

**FUNCTIONAL SERVICING AND STORMWATER
MANAGEMENT REPORT**

**ARKELL SUBDIVISION
RESIDENTIAL DEVELOPMENT**

TOWNSHIP OF PUSLINCH

PREPARED FOR:

**TIMBERWORX CUSTOM HOMES, SLOOT
CONSTRUCTION, JOHN SLOOT INVESTMENTS**

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Timberworx Custom Homes, Slood Construction, and John Slood Investments (Owners) to prepare a Functional Servicing and Stormwater Management Report in support of the Zoning By-Law Amendment Application for the residential development located at lots 7, 8, 9, Concession 10, Township of Puslinch, County of Wellington (Site; see Figure 1). The purpose of this report is to demonstrate that the proposed development is feasible from a functional servicing and stormwater management perspective and conforms with the requirements of the Township of Puslinch (Township), Wellington County (County), and the Grand River Conservation Authority (GRCA).

The relevant background studies and reports include:

- Township of Puslinch Municipal Development Standards (September 2019)
- Hydrogeological and Predictive Nitrate Assessment prepared by R.J. Burnside & Associates Ltd. (July 2006)
- Preliminary Stormwater Management Report prepared by Richardson Foster Ltd. (August 2006)
- Groundwater Supply Assessment prepared by ARL Groundwater Resources Ltd. (March 2023)
- 1669 tp Logs – Arkell prepared by Chung & Vander Doelen Engineering Ltd. (December 2023)
- The Ontario Building Code (OBC) (2012)
- Ministry of Transportation Drainage Management Manual (1997)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- Golden Horseshoe CA Erosion and Sediment Control Guideline for Urban Construction (2006)
- TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide (2010)
- City of Guelph Development Engineering Manual (October 2023)

This report has been prepared to support the second submission of the Zoning By-Law Amendment Application for the proposed residential development.

2.0 Site Description

The Site encompasses an area of 20.45 ha with a developable area of approximately 17.45 ha. The Site currently consists of a single detached dwelling, garage, existing woodlot, and agricultural fields. The Site is bounded by agricultural fields to the north, Arkell Road to the West, Guelph Junction Railway (GJR) to the East, Watson Road, and existing detached homes to the South.

According to the Conceptual Plan prepared by Stovel and Associates Inc. (July 29, 2025) included in Appendix A, it is understood that the Site will consist of the following elements:

- Forty-Four (44) residential lots with associated onsite sewage systems and private wells.
- One (1) stormwater management facility for flood control.
- One (1) swale to act as a bypass for drainage external to the Site and one (1) bioswale to infiltrate and convey Site stormwater during minor and major storm events.
- A half (0.5) hectare of land to remain undeveloped.
- An access road connecting to Watson Road in the southwest and a secondary access road connecting to Arkell Road in the northwest.

3.0 Soil and Groundwater Conditions

Chung & Vander Doelen Engineering Limited (CVD) was retained by the Owners to excavate test pits across the property. Ten (10) test pits were excavated in December 2023 to depths of up to 6.10m below ground surface (mbgs). According to CVD's test pit logs, subsurface conditions generally consisted of 250 to 450 mm of topsoil underlain by a thin layer of silt to silty sand and gravel followed by sand and gravel with trace silt to the maximum depth of investigation (6.10 mbgs). All test pits were dry at completion.

The sand and gravel is expected to be the receiving soil for the onsite sewage systems. Based on the grain size analysis of the sand and gravel, this material is classified a GP soil per the Unified Soil Classification System (USCS). According to Supplementary Standard SB-6 of the OBC, GP soils are described as poorly graded gravels and gravel-sand mixtures with little to no fines with a percolation rate of less than 1 min/cm. A conservative percolation rate of 15 min/cm was assigned for the onsite sewage system design.

In 2006, R.J. Burnside & Associates Limited (R.J. Burnside) completed a hydrogeological assessment on the property. As part of this assessment, ten (10) boreholes were advanced, two (2) of which were installed as groundwater monitoring wells. The stratigraphy encountered was similar to CVD's observations during the 2023 test pitting program, which was described as a later of topsoil (200 to 400 mm thick, or up to 1.5 mbgs in some locations), underlain by sandy gravel or sand and gravel. Groundwater was encountered between 7.43 and 10.37 mbgs, or 333.02 to 334.53 masl in January 2006. Refer to the Hydrogeological and Predictive Nitrate Assessment (R.J. Burnside, 2006) for additional details.

4.0 Water Servicing

4.1 Existing Water Servicing

There are no municipal water services available in the vicinity of the Site. Surrounding properties are serviced by private water supply wells.

4.2 Proposed Water Servicing

Each lot will be serviced as an individual water supply well. A groundwater supply assessment was completed by ARL Groundwater Resources Ltd. (ARL) to assess the suitability of servicing each lot by a water supply well and to meet the requirements of MECP Guideline D-5-5 (provided under separate cover). ARL concluded that the Gasport formation aquifer can support the water quantity requirements for development. Refer to the Groundwater Supply Assessment Report (ARL, 2003) for additional details.

Conceptual well locations have been included on the Onsite Sewage Servicing Schematic (Drawing C102). However, the depth, size, and location of the wells will be determined during detailed design of each individual lot.

Required fire flow calculations will be completed following zoning approvals. However, preliminary calculations were completed to estimate the required fire storage volume for the proposed development. The fire storage volume was calculated using the Ontario Fire Marshalls Fire Protection Water Supply Guideline (1999), as required in the OBC.

The fire storage volume was calculated assuming a house footprint of 240 m² and a height of 6 m, Group C (residential) occupancy. Table 1 summarizes the preliminary fire storage volumes calculated for the proposed development.

Table 1: Fire Storage Volume Requirements

Lot	Total Area (m ²)	Height (m)	Volume (m ³)	K ¹	S _{side} ²	Required Fire Storage Volume, Q (L)
35	240	6	1440	23	1.4	81,000

1. K values represent the water supply coefficient based upon building occupancy.
2. S_{side} values determined from distance to other structures using Figure 1 in Section A-3.2.5.7 of the OBC.

A storage volume of 81,000L is the required minimum fire storage volume that must be supplied at a rate of 45 L/s for a duration of 0.5-hours. The fire flows determined from the OBC fire flow method is a conservative estimate and is for comparison purposes.

5.0 Sanitary Servicing

There are no municipal sanitary services available in the vicinity of the Site. Surrounding properties are privately serviced via onsite sewage systems. Therefore, each lot within the proposed development will be serviced by individual onsite sewage systems.

5.1 Sanitary Design Calculations

The proposed development will consist of forty-four (44) residential lots with private servicing. It is Crozier's understanding that the proposed residential dwellings will be three (3) to four (4) bedrooms with the possibility of two (2) bedrooms in the basement. For the purposes of this assessment, preliminary sewage system design flows were calculated for a six (6) bedroom dwelling with 240m² of finished floor area, four (4) bathroom groups, two (2) powder rooms, two (2) basement rough-ins and additional fixtures for a total of 62 fixture units.

The preliminary sewage system design flows were calculated in accordance with OBC, Part 8 and are presented below in Table 2.

Table 2: Preliminary Sewage System Daily Design Flows

Unit Type	Number of Bedrooms	Floor Area (m ²)	Number of Fixture Units	Base Flow (L/day)	Additional Flow – Floor Area (L/day)	Additional Flow – Fixture Units (L/day)	Total Flow Per Unit (L/day)
240 m ² Residential Dwelling	6	240	61.5	2,500	400	2,075	4,575

As shown, the preliminary sewage system design flows are 4,575 L/day per lot. These flows were calculated based on the information provided at the time of this report. If details of the proposed dwellings change (e.g., number of bedrooms, fixtures, and floor area) during detailed design, the sewage system design flows may change, which may affect the size of the onsite sewage systems and the serviceability of the development.

Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks (MECP). Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA is not required. Building permits will be required for each sewage system prior to construction.

5.2 Proposed Sanitary Servicing

Sanitary servicing for the proposed development will be provided through individual Class 4 onsite sewage systems. The onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed.

5.3 Proposed Sewage System

Crozier prepared nitrate loading calculations to determine the effluent concentration of nitrate-nitrogen each sewage system must achieve for the proposed development to meet MECP Guideline D-5-4 and are provided under separate cover. At least a 50% reduction of nitrate-nitrogen (effluent concentration of 20 mg/L) is required to meet 10 mg/L of nitrate-nitrogen at the downgradient property boundary. A typical conventional onsite sewage system produces an effluent concentration of nitrate-nitrogen of approximately 40 mg/L. This is insufficient to meet D-5-4 requirements, therefore, advanced treatment with denitrification will be required.

The proposed sewage system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard with 50% nitrate-nitrogen reduction, discharging treated effluent to a Type A dispersal bed. A Waterloo Biofilter system (or equivalent) with recirculation is proposed. Sewage will flow from the dwelling to a Waterloo Biofilter anaerobic digester tank. Effluent from the digester tank is pumped to the Waterloo Biofilter basket tank, which is equipped with a patented foam media that effectively treats wastewater prior to discharge to the leaching bed. A portion of the treated effluent is recirculated to the anaerobic digester, effecting 50% nitrate-nitrogen reduction.

Treated effluent from the Waterloo Biofilter will be discharged to a Type A dispersal bed sized in accordance with Section 8.7.7. of the OBC. The Type A dispersal bed consists of a stone layer equipped with perforated distribution pipe, underlain by a sand layer. Table 3 below summarizes the preliminary sizing of the Type A Dispersal Bed.

Table 3: Preliminary Type A Dispersal Bed Sizing

Unit Type	Total Flow Per Unit (L/day)	Minimum Stone Area (m ²)	Provided Stone Area (m ²)	Minimum Sand Area (m ²)	Provided Sand Area (m ²)
240 m ² Residential Dwelling	4,575	91.5	104	80.74	104

The Onsite Sewage Servicing Schematic (Drawing C102) illustrates the proposed onsite sewage servicing for the proposed development. The conceptual figure illustrates a Waterloo Biofilter configuration; however, it is noted that any treatment unit meeting CAN/BNQ certification requirements with 50% nitrate-nitrogen removal may be considered. The details, size, and location of the onsite sewage systems will be determined once individual home designs and building permit applications are prepared.

6.0 Drainage Conditions

The following sections detail the drainage conditions of the Site under both pre-development and post-development scenarios.

6.1 Existing Drainage Conditions

The Site currently consists of an existing detached residential dwelling and accessory buildings, vacant grassed agricultural fields, and forested areas. The Site generally slopes from south to north and drains from Guelph Junction Railway (GJR) towards Arkell Road and ultimately outlets to a culvert on Arkell Road. The ultimate receiving watercourse of Site drainage is the Eramosa River.

As discussed in Section 3, test pits have been completed by CVD site suggesting that native soils are very coarse, and groundwater elevations are well below anticipated basement levels. These preliminary findings are consistent with other building sites in the area.

Additional monitoring is required, but initial indications suggest that soil conditions are conducive to the type of development proposed and that infiltration measures should be considered as part of the stormwater management strategy.

The site is divided into four (4) catchments under pre-development drainage conditions, as indicated on the Pre-development Drainage Plan (Figure 2).

The majority of the catchment area contributing to the Site outlet is external to the site and runoff from the external catchment area enters the Site from the lands north and south of the GJR. The external drainage primarily consists of agricultural fields and woodlot areas. Catchment Ext. 1 located north of the railroad is known as Starky Hill Conservation Area. Runoff from Starkey Hill concentrates at the toe of the embankment adjacent to GJR. This runoff continues to drain overland across the subject property before reaching the outlet at Arkell Road. Catchment Ext. 2 located south of the railroad consists of woodlot and agricultural fields. The drainage flows from the southeast to the northwest before entering a rectangular culvert situated underneath the railroad to the south of the property. Catchment Ext. 2, much like catchment Ext. 1, continues to drain overland across the subject property before reaching the culvert at Arkell Road.

Catchment 101 encompasses the Site itself and consists of grassed agricultural lands, and woodlot. Catchment 101 drains overland from south to north of the property before reaching the outlet at Arkell Road.

Table 4 describes the pre-development catchment areas and land-uses as illustrated in Figure 2.

Table 4: Pre-Development Hydrologic Parameters

Catchment ID	Land-Use Description	Impervious Area (ha)	Pervious Area (ha)	Total Area (ha)	Percent Impervious (%)	Outlet
Ext. 1	Conservation lands and residential	0.03	24.35	24.38	0.1	400 mm dia. Culvert on Arkell Road
Ext. 2	Woodlot, agriculture, and residential	1.43	19.21	20.64	6.9	
Ext. 3	Vacant grassed agricultural fields, residential, and grassed lands	1.39	5.48	6.87	20.3	
101	Vacant grassed agricultural fields, residential, and grassed lands	0.08	18.74	18.82	0.45	
Total Area (ha) = 70.71		2.93	67.78	70.71	4.1	

Considering the size of the study area (70.7 ha), a preliminary hydrologic model was prepared to determine the peak flows from each catchment and establish a target release rate to govern the site following development. The peak flow rates for the 2 through to 100-year City of Guelph 3 Hour Chicago Storm events under pre-development conditions can be seen in Table 5 below.

Table 5: Pre-Development Peak Flows

Catchment ID	Outlet	Peak Flow Rates (L/s)					
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Ext. 1	Arkell Road (Culvert)	29	60	89	138	178	224
Ext. 2	Arkell Road (Culvert)	61	123	178	269	342	423
Ext. 3	Arkell Road (Culvert)	43	81	113	164	205	249
101	Arkell Road (Culvert)	37	73	104	157	199	247

The peak flow from the combined hydrograph of catchments in Table 5 represents the target peak flow at the outlet of the Site under post-development conditions. The target release rates are summarized in Table 6 below.

Table 6: Target Flow Rates

Location	Target Flow Rates (L/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Arkell Road (Culvert)	135	270	392	593	756	940

6.2 Proposed Drainage Conditions

Based on the Conceptual Plan prepared by Stovel and Associates Inc, dated February 6, 2024, the proposed development will consist of forty-four (44) single detached residential lots, paved internal roadways (Road A, B, C & D), a stormwater management facility, and undeveloped land. Access to the site will be provided from the proposed entrances on Arkell Road and Watson Road South.

6.2.1 Post-development Drainage Catchment Areas

The proposed Site grading divides the Site into four (4) drainage catchment areas and four (4) external drainage areas to the north and south of GJR which are unaffected by the proposed development. All drainage culminates at the same outlet (Arkell Road). Referring to the Post-Development Drainage Plan (Figure 3), the catchment areas are described as follows:

- Catchment Ext. 1 ($A = 23.84$) consists of drainage from Starky Hill conservation lands and woodlots. Runoff generated within this catchment is directed to the north of GJR where it concentrates at the toe of railroad embankment and continues south before entering the subject property where it will be collected by the south bypass swale. The flow follows the swale along the western property line flowing from south to north before reaching the outlet culvert on Arkell Road.
- Catchment Ext. 2 ($A = 20.64$) consists of drainage from the existing cultivated lands and woodlot. Runoff drains to the south of the GJR draining before passing through the rectangular culvert crossing underneath GJR and then being picked up by the south bypass swale. The flow follows the swale along the western property line flowing from south to north before reaching the outlet culvert on Arkell Road.
- Catchment Ext. 3 ($A = 6.87$) consists of drainage from existing residential lots and Watson Road South. All the runoff generated in this catchment will be conveyed into the south bypass swale along the southwest property line before reaching the outlet culvert located at Arkell Road.
- Catchment Ext.4 ($A = 0.53$) consists of drainage from Starky Hill conservation lands and woodlots. Runoff generated within this catchment flows through UN01 and into the proposed north bioswale.
- Catchment 201 ($A = 10.55$) consists of drainage from proposed residential lots and internal roads (roads A, B, C, D). Runoff from the residential lots and internal roadways are conveyed to storm sewers before being directed to the north bioswale.
- Catchment 202 ($A = 2.39$) consists of drainage from the rear and side yards of the proposed residential lots that contribute directly to the south bypass swale.

- Catchment UC01 (A = 1.35) consists of drainage from the existing woodlot east of the development. Runoff generated in this catchment drains east to west before being intercepted by the proposed north bioswale.
- Catchment UC02 (A = 4.54) consists of drainage from the existing woodlot east of the development. Runoff generated in this catchment drains east to west before being intercepted by the proposed south bypass swale.

The post-development catchments, land use descriptions, and respective percent imperviousness are shown in Table 7 below.

Table 7: Post-Development Hydrologic Parameters

Catchment ID	Description	Impervious Area (ha)	Pervious Area (ha)	Total Area (ha)	Percent Impervious (%)	Outlet
EXT 1	Conservation lands and existing residential	0.03	23.81	23.84	0.1	400 mm dia. Culvert on Arkell Road
EXT 2	Woodlot, agriculture, and existing residential	1.43	19.21	20.64	6.9	
201	Internal roadway, residential, SWMF, and undeveloped land	4.49	6.06	10.55	42.6	
202	Internal rear yards and rear roof drainage	0.85	1.54	2.39	35.6	
EXT 3	Existing residential dwelling and Watson Road South	1.39	5.48	6.87	20.3	
EXT 4	Conservation lands	0.00	0.53	0.53	0	
UC01	Existing woodlot	0.00	1.35	1.35	0.0	
UC02	Existing woodlot	0.38	4.16	4.54	8.5	
Total Area (ha) = 70.71		8.57	62.14	70.71	12.1	

Drainage from Catchments Ext. 1, Ext. 2, 202, UC02, and Ext. 3 will discharge to the south swale in the before leaving the site via the outlet culvert at Arkell Road. Any minor land use changes within these catchments will be naturally attenuated and mitigated in the long bypass swale (approximately 830 m long) which exhibits excellent infiltration capacity due to sandy soils and gradual slope.

Finally, drainage from Catchment 201 will be controlled via a storm sewer network, swale system with a series of control weirs, and a stormwater management facility (SWMF) in the form of a dry pond. The post-development peak flows from Catchment 201 will be controlled to pre-development peak flows or less. Uncontrolled post-development peak flows for the 2 through to the 100-year City of Guelph 3 Hour Chicago Storm events are summarized in Table 8 below.

Table 8: Post-Development Peak Flows (Unmitigated)

Catchment ID	Outlet	Peak Flow Rates (L/s)					
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Ext. 1	South Swale	28	58	87	134	173	218
Ext. 2	South Swale	61	123	178	269	342	423
201	North Swale	573	770	898	1064	1181	1301
Ext. 3	South Swale	43	81	113	164	205	249
Ext. 4	North Swale	1	2	4	6	7	9
UC01	North Swale	2	4	6	10	12	16
UC02	South Swale	11	22	33	51	65	81
Total	Arkell Road (Culvert)	597	810	952	1140	1275	1418
Target (Pre-Dev)	Arkell Road (Culvert)	135	270	392	593	756	940

Each proposed site entrance will be complete with culvert(s) sized to convey the 5 year storm ditch flows across the site entrance. Additionally, one (1) swale culvert is proposed at the South swale crossing of Road A. Preliminary culvert sizing is included in Appendix B and shown on drawing C101.

7.0 Stormwater Management

Stormwater management and Site drainage for the proposed development must adhere to the policies and standards of the Township of Puslinch, Grand River Conservation Authority (GRCA), and Ministry of Environment and Climate Change (MECP, formerly MOE). It is important to note that efforts have been made to preserve and maintain the rural character of the property. As such, passive stormwater management practices have been incorporated throughout the design.

The stormwater management criteria for the development are summarized below:

Water Quality Control

The Puslinch Municipal Development requires as a minimum the “Enhanced” level of protection (i.e. 80% TSS removal) as described in the Ministry of Environment Stormwater Management Planning and Design Manual (2003).

Water Balance

According to the Puslinch Municipal Development Standards an annual water budget shall be prepared for the development site as described in the MOE SWMPD Manual (March 2003). Crozier prepared a Water Balance Assessment (August 2025) which calculated the infiltration deficit associated with the development of the proposed lands. Pre-development infiltration was estimated to be at 251 mm/year, which was reduced by 99 mm/year to an infiltration of 152 mm/year under post development conditions.

Low impact development best management practices shall be designed in accordance with the MOE SWMPD Manual, and the TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide (2010) to mitigate the infiltration deficit.

Erosion Control

According to the Puslinch Municipal Development Standards an Erosion and Sediment Control Plan will be provided, showing sediment and erosion control measures proposed to mitigate the effect of the construction on surrounding areas and infrastructure.

Water Quantity Control

According to the Township of Puslinch Municipal Development Standards Manual (2019), water quantity controls are required for the Site. The water quantity requirements include controlling the post-development peak flow event to the pre-development peak flow event for design storms up to and including the 100-year event.

Upon development, all runoff generated within the internal roadway or runoff that mixes with the roadway runoff will be conveyed to proposed bioswales and a dry pond for quantity and quality control. The bioswales have been designed based on a hydraulic conductivity of 35 mm/hr, representing a moderate infiltration rate reflective of the hydrologic group A soils in the area. No stormwater volume reduction associated with the infiltration component of the bioswale has been applied to the hydrologic modeling at this stage. Infiltration rates will be confirmed at the detailed design stage through in situ testing using a Guelph permeameter to confirm design drawdown times.

7.1 Stormwater Quality Control

Stormwater quality controls for the proposed development will be achieved by retaining, treating, and infiltrating runoff in a treatment train consisting of an Oil and Grit Separator (OGS), a bioswale system, and a dry pond. Runoff from the proposed development will be conveyed overland to one of four (4) storm sewer networks, each including an OGS within the downstream-most maintenance hole. The storm sewer networks outlet to the proposed bioswale that conveys the drainage to the dry pond. Runoff from the remainder of the site consists of natural heritage and landscaped areas and is therefore not subject to water quality treatment requirements.

The bioswale system treating runoff from the proposed development was sized to maximize the storage provided for quantity control while facilitating infiltration in the swale.

Table 9 summarizes the water quality storage required for enhanced 80% long term suspended solids removal and the water quality storage provided in the proposed bioswale system.

Table 9: Provided Water Quality Storage to Achieve Enhanced Water Quality Protection

Catchment	Catchment Area (ha)	25 mm Runoff Volume (mm)	25 mm Runoff Required Treatment Volume (m³)	MOE Table 3.2 Enhanced Water Quality Storage Requirements (m³)	Total Provided Treatment Volume (m³)
201	10.55	6.32	667	304	1586

At a minimum, a total of 667 m³ of runoff is required to be treated and infiltrated to remove 80% of TSS and achieve “Enhanced Protection”. The proposed bioswale system provides sufficient

treatment for this volume in addition to the pre-treatment provided in the OGS units. Additional treatment capacity will be provided downstream of the bioswale system in the form of a dry pond. The bioswale system accepts runoff from the internal storm sewer network. To optimize the amount of runoff infiltrating into the water table, runoff is retained behind weir structures (0.7 m tall) and spaced at varying intervals that are dictated based on the existing slope/gradient. The ponded runoff behind the control weirs will infiltrate into the water table in accordance with the CVC/TRCA Low Impact Development SWM Planning Design Guide (Version 1.0, 2010).

The bioswale system treatment capacity is governed by the surface ponding volume within the various control weirs. Further calculations and details regarding the control weirs will be provided as the site designs continue to advance.

Refer to the Preliminary Grading and Servicing Plan (Drawing C101) and Appendix B for OGS sizing details.

7.2 Low Impact Development Design

Water balance and erosion control measures will be designed to satisfy all relevant criteria and constraints. The above will be demonstrated and discussed at the detailed design stage.

7.3 Stormwater Quantity Controls

Design Storm – 3-hour Chicago

The City of Guelph IDF parameters (October 2023) were used to generate a 3-hour Chicago design storm, per Puslinch Municipal Development Standards. The quantity volume modeled only includes the proposed dry pond, though the bioswale could also provide additional stormwater quantity storage. An orifice size of 125 mm was used for the preliminary outfall design.

The required preliminary storage volumes and uncontrolled peak flow rates are presented in Table 10.

Table 10: Preliminary Storage Volume Requirements (3-hour Chicago)

Storm (3-hour Chicago)	Pre-Dev. Uncontrolled Peak Flow Rate¹ (L/s)	Post-Dev. Uncontrolled Peak Flow Rate² (L/s)	Post-Dev. Controlled Peak Flow Rate² (L/s)	Total Preliminary Storage Volume Required (m³)
2-year	135	597	130	710
5-year	270	810	255	1044
10-year	392	952	365	1318
25-year	593	1140	547	1735
50-year	756	1275	693	2051
100-year	940	1418	857	2399

1. Includes runoff directed to outlet culvert located at Arkell Road (Catchment 101, EXT 1, 2, & 3)

2. Includes runoff directed to outlet culvert located at Arkell Road (Catchment 201, EXT 1, 2, & 3, UC01, UC02). The maximum storage required for the 3-hour Chicago storm distribution is roughly 2400 m³ during the 100-year storm event and the quantity control will be provided for the required storage volume using the proposed dry pond.

The proposed dry pond is sized to store 2630 m³ of volume below the sill of the emergency spillway. The emergency spillway is sized to convey the uncontrolled 100 Year and Regional flows at a flow depth of approximately 0.1 meters, leaving approximately 0.3 meters of freeboard.

7.4 Stormwater Management Inspection and Maintenance

It is understood that that the Township of Puslinch will be responsible for the operation and maintenance of the stormwater management system. Maintenance procedures associated with the stormwater management system are detailed below.

Grass Swales

Table 11 outlines routine inspection and maintenance tasks and recommended minimum frequencies for grass swales.

Table 11: Routine Maintenance Tasks for Grassed Swales

Frequency	Routine Maintenance Task
Annually or as needed	Replace dead vegetation, remove invasive growth, dethatch, and aerate.
	Repair eroded or sparsely vegetated areas.
	Remove accumulated sediment on the swale surface when dry and exceeds 25 mm.
	If gullies are observed along the swale, regrading and revegetating may be required.
At least twice annually or as needed.	Regular watering may be required during the first two (2) years while vegetation is becoming established.
More frequently if desired for aesthetic reasons.	Mow grass to maintain height between 75 mm to 150 mm.
	Remove trash and debris from swale surface, inlets, and outlets.

In-Line Oil-Grit Separator (OGS) Units

According to the manufacturer (Imbrium Systems Inc.), inspection and maintenance is crucial for the long-term performance of the OGS Units. The recommended maintenance frequency is outlined below.

- Inspect every six months for the first year to determine the pollutant accumulation rate.
- In subsequent years, inspections can be based on accumulation rates, observations or typical township frequencies.
- Inspect the unit immediately after an oil, fuel or chemical spill. A licensed waste management company should remove oil and sediment and dispose responsibly.

Stormwater Management Dry Pond

Inspections of the proposed dry pond are to be conducted after every significant storm during the first two years after construction to ensure proper function of the facility and its infrastructure. After this period, inspections should be conducted on an annual basis at a minimum.

Recommended inspections should include observations of water levels. If water levels remain high several days after a storm, pond outlet should be inspected for trash, debris, and accumulated sediment. Sediment levels in the pond should also be inspected to ensure proper functioning the system.

8.0 Erosion and Sediment Controls During Construction

Erosion and sediment controls will be implemented prior to the commencement of any site servicing works for the development and will be maintained throughout construction until the Site is stabilized or as directed by the Site Engineer and/or Township of Puslinch. It will be critical for sediment to be controlled, and proper measures put in place to ensure the integrity of any site infiltration measures and bio-swales are maintained during construction.

Controls will be inspected after each significant rainfall event and maintained in proper working condition. A formal Erosion and Sediment Control Plan outlining the site-specific erosion and sediment controls will be prepared and provided to applicable review agencies during subsequent design submissions. This plan will include silt fencing, a mud mat, and more robust measures, such as check dams, in areas of concentrated flow.

Further details on the erosion and control measures to be included have been summarized below:

Sediment Control Silt Fence

Sediment Control Silt Fence will be installed on the perimeter of the Site where sheet flow can be identified. Additional Sediment Control Silt Fence may be added based on field decisions by the Site Engineer and Owner prior to, during, and following construction.

Mud Mat

A rock mud mat will be installed at the entrance to the Site off Watson Road South. The rock mud mat will help to prevent mud tracking. The primary construction entrance will have to be verified prior to construction commencing.

Rock Check Dams

Rock check dams installed according to OPSD 219.210 should be installed in the proposed swale to protect from erosion conveyance during construction.

9.0 Conclusions & Recommendations

This report was prepared in support of the Zoning By-Law Amendment Application for the property located at lots 7, 8, 9, Concession 10, Township of Puslinch, County of Wellington. The proposed development can be serviced for water, sanitary, and stormwater management in accordance with the Township of Puslinch, Wellington County, and the Grand River Conservation Authority requirements and standards. Our conclusions and recommendations include:

Proposed Water and Sanitary Servicing

1. Municipal servicing infrastructure is not available in the vicinity of the site, and therefore the proposed development will be serviced by individual onsite sewage systems and water supply wells.
2. The preliminary sewage system design flows are expected to be approximately 4,575 L/d for each lot. Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA issued by the MECP will not be required. Each onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed with a footprint of approximately 104 m². The advanced treatment system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard and must achieve the denitrification requirement of at least 50% nitrate-nitrogen reduction to meet MECP Guideline D-5-4.
3. Individual lots will be serviced with private drilled wells in accordance with O. Reg. 903 for potable water supply.

Stormwater Management

1. A passive stormwater management approach is proposed to preserve and maintain the rural character of the property using bioswale systems to control and infiltrate stormwater runoff.
2. Water quality controls, erosion protection, and water balance for the proposed development will be provided by the proposed bioswale systems pretreated by OGS units within the municipal roadway storm system. The bioswale system with OGS pretreatment and dry pond treatment train will provide water quality treatment that exceeds the "Enhanced Protection" criteria by retaining, treating, and infiltrating runoff volume equal to, or greater than, the runoff volume generated during a 25 mm rainfall event. The water quality storage provided in the bioswale system and dry pond provides active storage to simultaneously provide the necessary quantity controls for the Site.
3. No additional water quantity storage is required beyond what is provided in the bioswale system and dry pond. The post-development peak flows will be controlled to less than pre-development peak flows at outlet culvert located at Arkell Road for the 2-year to 100-year design storm events.
4. Runoff generated from catchments Ext. 1, Ext. 2, Ext. 3, 202, and UC02 will drain uncontrolled overland before being intercepted by the proposed conveyance bypass swale that safely directs towards the outlet culvert located at Arkell Road. This flow routing will maintain the existing drainage conditions of the subject property.
5. Water balance and erosion control measures will be designed to satisfy all relevant criteria and constraints. The above will be demonstrated and discussed at the detailed design stage.

Based on the above conclusions, we recommend the approval of the Zoning By-Law Amendment Application from the perspective of functional servicing and stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

J.B.

Jordan Bieri, P.Eng.
Project Engineer, Land Development



DC/t:cj

C.F. CROZIER & ASSOCIATES INC.

N.C.O'Connor

Nicole O'Connor, P.Eng.
Project Engineer, Land Development



Limited
to SWM

J:\2400\2433 - Timberworx Custom Homes\6646 - Arkell Developments\Reports\2026.01_3rd SPA\2026.01.16_(2433-6646)_FSRSWM_Final.docx

APPENDIX A

Background Information



Lot No	Frontage (m)	Depth (m)	Area (ha)
1	94.2	44	0.39
2	33.3	79	0.23
3	30	69.7	0.21
4	32.4	68.8	0.21
5	34.8	68.8	0.21
6	37.9	63	0.24
7-20	32	63.2-60.3	0.2
21	34	60.2	0.21
22	47.5	31.2	0.19
23	62.7	31.2	0.19
24	33.1	76.7	0.26
25	33.5	71.4	0.24
26	33.4	60.8	0.23
27	32.7	60.8	0.23
28	32.5	79	0.22
29	33.6	59	0.22
30	33.1	68.9	0.23
31	33.4	68.9	0.23
32	34	68.9	0.22
33	32.5	68.8	0.22
34	33.9	58.8	0.22
35	32.5	78.8	0.22
36	32.5	70.8	0.2
37	33.6	57.5	0.22
38	32.5	67.5	0.22
39	34	67.5	0.23
40	34	70.2	0.24
41	32.5	70.2	0.23
42	33.6	67.4	0.24
43	33.5	60.5	0.2
44	32.1	74.4	0.24

Conceptual Plan

44 Lots

PART OF LOTS 7, 8, & 9, CONCESSION 10
ASSESSMENT ROLL NUMBER 2301000008034800000
ARKELL, ONTARIO

1. This is Not a Plan Of Survey.
2. Locations of Natural Features Have Been Extracted From The Government of Ontario: Land Information Ontario Open Data.
3. Distances Shown on This Plan Are Adjusted Ground Distances and Can Be Converted To Grid Distances by Multiplying by An Averaged Combined Scale Factor of 0.999636.
4. Coordinates on This Plan Are UTM, ZONE 17, NAD83 (CSRS-2010) Adjustment and Are Based on GPS Observations From a Network of Permanent GPS Reference Stations.

