

# Fastfrate

## Site Servicing and Stormwater Management Report

Fastfrate Ottawa Warehouse and Distribution Facility

Client Project Number : GA18-0631-01



CIMA+ file number: A001083  
December 2, 2022 – Revision 4 – For Site Plan Control

# Fastfrate

## Site Servicing and Stormwater Management Report

Fastfrate Ottawa Warehouse and Distribution Facility

Prepared by:   
Julien Sauvé, P.Eng.  
PEO membership number: 100200100



Prepared by:   
Guillaume LeBlond, M.A.Sc., EIT  
PEO membership number: 100530467



Verified by:   
Christian Lavoie-Lebel, P.Eng.  
PEO membership number: 100067842



600-1400 Blair Towers Place, Ottawa, Ontario  
Canada K1J 9B8

CIMA+ file number: A001083  
December 2, 2022 – Revision 4 – For Site Plan Control

## Executive Summary

This Site Servicing and Stormwater Management Report presents the proposed potable water, sanitary and storm servicing for the Fastfrate Ottawa Warehouse and Distribution Facility. This report will be used in support of the Site Plan Approval process.

Sanitary servicing of the site will be achieved with an on-site wastewater treatment system. This system consists of a sewer, septic tank, pumping chamber, Level IV treatment unit, shallow-buried trench system and mantle. It is anticipated that an Environmental Compliance Approval (ECA) from the MECP will be required, as the system will treat over 10,000 L/d of sanitary sewage.

Potable water will be supplied to the site by a new drinking water well, with sufficient capacity to service the intended development. Since the site is not serviced by municipal watermains, and since the proposed drinking water well will not have the capacity required to provide fire protection, the fire protection volumes will be provided from the permanent pool of the proposed stormwater management wet pond. The fire protection system consists of two (2) dry hydrants, a Siamese connection, and a building sprinkler system.

The stormwater management (SWM) for the Fastfrate site is subject to the overall SWM of the Hawthorne Industrial Park, as presented in the Hawthorne Industrial Park Stormwater Management Report (HIP SWM report), prepared by J.L. Richards & Associates, and dated May 2009. This report also demonstrates how the proposed SWM strategy conforms to the requirements of the HIP SWM report and of the regulatory authorities. Overall, the SWM strategy will be achieved with a system of ditches, culverts, and a wet pond which will provide stormwater quality and quantity control for the site.

## Confidentiality and Ownership

Unless CIMA+ Canada Inc. and its client have agreed otherwise, the intellectual property rights and all documents delivered by CIMA+, whether in hard or electronic copy, are the property of CIMA+, which reserves copyright therein. It is strictly prohibited to use or reproduce such proprietary rights on any support, even in part, without the authorization of CIMA+.

## Notice to the Reader

This document was prepared by CIMA+ for:

**Fastfrate - Ottawa**

The material included in this document reflects the opinion of CIMA+. Any use of this document, reference to it, or decision based on it by someone else will be their own responsibility. CIMA+ will not take any responsibility for damages resulting in decisions or actions taken by someone else based on this document.

## Table of involved resources

In addition to the signatories of this report, the following individuals have also been involved in the study and writing of the report as technical experts within the project team:

Name	Discipline
Kayla Schmidt, M.A.Sc., P.Eng. – (CIMA+)	Septic System Design
Uzoechina Ukeje – (GWAL)	Building Fire Protection / Mechanical
Robert Neck, M.Eng., P.Geo. (Limited) – (GHD)	Hydrogeology

# Table of Contents

<b>1.</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Site Description and Proposed Development .....	1
1.2	Existing Infrastructure.....	2
1.3	Summary of Applicable Background Documents.....	2
1.3.1	Stormwater Management Report, Hawthorne Industrial Park By J.L. Richards & Associates Limited – May 2009. ....	2
1.3.2	Hydrogeological Assessment Report by GHD, 2022. ....	2
1.3.3	Septic Assessment Report by GHD, 2022.....	2
1.3.4	Environmental Impact Study by GHD, 2022. ....	2
1.4	Consultation and Permits .....	3
<b>2.</b>	<b>Sanitary Servicing.....</b>	<b>4</b>
2.1	Existing Conditions.....	4
2.2	Sanitary Sewer.....	4
2.3	Onsite Wastewater Disposal System.....	5
2.3.1	Daily Design Sewage Flow.....	5
2.3.2	System Design .....	5
2.4	Sanitary Servicing Summary and Conclusions .....	13
<b>3.</b>	<b>Potable Water Servicing .....</b>	<b>14</b>
3.1	Existing Conditions.....	14
3.2	Building Water Demands (Domestic and Fire Protection).....	14
3.2.1	Potable Water Quantity Requirements .....	14
3.2.2	Fire Protection Quantity Requirements.....	15
3.3	Proposed Water Supply Well.....	16
3.3.1	Well Quality .....	16
3.3.2	Well Quantity.....	16
3.4	Conclusion – Potable Water Servicing.....	16
<b>4.</b>	<b>Storm Water Management .....</b>	<b>17</b>
4.1	Background.....	17
4.2	Stormwater Management Strategy .....	17
4.2.1	Deviations from the HIP SWM Report & Drainage Plan.....	17
4.2.2	Allowable Post Development Flow Rates and Quantity Control Requirements .....	18
4.3	Design Criteria and Assumptions .....	19
4.4	Proposed Storm Servicing.....	19
4.4.1	Stormwater Quality Control .....	19
4.4.2	Stormwater Quantity Control .....	20
4.4.3	Site Culverts, Stormwater Outlet and Backwater Elevations.....	21
4.4.4	Municipal Ditch and Road Culverts.....	23
4.4.5	Building Service Connection.....	23
4.4.6	Deviations from the Ottawa Sewer Design Guidelines – Swale Minimum Slope.....	23
4.4.7	Culvert Ends .....	23
4.5	Proposed SWM Pond Sizing .....	24
4.6	Calculations .....	25
4.6.1	Sediment Accumulation Volume.....	25
4.6.2	Pond Controls .....	25

4.6.3	Watercourse Protection Measures .....	26
4.7	SWM Conclusions .....	27
<b>5.</b>	<b>Conclusion .....</b>	<b>28</b>
<b>6.</b>	<b>References.....</b>	<b>28</b>

## List of Tables

Table 2-1:	Sanitary Peak Flow Determination Design Criteria .....	4
Table 2-2:	Peak Sanitary Flows – Sanitary Sewer Sizing .....	4
Table 2-3:	Daily Design Sewage Flow Rate and Septic Tank Volume .....	5
Table 2-4:	Minimum Clearances for Treatment Units .....	7
Table 2-5:	Minimum Clearances for Distribution Piping and Leaching Chambers .....	8
Table 2-6:	Theoretical Pumping Flow Rates .....	9
Table 2-7:	OBC Treatment Unit Levels and Required Effluent Concentrations .....	9
Table 3-1	Potable Water Design Flows .....	14
Table 3-2	Potable Water Design Flows – City of Ottawa Design Guidelines – Water Distribution .....	14
Table 4-1:	Post-development Allowable 100-year Release Flows – HIP SWM Facility.....	18
Table 4-2:	Post-development Allowable 100-year Release Rates – HIP SWM Facility.....	19
Table 4-3:	Wet Pond Volume Calculations – 74% Impervious; 80% TSS Removal .....	20
Table 4-4:	Post-development Flowrate and Storage Summary .....	20
Table 4-5:	Culvert Sizing Summary – Freeflow .....	21
Table 4-6:	Culvert Sizing Summary – Submerged Outlet .....	22
Table 4-7:	Summary of Backwater Elevations – 100-year .....	22
Table 4-8:	Summary of Site Spill Points .....	22
Table 4-9:	Ditch Sizing Summary .....	23
Table 4-10:	Summary of Required SWM Pond Volumes.....	24
Table 4-11:	Summary of Provided SWM Pond Volumes .....	25
Table 4-12	Resulting Release Flow with Proposed Controls .....	26

## List of Appendices

### Appendix A – J.L. Richards HIP Storm Water Management Report

- Appendix A.1 – J.L. Richards HIP Storm Water Management Report
- Appendix A.2. – MOE Certificate of Approval Hawthorne Industrial Park

### Appendix B – Stormwater Management Plans and Calculations

- Appendix B.1 – SWM drawing Pre-Development
- Appendix B.2 – SWM drawing Post-Development
- Appendix B.3 – Storm Area Drainage Plan for HIP from J.L. Richards
- Appendix B.4 – Identification of Source Data from HIP SWM Report by J.L. Richards
- Appendix B.5 – Storm Runoff Coefficient
- Appendix B.6 – Storm Post-Dev 10 & 10-Year uncontrolled
- Appendix B.7 – Stormwater Management – Storage and Drawdown Full Release Rate
- Appendix B.8 – Stormwater Management – Storage and Drawdown Half Release Rate
- Appendix B.9 – Somme Street Ditch Elevation (100-year)
- Appendix B.10 – Storm Hydraulic Grade ine
- Appendix B.11 – SWM Pond Control Sizing
- Appendix B.12 – Storm Service Connection Sizing
- Appendix B.13-1 – Road Culvert Calculation Reports
- Appendix B.13-2 – Site Culvert Calculation Reports – Freeflow Outlet Condition
- Appendix B.13-3 – Site Culvert Calculation Reports – Submerged Outlet Condition
- Appendix B.13-4 – Culvert Flow Profile Types
- Appendix B.14 – Ditch Calculation Reports
- Appendix B.15 – Site Storage Volume Calculations
- Appendix B.16 – Culvert Ends (Roadside Safety Assessment)

### Appendix C – Potable Water & Fire Protection Calculations

- Appendix C.1 – Water Supply
- Appendix C.2 – Fire Flow
- Appendix C.3 – Gravity Watermain for Fire Protection
- Appendix C.4 – Ice Thickness Calculation

### Appendix D – Sanitary Servicing Calculations

- Appendix D.1 – Sanitary Sewer Flow
- Appendix D.2 – Sanitary Sewer Sizing

### Appendix E – Septic System Detailed Calculations

### Appendix F – Correspondance

- Appendix F.1 – Combine Correspondance
- Appendix F.2 – Development Servicing Study Checklist

### Appendix G – Technical References

- Appendix G.1 – Armtech Corrugated Steel Pipe
- Appendix G.2 – FT Solmax – Geomembrane HDPE 1.0mm BLACK technical Data Sheet
- Appendix G.3 – Backflow preventer – Checkmate Brochure

## 1. Introduction

CIMA+ was retained by CIVITAS & Fastfrate to prepare a Site Servicing and Stormwater Management Report for the proposed construction of a warehouse containing cross-docks and office building, at 301 Somme Street in Ottawa, Ontario.

The purpose of this assessment is to confirm that the proposed development will be serviced adequately by the proposed water supply well, septic system and stormwater management. This assessment shall be used in support of the application for Site Plan Approval.

The detailed design of sediment and erosion control measures, site servicing (storm, sanitary, water) and grading, as well as measures for the control of stormwater runoff, are considered in this report, in general accordance with the Ottawa Sewer Design Guidelines (2012), the Ottawa Design Guidelines – Water Distribution (2010) and associated Technical Bulletins.

### 1.1 Site Description and Proposed Development

The Site is located near the intersection of Rideau Road and Somme Street. The subject site is currently vacant and measures approximately 4.05 ha. The site is bounded by Somme Street to the south and west, by Rideau Road and Christie Creek to the north and by vacant land to the east. The proposed development is a 76,505 sq. ft. warehouse building with associated loading dock areas and employee parking stalls. Refer to the project drawings for the site plan of the proposed development (prepared by CIVITAS).



