	CN	Lawn Area (ha)	CN	Cultivated Area (ha)	CN	Subtotals Area	A*CN
EDV	0.00	73	0.00	76	0.00	50	2.24	79	0.00	82	2.240	176.96
GNY	0.00	73	0.00	76	0.00	50	0.62	79	0.00	82	0.62	48.98
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		2.86		0			

Pervious Area Calculations	Total Pervious Area	2.86
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	2.2
	Total Indirectly Connected Area	2.860
	Total Impervious Area	5.050
	% X imp	27.7
	% T imp	63.8
	Total Area Check	7.91

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	2.860	14.300
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	35	0.25
Impervious	2.0	1.64	230	0.013

Project Name:	Nottawa	**D.A. NAME**	**Pond**
Project Number:	1953-6040	**D.A. AREA (ha)**	**6.40**
Date:	2024.01.05		
By:	HR		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Full Buildout Drainage Area: Catchment Pond

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Edenvale Sandy Loam	EDV	C	100	6.4
				0
				0
				0
Total Area Check				6.4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	0.00	98	0.00	98	0.00	98	0.00	98	3.20	50	3.20	160.00
0	0	98	0	98	0	98	0	98	0	50	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0.00		3.2			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
EDV	0.00	73	0.00	76	0.00	50	3.20	79	0.00	82	3.200	252.80
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		3.20		0			

Pervious Area Calculations	Total Pervious Area	3.20
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	3.2
	Total Indirectly Connected Area	0.000
	Total Impervious Area	3.200
	% X imp	50.0
	% T imp	50.0
	Total Area Check	6.40

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.200	16.000
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	90	0.25
Impervious	2.0	0.36	207	0.013

CROZIER CONSULTING ENGINEERS

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME **Central Channel**
D.A. AREA (ha) **5.36**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment Central Channel

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	18.7%	1.0
Edenvale Sandy Loam	EDV	C	81.3%	4.4
			0.0%	
			0.0%	
			0.0%	
Total Area				5.36

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
EDV	0.00	98	0.00	98	0.00	98	0.00	98	0.00	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
TIG	0.00	32	0.00	38	0.14	50	0.86	49	0.00	62	1.00	49.14
EDV	0.00	73	0.00	76	1.07	50	3.29	79	0.00	82	4.36	313.41
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		1.21		4.15		0.00			

Composite Area Calculations	Total Pervious Area	5.36
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	67.6
	Total Area Check	5.36

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Tioga		Edenval		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.25	0.00	0.35	0.00		0		0	0
Meadow	8	0	0	0.28	0.00	0.40	0.00		0		0	0
Wetland	16	1.21	19.36	0.05	0.14	0.05	1.07		0		0	0.0605
Lawn	5	4.15	20.75	0.15	0.86	0.45	3.29		0		0	1.610
Cultivated	7	0	0	0.35	0.00	0.55	0.00		0		0	0.000
Impervious	2	0	0	0.95	0.00	0.95	0.00		0		0	0.000
Composite IA		5.36	7.48321	Comp								0.312

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	920	0.9	0.10%	2.7	0.08	3.03	2.03	2.03	1.18	0.79	2.80	1.87

Appropriate calculated time to	1.87	Appropriate Method:	Airport

Project Name: Nottawa
Project Number: 1953-6040
Date: 2024.01.05
By: HR

D.A. NAME North Channel
D.A. AREA (ha) 1.45

Hydrologic Parameters: CALIB NASHYD Command
Post Development Full Buildout Drainage Area: Catchment North Channel

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Tioga Sandy Loam	TIG	A	66.9%	0.97
Edenvale Sandy Loam	EDV	C	33.1%	0.48
Total Area				1.45

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
TIG	0.02	98	0.00	98	0.00	98	0.00	98	0.00	98	0.02	1.96
EDV	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
0	0	98	0	98	0	98	0	98	0	98	0	0
Subtotal Area	0.02		0		0		0		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
TIG	0.00	32	0.00	38	0.33	50	0.69	49	0.00	62	1.02	50.31
EDV	0.00	73	0.00	76	0.17	50	0.26	79	0.00	82	0.43	29.04
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0.00	0.00
Subtotal Area	0.00		0.00		0.50		0.95		0.00			

Composite Area Calculations		
	Total Pervious Area	1.45
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	56.1
	Total Area Check	1.45

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number										
Landuse	IA (mm)	Area (ha)	A * IA	Tioga Sandy RC	Tioga Sandy Area	Edenvale Sandy RC	Edenvale Sandy Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.08	0.00	0.35	0.00		0		0		0	0
Meadow	8	0	0	0.10	0.00	0.40	0.00		0		0		0	0
Wetland	16	0.5	8	0.05	0.33	0.05	0.17		0		0		0	0.025
Lawn	5	0.95	4.75	0.15	0.69	0.45	0.26		0		0		0	0.221
Cultivated	7	0	0	0.22	0.00	0.55	0.00		0		0		0	0.000
Impervious	2	0.02	0.04	0.95	0.02	0.95	0.00		0		0		0	0.019
Composite IA		1.47	8.70068	Composite Runoff Coefficient										0.182

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	980	1	0.10%	2.7	0.09	3.16	2.11	2.11	1.42	0.95	3.31	2.22

Appropriate calculated time to	2.22	Appropriate Method:	Airport

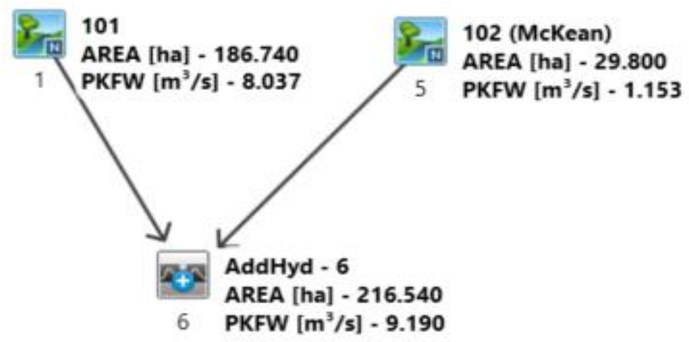
APPENDIX D

Hydrologic Modelling

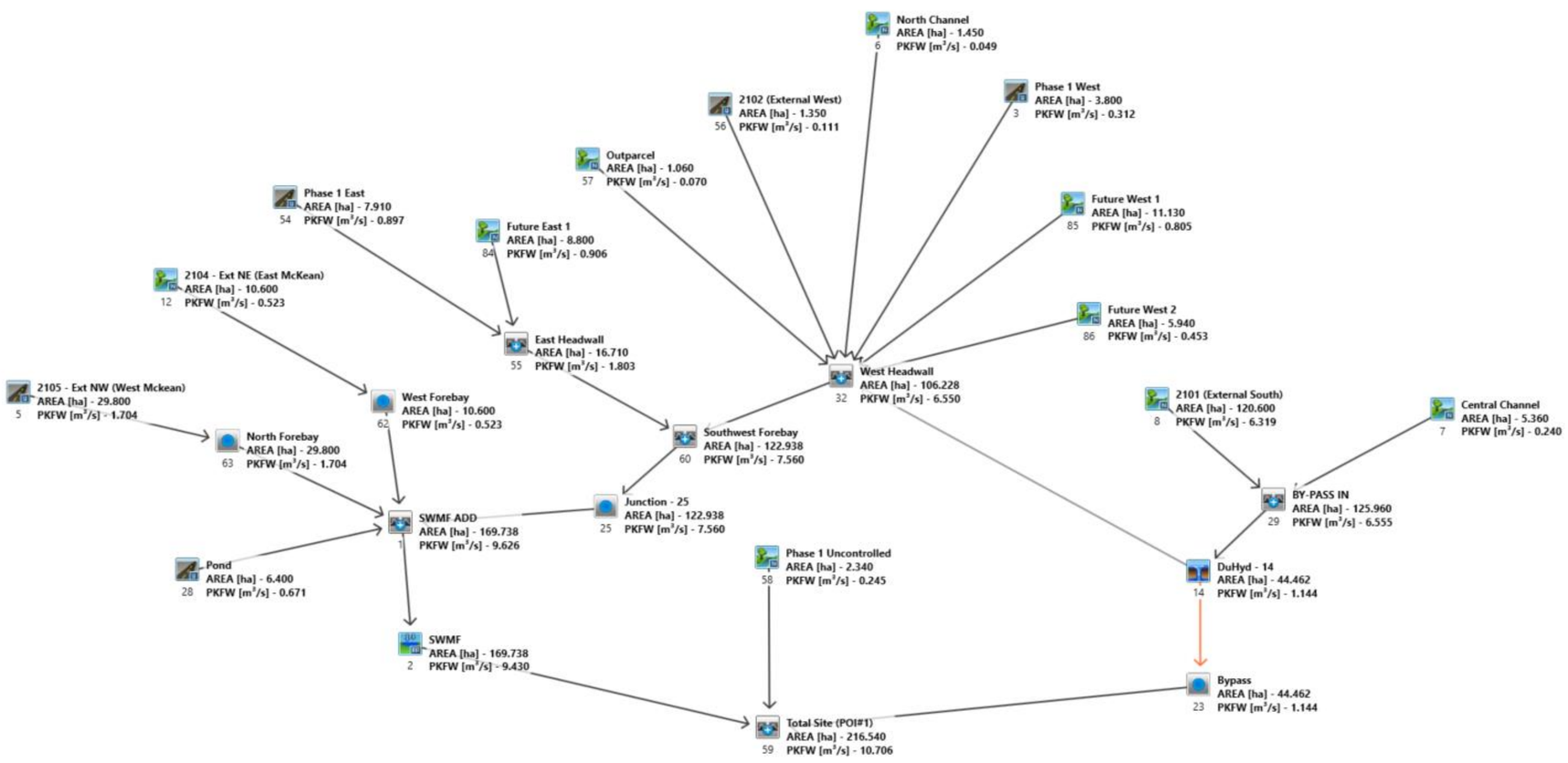
Project:	Nottawa Development
Project No.:	1953-6040
File:	Model Schematic
Design by:	HB
Date:	2024.04.09