SAI

PLANNING. AGROLOGY.
ENVIRONMENTAL.

Stovel and Associates Inc.

651 Orangeville Road,
Fergus ON
N1M 1T9

P: 519-766-8042
E: stovel.associates@outlook.com

DRAFT

July 29, 2025

500

0

50

100

Meters

1:2500

6646_GRAD-smss.dwg

APPENDIX B

Design Calculations

APPENDIX B1

Onsite Sewage Calculations

		ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET			
		Project Name: Arkell Development Project Number: 2433-6646		Date: 2026-01-16 Designed By: ZS Checked By: KR	
House Details: 6 bedroom 350.00 m2				#### input required	References
Description		Number of Units	Additional Flow per Unit (L)	Total Flow (L/day)	61.5 total
Base Flow				2500	
Additional Flow					
i) Each bedroom over 5		1	500	500	
ii) Area over 200m ²					
A) Each 10m ² over 200m ² to 400m ²		15	100	1500	
B) Each 10m ² over 400m ² to 600m ²		0	75	0	
C) Each 10m ² over 600m ²		0	50	0	
	Total Additional Sewage Flow from Area			1500	
iii) Fixture Units over 20		41.5	50	2075	
	Addition flow (greatest of i,ii,iii)			2075	
	Total Daily Design Sanitary Sewage Flow (L/day):			4575	
Pre-Treatment Options					
Required septic tank size = 9150 L minimum					
Propose Level IV Treatment (Y/N): Y					
Native Percolation time, T = 15 min/cm					
Imported Sand Percolation time = 10 min/cm					
Option #1 - Type A Dispersal Bed					T-time estimated by Crozier
Required		Provided			
Stone area =	92 m ²	(Q/50)	104 m ²		
Sand area =	81 m ²	(QT/400)	104 m ²		



ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: Arkell Development
Project Number: 2433-6646

2026-01-16
Designed By: ZS
Checked By: KR

input required

Fixtures	Number of Fixtures	Fixture Units per Fixture	Total Fixture Units
Bathroom Group (flush tank)	4	6	24.0
2 Piece Bathroom	2	5.5	11.0
Basement Rough-in	2	6	12.0
Sinks (Domestic Lavatory w. 1/2" trap, kitchen sink, single compartment laundry tray)	4	1.5	6.0
Clothes Washer	1	1.5	1.5
Dishwasher (if not connected to kitchen sink)	1	1	1.0
Shower (from 1 head)	1	1.5	2
Floor drain	1	3	3
Laundry Tub	1	1.5	2
		Total Fixture Units	61.5

Assumed fixture units based on similar house sizes

APPENDIX B2

Hydrologic Parameters



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME 101
D.A. AREA (ha) 18.82

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

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	18.82
				0
				0
				0
Total Area				18.82

Impervious Landuses Present:													
Soils		Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
		Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS			96		96		96	0.08	96		50	0.085	8.12
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
Subtotal		0.00		0.00		0.00		0.08		0.00			

Pervious Landuses Present:													
Soils		Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
		Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS		6.47	38					5.51	41	6.76	65	18.74	910.98
	0		38						41		65	0.00	0.00
	0		38						41		65	0.00	0.00
	0		38						41		65	0.00	0.00
Subtotal		6.47		0		0		5.51		6.76			

			Composite Area Calculations			
					Total Pervious Area	18.74
					Total Impervious Area	0.08
					% Impervious	0.45%
					Composite Curve Number	48.8
					Total Area Check	18.82

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient							
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0	
				RC	Area	RC	Area	RC	Area	RC	Area
Woodland	10	6.47	64.69	0.25	6		0		0		0
Meadow	8	0.00	0.00		0		0		0		0
Wetland	16	0.00	0.00		0		0		0		0
Lawn	5	5.51	27.53	0.25	6		0		0		0
Cultivated	7	6.76	47.32		7		0		0		0
Impervious	2	0.08	0.17	0.90	0		0		0		0
Composite		18.82	7.42	Composite Runoff Coefficient							0.16

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)
Sheet Flow	907.4	11.03	1.2%	-	-	-	-	-	0.62	0.41	1.44	0.96

Appropriate calculated time to peak: 0.96 Appropriate Method: Airport



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME EXT1 (PRE)
D.A. AREA (ha) 24.38

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment EXT1 (PRE)

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	24.38
				0
				0
				0
Total Area				24.38

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
GS	0.029	96	0	96	0	96	0	96		50	0.029	2.75
0		96		96		96		96		50	0	0
0		96		96		96		96		50	0	0
0		96		96		96		96		50	0	0
Subtotal	0.029		0		0		0		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
GS	20.06	38					4.29	41			24.35	938.24
0		38					0	41			0.00	0.00
0		38					0	41			0.00	0.00
0		38					0	41			0.00	0.00
Subtotal			0		0		4.29		0			

			Composite Area Calculations		Total Pervious Area		24.35	
					Total Impervious Area		0.03	
					% Impervious		0.12%	
					Composite Curve Number		38.6	
					Total Area Check		24.38	

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0		
				RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	20.06	200.57	0.25	20		0		0		0	5.01
Meadow	8	0.00	0.00		0		0		0		0	0.00
Wetland	16	0.00	0.00		0		0		0		0	0.00
Lawn	5	4.29	21.47	0.25	4		0		0		0	1.07
Cultivated	7	0.00	0.00		0		0		0		0	0.00
Impervious	2	0.03	0.06	0.90	0		0		0		0	0.03
Composite		24.38	9.11	Composite Runoff Coefficient								0.25



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME
D.A. AREA (ha)

EXT1 (POST)
23.84

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment EXT1 (POST)

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	23.84
				0
				0
				0
Total Area				23.84

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
GS		0.029	96	0	96	0	96	0	96		50	0.029	2.75
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
Subtotal		0.029		0		0		0		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
GS		20.06	38					3.75	41			23.81	916.10
	0		38					0	41			0.00	0.00
	0		38					0	41			0.00	0.00
	0		38					0	41			0.00	0.00
Subtotal				0		0		3.75		0			

			Composite Area Calculations		Total Pervious Area		23.81
					Total Impervious Area		0.03
					% Impervious		0.12%
					Composite Curve Number		38.5
					Total Area Check		23.84

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient							
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0	
				RC	Area	RC	Area	RC	Area	RC	Area
Woodland	10	20.06	200.57	0.25	20		0		0		0
Meadow	8	0.00	0.00		0		0		0		0
Wetland	16	0.00	0.00		0		0		0		0
Lawn	5	3.75	18.77	0.25	4		0		0		0
Cultivated	7	0.00	0.00		0		0		0		0
Impervious	2	0.03	0.06	0.90	0		0		0		0
Composite		23.84	9.20	Composite Runoff Coefficient							0.25

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)
Sheet Flow	939.8	20.5	2.2%	-	-	-	-	-	0.56	0.37	1.09	0.73

Appropriate calculated time to peak: 0.73 Appropriate Method: Airport



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME
D.A. AREA (ha)

EXT3
6.87

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment EXT3

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	6.87
				0
				0
				0
Total Area				6.87

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
GS		0.78	96		96		96	0.61	96		50	1.39	133.84
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
	0		96		96		96		96		50	0	0
Subtotal		0.78		0.00		0.00		0.61		0.00			
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
GS			38					5.476	41		65	5.48	224.51
	0		38						41		65	0.00	0.00
	0		38						41		65	0.00	0.00
	0		38						41		65	0.00	0.00
Subtotal		0.00		0		0		5.48		0.00			
Composite Area Calculations												Total Pervious Area	5.48
												Total Impervious Area	1.39
												% Impervious	20.29%
												Composite Curve Number	52.2
												Total Area Check	6.87

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0		
				RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0.00	0.25	0		0		0		0	0.00
Meadow	8	0.00	0.00		0		0		0		0	0.00
Wetland	16	0.00	0.00		0		0		0		0	0.00
Lawn	5	5.48	27.38	0.25	5		0		0		0	1.37
Cultivated	7	0.00	0.00	0.25	0		0		0		0	0.00
Impervious	2	1.39	2.79	0.90	1		0		0		0	1.25
Composite		6.87	4.39	Composite Runoff Coefficient								0.38

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)
Sheet Flow	131.9	3.83	2.9%	-	-	-	-	-	0.08	0.06	0.32	0.21

Appropriate calculated time to peak: 0.21 Appropriate Method: Airport



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME
D.A. AREA (ha)

EXT4
0.53

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment EXT4

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	0.53
				0
				0
				0
Total Area				0.53

Impervious Landuses Present:												
Soils	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS		96		96		96		96		50	0.00	0.00
0		96		96		96		96		50	0	0
0		96		96		96		96		50	0	0
0		96		96		96		96		50	0	0
Subtotal	0.00		0.00		0.00		0.00		0.00			

Pervious Landuses Present:												
Soils	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS	0.53	38						41		65	0.53	20.14
0		38						41		65	0.00	0.00
0		38						41		65	0.00	0.00
0		38						41		65	0.00	0.00
Subtotal	0.53		0		0		0.00		0.00			

	Composite Area Calculations	Total Pervious Area	0.53
		Total Impervious Area	0.00
		% Impervious	0.00%
		Composite Curve Number	38.0
		Total Area Check	0.53

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient							
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0	
				RC	Area	RC	Area	RC	Area	RC	Area
Woodland	10	0.53	5.30	0.25	1		0		0		0
Meadow	8	0.00	0.00		0		0		0		0
Wetland	16	0.00	0.00		0		0		0		0
Lawn	5	0.00	0.00	0.25	0		0		0		0
Cultivated	7	0.00	0.00	0.25	0		0		0		0
Impervious	2	0.00	0.00	0.90	0		0		0		0
Composite		0.53	10.00	Composite Runoff Coefficient							0.25

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)
Sheet Flow	131.9	3.83	2.9%	-	-	-	-	-	0.11	0.07	0.37	0.25

Appropriate calculated time to peak: 0.25 Appropriate Method: Airport



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME 201
D.A. AREA (ha) 10.55

Hydrologic Parameters: CALIB STANHYD Command

Post Development
Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	10.55
				0
				0
				0
Total Area Check				10.55

Impervious Landuses Present:													
Soils		Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
		Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS		2.05	98		98		98	2.24	98	0.205	98	4.492	440.22
	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		2.05		0.00		0.00		2.24		0.21			

Pervious Landuses Present:													
Soils		Woodland		Meadow		Permeable Pavers		Lawn		SWMF		Subtotals	
		Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
GS								5.85	41	0.21	50	6.06	250.22
	0								41			0	0
	0								41			0	0
	0								41			0	0
Subtotal Area		0.00		0		0		5.85		0.21			

		Pervious Area Calculations		Total Pervious Area		Composite Pervious Curve Number					
		Impervious Area Calculations		Total Directly Connected Area		Total Indirectly Connected Area		Total Impervious Area			
								% X imp			
								% T imp			
								Total Area Check			

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Permeable Pavers	16	0	0
Lawn	5	5.85	29.27
SWMF	5	0.21	1.03
Composite IA		6.06	5.00

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.00	2.00%	81	0.25
Impervious	2.00	0.50%	104	0.013



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME 202
D.A. AREA (ha) 2.39

Hydrologic Parameters: CALIB STANHYD Command

Post Development

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	2.39
				0
				0
				0
Total Area Check				2.39

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	
GS	0.09	98		98		98	0.76	98		98	0.850	83.30	
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	0.09		0.00		0.00		0.76		0.00				

Pervious Landuses Present:													
		Woodland		Meadow		Permeable Pavers		Lawn		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN	
GS							1.54	41		50	1.54	63.14	
0								41			0	0	
0								41			0	0	
0								41			0	0	
Subtotal Area	0.00		0		0		1.54		0.00				

	Pervious Area Calculations	Total Pervious Area	1.54
		Composite Pervious Curve Number	41
	Impervious Area Calculations	Total Directly Connected Area	0.09
		Total Indirectly Connected Area	0.76
		Total Impervious Area	0.85
		% X imp	3.8
		% T imp	35.6
Total Area Check		2.39	

min 10% used

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Permeable Pavers	16	0	0
Lawn	5	1.54	7.70
SWMF	5	0	0
Composite IA		1.54	5.00

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.00	2.00%	81	0.25
Impervious	2.00	0.50%	104	0.013



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: BAS

D.A. NAME UC01
D.A. AREA (ha) 1.35

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment UC01

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	1.35
				0
				0
				0
Total Area				1.35

Impervious Landuses Present:												Subtotals	
Roadway		Sidewalk		Driveway		Building		SWMF				Area	A*CN
Soils	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)		
GS												0.00	0.00
												0	0
												0	0
												0	0
												0	0
Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Pervious Landuses Present:													
Woodland		Meadow		Wetland		Lawn		Cultivated				Area	A*CN
Soils	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)		
GS	1.35											1.35	51.30
												0.0	0.0
												0.0	0.0
												0.0	0.0
												0.0	0.0
Subtotal	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Composite Area Calculations												1.35	
												0.00	
												0.00%	
												38.0	
Total Area Check												1.35	

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0		A*RC
				RC	Area	RC	Area	RC	Area	RC	Area	
Woodland	10	1.35	13.50	0.25	1		0		0		0	0.34
Meadow	8	0.00	0.00		0		0		0		0	0.00
Wetland	16	0.00	0.00		0		0		0		0	0.00
Lawn	5	0.00	0.00	0.25	0		0		0		0	0.00
Cultivated	7	0.00	0.00		0		0		0		0	0.00
Impervious	2	0.00	0.00	0.90	0		0		0		0	0.00
Composite		1.35	10.00	Composite Runoff Coefficient								0.25

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)
Sheet Flow	394.4	8.9	2.3%	-	-	-	-	-	0.31	0.21	0.70	0.47

Appropriate calculated time to peak: 0.47 Appropriate Method: Airport



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: 2026-01-15
Completed By: NOC

D.A. NAME UC02
D.A. AREA (ha) 4.54

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment UC02

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Gravelly Sand	GS	A	100	4.54
				0
				0
				0
Total Area				4.54

Impervious Landuses Present:												Subtotals	
Roadway			Sidewalk		Driveway		Building		SWMF			Area	A*CN
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN			
GS		96		96		96	0.38	96		50		0.38	36.86
0		96		96		96		96		50		0	0
0		96		96		96		96		50		0	0
0		96		96		96		96		50		0	0
Subtotal	0.00		0.00		0.00		0.38		0.00				
Pervious Landuses Present:													
Woodland			Meadow		Wetland		Lawn		Cultivated			Area	A*CN
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN			
GS	3.43	38					0.73	41				4.16	160.11
0		38						41				0.0	0.0
0		38						41				0.0	0.0
0		38						41				0.0	0.0
Subtotal	3.43		0.00		0.00		0.73		0.00				
			Composite Area Calculations				Total Pervious Area					4.16	
							Total Impervious Area					0.38	
							% Impervious					8.46%	
							Composite Curve Number					43.4	
							Total Area Check					4.54	

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient									
Landuse	IA (mm)	Area (ha)	A * IA	Gravelly Sand		0		0		0		A*RC	
				RC	Area	RC	Area	RC	Area	RC	Area		
Woodland	10	3.43	34.30	0.25	3		0		0		0	0.86	
Meadow	8	0.00	0.00		0		0		0		0	0.00	
Wetland	16	0.00	0.00		0		0		0		0	0.00	
Lawn	5	0.73	3.63	0.25	1		0		0		0	0.18	
Cultivated	7	0.00	0.00		0		0		0		0	0.00	
Impervious	2	0.38	0.77	0.90	0		0		0		0	0.35	
Composite		4.54	8.52	Composite Runoff Coefficient									0.30

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)	
Sheet Flow	274.4	6.3	2.3%	-	-	-	-	-	0.19	0.13	0.55	0.37	

Appropriate calculated time to peak: 0.37 Appropriate Method: Airport

APPENDIX B3

Pond, Swale, and Culvert Calculations



Project Name: Arkell Subdivision
Project Number: 2433-6646
Date: January 15, 2026
Completed By: NOC

Dry Pond Facility

Orifice 1

Orifice 1 Coefficient: 0.620
Orifice 1 Diameter: 0.125 m
Orifice 1 Invert Elevation: 338.50 m
Orifice 1 Centroid Elevation: 338.56 m

Emergency Weir

Weir Coefficient: 1.56
Emergency Spill Elev: 339.6 m
Em. Spill Bot. Width: 24 m
Trap. Side Slopes: 15 :1 H:V

Operating Level	Elev.	Depth Above Bottom of Pond	Depth Above PP / ED Orifice	Area	Total Storage Volume	Storage Volume Above PP	Discharge Orifice 1	Emerg. Weir Avg. Width	Emerg. Weir Discharge	Total Discharge
	(m)	(m)	(m)	(sq.m)	(cu.m)	(cu.m)	(cu.m/s)	(m)	(cu.m/s)	(cu.m/s)
Bottom of Pond	338.50	0.00	338.38	2,068	0	0	0.000			0.000
	338.60	0.10	338.48	2,127	210	210	0.007			0.007
	338.70	0.20	338.58	2,187	425	425	0.012			0.012
	338.80	0.30	338.68	2,246	647	647	0.016			0.016
	338.90	0.40	338.78	2,305	875	875	0.020			0.020
	339.00	0.50	338.88	2,365	1,108	1108	0.022			0.022
	339.10	0.60	338.98	2,424	1,348	1348	0.025			0.025
	339.20	0.70	339.08	2,483	1,593	1593	0.027			0.027
	339.30	0.80	339.18	2,543	1,844	1844	0.029			0.029
	339.40	0.90	339.28	2,602	2,102	2102	0.031			0.031
	339.50	1.00	339.38	2,661	2,365	2365	0.033			0.033
Emergency Weir Sill	339.60	1.10	339.48	2,721	2,634	2634	0.034	24,000		0.034
	339.70	1.20	339.58	2,780	2,909	2909	0.036	25.483	1.257	1.293
	339.80	1.30	339.68	2,839	3,190	3190	0.036	26.966	3.763	3.799
	339.90	1.40	339.78	2,899	3,477	3477	0.037	28.449	7.292	7.329
Top of Pond	340.00	1.50	339.88	2,958	3,770	3770	0.037	29.932	11.813	11.849



Project: Arkell Subdivision
Project No.: 2433-6743
Description: Catchment 201 Water Quality
Storage Requirements

Date: 2024-01-22
Revised: 2026-01-15
Designed By: AO
Checked By: NOC

Catchment 201 Water Quality Storage Requirements

Bioswale Catchment Area (ha): 10.55 Catchment 201
Imperviousness Level (%): 42.60

MOE Table 3.2

Storage Volume for enhanced 80% long term SS removal (m³/ha): 28.80

Design Storage Volume per MOE Table 3.2 (m³): 304

= Bioswale Catchment Area *
MOE Storage Volume Rate

VO Results Volume:

25 mm Runoff (mm): 6.32

Design Storage Volume per VO Results (m³): 667

Design Storage Required (m³): 667

Design Storage Provided (m³): 1586

See Weir Control Sizing Calculation Sheet



Project: Arkell Subdivision
Project No.: 2433-6743
Description: Bioswale Control Weir Sizing

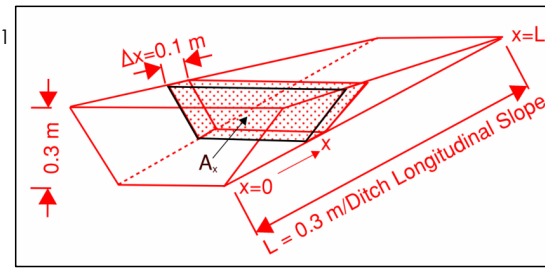
Date: 2024-01-22
Revised: 2026-01-15
Designed By: AO
Checked By: NOC

Bioswale Weir Control Sizing - Catchment 201

Ditch Bottom Width = 1.5 m
Ditch Top Width = 7.50 m
Roadside Ditch Side Slope = 3:1
Lot Line Ditch Slope = 3:1
Ditch Height = 1.00 m
Proposed Control Weir Height = 0.70 m

Road Segment Length = 487
Proposed Longitudinal Ditch Slope = 0.30%
Control Weir Spacing = 54 m
Number of Control Weir Ponding Areas = 9
Weir Control Ponding Storage per Area (V) = 176.22 m³/area
Surface Ponding Volume Provided = 1,585.98 m³

Catchment 201



$$V = \int_{x=0}^{x=L} dV \cong A_{x=\Delta x} \Delta x + A_{x=2\Delta x} \Delta x + A_{x=3\Delta x} \Delta x + \dots + A_{x=L} \Delta x$$

where $\Delta x = 0.1 \text{ m}$ and $A_x = \text{Cross sectional area of retained water @ } x$



Project: Arkell Subdivision
Project No.: 2433-6743
Description: Bioswale Sizing

Date: 2024-01-22
Revised: 2026-01-15
Designed By: AO
Checked By: NOC

Roadside Bioswale Sizing - Catchment 201

Parameter	Value	Units	Catchment 201
Provided Bioswale Design Parameters			
Surface Ponding Volume Provided Behind Weir Control Structures =	1,586	m ³	
Percolation Rate =	70.0	mm/hr	Table 9.6; Hydrology of Floods in Canada: A Guide to Planning and Design (National Research Council of Canada, 1989)
Safety Correction Factor =	2.00		
Design Percolation Rate (P) =	35.00	mm/hr	
LID Length =	486	m	= Length * width
LID Width =	1.5	m	
Provided footprint (A) =	729	m ²	
Gravel Storage Depth =	0.40	m	A = 1000 * V / [P*n* t] Equation 4.3 (MOE SWM Planning and Design Manual, 2003)
Void Space Ratio (n) =	0.40		
Total Bioswale Gravel Storage Volume Provided (V) =	117	m ³	
Infiltration Rate =	10.2	m ³ /hr	≥ Surface Ponding Storage =
Retention Time (t) =	11	hours	

1,586 m³

NOTES:

1. Surface storage and filter media storage not included in bioswale volume calculation to be conservative.

Proposed Bio-swale (North)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00300	m/m
Normal Depth	1.00	m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	1.50	m

Results

Discharge	5.68	m³/s
Flow Area	4.50	m²
Wetted Perimeter	7.82	m
Hydraulic Radius	0.58	m
Top Width	7.50	m
Critical Depth	0.73	m
Critical Slope	0.01208	m/m
Velocity	1.26	m/s
Velocity Head	0.08	m
Specific Energy	1.08	m
Froude Number	0.52	
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	1.00	m
Critical Depth	0.73	m
Channel Slope	0.00300	m/m

Proposed Bio-swale (North)

GVF Output Data

Critical Slope 0.01208 m/m

Proposed By-Pass Swale (South)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00300	m/m
Normal Depth	0.85	m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	1.50	m

Results

Discharge	3.96	m³/s
Flow Area	3.44	m²
Wetted Perimeter	6.88	m
Hydraulic Radius	0.50	m
Top Width	6.60	m
Critical Depth	0.61	m
Critical Slope	0.01268	m/m
Velocity	1.15	m/s
Velocity Head	0.07	m
Specific Energy	0.92	m
Froude Number	0.51	
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	0.85	m
Critical Depth	0.61	m
Channel Slope	0.00300	m/m

Proposed By-Pass Swale (South)

GVF Output Data

Critical Slope 0.01268 m/m

100 Year Depth - North Bioswale

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00300	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	1.50	m
Discharge	1.31	m³/s

Results

Normal Depth	0.50	m
Flow Area	1.52	m²
Wetted Perimeter	4.69	m
Hydraulic Radius	0.32	m
Top Width	4.52	m
Critical Depth	0.34	m
Critical Slope	0.01477	m/m
Velocity	0.86	m/s
Velocity Head	0.04	m
Specific Energy	0.54	m
Froude Number	0.47	
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	0.50	m
Critical Depth	0.34	m
Channel Slope	0.00300	m/m

100 Year Depth - North Bioswale

GVF Output Data

Critical Slope 0.01477 m/m

Worksheet for 100 Year Depth - South Bypass Swale

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00300	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	1.50	m
Discharge	0.83	m³/s

Results

Normal Depth	0.40	m
Flow Area	1.09	m²
Wetted Perimeter	4.04	m
Hydraulic Radius	0.27	m
Top Width	3.91	m
Critical Depth	0.26	m
Critical Slope	0.01579	m/m
Velocity	0.76	m/s
Velocity Head	0.03	m
Specific Energy	0.43	m
Froude Number	0.46	
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	0.40	m
Critical Depth	0.26	m
Channel Slope	0.00300	m/m

Worksheet for 100 Year Depth - South Bypass Swale

GVF Output Data

Critical Slope 0.01579 m/m

Culvert Calculator Report

Box Culvert -Street A

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	344.300 m	Headwater Depth/Height	0.87
Computed Headwater Elev.	344.300 m	Discharge	2.0248 m³/s
Inlet Control HW Elev.	344.287 m	Tailwater Elevation	343.400 m
Outlet Control HW Elev.	344.300 m	Control Type	Entrance Control
Grades			
Upstream Invert	343.500 m	Downstream Invert	343.400 m
Length	25.000 m	Constructed Slope	0.004000 m/m
Hydraulic Profile			
Profile	S2	Depth, Downstream	0.488 m
Slope Type	Steep	Normal Depth	0.488 m
Flow Regime	Supercritical	Critical Depth	0.500 m
Velocity Downstream	2.268 m/s	Critical Slope	0.003735 m/m
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.829 m
Section Size	6 x 3 ft	Rise	0.914 m
Number Sections	1		
Outlet Control Properties			
Outlet Control HW Elev.	344.300 m	Upstream Velocity Head	0.250 m
Ke	0.20	Entrance Loss	0.050 m
Inlet Control Properties			
Inlet Control HW Elev.	344.287 m	Flow Control	N/A
Inlet Type	90° headwall w 45° bevels	Area Full	1.67 m²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

Culvert Calculator Report

Arkell Road Site Entrance Culvert

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	339.600 m	Headwater Depth/Height	1.71
Computed Headwater Elev.	339.600 m	Discharge	0.2484 m³/s
Inlet Control HW Elev.	339.562 m	Tailwater Elevation	338.850 m
Outlet Control HW Elev.	339.600 m	Control Type	Outlet Control

Grades			
Upstream Invert	339.080 m	Downstream Invert	338.850 m
Length	22.900 m	Constructed Slope	0.010044 m/m

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	0.268 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.268 m
Velocity Downstream	1.829 m/s	Critical Slope	0.011643 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	0.305 m
Section Size	12 inch	Rise	0.305 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	339.600 m	Upstream Velocity Head	0.148 m
Ke	0.20	Entrance Loss	0.030 m

Inlet Control Properties			
Inlet Control HW Elev.	339.562 m	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° bevels	Area Full	0.15 m²
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

Culvert Calculator Report

Watson Road South Site Entrance Culvert

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	346.550 m	Headwater Depth/Height	0.69
Computed Headwater Elev.	346.550 m	Discharge	0.0352 m³/s
Inlet Control HW Elev.	346.539 m	Tailwater Elevation	346.000 m
Outlet Control HW Elev.	346.550 m	Control Type	Entrance Control

Grades			
Upstream Invert	346.340 m	Downstream Invert	346.000 m
Length	30.000 m	Constructed Slope	0.011333 m/m

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.115 m
Slope Type	Steep	Normal Depth	0.115 m
Flow Regime	Supercritical	Critical Depth	0.143 m
Velocity Downstream	1.397 m/s	Critical Slope	0.005111 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	0.305 m
Section Size	12 inch	Rise	0.305 m
Number Sections	1		

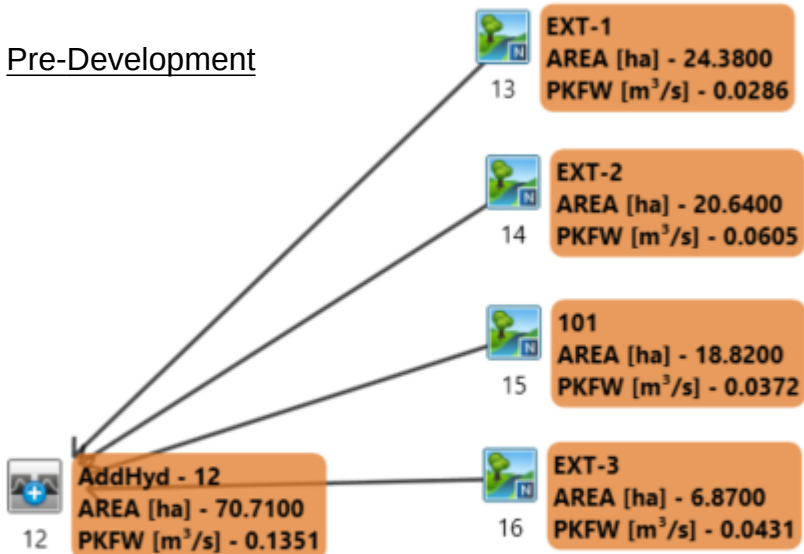
Outlet Control Properties			
Outlet Control HW Elev.	346.550 m	Upstream Velocity Head	0.055 m
Ke	0.20	Entrance Loss	0.011 m

Inlet Control Properties			
Inlet Control HW Elev.	346.539 m	Flow Control	Unsubmerged
Inlet Type	Beveled ring, 33.7° bevels	Area Full	0.07 m²
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

APPENDIX B4

Hydrologic Model Output

Pre-Development



=====

V V I SSSS U U A L (v 6.2.2015)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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\V02\voin.dat

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Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\ed7
3249b-c777-4303-a77c-ac0c6e622bd1\sce

DATE: 01-15-2026 TIME: 12:28:12

USER:

COMMENTS: _____

** SIMULATION : 1 - 2yr 3hr 10min Chicago **

CHICAGO STORM | IDF curve parameters: A= 475.610
Ptotal= 30.88 mm | B= 0.000
C= 0.738

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.17	0.83	86.95	1.67	5.04	2.50	3.05
0.17	3.77	1.00	15.73	1.83	4.42	2.67	2.85
0.33	4.72	1.17	9.66	2.00	3.95	2.83	2.67
0.50	6.58	1.33	7.25	2.17	3.59		
0.67	12.69	1.50	5.91	2.33	3.30		

CALIB
NASHYD (0013) | Area (ha)= 24.38 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 9.11 # 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	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.029 (i)
TIME TO PEAK (hrs)= 2.083
RUNOFF VOLUME (mm)= 0.961
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.031

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0014) | Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.59

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 3.17 | 0.833 12.69 | 1.583 5.91 | 2.33 3.59
0.167 3.17 | 0.917 86.95 | 1.667 5.91 | 2.42 3.30
0.250 3.77 | 1.000 86.95 | 1.750 5.04 | 2.50 3.30
0.333 3.77 | 1.083 15.73 | 1.833 5.04 | 2.58 3.05
0.417 4.72 | 1.167 15.73 | 1.917 4.42 | 2.67 3.05
0.500 4.72 | 1.250 9.66 | 2.000 4.42 | 2.75 2.85
0.583 6.58 | 1.333 9.66 | 2.083 3.95 | 2.83 2.85
0.667 6.58 | 1.417 7.25 | 2.167 3.95 | 2.92 2.67
0.750 12.69 | 1.500 7.25 | 2.250 3.59 | 3.00 2.67

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.061 (i)
TIME TO PEAK (hrs)= 1.833
RUNOFF VOLUME (mm)= 2.091
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.068

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0015) | Area (ha)= 18.82 Curve Number (CN)= 48.0
ID= 1 DT= 5.0 min | Ia (mm)= 7.42 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.96

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 3.17 | 0.833 12.69 | 1.583 5.91 | 2.33 3.59
0.167 3.17 | 0.917 86.95 | 1.667 5.91 | 2.42 3.30
0.250 3.77 | 1.000 86.95 | 1.750 5.04 | 2.50 3.30
0.333 3.77 | 1.083 15.73 | 1.833 5.04 | 2.58 3.05
0.417 4.72 | 1.167 15.73 | 1.917 4.42 | 2.67 3.05
0.500 4.72 | 1.250 9.66 | 2.000 4.42 | 2.75 2.85

0.583 6.58 | 1.333 9.66 | 2.083 3.95 | 2.83 2.85
0.667 6.58 | 1.417 7.25 | 2.167 3.95 | 2.92 2.67
0.750 12.69 | 1.500 7.25 | 2.250 3.59 | 3.00 2.67

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.037 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 1.843
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.060

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0016) | Area (ha)= 6.87 Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min | Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.21