Figure 1-1 : Site Location & Key Plan

The objective of this study is to assess current site servicing conditions through the review of available background documents and to present detailed concepts, calculations, and results to provide adequate site servicing for the new building and associated parking lot.



## 1.2 Existing Infrastructure

The proposed site is part of the Hawthorne Industrial Park (HIP) which is currently serviced by roads and an existing open ditch system and SWM facility that convey stormwater and provide SWM quantity control for the entire HIP. The site is not serviced by municipal sewers or municipal watermain.

## 1.3 Summary of Applicable Background Documents

- + MOE SWM Manual (2003)
- + 2012 Ottawa Sewer Design Guidelines, as amended by technical bulletins
- + 2010 Ottawa Design Guidelines for Water Supply, as amended by technical bulletins
- + Existing Master SWM Report (prepared by J.L. Richards Associates Ltd., May 2009)
- + Hydrogeological Assessment Report (prepared by GHD, 2022)
- + Septic Assessment Report (prepared by GHD, 2022)
- + Environmental Impact Study (prepared by GHD, 2022)

### 1.3.1 Stormwater Management Report, Hawthorne Industrial Park By J.L. Richards & Associates Limited – May 2009.

This report addresses stormwater management within the Hawthorne Industrial Park (**Appendix A – JL Richards SWM Plan**). The contents of this report are discussed in more detail in **Section 4**.

### 1.3.2 Hydrogeological Assessment Report by GHD, 2022.

This report addresses the hydrogeological characteristics of the site and assessing the capacity of the on-site well (GHD, 2021a).

### 1.3.3 Septic Assessment Report by GHD, 2022.

This report addresses the percolation rate of the site and assessing the capacity of the on-site septic system (GHD, 2021b).

### 1.3.4 Environmental Impact Study by GHD, 2022.

A scoped environmental impact study was prepared for this project. This report summarised the investigations of potential environmental impacts and required mitigation measures, & setbacks to be respected during construction of this project.

## 1.4 Consultation and Permits

In response to the pre-consultation requirements defined in the City's Development Servicing Study Checklist, the following agencies were consulted in support of the preparation of this report. The Development Servicing Study Checklist as well as all relevant correspondence with the consulted agencies can be found in **Appendix F**.

### City of Ottawa

A Pre-Application Consultation meeting was done with the City of Ottawa. The meeting discussions revolved around planning, engineering, and transportation requirements. Details of this consultation are included in **Appendix F**.

CIMA+ had a second meeting with Harry Alvey from the City of Ottawa on May 18, 2021. The discussion was mostly about SWM strategies and fire protection. Details of this consultation are included in **Appendix F**.

### South Nation Conservation Authority (SNCA)

The subject site falls under the jurisdiction of the South Nation Conservation Authority (SNCA). CIMA+ contacted James Holland from the SNCA to identify the any Natural Heritage/Hazards features that may impact the development as well as any Storm Water Management Criteria for the site and required approvals/permits. Correspondence with James Holland has been included in **Appendix F**.

### Ministry of the Environment, Conservation and Parks (MECP)

CIMA+ expects that the proposed development will require an Environmental Compliance Approval (ECA) as the development requires an on-site wastewater treatment system treating over 10,000 L/d.

It is expected that the application can be submitted directly to the MECP, and not through the City of Ottawa's Transfer of Review (ToR) Program. The correspondence with the City project manager has been provided in **Appendix F**.

## 2. Sanitary Servicing

### 2.1 Existing Conditions

The HIP and the subject site are not serviced by municipal sanitary sewers.

### 2.2 Sanitary Sewer

#### Design Criteria

The design criteria for determining the sanitary peak flow rates for the proposed development follow the parameters outlined in Figure 4.3 – Peak Flow Design Parameters Summary of the City of Ottawa Sewer Design Guidelines, 2012 as amended by all applicable Technical Bulletins. These criteria was used to size the sanitary sewers on this project. Namely, the following parameters have been used in determining the peak sanitary flow rates:

*Table 2-1: Sanitary Peak Flow Determination Design Criteria*

Design Criterion	Commercial Areas
Commercial Average Flow	2.80 L/m <sup>2</sup> /day
Commercial Peaking Factor	1.5
Total Infiltration Allowance	0.33 L/s/effective gross hectare (for all areas)

#### Proposed Sanitary Peak Flows for Sanitary Sewer Sizing

The estimated peak flows from the proposed development based on the design criteria listed in **Table 2-1** are outlined in the following Table.

*Table 2-2: Peak Sanitary Flows – Sanitary Sewer Sizing*

Flow Type	Total Flow Rate (L/s)
Average Dry Weather Flow Rate	0.23
Peak Dry Weather Flow Rate	0.35
Peak Wet Weather Flow Rate	0.35

Detailed calculations for peak sanitary flows for sanitary sewer sizing are presented in **Appendix D**.

#### Sanitary Sewer Sizing

The flows indicated above will be directed from the building to the onsite wastewater disposal system through a new 200mm diameter PVC sanitary sewer. This sewer sizing is acceptable per the calculations and sewer design sheets (refer to **Appendix D**).

## 2.3 Onsite Wastewater Disposal System

### 2.3.1 Daily Design Sewage Flow

Onsite wastewater treatment systems are regulated under the Ontario Regulation 332/12, the Building Code Act (1992) (OBC), Part 8 of Division B provides the information required the design, construction, installation, operation, and maintenance of these system. The Fastfrate warehouse facility requires a Class 4 system to accept both greywater and human waste.

The proposed Fastfrate facility will be developed with a maximum of 41 loading bays and will be provided with a total of 7 water closets. The daily design sewage flow for the Fastfrate facility was calculated to be 12,800 L/d in accordance with Table 8.2.1.3.3.B of the OBC. For non-residential occupancies, the septic tank working capacity shall be three times the daily design sanitary sewage flow. Therefore, the septic tank must have a minimum working volume of 38,400 L. A summary of the daily sewage design flow calculations are provided in **Table 2-3** below.

*Table 2-3: Daily Design Sewage Flow Rate and Septic Tank Volume*

Parameter as per OBC – Table 8.2.1.3.B.	Volume (L) as per OBC	Design Basis for Fastfrate	Flow (L/d) <sup>(1)</sup>
<b>Warehouse</b>			
a) Per water closet, and	950	7	6,650
b) Per loading bay	150	41	6,150
<b>Total Daily Design Flow</b>			<b>12,800</b>
<b>Minimum Septic Tank Volume (3x the Daily Design Flow) (L)</b>			<b>38,400</b>
Notes:			
1. Column 2 x Column 3 = Column 4 (e.g., 950 L x 7 = 6,650 L/d)			

### 2.3.2 System Design

A Class 4 septic system typically consists of a septic tank and leaching bed. Depending on the system, a pumping chamber to dose the leaching bed and/or a level IV treatment unit may be required. The design of the septic system is based on the following two factors:

- + Daily sewage design flowrate
- + Percolation Time of the native soil (T-Time)

The percolation time (T-Time) of the native soil is defined as the amount of time it takes for water to travel 1 cm. Typical T-times of soils ranges from 1 to 50 minutes, with some soils up to 125 minutes. GHD limited (GHD) was retained to excavate test pits to help determine soil stratigraphy and the T-time. Five test pits were advanced to depths ranging from 2.4 to 3.4 m within the proposed septic system area and SWM pond. The soil stratigraphy consisted of fill at each location and described as gravelly sand with silt trace clay to a silty sand with gravel and clay. Fill was observed to the bottom of each test pit. Refer to GHD's septic assessment (GHD, 2021b) for more information. Groundwater seepage was encountered at each test pit and was observed between 1.8 and 2.4 m below ground surface. GHD estimated the T-time to have an average value of 12 to 20 min/cm, based upon gradation test results only. As a conservative approach, a Design T-time of 20 min/cm was selected for sizing the leaching bed for this site.

There are 5 types of leaching beds regulated in Ontario under the OBC:

1. Conventional Leaching Bed
2. Sand Filter Bed
3. Shallow Buried Trench (SBT)
4. Type A Dispersal Bed
5. Type B Dispersal Bed

For the Fastfrate site, a raised SBT leaching bed was selected as it would meet all space and site constraints. The footprint of the SBT system is smaller than a conventional absorption trench system such as a conventional leaching or sand filter bed because the soil is not relied upon for any significant portion of the treatment.

A SBT is an alternative to a conventional leaching bed and are always used in conjunction with a treatment unit capable of consistently providing effluent with 10 mg/L five-day carbonaceous biochemical oxygen demand (cBOD<sub>5</sub>) and 10 mg/L suspended solids (SS). A SBT leaching bed is a pressurized distribution system which delivers regular timed doses of effluent to small diameter laterals (typically 25 mm PVC pipe) supported inside of a plastic chamber. The laterals are perforated at regular intervals on the top of the pipe with an adequate number of orifices on the bottom to provide self-drainage to prevent freezing during cold weather. When the dosing pump starts, effluent is forced along the entire length of the lateral and sprayed upwards where it hits the chamber and trickles down into the soil. The pump is sized to account for friction losses, static losses, and a residual pressure head of at least 600 mm at the furthest point from the pump. This ensures the entire footprint of the leaching bed is utilized and provides a more efficient distribution and use of the soil absorption system. For soils with T-times of up to 50 min/cm, hourly dosing is generally sufficient to allow the ponded water in the trench to infiltrate into the soil.

## Septic Tank, Pumping Chamber & Level IV Treatment Unit Clearances

As per Section 8.2.1.6.(1), the septic tank, level IV treatment unit and the pumping chamber will meet the minimum clearances for treatment unit listed in the OBC Table 8.2.1.6.A. In addition, as per 8.7.4.0.(11), the distances set out in column 2 of Table 8.2.1.6.B. shall be increased by twice the height that the leaching bed is raised above the original grade. The current grade at the site where the septic system will be installed is 90.950 meters above sea level (m ASL). The SBT will be raised with a sand mantle below the SBT. The top of grade of the SBT at the highest elevation is 91.6 m. Therefore, the minimum clearances must be increased by 1.3m. A summary of the clearances required for the treatment units (septic system, pumping chamber, and level IV treatment unit) and the SBT leaching bed at the Fastfrate facility septic system is given in **Table 2-4** and **Table 2-5** below, respectively.

It is noted that there will be a SWM facility located east of the septic system, which will be considered as a pond for establishing minimum separation requirements.

Table 2-4: Minimum Clearances for Treatment Units

Object <sup>(1)</sup>	Treatment Units Minimum Clearance, m <sup>(1)</sup>	Additional Clearance required for the Treatment Units at Fastfrate, m <sup>(2)</sup>	Total Clearance required for the Treatment Units at Fastfrate, m <sup>(3)</sup>
Structure	1.5	1.3	2.8
Well	15	1.3	16.3
Lake	15	1.3	16.3
Pond	15	1.3	16.3
Reservoir	15	1.3	16.3
River	15	1.3	16.3
Spring	15	1.3	16.3
Stream	15	1.3	16.3
Property Line	3	1.3	4.3
Notes: 1. Columns 1 and 2 are taken from OBC Table 8.2.4.6.A 2. [SBT Top of Grade (91.6 m) - Original ground elevation (90.95 m)] x 2 = 1.3 m 3. Total Clearances required for the Treatment Units for the Fastfrate facility			

*Table 2-5: Minimum Clearances for Distribution Piping and Leaching Chambers*

Object <sup>(1)</sup>	Distribution Piping and Leaching Chambers Minimum Clearance, m <sup>(1)</sup>	Additional Clearance required for the SBT leaching bed at Fastfrate, m <sup>(2)</sup>	Total Clearance required for the SBT leaching bed at Fastfrate <sup>(3)</sup>
Structure	5	1.3	6.3
Well with a watertight casing to a depth of at least 6 m	15	1.3	16.3
Any other well	30	1.3	31.3
Lake	15	1.3	16.3
Pond	15	1.3	16.3
Reservoir	15	1.3	16.3
River	15	1.3	16.3
Spring not used as a source of potable water	15	1.3	16.3
Stream	15	1.3	16.3
Property Line	3	1.3	4.3
Notes: 1. Columns 1 and 2 is taken from OBC Table 8.2.4.6.B 2. [SBT Top of Grade (91.6 m) - Original ground elevation (90.95 m)] x 2 = 1.3 m 3. Total Clearances required for the Treatment Units for the Fastfrate facility			

### Pumping Chamber

In accordance with sentence 8.7.6.1(3) of the OBC, the pump chamber should have a volume between 50% and 75% of the daily design capacity is recommended. Therefore, it is recommended the pump chamber have a minimum working capacity of 19,200 L.