Visual OTTHYMO 6.1 - Model Schematic

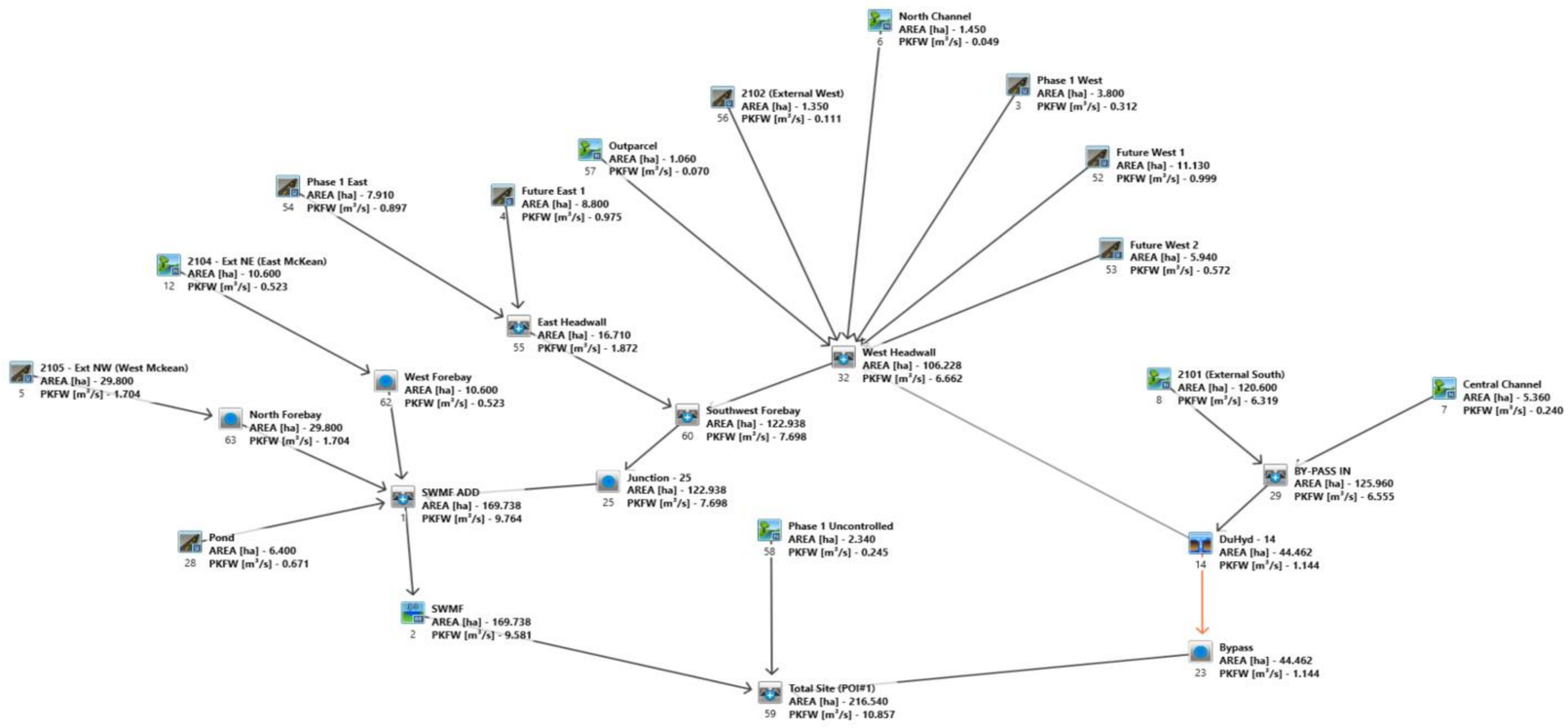
Pre-Development



Post-Development - Interim Conditions



Post-Development - Full Buildout Conditions



APPENDIX D1

Hydrologic Modelling – Pre-Development

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        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 04-09-2024                          TIME: 11:24:38

USER:



COMMENTS: _____________________________________________________________


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                0.00   15.00 |  3.00    3.00 |  6.00   43.00 |  9.00   13.00
                1.00   20.00 |  4.00    5.00 |  7.00   20.00 | 10.00   13.00
                2.00   10.00 |  5.00   20.00 |  8.00   23.00 | 11.00    8.00

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--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 186.74   Curve Number   (CN)= 67.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.89   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.12

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

    Unit Hyd Qpeak  (cms)=   3.364

    PEAK FLOW       (cms)=   8.037 (i)
    TIME TO PEAK    (hrs)=  10.000
    RUNOFF VOLUME    (mm)= 112.921
    TOTAL RAINFALL   (mm)= 193.000
    RUNOFF COEFFICIENT   =   0.585

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)=  29.80   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

    Unit Hyd Qpeak  (cms)=   0.534

    PEAK FLOW       (cms)=   1.153 (i)
    TIME TO PEAK    (hrs)=  10.083
    RUNOFF VOLUME    (mm)= 101.253
    TOTAL RAINFALL   (mm)= 193.000
    RUNOFF COEFFICIENT   =   0.525

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0006)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):   186.74   8.037    10.00   112.92
     + ID2= 2 (  0005):    29.80   1.153    10.08   101.25
       ==========================================================
       ID = 3 (  0006):   216.54   9.190    10.00   111.32

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

APPENDIX D2

Hydrologic Modelling – Post-Development Interim Conditions

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================================================================================
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\hbirrell\AppData\Local\Civica\VH5\852cc72f-b9c3-4bc0-93c6-8ba1df6dda66\9a4
e0a05-97db-48bb-928b-03b46c9ecafc\sce
  Summary filename:
C:\Users\hbirrell\AppData\Local\Civica\VH5\852cc72f-b9c3-4bc0-93c6-8ba1df6dda66\9a4
e0a05-97db-48bb-928b-03b46c9ecafc\sce


DATE: 04-09-2024                          TIME: 11:08:19

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
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  ************************************************
  ** SIMULATION : N. tim                        **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\hbirrell\AppD
|                  |              ata\Local\Temp\
```

```
|                  |              350f0681-977f-4afa-aad7-2119b05671fd\2b68f528
| Ptotal=193.00 mm |    Comments: tim
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00   15.00 |  3.00    3.00 |  6.00   43.00 |  9.00   13.00
               1.00   20.00 |  4.00    5.00 |  7.00   20.00 | 10.00   13.00
               2.00   10.00 |  5.00   20.00 |  8.00   23.00 | 11.00    8.00

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--------------------
| CALIB            |
| NASHYD   (  0043)|   Area    (ha)=   0.68   Curve Number   (CN)= 49.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
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               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Unit Hyd Qpeak  (cms)=   0.036

     PEAK FLOW       (cms)=   0.028 (i)
     TIME TO PEAK    (hrs)=   7.417
     RUNOFF VOLUME    (mm)=  78.127
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =   0.405

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0064)|   Area    (ha)=   1.35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  43.70   Dir. Conn.(%)=  43.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.76
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.05         2.00
     Length            (m)=      94.87        35.00
     Mannings n             =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        21.04
               over (min)        5.00        20.00
     Storage Coeff.  (min)=      3.42 (ii)   15.57 (ii)
     Unit Hyd. Tpeak (min)=      5.00        20.00
     Unit Hyd. peak  (cms)=      0.26         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.07         0.04         0.111 (iii)
     TIME TO PEAK    (hrs)=      6.83         7.00         7.00
     RUNOFF VOLUME    (mm)=    192.00        78.13       127.88
     TOTAL RAINFALL   (mm)=    193.00       193.00       193.00
     RUNOFF COEFFICIENT   =      0.99         0.40         0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0042)|
```

```
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0043):     0.68   0.028     7.42    78.13
     + ID2= 2 (  0064):     1.35   0.111     7.00   127.88
       ================================================
       ID = 3 (  0042):     2.03   0.135     7.00   111.22

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0045)|   Area    (ha)=   0.44   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.00   # of Linear Res.(N)= 3.00
------------------   U.H. Tp(hrs)=   1.08

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

    Unit Hyd Qpeak  (cms)=   3.011

    PEAK FLOW       (cms)=   6.319 (i)
    TIME TO PEAK    (hrs)=   9.250
    RUNOFF VOLUME    (mm)= 124.302
    TOTAL RAINFALL   (mm)= 193.000
    RUNOFF COEFFICIENT   =   0.644

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0046)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0045):     0.44   0.015     9.17    72.68
     + ID2= 2 (  0066):   120.60   6.319     9.25   124.30
       ================================================
       ID = 3 (  0046):   121.04   6.334     9.25   124.11

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| NASHYD   (  0066)|   Area    (ha)=   1.45   Curve Number   (CN)= 56.1
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.70   # of Linear Res.(N)= 3.00
------------------   U.H. Tp(hrs)=   2.22

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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  2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
  2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
  2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
  2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
  2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
  2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
  3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

Unit Hyd Qpeak  (cms)=   0.016

PEAK FLOW       (cms)=   0.015 (i)
TIME TO PEAK    (hrs)=   9.167
RUNOFF VOLUME    (mm)=  72.683
TOTAL RAINFALL   (mm)= 193.000
RUNOFF COEFFICIENT   =   0.377

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0066)|   Area    (ha)= 120.60   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
------------------   U.H. Tp(hrs)=   1.53

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
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                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

Unit Hyd Qpeak  (cms)=   0.025

PEAK FLOW       (cms)=   0.049 (i)
TIME TO PEAK    (hrs)=  10.333
RUNOFF VOLUME    (mm)=  88.667
TOTAL RAINFALL   (mm)= 193.000
RUNOFF COEFFICIENT   =   0.459

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| NASHYD   (  0007)|   Area    (ha)=   5.36   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.48   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.87

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

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    Unit Hyd Qpeak  (cms)=   0.109

    PEAK FLOW       (cms)=   0.240 (i)
    TIME TO PEAK    (hrs)=   9.667
    RUNOFF VOLUME    (mm)= 112.014
    TOTAL RAINFALL   (mm)= 193.000
    RUNOFF COEFFICIENT   =   0.580

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0008)|   Area    (ha)= 120.60   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.53

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

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    Unit Hyd Qpeak  (cms)=   3.011

    PEAK FLOW       (cms)=   6.319 (i)
    TIME TO PEAK    (hrs)=   9.250
    RUNOFF VOLUME    (mm)= 124.302
    TOTAL RAINFALL   (mm)= 193.000
    RUNOFF COEFFICIENT   =   0.644

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0007):     5.36   0.240     9.67   112.01
      + ID2= 2 (  0008):   120.60   6.319     9.25   124.30
        ========================================================
        ID = 3 (  0029):   125.96   6.555     9.25   123.78

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| DUHYD    (  0014)|
| Inlet Cap.= 1.144|
| #of Inlets=    1|
| Total(cms)=   1.1|      AREA     QPEAK     TPEAK    R.V.
--------------------       (ha)     (cms)     (hrs)    (mm)
    TOTAL HYD.(ID= 1): 125.96      6.55      9.25  123.78
    ========================================================
    MAJOR SYS.(ID= 2):  81.50      5.41      9.25  123.78
    MINOR SYS.(ID= 3):  44.46      1.14      3.42  123.78

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| NASHYD   (  0057)|   Area    (ha)=   1.06   Curve Number   (CN)= 55.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.72   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.15

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

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    Unit Hyd Qpeak  (cms)=   0.270

    PEAK FLOW       (cms)=   0.070 (i)
    TIME TO PEAK    (hrs)=   7.000
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     RUNOFF VOLUME    (mm)=  88.980
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =   0.461