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 3.17 | 0.833 12.69 | 1.583 5.91 | 2.33 3.59
0.167 3.17 | 0.917 86.95 | 1.667 5.91 | 2.42 3.30
0.250 3.77 | 1.000 86.95 | 1.750 5.04 | 2.50 3.30
0.333 3.77 | 1.083 15.73 | 1.833 5.04 | 2.58 3.05
0.417 4.72 | 1.167 15.73 | 1.917 4.42 | 2.67 3.05
0.500 4.72 | 1.250 9.66 | 2.000 4.42 | 2.75 2.85
0.583 6.58 | 1.333 9.66 | 2.083 3.95 | 2.83 2.85
0.667 6.58 | 1.417 7.25 | 2.167 3.95 | 2.92 2.67
0.750 12.69 | 1.500 7.25 | 2.250 3.59 | 3.00 2.67

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.043 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 2.158
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.070

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

| ADD HYD ( 0012) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0013):  24.38  0.029  2.08  0.96
+ ID2= 2 ( 0014):  20.64  0.061  1.83  2.09
=====
ID = 3 ( 0012):  45.02  0.088  1.92  1.48

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0012) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0012):  45.02  0.088  1.92  1.48
+ ID2= 2 ( 0015):  18.82  0.037  2.42  1.84
=====
ID = 1 ( 0012):  63.84  0.122  2.08  1.59

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0012) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0012):  63.84  0.122  2.08  1.59
+ ID2= 2 ( 0016):  6.87  0.043  1.17  2.16
=====
ID = 3 ( 0012):  70.71  0.135  2.00  1.64

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

=====

```

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  A A A A L
V  V  I  SS    U  U  A  A  L
VV   I  SSSSS  UUUUU  A  A  LLLLL

```

```

000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
O  O  T    T  H  H  Y  Y  MM MM  O  O
O  O  T    T  H  H  Y  M  M  O  O
000  T    T  H  H  Y  M  M  000

```

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cda9d-b6d6-4fa7-9313-0c87802336dd\sce

DATE: 01-15-2026

TIME: 12:28:12

USER:

COMMENTS: _____

```

*****
** SIMULATION : 2 - 5yr 3hr 10min Chicago **
*****

```

```

| CHICAGO STORM | IDF curve parameters: A= 632.750
| Ptotal= 40.45 mm | B= 0.000
| C= 0.741
used in: INTENSITY = A / (t + B)^C

```

Duration of storm = 3.00 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	4.11	0.83	114.88	1.67	6.54	2.50	3.95
0.17	4.88	1.00	20.52	1.83	5.73	2.67	3.69
0.33	6.13	1.17	12.57	2.00	5.13	2.83	3.46
0.50	8.55	1.33	9.43	2.17	4.65		
0.67	16.54	1.50	7.68	2.33	4.27		

CALIB	Area (ha)=	24.38	Curve Number (CN)=	35.0
NASHYD (0013)	Ia (mm)=	9.11	# of Linear Res.(N)=	3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)=	0.73		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW	(cms)=	0.060 (i)
TIME TO PEAK	(hrs)=	2.000
RUNOFF VOLUME	(mm)=	1.953
TOTAL RAINFALL	(mm)=	40.451
RUNOFF COEFFICIENT	=	0.048

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0014)	Area (ha)=	20.64	Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.11	# of Linear Res.(N)= 3.00
U.H. Tp(hrs)=		0.59	

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	4.11	0.813	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.937	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95

0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW	(cms)=	0.123 (i)
TIME TO PEAK	(hrs)=	1.750
RUNOFF VOLUME	(mm)=	4.060
TOTAL RAINFALL	(mm)=	40.451
RUNOFF COEFFICIENT	=	0.100

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0015)	Area (ha)=	18.82	Curve Number (CN)= 48.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.42	# of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)=	0.96	

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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 0.749

```

PEAK FLOW      (cms)=    0.073 (i)
TIME TO PEAK   (hrs)=    2.333
RUNOFF VOLUME   (mm)=    3.540
TOTAL RAINFALL  (mm)=   40.451
RUNOFF COEFFICIENT =    0.088

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0016) | Area (ha)= 6.87 Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min | Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.21

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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.081 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 3.885
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.096

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0012) |
1 + 2 = 3
ID1= 1 (0013): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
+ ID2= 2 (0014): 24.38 0.060 2.00 1.95
ID = 3 (0012): 20.64 0.123 1.75 4.06

ID = 3 (0012): 45.02 0.180 1.83 2.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0012) |
3 + 2 = 1
ID1= 3 (0012): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
45.02 0.180 1.83 2.92

+ ID2= 2 (0015): 18.82 0.073 2.33 3.54
=====

ID = 1 (0012): 63.84 0.245 2.00 3.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0012) |
1 + 2 = 3
ID1= 1 (0012): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
+ ID2= 2 (0016): 63.84 0.245 2.00 3.10
ID = 3 (0012): 6.87 0.081 1.17 3.88
=====

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 A A A A L
V V I SS U U A A L
VV I SSSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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***** D E T A I L E D O U T P U T *****

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DATE: 01-15-2026

TIME: 12:28:12

USER:

COMMENTS: _____

** SIMULATION : 3 - 10yr 3hr 10min Chicago **

CHICAGO STORM
Ptotal= 47.37 mm

IDF curve parameters: A= 721.920
B= 0.000
C= 0.736
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.90	0.83	132.58	1.67	7.77	2.50	4.72
0.17	5.82	1.00	24.19	1.83	6.82	2.67	4.40
0.33	7.29	1.17	14.88	2.00	6.10	2.83	4.13
0.50	10.14	1.33	11.18	2.17	5.54		
0.67	19.52	1.50	9.12	2.33	5.09		

CALIB
NASHYD (0013)
ID= 1 DT= 5.0 min

Area (ha)= 24.38 Curve Number (CN)= 35.0
Ia (mm)= 9.11 # 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	4.90	0.833	19.52	1.583	9.12	2.33	5.54
0.167	4.90	0.917	132.58	1.667	9.12	2.42	5.09
0.250	5.82	1.000	132.58	1.750	7.77	2.50	5.09
0.333	5.82	1.083	24.19	1.833	7.77	2.58	4.72

0.417	7.29	1.167	24.19	1.917	6.82	2.67	4.72
0.500	7.29	1.250	14.88	2.000	6.82	2.75	4.40
0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.089 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.870
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.061

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0014)
ID= 1 DT= 5.0 min

Area (ha)= 20.64 Curve Number (CN)= 53.0
Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	4.90	0.833	19.52	1.583	9.12	2.33	5.54
0.167	4.90	0.917	132.58	1.667	9.12	2.42	5.09
0.250	5.82	1.000	132.58	1.750	7.77	2.50	5.09
0.333	5.82	1.083	24.19	1.833	7.77	2.58	4.72
0.417	7.29	1.167	24.19	1.917	6.82	2.67	4.72
0.500	7.29	1.250	14.88	2.000	6.82	2.75	4.40
0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.178 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 5.826
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.123

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.


```

-----
| CALIB |
| NASHYD ( 0015) | Area (ha)= 18.82 Curve Number (CN)= 48.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.42 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.96

```

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 4.90 0.833 19.52 1.583 9.12 2.33 5.54
0.167 4.90 0.917 132.58 1.667 9.12 2.42 5.09
0.250 5.82 1.000 132.58 1.750 7.77 2.50 5.09
0.333 5.82 1.083 24.19 1.833 7.77 2.58 4.72
0.417 7.29 1.167 24.19 1.917 6.82 2.67 4.72
0.500 7.29 1.250 14.88 2.000 6.82 2.75 4.40
0.583 10.14 1.333 14.88 2.083 6.10 2.83 4.40
0.667 10.14 1.417 11.18 2.167 6.10 2.92 4.13
0.750 19.52 1.500 11.18 2.250 5.54 3.00 4.13

```

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.104 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 5.064
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.107

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 0016) | Area (ha)= 6.87 Curve Number (CN)= 46.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.21

```

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 4.90 0.833 19.52 1.583 9.12 2.33 5.54
0.167 4.90 0.917 132.58 1.667 9.12 2.42 5.09
0.250 5.82 1.000 132.58 1.750 7.77 2.50 5.09
0.333 5.82 1.083 24.19 1.833 7.77 2.58 4.72
0.417 7.29 1.167 24.19 1.917 6.82 2.67 4.72

```

```

0.500 7.29 | 1.250 14.88 | 2.000 6.82 | 2.75 4.40
0.583 10.14 | 1.333 14.88 | 2.083 6.10 | 2.83 4.40
0.667 10.14 | 1.417 11.18 | 2.167 6.10 | 2.92 4.13
0.750 19.52 | 1.500 11.18 | 2.250 5.54 | 3.00 4.13

```

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.113 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 5.405
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.114

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0012) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0013): 24.38 0.089 2.00 2.87
+ ID2= 2 ( 0014): 20.64 0.178 1.75 5.83
=====
ID = 3 ( 0012): 45.02 0.263 1.83 4.22

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0012) |
| 3 + 2 = 1 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 3 ( 0012): 45.02 0.263 1.83 4.22
+ ID2= 2 ( 0015): 18.82 0.104 2.33 5.06
=====
ID = 1 ( 0012): 63.84 0.357 1.92 4.47

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0012) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0012): 63.84 0.357 1.92 4.47
+ ID2= 2 ( 0016): 6.87 0.113 1.17 5.41
=====
ID = 3 ( 0012): 70.71 0.392 1.83 4.56

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| Ptotal= 57.15 mm |

B= 0.000

C= 0.725

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	6.14	0.83	154.98	1.67	9.68	2.50	5.92
0.17	7.28	1.00	29.61	1.83	8.51	2.67	5.53
0.33	9.09	1.17	18.34	2.00	7.63	2.83	5.19
0.50	12.58	1.33	13.85	2.17	6.94		
0.67	23.97	1.50	11.32	2.33	6.38		

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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\V02\voindat

Output filename:

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Summary filename:

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DATE: 01-15-2026

TIME: 12:28:12

USER:

COMMENTS: _____

| CALIB

| NASHYD (0013) |

| ID= 1 DT= 5.0 min |

Area (ha)= 24.38 Curve Number (CN)= 35.0

Ia (mm)= 9.11 # 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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.138 (i)

TIME TO PEAK (hrs)= 2.000

RUNOFF VOLUME (mm)= 4.441

TOTAL RAINFALL (mm)= 57.153

RUNOFF COEFFICIENT = 0.078

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CHICAGO STORM | IDF curve parameters: A= 822.740

CALIB							
NASHYD (0014)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	20.64	Curve Number	(CN)=	53.0
		Ia	(mm)=	8.11	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.59				

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.269 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 8.769
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.153

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (0015)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	18.82	Curve Number	(CN)=	48.0
		Ia	(mm)=	7.42	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.96				

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.157 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 7.613
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.133

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.164 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 7.920
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.139

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (0016)							
ID= 1 DT= 5.0 min							

		Area	(ha)=	6.87	Curve Number	(CN)=	46.0
		Ia	(mm)=	4.39	# of Linear Res.(N)=	3.00	
		U.H. Tp(hrs)=	0.21				

```
***** D E T A I L E D   O U T P U T *****
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Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\dea
0f33f-e710-4fa3-a6ae-82ed1b93151a\sce
```

USER:

COMMENTS: _____

```

| CHICAGO STORM |      IDF curve parameters: A= 893.800
| Ptotal= 64.05 mm |      B= 0.000
|-----|      C= 0.719
|      used in:  INTENSITY = A / (t + B)^C
|
|      Duration of storm = 3.00 hrs
|      Storm time step  = 10.00 min
|      Time to peak ratio = 0.33

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	7.02	0.83	170.70	1.67	11.03	2.50	6.77
0.17	8.31	1.00	33.42	1.83	9.71	2.67	6.33
0.33	10.36	1.17	20.79	2.00	8.71	2.83	5.95
0.50	14.30	1.33	15.73	2.17	7.93		
0.67	27.09	1.50	12.89	2.33	7.29		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

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
    W  I  SSSSS  UUUUU  A  A  LLLLL

    000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
    0  0  T    T    H  H  Y  Y  MM  MM  0  0
    0  0  T    T    H  H  Y    M  M  0  0
    000  T    T    H  H  Y    M  M  000
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```

CALIB
NASHYD (0013)
ID= 1 DT= 5.0 min

Area (ha)= 24.38 Curve Number (CN)= 35.0
Ia (mm)= 9.11 # 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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.178 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 5.732
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.089

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0014)
ID= 1 DT= 5.0 min

Area (ha)= 20.64 Curve Number (CN)= 53.0
Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29

0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.341 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 11.130
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.174

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0015)
ID= 1 DT= 5.0 min

Area (ha)= 18.82 Curve Number (CN)= 48.0
Ia (mm)= 7.42 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.96

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.199 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 9.666
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.151

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 0016) | Area (ha)= 6.87 Curve Number (CN)= 46.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.21

```

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 7.02 0.833 27.09 1.583 12.89 2.33 7.93
0.167 7.02 0.917 170.70 1.667 12.89 2.42 7.29
0.250 8.31 1.000 170.70 1.750 11.03 2.50 7.29
0.333 8.31 1.083 33.42 1.833 11.03 2.58 6.77
0.417 10.36 1.167 33.42 1.917 9.71 2.67 6.77
0.500 10.36 1.250 20.79 2.000 9.71 2.75 6.33
0.583 14.30 1.333 20.79 2.083 8.71 2.83 6.33
0.667 14.30 1.417 15.73 2.167 8.71 2.92 5.95
0.750 27.09 1.500 15.73 2.250 7.93 3.00 5.95

```

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.205 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 9.932
 TOTAL RAINFALL (mm)= 64.054
 RUNOFF COEFFICIENT = 0.155

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0012) |
| 1 + 2 = 3 |
|-----|
ID1= 1 ( 0013): 24.38 0.178 2.00 5.73
+ ID2= 2 ( 0014): 20.64 0.341 1.75 11.13
=====
ID = 3 ( 0012): 45.02 0.513 1.83 8.21

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0012) |
| 3 + 2 = 1 |
|-----|
AREA QPEAK TPEAK R.V.

```

```

-----
ID1= 3 ( 0012): 45.02 0.513 1.83 8.21
+ ID2= 2 ( 0015): 18.82 0.199 2.33 9.67
=====
ID = 1 ( 0012): 63.84 0.691 1.92 8.64

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0012) |
| 1 + 2 = 3 |
|-----|
ID1= 1 ( 0012): 63.84 0.691 1.92 8.64
+ ID2= 2 ( 0016): 6.87 0.205 1.17 9.93
=====
ID = 3 ( 0012): 70.71 0.756 1.83 8.76

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 A A A L
 V V I SS U U A A L
 VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
 O O T T H H Y Y MM MM O O
 O O T T H H Y M M O O
 000 T T H H Y M M 000

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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\V02\voin.dat

Output filename:
 C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\55c
 89b47-39b0-4332-8840-257d83fc52f8\sce
 Summary filename:
 C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\55c
 89b47-39b0-4332-8840-257d83fc52f8\sce

DATE: 01-15-2026

TIME: 12:28:12

USER:

COMMENTS: _____

** SIMULATION : 6 - 100yr 3hr 10min Chicago **

CHICAGO STORM | IDF curve parameters: A= 953.290
Ptotal= 71.21 mm | B= 0.000
C= 0.711
used in: INTENSITY = $A / (t + B)^C$
Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	8.02	0.83	185.45	1.67	12.53	2.50	7.73
0.17	9.47	1.00	37.49	1.83	11.04	2.67	7.23
0.33	11.77	1.17	23.45	2.00	9.92	2.83	6.80
0.50	16.19	1.33	17.80	2.17	9.04		
0.67	30.45	1.50	14.61	2.33	8.32		

CALIB |
NASHYD (0013) | Area (ha)= 24.38 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 9.11 # 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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32

0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.224 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 7.225
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.101

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB |
NASHYD (0014) | Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.423 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 13.810
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.194

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0015)
ID= 1 DT= 5.0 min

Area (ha)= 18.82 Curve Number (CN)= 48.0
Ia (mm)= 7.42 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.96

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.247 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 12.006
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.169

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0016)
ID= 1 DT= 5.0 min

Area (ha)= 6.87 Curve Number (CN)= 46.0
Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.21

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32

0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.249 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 12.215
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.172

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0012)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0013):	24.38	0.224	2.00	7.23
+ ID2= 2 (0014):	20.64	0.423	1.75	13.81
=====				
ID = 3 (0012):	45.02	0.638	1.83	10.24

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0012):	45.02	0.638	1.83	10.24
+ ID2= 2 (0015):	18.82	0.247	2.33	12.01
=====				
ID = 1 (0012):	63.84	0.859	1.92	10.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0012):	63.84	0.859	1.92	10.76
+ ID2= 2 (0016):	6.87	0.249	1.17	12.21
=====				

ID = 3 (0012): 70.71 0.940 1.83 10.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

=====

V V I SSSS U U A L (v 6.2.2015)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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\V02\voin.dat

Output filename:
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d4b67-9043-4556-aca9-1bb23a06bf19\sce
Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\fcf
d4b67-9043-4556-aca9-1bb23a06bf19\sce

DATE: 01-15-2026 TIME: 12:28:12

USER:

COMMENTS: _____

** SIMULATION : 7 - 25mm **

READ STORM
Ptotal= 24.99 mm

Filename: C:\Users\noconnor\AppData
ata\Local\Temp\
e371b535-ff13-4e8d-b96e-67f000c4b43f\1e3bc16b
Comments: 25MM_S~1

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.44	6.00	0.77	12.00	1.20	18.00	0.60
0.17	0.44	6.17	0.77	12.17	1.20	18.17	0.60
0.33	0.44	6.33	0.77	12.33	1.20	18.33	0.60
0.50	0.44	6.50	0.77	12.50	1.05	18.50	0.60
0.67	0.44	6.67	0.78	12.67	1.05	18.67	0.60
0.83	0.44	6.83	0.77	12.83	1.05	18.83	0.60
1.00	0.44	7.00	0.95	13.00	1.05	19.00	0.60
1.17	0.44	7.17	0.95	13.17	1.05	19.17	0.60
1.33	0.44	7.33	0.95	13.33	1.05	19.33	0.60
1.50	0.44	7.50	0.95	13.50	0.95	19.50	0.60
1.67	0.44	7.67	0.95	13.67	0.95	19.67	0.60
1.83	0.44	7.83	0.95	13.83	0.95	19.83	0.60
2.00	0.51	8.00	1.25	14.00	0.79	20.00	0.46
2.17	0.51	8.17	1.25	14.17	0.79	20.17	0.46
2.33	0.51	8.33	1.25	14.33	0.79	20.33	0.46
2.50	0.51	8.50	1.75	14.50	0.79	20.50	0.46
2.67	0.51	8.67	1.75	14.67	0.79	20.67	0.46
2.83	0.51	8.83	1.75	14.83	0.79	20.83	0.46
3.00	0.51	9.00	2.45	15.00	0.79	21.00	0.46
3.17	0.51	9.17	2.45	15.17	0.79	21.17	0.46
3.33	0.51	9.33	2.45	15.33	0.79	21.33	0.46
3.50	0.51	9.50	5.90	15.50	0.79	21.50	0.46
3.67	0.51	9.67	10.60	15.67	0.79	21.67	0.46
3.83	0.51	9.83	15.30	15.83	0.79	21.83	0.46
4.00	0.61	10.00	3.40	16.00	0.60	22.00	0.46
4.17	0.61	10.17	3.40	16.17	0.60	22.17	0.46
4.33	0.61	10.33	3.40	16.33	0.60	22.33	0.46
4.50	0.61	10.50	2.05	16.50	0.60	22.50	0.46
4.67	0.61	10.67	2.05	16.67	0.60	22.67	0.46
4.83	0.61	10.83	2.05	16.83	0.60	22.83	0.46
5.00	0.61	11.00	1.50	17.00	0.60	23.00	0.46
5.17	0.61	11.17	1.50	17.17	0.60	23.17	0.46
5.33	0.61	11.33	1.50	17.33	0.60	23.33	0.46
5.50	0.61	11.50	1.50	17.50	0.60	23.50	0.46
5.67	0.61	11.67	1.40	17.67	0.60	23.67	0.46
5.83	0.61	11.83	1.30	17.83	0.60	23.83	0.46

CALIB

| NASHYD (0013) | Area (ha)= 24.38 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 9.11 # 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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46

3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.004 (i)
TIME TO PEAK (hrs)= 11.333
RUNOFF VOLUME (mm)= 0.517
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.021

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0014) | Area (ha)= 20.64 Curve Number (CN)= 53.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.59

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46

3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 10.833
RUNOFF VOLUME (mm)= 1.176
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.047

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0015)	Area (ha)= 18.82	Curve Number (CN)= 48.0	
ID= 1 DT= 5.0 min	Ia (mm)= 7.42	# of Linear Res.(N)= 3.00	

U.H. Tp(hrs)= 0.96			

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46

4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 0.749

PEAK FLOW (cms)= 0.006 (i)

TIME TO PEAK (hrs)= 11.500

RUNOFF VOLUME (mm)= 1.054

TOTAL RAINFALL (mm)= 24.987

RUNOFF COEFFICIENT = 0.042

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0016)	Area (ha)=	6.87	Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min	Ia (mm)=	4.39	# of Linear Res.(N)= 3.00

	U.H. Tp(hrs)=	0.21	

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60

0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46

4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.008 (i)
 TIME TO PEAK (hrs)= 10.083
 RUNOFF VOLUME (mm)= 1.329
 TOTAL RAINFALL (mm)= 24.987
 RUNOFF COEFFICIENT = 0.053

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0012)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0013):	24.38	0.004	11.33	0.52
+ ID2= 2 (0014):	20.64	0.009	10.83	1.18
=====				
ID = 3 (0012):	45.02	0.012	11.00	0.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	45.02	0.012	11.00	0.82

```
+ ID2= 2 ( 0015):   18.82   0.006   11.50   1.05
=====
ID = 1 ( 0012):   63.84   0.018   11.17   0.89
```

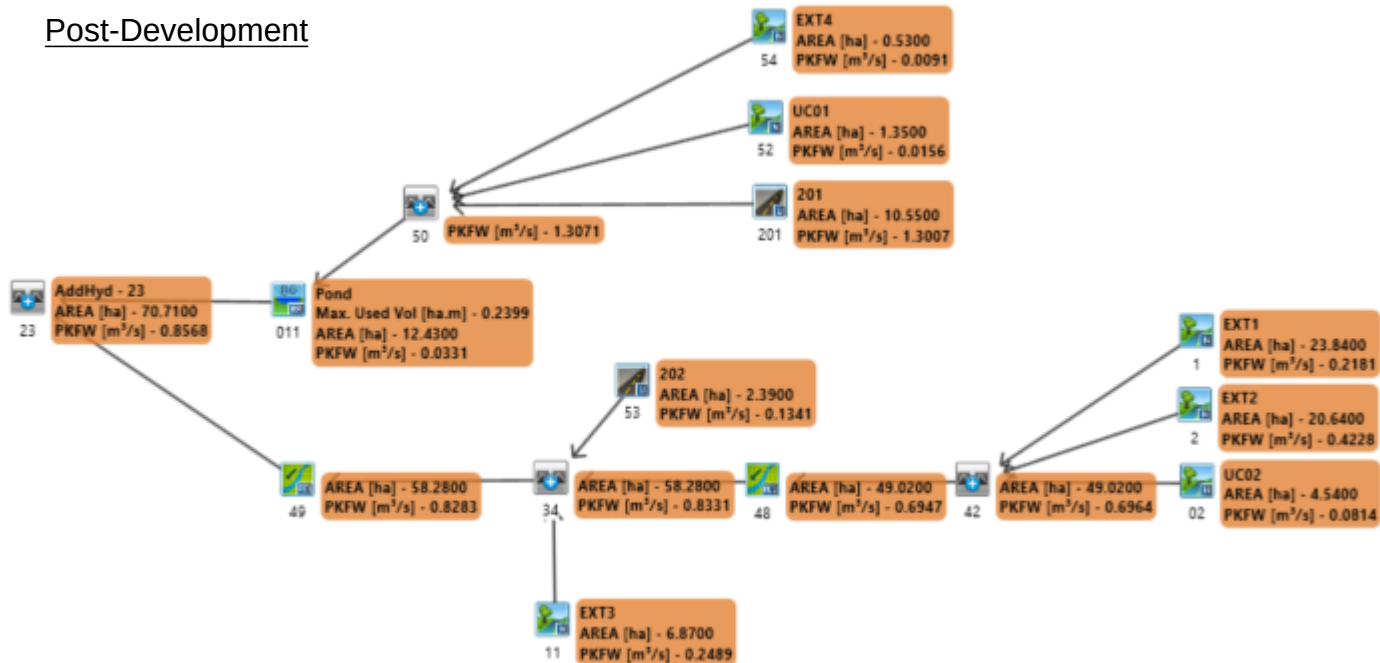
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0012)|
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0012):   63.84   0.018   11.17   0.89
+ ID2= 2 ( 0016):    6.87   0.008   10.08   1.33
=====
ID = 3 ( 0012):   70.71   0.021   11.08   0.93
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
FINISH
=====
=====
```

Post-Development



=====

V V I SSSS U U A L (v 6.2.2015)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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\V02\voin.dat

Output filename:
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ef064-0a7a-4364-a20b-f2ff37b9f254\sce
Summary filename:
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ef064-0a7a-4364-a20b-f2ff37b9f254\sce

DATE: 01-15-2026 TIME: 04:40:13

USER:

COMMENTS: _____

** SIMULATION : 1 - 2yr 3hr 10min Chicago **

CHICAGO STORM IDF curve parameters: A= 475.610
Ptotal= 30.88 mm B= 0.000
C= 0.738

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.17	0.83	86.95	1.67	5.04	2.50	3.05
0.17	3.77	1.00	15.73	1.83	4.42	2.67	2.85
0.33	4.72	1.17	9.66	2.00	3.95	2.83	2.67
0.50	6.58	1.33	7.25	2.17	3.59		
0.67	12.69	1.50	5.91	2.33	3.30		

CALIB
NASHYD (0001) Area (ha)= 23.84 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min Ia (mm)= 9.20 # 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	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.028 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 0.953
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.031

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0002) | Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.59

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 3.17 0.833 12.69 1.583 5.91 2.33 3.59
0.167 3.17 0.917 86.95 1.667 5.91 2.42 3.30
0.250 3.77 1.000 86.95 1.750 5.04 2.50 3.30
0.333 3.77 1.083 15.73 1.833 5.04 2.58 3.05
0.417 4.72 1.167 15.73 1.917 4.42 2.67 3.05
0.500 4.72 1.250 9.66 2.000 4.42 2.75 2.85
0.583 6.58 1.333 9.66 2.083 3.95 2.83 2.85
0.667 6.58 1.417 7.25 2.167 3.95 2.92 2.67
0.750 12.69 1.500 7.25 2.250 3.59 3.00 2.67

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.061 (i)
TIME TO PEAK (hrs)= 1.833
RUNOFF VOLUME (mm)= 2.091
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.068

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0002) | Area (ha)= 4.54 Curve Number (CN)= 41.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.52 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.37

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 3.17 0.833 12.69 1.583 5.91 2.33 3.59
0.167 3.17 0.917 86.95 1.667 5.91 2.42 3.30
0.250 3.77 1.000 86.95 1.750 5.04 2.50 3.30
0.333 3.77 1.083 15.73 1.833 5.04 2.58 3.05
0.417 4.72 1.167 15.73 1.917 4.42 2.67 3.05
0.500 4.72 1.250 9.66 2.000 4.42 2.75 2.85

0.583 6.58 | 1.333 9.66 | 2.083 3.95 | 2.83 2.85
0.667 6.58 | 1.417 7.25 | 2.167 3.95 | 2.92 2.67
0.750 12.69 | 1.500 7.25 | 2.250 3.59 | 3.00 2.67

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 1.289
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.042

(i) 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 (0002): 4.54 0.010 1.50 1.29
+ ID2= 2 (0001): 23.84 0.028 2.17 0.95
===== ID = 3 (0042): 28.38 0.035 2.00 1.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042) |
| 3 + 2 = 1 | AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 3 (0042): 28.38 0.035 2.00 1.01
+ ID2= 2 (0002): 20.64 0.061 1.83 2.09
===== ID = 1 (0042): 49.02 0.095 1.83 1.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048) |
| IN= 2--> OUT= 1 | Routing time step (min)'= 5.00

----- DATA FOR SECTION (1.1) ----->
Distance Elevation Manning
0.00 342.60 0.0350
2.55 341.75 0.0350 /0.0350 Main Channel
4.05 341.75 0.0350 /0.0350 Main Channel
6.50 342.60 0.0350

<----- TRAVEL TIME TABLE ----->

DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.203E+02	0.0	0.35	13.28
0.09	341.84	.438E+02	0.1	0.54	8.60
0.13	341.88	.706E+02	0.2	0.69	6.73
0.18	341.93	.101E+03	0.3	0.81	5.68
0.22	341.97	.134E+03	0.4	0.93	4.99
0.27	342.02	.171E+03	0.6	1.03	4.50
0.31	342.06	.210E+03	0.8	1.12	4.13
0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72
0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

<---- hydrograph ---->

<-pipe / channel->

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0042)	49.02	0.10	1.83	1.46	0.09	0.55
OUTFLOW: ID= 1 (0048)	49.02	0.09	2.00	1.46	0.09	0.55

0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.043 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 2.158
TOTAL RAINFALL (mm)= 30.883
RUNOFF COEFFICIENT = 0.070

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0053)	Area (ha)=	2.39	
ID= 1 DT= 5.0 min	Total Imp(%)=	35.60	Dir. Conn.(%)= 10.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.85	1.54
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
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	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Max.Eff.Inten.(mm/hr)= 86.95 2.34
over (min) 5.00 55.00
Storage Coeff. (min)= 3.41 (ii) 51.77 (ii)
Unit Hyd. Tpeak (min)= 5.00 55.00
Unit Hyd. peak (cms)= 0.26 0.02

TOTALS

PEAK FLOW (cms)= 0.06 0.01 0.055 (iii)

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB			
NASHYD (0011)	Area (ha)=	6.87	Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min	Ia (mm)=	4.39	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.21	

TIME TO PEAK (hrs)= 1.00 1.92 1.00
RUNOFF VOLUME (mm)= 28.88 2.04 4.72
TOTAL RAINFALL (mm)= 30.88 30.88 30.88
RUNOFF COEFFICIENT = 0.94 0.07 0.15

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0034) |
1 + 2 = 3
ID1= 1 (0011): 6.87 0.043 1.17 2.16
+ ID2= 2 (0048): 49.02 0.095 2.00 1.46
=====

ID = 3 (0034): 55.89 0.109 1.83 1.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0034) |
3 + 2 = 1
ID1= 3 (0034): 55.89 0.109 1.83 1.55
+ ID2= 2 (0053): 2.39 0.055 1.00 4.72
=====

ID = 1 (0034): 58.28 0.118 1.83 1.68

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ROUTE CHN(0049) |
IN= 2--> OUT= 1
Routing time step (min)'= 5.00

----- DATA FOR SECTION (1.1) -----
Distance Elevation Manning
0.00 342.60 0.0350
2.55 341.75 0.0350 /0.0350 Main Channel
4.05 341.75 0.0350 /0.0350 Main Channel
6.50 342.60 0.0350

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.04	341.79	.323E+02	0.0	0.35	21.13
0.09	341.84	.697E+02	0.1	0.54	13.69
0.13	341.88	.112E+03	0.2	0.69	10.71
0.18	341.93	.160E+03	0.3	0.81	9.04
0.22	341.97	.213E+03	0.4	0.93	7.95
0.27	342.02	.272E+03	0.6	1.03	7.17
0.31	342.06	.335E+03	0.8	1.12	6.57
0.36	342.11	.404E+03	1.1	1.21	6.10
0.40	342.15	.477E+03	1.4	1.29	5.72
0.45	342.20	.557E+03	1.7	1.36	5.40
0.49	342.24	.641E+03	2.1	1.44	5.13
0.54	342.29	.730E+03	2.5	1.51	4.89
0.58	342.33	.825E+03	2.9	1.57	4.68
0.63	342.38	.925E+03	3.4	1.64	4.50
0.67	342.42	.103E+04	4.0	1.70	4.33
0.72	342.47	.114E+04	4.5	1.76	4.18
0.76	342.51	.126E+04	5.2	1.82	4.05
0.81	342.55	.138E+04	5.8	1.88	3.92
0.85	342.60	.150E+04	6.6	1.93	3.81

----- hydrograph -----<-pipe / channel->
AREA QPEAK TPEAK R.V. MAX DEPTH MAX VEL
(ha) (cms) (hrs) (mm) (m) (m/s)
INFLOW : ID= 2 (0034) 58.28 0.12 1.83 1.68 0.11 0.58
OUTFLOW: ID= 1 (0049) 58.28 0.11 2.08 1.68 0.10 0.58

| CALIB |
| NASHYD (0052) | Area (ha)= 1.35 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
|----- U.H. Tp(hrs)= 0.47