### Submersible Pumps

Wastewater will flow by gravity to the septic tank, and then by gravity to the pumping chamber. The discharge from the pumping chamber and the rest of the system will be pressurized and require submersible pumps. Submersible, readily available and replaceable pumps are wired and rated for an effluent with 3 mm to 20 mm solids handling capacity. An alternating duplex pump configuration is recommended to allow time for service in the event of a pump failure. The specified pump must have a capacity equal to or greater than the calculated maximum pressure requirement as per the SBT design at the design flow. Five submersible pumps will be required:

- + Two pumps for the pumping chamber discharge which will operate in a duty / standby configuration with rotation on stop, time, and failure
- + Two pumps for the level IV treatment discharge which will operate in a duty / standby configuration with rotation on stop, time, and failure
- + One pump for the level IV treatment discharge that will recycle effluent upstream of the septic tank.

The submersible pumps will be provided by the level IV treatment unit supplier, Waterloo Biofilter. Waterloo Biofilter typically specifies Little Giant WS Effluent Series submersible pumps. As per item 8.6.1.3.(4), when a pump or siphon is required the pump or siphon shall be designed to discharge a dose of at least 75% of the internal volume of the distribution pipe within a time period not exceeding fifteen minutes. Therefore, the volume required to dose 75% of 175 m of 50 mm diameter schedule 40 PVC pipe is approximately 64.5 L within 15 minutes, or a required pump flow rate of 4.30 L/min (0.07 L/s). Sentence 8.7.6.1.(2) requires residual pressure (minimum 600 mm as per sentence 8.7.6.1.(2) at the furthest lateral) to ensure the entire bed is dosed.

The Little Giant WS Effluent Series includes submersible pumps capable of dosing 1.70 L/s to 9.5 L/s, depending on the model. With a minimum flow rate of 0.07 L/s, the Little Giant submersible pumps will provide more than the minimum required dosing flowrate. There are several Little Giant WS Effluent Series submersible pump models. The Hazen William formula was used to calculate the theoretical total dynamic head (TDH) in meters of each of the three pumping scenarios and plotted against the different Little Giant submersible pump curves to find the theoretical operating flowrate. A summary of the results in listed in Table 2-6 below. Refer to **Appendix E** for the pump system curves and calculations.

Table 2-6: Theoretical Pumping Flow Rates

System	Recommended Pump Model	Theoretical Operating Point
Pumping Chamber Discharge	WS50HM-12-20	3.2 L/s at 12.8 m TDH
Level IV Treatment Discharge to SBT	WS100HM-12-20	2.2 L/s at 23.8 m TDH
Level IV Treatment Discharge Recycle Line	WS50M-20	5.7 L/s at 3.1 m TDH

### Level IV Treatment Unit

A Level IV Treatment is required for SBT type leaching beds. The Waterloo Biofilter level IV treatment unit will be designed to meet the level IV treatment effluent requirements of 10 mg/L for both SS and cBOD<sub>5</sub>, as listed in Table 2-7 (adapted from OBC Table 8.6.2.2.).

Table 2-7: OBC Treatment Unit Levels and Required Effluent Concentrations

Item	Column 1 Classification of Treatment Unit <sup>(1)</sup>	Column 2 Suspended Solids <sup>(2)</sup>	Column 3 CBOD <sub>5</sub> <sup>(2)</sup>
1.	Level II	30	25
2.	Level III	15	15
3.	Level IV	10	10

Notes:

- The classifications of *treatment units* specified in Column 1 correspond to the levels of treatment described in CAN/BNQ 3680-600, "Onsite Residential Wastewater Treatment Technologies".
- Maximum concentration in mg/L based on a 30-day average.



The level IV treatment unit must be certified to CAN/BNQ 3680-600 “Onsite Residential Water Treatment Technologies”. The treatment units installed in Ontario typically either use aeration or a filter media to provide treatment. Aeration treatment units have higher operation and maintenance costs and effort as blowers are required in addition to pumps. Filter media type treatment units do not require blowers and require the filter media to be replaced approximately every 10+ years or to the manufacturer’s recommendation. A filter media type level IV treatment unit such as a Waterloo Biofilter is recommended for this application. The sanitary waste from the warehouse will flow by gravity to the septic tank, where settling will occur, and the effluent will flow by gravity to a pumping chamber. The pumping chamber will consist of 2 pumps (duty/standby configuration with frequent rotation via an alternating timer), which will pump the effluent to the level IV treatment unit to evenly dose the filter media. The filtered water will then be either pumped to the shallow buried trench by one of two pumps (duty / standby configuration with frequent rotation on an alternating timer) or recycled to the inlet of the septic tank by a third dedicated pump. This recycle line from the level IV treatment unit post nitrification will allow for partial denitrification of the effluent – the reduction in effluent nitrates. All pumps will be controlled and monitored by a common control panel for remote monitoring, control, and data logging over a stable cellular network to Waterloo Biofilter who will contact personnel from the Fastfrate facility. Alarms include high water, float failure and pump failure from the Waterloo Smart Panel. A flow schematic of the system is given in **Figure 2-1** below.

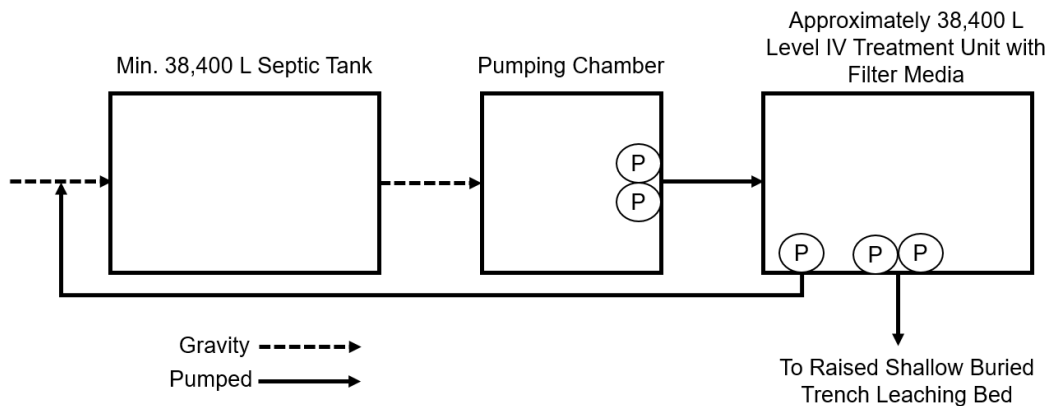


Figure 2-1: Septic System Process Flow Schematic

### Shallow Buried Trench Leaching Bed

Due to the shallow groundwater seepage observed at 1.8 to 2.4 m below the surface and the requirement that the bottom of the leaching bed must be a minimum of 900 mm above the top of the high ground water table, the leaching bed must be raised. Due to the limited available space on the site, a SBT system with a sand mantle is recommended to minimize the system footprint. The sand mantle will be approximately 15 m in total length with the last 3 meters of the mantle changing direction slightly more north-west than the first 12 m of the mantle. Even with the irregular shape of the mantle, effluent will flow through the mantle as the T-time of the sand mantle will be imported sand fill with a percolation rate of 6 to 10 minutes/cm and have a maximum 5% if fines passing through a No. 200 sieve.

The length of the SBT distribution pipe laterals is calculated based on the T-time and the Table 8.7.3.1 in the OBC. The percolation tests of the native soil in the area of the proposed septic bed yield 12 to 20 minutes/cm according the GHD report. As per Table 8.7.3.1 in the OBC, a percolation between 1 to 20 minutes/cm corresponds to the following formula to calculate the length of distribution pipe required:

$$L = \frac{Q}{75}$$

Where:

$L$  = The length of distribution pipe in m

$Q$  = Total Daily Design Flow Rate (12,800 L/d for the Fastfrate Facility)

Therefore, the SBT must have a minimum distribution pipe length of 171 m (rounded up to the nearest meter). The OBC stipulates the maximum length of a SBT distribution run is 30 m as specified in clause 8.7.3.2(2)(a). To accommodate the clearances for the SWM pond and property line, 7 distribution pipe runs of 25 m (175 m total) is recommended.

Each lateral shall include a test port at the end of each line. Each test port will have a long radius sweep bend at the end, equipped with a normally closed ball valve and a removal plug with a drilled orifice the same diameter as the lateral spray orifices. The test ports are intended to allow individual line squirt testing and testing of all lines at once. The plugs will be removable to allow line flushing and cleaning as necessary.

The spray orifice size is important in the flow/pressure calculation, and it is recommended that 3 mm sizing be used as a default. OOWA best practices recommends orifices are spaced between 0.6 to 1.2 m along the lateral for even distribution of effluent. The orifices for the Fastfrate facility are specified to be spaced 0.6 m apart.

In addition to the spray orifices, drain orifices are recommended to be evenly spaced, facing downward, on each lateral to allow for drain-out and prevent freezing between pump cycles. It is recommended to have a drain orifice every 2 to 4 spray orifices, offset from the spray orifices and having orifice shields installed to prevent erosion of the trench base. The drain orifices will be spaced every 3 m apart and will be offset from the spray orifices.

OOWA Best Practices recommends the manifold should be at least one trade size larger than the laterals, typically between 32 mm (1.25" nominal) and 50 mm (2" nominal). The distribution laterals will be 25 mm diameter Schedule 40 PVC, and the manifold will be 50 mm diameter Schedule 40 PVC. Each lateral will include a ball valve for isolation and a 50 mm to 25 mm reducer. The components of the SBT leaching bed are given in the section below.

Fill will be required for the raised SBT system. The contact area at the base of the fill system was carefully considered. The contact area between the fill and the native receiving soils is important in order to safely transition treated effluent from the fill to the native soils without causing environmental risks. Due to inconsistent native soil type at the site and as a precaution, a sand mantle is recommended.

The mantle for the Fastfrate septic system was designed according to Option 2 of the Ontario Onsite Wastewater Association (OOWA) Best Practices: Shallow Buried Trench Guidance Document:

The contact area between the native soils and the fill material is which the SBT bed and mantle area should be at least equal to the following formula:

$$A = \frac{Q \times T}{850}$$

Where:

$A$  = Contact Area (m<sup>2</sup>)

$T$  = The T-time of the receiving soils (a conservative T-time of 20 minutes/cm was used)

$Q$  = Total Daily Design Flow Rate (12,800 L/d for the Fastfrate facility)

Therefore, the minimum recommended mantle area is 302 m<sup>2</sup>. The total mantle surface area provided (extended and beneath the SBT) has an approximate contact surface area of 660 m<sup>2</sup> and is over double the minimum surface area as calculated by the OOWA Best Practices.