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   3.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.50   Dir. Conn.(%)=  35.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.11         1.69
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.40         2.00
     Length            (m)=     159.16        35.00
     Mannings n           =      0.013        0.353

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
    hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        43.36
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.64 (ii)   33.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.25         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.16          0.312 (iii)
     TIME TO PEAK    (hrs)=       6.92         7.25          7.00
     RUNOFF VOLUME    (mm)=     192.00       111.44        139.88
     TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
     RUNOFF COEFFICIENT   =       0.99         0.58          0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  56.8    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0056)|   Area    (ha)=   1.35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  43.70   Dir. Conn.(%)=  43.70
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.76
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.05         2.00
     Length            (m)=      94.87        35.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
    hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        21.04
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.42 (ii)   15.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.26         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.04          0.111 (iii)
     TIME TO PEAK    (hrs)=       6.83         7.00          7.00
     RUNOFF VOLUME    (mm)=     192.00        78.13        127.88
     TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
     RUNOFF COEFFICIENT   =       0.99         0.40          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  49.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| NASHYD   (  0085)|   Area    (ha)=  11.13   Curve Number   (CN)= 63.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.77   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.33

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
    hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
```

2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 1.288

PEAK FLOW (cms)= 0.805 (i)
TIME TO PEAK (hrs)= 7.083
RUNOFF VOLUME (mm)= 104.957
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.544

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0086)	Area (ha)=	5.94	Curve Number (CN)= 66.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.31	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.732

PEAK FLOW (cms)= 0.453 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 109.150
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.566

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0014):	81.50	5.410	9.25	123.78
	+ ID2= 2 (0003):	3.80	0.312	7.00	139.88
	ID = 3 (0032):	85.30	5.578	9.00	124.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (0032):	85.30	5.578	9.00	124.50
	+ ID2= 2 (0056):	1.35	0.111	7.00	127.88
	ID = 1 (0032):	86.65	5.644	9.00	124.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0032):	86.65	5.644	9.00	124.55
	+ ID2= 2 (0057):	1.06	0.070	7.00	88.98
	ID = 3 (0032):	87.71	5.689	9.00	124.12

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (0032):	87.71	5.689	9.00	124.12
	+ ID2= 2 (0006):	1.45	0.049	10.33	88.67
	ID = 1 (0032):	89.16	5.732	9.00	123.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0032):	89.16	5.732	9.00	123.54
	+ ID2= 2 (0085):	11.13	0.805	7.08	104.96
	ID = 3 (0032):	100.29	6.259	9.00	121.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0032)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (0032):	100.29	6.259	9.00	121.48
	+ ID2= 2 (0086):	5.94	0.453	7.00	109.15
	ID = 1 (0032):	106.23	6.550	9.00	120.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0054)	Area (ha)=	7.91	
ID= 1 DT= 5.0 min	Total Imp(%)=	63.80	Dir. Conn.(%)= 27.70

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.05	2.86
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.64	2.00
Length	(m)=	229.64	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00

2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	81.13	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.08 (ii)	12.17 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.21	0.09	
			TOTALS
PEAK FLOW (cms)=	0.26	0.64	0.897 (iii)
TIME TO PEAK (hrs)=	6.92	7.00	7.00
RUNOFF VOLUME (mm)=	192.00	161.78	170.15
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.84	0.88

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 79.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0084)	Area (ha)=	8.80	Curve Number (CN)= 82.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.22	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 1.528

PEAK FLOW (cms)= 0.906 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 142.915
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.740

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0055)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0054):	7.91	0.897	7.00	170.15
+ ID2= 2 (0084):	8.80	0.906	7.00	142.91
ID = 3 (0055):	16.71	1.803	7.00	155.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0060)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0032):	106.23	6.550	9.00	120.79
+ ID2= 2 (0055):	16.71	1.803	7.00	155.81
ID = 3 (0060):	122.94	7.560	9.00	125.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Junction Command(0025)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 1(0060)	122.94	7.56	9.00	125.55
OUTFLOW: ID= 2(0025)	122.94	7.56	9.00	125.55

CALIB			
NASHYD (0012)	Area (ha)=	10.60	Curve Number (CN)= 55.9
ID= 1 DT= 5.0 min	Ia (mm)=	4.58	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.71	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.570

PEAK FLOW (cms)= 0.523 (i)
TIME TO PEAK (hrs)= 7.417
RUNOFF VOLUME (mm)= 91.310
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.473

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Junction Command(0062)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2(0012)	10.60	0.52	7.42	91.31
OUTFLOW: ID= 2(0062)	10.60	0.52	7.42	91.31

CALIB			
STANDHYD (0005)	Area (ha)=	29.80	
ID= 1 DT= 5.0 min	Total Imp(%)=	25.00	Dir. Conn.(%)= 15.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	7.45	22.35
Dep. Storage (mm)=	1.00	5.00

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Average Slope     (%)=       0.36         2.00
Length            (m)=     445.72        90.00
Mannings n            =      0.013        0.250

    NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

Max.Eff.Inten.(mm/hr)=      43.00        25.14
          over (min)        10.00        35.00
Storage Coeff.  (min)=      11.93 (ii)   31.87 (ii)
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    Unit Hyd. Tpeak (min)=      10.00        35.00
    Unit Hyd. peak  (cms)=       0.10         0.03
                                                    *TOTALS*
    PEAK FLOW       (cms)=       0.56         1.23          1.704 (iii)
    TIME TO PEAK    (hrs)=       7.00         7.25          7.08
    RUNOFF VOLUME    (mm)=     192.00        83.90         100.87
    TOTAL RAINFALL   (mm)=     193.00       193.00         193.00
    RUNOFF COEFFICIENT   =       0.99         0.43          0.52

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  -------------------------
  | Junction Command(0063) |
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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 2(  0005)   29.80     1.70    7.08   100.87
  OUTFLOW: ID= 2(  0063)   29.80     1.70    7.08   100.87

  --------------------------------------------------------------------------------
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| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   6.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
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                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.20         3.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     206.56        90.00
    Mannings n            =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
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 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

Max.Eff.Inten.(mm/hr)=      43.00        36.31
          over (min)         5.00        25.00
Storage Coeff.  (min)=       5.53 (ii)   22.75 (ii)
Unit Hyd. Tpeak (min)=       5.00        25.00
Unit Hyd. peak  (cms)=       0.20         0.05
                                                *TOTALS*
PEAK FLOW       (cms)=       0.38         0.29          0.671 (iii)
TIME TO PEAK    (hrs)=       7.00         7.08          7.00
RUNOFF VOLUME    (mm)=     192.00       138.32        165.16
TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
RUNOFF COEFFICIENT   =       0.99         0.72          0.86


  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
       CN*  =  79.0    Ia = Dep. Storage  (Above)
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0025):   122.94   7.560     9.00   125.55
     + ID2= 2 (  0028):     6.40   0.671     7.00   165.16
       ================================================
       ID = 3 (  0001):   129.34   7.946     9.00   127.51

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):   129.34   7.946     9.00   127.51
     + ID2= 2 (  0062):    10.60   0.523     7.42    91.31
       ================================================
       ID = 1 (  0001):   139.94   8.374     9.00   124.77

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):   139.94   8.374     9.00   124.77
     + ID2= 2 (  0063):    29.80   1.704     7.08   100.87
       ================================================
       ID = 3 (  0001):   169.74   9.626     9.00   120.57

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   1.2150     2.9020
                         0.0080     0.2920    |   1.6810     3.2500
                         0.0200     0.5940    |   2.1950     3.6030
                         0.0270     0.9050    |   2.7540     3.9590
```

	0.0320	1.2250	3.3540	4.3200	
	0.0370	1.5520	3.9930	4.6850	
	0.1870	1.8830	6.1570	5.0540	
	0.4560	2.2190	9.6890	5.4270	
	0.8040	2.5580	14.2220	5.8050	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	169.738	9.626	9.00	120.57
OUTFLOW: ID= 1 (0002)	169.738	9.430	9.08	118.41

PEAK FLOW REDUCTION [Qout/Qin](%)= 97.97
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 5.3999

Junction Command(0023)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 9(0014)	44.46	1.14	3.42	123.78
OUTFLOW: ID= 2(0023)	44.46	1.14	3.42	123.78

CALIB
NASHYD (0058) | ID= 1 DT= 5.0 min

Area (ha)= 2.34 Curve Number (CN)= 82.7
Ia (mm)= 4.58 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.447

PEAK FLOW (cms)= 0.245 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 146.694
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.760

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0059)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0002):	169.74	9.430	9.08	118.41
+ ID2= 2 (0023):	44.46	1.144	3.42	123.78
ID = 3 (0059):	214.20	10.575	9.08	119.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0059)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0059):	214.20	10.575	9.08	119.52
+ ID2= 2 (0058):	2.34	0.245	7.00	146.69
ID = 1 (0059):	216.54	10.706	9.08	119.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0075) | ID= 1 DT= 5.0 min

Area (ha)= 5.36 Curve Number (CN)= 67.6
Ia (mm)= 7.48 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 1.87

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.109

PEAK FLOW (cms)= 0.240 (i)
TIME TO PEAK (hrs)= 9.667
RUNOFF VOLUME (mm)= 112.014
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.580

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0076) | ID= 1 DT= 5.0 min

Area (ha)= 120.60 Curve Number (CN)= 73.3
Ia (mm)= 6.90 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 1.53

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00

1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 3.011

PEAK FLOW (cms)= 6.319 (i)
TIME TO PEAK (hrs)= 9.250
RUNOFF VOLUME (mm)= 124.302
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.644

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (0081)	Area (ha)=	1.06	Curve Number (CN)= 55.0				
ID= 1 DT= 5.0 min	Ia (mm)=	4.72	# of Linear Res.(N)= 3.00				
	U.H. Tp(hrs)=	0.15					

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.270

PEAK FLOW (cms)= 0.070 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 88.980
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.461

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (0082)	Area (ha)=	1.45	Curve Number (CN)= 56.1				
ID= 1 DT= 5.0 min	Ia (mm)=	8.70	# of Linear Res.(N)= 3.00				
	U.H. Tp(hrs)=	2.22					

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.025

PEAK FLOW (cms)= 0.049 (i)
TIME TO PEAK (hrs)= 10.333
RUNOFF VOLUME (mm)= 88.667
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.459

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
STANDHYD (0077)	Area (ha)=	5.94					
ID= 1 DT= 5.0 min	Total Imp(%)=	65.70	Dir. Conn.(%)=	32.80			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.90	2.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	0.36	2.00
Length	(m)=	199.00	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00

2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	63.99	
over (min)	5.00	20.00	
Storage Coeff. (min)=	7.35 (ii)	15.14 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.17	0.07	
			TOTALS
PEAK FLOW (cms)=	0.23	0.34	0.572 (iii)
TIME TO PEAK (hrs)=	7.00	7.00	7.00
RUNOFF VOLUME (mm)=	192.00	122.50	145.29
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.63	0.75