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 3.17 0.833 12.69 1.583 5.91 2.33 3.59
0.167 3.17 0.917 86.95 1.667 5.91 2.42 3.30
0.250 3.77 1.000 86.95 1.750 5.04 2.50 3.30
0.333 3.77 1.083 15.73 1.833 5.04 2.58 3.05
0.417 4.72 1.167 15.73 1.917 4.42 2.67 3.05

0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW (cms)= 0.002 (i)
 TIME TO PEAK (hrs)= 1.667
 RUNOFF VOLUME (mm)= 0.884
 TOTAL RAINFALL (mm)= 30.883
 RUNOFF COEFFICIENT = 0.029

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0201)	Area (ha)= 10.55	
ID= 1 DT= 5.0 min	Total Imp(%)= 42.60	Dir. Conn.(%)= 23.50

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.49	6.06
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
Mannings n	= 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB		
NASHYD (0054)	Area (ha)= 0.53	Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.25	

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	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 0.883
 TOTAL RAINFALL (mm)= 30.883
 RUNOFF COEFFICIENT = 0.029

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.17	0.833	12.69	1.583	5.91	2.33	3.59
0.167	3.17	0.917	86.95	1.667	5.91	2.42	3.30
0.250	3.77	1.000	86.95	1.750	5.04	2.50	3.30
0.333	3.77	1.083	15.73	1.833	5.04	2.58	3.05
0.417	4.72	1.167	15.73	1.917	4.42	2.67	3.05
0.500	4.72	1.250	9.66	2.000	4.42	2.75	2.85
0.583	6.58	1.333	9.66	2.083	3.95	2.83	2.85
0.667	6.58	1.417	7.25	2.167	3.95	2.92	2.67
0.750	12.69	1.500	7.25	2.250	3.59	3.00	2.67

Max.Eff.Inten.(mm/hr)= 86.95 1.99
 over (min) 5.00 60.00
 Storage Coeff. (min)= 3.41 (ii) 55.07 (ii)
 Unit Hyd. Tpeak (min)= 5.00 60.00
 Unit Hyd. peak (cms)= 0.26 0.02

TOTALS

PEAK FLOW (cms)= 0.57 0.02 0.573 (iii)
 TIME TO PEAK (hrs)= 1.00 2.08 1.00
 RUNOFF VOLUME (mm)= 28.88 1.93 8.26
 TOTAL RAINFALL (mm)= 30.88 30.88 30.88
 RUNOFF COEFFICIENT = 0.94 0.06 0.27

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 35.0 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 ( 0050)|
| 1 + 2 = 3 |
-----
ID1= 1 ( 0201): 10.55 0.573 1.00 8.26
+ ID2= 2 ( 0052): 1.35 0.002 1.67 0.88
=====
ID = 3 ( 0050): 11.90 0.573 1.00 7.43
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0050)|
| 3 + 2 = 1 |
-----
ID1= 3 ( 0050): 11.90 0.573 1.00 7.43
+ ID2= 2 ( 0054): 0.53 0.001 1.33 0.88
=====
ID = 1 ( 0050): 12.43 0.573 1.00 7.15
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0011)|
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.0290 0.1844
0.0070 0.0210 | 0.0310 0.2102
0.0120 0.0425 | 0.0330 0.2365
0.0160 0.0647 | 0.0340 0.2634
0.0200 0.0875 | 0.0360 0.2909
0.0220 0.1108 | 1.2930 0.3190
0.0250 0.1348 | 3.8000 0.3477
0.0270 0.1593 | 7.3300 0.3769

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 ( 0050) 12.430 0.573 1.00 7.15
OUTFLOW: ID= 1 ( 0011) 12.430 0.017 3.08 7.09
```

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.98
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0710

```
-----
| ADD HYD ( 0023)|
| 1 + 2 = 3 |
-----
AREA QPEAK TPEAK R.V.
```

```
-----
(ha) (cms) (hrs) (mm)
ID1= 1 ( 0011): 12.43 0.017 3.08 7.09
+ ID2= 2 ( 0049): 58.28 0.115 2.08 1.68
=====
ID = 3 ( 0023): 70.71 0.130 2.08 2.63
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V V I SSSS U U A L (v 6.2.2015)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VW I SSSS UUUU A A LLLLL
```

```
000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000
```

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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\V02\voin.dat

Output filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\860
5cbaa-f661-4e40-8104-d42836994678\sce
Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\860
5cbaa-f661-4e40-8104-d42836994678\sce

DATE: 01-15-2026

TIME: 04:40:13

USER:

COMMENTS: _____

** SIMULATION : 2 - 5yr 3hr 10min Chicago **

| CHICAGO STORM | IDF curve parameters: A= 632.750
| Ptotal= 40.45 mm | B= 0.000
C= 0.741
used in: INTENSITY = A / (t + B)^C
Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.11	0.83	114.88	1.67	6.54	2.50	3.95
0.17	4.88	1.00	20.52	1.83	5.73	2.67	3.69
0.33	6.13	1.17	12.57	2.00	5.13	2.83	3.46
0.50	8.55	1.33	9.43	2.17	4.65		
0.67	16.54	1.50	7.68	2.33	4.27		

| CALIB |
| NASHYD (0001) | Area (ha)= 23.84 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 9.20 # 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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.058 (i)
TIME TO PEAK (hrs)= 2.000

RUNOFF VOLUME (mm)= 1.942
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.048

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002) | Area (ha)= 20.64 Curve Number (CN)= 53.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.123 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 4.060
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.100

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002) | Area (ha)= 4.54 Curve Number (CN)= 41.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.52 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.37

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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.022 (i)
 TIME TO PEAK (hrs)= 1.417
 RUNOFF VOLUME (mm)= 2.565
 TOTAL RAINFALL (mm)= 40.451
 RUNOFF COEFFICIENT = 0.063

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0042)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0002):	4.54	0.022	1.42	2.56
+ ID2= 2 (0001):	23.84	0.058	2.00	1.94
=====				
ID = 3 (0042):	28.38	0.074	1.83	2.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1				
ID1= 3 (0042):	28.38	0.074	1.83	2.04
+ ID2= 2 (0002):	20.64	0.123	1.75	4.06
=====				
ID = 1 (0042):	49.02	0.196	1.83	2.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)
 IN= 2---> OUT= 1 Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->			
Distance	Elevation	Manning	
0.00	342.60	0.0350	
2.55	341.75	0.0350 /0.0350	Main Channel
4.05	341.75	0.0350 /0.0350	Main Channel
6.50	342.60	0.0350	

<----- TRAVEL TIME TABLE ----->					
DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.04	341.79	.203E+02	0.0	0.35	13.28
0.09	341.84	.438E+02	0.1	0.54	8.60
0.13	341.88	.706E+02	0.2	0.69	6.73
0.18	341.93	.101E+03	0.3	0.81	5.68
0.22	341.97	.134E+03	0.4	0.93	4.99
0.27	342.02	.171E+03	0.6	1.03	4.50
0.31	342.06	.210E+03	0.8	1.12	4.13
0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72
0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0042)	49.02	0.20	1.83	2.89	0.14	0.71
OUTFLOW: ID= 1 (0048)	49.02	0.19	1.92	2.89	0.14	0.71

CALIB	Area (ha)	Ia (mm)	U.H. Tp(hrs)=	Curve Number (CN)=	46.0
NASHYD (0011)	6.87	4.39	0.21	# of Linear Res.(N)=	3.00

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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.081 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 3.885
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.096

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0053) | Area (ha)= 2.39
ID= 1 DT= 5.0 min | Total Imp(%)= 35.60 Dir. Conn.(%)= 10.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.85	1.54
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
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	4.11	0.833	16.54	1.583	7.68	2.33	4.65
0.167	4.11	0.917	114.88	1.667	7.68	2.42	4.27
0.250	4.88	1.000	114.88	1.750	6.54	2.50	4.27
0.333	4.88	1.083	20.52	1.833	6.54	2.58	3.95
0.417	6.13	1.167	20.52	1.917	5.73	2.67	3.95
0.500	6.13	1.250	12.57	2.000	5.73	2.75	3.69
0.583	8.55	1.333	12.57	2.083	5.13	2.83	3.69
0.667	8.55	1.417	9.43	2.167	5.13	2.92	3.46
0.750	16.54	1.500	9.43	2.250	4.65	3.00	3.46

Max.Eff.Inten.(mm/hr)=	114.88	5.27	
over (min)	5.00	40.00	
Storage Coeff. (min)=	3.05 (ii)	38.02 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.27	0.03	
			TOTALS
PEAK FLOW (cms)=	0.07	0.01	0.075 (iii)
TIME TO PEAK (hrs)=	1.00	1.58	1.00
RUNOFF VOLUME (mm)=	38.45	3.63	7.10
TOTAL RAINFALL (mm)=	40.45	40.45	40.45
RUNOFF COEFFICIENT =	0.95	0.09	0.18

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0034)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0011):	6.87	0.081	1.17	3.88
+ ID2= 2 (0048):	49.02	0.195	1.92	2.89
=====				
ID = 3 (0034):	55.89	0.222	1.75	3.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0034)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1				
ID1= 3 (0034):	55.89	0.222	1.75	3.01
+ ID2= 2 (0053):	2.39	0.075	1.00	7.10
=====				
ID = 1 (0034):	58.28	0.238	1.75	3.18

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ROUTE CHN(0049)|

| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->
Distance Elevation Manning
0.00 342.60 0.0350
2.55 341.75 0.0350 /0.0350 Main Channel
4.05 341.75 0.0350 /0.0350 Main Channel
6.50 342.60 0.0350

<----- TRAVEL TIME TABLE ----->
DEPTH ELEV VOLUME FLOW RATE VELOCITY TRAV.TIME
(m) (m) (cu.m.) (cms) (m/s) (min)
0.04 341.79 .323E+02 0.0 0.35 21.13
0.09 341.84 .697E+02 0.1 0.54 13.69
0.13 341.88 .112E+03 0.2 0.69 10.71
0.18 341.93 .160E+03 0.3 0.81 9.04
0.22 341.97 .213E+03 0.4 0.93 7.95
0.27 342.02 .272E+03 0.6 1.03 7.17
0.31 342.06 .335E+03 0.8 1.12 6.57
0.36 342.11 .404E+03 1.1 1.21 6.10
0.40 342.15 .477E+03 1.4 1.29 5.72
0.45 342.20 .557E+03 1.7 1.36 5.40
0.49 342.24 .641E+03 2.1 1.44 5.13
0.54 342.29 .730E+03 2.5 1.51 4.89
0.58 342.33 .825E+03 2.9 1.57 4.68
0.63 342.38 .925E+03 3.4 1.64 4.50
0.67 342.42 .103E+04 4.0 1.70 4.33
0.72 342.47 .114E+04 4.5 1.76 4.18
0.76 342.51 .126E+04 5.2 1.82 4.05
0.81 342.55 .138E+04 5.8 1.88 3.92
0.85 342.60 .150E+04 6.6 1.93 3.81

<---- hydrograph ----> <-pipe / channel->
AREA QPEAK TPEAK R.V. MAX DEPTH MAX VEL
(ha) (cms) (hrs) (mm) (m) (m/s)
INFLOW : ID= 2 (0034) 58.28 0.24 1.75 3.18 0.16 0.75
OUTFLOW: ID= 1 (0049) 58.28 0.23 1.92 3.18 0.16 0.74

| CALIB
| NASHYD (0052) | Area (ha)= 1.35 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.47

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 4.11 0.833 16.54 1.583 7.68 2.33 4.65
0.167 4.11 0.917 114.88 1.667 7.68 2.42 4.27
0.250 4.88 1.000 114.88 1.750 6.54 2.50 4.27
0.333 4.88 1.083 20.52 1.833 6.54 2.58 3.95
0.417 6.13 1.167 20.52 1.917 5.73 2.67 3.95
0.500 6.13 1.250 12.57 2.000 5.73 2.75 3.69
0.583 8.55 1.333 12.57 2.083 5.13 2.83 3.69
0.667 8.55 1.417 9.43 2.167 5.13 2.92 3.46
0.750 16.54 1.500 9.43 2.250 4.65 3.00 3.46

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW (cms)= 0.004 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 1.846
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.046

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB
| NASHYD (0054) | Area (ha)= 0.53 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.25

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 4.11 0.833 16.54 1.583 7.68 2.33 4.65
0.167 4.11 0.917 114.88 1.667 7.68 2.42 4.27
0.250 4.88 1.000 114.88 1.750 6.54 2.50 4.27
0.333 4.88 1.083 20.52 1.833 6.54 2.58 3.95
0.417 6.13 1.167 20.52 1.917 5.73 2.67 3.95
0.500 6.13 1.250 12.57 2.000 5.73 2.75 3.69
0.583 8.55 1.333 12.57 2.083 5.13 2.83 3.69
0.667 8.55 1.417 9.43 2.167 5.13 2.92 3.46
0.750 16.54 1.500 9.43 2.250 4.65 3.00 3.46

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 1.250

RUNOFF VOLUME (mm)= 1.844
TOTAL RAINFALL (mm)= 40.451
RUNOFF COEFFICIENT = 0.046

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0201)
ID= 1 DT= 5.0 min
Area (ha)= 10.55
Total Imp(%)= 42.60 Dir. Conn.(%)= 23.50

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 4.49 6.06
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 104.00 81.00
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 4.11 0.833 16.54 1.583 7.68 2.33 4.65
0.167 4.11 0.917 114.88 1.667 7.68 2.42 4.27
0.250 4.88 1.000 114.88 1.750 6.54 2.50 4.27
0.333 4.88 1.083 20.52 1.833 6.54 2.58 3.95
0.417 6.13 1.167 20.52 1.917 5.73 2.67 3.95
0.500 6.13 1.250 12.57 2.000 5.73 2.75 3.69
0.583 8.55 1.333 12.57 2.083 5.13 2.83 3.69
0.667 8.55 1.417 9.43 2.167 5.13 2.92 3.46
0.750 16.54 1.500 9.43 2.250 4.65 3.00 3.46

Max.Eff.Inten.(mm/hr)= 114.88 4.39
over (min)= 5.00 45.00
Storage Coeff. (min)= 3.05 (ii) 40.66 (ii)
Unit Hyd. Tpeak (min)= 5.00 45.00
Unit Hyd. peak (cms)= 0.27 0.03
TOTALS
PEAK FLOW (cms)= 0.77 0.04 0.770 (iii)
TIME TO PEAK (hrs)= 1.00 1.67 1.00
RUNOFF VOLUME (mm)= 38.45 3.45 11.67
TOTAL RAINFALL (mm)= 40.45 40.45 40.45
RUNOFF COEFFICIENT = 0.95 0.09 0.29

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 35.0 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 (0050)
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0201): 10.55 0.770 1.00 11.67
+ ID2= 2 (0052): 1.35 0.004 1.67 1.85
===== ID = 3 (0050): 11.90 0.770 1.00 10.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0050)
3 + 2 = 1
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 3 (0050): 11.90 0.770 1.00 10.56
+ ID2= 2 (0054): 0.53 0.002 1.25 1.84
===== ID = 1 (0050): 12.43 0.771 1.00 10.19

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0011) 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 0.0290 0.1844
0.0070 0.0210 0.0310 0.2102
0.0120 0.0425 0.0330 0.2365
0.0160 0.0647 0.0340 0.2634
0.0200 0.0875 0.0360 0.2909
0.0220 0.1108 0.1293 0.3190
0.0250 0.1348 0.3800 0.3477
0.0270 0.1593 0.7330 0.3769

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0050) 12.430 0.771 1.00 10.19
OUTFLOW: ID= 1 (0011) 12.430 0.021 3.25 10.12

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.78

TIME SHIFT OF PEAK FLOW (min)=135.00
MAXIMUM STORAGE USED (ha.m.)= 0.1044

COMMENTS: _____

```
-----
| ADD HYD ( 0023)|
| 1 + 2 = 3 |
-----
ID1= 1 ( 0011): 12.43 0.021 3.25 10.12
+ ID2= 2 ( 0049): 58.28 0.235 1.92 3.18
=====
ID = 3 ( 0023): 70.71 0.255 1.92 4.40
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
*****
** SIMULATION : 3 - 10yr 3hr 10min Chicago **
*****
```

```
-----
| CHICAGO STORM | IDF curve parameters: A= 721.920
| Ptotal= 47.37 mm | B= 0.000
C= 0.736
used in: INTENSITY = A / (t + B)^C
```

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.90	0.83	132.58	1.67	7.77	2.50	4.72
0.17	5.82	1.00	24.19	1.83	6.82	2.67	4.40
0.33	7.29	1.17	14.88	2.00	6.10	2.83	4.13
0.50	10.14	1.33	11.18	2.17	5.54		
0.67	19.52	1.50	9.12	2.33	5.09		

```
=====
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 A A A A L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL
000 TTTTT TTTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y M M O O
000 T T H H Y M M 000
```

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***** D E T A I L E D O U T P U T *****

```
-----
| CALIB |
| NASHYD ( 0001)| Area (ha)= 23.84 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 9.20 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.73 |
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\b9f1746c-d833-4333-ac33-2cfd38f28a1d\sce
Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\b9f1746c-d833-4333-ac33-2cfd38f28a1d\sce

DATE: 01-15-2026 TIME: 04:40:13

USER:

```
-----
---- TRANSFORMED HYETOGRAPH ----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 4.90 | 0.833 19.52 | 1.583 9.12 | 2.33 5.54
0.167 4.90 | 0.917 132.58 | 1.667 9.12 | 2.42 5.09
0.250 5.82 | 1.000 132.58 | 1.750 7.77 | 2.50 5.09
0.333 5.82 | 1.083 24.19 | 1.833 7.77 | 2.58 4.72
0.417 7.29 | 1.167 24.19 | 1.917 6.82 | 2.67 4.72
0.500 7.29 | 1.250 14.88 | 2.000 6.82 | 2.75 4.40
```

0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.086 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.857
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.060

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
NASHYD (0002)	Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min	Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.59

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	4.90	0.833	19.52	1.583	9.12	2.33	5.54
0.167	4.90	0.917	132.58	1.667	9.12	2.42	5.09
0.250	5.82	1.000	132.58	1.750	7.77	2.50	5.09
0.333	5.82	1.083	24.19	1.833	7.77	2.58	4.72
0.417	7.29	1.167	24.19	1.917	6.82	2.67	4.72
0.500	7.29	1.250	14.88	2.000	6.82	2.75	4.40
0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.178 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 5.826
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.123

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

NASHYD (0002)	Area (ha)= 4.54 Curve Number (CN)= 41.0
ID= 1 DT= 5.0 min	Ia (mm)= 8.52 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.37

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	4.90	0.833	19.52	1.583	9.12	2.33	5.54
0.167	4.90	0.917	132.58	1.667	9.12	2.42	5.09
0.250	5.82	1.000	132.58	1.750	7.77	2.50	5.09
0.333	5.82	1.083	24.19	1.833	7.77	2.58	4.72
0.417	7.29	1.167	24.19	1.917	6.82	2.67	4.72
0.500	7.29	1.250	14.88	2.000	6.82	2.75	4.40
0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.033 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 3.731
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.079

(i) 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 (0002):	4.54	0.033	1.42	3.73
+ ID2= 2 (0001):	23.84	0.086	2.00	2.86
=====				
ID = 3 (0042):	28.38	0.110	1.83	3.00

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0042):	28.38	0.110	1.83	3.00
+ ID2= 2 (0002):	20.64	0.178	1.75	5.83

=====
ID = 1 (0042): 49.02 0.287 1.75 4.19

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)
IN= 2--> OUT= 1 Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->
Distance Elevation Manning
0.00 342.60 0.0350
2.55 341.75 0.0350 /0.0350 Main Channel
4.05 341.75 0.0350 /0.0350 Main Channel
6.50 342.60 0.0350

<----- TRAVEL TIME TABLE ----->
DEPTH ELEV VOLUME FLOW RATE VELOCITY TRAV.TIME
(m) (m) (cu.m.) (cms) (m/s) (min)
0.04 341.79 .203E+02 0.0 0.35 13.28
0.09 341.84 .438E+02 0.1 0.54 8.60
0.13 341.88 .706E+02 0.2 0.69 6.73
0.18 341.93 .101E+03 0.3 0.81 5.68
0.22 341.97 .134E+03 0.4 0.93 4.99
0.27 342.02 .171E+03 0.6 1.03 4.50
0.31 342.06 .210E+03 0.8 1.12 4.13
0.36 342.11 .254E+03 1.1 1.21 3.83
0.40 342.15 .300E+03 1.4 1.29 3.59
0.45 342.20 .350E+03 1.7 1.36 3.39
0.49 342.24 .403E+03 2.1 1.44 3.22
0.54 342.29 .459E+03 2.5 1.51 3.07
0.58 342.33 .518E+03 2.9 1.57 2.94
0.63 342.38 .581E+03 3.4 1.64 2.82
0.67 342.42 .647E+03 4.0 1.70 2.72
0.72 342.47 .716E+03 4.5 1.76 2.63
0.76 342.51 .789E+03 5.2 1.82 2.54
0.81 342.55 .865E+03 5.8 1.88 2.46
0.85 342.60 .944E+03 6.6 1.93 2.39

<---- hydrograph ----> <-pipe / channel->
AREA QPEAK TPEAK R.V. MAX DEPTH MAX VEL
(ha) (cms) (hrs) (mm) (m) (m/s)
INFLOW : ID= 2 (0042) 49.02 0.29 1.75 4.19 0.18 0.80
OUTFLOW: ID= 1 (0048) 49.02 0.29 1.83 4.19 0.18 0.80

NASHYD (0011) Area (ha)= 6.87 Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.21

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 4.90 0.833 19.52 1.583 9.12 2.33 5.54
0.167 4.90 0.917 132.58 1.667 9.12 2.42 5.09
0.250 5.82 1.000 132.58 1.750 7.77 2.50 5.09
0.333 5.82 1.083 24.19 1.833 7.77 2.58 4.72
0.417 7.29 1.167 24.19 1.917 6.82 2.67 4.72
0.500 7.29 1.250 14.88 2.000 6.82 2.75 4.40
0.583 10.14 1.333 14.88 2.083 6.10 2.83 4.40
0.667 10.14 1.417 11.18 2.167 6.10 2.92 4.13
0.750 19.52 1.500 11.18 2.250 5.54 3.00 4.13

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.113 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 5.405
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.114

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0053) Area (ha)= 2.39
ID= 1 DT= 5.0 min Total Imp(%)= 35.60 Dir. Conn.(%)= 10.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.85 1.54
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 104.00 81.00
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 4.90 0.833 19.52 1.583 9.12 2.33 5.54

CALIB

0.167	4.90	0.917	132.58	1.667	9.12	2.42	5.09
0.250	5.82	1.000	132.58	1.750	7.77	2.50	5.09
0.333	5.82	1.083	24.19	1.833	7.77	2.58	4.72
0.417	7.29	1.167	24.19	1.917	6.82	2.67	4.72
0.500	7.29	1.250	14.88	2.000	6.82	2.75	4.40
0.583	10.14	1.333	14.88	2.083	6.10	2.83	4.40
0.667	10.14	1.417	11.18	2.167	6.10	2.92	4.13
0.750	19.52	1.500	11.18	2.250	5.54	3.00	4.13

Max.Eff.Inten.(mm/hr)=	132.58	8.05	
over (min)	5.00	35.00	
Storage Coeff. (min)=	2.88 (ii)	32.41 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.28	0.03	
			TOTALS
PEAK FLOW (cms)=	0.09	0.02	0.088 (iii)
TIME TO PEAK (hrs)=	1.00	1.50	1.00
RUNOFF VOLUME (mm)=	45.37	5.03	9.05
TOTAL RAINFALL (mm)=	47.37	47.37	47.37
RUNOFF COEFFICIENT =	0.96	0.11	0.19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 35.0 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 (0034)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0011):	6.87	0.113	1.17	5.41
+ ID2= 2 (0048):	49.02	0.286	1.83	4.19
ID = 3 (0034):	55.89	0.326	1.75	4.34

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0034)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0034):	55.89	0.326	1.75	4.34

+ ID2= 2 (0053): 2.39 0.088 1.00 9.05
 =====
 ID = 1 (0034): 58.28 0.348 1.75 4.53

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0049)
 IN= 2--> OUT= 1 Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->
 Distance Elevation Manning
 0.00 342.60 0.0350
 2.55 341.75 0.0350 /0.0350 Main Channel
 4.05 341.75 0.0350 /0.0350 Main Channel
 6.50 342.60 0.0350

DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.323E+02	0.0	0.35	21.13
0.09	341.84	.697E+02	0.1	0.54	13.69
0.13	341.88	.112E+03	0.2	0.69	10.71
0.18	341.93	.160E+03	0.3	0.81	9.04
0.22	341.97	.213E+03	0.4	0.93	7.95
0.27	342.02	.272E+03	0.6	1.03	7.17
0.31	342.06	.335E+03	0.8	1.12	6.57
0.36	342.11	.404E+03	1.1	1.21	6.10
0.40	342.15	.477E+03	1.4	1.29	5.72
0.45	342.20	.557E+03	1.7	1.36	5.40
0.49	342.24	.641E+03	2.1	1.44	5.13
0.54	342.29	.730E+03	2.5	1.51	4.89
0.58	342.33	.825E+03	2.9	1.57	4.68
0.63	342.38	.925E+03	3.4	1.64	4.50
0.67	342.42	.103E+04	4.0	1.70	4.33
0.72	342.47	.114E+04	4.5	1.76	4.18
0.76	342.51	.126E+04	5.2	1.82	4.05
0.81	342.55	.138E+04	5.8	1.88	3.92
0.85	342.60	.150E+04	6.6	1.93	3.81

<---- hydrograph ----> <-pipe / channel->
 AREA QPEAK TPEAK R.V. MAX DEPTH MAX VEL
 (ha) (cms) (hrs) (mm) (m) (m/s)
 INFLOW : ID= 2 (0034) 58.28 0.35 1.75 4.53 0.19 0.85
 OUTFLOW: ID= 1 (0049) 58.28 0.34 1.83 4.53 0.19 0.85

CALIB
NASHYD (0052) | Area (ha)= 1.35 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.47

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 4.90 | 0.833 19.52 | 1.583 9.12 | 2.33 5.54
0.167 4.90 | 0.917 132.58 | 1.667 9.12 | 2.42 5.09
0.250 5.82 | 1.000 132.58 | 1.750 7.77 | 2.50 5.09
0.333 5.82 | 1.083 24.19 | 1.833 7.77 | 2.58 4.72
0.417 7.29 | 1.167 24.19 | 1.917 6.82 | 2.67 4.72
0.500 7.29 | 1.250 14.88 | 2.000 6.82 | 2.75 4.40
0.583 10.14 | 1.333 14.88 | 2.083 6.10 | 2.83 4.40
0.667 10.14 | 1.417 11.18 | 2.167 6.10 | 2.92 4.13
0.750 19.52 | 1.500 11.18 | 2.250 5.54 | 3.00 4.13

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 2.742
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.058

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0054) | Area (ha)= 0.53 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.25

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 4.90 | 0.833 19.52 | 1.583 9.12 | 2.33 5.54
0.167 4.90 | 0.917 132.58 | 1.667 9.12 | 2.42 5.09
0.250 5.82 | 1.000 132.58 | 1.750 7.77 | 2.50 5.09
0.333 5.82 | 1.083 24.19 | 1.833 7.77 | 2.58 4.72
0.417 7.29 | 1.167 24.19 | 1.917 6.82 | 2.67 4.72
0.500 7.29 | 1.250 14.88 | 2.000 6.82 | 2.75 4.40

0.583 10.14 | 1.333 14.88 | 2.083 6.10 | 2.83 4.40
0.667 10.14 | 1.417 11.18 | 2.167 6.10 | 2.92 4.13
0.750 19.52 | 1.500 11.18 | 2.250 5.54 | 3.00 4.13

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.003 (i)
TIME TO PEAK (hrs)= 1.250
RUNOFF VOLUME (mm)= 2.739
TOTAL RAINFALL (mm)= 47.366
RUNOFF COEFFICIENT = 0.058

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0201) | Area (ha)= 10.55
ID= 1 DT= 5.0 min | Total Imp(%)= 42.60 Dir. Conn.(%)= 23.50

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 4.49 6.06
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 104.00 81.00
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 4.90 | 0.833 19.52 | 1.583 9.12 | 2.33 5.54
0.167 4.90 | 0.917 132.58 | 1.667 9.12 | 2.42 5.09
0.250 5.82 | 1.000 132.58 | 1.750 7.77 | 2.50 5.09
0.333 5.82 | 1.083 24.19 | 1.833 7.77 | 2.58 4.72
0.417 7.29 | 1.167 24.19 | 1.917 6.82 | 2.67 4.72
0.500 7.29 | 1.250 14.88 | 2.000 6.82 | 2.75 4.40
0.583 10.14 | 1.333 14.88 | 2.083 6.10 | 2.83 4.40
0.667 10.14 | 1.417 11.18 | 2.167 6.10 | 2.92 4.13
0.750 19.52 | 1.500 11.18 | 2.250 5.54 | 3.00 4.13

Max.Eff.Inten.(mm/hr)= 132.58 6.59
over (min) 5.00 35.00
Storage Coeff. (min)= 2.88 (ii) 34.85 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= 0.28 0.03

PEAK FLOW (cms)= 0.89 0.06 *TOTALS* 0.898 (iii)

TIME TO PEAK (hrs)=	1.00	1.50	1.00
RUNOFF VOLUME (mm)=	45.37	4.78	14.32
TOTAL RAINFALL (mm)=	47.37	47.37	47.37
RUNOFF COEFFICIENT =	0.96	0.10	0.30

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0050)				
1 + 2 = 3				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	10.55	0.898	1.00	14.32
+ ID2= 2 (0052):	1.35	0.006	1.58	2.74
=====				
ID = 3 (0050):	11.90	0.899	1.00	13.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.				

ADD HYD (0050)				
3 + 2 = 1				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0050):	11.90	0.899	1.00	13.01
+ ID2= 2 (0054):	0.53	0.003	1.25	2.74
=====				
ID = 1 (0050):	12.43	0.900	1.00	12.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.				