Each lateral shall include a test port at the end of each line this may be an individual access port at the end of each lateral. Each test port will have a long radius sweep bend at each test port equipped with a normal closed ball valve and a removal plug with a drilled orifice the same diameter as the lateral spray orifices. The test ports are intended to allow individual line squirt testing and testing of all lines at once. The plugs will be removable to allow line flushing and cleaning as necessary.

The orifice size is important in the flow/pressure calculation, and it is recommended that 3 mm sizing be used as a default. OOWA Best Practices recommends orifices are spaced between 0.6 to 1.2 m along the later for even distribution of effluent. The orifices for the Fastfrate facility septic system are specified to be spaced 0.6 m apart.

The drain orifices are evenly spaced, facing downward, on each lateral to allow for drain-out and prevent freezing during pump cycles. It is recommended to have a drain orifice every 2 to 4 spray orifices, offset from the spray orifices and having orifice shields installed to prevent erosion of the trench base. The drain orifices will be spaced every 3 m apart and will be offset from the spray orifices.

OOWA Best Practices recommends the manifold should be at least one trade size larger than the laterals, typically between 32 mm (1.25" nominal) and 50 mm (2" nominal). The distribution laterals will be 25 mm diameter Schedule 40 PVC pipe, and the manifold will be 50 mm diameter Schedule 40 PVC pipe. Each lateral will include a ball valve for isolation and a 50 mm to 25 mm reducer. To summarize, the components of the SBT system for the Fastfrate facility include:

- + Treatment Unit certified to Level IV CAN/BNQ 3680-600 "Onsite Residential Wastewater Treatment Technologies"
- + Dosing pump chamber and pumps equipped with timer controls.
- + Forcemain from dosing chamber to distribution manifold which typically is PVC schedule 40
- + Manifold (header) assembly, consisting of 50 mm (2") pressure pipe (PVC Schedule 40)
- + Laterals in the leaching bed consisting of 25 mm (1") pressure pipe (PVC Schedule 40) with 3 mm orifice holes spaced evenly along the top of the pipe and 3 mm drain holes on the bottom
- + Pipe support to keep the lateral off the bottom of the trench
- + Leaching chamber covering the laterals. Large diameter pipe cut in half is not acceptable, as the footprint of the sidewalls is not sufficient to prevent settling of the chambers over time. Chambers with a wide resting foot are preferred.
- + Filter cloth over the chambers
- + "Sweep 90' fitting extending within 10 cm of the finished grade at the end of each lateral. The vertical piece may be equipped with a ball valve if desired, and terminate with a threaded cap.

### Ground Water Elevation and Native Fill

The septic, pump chamber, and level IV treatment unit tanks will require to be wrapped in a waterproof material to prevent groundwater infiltration. Due to the inconsistency of the fill material observed and the shallow groundwater seepage encountered by GHD, the leaching bed will be required to be raised. The 100-year flood elevation is 90.1 m ASL, therefore the SBT leaching bed and sand mantle have been designed to be above this elevation as not to flood out the septic system during a 100-year storm event. It is recommended prior to placement of the imported fill that any surficial organics are to be removed from the tile bed and mantle area. Additionally, the existing fill material is recommended to be compacted to ensure uneven settlement does not occur.

## 2.4 Sanitary Servicing Summary and Conclusions

The sanitary servicing design for the proposed development conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, as amended by all applicable Technical Bulletins.

The on-site wastewater disposal system (Septic Tank, Level IV treatment unit and shallow-buried trench system) conform to the requirements of the Ontario Building Code part 8. However, due to the Total Daily Design Sewage Flow being >10,000L, and ECA from the MECP will be required for this system.

### 3. Potable Water Servicing

#### 3.1 Existing Conditions

The site is currently undeveloped and is not serviced by municipal watermains. As such potable water for this site will be provided by a groundwater supply well. Refer to the GHD's Hydrogeological Assessment (GHD, 2022) for more information.

#### 3.2 Building Water Demands (Domestic and Fire Protection)

##### 3.2.1 Potable Water Quantity Requirements

Based on design flows from the OBC, the average daily water use for the facility is **8.9 L/min (Table 3-1)**. Considering a peak demand of 35.6 L/min (average demand \* 4), the well discharge of 60 L/min in the Hydrogeological Report will sufficiently meet the water demand requirements of the facility.

*Table 3-1 Potable Water Design Flows*

Parameter as per OBC – Table 8.2.1.3.B.	Volume (L) as per OBC	Design Basis for Fastfrate	Flow (L/d) <sup>(1)</sup>
<b>Warehouse</b>			
a) Per water closet, and	950	7	6,650
b) Per loading bay	150	41	6,150
<b>Total Daily Design Flow (L/d)</b>			<b>12,800</b>
Notes:			
1. Column 2 x Column 3 = Column 4 (e.g., 950 L x 7 = 6,650 L/d)			

The above water demands were also compared with ones obtained following the City of Ottawa Design Guidelines – Water Distribution, 2010 as amended by all applicable Technical Bulletins. The peak water demand obtained using this method is **0.75 L/s (45.0 L/min)**. This value is also within well discharge capacity. (Table 3-2).

*Table 3-2 Potable Water Design Flows – City of Ottawa Design Guidelines – Water Distribution*

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Commercial	0.28	0.42	0.75
<b>Total</b>	<b>0.28</b>	<b>0.42</b>	<b>0.75</b>

## 3.2.2 Fire Protection Quantity Requirements

The facility is not connected to a municipal water supply and will therefore require other means of fire protection. The fire protection flow and volumes have been determined by Civilec in a report. Refer to **(Appendix C)**.

### 3.2.2.1 Fire Protection Flow

The Fire Protection flow identified in Civilec report is 7500L/min (125L/s). Refer to **(Appendix C)**. The fire flow will be divided between one intake pipe to supply the sprinkler system and two dry fire hydrants. The intake pipe to supply the sprinkler system has been designed for the entire fire flow.

### 3.2.2.2 Fire Protection Volume

The Fire Protection Volume required for this site as per Civilec report is 675m<sup>3</sup>. Refer to **(Appendix C)**. The current pond configuration has a storage capacity of 683m<sup>3</sup> of volume between the max ice thickness (88.610) and the top of the intake pipe (87.550).

### 3.2.2.3 Fire Protection System

The proposed SWM wet pond shall be used for storing water for fire protection. Refer to **Section 4.5** for more information on the design of the proposed SWM pond.

A fire pump located in a 2-hour fire rated mechanical room in the building shall serve the Fire Protection system. The fire pump inlet shall be connected to an 8.0 m deep sump, to be hydraulically connected to the pond via an intake pipe at the base of Pond.

To ensure that the fire protection volumes are adequate during winter conditions, the maximum ice thickness on the permanent pool of the SWM wet pond was determined based on the Annual Freezing Degree Days method. Based on an Ice cover condition coefficient of 2.4 and the Annual Freezing Degree Days value 785 °C-day for 2019, the ice thickness of 67.24 cm was obtained. Based on this calculation, the design ice thickness used is of 69 cm. Detailed calculations are presented in **Appendix C**.

The permanent pool of the proposed SWM pond provides fire protection volumes of 683 m<sup>3</sup> with Ice cover, and 1305 m<sup>3</sup> without ice cover. This volume will provide sufficient volume of water to supply the building, fire protection intake, and two (2) dry hydrants.

A free-standing Siamese connection will be located outside the front entrance and would be used to supply the sprinkler system if the pump within the shaft were unable to draw water from the fire protection pond.

To prevent exfiltration and maintain the water level of the permanent pool, the SWM pond will be constructed with a liner. Specifications for the liner are provided in **Appendix G**. In the event the water level in the sump & pond drops below the minimum level, makeup water will be provided to the sump and pond from the well to mitigate losses due to infiltration and evaporation. Alarm indicators will monitor the levels in the sump & pond, and will control the supply of makeup water to the pond and sump from the well.

The building fire protection system requires 6624 US gal. per minute (110 L/s) per NFPA 13. As such, the building fire protection intake was sized as a 450mm pipe, slopes at 0.2% with a capacity of 127 L/s under gravity free flow conditions (Factor of safety = 1.15). An intake screen capacity of 220 L/s is also specified for the building fire protection intake (Factor of safety = 2.0).

### 3.3 Proposed Water Supply Well

#### 3.3.1 Well Quality

Samples tested from an existing water supply well confirmed that there were no health-related parameters in exceedance of the Ontario Drinking Water Standards (ODWS). There were several parameters that exceeded their respective ODWS for aesthetic objectives including hardness, total dissolved solids, turbidity, manganese, and iron. These parameters will require commercially available treatment equipment (for example a water softener for treatment of hardness). The treatment systems will be determined later in the design process. A detailed breakdown of test results is presented in GHD's Hydrogeological Assessment (GHD, 2022).

As a proactive measure, it is recommended that bacteriological treatment (i.e., ultraviolet treatment) be used at a minimum. It is anticipated that the well system will be regulated and will require treatment to meet appropriate standards to ensure potable water is available to employees and visitors. A water treatment specialist should be retained for treatment and a qualified engineer should review the final treatment system before use.

#### 3.3.2 Well Quantity

The water supply well referred to as TW-2 in the Hydrogeological Assessment is capable of providing long-term quantities of groundwater at a pumping rate of 60 L/min based upon the pumping test completed (GHD, 2022). After 6 hours of pumping, the well drawdown was 1.15 m with 23.9 m of available drawdown remaining. A total of 21,600 L was pumped from the well during the testing.

Based upon the septic total daily design values of 12,800 L/day, the well exceeds the daily design quantities estimated. The actual water volume required for the development on a daily basis is expected to be much less than 10,000 L/day. The water supply well and the aquifer that it is drilled into can safely provide the long-term quantities required for this development based upon the testing completed without significant interference to future and existing neighbouring wells.

### 3.4 Conclusion – Potable Water Servicing

The proposed well will provide sufficient potable water supply for the development, while the proposed SWM pond permanent pool will provide sufficient fire protection volume for the development.

## 4. Storm Water Management

### 4.1 Background

As previously mentioned, the subject site is currently vacant and is part of the Hawthorne Industrial Park (HIP). The site is generally flat and slopes towards the North-East corner before it reaches the 6m tall embankment and reaches Christie Creek on Rideau Road. There is a fill layer of approx. 6m thick across most of the site.

The HIP sector and the Fastfrate site are subject to the HIP Stormwater Management Report and associated drawings (**Appendix A**), developed by J.L. Richards and dated May 2009. This report established the Stormwater Management design for the HIP, which was then used as the design basis for the roads, open ditch system, and HIP SWM facility (refer to Drawings issued for MOE Approval; **Appendix A**).

The HIP SWM facility, located east of the industrial site, only provides stormwater quantity control for the HIP sector. The HIP SWM facility controls storm events up to the 2 - year post-development peak flow to 50% of the 2-year pre-development peak flow; and controls post-development peak flows to pre-development levels for storm events ranging from the 2-year to the 100-year recurrence. The HIP SWM report specifies that individual parcels of the HIP must provide stormwater quality control.

### 4.2 Stormwater Management Strategy

#### 4.2.1 Deviations from the HIP SWM Report & Drainage Plan

The proposed SWM strategy for this site deviates from that of the HIP SWM report.

The drainage plan for the HIP divides the drainage of the Fastfrate site between two outlets. Part of the site drains to Christie Creek while the remainder drains to the HIP SWM facility via the open ditch system along Somme Street. (**Figure 4-1**).