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.1 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0078)	Area (ha)=	11.13	
ID= 1 DT= 5.0 min	Total Imp(%)=	64.60	Dir. Conn.(%)= 32.30

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.19	3.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	0.36	2.00
Length	(m)=	272.40	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	56.87	
over (min)	10.00	20.00	
Storage Coeff. (min)=	8.88 (ii)	17.04 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.12	0.06	
			TOTALS
PEAK FLOW (cms)=	0.43	0.57	0.999 (iii)
TIME TO PEAK (hrs)=	7.00	7.00	7.00
RUNOFF VOLUME (mm)=	192.00	110.67	136.94
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.57	0.71

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 49.2 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0079)	Area (ha)=	3.80	
ID= 1 DT= 5.0 min	Total Imp(%)=	55.50	Dir. Conn.(%)= 35.30

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.11	1.69
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	2.40	2.00
Length	(m)=	159.16	35.00
Mannings n	=	0.013	0.353

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	43.36	
over (min)	5.00	15.00	
Storage Coeff. (min)=	3.64 (ii)	33.30 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.25	0.03	
			TOTALS
PEAK FLOW (cms)=	0.16	0.16	0.312 (iii)
TIME TO PEAK (hrs)=	6.92	7.25	7.00
RUNOFF VOLUME (mm)=	192.00	111.44	139.88
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.58	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 56.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0080)	Area (ha)=	1.35	
ID= 1 DT= 5.0 min	Total Imp(%)=	43.70	Dir. Conn.(%)= 43.70

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.59	0.76
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.05	2.00
Length	(m)=	94.87	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00

0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	21.04	
over (min)	5.00	20.00	
Storage Coeff. (min)=	3.42 (ii)	15.57 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.07	
			TOTALS
PEAK FLOW (cms)=	0.07	0.04	0.111 (iii)
TIME TO PEAK (hrs)=	6.83	7.00	7.00
RUNOFF VOLUME (mm)=	192.00	78.13	127.88
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.40	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 49.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0075):		5.36	0.240	9.67	112.01
+ ID2= 2 (0076):		120.60	6.319	9.25	124.30
ID = 3 (0083):		125.96	6.555	9.25	123.78

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0083):		125.96	6.555	9.25	123.78
+ ID2= 2 (0077):		5.94	0.572	7.00	145.29
ID = 1 (0083):		131.90	6.853	9.00	124.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0083):		131.90	6.853	9.00	124.75
+ ID2= 2 (0078):		11.13	0.999	7.00	136.94
ID = 3 (0083):		143.03	7.450	9.00	125.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0083):		143.03	7.450	9.00	125.70
+ ID2= 2 (0079):		3.80	0.312	7.00	139.88
ID = 1 (0083):		146.83	7.653	9.00	126.06

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0083):		146.83	7.653	9.00	126.06
+ ID2= 2 (0080):		1.35	0.111	7.00	127.88
ID = 3 (0083):		148.18	7.719	9.00	126.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0083):		148.18	7.719	9.00	126.08
+ ID2= 2 (0081):		1.06	0.070	7.00	88.98
ID = 1 (0083):		149.24	7.764	9.00	125.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0083)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0083):		149.24	7.764	9.00	125.82
+ ID2= 2 (0082):		1.45	0.049	10.33	88.67
ID = 3 (0083):		150.69	7.807	9.00	125.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

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APPENDIX D3

Hydrologic Modelling – Post-Development Full-Buildout Conditions

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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\hbirrell\AppData\Local\Civica\VH5\852cc72f-b9c3-4bc0-93c6-8ba1df6dda66\f6a
2b369-b6d1-451b-948c-6c61748852eb\sce
  Summary filename:
C:\Users\hbirrell\AppData\Local\Civica\VH5\852cc72f-b9c3-4bc0-93c6-8ba1df6dda66\f6a
2b369-b6d1-451b-948c-6c61748852eb\sce


DATE: 04-09-2024                          TIME: 11:12:25

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  ************************************************
  ** SIMULATION : H. 2YR CHI - 4HR               **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 358.659
| Ptotal= 31.10 mm |                          B=   0.000
--------------------                          C=   0.699
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step   = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.62	1.00	12.38	2.00	5.17	3.00	3.01
0.17	2.92	1.17	71.73	2.17	4.57	3.17	2.84
0.33	3.33	1.33	15.19	2.33	4.11	3.33	2.68
0.50	3.93	1.50	9.58	2.50	3.75	3.50	2.55
0.67	4.86	1.67	7.30	2.67	3.46	3.67	2.43
0.83	6.65	1.83	6.02	2.83	3.22	3.83	2.33

```
--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0043)|   Area    (ha)=   0.68   Curve Number   (CN)= 49.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.73

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

```
    Unit Hyd Qpeak  (cms)=   0.036

    PEAK FLOW       (cms)=   0.002 (i)
    TIME TO PEAK    (hrs)=   2.333
    RUNOFF VOLUME    (mm)=   2.344
    TOTAL RAINFALL   (mm)=  31.104
    RUNOFF COEFFICIENT   =   0.075
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0064)|   Area    (ha)=   1.35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  43.70   Dir. Conn.(%)=  43.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.76
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.05         2.00
     Length            (m)=      94.87        35.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

```
    Max.Eff.Inten.(mm/hr)=      71.73         1.92
                over (min)        5.00        35.00
    Storage Coeff.  (min)=       2.79 (ii)   34.46 (ii)
    Unit Hyd. Tpeak (min)=       5.00        35.00
    Unit Hyd. peak  (cms)=       0.28         0.03
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.11         0.00         0.115 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.92          1.33
    RUNOFF VOLUME    (mm)=      30.10         2.35         14.46
    TOTAL RAINFALL   (mm)=      31.10        31.10         31.10
    RUNOFF COEFFICIENT   =       0.97         0.08          0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
```

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0042)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0043):     0.68   0.002     2.33     2.34
     + ID2= 2 (  0064):     1.35   0.115     1.33    14.46
       ==================================================
       ID = 3 (  0042):     2.03   0.115     1.33    10.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0045)|   Area    (ha)=   0.44   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  16.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   1.08

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

```
    Unit Hyd Qpeak  (cms)=   0.016

    PEAK FLOW       (cms)=   0.000 (i)
    TIME TO PEAK    (hrs)=   4.083
    RUNOFF VOLUME    (mm)=   0.842
    TOTAL RAINFALL   (mm)=  31.104
    RUNOFF COEFFICIENT   =   0.027
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB								
NASHYD (0066)	Area (ha)= 120.60	Curve Number (CN)= 73.3						
ID= 1 DT= 5.0 min	Ia (mm)= 6.90	# of Linear Res.(N)= 3.00						
	U.H. Tp(hrs)= 1.53							

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 3.011

PEAK FLOW (cms)= 0.441 (i)
TIME TO PEAK (hrs)= 3.750
RUNOFF VOLUME (mm)= 5.019
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.161

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0046)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0045):	0.44	0.000	4.08	0.84
+ ID2= 2 (0066):	120.60	0.441	3.75	5.02
ID = 3 (0046):	121.04	0.441	3.75	5.00

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB								
NASHYD (0006)	Area (ha)= 1.45	Curve Number (CN)= 56.1						
ID= 1 DT= 5.0 min	Ia (mm)= 8.70	# of Linear Res.(N)= 3.00						
	U.H. Tp(hrs)= 2.22							

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 0.025

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 4.667
RUNOFF VOLUME (mm)= 2.266
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.073

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB								
NASHYD (0007)	Area (ha)= 5.36	Curve Number (CN)= 67.6						
ID= 1 DT= 5.0 min	Ia (mm)= 7.48	# of Linear Res.(N)= 3.00						
	U.H. Tp(hrs)= 1.87							

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

PEAK FLOW (cms)= 0.441 (i)
TIME TO PEAK (hrs)= 3.750
RUNOFF VOLUME (mm)= 5.019
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.161

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0029)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0007):	5.36	0.013	4.25	3.84
+ ID2= 2 (0008):	120.60	0.441	3.75	5.02
ID = 3 (0029):	125.96	0.454	3.75	4.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

DUHYD (0014)				
Inlet Cap.= 1.144				
#of Inlets= 1				
Total(cms)= 1.1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD.(ID= 1):	125.96	0.45	3.75	4.97
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	125.96	0.45	3.75	4.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB								
NASHYD (0008)	Area (ha)= 120.60	Curve Number (CN)= 73.3						
ID= 1 DT= 5.0 min	Ia (mm)= 6.90	# of Linear Res.(N)= 3.00						
	U.H. Tp(hrs)= 1.53							

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 3.011

CALIB								
NASHYD (0057)	Area (ha)= 1.06	Curve Number (CN)= 55.0						
ID= 1 DT= 5.0 min	Ia (mm)= 4.72	# of Linear Res.(N)= 3.00						
	U.H. Tp(hrs)= 0.15							

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84

0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 0.270

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 2.955
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.095

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0003)	Area (ha)= 3.80
ID= 1 DT= 5.0 min	Total Imp(%)= 55.50 Dir. Conn.(%)= 35.30

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.11	1.69
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.40	2.00
Length (m)=	159.16	35.00
Mannings n =	0.013	0.353

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

			TOTALS
Max.Eff.Inten.(mm/hr)=	71.73	7.28	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.97 (ii)	33.30 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.28	0.03	
PEAK FLOW (cms)=	0.26	0.02	0.262 (iii)
TIME TO PEAK (hrs)=	1.33	1.83	1.33
RUNOFF VOLUME (mm)=	30.10	4.77	13.71
TOTAL RAINFALL (mm)=	31.10	31.10	31.10
RUNOFF COEFFICIENT =	0.97	0.15	0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 56.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0052)	Area (ha)= 11.13
ID= 1 DT= 5.0 min	Total Imp(%)= 64.60 Dir. Conn.(%)= 32.30

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	7.19	3.94
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.36	2.00
Length (m)=	272.40	35.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

			TOTALS
Max.Eff.Inten.(mm/hr)=	71.73	13.24	
over (min)	5.00	25.00	
Storage Coeff. (min)=	7.23 (ii)	21.86 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.17	0.05	
PEAK FLOW (cms)=	0.56	0.07	0.581 (iii)
TIME TO PEAK (hrs)=	1.33	1.67	1.33
RUNOFF VOLUME (mm)=	30.10	4.90	13.04
TOTAL RAINFALL (mm)=	31.10	31.10	31.10
RUNOFF COEFFICIENT =	0.97	0.16	0.42

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 49.2 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0053)	Area (ha)= 5.94
ID= 1 DT= 5.0 min	Total Imp(%)= 65.70 Dir. Conn.(%)= 32.80

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.90	2.04
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.36	2.00
Length (m)=	199.00	35.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

			TOTALS
Max.Eff.Inten.(mm/hr)=	71.73	17.12	
over (min)	5.00	20.00	
Storage Coeff. (min)=	5.99 (ii)	19.19 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.19	0.06	
PEAK FLOW (cms)=	0.33	0.05	0.343 (iii)
TIME TO PEAK (hrs)=	1.33	1.58	1.33
RUNOFF VOLUME (mm)=	30.10	6.07	13.95
TOTAL RAINFALL (mm)=	31.10	31.10	31.10
RUNOFF COEFFICIENT =	0.97	0.20	0.45

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.1 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0056)	Area (ha)= 1.35
ID= 1 DT= 5.0 min	Total Imp(%)= 43.70 Dir. Conn.(%)= 43.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.59	0.76
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.05	2.00
Length (m)=	94.87	35.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55