RESERVOIR(0011)				
IN= 2---> OUT= 1				
DT= 5.0 min				

OVERFLOW IS OFF				
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
0.0000	0.0000	0.0290	0.1844	
0.0070	0.0210	0.0310	0.2102	
0.0120	0.0425	0.0330	0.2365	
0.0160	0.0647	0.0340	0.2634	
0.0200	0.0875	0.0360	0.2909	
0.0220	0.1108	1.2930	0.3190	
0.0250	0.1348	3.8000	0.3477	

	0.0270	0.1593		7.3300	0.3769
	AREA (ha)	QPEAK (cms)		TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0050)	12.430	0.900		1.00	12.57
OUTFLOW: ID= 1 (0011)	12.430	0.025		3.33	12.51
PEAK FLOW REDUCTION [Qout/Qin](%)=	2.74				
TIME SHIFT OF PEAK FLOW	(min)=140.00				
MAXIMUM STORAGE USED	(ha.m.)= 0.1318				

ADD HYD (0023)				
1 + 2 = 3				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0011):	12.43	0.025	3.33	12.51
+ ID2= 2 (0049):	58.28	0.343	1.83	4.53
=====				
ID = 3 (0023):	70.71	0.365	1.83	5.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.				
=====				
=====				
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
000	TTTTT	TTTTT	H H Y Y M M	000 TM
0 0	T	T	H H Y Y MM MM	0 0
0 0	T	T	H H Y M M	0 0
000	T	T	H H Y M M	000

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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\V02\voin.dat

Output filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\87883151-ed4b-4318-bc5c-19ae2e3b10b8\sce

Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\878
83151-ed4b-4318-bc5c-19ae2e3b10b8\sce

DATE: 01-15-2026 TIME: 04:40:13

USER:

COMMENTS: _____

** SIMULATION : 4 - 25yr 3hr 10min Chicago **

CHICAGO STORM | IDF curve parameters: A= 822.740
Ptotal= 57.15 mm | B= 0.000
C= 0.725
used in: INTENSITY = $A / (t + B)^C$
Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	6.14	0.83	154.98	1.67	9.68	2.50	5.92
0.17	7.28	1.00	29.61	1.83	8.51	2.67	5.53
0.33	9.09	1.17	18.34	2.00	7.63	2.83	5.19
0.50	12.58	1.33	13.85	2.17	6.94		
0.67	23.97	1.50	11.32	2.33	6.38		

CALIB |
NASHYD (0001) | Area (ha)= 23.84 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 9.20 # 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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.134 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 4.425
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.077

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB |
NASHYD (0002) | Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.269 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 8.769

TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.153

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
NASHYD (0002)	Area (ha)=	4.54	Curve Number (CN)=	41.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.52	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.37		

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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.051 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 5.710
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.100

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0042)				
1 + 2 = 3				
ID1= 1 (0002):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
+ ID2= 2 (0001):	4.54	0.051	1.42	5.71
	23.84	0.134	2.00	4.42
ID = 3 (0042):	28.38	0.170	1.83	4.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)				
3 + 2 = 1				
ID1= 3 (0042):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
+ ID2= 2 (0002):	28.38	0.170	1.83	4.63
	20.64	0.269	1.75	8.77
ID = 1 (0042):	49.02	0.437	1.75	6.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)				
IN= 2---> OUT= 1				
	Routing time step (min)'=	5.00		
<----- DATA FOR SECTION (1.1) ----->				
Distance	Elevation	Manning		
0.00	342.60	0.0350		
2.55	341.75	0.0350 /0.0350	Main Channel	
4.05	341.75	0.0350 /0.0350	Main Channel	
6.50	342.60	0.0350		

<----- TRAVEL TIME TABLE ----->					
DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.203E+02	0.0	0.35	13.28
0.09	341.84	.438E+02	0.1	0.54	8.60
0.13	341.88	.706E+02	0.2	0.69	6.73
0.18	341.93	.101E+03	0.3	0.81	5.68
0.22	341.97	.134E+03	0.4	0.93	4.99
0.27	342.02	.171E+03	0.6	1.03	4.50
0.31	342.06	.210E+03	0.8	1.12	4.13
0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72
0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

<---- hydrograph ---->				<-pipe / channel->	
AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)

INFLOW : ID= 2 (0042) 49.02 0.44 1.75 6.37 0.22 0.92
OUTFLOW: ID= 1 (0048) 49.02 0.44 1.83 6.37 0.22 0.91

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB
NASHYD (0011) Area (ha)= 6.87 Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.21

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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.164 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 7.920
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.139

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0053) Area (ha)= 2.39
ID= 1 DT= 5.0 min Total Imp(%)= 35.60 Dir. Conn.(%)= 10.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.85	1.54
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
Mannings n =	0.013	0.250

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Max.Eff.Inten.(mm/hr)= 154.98 12.87
over (min) 5.00 30.00
Storage Coeff. (min)= 2.70 (ii) 27.17 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.29 0.04

TOTALS

PEAK FLOW (cms)= 0.10 0.03 0.106 (iii)
TIME TO PEAK (hrs)= 1.00 1.42 1.00
RUNOFF VOLUME (mm)= 55.15 7.34 12.11
TOTAL RAINFALL (mm)= 57.15 57.15 57.15
RUNOFF COEFFICIENT = 0.97 0.13 0.21

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0034)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0011):	6.87	0.164	1.17	7.92
+ ID2= 2 (0048):	49.02	0.436	1.83	6.37
=====				
ID = 3 (0034):	55.89	0.495	1.75	6.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0034) |
| 3 + 2 = 1 |
|-----|
| ID1= 3 ( 0034): 55.89 0.495 1.75 6.56 |
| + ID2= 2 ( 0053): 2.39 0.106 1.00 12.11 |
|=====|
| ID = 1 ( 0034): 58.28 0.527 1.75 6.79 |
|-----|
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTE CHN( 0049) |
| IN= 2--> OUT= 1 | Routing time step (min)'= 5.00
|-----|
```

```
<----- DATA FOR SECTION ( 1.1) ----->
Distance      Elevation      Manning
0.00          342.60        0.0350
2.55          341.75        0.0350 /0.0350 Main Channel
4.05          341.75        0.0350 /0.0350 Main Channel
6.50          342.60        0.0350
```

```
<----- TRAVEL TIME TABLE ----->
DEPTH    ELEV    VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
(m)      (m)      (cu.m.)    (cms)        (m/s)       (min)
0.04     341.79    .323E+02    0.0           0.35        21.13
0.09     341.84    .697E+02    0.1           0.54        13.69
0.13     341.88    .112E+03    0.2           0.69        10.71
0.18     341.93    .160E+03    0.3           0.81         9.04
0.22     341.97    .213E+03    0.4           0.93         7.95
0.27     342.02    .272E+03    0.6           1.03         7.17
0.31     342.06    .335E+03    0.8           1.12         6.57
0.36     342.11    .404E+03    1.1           1.21         6.10
0.40     342.15    .477E+03    1.4           1.29         5.72
0.45     342.20    .557E+03    1.7           1.36         5.40
0.49     342.24    .641E+03    2.1           1.44         5.13
0.54     342.29    .730E+03    2.5           1.51         4.89
0.58     342.33    .825E+03    2.9           1.57         4.68
0.63     342.38    .925E+03    3.4           1.64         4.50
0.67     342.42    .103E+04    4.0           1.70         4.33
0.72     342.47    .114E+04    4.5           1.76         4.18
0.76     342.51    .126E+04    5.2           1.82         4.05
0.81     342.55    .138E+04    5.8           1.88         3.92
0.85     342.60    .150E+04    6.6           1.93         3.81
```

```
<---- hydrograph ----> <-pipe / channel->
AREA    QPEAK    TPEAK    R.V.    MAX DEPTH    MAX VEL
```

```

(ha) (cms) (hrs) (mm) (m) (m/s)
INFLOW : ID= 2 ( 0034) 58.28 0.53 1.75 6.79 0.24 0.97
OUTFLOW: ID= 1 ( 0049) 58.28 0.52 1.83 6.79 0.24 0.96
```

```
-----
| CALIB |
| NASHYD ( 0052) | Area (ha)= 1.35 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.47
```

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 6.14 | 0.833 23.97 | 1.583 11.32 | 2.33 6.94
0.167 6.14 | 0.917 154.98 | 1.667 11.32 | 2.42 6.38
0.250 7.28 | 1.000 154.98 | 1.750 9.68 | 2.50 6.38
0.333 7.28 | 1.083 29.61 | 1.833 9.68 | 2.58 5.92
0.417 9.09 | 1.167 29.61 | 1.917 8.51 | 2.67 5.92
0.500 9.09 | 1.250 18.34 | 2.000 8.51 | 2.75 5.53
0.583 12.58 | 1.333 18.34 | 2.083 7.63 | 2.83 5.53
0.667 12.58 | 1.417 13.85 | 2.167 7.63 | 2.92 5.19
0.750 23.97 | 1.500 13.85 | 2.250 6.94 | 3.00 5.19
```

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 4.284
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.075

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CALIB |
| NASHYD ( 0054) | Area (ha)= 0.53 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.25
```

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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 1.250
RUNOFF VOLUME (mm)= 4.281
TOTAL RAINFALL (mm)= 57.153
RUNOFF COEFFICIENT = 0.075

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0201)	Area (ha)= 10.55
ID= 1 DT= 5.0 min	Total Imp(%)= 42.60 Dir. Conn.(%)= 23.50

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.49	6.06
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
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	6.14	0.833	23.97	1.583	11.32	2.33	6.94
0.167	6.14	0.917	154.98	1.667	11.32	2.42	6.38
0.250	7.28	1.000	154.98	1.750	9.68	2.50	6.38
0.333	7.28	1.083	29.61	1.833	9.68	2.58	5.92
0.417	9.09	1.167	29.61	1.917	8.51	2.67	5.92
0.500	9.09	1.250	18.34	2.000	8.51	2.75	5.53
0.583	12.58	1.333	18.34	2.083	7.63	2.83	5.53
0.667	12.58	1.417	13.85	2.167	7.63	2.92	5.19
0.750	23.97	1.500	13.85	2.250	6.94	3.00	5.19

Max.Eff.Inten.(mm/hr)=	154.98	10.51	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.70 (ii)	29.25 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.29	0.04	
TOTALS			
PEAK FLOW (cms)=	1.04	0.10	1.064 (iii)
TIME TO PEAK (hrs)=	1.00	1.42	1.00
RUNOFF VOLUME (mm)=	55.15	7.00	18.31
TOTAL RAINFALL (mm)=	57.15	57.15	57.15
RUNOFF COEFFICIENT =	0.97	0.12	0.32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0050)				
1	2	3	AREA (ha)	QPEAK (cms)
ID1= 1 (0201):	10.55	1.064	1.00	18.31
+ ID2= 2 (0052):	1.35	0.010	1.58	4.28
=====				
ID = 3 (0050):	11.90	1.065	1.00	16.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0050)				
3	2	1	AREA (ha)	QPEAK (cms)
ID1= 3 (0050):	11.90	1.065	1.00	16.72
+ ID2= 2 (0054):	0.53	0.006	1.25	4.28
=====				
ID = 1 (0050):	12.43	1.068	1.00	16.19

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0011)	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		0.0290	0.1844
0.0070	0.0210		0.0310	0.2102
0.0120	0.0425		0.0330	0.2365
0.0160	0.0647		0.0340	0.2634
0.0200	0.0875		0.0360	0.2909
0.0220	0.1108		1.2930	0.3190
0.0250	0.1348		3.8000	0.3477
0.0270	0.1593		7.3300	0.3769

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0050)	12.430	1.068	1.00	16.19
OUTFLOW: ID= 1 (0011)	12.430	0.028	3.42	16.13

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.63
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.1735

ADD HYD (0023)
1 + 2 = 3

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0011):	12.43	0.028	3.42	16.13
+ ID2= 2 (0049):	58.28	0.522	1.83	6.79
=====				
ID = 3 (0023):	70.71	0.547	1.83	8.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2015)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
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000 T T H H Y Y M M 000

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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\V02\voin.dat

Output filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\5b8
caeb5-5cd6-4e2a-82a8-a5225e4a6aa8\sce
Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\5b8
caeb5-5cd6-4e2a-82a8-a5225e4a6aa8\sce

DATE: 01-15-2026

TIME: 04:40:13

USER:

COMMENTS: _____

** SIMULATION : 5 - 50yr 3hr 10min Chicago **

CHICAGO STORM
Ptotal= 64.05 mm

IDF curve parameters: A= 893.800
B= 0.000
C= 0.719

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	7.02	0.83	170.70	1.67	11.03	2.50	6.77
0.17	8.31	1.00	33.42	1.83	9.71	2.67	6.33
0.33	10.36	1.17	20.79	2.00	8.71	2.83	5.95
0.50	14.30	1.33	15.73	2.17	7.93		
0.67	27.09	1.50	12.89	2.33	7.29		

CALIB

| NASHYD (0001)| Area (ha)= 23.84 Curve Number (CN)= 35.0
|ID= 1 DT= 5.0 min| Ia (mm)= 9.20 # 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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.173 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 5.714
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.089

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB
| NASHYD (0002)| Area (ha)= 20.64 Curve Number (CN)= 53.0
|ID= 1 DT= 5.0 min| Ia (mm)= 8.11 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.59

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33

0.667 14.30 | 1.417 15.73 | 2.167 8.71 | 2.92 5.95
0.750 27.09 | 1.500 15.73 | 2.250 7.93 | 3.00 5.95

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.341 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 11.130
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.174

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB
| NASHYD (0002)| Area (ha)= 4.54 Curve Number (CN)= 41.0
|ID= 1 DT= 5.0 min| Ia (mm)= 8.52 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.37

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.065 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 7.323
TOTAL RAINFALL (mm)= 64.054
RUNOFF COEFFICIENT = 0.114

(i) 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 (0002):	4.54	0.065	1.42	7.32
+ ID2= 2 (0001):	23.84	0.173	2.00	5.71
=====				
ID = 3 (0042):	28.38	0.219	1.83	5.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0042):	28.38	0.219	1.83	5.97
+ ID2= 2 (0002):	20.64	0.341	1.75	11.13
=====				
ID = 1 (0042):	49.02	0.559	1.75	8.14

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)	Routing time step (min) '= 5.00
IN= 2--> OUT= 1	

<----- DATA FOR SECTION (1.1) ----->			
Distance	Elevation	Manning	
0.00	342.60	0.0350	
2.55	341.75	0.0350 /0.0350	Main Channel
4.05	341.75	0.0350 /0.0350	Main Channel
6.50	342.60	0.0350	

<----- TRAVEL TIME TABLE ----->					
DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.203E+02	0.0	0.35	13.28
0.09	341.84	.438E+02	0.1	0.54	8.60
0.13	341.88	.706E+02	0.2	0.69	6.73
0.18	341.93	.101E+03	0.3	0.81	5.68
0.22	341.97	.134E+03	0.4	0.93	4.99
0.27	342.02	.171E+03	0.6	1.03	4.50
0.31	342.06	.210E+03	0.8	1.12	4.13
0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72

0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0042)	49.02	0.56	1.75	8.14	0.25	0.99
OUTFLOW: ID= 1 (0048)	49.02	0.56	1.83	8.14	0.25	0.98

CALIB	
NASHYD (0011)	Area (ha)= 6.87 Curve Number (CN)= 46.0
ID= 1 DT= 5.0 min	Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.21

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.205 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 9.932
 TOTAL RAINFALL (mm)= 64.054
 RUNOFF COEFFICIENT = 0.155

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0053)	Area (ha)= 2.39

|ID= 1 DT= 5.0 min | Total Imp(%)= 35.60 Dir. Conn.(%)= 10.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.85	1.54
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Max.Eff.Inten.(mm/hr)=	170.70	15.99
over (min)	5.00	30.00
Storage Coeff. (min)=	2.60 (ii)	25.04 (ii)
Unit Hyd. Tpeak (min)=	5.00	30.00
Unit Hyd. peak (cms)=	0.29	0.04

TOTALS

PEAK FLOW (cms)=	0.11	0.04	0.119 (iii)
TIME TO PEAK (hrs)=	1.00	1.42	1.00
RUNOFF VOLUME (mm)=	62.05	9.19	14.47
TOTAL RAINFALL (mm)=	64.05	64.05	64.05
RUNOFF COEFFICIENT =	0.97	0.14	0.23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0034)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0011):	6.87	0.205	1.17	9.93
+ ID2= 2 (0048):	49.02	0.558	1.83	8.14
=====				
ID = 3 (0034):	55.89	0.632	1.75	8.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0034)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0034):	55.89	0.632	1.75	8.36
+ ID2= 2 (0053):	2.39	0.119	1.00	14.47
=====				
ID = 1 (0034):	58.28	0.671	1.75	8.61

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0049)	Routing time step (min)'= 5.00		
IN= 2--> OUT= 1			
<----- DATA FOR SECTION (1.1) ----->			
Distance	Elevation	Manning	
0.00	342.60	0.0350	
2.55	341.75	0.0350 /0.0350	Main Channel
4.05	341.75	0.0350 /0.0350	Main Channel
6.50	342.60	0.0350	

<----- TRAVEL TIME TABLE ----->					
DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.323E+02	0.0	0.35	21.13
0.09	341.84	.697E+02	0.1	0.54	13.69
0.13	341.88	.112E+03	0.2	0.69	10.71
0.18	341.93	.160E+03	0.3	0.81	9.04
0.22	341.97	.213E+03	0.4	0.93	7.95
0.27	342.02	.272E+03	0.6	1.03	7.17
0.31	342.06	.335E+03	0.8	1.12	6.57
0.36	342.11	.404E+03	1.1	1.21	6.10
0.40	342.15	.477E+03	1.4	1.29	5.72
0.45	342.20	.557E+03	1.7	1.36	5.40
0.49	342.24	.641E+03	2.1	1.44	5.13
0.54	342.29	.730E+03	2.5	1.51	4.89
0.58	342.33	.825E+03	2.9	1.57	4.68
0.63	342.38	.925E+03	3.4	1.64	4.50

0.67	342.42	.103E+04	4.0	1.70	4.33
0.72	342.47	.114E+04	4.5	1.76	4.18
0.76	342.51	.126E+04	5.2	1.82	4.05
0.81	342.55	.138E+04	5.8	1.88	3.92
0.85	342.60	.150E+04	6.6	1.93	3.81

NASHYD (0054)	Area (ha)= 0.53	Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.25	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

		<---- hydrograph ---->			<-pipe / channel->		
		AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
		(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0034)	58.28	0.67	1.75	8.61	0.28	1.04	
OUTFLOW: ID= 1 (0049)	58.28	0.67	1.83	8.61	0.28	1.04	

CALIB						
NASHYD (0052)	Area (ha)= 1.35	Curve Number (CN)= 35.0				
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00				
	U.H. Tp(hrs)= 0.47					

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	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW	(cms)= 0.012 (i)
TIME TO PEAK	(hrs)= 1.583
RUNOFF VOLUME	(mm)= 5.556
TOTAL RAINFALL	(mm)= 64.054
RUNOFF COEFFICIENT	= 0.087

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.02	0.833	27.09	1.583	12.89	2.33	7.93
0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW	(cms)= 0.007 (i)
TIME TO PEAK	(hrs)= 1.250
RUNOFF VOLUME	(mm)= 5.552
TOTAL RAINFALL	(mm)= 64.054
RUNOFF COEFFICIENT	= 0.087

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB						
STANDHYD (0201)	Area (ha)= 10.55					
ID= 1 DT= 5.0 min	Total Imp(%)= 42.60	Dir. Conn.(%)= 23.50				

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)= 4.49		6.06
Dep. Storage	(mm)= 2.00		5.00
Average Slope	(%)= 0.50		2.00
Length	(m)= 104.00		81.00
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	7.02	0.833	27.09	1.583	12.89	2.33	7.93

0.167	7.02	0.917	170.70	1.667	12.89	2.42	7.29
0.250	8.31	1.000	170.70	1.750	11.03	2.50	7.29
0.333	8.31	1.083	33.42	1.833	11.03	2.58	6.77
0.417	10.36	1.167	33.42	1.917	9.71	2.67	6.77
0.500	10.36	1.250	20.79	2.000	9.71	2.75	6.33
0.583	14.30	1.333	20.79	2.083	8.71	2.83	6.33
0.667	14.30	1.417	15.73	2.167	8.71	2.92	5.95
0.750	27.09	1.500	15.73	2.250	7.93	3.00	5.95

Max.Eff.Inten.(mm/hr)= 170.70 14.53
over (min) 5.00 30.00
Storage Coeff. (min)= 2.60 (ii) 25.91 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.29 0.04

TOTALS

PEAK FLOW (cms)= 1.15 0.14 1.181 (iii)
TIME TO PEAK (hrs)= 1.00 1.42 1.00
RUNOFF VOLUME (mm)= 62.05 8.78 21.30
TOTAL RAINFALL (mm)= 64.05 64.05
RUNOFF COEFFICIENT = 0.97 0.14 0.33

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0050)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0201):	10.55	1.181	1.00	21.30
+ ID2= 2 (0052):	1.35	0.012	1.58	5.56
=====				
ID = 3 (0050):	11.90	1.183	1.00	19.51

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0050)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1				
ID1= 3 (0050):	11.90	1.183	1.00	19.51
+ ID2= 2 (0054):	0.53	0.007	1.25	5.55
=====				

ID = 1 (0050): 12.43 1.186 1.00 18.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0011)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0290	0.1844
	0.0070	0.0210	0.0310	0.2102
	0.0120	0.0425	0.0330	0.2365
	0.0160	0.0647	0.0340	0.2634
	0.0200	0.0875	0.0360	0.2909
	0.0220	0.1108	1.2930	0.3190
	0.0250	0.1348	3.8000	0.3477
	0.0270	0.1593	7.3300	0.3769
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0050)	12.430	1.186	1.00	18.92
OUTFLOW: ID= 1 (0011)	12.430	0.031	3.42	18.86

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.58
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.2051

ADD HYD (0023)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0011):	12.43	0.031	3.42	18.86
+ ID2= 2 (0049):	58.28	0.667	1.83	8.61
=====				
ID = 3 (0023):	70.71	0.693	1.83	10.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

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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\V02\voin.dat

Output filename:

C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\6d2
b18c8-cc94-42a3-a178-eb08c669e112\sce

Summary filename:

C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\6d2
b18c8-cc94-42a3-a178-eb08c669e112\sce

DATE: 01-15-2026

TIME: 04:40:13

USER:

COMMENTS: _____

** SIMULATION : 6 - 100yr 3hr 10min Chicago **

CHICAGO STORM | IDF curve parameters: A= 953.290
Ptotal= 71.21 mm | B= 0.000
C= 0.711
used in: INTENSITY = A / (t + B)^C
Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	8.02	0.83	185.45	1.67	12.53	2.50	7.73
0.17	9.47	1.00	37.49	1.83	11.04	2.67	7.23

0.33	11.77	1.17	23.45	2.00	9.92	2.83	6.80
0.50	16.19	1.33	17.80	2.17	9.04		
0.67	30.45	1.50	14.61	2.33	8.32		

CALIB
NASHYD (0001) | Area (ha)= 23.84 Curve Number (CN)= 35.0
ID= 1 DT= 5.0 min | Ia (mm)= 9.20 # 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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.218 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 7.205
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.101

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0002) | Area (ha)= 20.64 Curve Number (CN)= 53.0
ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.59

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.423 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 13.810
 TOTAL RAINFALL (mm)= 71.214
 RUNOFF COEFFICIENT = 0.194

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
 NASHYD (0002)
 ID= 1 DT= 5.0 min
 Area (ha)= 4.54 Curve Number (CN)= 41.0
 Ia (mm)= 8.52 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.37

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.081 (i)
 TIME TO PEAK (hrs)= 1.417
 RUNOFF VOLUME (mm)= 9.177
 TOTAL RAINFALL (mm)= 71.214

RUNOFF COEFFICIENT = 0.129

(i) 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 (0002): 4.54 0.081 1.42 9.18
 + ID2= 2 (0001): 23.84 0.218 2.00 7.21
 ID = 3 (0042): 28.38 0.275 1.83 7.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)
 3 + 2 = 1
 AREA QPEAK TPEAK R.V.
 (ha) (cms) (hrs) (mm)
 ID1= 3 (0042): 28.38 0.275 1.83 7.52
 + ID2= 2 (0002): 20.64 0.423 1.75 13.81
 ID = 1 (0042): 49.02 0.696 1.75 10.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)
 IN= 2--> OUT= 1
 Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->
 Distance Elevation Manning
 0.00 342.60 0.0350
 2.55 341.75 0.0350 /0.0350 Main Channel
 4.05 341.75 0.0350 /0.0350 Main Channel
 6.50 342.60 0.0350

<----- TRAVEL TIME TABLE ----->
 DEPTH ELEV VOLUME FLOW RATE VELOCITY TRAV.TIME
 (m) (m) (cu.m.) (cms) (m/s) (min)
 0.04 341.79 .203E+02 0.0 0.35 13.28
 0.09 341.84 .438E+02 0.1 0.54 8.60
 0.13 341.88 .706E+02 0.2 0.69 6.73
 0.18 341.93 .101E+03 0.3 0.81 5.68
 0.22 341.97 .134E+03 0.4 0.93 4.99
 0.27 342.02 .171E+03 0.6 1.03 4.50
 0.31 342.06 .210E+03 0.8 1.12 4.13

0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72
0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0042)	49.02	0.70	1.75	10.17	0.28	1.05
OUTFLOW: ID= 1 (0048)	49.02	0.69	1.83	10.17	0.28	1.05

RUNOFF COEFFICIENT = 0.172

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)=	2.39	
STANDHYD (0053)	Total Imp(%)=	35.60	Dir. Conn.(%)= 10.00
ID= 1 DT= 5.0 min			

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.85	1.54
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	104.00	81.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

CALIB	Area (ha)=	6.87	Curve Number (CN)= 46.0
NASHYD (0011)	Ia (mm)=	4.39	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)=	0.21	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.249 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 12.215
 TOTAL RAINFALL (mm)= 71.214

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Max.Eff.Inten.(mm/hr)=	185.45	22.35
over (min)	5.00	25.00
Storage Coeff. (min)=	2.52 (ii)	22.14 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.29	0.05
		TOTALS
PEAK FLOW (cms)=	0.12	0.05
TIME TO PEAK (hrs)=	1.00	1.33
RUNOFF VOLUME (mm)=	69.21	17.08
TOTAL RAINFALL (mm)=	71.21	71.21
RUNOFF COEFFICIENT =	0.97	0.16
		0.24

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 35.0 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 ( 0034)|
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0011):    6.87    0.249    1.17    12.21
+ ID2= 2 ( 0048):   49.02    0.695    1.83    10.17
=====
ID = 3 ( 0034):   55.89    0.786    1.75    10.42
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0034)|
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0034):   55.89    0.786    1.75    10.42
+ ID2= 2 ( 0053):    2.39    0.134    1.00    17.08
=====
ID = 1 ( 0034):   58.28    0.833    1.67    10.69
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTE CHN( 0049)|
| IN= 2---> OUT= 1 |
-----
Routing time step (min)'= 5.00
```

```
<----- DATA FOR SECTION ( 1.1) ----->
Distance      Elevation      Manning
0.00          342.60          0.0350
2.55          341.75          0.0350 /0.0350 Main Channel
4.05          341.75          0.0350 /0.0350 Main Channel
6.50          342.60          0.0350
```

```
<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      VOLUME      FLOW RATE      VELOCITY      TRAV.TIME
(m)         (m)         (cu.m.)      (cms)          (m/s)         (min)
0.04       341.79      .323E+02      0.0            0.35          21.13
0.09       341.84      .697E+02      0.1            0.54          13.69
0.13       341.88      .112E+03      0.2            0.69          10.71
0.18       341.93      .160E+03      0.3            0.81           9.04
0.22       341.97      .213E+03      0.4            0.93           7.95
0.27       342.02      .272E+03      0.6            1.03           7.17
```

0.31	342.06	.335E+03	0.8	1.12	6.57
0.36	342.11	.404E+03	1.1	1.21	6.10
0.40	342.15	.477E+03	1.4	1.29	5.72
0.45	342.20	.557E+03	1.7	1.36	5.40
0.49	342.24	.641E+03	2.1	1.44	5.13
0.54	342.29	.730E+03	2.5	1.51	4.89
0.58	342.33	.825E+03	2.9	1.57	4.68
0.63	342.38	.925E+03	3.4	1.64	4.50
0.67	342.42	.103E+04	4.0	1.70	4.33
0.72	342.47	.114E+04	4.5	1.76	4.18
0.76	342.51	.126E+04	5.2	1.82	4.05
0.81	342.55	.138E+04	5.8	1.88	3.92
0.85	342.60	.150E+04	6.6	1.93	3.81

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0034)	58.28	0.83	1.67	10.69	0.31	1.11
OUTFLOW: ID= 1 (0049)	58.28	0.83	1.75	10.69	0.31	1.11

```
-----
| CALIB
| NASHYD ( 0052)|
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 1.35    Curve Number (CN)= 35.0
Ia (mm)= 10.00    # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47
```

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	8.02	0.833	30.45	1.583	14.61	2.33	9.04
0.167	8.02	0.917	185.45	1.667	14.61	2.42	8.32
0.250	9.47	1.000	185.45	1.750	12.53	2.50	8.32
0.333	9.47	1.083	37.49	1.833	12.53	2.58	7.73
0.417	11.77	1.167	37.49	1.917	11.04	2.67	7.73
0.500	11.77	1.250	23.45	2.000	11.04	2.75	7.23
0.583	16.19	1.333	23.45	2.083	9.92	2.83	7.23
0.667	16.19	1.417	17.80	2.167	9.92	2.92	6.80
0.750	30.45	1.500	17.80	2.250	9.04	3.00	6.80

Unit Hyd Qpeak (cms)= 0.110
PEAK FLOW (cms)= 0.016 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 7.030

TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.099

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB
| NASHYD (0054) | Area (ha)= 0.53 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00
|-----
| U.H. Tp(hrs)= 0.25

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 8.02 | 0.833 30.45 | 1.583 14.61 | 2.33 9.04
0.167 8.02 | 0.917 185.45 | 1.667 14.61 | 2.42 8.32
0.250 9.47 | 1.000 185.45 | 1.750 12.53 | 2.50 8.32
0.333 9.47 | 1.083 37.49 | 1.833 12.53 | 2.58 7.73
0.417 11.77 | 1.167 37.49 | 1.917 11.04 | 2.67 7.73
0.500 11.77 | 1.250 23.45 | 2.000 11.04 | 2.75 7.23
0.583 16.19 | 1.333 23.45 | 2.083 9.92 | 2.83 7.23
0.667 16.19 | 1.417 17.80 | 2.167 9.92 | 2.92 6.80
0.750 30.45 | 1.500 17.80 | 2.250 9.04 | 3.00 6.80

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 1.250
RUNOFF VOLUME (mm)= 7.025
TOTAL RAINFALL (mm)= 71.214
RUNOFF COEFFICIENT = 0.099

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB
| STANDHYD (0201) | Area (ha)= 10.55
| ID= 1 DT= 5.0 min | Total Imp(%)= 42.60 Dir. Conn.(%)= 23.50
|-----
IMPervIOUS PERVIOUS (i)
Surface Area (ha)= 4.49 6.06
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 104.00 81.00
Mannings n = 0.013 0.250

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 8.02 | 0.833 30.45 | 1.583 14.61 | 2.33 9.04
0.167 8.02 | 0.917 185.45 | 1.667 14.61 | 2.42 8.32
0.250 9.47 | 1.000 185.45 | 1.750 12.53 | 2.50 8.32
0.333 9.47 | 1.083 37.49 | 1.833 12.53 | 2.58 7.73
0.417 11.77 | 1.167 37.49 | 1.917 11.04 | 2.67 7.73
0.500 11.77 | 1.250 23.45 | 2.000 11.04 | 2.75 7.23
0.583 16.19 | 1.333 23.45 | 2.083 9.92 | 2.83 7.23
0.667 16.19 | 1.417 17.80 | 2.167 9.92 | 2.92 6.80
0.750 30.45 | 1.500 17.80 | 2.250 9.04 | 3.00 6.80

Max.Eff.Inten.(mm/hr)= 185.45 17.64
over (min) 5.00 25.00
Storage Coeff. (min)= 2.52 (ii) 24.09 (ii)
Unit Hyd. Tpeak (min)= 5.00 25.00
Unit Hyd. peak (cms)= 0.29 0.05
PEAK FLOW (cms)= 1.26 0.18 1.301 (iii)
TIME TO PEAK (hrs)= 1.00 1.33 1.00
RUNOFF VOLUME (mm)= 69.21 10.80 24.53
TOTAL RAINFALL (mm)= 71.21 71.21 71.21
RUNOFF COEFFICIENT = 0.97 0.15 0.34

TOTALS

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0050) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|----- (ha) (cms) (hrs) (mm)
ID1= 1 (0201): 10.55 1.301 1.00 24.53
+ ID2= 2 (0052): 1.35 0.016 1.58 7.03
===== ID = 3 (0050): 11.90 1.303 1.00 22.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0050)
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0050):	11.90	1.303	1.00	22.54
+ ID2= 2 (0054):	0.53	0.009	1.25	7.02
=====				
ID = 1 (0050):	12.43	1.307	1.00	21.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0011)
IN= 2---> OUT= 1
DT= 5.0 min

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.1844
0.0070	0.0210	0.0310	0.2102
0.0120	0.0425	0.0330	0.2365
0.0160	0.0647	0.0340	0.2634
0.0200	0.0875	0.0360	0.2909
0.0220	0.1108	1.2930	0.3190
0.0250	0.1348	3.8000	0.3477
0.0270	0.1593	7.3300	0.3769

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0050)	12.430	1.307	1.00	21.88
OUTFLOW: ID= 1 (0011)	12.430	0.033	3.42	21.82

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.53
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.2399

ADD HYD (0023)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0011):	12.43	0.033	3.42	21.82
+ ID2= 2 (0049):	58.28	0.828	1.75	10.69
=====				
ID = 3 (0023):	70.71	0.857	1.75	12.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 A A A L
V V I SS U U A A L
VV I SSSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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\V02\voin.dat

Output filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\7f0
7d98d-dd97-4770-bd76-82d4e910b62d\sce
Summary filename:
C:\Users\noconnor\AppData\Local\Civica\XH5\ad5ffb59-cdbf-44b8-b93e-1def18aa052d\7f0
7d98d-dd97-4770-bd76-82d4e910b62d\sce

DATE: 01-15-2026

TIME: 04:40:13

USER:

COMMENTS:

** SIMULATION : 7 - 25mm **

READ STORM	Filename: C:\Users\noconnor\AppData\Local\Temp\07d6ecb2-f0d3-45b3-b26b-47c96473cb42\1e3bc16b
Ptotal= 24.99 mm	Comments: 25MM_S~1