To simplify the SWM strategy the drainage distribution between both outlets has been altered from what was presented in the HIP SWM report, redirecting more runoff towards the HIP SWM facility (**Figure 4-1**). This simplifies the site grading and allows all quality control measures to be in a single location. Therefore, the proposed conditions require quantity control (through on-site retention) to respect the allowable release flowrates up to the 100-year storm stipulated in the HIP SWM report.





Figure 4-1 SWM Drainage Area from HIP SWM (left), and from Proposed SWM (right)

The original drainage plans and sewer design sheets for the HIP sector, as well as the proposed SWM plan for the Fastfrate site are provided in **Appendix B**.

#### 4.2.2 Allowable Post Development Flow Rates and Quantity Control Requirements

The allowable release rate for the proposed site was determined based on parameters of the HIP SWM report, sewer design sheets and SWM plans. Since the Fastfrate site is smaller than its corresponding catchments of the HIP SWM report, the allowable release rate for the catchments to the HIP SWM facility was re-calculated to account for this. For this calculation, the runoff coefficient, time of concentration and rainfall intensity were kept identical to the HIP SWM report.

Based on this calculation, the allowable release rate for the site to the HIP SWM facility is of **906.9 L/s**, up to and including the 100-year storm event to comply with the HIP SWM report (**Table 4-1**). Supporting calculations and location of sourced information can be found in **Appendix B**.

Table 4-1: Post-development Allowable 100-year Release Flows – HIP SWM Facility

Catchment ID	Catchment area (ha)	Runoff Coefficient (factored)	Time of Concentration (minutes)	Rainfall Intensity (mm/hr)	Allowable Release Flow (L/s)
Fastfrate Site – HIP SWM Report	3.06	0.88	19.43	122.15	906.87

The uncontrolled release flow for the proposed site was calculated and compared with the values determined in **Table 4-1**. This comparison is summarised in **Table 4-2**.

Quantity control is therefore required for this site due to the catchment redistribution discussed in Section 4.2.1. Supporting calculations and location of sourced information can be found in **Appendix B**.

Table 4-2: Post-development Allowable 100-year Release Rates – HIP SWM Facility

Catchment ID	Catchment area (ha)	Runoff Coefficient (factored)	Uncontrolled Release Flow – 100year (L/s)	Allowable Release Flow – 100-year (L/s)	Allowable Release Rate – 100-year (L/s/ha)
Fastfrate Site – HIP SWM Report	3.06	0.88	906.9	906.9	296.89
Fastfrate Site – Proposed SWM	3.66	0.92	1093.2	906.9	247.78

Similar calculations for the redistribution of catchments that outlet to Christie Creek were undertaken and are included in **Appendix B**.

### 4.3 Design Criteria and Assumptions

- + Quality control requirements: 80% TSS Removal must be provided for our site as required by the South Nation Conservation Authority (SNCA).
- + Per the HIP SWM report, the existing open ditch system is designed to the 100-year event, and the existing culverts are designed to the 10-year event.
- + The current site plan deviates from the HIP SWM report. To conform with the original SWM, the 100-year allowable release rate to the SWM facility must remain at 906.9 L/s (refer to **Section 4.2.2**).

### 4.4 Proposed Storm Servicing

All detailed SWM calculations and plans are presented in **Appendix B**.

#### 4.4.1 Stormwater Quality Control

As specified in the HIP SWM report, the HIP SWM facility was not designed to provide quality control. It was anticipated that each individual parcel was to provide its own quality control and achieve the normal level of protection (70% TSS Removal).

Through consultation with the South Nation Conservation Authority (SNCA, refer to **Appendix F**) the quality control requirements for the HIP parcels have been revised to the enhanced level of protection (80% TSS removal).

The portion of the site that naturally drains into Christie Creek will not require quality treatment since this area will remain undeveloped and vegetated. Therefore, only the developed portion of the site draining towards the Somme Street ditches and to the existing HIP SWM facility will be treated for quality.

The quality control requirements will be achieved using a combination of grassed swales and a wet pond, operating as a “treatment train”. The grassed swales, which are sloped to promote infiltration and low channel velocities (<0.5 m/s) will provide the required pre-treatment for the wet pond.

The wet pond was designed based on the volumetric water quality criteria, interpolated Table 3.2 of the MECP SWM guidelines (2003). Since the proposed site has an imperviousness ratio of 74%, the total storage requirement for quality control is of 231.67 m<sup>3</sup>/ha. The wet pond requires a total water Quality Storage of 847m<sup>3</sup>. In the pond dimensioning, at least 701.5 m<sup>3</sup> will be provided in the permanent pool and at least 147m<sup>3</sup> will be provided as extended detention (**Table 4-3**).

For this facility, the extended detention volume will be retained for a period of at least 12 hours, as per the MECP SWM Guidelines on wet ponds with < 8 ha of drainage area.

*Table 4-3: Wet Pond Volume Calculations – 74% Impervious; 80% TSS Removal*

Quality Control Volumes	MECP Storage Requirement (m <sup>3</sup> /ha)	Catchment Area (ha)	Required Storage Volume (m <sup>3</sup> )
Permanent Pool	191.67	3.66	701.5
Extended Detention	40		146.4
<b>Total</b>	<b>231.67</b>	<b>3.66</b>	<b>847.9</b>

#### 4.4.2 Stormwater Quantity Control

The anticipated post-development flow rates and required storage when controlled to the allowable post-development release rate are summarized below.

The site’s SWM outlet will likely to be submerged during the 100-year storm due to the water level in the Somme street ditch. Considering this, the storage volumes for this site were determined assuming constant discharge at **half of the allowable release rate**. This method is used to provide the additional retention required because of the hydraulic grade line at the outlet. The storage requirements at the full and half release rates are compared in **Table 4-4**, and Supporting calculations can be found in **Appendix B**.

At a release rate of **435.4 L/s**, a storage volume of **716 m<sup>3</sup>** is proposed in the SWM pond and a storage volume of **115 m<sup>3</sup>** is proposed on roofs for a total of **831 m<sup>3</sup>**. This volume can be accumulated on the site available storage volume. The available storage volumes do not account for surface storage in storm sewers, culverts or other ponding areas.

For the roof sub-areas of the warehouse and office building, the proposed release rate is **236.7 L/s**. This release rate generates **115 m<sup>3</sup>** of roof storage, which is conservative with respect to the maximum available storage on the building roof (**Table 4-4**). This release rate cannot be reduced further without exceeding available roof storage.

*Table 4-4: Post-development Flowrate and Storage Summary*

Retention Areas	100-year – Full Release Rate (L/s)	100-year – Half Release Rate (L/s)	100-year Storage Volume – Full Release Rate (m <sup>3</sup> )	100-year Storage Volume – Half Release Rate (m <sup>3</sup> )	Available Storage Volume (m <sup>3</sup> )
Roof Sub-Area	236.7		115.0		143.9

<b>SWM Pond &amp; Swales</b>	670.2	216.76	329.9	<b>716.0</b>	996.1
<b>Total Site</b>	<b>906.9</b>	453.4	444.9	<b>831.0</b>	1140.0

To protect the site from a backwater in the Somme street Ditch, the outlet pipe will be equipped with an inline backflow preventer (**Appendix G**). This coupled with the ample available storage capacity on site will be sufficient to ensure the site SWM functions properly in the event of prolonged surcharging of the receiving open ditch system during the 100-year event.

As mentioned in section 3.2.2.3, the SWM Pond will be equipped with an impermeable liner. In order to mitigate any impact of seasonal groundwater infiltration into the SWM pond the liner is to be installed up to the surface.

#### 4.4.3 Site Culverts, Stormwater Outlet and Backwater Elevations

The site culverts were sized based the 100-year peak flow and resulting backwater elevations. The backwater elevations were determined based on elevations culvert headwater, calculated assuming steady-state flow conditions and a constant tailwater elevation.

To simplify the headwater calculation, upstream culverts used the downstream culvert’s headwater elevation as the upstream tailwater elevation.

The 100-year water level in the municipal ditch (90.07 m ASL) was used as the tailwater elevation for the site’s stormwater outlet. This depth was determined from grades in the Somme Street Ditch and its 100-year flow depth determined in the HIP SWM report.

Because of the flat nature of the site, the site's culverts are designed for the 100-year design storm due to the limited freeboard between the site and Somme street catchments.

A summary of the site culvert design under freeflow and submerged condition of the site outlet are presented in **Table 4-5** and **Table 4-6**, respectively. Detailed calculations supporting the culvert sizing are available under **Appendix B**.

*Table 4-5: Culvert Sizing Summary – Freeflow*

Culvert	Size	Catchment	Q <sub>100y</sub> (L/s)	HW	HW/D	HW elevation	TW elevation
East Ditch	1x CSPA 1030x740	A2	446	0.56	0.76	90.09	89.82
West Ditch	1x CSPA 910x660	A1	231	0.575	0.87	90.09	89.82
STM Pond Transfer Culvert	2x CSPA 1030x740	A1-A7	907	0.595	0.80	89.82	89.50

*Table 4-6: Culvert Sizing Summary – Submerged Outlet*

Culvert	Size	Catchment	Q <sub>100y</sub> (L/s)	HW	HW/D	HW elevation	TW elevation
East Ditch	1x CSPA 1030x740	A2	446	0.92	1.24	90.45	90.300
West Ditch	1x CSPA 910x660	A1	231	0.92	1.39	90.51	90.300
STM Pond Transfer Culvert	2x CSPA 1030x740	A1 to A7	907	1.00	1.35	90.300	90.150

Further to the tables above, the backwater elevations resulting from the 100-year design storm are summarized below, for both the Freeflow and Submerged Outlet conditions. Based on these elevations, the water surface elevation on the site remains at 0.300 from the building underside of footing in both conditions.

*Table 4-7: Summary of Backwater Elevations – 100-year*

Location	Headwater Elevation – Freeflow Outlet Condition (m)	Headwater Elevation – Surcharged Outlet Condition (m)	Reference to Supporting Calculations
Outlet Pipe	90.09	90.150	
Culvert #1	90.09	90.51	HW for “West Site – 100y”
Culvert #2	90.16	90.45	HW for “East Site – 100y”
Culvert #3	90.55	90.55	HW for “West Entrance”
Culvert #4	90.22	90.22	HW for “East Entrance”
Culvert #5	89.82	90.30	HW for “Transfer Culvert – 100y”

Spill points have been included in the site to mitigate the risk of localised flooding should site culverts be blocked during the 100-year design storm (**Table 4-8**).

*Table 4-8: Summary of Site Spill Points*

Site Spill Points	Spill Elevation (m)
SWM Pond Overflow to Somme Street Ditch	90.200
West Site Spill to Christie Creek	90.280
East Site Spill to Christie Creek	90.280
SWM Pond Overflow u/s of Transfer Culvert	90.375

Site ditches have been designed to convey the 100-year flow with a manning’s ‘n’-value of 0.03 for long grassed swale. Detailed calculations with input values shown in **Table 4-9** have been provided in **Appendix B**, . A summary of inputs to the calculations is provided

*Table 4-9: Ditch Sizing Summary*

Ditch	Catchment	Q <sub>100y</sub> (L/s)
East Ditch	A2	446
West Ditch	A1	231

#### 4.4.4 Municipal Ditch and Road Culverts

The east and west entrances to the site cross the existing open ditch system and require installation of culverts. The sizing of the culverts was determined with consideration of the upstream municipal culverts since the SWM system outlet for stormwater is situated downstream of these culverts. The culverts were sized for the 10-year storm, as per the HIP SWM report. Culvert sizing suitability calculations can be found in **Appendix B**.