```
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

     Max.Eff.Inten.(mm/hr)=      71.73         1.92
               over (min)        5.00        35.00
     Storage Coeff.  (min)=      2.79 (ii)   34.46 (ii)
     Unit Hyd. Tpeak (min)=      5.00        35.00
     Unit Hyd. peak  (cms)=      0.28         0.03
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.11         0.00          0.115 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.92           1.33
     RUNOFF VOLUME    (mm)=     30.10         2.35          14.46
     TOTAL RAINFALL   (mm)=     31.10        31.10          31.10
     RUNOFF COEFFICIENT   =      0.97         0.08           0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0032)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0014 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0032 = HYDROGRAPH 0003
       ID1= 1 (  0014):     0.00   0.000     0.00     0.00
     + ID2= 2 (  0003):     3.80   0.262     1.33    13.71
       ====================================================
       ID = 3 (  0032):     3.80   0.262     1.33    13.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0032)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0032):     3.80   0.262     1.33    13.71
     + ID2= 2 (  0052):    11.13   0.581     1.33    13.04
       ====================================================
       ID = 1 (  0032):    14.93   0.843     1.33    13.21
```

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     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0032)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0032):    14.93   0.843     1.33    13.21
     + ID2= 2 (  0053):     5.94   0.343     1.33    13.95
       ====================================================
       ID = 3 (  0032):    20.87   1.186     1.33    13.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0032)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0032):    20.87   1.186     1.33    13.42
     + ID2= 2 (  0056):     1.35   0.115     1.33    14.46
       ====================================================
       ID = 1 (  0032):    22.22   1.301     1.33    13.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0032)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0032):    22.22   1.301     1.33    13.48
     + ID2= 2 (  0057):     1.06   0.009     1.42     2.95
       ====================================================
       ID = 3 (  0032):    23.28   1.308     1.33    13.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0032)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0032):    23.28   1.308     1.33    13.01
     + ID2= 2 (  0006):     1.45   0.002     4.67     2.27
       ====================================================
       ID = 1 (  0032):    24.73   1.308     1.33    12.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   8.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  30.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.28         3.52
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       0.36         2.00
     Length            (m)=     242.21        35.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
               0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
               0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
               0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
               0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
               0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
               0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
               0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
               0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
               0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
               0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
               1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

     Max.Eff.Inten.(mm/hr)=      71.73        42.51
               over (min)        5.00        20.00
     Storage Coeff.  (min)=      6.74 (ii)   15.91 (ii)
     Unit Hyd. Tpeak (min)=      5.00        20.00
     Unit Hyd. peak  (cms)=      0.18         0.07
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.42         0.18          0.488 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.58           1.33
     RUNOFF VOLUME    (mm)=     30.10        11.94          17.39
     TOTAL RAINFALL   (mm)=     31.10        31.10          31.10
     RUNOFF COEFFICIENT   =      0.97         0.38           0.56


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  0054)|   Area    (ha)=   7.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  63.80   Dir. Conn.(%)=  27.70
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.05         2.86
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.64         2.00
     Length            (m)=     229.64        35.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
               0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
               0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
               0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
               0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
               0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
               0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
               0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
               0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
               0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
               0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
               1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

     Max.Eff.Inten.(mm/hr)=      71.73        54.64
               over (min)        5.00        15.00
     Storage Coeff.  (min)=      4.14 (ii)   12.44 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.24         0.08
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.40         0.23          0.517 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=     30.10        13.11          17.81
     TOTAL RAINFALL   (mm)=     31.10        31.10          31.10
     RUNOFF COEFFICIENT   =      0.97         0.42           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0055)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     8.80   0.488     1.33    17.39
     + ID2= 2 (  0054):     7.91   0.517     1.33    17.81
       ================================================
       ID = 3 (  0055):    16.71   1.005     1.33    17.59

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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-------------------
| ADD HYD  (  0060)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0032):    24.73   1.308     1.33    12.38
     + ID2= 2 (  0055):    16.71   1.005     1.33    17.59
       ================================================
       ID = 3 (  0060):    41.44   2.313     1.33    14.48

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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  | Junction Command(0025) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0060)   41.44     2.31    1.33    14.48
  OUTFLOW: ID= 2(  0025)   41.44     2.31    1.33    14.48

  --------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0012)|   Area    (ha)=  10.60   Curve Number   (CN)= 55.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.58   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.71

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
               0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
               0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
               0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
               0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
               0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
               0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
               0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
               0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
               0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
               0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
               1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Max.Eff.Inten.(mm/hr)=      71.73         1.89
              over (min)        10.00        70.00
    Storage Coeff.  (min)=       9.72 (ii)   65.85 (ii)
    Unit Hyd. Tpeak (min)=      10.00        70.00
    Unit Hyd. peak  (cms)=       0.11         0.02
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.57         0.06          0.576 (iii)
    TIME TO PEAK    (hrs)=       1.42         2.67           1.42
    RUNOFF VOLUME    (mm)=      30.10         2.71           7.01
    TOTAL RAINFALL   (mm)=      31.10        31.10          31.10
    RUNOFF COEFFICIENT   =       0.97         0.09           0.23

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  --------------------------
  | Junction Command(0063) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 2(  0005)   29.80     0.58    1.42     7.01
  OUTFLOW: ID= 2(  0063)   29.80     0.58    1.42     7.01

  --------------------------------------------------------------------------------
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
               0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
               0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
               0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
               0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
               0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
               0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
               0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
               0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
               0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
               0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
               1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Unit Hyd Qpeak  (cms)=   0.570

    PEAK FLOW       (cms)=   0.037 (i)
    TIME TO PEAK    (hrs)=   2.333
    RUNOFF VOLUME    (mm)=   3.100
    TOTAL RAINFALL   (mm)=  31.104
    RUNOFF COEFFICIENT   =   0.100

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  --------------------------
  | Junction Command(0062) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 2(  0012)   10.60     0.04    2.33     3.10
  OUTFLOW: ID= 2(  0062)   10.60     0.04    2.33     3.10

  --------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=  29.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.00   Dir. Conn.(%)=  15.70
-------------------

                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       7.45        22.35
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       0.36         2.00
    Length            (m)=     445.72        90.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


-------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   6.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------

                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.20         3.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     206.56        90.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
               0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
               0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
               0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
               0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
               0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
               0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
               0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
               0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
               0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
               0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
               1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Max.Eff.Inten.(mm/hr)=      71.73         6.34
              over (min)         5.00        40.00
    Storage Coeff.  (min)=       4.51 (ii)   39.12 (ii)
    Unit Hyd. Tpeak (min)=       5.00        40.00
    Unit Hyd. peak  (cms)=       0.23         0.03
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.58         0.03          0.583 (iii)
    TIME TO PEAK    (hrs)=       1.33         2.00           1.33
    RUNOFF VOLUME    (mm)=      30.10         7.28          18.69
    TOTAL RAINFALL   (mm)=      31.10        31.10          31.10
    RUNOFF COEFFICIENT   =       0.97         0.23           0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0025):    41.44   2.313     1.33    14.48
     + ID2= 2 (  0028):     6.40   0.583     1.33    18.69
       ================================================
       ID = 3 (  0001):    47.84   2.895     1.33    15.04

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    47.84   2.895     1.33    15.04
     + ID2= 2 (  0062):    10.60   0.037     2.33     3.10
       ================================================
       ID = 1 (  0001):    58.44   2.898     1.33    12.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):    58.44   2.898     1.33    12.88
     + ID2= 2 (  0063):    29.80   0.576     1.42     7.01
       ================================================
       ID = 3 (  0001):    88.24   3.434     1.33    10.90

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.2150     2.9020
                          0.0080     0.2920   |   1.6810     3.2500
                          0.0200     0.5940   |   2.1950     3.6030
                          0.0270     0.9050   |   2.7540     3.9590
                          0.0320     1.2250   |   3.3540     4.3200
                          0.0370     1.5520   |   3.9930     4.6850
                          0.1870     1.8830   |   6.1570     5.0540
```

```
                          0.4560     2.2190   |   9.6890     5.4270
                          0.8040     2.5580   |  14.2220     5.8050

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0001)     88.240     3.434      1.33      10.90
  OUTFLOW: ID= 1 (  0002)     88.240     0.027      5.50       9.03

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  0.79
                 TIME SHIFT OF PEAK FLOW         (min)=250.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.9161

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  --------------------------
  | Junction Command(0023) |
  --------------------------

                                AREA     QPEAK   TPEAK     R.V.
                                (ha)     (cms)   (hrs)     (mm)
  INFLOW : ID= 9(  0014)  125.96     0.45    3.75     4.97
  OUTFLOW: ID= 2(  0023)  125.96     0.45    3.75     4.97

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0058)|   Area    (ha)=   2.34   Curve Number   (CN)= 82.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.58   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
              0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
              0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
              0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
              0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
              0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
              0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Unit Hyd Qpeak  (cms)=   0.447
```

```
    PEAK FLOW      (cms)=   0.055 (i)
    TIME TO PEAK   (hrs)=   1.500
    RUNOFF VOLUME   (mm)=   8.815
    TOTAL RAINFALL  (mm)=  31.104
    RUNOFF COEFFICIENT   =   0.283

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0059)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    88.24   0.027     5.50     9.03
     + ID2= 2 (  0023):   125.96   0.454     3.75     4.97
       ================================================
       ID = 3 (  0059):   214.20   0.480     3.83     6.64

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0059)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0059):   214.20   0.480     3.83     6.64
     + ID2= 2 (  0058):     2.34   0.055     1.50     8.81
       ================================================
       ID = 1 (  0059):   216.54   0.489     3.75     6.66

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0075)|   Area    (ha)=   5.36   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.48   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.87

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
              0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
              0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
              0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
```

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              0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
              0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
              0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Unit Hyd Qpeak  (cms)=   0.109

    PEAK FLOW      (cms)=   0.013 (i)
    TIME TO PEAK   (hrs)=   4.250
    RUNOFF VOLUME   (mm)=   3.839
    TOTAL RAINFALL  (mm)=  31.104
    RUNOFF COEFFICIENT   =   0.123