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.44	6.00	0.77	12.00	1.20	18.00	0.60
0.17	0.44	6.17	0.77	12.17	1.20	18.17	0.60
0.33	0.44	6.33	0.77	12.33	1.20	18.33	0.60
0.50	0.44	6.50	0.77	12.50	1.05	18.50	0.60
0.67	0.44	6.67	0.78	12.67	1.05	18.67	0.60
0.83	0.44	6.83	0.77	12.83	1.05	18.83	0.60
1.00	0.44	7.00	0.95	13.00	1.05	19.00	0.60
1.17	0.44	7.17	0.95	13.17	1.05	19.17	0.60
1.33	0.44	7.33	0.95	13.33	1.05	19.33	0.60
1.50	0.44	7.50	0.95	13.50	0.95	19.50	0.60
1.67	0.44	7.67	0.95	13.67	0.95	19.67	0.60
1.83	0.44	7.83	0.95	13.83	0.95	19.83	0.60
2.00	0.51	8.00	1.25	14.00	0.79	20.00	0.46
2.17	0.51	8.17	1.25	14.17	0.79	20.17	0.46
2.33	0.51	8.33	1.25	14.33	0.79	20.33	0.46
2.50	0.51	8.50	1.75	14.50	0.79	20.50	0.46
2.67	0.51	8.67	1.75	14.67	0.79	20.67	0.46
2.83	0.51	8.83	1.75	14.83	0.79	20.83	0.46
3.00	0.51	9.00	2.45	15.00	0.79	21.00	0.46
3.17	0.51	9.17	2.45	15.17	0.79	21.17	0.46
3.33	0.51	9.33	2.45	15.33	0.79	21.33	0.46
3.50	0.51	9.50	5.90	15.50	0.79	21.50	0.46
3.67	0.51	9.67	10.60	15.67	0.79	21.67	0.46
3.83	0.51	9.83	15.30	15.83	0.79	21.83	0.46
4.00	0.61	10.00	3.40	16.00	0.60	22.00	0.46
4.17	0.61	10.17	3.40	16.17	0.60	22.17	0.46
4.33	0.61	10.33	3.40	16.33	0.60	22.33	0.46
4.50	0.61	10.50	2.05	16.50	0.60	22.50	0.46
4.67	0.61	10.67	2.05	16.67	0.60	22.67	0.46
4.83	0.61	10.83	2.05	16.83	0.60	22.83	0.46
5.00	0.61	11.00	1.50	17.00	0.60	23.00	0.46
5.17	0.61	11.17	1.50	17.17	0.60	23.17	0.46
5.33	0.61	11.33	1.50	17.33	0.60	23.33	0.46
5.50	0.61	11.50	1.50	17.50	0.60	23.50	0.46
5.67	0.61	11.67	1.40	17.67	0.60	23.67	0.46
5.83	0.61	11.83	1.30	17.83	0.60	23.83	0.46

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46

CALIB	Area (ha)=	23.84	Curve Number (CN)=	35.0
NASHYD (0001)	Ia (mm)=	9.20	# of Linear Res.(N)=	3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)=	0.73		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.247

PEAK FLOW (cms)= 0.003 (i)
TIME TO PEAK (hrs)= 11.333
RUNOFF VOLUME (mm)= 0.511
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.020

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002) | Area (ha)= 20.64 Curve Number (CN)= 53.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.11 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.59

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46

4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.336

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 10.833
RUNOFF VOLUME (mm)= 1.176
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.047

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0002) | Area (ha)= 4.54 Curve Number (CN)= 41.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.52 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.37

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60

0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46

4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 0.469

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 10.500
RUNOFF VOLUME (mm)= 0.710
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.028

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0042)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	4.54	0.001	10.50	0.71
+ ID2= 2 (0001):	23.84	0.003	11.33	0.51
=====				
ID = 3 (0042):	28.38	0.004	11.17	0.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0042)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0042):	28.38	0.004	11.17	0.54
+ ID2= 2 (0002):	20.64	0.009	10.83	1.18
=====				

ID = 1 (0042): 49.02 0.013 11.00 0.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0048)
IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->			
Distance	Elevation	Manning	
0.00	342.60	0.0350	
2.55	341.75	0.0350 /0.0350	Main Channel
4.05	341.75	0.0350 /0.0350	Main Channel
6.50	342.60	0.0350	

<----- TRAVEL TIME TABLE ----->					
DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.203E+02	0.0	0.35	13.28
0.09	341.84	.438E+02	0.1	0.54	8.60
0.13	341.88	.706E+02	0.2	0.69	6.73
0.18	341.93	.101E+03	0.3	0.81	5.68
0.22	341.97	.134E+03	0.4	0.93	4.99
0.27	342.02	.171E+03	0.6	1.03	4.50
0.31	342.06	.210E+03	0.8	1.12	4.13
0.36	342.11	.254E+03	1.1	1.21	3.83
0.40	342.15	.300E+03	1.4	1.29	3.59
0.45	342.20	.350E+03	1.7	1.36	3.39
0.49	342.24	.403E+03	2.1	1.44	3.22
0.54	342.29	.459E+03	2.5	1.51	3.07
0.58	342.33	.518E+03	2.9	1.57	2.94
0.63	342.38	.581E+03	3.4	1.64	2.82
0.67	342.42	.647E+03	4.0	1.70	2.72
0.72	342.47	.716E+03	4.5	1.76	2.63
0.76	342.51	.789E+03	5.2	1.82	2.54
0.81	342.55	.865E+03	5.8	1.88	2.46
0.85	342.60	.944E+03	6.6	1.93	2.39

	<---- hydrograph ---->				<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0042)	49.02	0.01	11.00	0.81	0.02	0.35
OUTFLOW: ID= 1 (0048)	49.02	0.01	11.25	0.81	0.02	0.35

CALIB
NASHYD (0011) | Area (ha)= 6.87 Curve Number (CN)= 46.0

|ID= 1 DT= 5.0 min | Ia (mm)= 4.39 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.21

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46

3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 1.250

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 10.083
RUNOFF VOLUME (mm)= 1.329
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.053

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (0053) | Area (ha)= 2.39
| ID= 1 DT= 5.0 min | Total Imp(%)= 35.60 Dir. Conn.(%)= 10.00

Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
0.85 1.54

Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 104.00 81.00
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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46

3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Max.Eff.Inten.(mm/hr)= 15.30 0.42
over (min) 5.00 105.00
Storage Coeff. (min)= 6.82 (ii) 103.12 (ii)
Unit Hyd. Tpeak (min)= 5.00 105.00
Unit Hyd. peak (cms)= 0.18 0.01

TOTALS
PEAK FLOW (cms)= 0.01 0.00 0.009 (iii)
TIME TO PEAK (hrs)= 10.00 11.92 10.00
RUNOFF VOLUME (mm)= 22.99 1.28 3.42
TOTAL RAINFALL (mm)= 24.99 24.99 24.99
RUNOFF COEFFICIENT = 0.92 0.05 0.14

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 35.0 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 (0034)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0011):	6.87	0.008	10.08	1.33
+ ID2= 2 (0048):	49.02	0.013	11.25	0.81
=====				
ID = 3 (0034):	55.89	0.015	11.08	0.87

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0034)				
3 + 2 = 1				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0034):	55.89	0.015	11.08	0.87
+ ID2= 2 (0053):	2.39	0.009	10.00	3.42
=====				
ID = 1 (0034):	58.28	0.017	10.00	0.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ROUTE CHN(0049)|
| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<----- DATA FOR SECTION (1.1) ----->			
Distance	Elevation	Manning	
0.00	342.60	0.0350	
2.55	341.75	0.0350 /0.0350	
4.05	341.75	0.0350 /0.0350	
6.50	342.60	0.0350	

<----- TRAVEL TIME TABLE ----->					
DEPTH	ELEV	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(m)	(cu.m.)	(cms)	(m/s)	(min)
0.04	341.79	.323E+02	0.0	0.35	21.13
0.09	341.84	.697E+02	0.1	0.54	13.69
0.13	341.88	.112E+03	0.2	0.69	10.71
0.18	341.93	.160E+03	0.3	0.81	9.04
0.22	341.97	.213E+03	0.4	0.93	7.95
0.27	342.02	.272E+03	0.6	1.03	7.17

0.31	342.06	.335E+03	0.8	1.12	6.57
0.36	342.11	.404E+03	1.1	1.21	6.10
0.40	342.15	.477E+03	1.4	1.29	5.72
0.45	342.20	.557E+03	1.7	1.36	5.40
0.49	342.24	.641E+03	2.1	1.44	5.13
0.54	342.29	.730E+03	2.5	1.51	4.89
0.58	342.33	.825E+03	2.9	1.57	4.68
0.63	342.38	.925E+03	3.4	1.64	4.50
0.67	342.42	.103E+04	4.0	1.70	4.33
0.72	342.47	.114E+04	4.5	1.76	4.18
0.76	342.51	.126E+04	5.2	1.82	4.05
0.81	342.55	.138E+04	5.8	1.88	3.92
0.85	342.60	.150E+04	6.6	1.93	3.81

<---- hydrograph ----> <-pipe / channel->						
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0034)	58.28	0.02	10.00	0.98	0.03	0.35
OUTFLOW: ID= 1 (0049)	58.28	0.02	11.42	0.98	0.03	0.35

| CALIB
| NASHYD (0052)| Area (ha)= 1.35 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.47

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60

1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46

5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 0.110

PEAK FLOW (cms)= 0.000 (i)
TIME TO PEAK (hrs)= 11.000
RUNOFF VOLUME (mm)= 0.461
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.018

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0054) | Area (ha)= 0.53 Curve Number (CN)= 35.0
| ID= 1 DT= 5.0 min | Ia (mm)= 10.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.25

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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60
1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60

1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
3.167	0.51	9.167	2.45	15.167	0.79	21.17	0.46
3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
3.333	0.51	9.333	2.45	15.333	0.79	21.33	0.46
3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46
5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46

5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Unit Hyd Qpeak (cms)= 0.081

PEAK FLOW (cms)= 0.000 (i)
TIME TO PEAK (hrs)= 10.500
RUNOFF VOLUME (mm)= 0.460
TOTAL RAINFALL (mm)= 24.987
RUNOFF COEFFICIENT = 0.018

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (0201) | Area (ha)= 10.55
| ID= 1 DT= 5.0 min | Total Imp(%)= 42.60 Dir. Conn.(%)= 23.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	4.49	6.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.50	2.00
Length	(m)=	104.00	81.00
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	0.44	6.083	0.77	12.083	1.20	18.08	0.60
0.167	0.44	6.167	0.77	12.167	1.20	18.17	0.60
0.250	0.44	6.250	0.77	12.250	1.20	18.25	0.60
0.333	0.44	6.333	0.77	12.333	1.20	18.33	0.60
0.417	0.44	6.417	0.77	12.417	1.20	18.42	0.60
0.500	0.44	6.500	0.77	12.500	1.20	18.50	0.60
0.583	0.44	6.583	0.77	12.583	1.05	18.58	0.60
0.667	0.44	6.667	0.77	12.667	1.05	18.67	0.60
0.750	0.44	6.750	0.78	12.750	1.05	18.75	0.60
0.833	0.44	6.833	0.78	12.833	1.05	18.83	0.60
0.917	0.44	6.917	0.77	12.917	1.05	18.92	0.60
1.000	0.44	7.000	0.77	13.000	1.05	19.00	0.60
1.083	0.44	7.083	0.95	13.083	1.05	19.08	0.60
1.167	0.44	7.167	0.95	13.167	1.05	19.17	0.60
1.250	0.44	7.250	0.95	13.250	1.05	19.25	0.60
1.333	0.44	7.333	0.95	13.333	1.05	19.33	0.60
1.417	0.44	7.417	0.95	13.417	1.05	19.42	0.60

1.500	0.44	7.500	0.95	13.500	1.05	19.50	0.60
1.583	0.44	7.583	0.95	13.583	0.95	19.58	0.60
1.667	0.44	7.667	0.95	13.667	0.95	19.67	0.60
1.750	0.44	7.750	0.95	13.750	0.95	19.75	0.60
1.833	0.44	7.833	0.95	13.833	0.95	19.83	0.60
1.917	0.44	7.917	0.95	13.917	0.95	19.92	0.60
2.000	0.44	8.000	0.95	14.000	0.95	20.00	0.60
2.083	0.51	8.083	1.25	14.083	0.79	20.08	0.46
2.167	0.51	8.167	1.25	14.167	0.79	20.17	0.46
2.250	0.51	8.250	1.25	14.250	0.79	20.25	0.46
2.333	0.51	8.333	1.25	14.333	0.79	20.33	0.46
2.417	0.51	8.417	1.25	14.417	0.79	20.42	0.46
2.500	0.51	8.500	1.25	14.500	0.79	20.50	0.46
2.583	0.51	8.583	1.75	14.583	0.79	20.58	0.46
2.667	0.51	8.667	1.75	14.667	0.79	20.67	0.46
2.750	0.51	8.750	1.75	14.750	0.79	20.75	0.46
2.833	0.51	8.833	1.75	14.833	0.79	20.83	0.46
2.917	0.51	8.917	1.75	14.917	0.79	20.92	0.46
3.000	0.51	9.000	1.75	15.000	0.79	21.00	0.46
3.083	0.51	9.083	2.45	15.083	0.79	21.08	0.46
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3.250	0.51	9.250	2.45	15.250	0.79	21.25	0.46
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3.417	0.51	9.417	2.45	15.417	0.79	21.42	0.46
3.500	0.51	9.500	2.45	15.500	0.79	21.50	0.46
3.583	0.51	9.583	5.90	15.583	0.79	21.58	0.46
3.667	0.51	9.667	5.90	15.667	0.79	21.67	0.46
3.750	0.51	9.750	10.60	15.750	0.79	21.75	0.46
3.833	0.51	9.833	10.60	15.833	0.79	21.83	0.46
3.917	0.51	9.917	15.30	15.917	0.79	21.92	0.46
4.000	0.51	10.000	15.30	16.000	0.79	22.00	0.46
4.083	0.61	10.083	3.40	16.083	0.60	22.08	0.46
4.167	0.61	10.167	3.40	16.167	0.60	22.17	0.46
4.250	0.61	10.250	3.40	16.250	0.60	22.25	0.46
4.333	0.61	10.333	3.40	16.333	0.60	22.33	0.46
4.417	0.61	10.417	3.40	16.417	0.60	22.42	0.46
4.500	0.61	10.500	3.40	16.500	0.60	22.50	0.46
4.583	0.61	10.583	2.05	16.583	0.60	22.58	0.46
4.667	0.61	10.667	2.05	16.667	0.60	22.67	0.46
4.750	0.61	10.750	2.05	16.750	0.60	22.75	0.46
4.833	0.61	10.833	2.05	16.833	0.60	22.83	0.46
4.917	0.61	10.917	2.05	16.917	0.60	22.92	0.46
5.000	0.61	11.000	2.05	17.000	0.60	23.00	0.46
5.083	0.61	11.083	1.50	17.083	0.60	23.08	0.46
5.167	0.61	11.167	1.50	17.167	0.60	23.17	0.46
5.250	0.61	11.250	1.50	17.250	0.60	23.25	0.46
5.333	0.61	11.333	1.50	17.333	0.60	23.33	0.46
5.417	0.61	11.417	1.50	17.417	0.60	23.42	0.46
5.500	0.61	11.500	1.50	17.500	0.60	23.50	0.46
5.583	0.61	11.583	1.50	17.583	0.60	23.58	0.46

5.667	0.61	11.667	1.50	17.667	0.60	23.67	0.46
5.750	0.61	11.750	1.40	17.750	0.60	23.75	0.46
5.833	0.61	11.833	1.40	17.833	0.60	23.83	0.46
5.917	0.61	11.917	1.30	17.917	0.60	23.92	0.46
6.000	0.61	12.000	1.30	18.000	0.60	24.00	0.46

Max.Eff.Inten.(mm/hr)=	15.30	0.37	
over (min)	5.00	110.00	
Storage Coeff. (min)=	6.82 (ii)	107.69 (ii)	
Unit Hyd. Tpeak (min)=	5.00	110.00	
Unit Hyd. peak (cms)=	0.18	0.01	
			TOTALS
PEAK FLOW (cms)=	0.10	0.00	0.096 (iii)
TIME TO PEAK (hrs)=	10.00	12.08	10.00
RUNOFF VOLUME (mm)=	22.99	1.20	6.32
TOTAL RAINFALL (mm)=	24.99	24.99	24.99
RUNOFF COEFFICIENT =	0.92	0.05	0.25

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 35.0 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 (0050)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):	10.55	0.096	10.00	6.32
+ ID2= 2 (0052):	1.35	0.000	11.00	0.46
=====				
ID = 3 (0050):	11.90	0.096	10.00	5.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0050)				
3 + 2 = 1				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0050):	11.90	0.096	10.00	5.65
+ ID2= 2 (0054):	0.53	0.000	10.50	0.46
=====				
ID = 1 (0050):	12.43	0.096	10.00	5.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR(0011)|
| IN= 2---> OUT= 1 |
DT= 5.0 min

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.1844
0.0070	0.0210	0.0310	0.2102
0.0120	0.0425	0.0330	0.2365
0.0160	0.0647	0.0340	0.2634
0.0200	0.0875	0.0360	0.2909
0.0220	0.1108	1.2930	0.3190
0.0250	0.1348	3.8000	0.3477
0.0270	0.1593	7.3300	0.3769

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0050)	12.430	0.096	10.00	5.43
OUTFLOW: ID= 1 (0011)	12.430	0.009	13.92	5.37

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.40
TIME SHIFT OF PEAK FLOW (min)=235.00
MAXIMUM STORAGE USED (ha.m.)= 0.0298

| ADD HYD (0023)|
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0011):	12.43	0.009	13.92	5.37
+ ID2= 2 (0049):	58.28	0.016	11.42	0.98
=====				
ID = 3 (0023):	70.71	0.025	11.50	1.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH
=====

APPENDIX B5

OGS Sizing Reports

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/07/2026

Province:	Ontario	Project Name:	Arkell Road Developments
City:	Township of Puslinch	Project Number:	2433-6646
Nearest Rainfall Station:	TORONTO INTL AP	Designer Name:	Cole Martin
Climate Station Id:	6158731	Designer Company:	C.F. Crozier & Associates Inc.
Years of Rainfall Data:	20	Designer Email:	cmartin@cfcrozier.ca
		Designer Phone:	289-204-8239
Site Name:	Arkell - OGS #1	EOR Name:	
		EOR Company:	
Drainage Area (ha):	1.74	EOR Email:	
% Imperviousness:	35.00	EOR Phone:	

Runoff Coefficient 'c': 0.51

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	27.60
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	606
Estimated Average Annual Sediment Volume (L/yr):	492

**Net Annual Sediment
(TSS) Load Reduction
Sizing Summary**

Stormceptor Model	TSS Removal Provided (%)
EFO4	74
EFO5	81
EFO6	86
EFO8	92
EFO10	95
EFO12	97

Recommended Stormceptor EFO Model: **EFO5**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **81**

Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

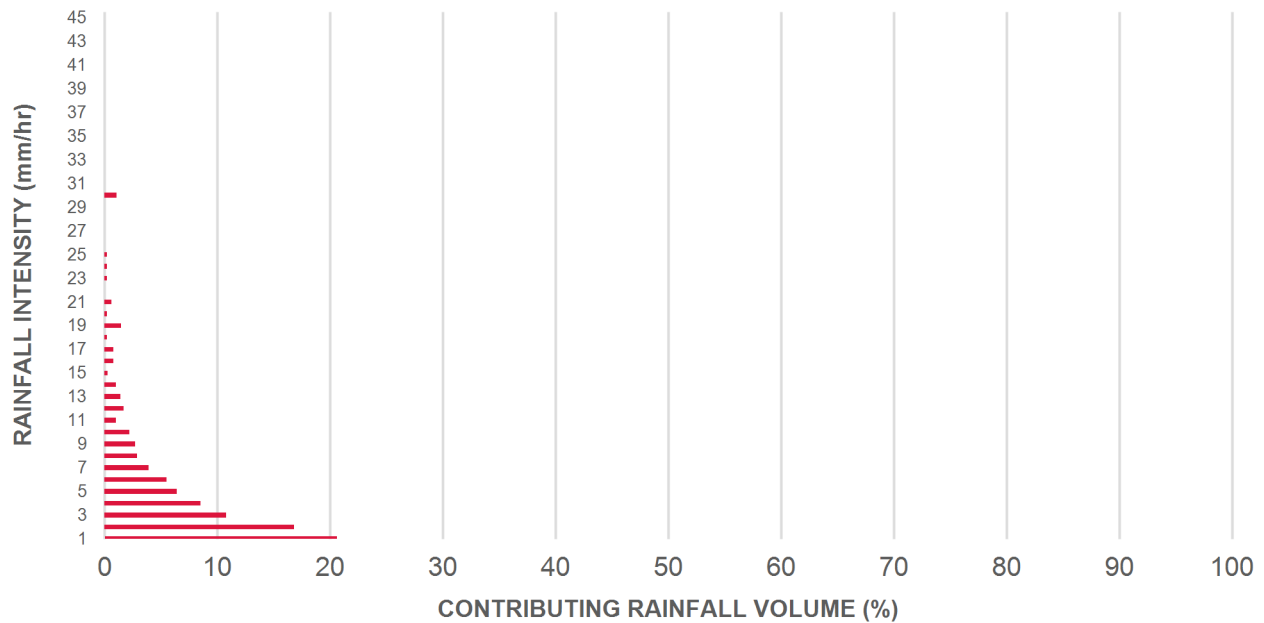
► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a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

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

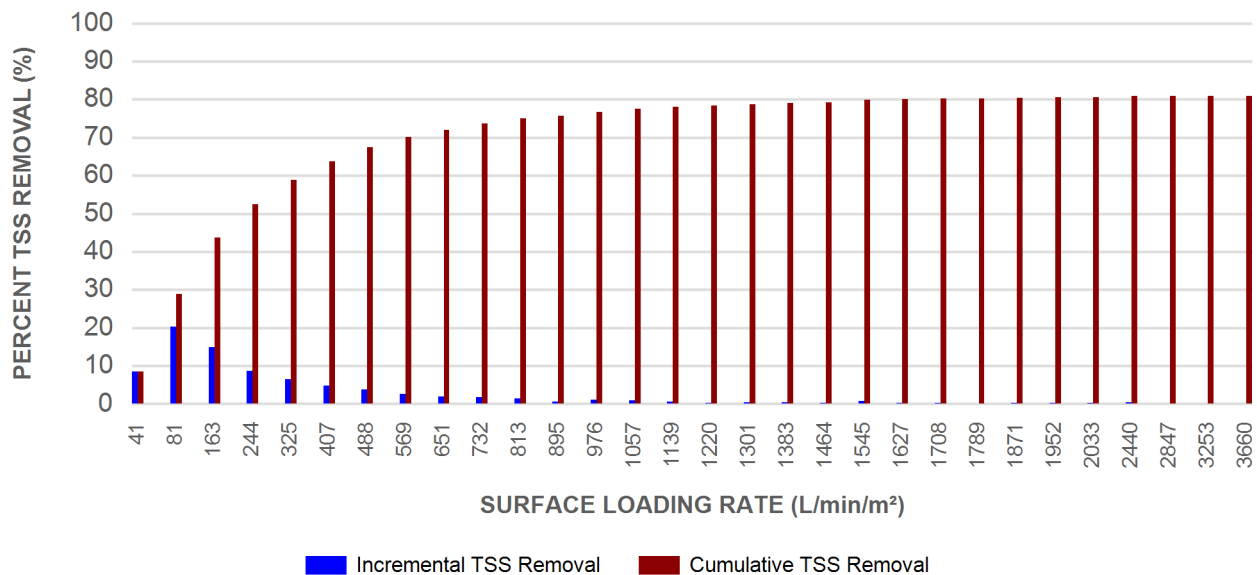
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.23	74.0	41.0	100	8.5	8.5
1.00	20.6	29.1	2.47	148.0	81.0	98	20.3	28.8
2.00	16.8	45.9	4.93	296.0	163.0	88	14.8	43.7
3.00	10.8	56.7	7.40	444.0	244.0	81	8.7	52.4
4.00	8.5	65.2	9.87	592.0	325.0	78	6.6	58.9
5.00	6.4	71.6	12.33	740.0	407.0	74	4.7	63.7
6.00	5.5	77.0	14.80	888.0	488.0	70	3.8	67.5
7.00	3.9	81.0	17.27	1036.0	569.0	66	2.6	70.1
8.00	2.9	83.9	19.74	1184.0	651.0	64	1.9	72.0
9.00	2.7	86.5	22.20	1332.0	732.0	64	1.7	73.7
10.00	2.2	88.7	24.67	1480.0	813.0	63	1.4	75.0
11.00	1.0	89.7	27.14	1628.0	895.0	62	0.6	75.6
12.00	1.7	91.3	29.60	1776.0	976.0	62	1.0	76.7
13.00	1.4	92.8	32.07	1924.0	1057.0	60	0.9	77.5
14.00	1.0	93.7	34.54	2072.0	1139.0	59	0.6	78.1
15.00	0.3	94.0	37.00	2220.0	1220.0	56	0.2	78.3
16.00	0.8	94.8	39.47	2368.0	1301.0	55	0.4	78.7
17.00	0.8	95.7	41.94	2516.0	1383.0	53	0.4	79.1
18.00	0.2	95.8	44.41	2664.0	1464.0	50	0.1	79.2
19.00	1.5	97.3	46.87	2812.0	1545.0	48	0.7	79.9
20.00	0.2	97.5	49.34	2960.0	1627.0	45	0.1	80.0
21.00	0.6	98.2	51.81	3108.0	1708.0	43	0.3	80.3
22.00	0.0	98.2	54.27	3256.0	1789.0	41	0.0	80.3
23.00	0.2	98.4	56.74	3404.0	1871.0	39	0.1	80.4
24.00	0.2	98.6	59.21	3552.0	1952.0	38	0.1	80.5
25.00	0.2	98.9	61.67	3700.0	2033.0	36	0.1	80.6
30.00	1.1	100.0	74.01	4441.0	2440.0	30	0.3	80.9
35.00	0.0	100.0	86.34	5181.0	2847.0	26	0.0	80.9
40.00	0.0	100.0	98.68	5921.0	3253.0	23	0.0	80.9
45.00	0.0	100.0	111.01	6661.0	3660.0	20	0.0	80.9
Estimated Net Annual Sediment (TSS) Load Reduction =								81 %

Climate Station ID: 6158731 Years of Rainfall Data: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

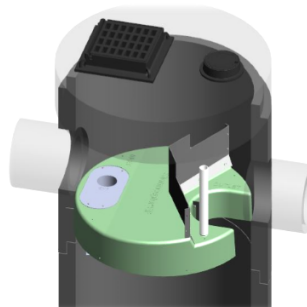
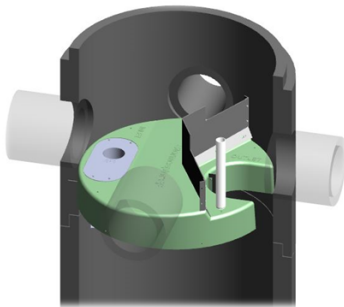
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

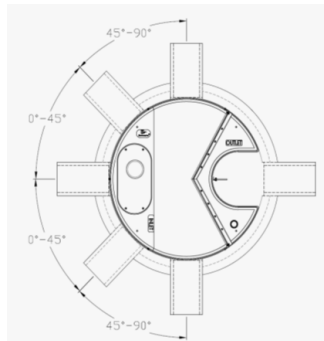
DESIGN FLEXIBILITY

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

OIL CAPTURE AND RETENTION

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



**INLET-TO-OUTLET DROP**

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

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

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/07/2026

Province:	Ontario	Project Name:	Arkell Road Developments
City:	Township of Puslinch	Project Number:	2433-6646
Nearest Rainfall Station:	TORONTO INTL AP	Designer Name:	Cole Martin
Climate Station Id:	6158731	Designer Company:	C.F. Crozier & Associates Inc.
Years of Rainfall Data:	20	Designer Email:	cmartin@cfcrozier.ca
		Designer Phone:	289-204-8239
Site Name:	Arkell - OGS #2	EOR Name:	
		EOR Company:	
Drainage Area (ha):	2.04	EOR Email:	
% Imperviousness:	29.00	EOR Phone:	
Runoff Coefficient 'c': 0.47			

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	30.07
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	581
Estimated Average Annual Sediment Volume (L/yr):	472

**Net Annual Sediment
(TSS) Load Reduction
Sizing Summary**

Stormceptor Model	TSS Removal Provided (%)
EFO4	73
EFO5	80
EFO6	85
EFO8	91
EFO10	95
EFO12	97

Recommended Stormceptor EFO Model: **EFO5**
Estimated Net Annual Sediment (TSS) Load Reduction (%): **80**
Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

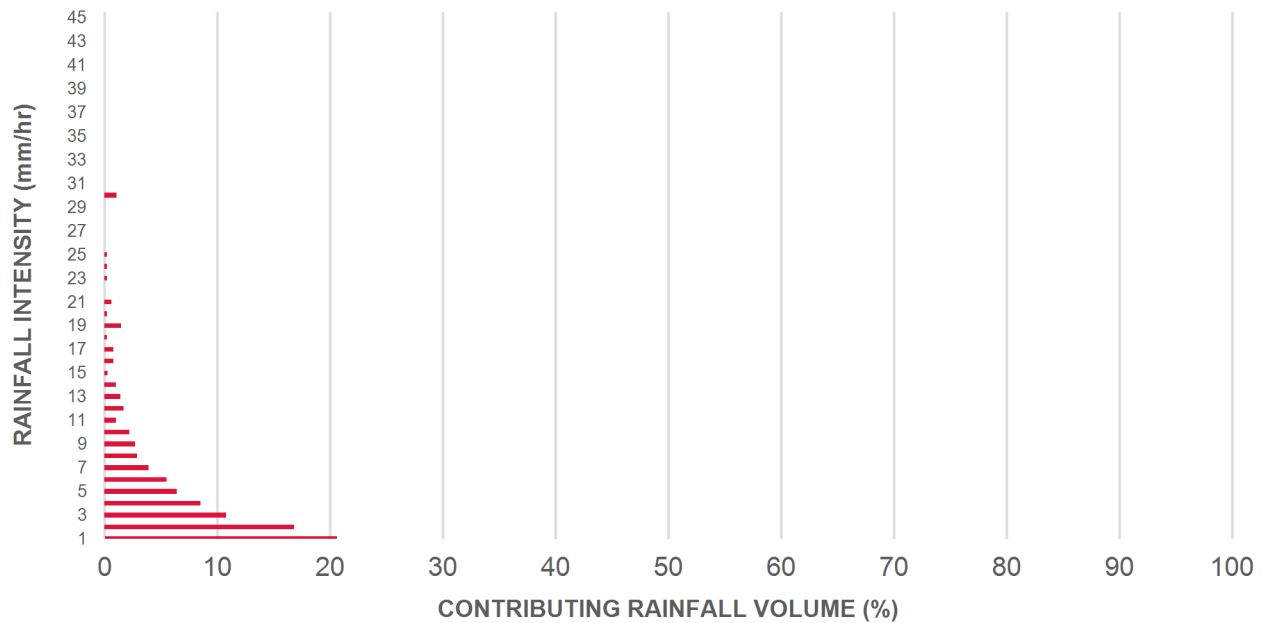
► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a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