#### 4.4.5 Building Service Connection

A 600 mm storm sewer service connection will be provided on the south side of the proposed building and will be directed towards the SWM pond. The storm sewer will convey controlled runoff from the roof and uncontrolled runoff from catchments A4 and A5 (refer to **Appendix B**).

#### 4.4.6 Deviations from the Ottawa Sewer Design Guidelines – Swale Minimum Slope

The slope of the swales conveying stormwater for this site are inferior to the minimum slope specified in section 6.4.1 of the Sewer Design guidelines.

The grassed swales are intended to contribute to runoff quality control, operating with the proposed wet pond as a “treatment train”. The reduced slope of grassed swales promotes infiltration and low channel velocities (<0.5 m/s). This improves the effectiveness of grassed swales for runoff quality control (LID SWM Planning and Design Manual).

Based on the interpretation from percolation tests for this site, the soil infiltration rate can be estimated to range between 30 to 50mm/hr. With dry swales, an underdrain is typically recommended if the soil infiltration rate is <15 mm/hr.

As such, the risk of prolonged ponding of water in the ditches is mitigated by the soil infiltration rate and presence of on-site existing fill and well draining soil.

#### 4.4.7 Culvert Ends

Given the addition of localized clear zone with recoverable slopes at the culvert location is not feasible, an assessment of roadway safety implications for the culvert ends were completed by CIMA+ in accordance with the MTO Roadside Design Manual and MTO

Roadside Evaluation Manual. The assessment focused on the installation of guiderails to shield the culvert ends.

Although the culvert ends are located within the clear zone, the installation of new guide rail is also considered a hazard within the clear zone, and thus the collision risk and severity with the new guiderail may outweigh the benefits of shielding the culvert ends. The installation of guide rail is generally recommended where the Cost/Benefit (CB) ratio is  $\geq 1$ . The findings of the analysis produced a CB Ratio of  $-4.27$  for the west entrance and  $-2.23$  for the east entrance meaning that the collision risk and severity with a new guiderail is greater than that of the culvert ends. Refer to **Appendix B.16** for the MTO Roadside Evaluation spreadsheet and calculations.

## 4.5 Proposed SWM Pond Sizing

This section presents the proposed sizing of the SWM Pond for this project. A summary of the required volumes to be provided in the Wet Pond is presented in **Table 4-10**, and a breakdown of the pond levels and provided volumes is presented in **Table 4-11**.

*Table 4-10: Summary of Required SWM Pond Volumes*

Parameter	Required Volume (m <sup>3</sup> )	Source
Retention Volume	Full Release Rate: 329.9 Half Release Rate: 716.04	Table 4-4
Extended Detention	146.4	Table 4-3
Fire Protection Volume	675	Section 3.2.2.2
Permanent Pool for Quality Control	701.5	Table 4-3
Sediment Accumulation Volume (25 years)	226.8	Section 4.6.1

Table 4-11: Summary of Provided SWM Pond Volumes

Control Volumes		Bottom Elevation	Top Elevation	Depth	Provided Volume	Required Volume		
		(m ASL)	(m ASL)	(m)	(m <sup>3</sup> )	(m <sup>3</sup> )		
Freeboard	to 90.375	90.150	90.375	0.225	232.9	-		
	to 90.200	90.150	90.200	0.050	50.8	-		
Retention Volume		89.500	90.150	0.650	Pond: 610.3 Swales: 436.0 Total: 1046.3	Full Release Rate 329.9	Half Release Rate 716.04	
Extended Detention		89.300	89.500	0.200	169.1	146.4		
Permanent Pool (PP)	Fire Protection Volume	With Ice Cover	87.550	88.610	1.06	683	675	
		Normal	87.550	89.300	1.60	1305	-	
	Depth of Fire Protection Intake		87.100	87.550	0.450	209	-	
	Sediment Accumulation Volume		86.100	87.100	1.0	327	226.8	
	Total PP Volume		86.100	89.300	3.2	1946	701.5	

## 4.6 Calculations

### 4.6.1 Sediment Accumulation Volume

Based on the MECP SWM planning and design guidelines, a conservative estimate of the sediment accumulation volume required for a duration of 25 years is 226.8 m<sup>3</sup> assuming an annual TSS loading of 3.10 m<sup>3</sup>/ha/year and a removal efficiency of 80%.

### 4.6.2 Pond Controls

As defined in the City of Ottawa Sewer Design Guidelines (2012), the Rational Method is a valid approach to determination of peak flows and pipe capacity for drainage areas of less than 40 ha in size. Thus, the Rational Method has been used in the determination of required storage volumes to store the 100-year storm events to the pre-determined allowable release rates.

#### 4.6.2.1 Extended Detention Control (Quality)



The wet pond will use a 200mm reverse pipe with **one 80 mm dia. orifice plate** to control the detention time to the minimum detention time of 12h, per MOE Guidelines for drainage areas less than 8 ha.

Using equation 4.10 from the MECP SWM guidelines resulted in a drawdown time of 15.53 hours.

$$t = \frac{2 A_p}{C A_o (2g)^{0.5}} \left( h_1^{0.5} - h_2^{0.5} \right) \quad \text{Equation 4.10: Drawdown Time}$$

Where:

- $t$  = drawdown time in seconds
- $A_p$  = surface area of pond (m<sup>2</sup>)
- $C$  = discharge coefficient
- $A_o$  = cross-sectional area of the orifice (m<sup>2</sup>)
- $g$  = gravitational acceleration constant
- $h_1$  = starting water elevation above the orifice (m)
- $h_2$  = ending water elevation above the orifice (m)

$$t = \frac{2A_p}{CA_o(2g)^{0.5}} (h_1^{0.5} - h_2^{0.5})$$

$$t = \frac{2(876.75)}{(0.63)(0.005)(2 * 9.81)^{0.5}} (0.2^{0.5} - 0^{0.5})$$

$$t = 55906 \text{ s} = 15.53 \text{ hours}$$

#### 4.6.2.2 Release Rate Control (Quantity)

The release rate control, under free flow conditions, will be achieved by **one 450x830 mm rectangular orifice** set at an invert elevation of **89.500 m ASL** and **one 200x775 mm rectangular orifice** set at an invert elevation of **89.925 m ASL**. The outlet structure will control the 100-year release rate to 906.6 L/s under freeflow outlet conditions, and to 470.8 L/s under submerged outlet conditions (Table 4-12).

Table 4-12 Resulting Release Flow with Proposed Controls

Release Rate Control Flow condition	Controlled Release Flow (L/s)	Max. Water Surface Elevation at pond outlet (m ASL)
Free Flow Outlet Condition	906.6	90.090
Submerged Outlet Condition	470.8	90.170

#### 4.6.3 Watercourse Protection Measures

Erosion protection of the soils is required at the inlet and outlet ends of the culverts across the site to provide channel stabilization and scour resistance of the flowing water based on the outlet velocity generated by the check flow for scour, which is the 100-year event.

Design Chart 2.17 of the MTO Drainage Management Manual specifies the maximum permissible flow velocities for a channel based on the channel’s native lining material (i.e. soil type). The maximum permissible velocity of a silty sand channel shall be 1.5m/s for water carrying fine silts. In accordance with HDDS WC-3, section 3.2, where the velocity is exceeded the stone size for scour and erosion protection shall be as follows.

*Table 4-13: Scour Protection Sizing*

Stone Sizes for Scour and Erosion Protection-Low Volume Roads							
Velocity (m/s)	<2.0	<2.6	<3.0	<3.5	<4.0	<4.7	<5.0
Nominal Stone Size* (mm)	100	200	300	400	500	800	1000

\* Maximum size of stone to be 1.5 times the nominal stone size. 80% of stones (by mass) must have a diameter of at least 60% of nominal stone size.

The proposed culverts for the Fastfrate site all have velocities below 1.5m/s during the 100-year event and therefore would not require any scour protection. However, to be conservative, CIMA+ recommends scour protection at each culvert entrance and outlet. A nominal stone size of 100mm for erosion protection at the disturbed areas of the watercourse, upstream and downstream within the vicinity of the structure required. The protective apron shall consist of a minimum thickness of 1.5 times the nominal stone size and shall extend for a distance of two times the total culvert rise. Protection along the inlet and outlet embankments to an elevation of 0.3m above the high-water mark is also recommended.

## 4.7 SWM Conclusions

The storm servicing design for the proposed development generally conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, as amended by all applicable Technical Bulletins. The storm servicing design also conforms to the HIP SWM report (J.L. Richards ,2009). Justifications have been provided where deviations were proposed by the SWM strategy.

The allowable release rate for the site post-development was calculated to be **906.9 L/s**. It is expected that this can be achieved via roof storage and the proposed SWM wet pond.

A Roof Flow Control Declaration will be provided upon completion of the Mechanical and Structural design.

## 5. Conclusion

The current study demonstrates how the proposed servicing of the site will be achieved, in that the proposed SWM strategy conforms to the existing SWM plan and that the proposed Potable Water, Fire Protection and Sanitary Servicing works will be sufficient to service the proposed development.

Within the site, all services have been designed in keeping with the City of Ottawa design requirements and the requirements of the HIP SWM Report.

We trust this site servicing and stormwater management report is to your satisfaction. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

## 6. References

- CIMA+.** 2021. *Fastfrate Ottawa Warehouse and Distribution Facility Somme Street Ottawa, ON - Civil Drawings Issued for Site Plan Approval.* Ottawa, ON : s.n., 2021.
- City of Ottawa.** 2012, 2020. *Sewer Design Guidelines – as ammended by Technical Bulletins.* Ottawa : s.n., 2012, 2020.
- . 2010, 2020. *Water Design Guidelines – as ammended by Technical Bulletins.* Ottawa : s.n., 2010, 2020.
- GHD.** 2020. *Geotechnical Investigation Warehouse and Offices Intersection of Rideau Street and Somme Street, Ottawa, Ontario.* Ottawa : s.n., September 10, 2020.
- . 2022. *Hydrogeological Assessment Report – Proposed Commercial Development Rideau Road and Somme Street Gloucester Con 6 from Rideau River, Lot 26 Ottawa, Ontario .* Ottawa : s.n., January 19, 2021.
- . 2021. *Scoped Environmental Impact Study – Proposed Development, Part of Lot 26, Concession 6, 301 Somme Street, Gloucester, Ontario, City of Ottawa.* 2021.
- . 2021. *Septic Assessment and Percolation Rate Evaluation – Proposed Commercial Development Rideau Road and Somme Street Gloucester Con 6 from Rideau River, Lot 26 Ottawa, Ontario.* Ottawa : s.n., April 12, 2021.
- J.L. Richards & Associates Ltd.** 2009. *Stormwater Management Report – Hawthorne Industrial Park.* Ottawa : s.n., May 2009.
- Ministry of the Environment.** 2003. *Stormwater Management Planning and Design Manual.* Toronto : s.n., 2003.
- 2017.** Ontario Building Code, O Reg. 332/12. 2017.