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0076)|   Area    (ha)= 120.60   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.53

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
              0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
              0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
              0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
              0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
              0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
              0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

    Unit Hyd Qpeak  (cms)=   3.011

    PEAK FLOW      (cms)=   0.441 (i)
    TIME TO PEAK   (hrs)=   3.750
    RUNOFF VOLUME   (mm)=   5.019
```

TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.161

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0081)	Area (ha)=	1.06	Curve Number (CN)=	55.0	
ID= 1 DT= 5.0 min	Ia (mm)=	4.72	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.15			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 0.270

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 2.955
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.095

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0082)	Area (ha)=	1.45	Curve Number (CN)=	56.1	
ID= 1 DT= 5.0 min	Ia (mm)=	8.70	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	2.22			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Unit Hyd Qpeak (cms)= 0.025

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 4.667
RUNOFF VOLUME (mm)= 2.266
TOTAL RAINFALL (mm)= 31.104
RUNOFF COEFFICIENT = 0.073

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0077)	Area (ha)=	5.94			
ID= 1 DT= 5.0 min	Total Imp(%)=	65.70	Dir. Conn.(%)=	32.80	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.90	2.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	0.36	2.00
Length	(m)=	199.00	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Max.Eff.Inten.(mm/hr)=	71.73	17.12		
over (min)	5.00	20.00		
Storage Coeff. (min)=	5.99 (ii)	19.19 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.19	0.06		
			TOTALS	
PEAK FLOW (cms)=	0.33	0.05	0.343 (iii)	
TIME TO PEAK (hrs)=	1.33	1.58	1.33	
RUNOFF VOLUME (mm)=	30.10	6.07	13.95	
TOTAL RAINFALL (mm)=	31.10	31.10	31.10	
RUNOFF COEFFICIENT =	0.97	0.20	0.45	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.1 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0078)	Area (ha)=	11.13			
ID= 1 DT= 5.0 min	Total Imp(%)=	64.60	Dir. Conn.(%)=	32.30	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.19	3.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	0.36	2.00
Length	(m)=	272.40	35.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01
0.250	2.92	1.250	71.73	2.250	4.57	3.25	2.84
0.333	2.92	1.333	71.73	2.333	4.57	3.33	2.84
0.417	3.33	1.417	15.19	2.417	4.11	3.42	2.68
0.500	3.33	1.500	15.19	2.500	4.11	3.50	2.68
0.583	3.93	1.583	9.58	2.583	3.75	3.58	2.55
0.667	3.93	1.667	9.58	2.667	3.75	3.67	2.55
0.750	4.86	1.750	7.30	2.750	3.46	3.75	2.43
0.833	4.86	1.833	7.30	2.833	3.46	3.83	2.43
0.917	6.65	1.917	6.02	2.917	3.22	3.92	2.33
1.000	6.65	2.000	6.02	3.000	3.22	4.00	2.33

Max.Eff.Inten.(mm/hr)=	71.73	13.24		
over (min)	5.00	25.00		
Storage Coeff. (min)=	7.23 (ii)	21.86 (ii)		
Unit Hyd. Tpeak (min)=	5.00	25.00		
Unit Hyd. peak (cms)=	0.17	0.05		
			TOTALS	
PEAK FLOW (cms)=	0.56	0.07	0.581 (iii)	
TIME TO PEAK (hrs)=	1.33	1.67	1.33	
RUNOFF VOLUME (mm)=	30.10	4.90	13.04	
TOTAL RAINFALL (mm)=	31.10	31.10	31.10	
RUNOFF COEFFICIENT =	0.97	0.16	0.42	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 49.2 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0079)	Area (ha)=	3.80			
ID= 1 DT= 5.0 min	Total Imp(%)=	55.50	Dir. Conn.(%)=	35.30	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.11	1.69
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	2.40	2.00
Length	(m)=	159.16	35.00
Mannings n	=	0.013	0.353

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.62	1.083	12.38	2.083	5.17	3.08	3.01
0.167	2.62	1.167	12.38	2.167	5.17	3.17	3.01

```
              0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
              0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
              0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
              0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
              0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