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

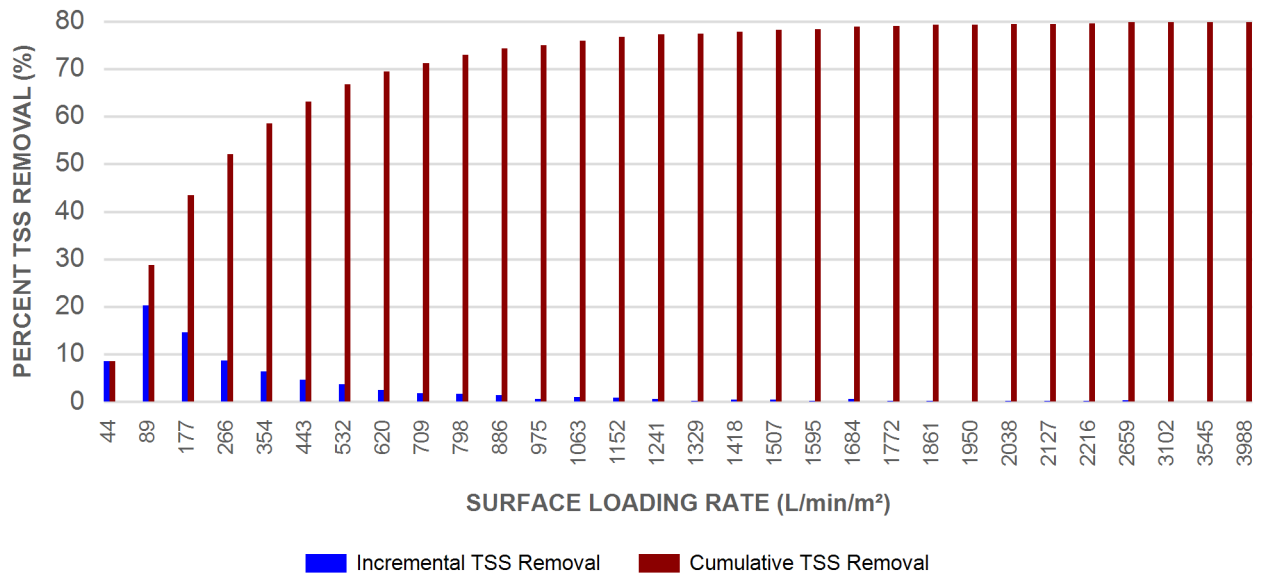
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.34	81.0	44.0	100	8.5	8.5
1.00	20.6	29.1	2.69	161.0	89.0	98	20.3	28.8
2.00	16.8	45.9	5.38	323.0	177.0	87	14.6	43.4
3.00	10.8	56.7	8.06	484.0	266.0	80	8.6	52.1
4.00	8.5	65.2	10.75	645.0	354.0	76	6.4	58.5
5.00	6.4	71.6	13.44	806.0	443.0	72	4.6	63.1
6.00	5.5	77.0	16.13	968.0	532.0	68	3.7	66.8
7.00	3.9	81.0	18.82	1129.0	620.0	64	2.5	69.4
8.00	2.9	83.9	21.51	1290.0	709.0	64	1.8	71.2
9.00	2.7	86.5	24.19	1452.0	798.0	63	1.7	72.9
10.00	2.2	88.7	26.88	1613.0	886.0	62	1.4	74.3
11.00	1.0	89.7	29.57	1774.0	975.0	62	0.6	74.9
12.00	1.7	91.3	32.26	1935.0	1063.0	60	1.0	75.9
13.00	1.4	92.8	34.95	2097.0	1152.0	58	0.8	76.7
14.00	1.0	93.7	37.63	2258.0	1241.0	56	0.5	77.2
15.00	0.3	94.0	40.32	2419.0	1329.0	54	0.2	77.4
16.00	0.8	94.8	43.01	2581.0	1418.0	52	0.4	77.8
17.00	0.8	95.7	45.70	2742.0	1507.0	49	0.4	78.2
18.00	0.2	95.8	48.39	2903.0	1595.0	46	0.1	78.3
19.00	1.5	97.3	51.07	3064.0	1684.0	44	0.7	78.9
20.00	0.2	97.5	53.76	3226.0	1772.0	41	0.1	79.0
21.00	0.6	98.2	56.45	3387.0	1861.0	39	0.2	79.3
22.00	0.0	98.2	59.14	3548.0	1950.0	38	0.0	79.3
23.00	0.2	98.4	61.83	3710.0	2038.0	36	0.1	79.4
24.00	0.2	98.6	64.52	3871.0	2127.0	35	0.1	79.4
25.00	0.2	98.9	67.20	4032.0	2216.0	33	0.1	79.5
30.00	1.1	100.0	80.64	4839.0	2659.0	28	0.3	79.8
35.00	0.0	100.0	94.09	5645.0	3102.0	24	0.0	79.8
40.00	0.0	100.0	107.53	6452.0	3545.0	21	0.0	79.8
45.00	0.0	100.0	120.97	7258.0	3988.0	19	0.0	79.8
Estimated Net Annual Sediment (TSS) Load Reduction =								80 %

Climate Station ID: 6158731 Years of Rainfall Data: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
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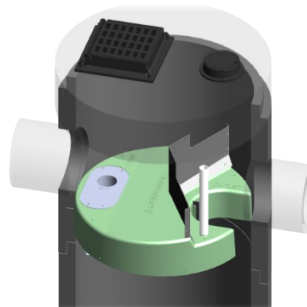
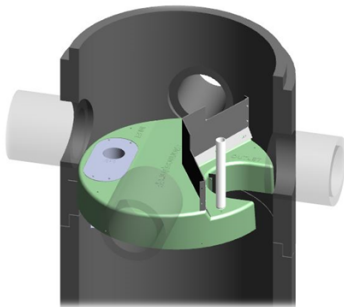
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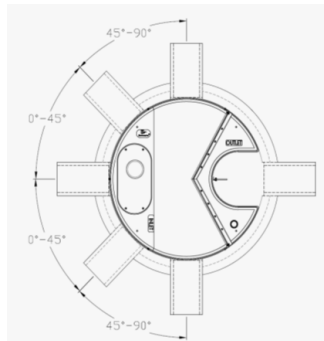
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Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/07/2026

Province:	Ontario	Project Name:	Arkell Road Developments
City:	Township of Puslinch	Project Number:	2433-6646
Nearest Rainfall Station:	TORONTO INTL AP	Designer Name:	Cole Martin
Climate Station Id:	6158731	Designer Company:	C.F. Crozier & Associates Inc.
Years of Rainfall Data:	20	Designer Email:	cmartin@cfcrozier.ca
		Designer Phone:	289-204-8239
Site Name:	Arkell - OGS #3	EOR Name:	
		EOR Company:	
Drainage Area (ha):	1.33	EOR Email:	
% Imperviousness:	22.00	EOR Phone:	
Runoff Coefficient 'c': 0.43			

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	17.87
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	291
Estimated Average Annual Sediment Volume (L/yr):	237

**Net Annual Sediment
(TSS) Load Reduction
Sizing Summary**

Stormceptor Model	TSS Removal Provided (%)
EFO4	81
EFO5	87
EFO6	91
EFO8	95
EFO10	98
EFO12	99

Recommended Stormceptor EFO Model: **EFO4**
Estimated Net Annual Sediment (TSS) Load Reduction (%): **81**
Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

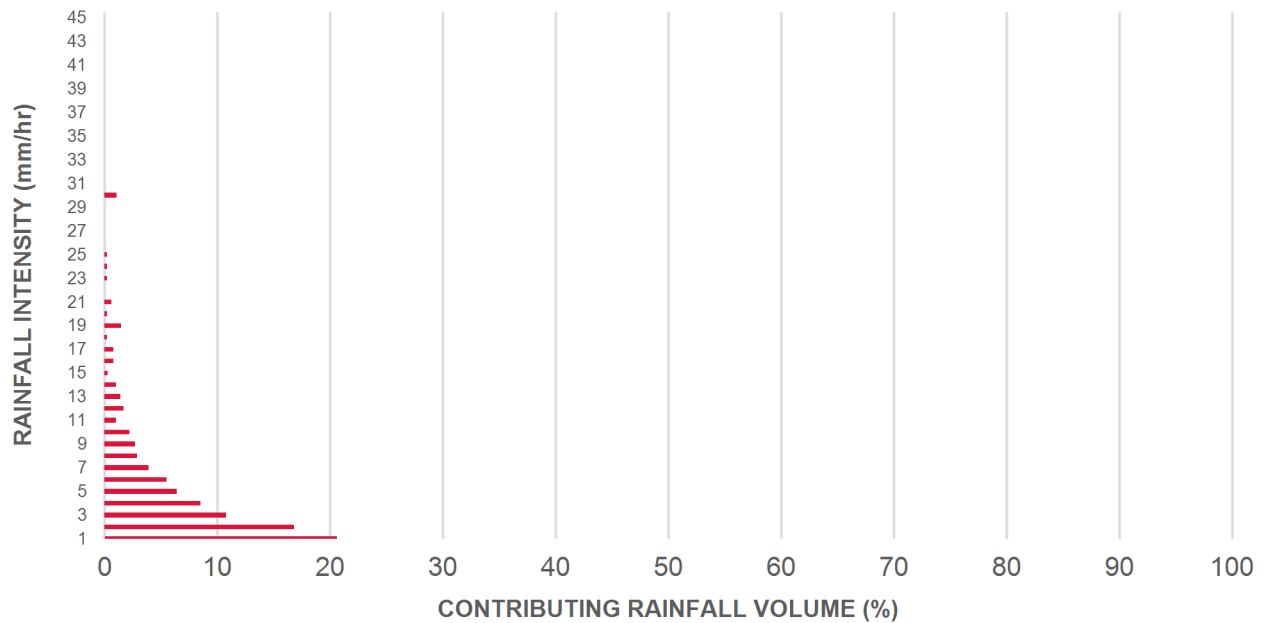
► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a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

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

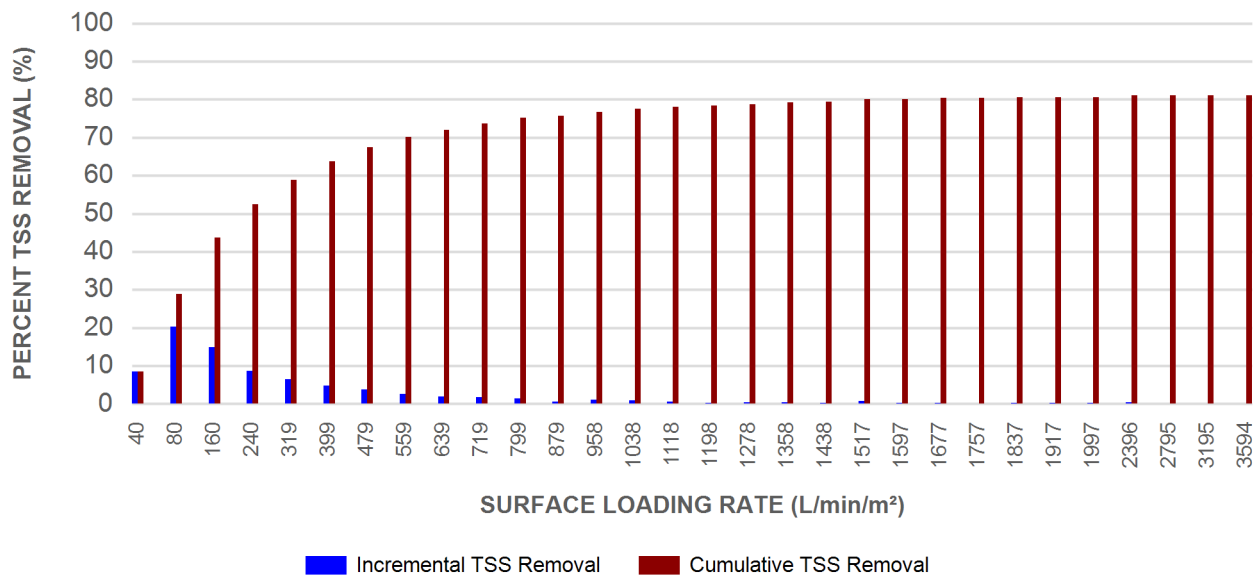
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.80	48.0	40.0	100	8.5	8.5
1.00	20.6	29.1	1.60	96.0	80.0	98	20.3	28.8
2.00	16.8	45.9	3.19	192.0	160.0	88	14.8	43.7
3.00	10.8	56.7	4.79	288.0	240.0	81	8.7	52.4
4.00	8.5	65.2	6.39	383.0	319.0	78	6.6	58.9
5.00	6.4	71.6	7.99	479.0	399.0	74	4.7	63.7
6.00	5.5	77.0	9.58	575.0	479.0	70	3.8	67.5
7.00	3.9	81.0	11.18	671.0	559.0	66	2.6	70.1
8.00	2.9	83.9	12.78	767.0	639.0	64	1.9	72.0
9.00	2.7	86.5	14.38	863.0	719.0	64	1.7	73.7
10.00	2.2	88.7	15.97	958.0	799.0	63	1.4	75.1
11.00	1.0	89.7	17.57	1054.0	879.0	63	0.6	75.7
12.00	1.7	91.3	19.17	1150.0	958.0	62	1.0	76.7
13.00	1.4	92.8	20.76	1246.0	1038.0	61	0.9	77.6
14.00	1.0	93.7	22.36	1342.0	1118.0	59	0.6	78.1
15.00	0.3	94.0	23.96	1438.0	1198.0	57	0.2	78.3
16.00	0.8	94.8	25.56	1533.0	1278.0	55	0.4	78.7
17.00	0.8	95.7	27.15	1629.0	1358.0	53	0.4	79.2
18.00	0.2	95.8	28.75	1725.0	1438.0	51	0.1	79.3
19.00	1.5	97.3	30.35	1821.0	1517.0	48	0.7	80.0
20.00	0.2	97.5	31.95	1917.0	1597.0	46	0.1	80.1
21.00	0.6	98.2	33.54	2013.0	1677.0	44	0.3	80.4
22.00	0.0	98.2	35.14	2108.0	1757.0	42	0.0	80.4
23.00	0.2	98.4	36.74	2204.0	1837.0	40	0.1	80.5
24.00	0.2	98.6	38.33	2300.0	1917.0	38	0.1	80.6
25.00	0.2	98.9	39.93	2396.0	1997.0	37	0.1	80.6
30.00	1.1	100.0	47.92	2875.0	2396.0	31	0.4	81.0
35.00	0.0	100.0	55.90	3354.0	2795.0	27	0.0	81.0
40.00	0.0	100.0	63.89	3833.0	3195.0	24	0.0	81.0
45.00	0.0	100.0	71.88	4313.0	3594.0	21	0.0	81.0
Estimated Net Annual Sediment (TSS) Load Reduction =								81 %

Climate Station ID: 6158731 Years of Rainfall Data: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

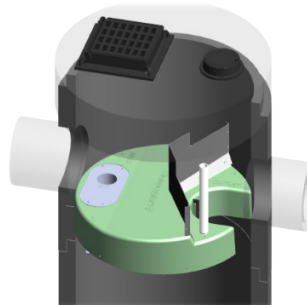
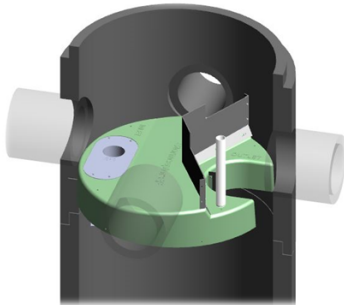
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

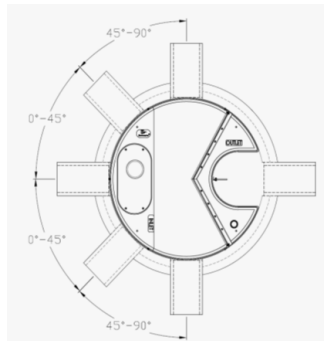
DESIGN FLEXIBILITY

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

OIL CAPTURE AND RETENTION

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



**INLET-TO-OUTLET DROP**

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

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

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/07/2026

Province:	Ontario	Project Name:	Arkell Road Developments
City:	Township of Puslinch	Project Number:	2433-6646
Nearest Rainfall Station:	TORONTO INTL AP	Designer Name:	Cole Martin
Climate Station Id:	6158731	Designer Company:	C.F. Crozier & Associates Inc.
Years of Rainfall Data:	20	Designer Email:	cmartin@cfcrozier.ca
		Designer Phone:	289-204-8239
Site Name:	Arkell - OGS #4	EOR Name:	
		EOR Company:	
Drainage Area (ha):	1.01	EOR Email:	
% Imperviousness:	86.00	EOR Phone:	

Runoff Coefficient 'c': 0.81

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	25.63
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	874
Estimated Average Annual Sediment Volume (L/yr):	711

**Net Annual Sediment
(TSS) Load Reduction
Sizing Summary**

Stormceptor Model	TSS Removal Provided (%)
EFO4	76
EFO5	82
EFO6	87
EFO8	93
EFO10	96
EFO12	98

Recommended Stormceptor EFO Model: EFO5
Estimated Net Annual Sediment (TSS) Load Reduction (%): 82
Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

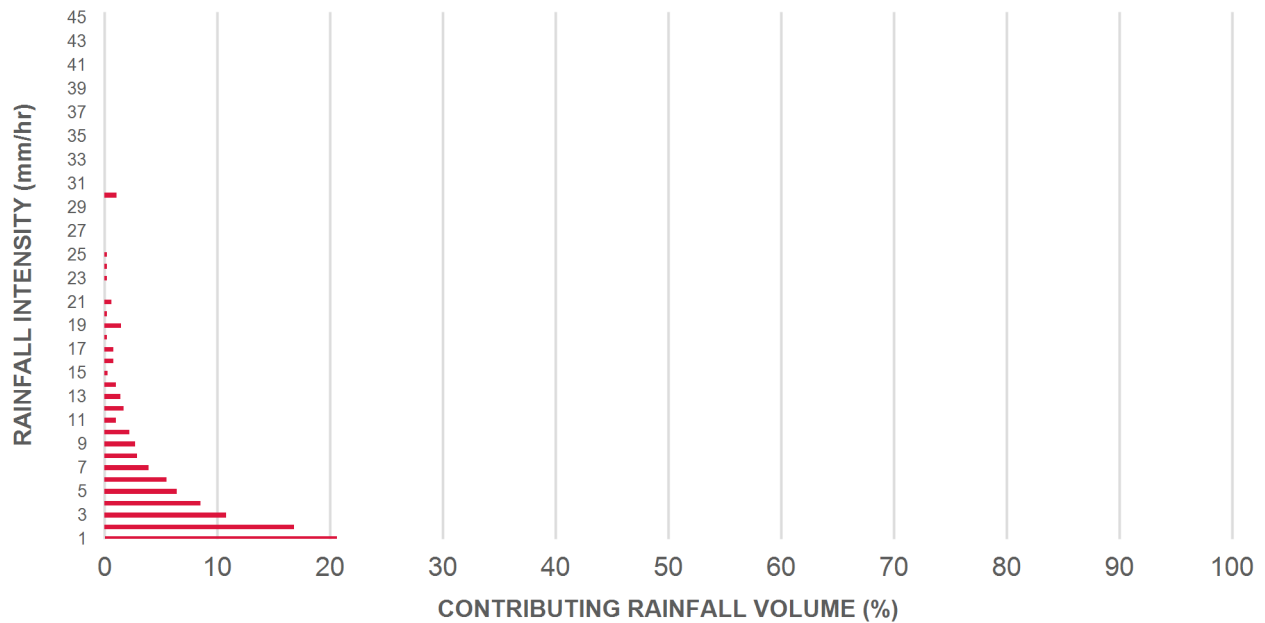
► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a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

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

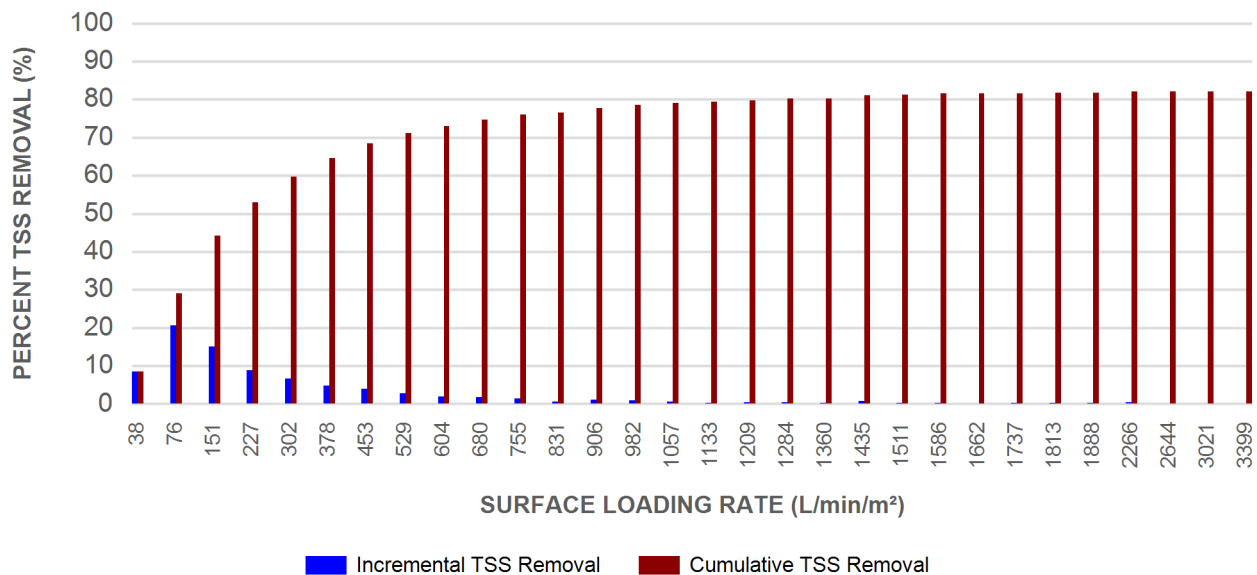
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.15	69.0	38.0	100	8.5	8.5
1.00	20.6	29.1	2.29	137.0	76.0	100	20.6	29.1
2.00	16.8	45.9	4.58	275.0	151.0	89	15.0	44.2
3.00	10.8	56.7	6.87	412.0	227.0	82	8.8	53.0
4.00	8.5	65.2	9.16	550.0	302.0	78	6.6	59.6
5.00	6.4	71.6	11.46	687.0	378.0	75	4.8	64.5
6.00	5.5	77.0	13.75	825.0	453.0	72	3.9	68.4
7.00	3.9	81.0	16.04	962.0	529.0	68	2.7	71.1
8.00	2.9	83.9	18.33	1100.0	604.0	65	1.9	72.9
9.00	2.7	86.5	20.62	1237.0	680.0	64	1.7	74.6
10.00	2.2	88.7	22.91	1375.0	755.0	63	1.4	76.0
11.00	1.0	89.7	25.20	1512.0	831.0	63	0.6	76.6
12.00	1.7	91.3	27.49	1650.0	906.0	62	1.0	77.7
13.00	1.4	92.8	29.79	1787.0	982.0	62	0.9	78.6
14.00	1.0	93.7	32.08	1925.0	1057.0	60	0.6	79.1
15.00	0.3	94.0	34.37	2062.0	1133.0	59	0.2	79.3
16.00	0.8	94.8	36.66	2200.0	1209.0	57	0.4	79.8
17.00	0.8	95.7	38.95	2337.0	1284.0	55	0.5	80.2
18.00	0.2	95.8	41.24	2474.0	1360.0	53	0.1	80.3
19.00	1.5	97.3	43.53	2612.0	1435.0	51	0.8	81.1
20.00	0.2	97.5	45.82	2749.0	1511.0	48	0.1	81.2
21.00	0.6	98.2	48.11	2887.0	1586.0	46	0.3	81.5
22.00	0.0	98.2	50.41	3024.0	1662.0	44	0.0	81.5
23.00	0.2	98.4	52.70	3162.0	1737.0	42	0.1	81.6
24.00	0.2	98.6	54.99	3299.0	1813.0	40	0.1	81.7
25.00	0.2	98.9	57.28	3437.0	1888.0	39	0.1	81.8
30.00	1.1	100.0	68.73	4124.0	2266.0	32	0.4	82.1
35.00	0.0	100.0	80.19	4811.0	2644.0	28	0.0	82.1
40.00	0.0	100.0	91.65	5499.0	3021.0	24	0.0	82.1
45.00	0.0	100.0	103.10	6186.0	3399.0	22	0.0	82.1
Estimated Net Annual Sediment (TSS) Load Reduction =								82 %

Climate Station ID: 6158731 Years of Rainfall Data: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

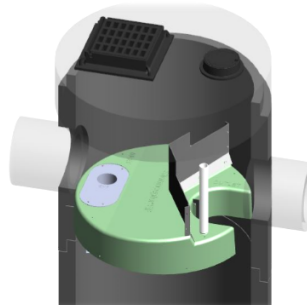
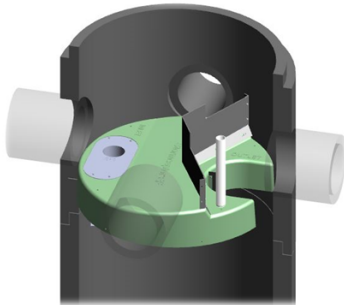
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

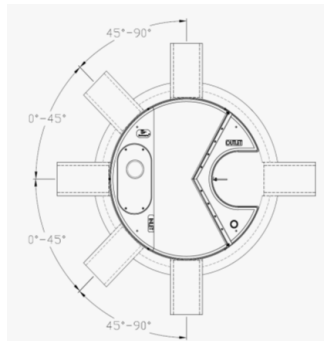
DESIGN FLEXIBILITY

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

OIL CAPTURE AND RETENTION

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



**INLET-TO-OUTLET DROP**

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

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

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

DRAWINGS & FIGURES

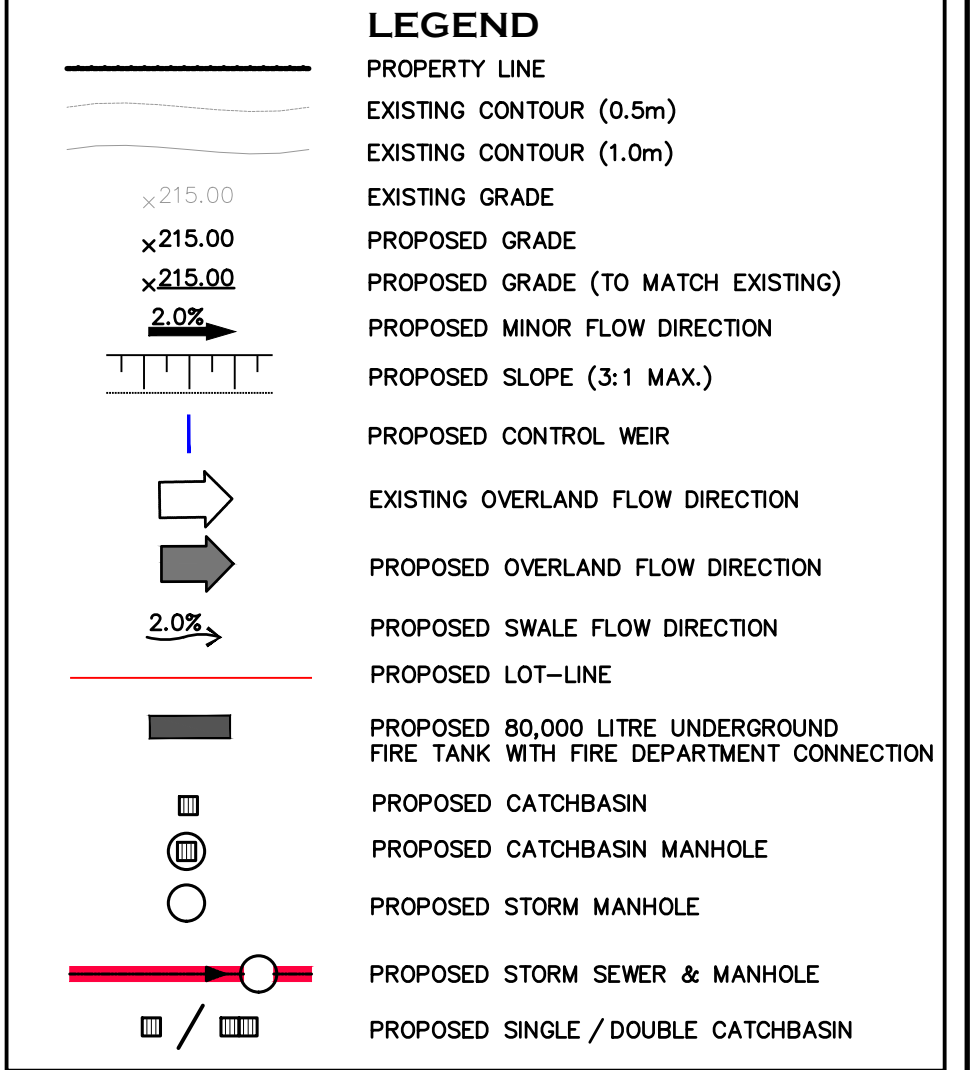
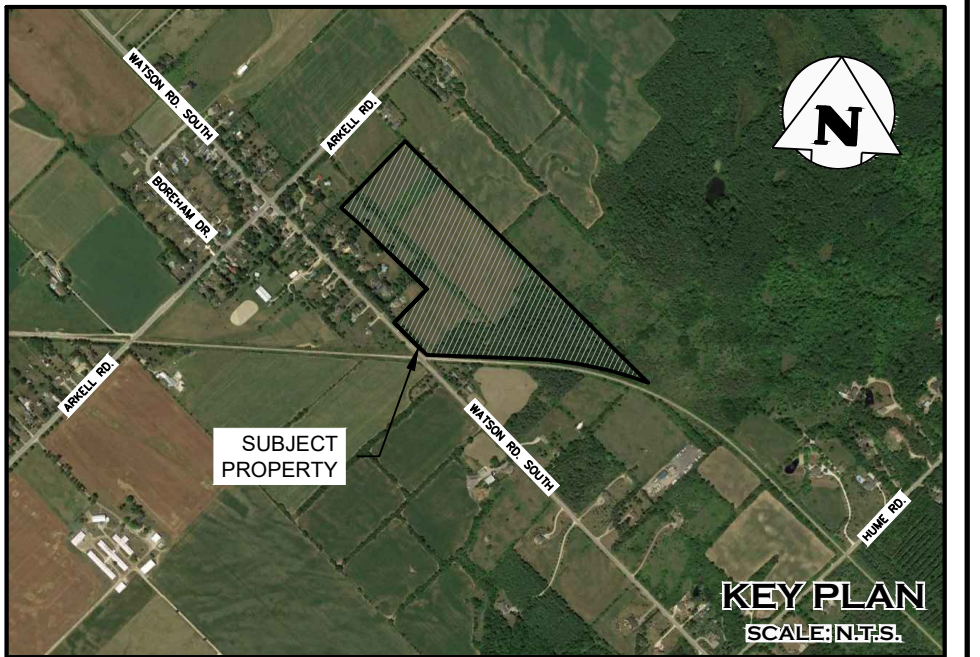
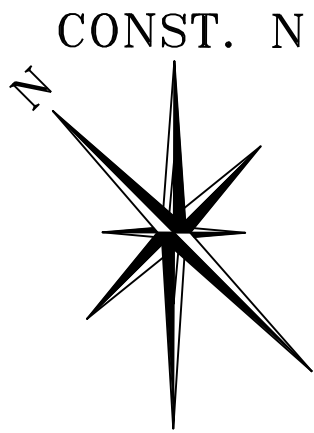
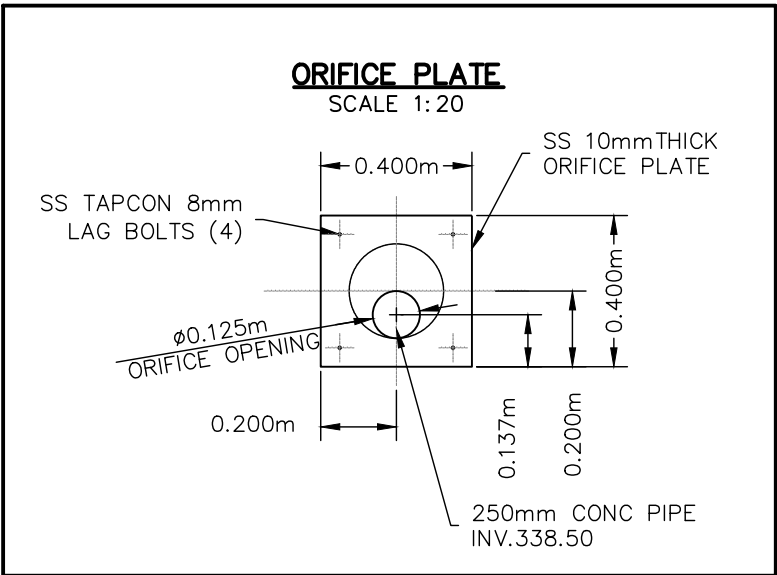
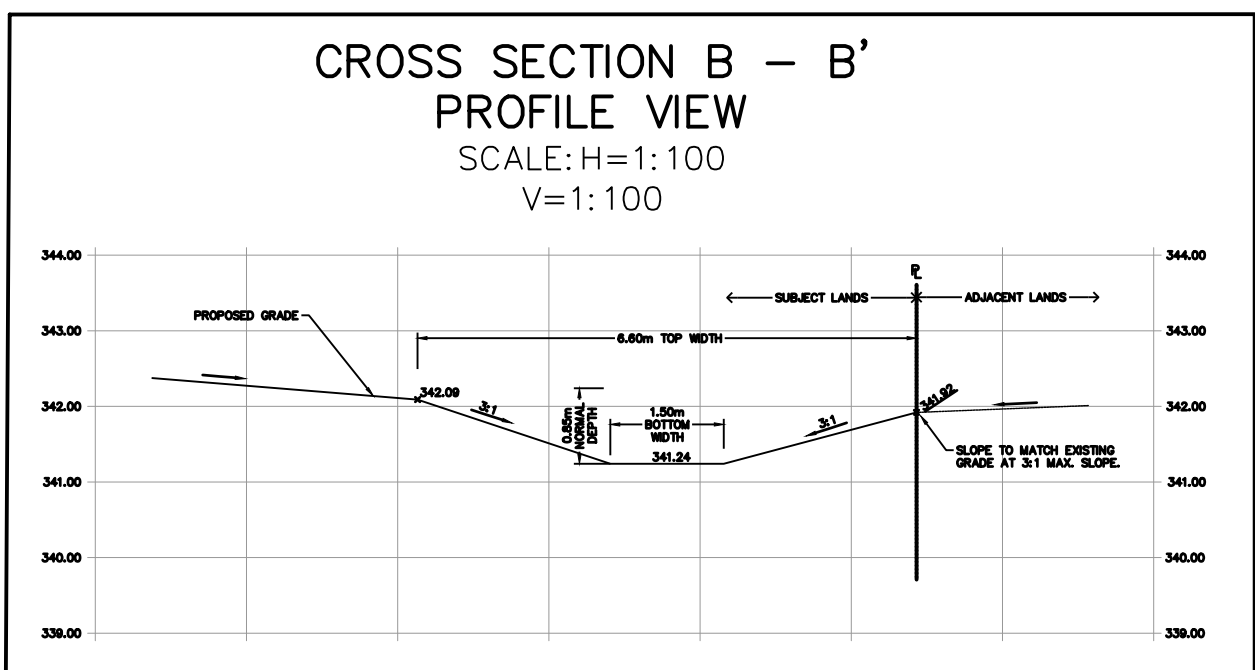
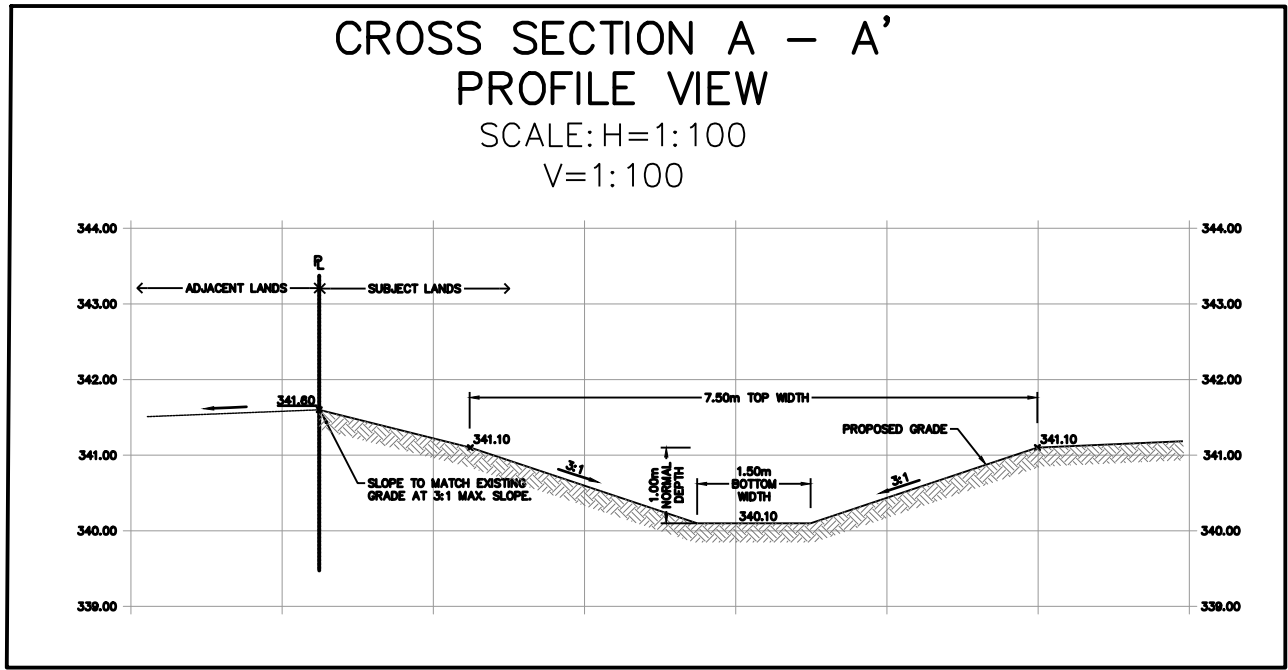
Drawing C101: Preliminary Grading and Servicing Plan

Drawing C102: Onsite Sewage Servicing Schematic

Figure 1: Study Area

Figure 2: Pre-development Drainage Plan

Figure 3: Post-development Drainage Plan



REFER TO TOWNSHIP OF PUSLINCH STANDARD DRAWING STD-102
"TYPICAL URBAN CROSS-SECTION" FOR DIMENSIONS AND DETAILS OF
PROPOSED ROAD CROSS-SECTION.