# A

## Appendix A-1 - JL Richards Storm Water Management Report

**STORMWATER MANAGEMENT REPORT**  
**HAWTHORNE INDUSTRIAL PARK**

February 2009  
(Revised April 2009)  
(Revised May 2009)

Prepared for:

**R.W. TOMLINSON LIMITED**  
5597 Power Road  
Ottawa, Ontario  
K1G 3N4

Prepared by:

**J.L. RICHARDS & ASSOCIATES LIMITED**  
Consulting Engineers, Architects & Planners  
864 Lady Ellen Place  
Ottawa, Ontario  
K1Z 5M2

JLR 20983

**STORMWATER MANAGEMENT REPORT**  
**HAWTHORNE INDUSTRIAL PARK**

---

- TABLE OF CONTENTS -

		<u>PAGE</u>
1.0	INTRODUCTION .....	1
1.1	Background .....	1
1.2	General .....	1
1.3	Objectives .....	2
2.0	STORM DRAINAGE .....	3
2.1	General .....	3
2.2	Design Criteria .....	3
3.0	STORM SERVICING .....	5
3.1	General .....	5
3.2	Description of Conveyance Systems and Design Basis .....	5
	3.2.1 Open Ditch System .....	6
	3.2.2 Culvert System .....	7
4.0	WATER BALANCE .....	9
5.0	WATER QUALITY .....	10
5.1	General .....	10
5.2	Water Quality Requirement .....	10
6.0	HYDROLOGICAL ANALYSIS .....	11
6.1	General .....	11
6.2	Synthetic Design Storm Simulation and Hydrological Parameters .....	12
6.3	Simulation of Pre- and Post-Development (Uncontrolled) Conditions .....	14
6.4	Simulation of Phase-1 Post-Development (Controlled) Conditions .....	15
6.5	Simulation of Phase-2 Post-Development (Controlled) Conditions .....	17
6.6	Simulation of July 1, 1979 Historical Storm Event and Flood Potential .....	18
	6.6.1 Simulation of July 1, 1979 Historical Storm Event .....	18
	6.6.2 Flood Potential .....	19
7.0	EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION ...	20
8.0	SUMMARY AND CONCLUSION .....	22

- LIST OF FIGURES -

- Figure 1 Key Plan
- Figure 2 Pre-Development Storm Drainage Area Plan
- Figure 3 Post-Development - Phase 1 Storm Drainage Area Plan
- Figure 4 Post-Development - Phase 2 Storm Drainage Area Plan

**- LIST OF TABLES -**

Table 1	Summary of Peak Flow Rates . . . . .	3
Table 2	Typical Potential Land Use Breakdown . . . . .	6
Table 3	Water Quality Infiltration Requirements . . . . .	11
Table 4	SWMHYMO Simulation Results . . . . .	15
Table 5	SWMHYMO Simulation Results (Post-Development - Phase 1 Controlled Conditions) . . . . .	17
Table 6	SWMHYMO Simulation Results (Post-Development - Phase 2 Controlled Conditions) . . . . .	18

**- LIST OF DRAWINGS -**

Site Servicing & Grading Plan	SG
Storm Drainage Area Plans Plan and Profiles	D-ST1 and D-ST2 01, 02 and 03
Stormwater Management Facility	SWM1
Erosion and Sedimentation Control Plan Details	ESC DT

**- LIST OF APPENDICES -**

APPENDIX 'A'	-	RATIONAL METHOD DESIGN SHEETS (1:10 Year and 1:100 Year Design Sheets)
APPENDIX 'B'	-	CONVENTIONAL CULVERT DESIGN SHEET
APPENDIX 'C'	-	WATER QUALITY - INFILTRATION CALCULATION
APPENDIX 'D'	-	HYDROLOGICAL PARAMETERS ( $CN_{pre}$ , Imperviousness Calculation, Time to Peak Calculation)
APPENDIX 'E'	-	SWMHYMO INPUT AND OUTPUT FILES (Pre - and Uncontrolled Post-Development Conditions)
APPENDIX 'F'	-	STAGE-STORAGE-DISCHARGE TABLE
APPENDIX 'G'	-	SWMHYMO INPUT AND OUTPUT FILES (Post-Development Phase 1 Controlled Conditions)
APPENDIX 'H'	-	SWMHYMO INPUT AND OUTPUT FILES (Post-Development Phase 2 Controlled Conditions)
APPENDIX 'I'	-	CERTIFICATE OF APPROVAL - EXISTING SETTLING PONDS
APPENDIX 'J'	-	ASSESSMENT OF CULVERT CROSSING DURING AN EXTREME STORM EVENT
APPENDIX 'K'	-	SWMHYMO INPUT AND OUTPUT FILES (July 1, 1979 Historical Storm Event)



# STORMWATER MANAGEMENT REPORT

## HAWTHORNE INDUSTRIAL PARK

---

### 1.0 INTRODUCTION

#### 1.1 Background

In 1999, J.L. Richards & Associates Limited (JLR) completed a Stormwater Management Study, on behalf of Beaver Road Builders Ltd., for the development of a proposed area previously referred to as the Hawthorne Road Industrial Subdivision. The main objective of the 1999 Study was to develop a conceptual storm servicing alternative (including stormwater management) that would support the proposed development without adversely affecting the hydrological regimes of receiving streams. The 1999 Study provided a conceptual design of the conveyance system and on-site storage requirements for the proposed development in order to satisfy the regulatory agencies of the time, namely the Region of Ottawa-Carleton, the City of Gloucester and the South Nation Conservation Authority (SNC).

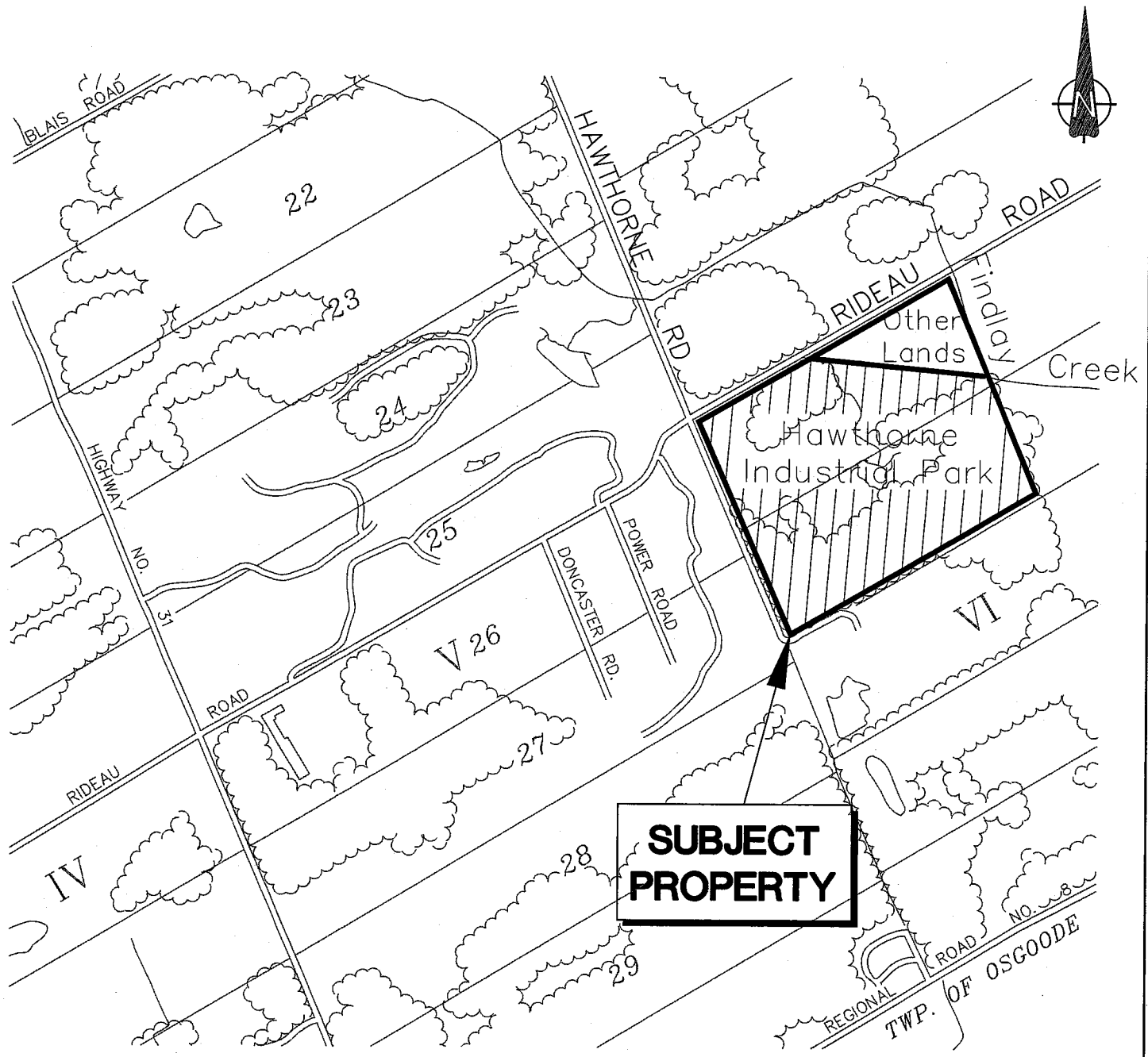
The current landowner, R.W. Tomlinson Limited (Tomlinson), now wishes to complete the development of the subject land, herein referred to as the Hawthorne Industrial Park (HIP).

#### 1.2 General

The proposed 70 hectare (ha) site is located immediately southeast of the Hawthorne Road/ Rideau Road intersection (refer to Figure 1) in the City of Ottawa (formerly in the City of Gloucester) and is expected to service future industrial operations varying in size. Over the past decade, the site has been used to dispose of fill materials resulting from Tomlinson's construction activities. The fill material has been placed in areas where fill was required for the construction of the proposed HIP.

Currently, Orgaworld Canada Ltd. (Orgaworld), has leased approximately 10 ha within HIP, which will house the source separated organics program being implemented by the City of Ottawa in 2009. The Orgaworld site includes a Stormwater Management Facility with a capacity of 15,994 m<sup>3</sup> providing on-site water quantity and quality control.

In addition, a permanent facility within the above subject lands is a total suspended solids (TSS) treatment facility. Consisting of three (3) ponds, this facility was designed




This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

NOT TO SCALE

PROJECT: <h2 style="text-align: center;">HAWTHORNE INDUSTRIAL PARK</h2>	DRAWING: <h2 style="text-align: center;">KEY PLAN</h2>
--	---

1.dwg

 <b>J.L. Richards</b> ENGINEERS-ARCHITECTS-PLANNERS	<b>J.L. Richards &amp; Associates Limited</b> 864 Lady Ellen Place Ottawa, ON Canada K1Z 5M2 Tel: 613 728 3571 Fax: 613 728 6012	DESIGN: M.B.	DRAWING NO.: <h1 style="text-align: center;">FIGURE 1</h1>
		DRAWN: ARM	
		CHECKED: G.F.	PLOTTED: Apr 30, 2009

to provide aggregate wash water management to Tomlinson's existing quarry operations on the west side of Hawthorne Road (refer to Appendix 'I' for a copy of the Ministry of the Environment (MOE) Certificate of Approval (C of A) related to these works). In addition to the existing aggregate wash treatment facility, it is proposed to construct separate stormwater management facilities to service water quantity and quality requirements for the HIP.

### 1.3 Objectives

This Stormwater Management Report (SWMR) was prepared to demonstrate that the subject lands can be developed as an Industrial Park Subdivision in compliance with the current surface water objectives of the watershed. Since the subject lands drain to Findlay Creek, which is tributary to the North Castor River, storm runoff criteria for this development must be in accordance with the recommendations of the document entitled "Shield's Creek Subwatershed Study, Totten Sims Hubicki Associates, June, 2004", referred throughout this Report as SCSS. More specifically, the above Report provided the following design criteria with regard to stormwater:

#### Water Quantity

- Peak Flow Post-development peak flows must be controlled to pre-development levels for storm events ranging from a 1:2 year to a 1:100 year recurrence.
- Infiltration Section 5.5 of the SCSS recommends that the quantity and quality of groundwater infiltration be maintained to pre-development rates.
- Erosion The stormwater management strategy for the proposed HIP must be developed to maintain the erosion potential to current levels.