     Max.Eff.Inten.(mm/hr)=      71.73         7.28
               over (min)        5.00        30.00
     Storage Coeff.  (min)=      2.97 (ii)   33.30 (ii)
     Unit Hyd. Tpeak (min)=      5.00        35.00
     Unit Hyd. peak  (cms)=      0.28         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.26         0.02         0.262 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.83          1.33
     RUNOFF VOLUME    (mm)=     30.10         4.77         13.71
     TOTAL RAINFALL   (mm)=     31.10        31.10         31.10
     RUNOFF COEFFICIENT   =      0.97         0.15          0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  56.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD (  0080)|   Area    (ha)=   1.35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  43.70   Dir. Conn.(%)=  43.70
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.76
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.05         2.00
     Length            (m)=      94.87        35.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

```
              0.083    2.62 | 1.083   12.38 | 2.083    5.17 |  3.08    3.01
              0.167    2.62 | 1.167   12.38 | 2.167    5.17 |  3.17    3.01
              0.250    2.92 | 1.250   71.73 | 2.250    4.57 |  3.25    2.84
              0.333    2.92 | 1.333   71.73 | 2.333    4.57 |  3.33    2.84
              0.417    3.33 | 1.417   15.19 | 2.417    4.11 |  3.42    2.68
              0.500    3.33 | 1.500   15.19 | 2.500    4.11 |  3.50    2.68
              0.583    3.93 | 1.583    9.58 | 2.583    3.75 |  3.58    2.55
              0.667    3.93 | 1.667    9.58 | 2.667    3.75 |  3.67    2.55
              0.750    4.86 | 1.750    7.30 | 2.750    3.46 |  3.75    2.43
              0.833    4.86 | 1.833    7.30 | 2.833    3.46 |  3.83    2.43
              0.917    6.65 | 1.917    6.02 | 2.917    3.22 |  3.92    2.33
              1.000    6.65 | 2.000    6.02 | 3.000    3.22 |  4.00    2.33

     Max.Eff.Inten.(mm/hr)=      71.73         1.92
               over (min)        5.00        35.00
     Storage Coeff.  (min)=      2.79 (ii)   34.46 (ii)
     Unit Hyd. Tpeak (min)=      5.00        35.00
     Unit Hyd. peak  (cms)=      0.28         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.11         0.00          0.115 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.92           1.33
     RUNOFF VOLUME    (mm)=     30.10         2.35          14.46
     TOTAL RAINFALL   (mm)=     31.10        31.10          31.10
     RUNOFF COEFFICIENT   =      0.97         0.08           0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0075):     5.36   0.013     4.25     3.84
     + ID2= 2 (  0076):   120.60   0.441     3.75     5.02
       ================================================
       ID = 3 (  0083):   125.96   0.454     3.75     4.97

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
```

```
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0083):   125.96   0.454     3.75     4.97
     + ID2= 2 (  0077):     5.94   0.343     1.33    13.95
       ================================================
       ID = 1 (  0083):   131.90   0.479     3.75     5.37

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0083):   131.90   0.479     3.75     5.37
     + ID2= 2 (  0078):    11.13   0.581     1.33    13.04
       ================================================
       ID = 3 (  0083):   143.03   0.928     1.33     5.97

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0083):   143.03   0.928     1.33     5.97
     + ID2= 2 (  0079):     3.80   0.262     1.33    13.71
       ================================================
       ID = 1 (  0083):   146.83   1.190     1.33     6.17

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0083):   146.83   1.190     1.33     6.17
     + ID2= 2 (  0080):     1.35   0.115     1.33    14.46
       ================================================
       ID = 3 (  0083):   148.18   1.305     1.33     6.25

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0083):   148.18   1.305     1.33     6.25
```

```
     + ID2= 2 (  0081):     1.06   0.009     1.42     2.95
       ================================================
       ID = 1 (  0083):   149.24   1.312     1.33     6.22

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0083)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0083):   149.24   1.312     1.33     6.22
     + ID2= 2 (  0082):     1.45   0.002     4.67     2.27
       ================================================
       ID = 3 (  0083):   150.69   1.312     1.33     6.18

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

APPENDIX E

SWM Facility Calculations

CROZIER CONSULTING ENGINEERS

Project #: 1953-6040
Project: Nottawa
Date: 2024.04.01
By: / Check: HR/HB

Water Quality Requirements for Wet Pond

Areas Contributing	Area (ha)	% Imp	25mm RV (mm)	25mm RV (m^3)
2102 (External West)	1.35	43.7	11.91	161
2104 (East McKean)	10.60	14.2	2.12	224
2105 (West McKean)	29.80	25.0	5.52	1646
North Channel	1.45	0.0	1.42	21
Phase 1 East	7.91	63.8	14.08	1114
Future East 1	8.80	60.0	13.76	1211
Outparcel	1.06	6.6	2.01	21
Phase 1 West	3.80	55.5	11.07	421
Future West 1	11.13	64.6	10.51	1170
Future West 2	5.94	65.7	11.20	665
SWMF	6.40	50.0	15.17	971
WEIGHTED IMP	**88.24**	**41**		**7625**

MOE Total WQ Volume (m^3/ha)	155
MOE ED Volume (m^3/ha)	40
MOE ED Volume (m^3)	3530
MOE PP Volume (m^3/ha)	115
MOE PP Volume (m^3)	10189
Pond Required ED Volume (m^3)	7625
Pond Required PP Volume (m^3)	10189
Available ED Volume (m^3)	12248
Provided PP Volume (m^3)	32810

Project: Nottawa
Project No.: 1953-6040
Design by: HR
Date: 2024.04.02
Check By: HB

EXTENDED DETENTION SPECIFICATIONS - SWM FACILITY (PER MECP)

Extended Detention Volume (Area x runoff from 25mm storm event)		7625
t (drawdown time - seconds, *hours in italics*)	*48.0*	172800
Ao (cross section area of orifice - sqm)		0.0201
h (maximum water elevation above orifice for extended detention- m)		0.25
C (discharge coefficient)		0.64
Ap (average surface area for extended detention - sqm)		30043

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

Ao = 0.06132973 sqm

d= 280 mm

Extended Detention Orifice Diameter (as designed) d= **160** mm

CROZIER CONSULTING ENGINEERS

Project: 1953-6040
Project No.: Nottawa
Design by: HR
Date: 2024.04.09

SWM Facility Pond Stage Storage Outflow Calculations

Outlet Structure Dimensions	
E.D. Orifice Diameter:	0.16 m
E.D. Orifice Invert Elevation:	213.8 m
V- Notch Weir Angle (degrees)	0
V-Notch Weir Constant	0.00
V-Notch Weir Invert	0 m
Rectangular Weir width	2.50 m
Rectanular Weir Invert	214.30 m
Spillway Elev.	215.20 m
Spillway Bot. Width	25 m
Trap Side Slopes	0.1:1

	Pond Dimensions				Outlet Structure Discharge						
	Elev. (m)	Depth Above PP (m)	Area (sqm)	Storage Volume (cu.m)	ED Orifice Discharge (cu.m/s)	V-Notch Weir Discharge (cu.m/s)	Rectangular Weir Discharge (m)	Spillway Width (m)	Spillway Discharge (cu.m/s)	Storage (ha-m)	Total Discharge (cu.m/s)
PP	213.80	0.00	28743	0	0.000	0.00	0.00	0.00	0.00	0.000	0.000
	213.90	0.10	29681	2921	0.008	0.00	0.00	0.00	0.00	0.292	0.008
	214.00	0.20	30619	5936	0.020	0.00	0.00	0.00	0.00	0.594	0.020
	214.10	0.30	31557	9045	0.027	0.00	0.00	0.00	0.00	0.905	0.027
ED	214.20	0.40	32495	12248	0.032	0.00	0.00	0.00	0.00	1.225	0.032
	214.30	0.50	32917	15518	0.037	0.00	0.00	0.00	0.00	1.552	0.037
Weir	214.40	0.60	33338	18831	0.041	0.00	0.15	0.00	0.00	1.883	0.187
	214.50	0.70	33759	22186	0.045	0.00	0.41	0.00	0.00	2.219	0.456
	214.60	0.80	34180	25583	0.048	0.00	0.76	0.00	0.00	2.558	0.804
	214.70	0.90	34601	29022	0.052	0.00	1.16	0.00	0.00	2.902	1.215
	214.80	1.00	35022	32503	0.055	0.00	1.63	0.00	0.00	3.250	1.681
	214.90	1.10	35443	36026	0.058	0.00	2.14	0.00	0.00	3.603	2.195
	215.00	1.20	35864	39592	0.060	0.00	2.69	0.00	0.00	3.959	2.754
	215.10	1.30	36286	43199	0.063	0.00	3.29	0.00	0.00	4.320	3.354
Spillway	215.20	1.40	36707	46849	0.065	0.00	3.93	25.00	0.00	4.685	3.993