2	ISSUED FOR 3rd DRAFT PLAN SUBMISSION	2026/JAN/16
1	ISSUED FOR 2nd DRAFT PLAN SUBMISSION	2025/AUG/01
0	ISSUED FOR PRE-CONSULTATION	2023/AUG/31
No.	ISSUE / REVISION	YYYY/MM/DD

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DESIGN ELEMENTS ARE BASED ON DRAFT SITE PLAN BY STOVEL AND ASSOCIATES INC.
PROJECT No. XXX
DRAWING No. XXX
DATE RECEIVED 2025/JUL/29

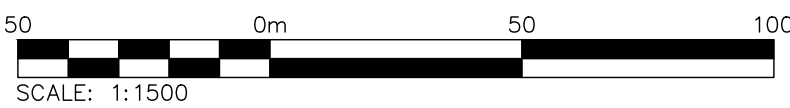
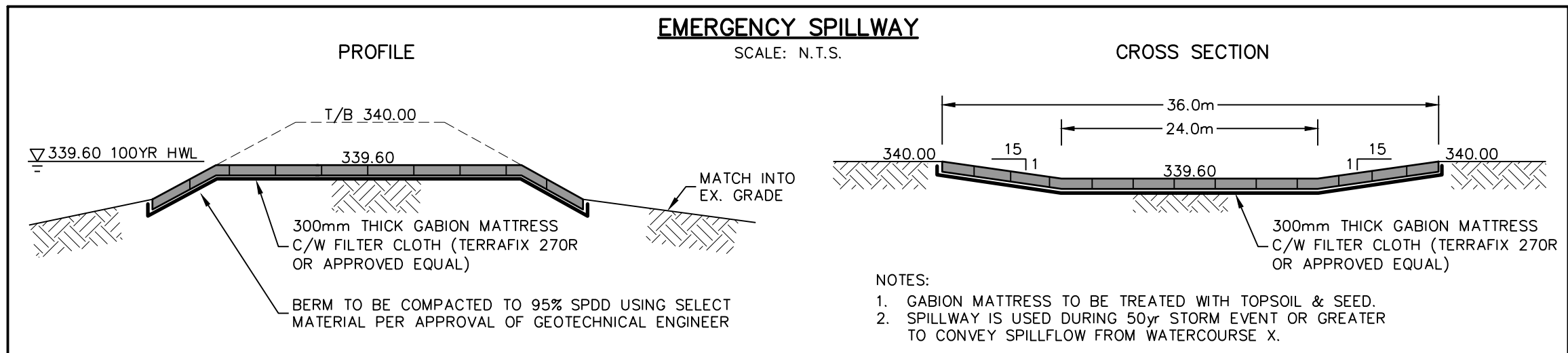
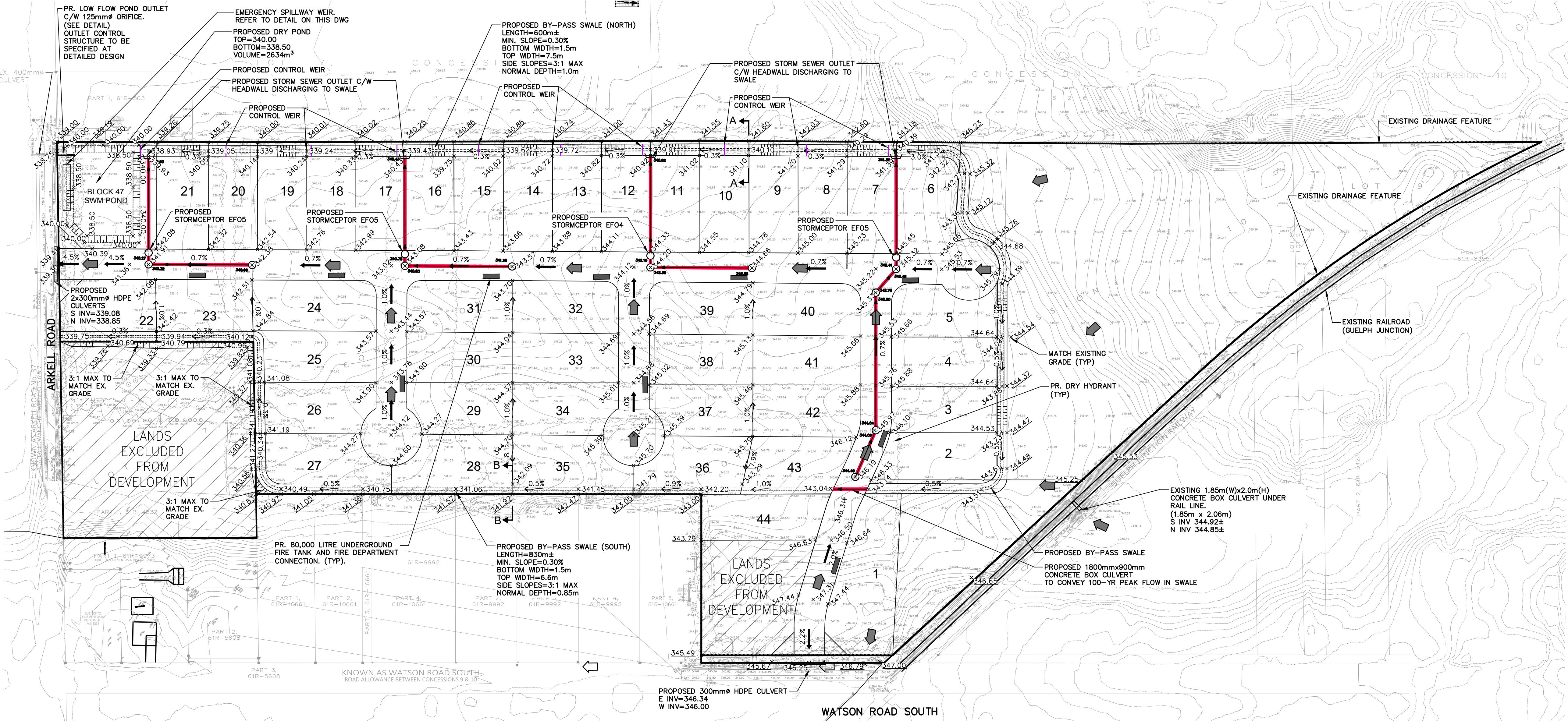
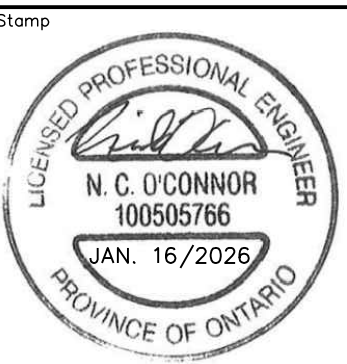
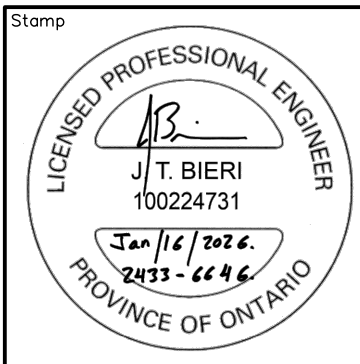
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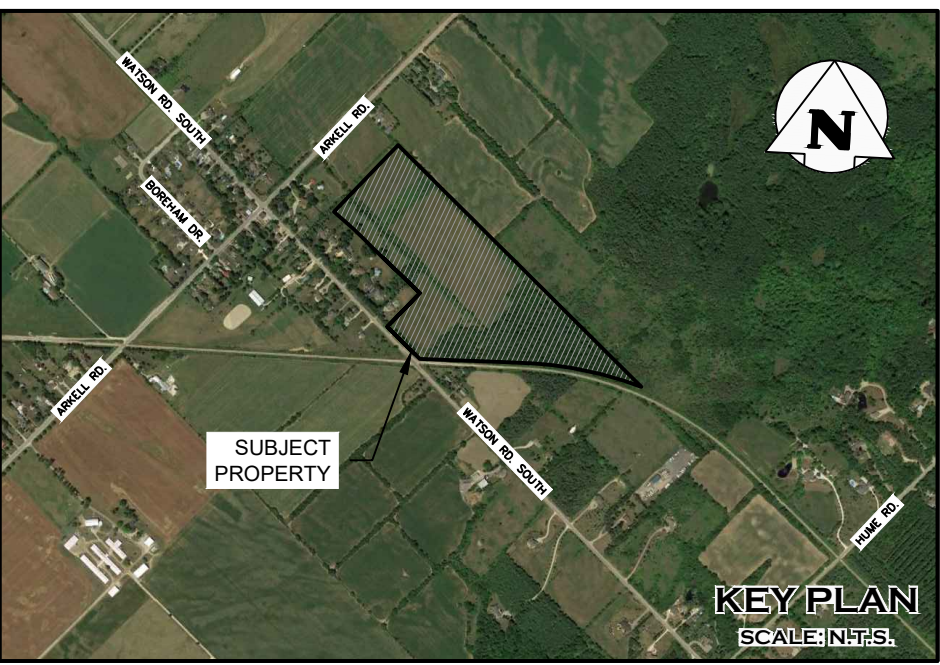
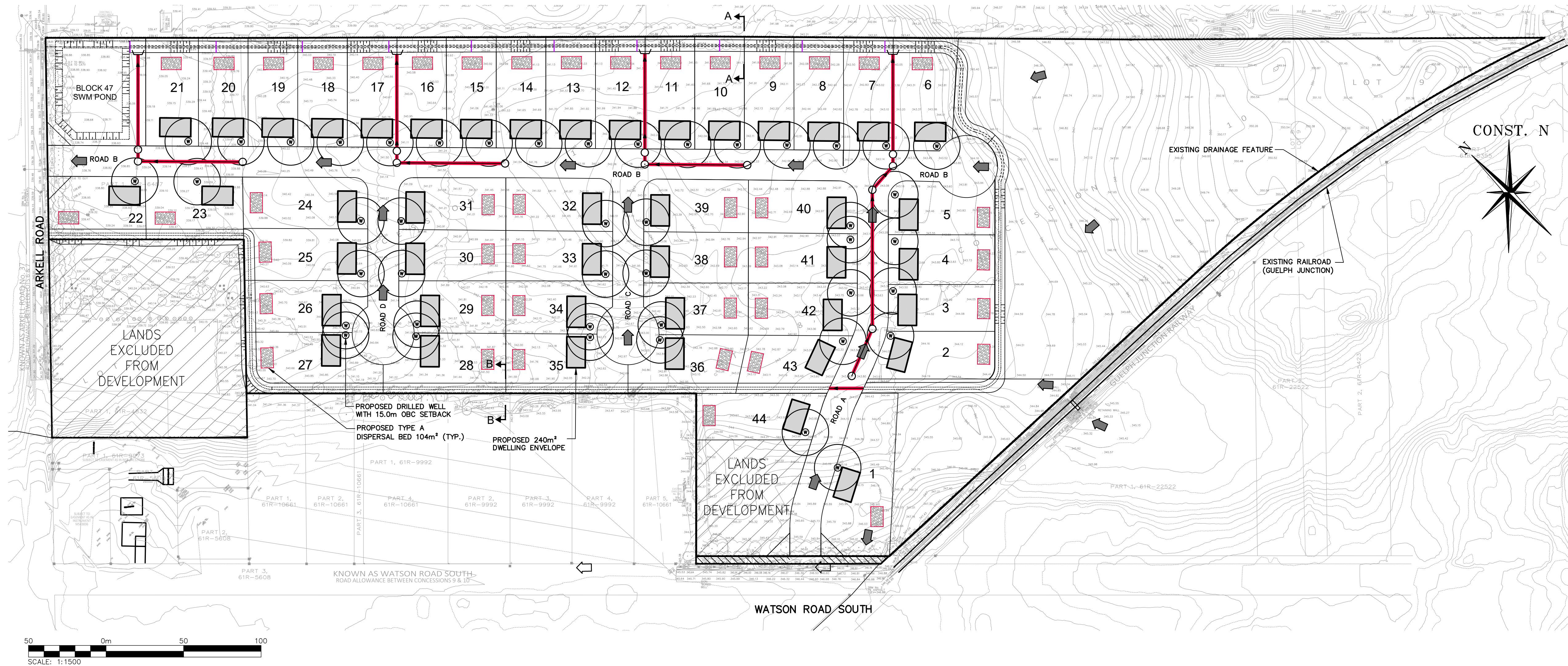
Project
**WATSON ROAD SOUTH
TOWN OF PUSLINCH**

Drawing
**PRELIMINARY GRADING AND
SERVICING PLAN**



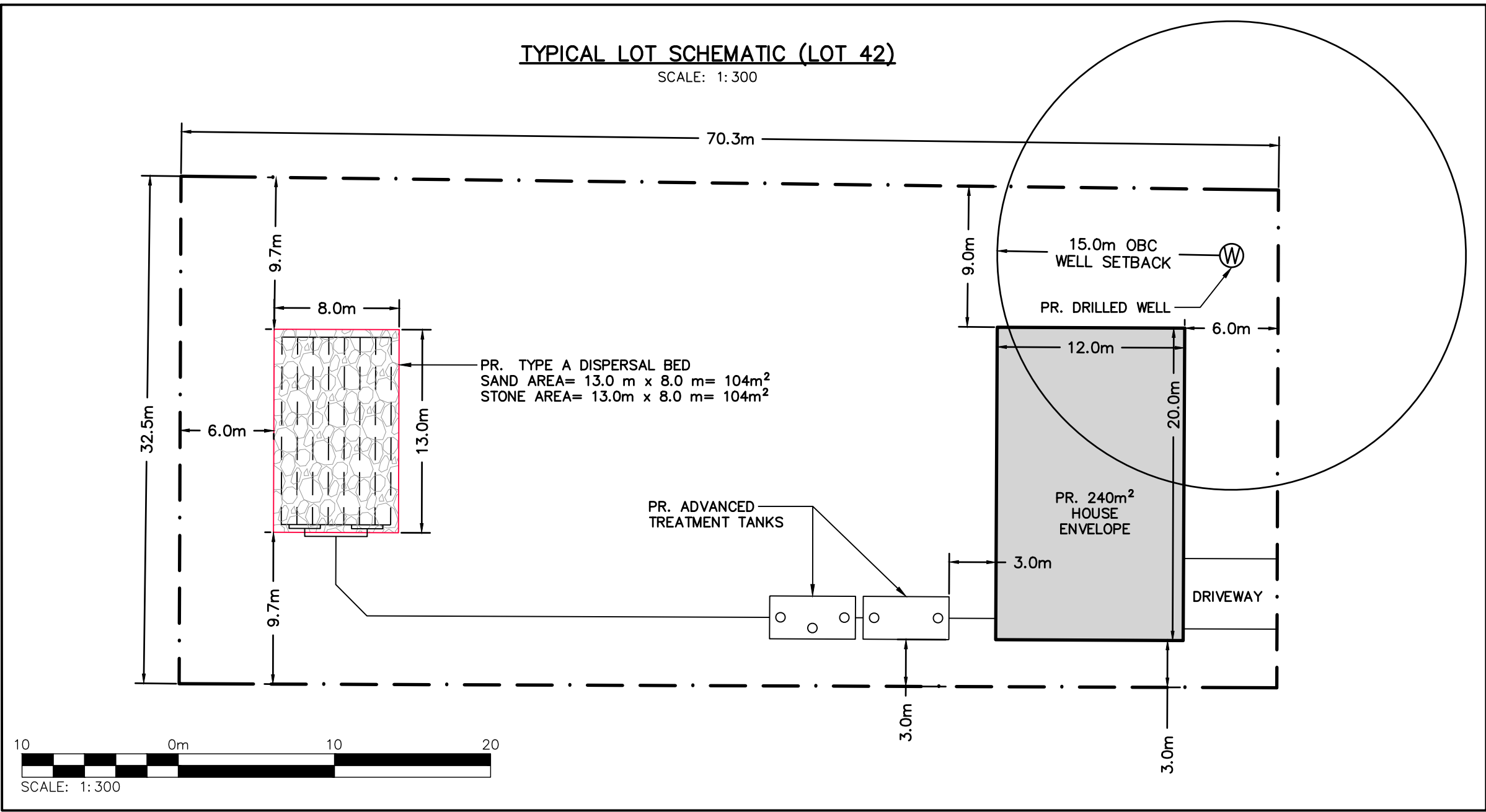
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Check	J.B.	Check	J.B.	Scale	1:1500
				Dwg.	C101





LEGEND	
	PROPERTY LINE
	EXISTING CONTOUR (0.5m)
	EXISTING CONTOUR (1.0m)
	LOT NUMBER
	EXISTING GRADE
	PROPOSED GRADE
	PROPOSED GRADE (TO MATCH EXISTING)
	PROPOSED SLOPE (3:1 MAX.)
	PROPOSED LOT-LINE
	CONCEPTUAL 240 m² BUILDING ENVELOPE
	PROPOSED TYPE A DISPERSAL BED 104 m²
	CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK

ONSITE SEWAGE SYSTEM DESIGN TYPICAL LOT NOTES	
PROPOSED 6 BEDROOM, 240 m² HOME WITH SIXTY-TWO (62) FIXTURE UNITS	BASE FLOW (6 BEDROOMS)= 2,500 L/DAY ADDITIONAL FLOOR AREA (40 m²)= 400 L/DAY ADDITIONAL FIXTURE UNITS (42)= 2,075 L/DAY Q TOTAL (2,500+2,075)= 4,575 L/DAY
SOIL PERCOLATION RATE	T = 15 min/cm (ESTIMATED BY C.F. CROZIER)
PROPOSED TREATMENT UNIT	WATERLOO BIOFILTER AD-BA50
TYPE A DISPERSAL BED STONE AREA	MINIMUM SIZE=Q/50=4,575/50 = 91.5m² PROVIDED 13m x 8m = 104m²
TYPE A DISPERSAL BED SAND AREA	MINIMUM SIZE=QT/850= 4,575*15/850 = 80.7m² PROVIDED 13m x 8m = 104m²



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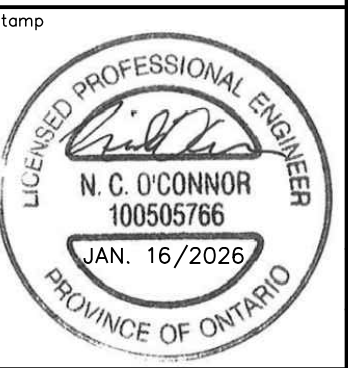
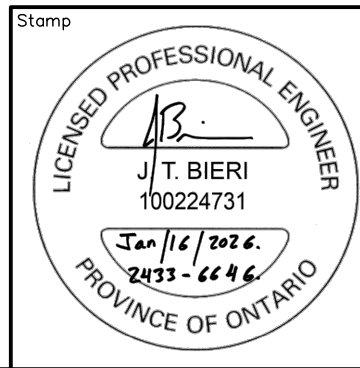
No.	ISSUE / REVISION	YYYY/MM/DD
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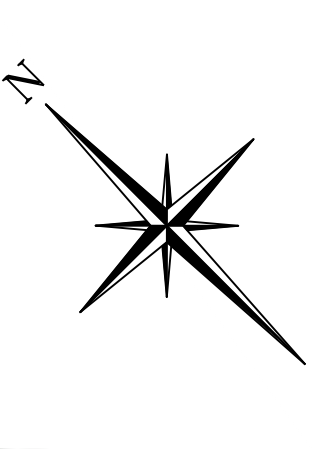
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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project
**WATSON ROAD SOUTH
TOWN OF PUSLINCH**

Drawing
ONSITE SEWAGE SERVICING SCHEMATIC



Drawn	J.G.	Design	J.G.	Project No.	2433-6646
Check	J.G.	Check	J.G.	Scale	1:1500
				Dwg.	C102



LEGEND

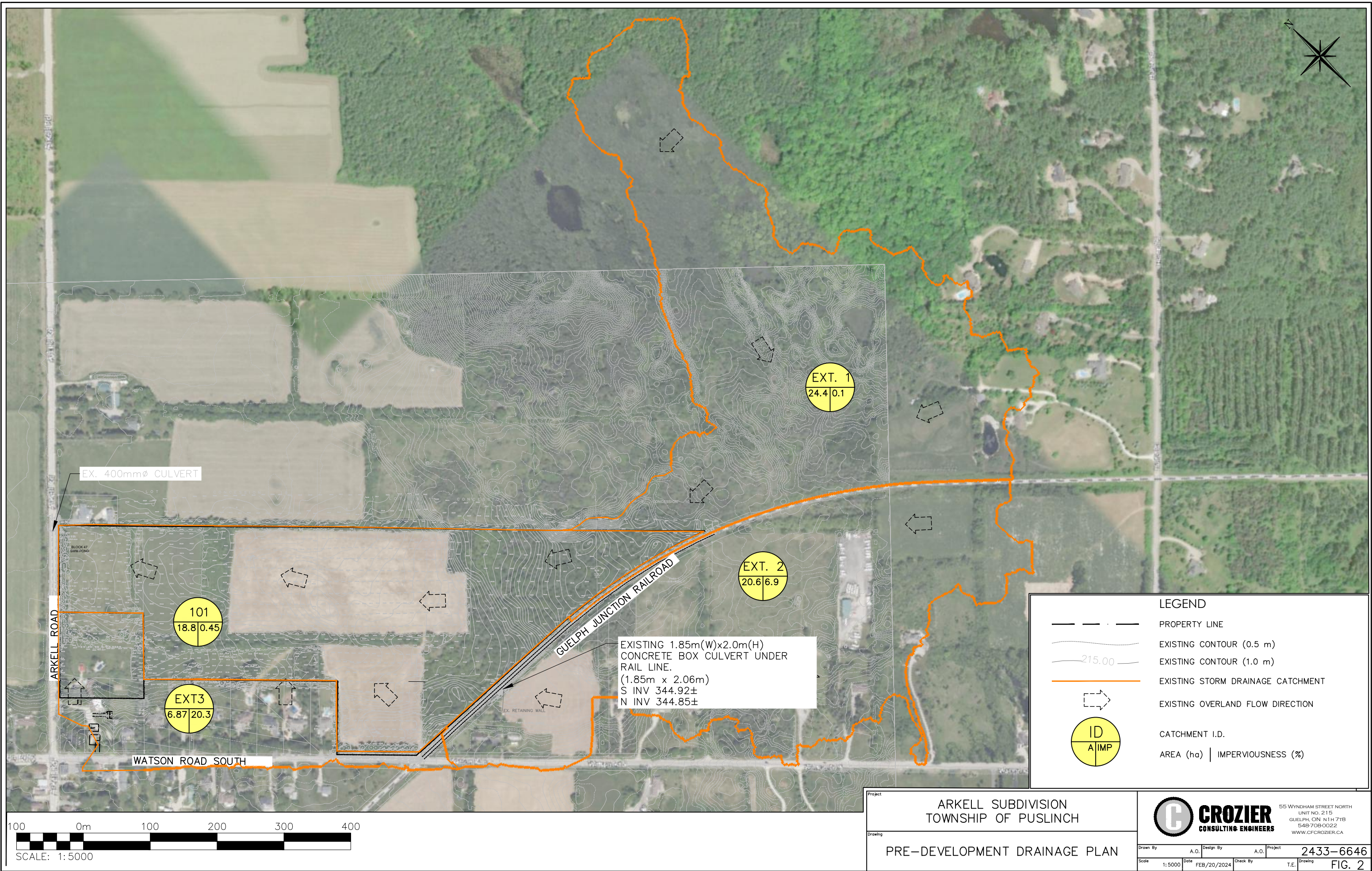
---	PROPERTY LINE
==	GUELPH JUNCTION RAILROAD

**CROZIER**
CONSULTING ENGINEERS

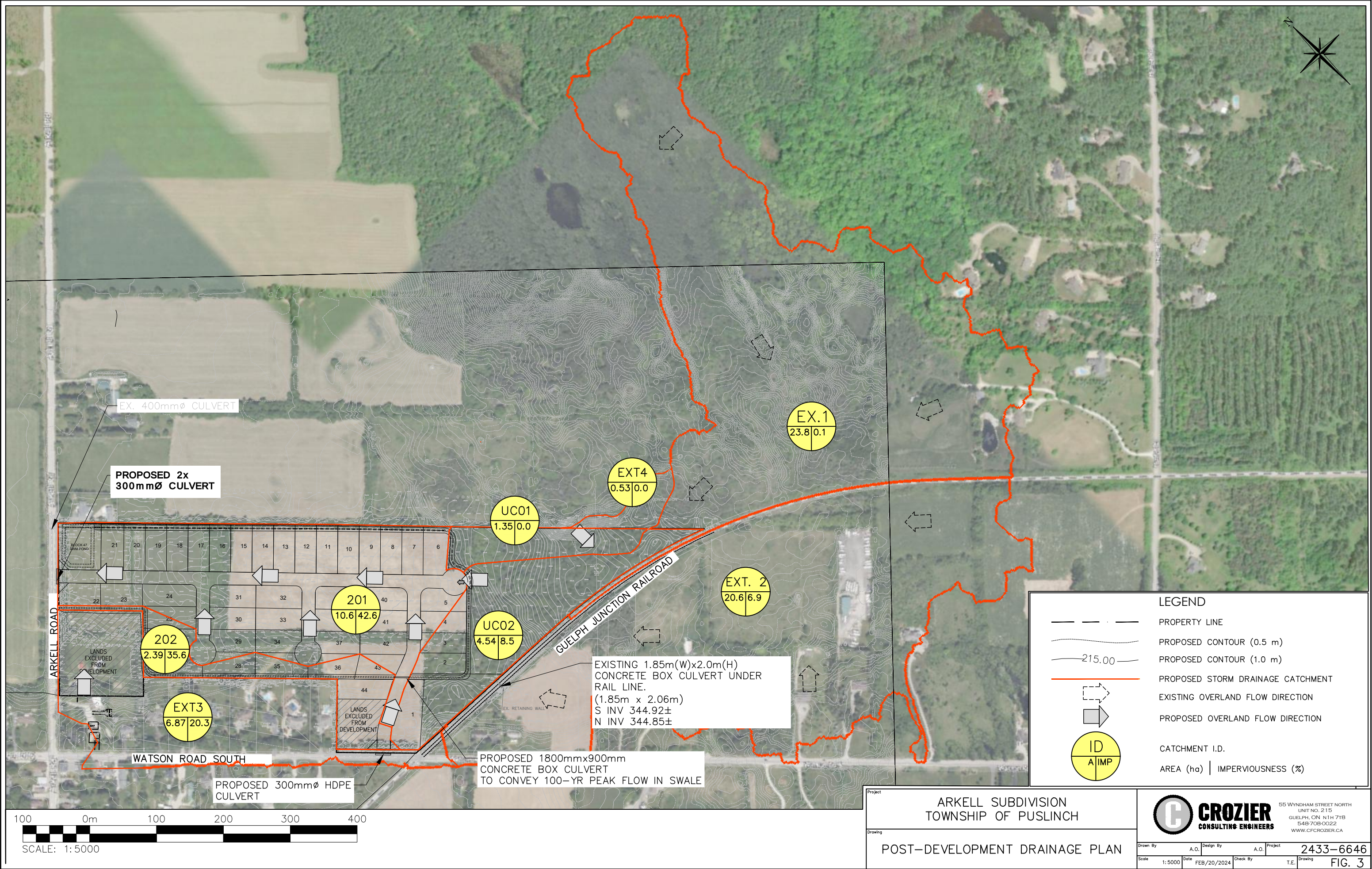
ARKELL SUBDIVISION
STUDY AREA

SCALE: 1:1000

FIGURE 1



Project		Arkell Subdivision Township of Puslinch		 55 WYNDHAM STREET NORTH UNIT NO. 215 GUELPH, ON N1H 7T8 548-708-0022 WWW.CFCROZIER.CA	
Drawing		PRE-DEVELOPMENT DRAINAGE PLAN		2433-6646	
Drawn By	A.O.	Design By	A.O.	Project	2433-6646
Scale	1:5000	Date	FEB/20/2024	Check By	T.E.
				Drawing	FIG. 2



LEGEND

- PROPERTY LINE
- - - PROPOSED CONTOUR (0.5 m)
- - - PROPOSED CONTOUR (1.0 m)
- - - 215.00
- PROPOSED STORM DRAINAGE CATCHMENT
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- ID
A|IMP CATCHMENT I.D.
AREA (ha) | IMPERVIOUSNESS (%)

Project		Arkell Subdivision Township of Puslinch		CROZIER CONSULTING ENGINEERS		55 WYNDHAM STREET NORTH UNIT NO. 215 GUELPH, ON N1H 7Y8 548-708-0022 WWW.CFCROZIER.CA					
Drawing		POST-DEVELOPMENT DRAINAGE PLAN		Drawn By		A.O. Design By		A.O. Project		2433-6646	
Scale		1:5000		Date		FEB/20/2024		Check By		T.E. Drawing	
										FIG. 3	