	215.30	1.50	37128	50540	0.068	0.00	4.60	25.60	1.49	5.054	6.157
	215.40	1.60	37549	54274	0.070	0.00	5.31	26.20	4.31	5.427	9.689
TOB	215.50	1.70	37970	58050	0.073	0.00	6.05	26.80	8.10	5.805	14.222

Emergency Spillway

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.02000	m/m
Left Side Slope	0.10	m/m (H:V)
Right Side Slope	0.10	m/m (H:V)
Bottom Width	25.00	m
Discharge	14.22	m³/s

Results

Normal Depth	0.28	m
Flow Area	7.09	m²
Wetted Perimeter	25.57	m
Hydraulic Radius	0.28	m
Top Width	25.06	m
Critical Depth	0.32	m
Critical Slope	0.01330	m/m
Velocity	2.01	m/s
Velocity Head	0.21	m
Specific Energy	0.49	m
Froude Number	1.20	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

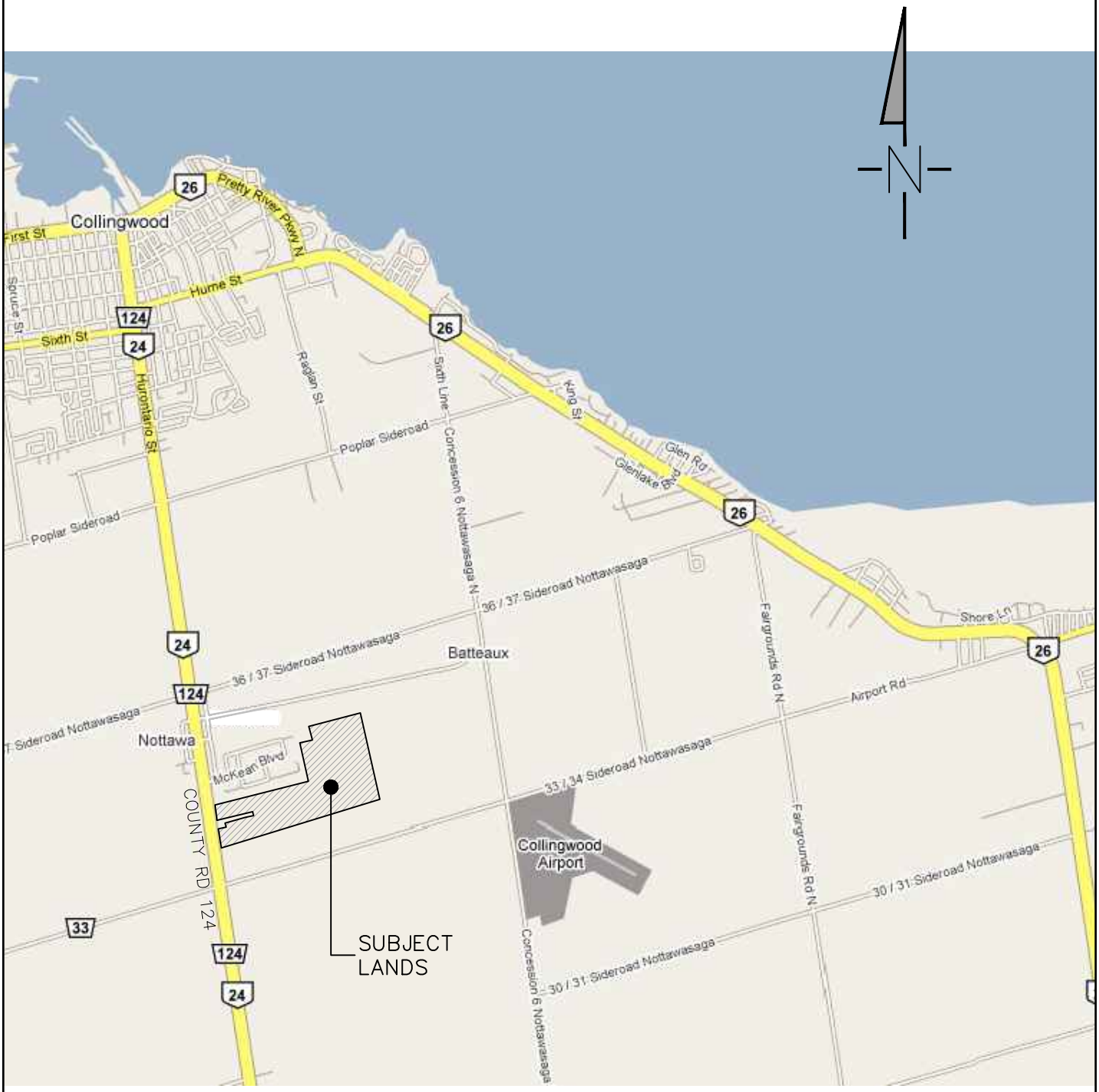
Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.28	m
Critical Depth	0.32	m
Channel Slope	0.02000	m/m

Emergency Spillway

GVF Output Data

Critical Slope	0.01330	m/m

FIGURES



Legend

= SUBJECT LANDS

Project

NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing

SITE LOCATION

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
A.T.	H.B.	1953-6040

Scale	Date	Check By	Drawing
N.T.S.	03/04/2024	B.H.	FIG.1

DRAFT PLAN OF PROPOSED SUBDIVISION

PART OF LOT 34 AND 35, CONCESSION 8
(GEOGRAPHIC TOWNSHIP OF NOTTAWASAGA)
TOWNSHIP OF CLEARVIEW
COUNTY OF SIMCOE

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE: mar 18/11

CLEARVIEW DEVELOPMENTS INC.

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

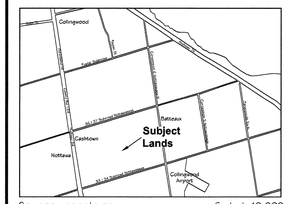
DATE: March 17th, 2011

P HOFMANN
LM PASTUSHAK LIMITED

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 1990, c.P.13, AS AMENDED

A. AS SHOWN	B. AS SHOWN	C. AS SHOWN
D. AS SHOWN	E. AS SHOWN	F. AS SHOWN
G. AS SHOWN	H. MUNICIPAL WATER SUPPLY	I. LOAM
J. AS SHOWN	K. ALL SERVICES AS REQUIRED	L. AS SHOWN

KEY PLAN



Source: google.com Scale 1:40,000m N.T.S.

AREA SCHEDULE

DESCRIPTION	LOTS/ BLKS	AREA (ha.)	UNIT COUNT
RESIDENTIAL LOTS	1 - 192	12.541	192
CONDOMINIUM RESIDENTIAL BLOCKS	193 - 195	13.541	
RESIDENTIAL CONDOMINIUM UNITS			278
MIXED USE	196 - 199	5.604	
RESIDENTIAL CONDOMINIUM UNITS			30
RURAL/RURAL - INDUSTRIAL/OPEN SPACE	200	19.840	
OPEN SPACE	201	17.241	
PARK	202	2.609	
WALKWAYS	203 - 207	0.175	
DRAINAGE	208 - 211	0.381	
DRAINAGE/TRAIL	212 - 216	3.224	
STORMWATER MANAGEMENT FACILITY	217	6.336	
FUTURE DEVELOPMENT	218	0.011	
0.3m RESERVE	219	0.001	
ROADS	A - E	7.603	
TOTAL	219	89.109	500

Approval Stamp

NOTES:
CONTOUR INTERVAL 1.0 METRE.
ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

	March 8, 2011
	Nov 16, 2009
SCALE 1:2000	May 25, 2009
DRAWN: A.S.	DATE

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
13 PORTHILL STREET, BARRIE, ON L4M 3H4 | TEL: (705) 728-0045 | FAX: (705) 728-2010 | WWW.MHBCPLAN.COM

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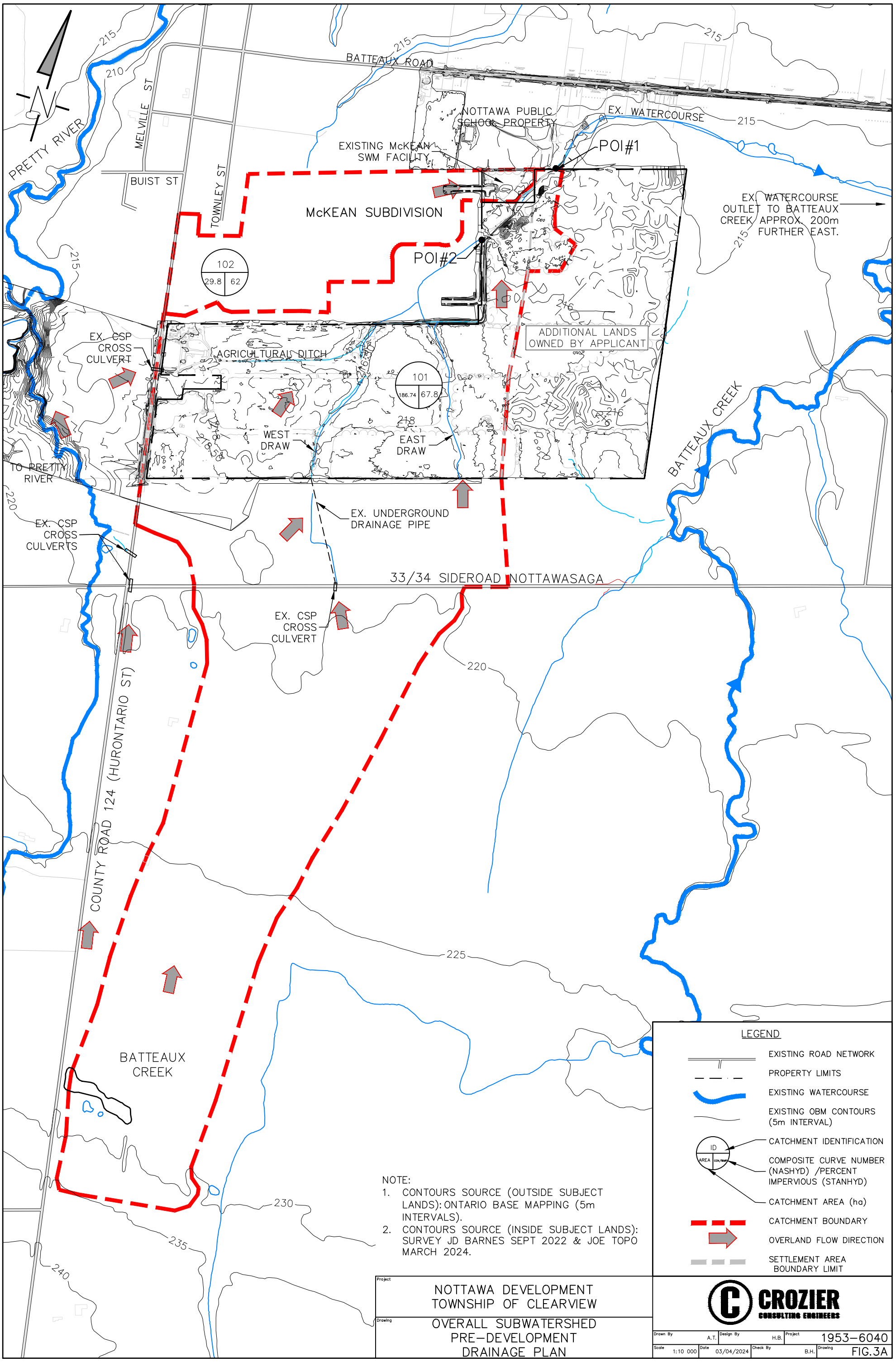

NOTE:
1. CONTOURS SOURCE (OUTSIDE SUBJECT LANDS): ONTARIO BASE MAPPING (5m INTERVALS).
2. CONTOURS SOURCE (INSIDE SUBJECT LANDS): SURVEY JD BARNES SEPT 2022 & JOE TOPO MARCH 2024.

LEGEND

- EXISTING ROAD NETWORK
- PROPERTY LIMITS
- EXISTING WATERCOURSE
- EXISTING OBM CONTOURS (5m INTERVAL)
- CATCHMENT IDENTIFICATION
- COMPOSITE CURVE NUMBER (NASHYD) /PERCENT IMPERVIOUS (STANHYD)
- CATCHMENT AREA (ha)
- CATCHMENT BOUNDARY
- OVERLAND FLOW DIRECTION
- SETTLEMENT AREA BOUNDARY LIMIT

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: OVERALL SUBWATERSHED PRE-DEVELOPMENT DRAINAGE PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
A.T.	H.B.	1953-6040
Scale	Date	Check By	Drawing
1:10 000	03/04/2024	B.H.	FIG.3A

PRETTY RIVER

BUIST ST

TOWNLEY ST

McKEAN SUBDIVISION

EXISTING McKEAN SWM FACILITY

NOTTAWA PUBLIC SCHOOL PROPERTY

EX. WATERCOURSE OUTLETING TO BATTEAUX CREEK

POI#1

POI#2

ADDITIONAL LANDS OWNED BY APPLICANT

102
29.8 | 62

101
186.74 | 67.8

EX. CSP CROSS CULVERT

AGRICULTURAL DITCH

WEST DRAW

EAST DRAW

TO PRETTY RIVER

COUNTY ROAD 12 (HURONTARIO ST)

EX. UNDERGROUND DRAINAGE PIPE

EX. CSP CROSS CULVERTS

EX. CSP CROSS CULVERT

33/34 SIDEROAD NOTTAWASAGA

REFER TO FIGURE 3A FOR DRAINAGE DELINEATION SOUTH OF 33/34 SIDEROAD NOTTAWASAGA.

NOTE:
1. CONTOURS SOURCE (OUTSIDE SUBJECT LANDS): ONTARIO BASE MAPPING (5m INTERVALS).
2. CONTOURS SOURCE (INSIDE SUBJECT LANDS): SURVEY JD BARNES SEPT 2022 & JOE TOPO MARCH 2024.

LEGEND

- EXISTING ROAD NETWORK
- PROPERTY LIMITS
- EXISTING WATERCOURSE
- EXISTING OBM CONTOURS (5m INTERVAL)
- CATCHMENT IDENTIFICATION (ID / AREA / COMPOSITE)
- COMPOSITE CURVE NUMBER (NASHYD) /PERCENT IMPERVIOUS (STANHYD)
- CATCHMENT AREA (ha)
- CATCHMENT BOUNDARY
- OVERLAND FLOW DIRECTION
- SETTLEMENT AREA BOUNDARY LIMIT

Project: NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing: PRE-DEVELOPMENT DRAINAGE PLAN

CROZIER CONSULTING ENGINEERS

Drawn By: A.T.	Design By: H.B.	Project: 1953-6040	
Scale: 1:5000	Date: 03/04/2024	Check By: B.H.	Drawing: FIG.3B

DONALD AVENUE

TOWNLEY STREET

WAGNER ROAD

MCKEAN BOULEVARD

GLEASON ROAD

BLACKBURN AVENUE (BY PLAN 51M-418)

BLACKBURN AVENUE (BY PLAN 51M-641)

REGISTERED PLAN 51M-641

REGISTERED PLAN 51M-418

PART OF PART 2, PLAN 51R-19711

REMAINDER OF PART 2, PLAN 51R-19711

LINE BETWEEN NORTH & SOUTH HALVES OF LOT 35, CONCESSION 8

LINE BETWEEN NORTH AND SOUTH HALVES OF LOT 34, CONCESSION 8

POST & WIRE FENCE (UNCERTAIN) ACCEPTED AS LINE BETWEEN NORTH AND SOUTH HALVES OF LOT 34, CONCESSION 8

STREET A

STREET B

STREET C

STREET D

STREET E

STREET F

SIMCOE COUNTY ROAD No. 24 (ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 8 AND 9)

Residential

Residential

Residential

2105–EXT NW (WEST MCKEAN)
29.80 | 25%

2104–EXT NW (EAST MCKEAN)
10.60 | 55.9

POND
6.40 | 50%

NORTH CHANNEL
1.45 | 56.1

FUTURE WEST 1
11.13 | 63.8

PHASE 1 WEST
3.80 | 56%

PHASE 1 EAST
7.91 | 64%

OUTPARCEL
1.06 | 55

CENTRAL CHANNEL
5.36 | 67.6

2102 EXTERNAL WEST
1.35 | 44%

FUTURE WEST 2
5.94 | 66

FUTURE EAST 1
8.8 | 82

PH1 UNC
2.34 | 82.7

2101 EXTERNAL SOUTH
120.6 | 73.3

50 0m 50 100 150
SCALE: 1:2000

LEGEND

- STORM CATCHMENT
- CATCHMENT IDENTIFICATION
- COMPOSITE CURVE NUMBER (NASHYD) /PERCENT IMPERVIOUS (STANHYD)
- CATCHMENT AREA (ha)
- EXISTING CONTOURS (m)
- PROPERTY LIMIT

Project
NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing
POST DEVELOPMENT DRAINAGE PLAN – INTERIM CONDITIONS

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Scale
B.H./R.W.	B.H./R.W.	Drawing FIG4A

DONALD AVENUE

TOWNLEY STREET

WAGNER ROAD

MCKEAN BOULEVARD

GLEASON ROAD

BLACKBURN AVENUE (BY PLAN 51M-418)

BLACKBURN AVENUE (BY PLAN 51M-641)

REGISTERED PLAN 51M-641

PART OF PART 2, PLAN 51R-19711

REMAINDER OF PART 2, PLAN 51R-19711

LINE BETWEEN NORTH & SOUTH HALVES OF LOT 35, CONCESSION 8

LINE BETWEEN NORTH AND SOUTH HALVES OF LOT 34, CONCESSION 8

Residential

Residential

Residential

Residential

STREET A

STREET B

STREET C

STREET D

STREET E

STREET F

STREET G

BLOCK 123

LIFTING STATION

SIMCOE COUNTY ROAD No. 91 (ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 8 AND 9)

SIMCOE COUNTY ROAD No. 91 (ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 7 AND 8)

2105–EXT NW (WEST MCKEAN)
29.80 | 25%

2104–EXT NW (EAST MCKEAN)
10.60 | 55.9

POND
6.40 | 50%

NORTH CHANNEL
1.45 | 56.1

FUTURE WEST 1
11.13 | 65%

PHASE 1 WEST
3.80 | 56%

PHASE 1 EAST
7.91 | 64%

OUTPARCEL
1.06 | 55

CENTRAL CHANNEL
5.36 | 67.6

2102 EXTERNAL WEST
1.35 | 44%

FUTURE WEST 2
5.94 | 66%

FUTURE EAST 1
8.8 | 60%

PH1 UNC
2.34 | 82.7

2101 EXTERNAL SOUTH
120.6 | 73.3

50 0m 50 100 150
SCALE: 1:2000

LEGEND

- STORM CATCHMENT
- CATCHMENT IDENTIFICATION
- COMPOSITE CURVE NUMBER (NASHYD) /PERCENT IMPERVIOUS (STANHYD)
- CATCHMENT AREA (ha)
- EXISTING CONTOURS (m)
- PROPERTY LIMIT

Project
NOTTAWA DEVELOPMENT
TOWNSHIP OF CLEARVIEW

Drawing
POST DEVELOPMENT DRAINAGE PLAN –FULL BUILDOUT CONDITIONS

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
V.P.	V.P./B.H./R.W.	1953–6040
Check By	Check By	Scale
B.H./R.W.	B.H./R.W.	Drawing
		FIG4B