#### Water Quality

The proposed stormwater management strategy for HIP must be developed to meet a Normal Level of Protection (as per the MOE's publication entitled "Stormwater Management Planning and Design Manual, March, 2003", referred throughout this Report as SWMPDM, which corresponds to a standard approach used in urban development to obtain a targeted total suspended solids (TSS) removal rate of 70%.

## 2.0 STORM DRAINAGE

### 2.1 General

Storm servicing for the HIP was designed using the dual drainage concept, also known as the minor/major drainage system. The minor drainage system is mainly comprised of an on-site open ditch and culvert system. The minor system was designed to capture and convey runoff during frequent storm events up to a 1:10 year recurrence. The major system formed by swales/ditches, streets, etc. was sized to accommodate runoff during storm events exceeding 1:10 year up to the 1:100 year recurrence.

The open ditches, culverts and swales were sized using the Rational Method. An inlet time of 15 minutes and runoff coefficients (C-factors) ranging from 0.20 to 0.90 were used in the sizing of the conveyance systems. It should be noted, however, that C-factors used were increased by 10% for the 1:25 year peak flow calculations and by 25% for the 1:100 year recurrence, as per Section 5.4.5.2.1 of the City of Ottawa's Sewer Design Guidelines (November 2004). Rainfall intensities (i.e., Intensity-Duration-Frequency curves (IDF)) required by the Rational Method were also extracted from the City of Ottawa's Sewer Design Guidelines. Peak flow rates for the HIP and Hawthorne Road and Rideau Road are summarized in Table 1 (refer to Appendix 'A' for copies of the Rational Method Design Sheets for the 1:10 year and 1:100 year storm events).

**Table 1 - Summary of Peak Flow Rates**

Description	Peak Flows (L/s)	
	10 Year	100 Year
Hawthorne Industrial Park (HIP)	5,422	12,814
Hawthorne Road / Rideau Road	3,192	5,417

### 2.2 Design Criteria

The municipal infrastructure associated with the HIP was designed using the following criteria:

- The HIP open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).
- The Hawthorne Road open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).
- The existing downstream ditch system along Rideau Road was evaluated to ensure sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).
- The culverts included in the HIP and along Hawthorne Road/Rideau Road were sized with sufficient capacity to convey the 1:10 year peak flow rate without overtopping the roadway embankment (refer to Appendix 'A' for a copy of the 1:10 year Design Sheet).
- Given that the receiving watercourse was found to shelter fisheries, the SCSS recommended that a "normal" level of protection be achieved for quality control. To fulfill this requirement, industrial sites must direct runoff to an appropriately sized oil/grit separator unit before stormwater can be conveyed off site to the open roadside ditch/culvert system. To achieve quality control for the internal roads, it is proposed to provide infiltration storage volume in the roadside open ditch system, as per the requirements presented in Table 3.2 of the SWMPDM.
- The SCSS recommended that the erosion potential be maintained to current levels for the receiving water course. To fulfill the above requirement, the two year post-development peak flow will be controlled to 50% of the pre-development peak flow rate.
- Storage volume is to be implemented for the control of the post-development peak flows to pre-development levels for storm events ranging from a 1:2 year to a 1:100 year recurrence to comply with the recommendations of the SCSS.

This Stormwater Management Report (SWMR) has been written to demonstrate that the subject land could be developed in compliance with the above surface water criteria and also prepared in accordance with the SWMPDM. The proposed stormwater management strategy for the HIP was developed to meet a "normal" level of protection, which corresponds to a standard approach used in land development to obtain a targeted TSS removal rate of 70%.

### **3.0 STORM SERVICING**

#### **3.1 General**

Peak flow estimation is an important task that is carried out for any proposed development. There are several reasons that explain why flood flow rates are computed as part of site development. The main purpose of these calculations, however, is to allow for the proper configuration and sizing of the proposed conveyance systems to minimize the risk of flooding.

Drainage works are designed for a real or hypothetical storm event that may or may not happen during the lifetime of the facilities. At the onset of the design process, design criteria are adopted that may vary with the type of project, in recognition of the impacts of failure. For this particular project, the level of protection adopted (storm events up to a 1:100 year recurrence) was based on design storm characteristics of an infrequent storm event having a low probability to occur.

#### **3.2 Description of Conveyance Systems and Design Basis**

Flowing water can be conveyed to an outlet by either open-channel flow or pipe flow. Storm runoff generated by the subject lands is to be collected and conveyed by a roadside ditch/culvert system before discharging to Findlay Creek via an end-of-pipe stormwater management facility (SWMF).

Sizing of the conveyance systems was carried out using various levels of service. The open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, storm runoff up to the 1:100 year recurrence, while roadway culverts were sized to provide conveyance of the 1:10 year peak flow rates without overtopping the roadway embankments.

As part of this sizing exercise, Storm Drainage Area Plans were prepared and included in this Report (refer to Drawing D-ST1 for the HIP and Drawing D-ST2 for Hawthorne and Rideau Road) that show the delineated area for each of the conveyance segments (i.e., from node location to node location), along with its assigned runoff coefficient (C-factor) based on the type of surface. Since the final development of Hawthorne Industrial Park is unknown at this time, a conservative on-site runoff coefficient (C-factor) of 0.70 was used. Table 2 illustrates the breakdown of a typical site that would generate a weighted runoff coefficient of 0.70.

**Table 2 - Typical Potential Land Use Breakdown**

Type of Surface	Area (%)	C-Factor
Building	10	1.0
Asphalt Parking	35	0.90
Gravel	35	0.70
Grass	20	0.20
Overall	100	<b>0.70</b>

It should be noted that the C-factors shown on the Storm Drainage Area Plans denote those associated with 1:10 year peak flow calculations. As recommended in Section 5.4.5.2.1 of the City of Ottawa's Sewer Design Guidelines, C-factors shown on drawings were increased by 10% and 25% for the 1:25 year and 1:100 year peak flow calculations, respectively (refer to Appendix 'A' for copies of the Rational Method Design Sheets).

### 3.2.1 Open Ditch System

An open ditch channel is a conduit used to convey flowing water from one location to another, with a free surface. A channel can be classified as either artificial (i.e., manmade) or natural. Artificial channels are those constructed or developed as a result of human activity. This type of conveyance system is usually implemented as a long and mild-sloped channel built in the ground, which provides conveyance of water between two points, with sections of regular geometry and shape. An open ditch system is generally designed to follow site topography and the vertical profile of the adjacent roadway. The most commonly used shapes for open channel ditches are trapezoidal and triangular, with the latter shape utilized mainly for ditches servicing small drainage areas.

The open ditches associated with the HIP and Hawthorne Road were sized with sufficient capacity to convey 1:100 year peak flow rates. As previously noted, the Rational Method Design Sheets (refer to Appendix 'A' for copy of the 1:100 year design sheet) were used to quantify the 1:100 year peak flow rates. The open ditch configuration was carried out utilizing Manning's relationship, along with the proposed geometry and slope of the channel. Two Storm Drainage Area Plans were prepared (refer to Drawings D-ST1 and D-ST2) showing proposed ditch inverts that match those shown on the Rational Method Design Sheets. Based on the ditch sizing exercise, it was determined that triangular shape ditches with 3:1 side slopes and variable depths provided the necessary conveyance of the 1:100 year peak flow rate. The Site Servicing and Grading Plan (refer to Drawing SG) was developed to provide the configuration of open ditch segments.

The existing open ditches along Rideau Road were also evaluated to ensure sufficient capacity was able to convey the 1:100 year peak flow rates resulting from upstream construction works (i.e., construction of Hawthorne Road). The Rational Method Design Sheets (refer to Appendix 'A' for copy of the 1:100 year design sheet) were used to quantify the 1:100 year peak flow rates. An existing 900 mm diameter culvert crossing under Hawthorne Road conveys flow along the north side of Rideau Road (refer to Drawing D-ST2). The capacity of this existing culvert was estimated at 1,400 L/s under a 1.5 m headwater (refer to Appendix 'B' for Culvert Design Summary Table). Upon the review of existing topography, any headwater depths greater than 1.5 m resulted in runoff being directed northerly along Hawthorne Road towards Findlay Creek. In light of the above, the existing open ditches along Rideau Road were evaluated using a conservative plug flow of 1,400 L/s in addition to surface runoff generated by the contributing areas.

### **3.2.2 Culvert System**

The principal function of a culvert is to convey water through an embankment while, at the same time, supporting the weight of the overlying fill and vehicular movement. Culverts can be made of many different materials; steel, polyvinylchloride (PVC), high density polyethylene (HDPE) and concrete. Culverts selected for the HIP and Hawthorne Road are made of corrugated steel, in either round or arch shape. Field observations have shown that there are two major types of culvert flow conditions: inlet control and outlet control.



### 1. Flow Under Inlet Control

Flow with inlet control means that the discharge capacity of a culvert is controlled at the culvert entrance by the depth of headwater and by the entrance geometry, including the barrel shape, cross sectional area and the type of inlet edge. The roughness and length of the culvert barrel, and the outlet conditions are not factors in determining the culvert capacity. The longitudinal slope reduces headwater only to a small degree and can normally be neglected for conventional culverts flowing in inlet control.

### 2. Flow Under Outlet Control

Flow with outlet control means that the discharge capacity of a culvert is controlled by the depth of tailwater, including the velocity head within the barrel, the entrance and friction losses. The roughness, length of the culvert barrel, and slope are factors in determining the culvert capacity; the inlet geometry is of lesser importance.

To avoid having to conduct detailed hydraulic computations that would determine the type of flow under which a culvert will probably operate, the procedure recommended by the MTO (refer to MTO's Drainage Management Manual) was utilized. This methodology, referred to as the Conventional Culvert Design procedure, requires that MTO's Design Charts and Design Nomographs be used for both inlet and outlet control conditions. The higher headwater depth that is calculated from those two operating conditions would indicate the type of control and would provide the governing headwater depth. This methodology was utilized to size each culvert crossing, along with the 1:10 year peak flow rates calculated by the Rational Method Design Sheets (refer to Appendix 'A') for each of the conveyance segments. Furthermore, this calculation sheet also provides proposed culvert sizes, along with the type of control and governing depth found when using the conventional culvert design procedure. A summary of the various parameters estimated using MTO's nomographs at each of the culverts has been tabulated using MTO's Form D4-I (refer to Appendix 'B' for Conventional Culvert Design Sheet). This analysis shows that the proposed culvert crossings within the HIP and along Hawthorne Road are capable of conveying the 1:10 year peak flow rates as a minimum, without overtopping any of the roadway embankments. The hydraulic calculations were carried out assuming a roughness coefficient of 0.024 for any of the CSP and CSPA culverts. The Site Servicing and Grading Plan (Drawing SG) shows proposed culvert sizes, lengths and invert elevations at each of the crossings.

The proposed 1030 x 740 mm CSPA culvert crossing under the entrance of the pond access road was of concern due to the high flow rate during the 1:100 year storm event.

There was a possibility that the excess flow overtopping this culvert could short circuit into SWMF via the pond access road. Therefore, an analysis of the flow overtopping the proposed entrance culvert was conducted and the results confirmed that the residual flow would indeed be contained within the right-of-way corridor (refer to Appendix 'J' for desktop calculation).

#### 4.0 WATER BALANCE

Water balance analyses are typically carried out to assess any changes in infiltration to subsurface water-bearing zones as a result of the urbanization (i.e., increase of hard surfaces) of land. The SCSS has identified the need to maintain a necessary level of quantity and quality groundwater recharge via infiltration. Groundwater recharge is required to maintain subsurface base flow to streams and wetlands in addition to maintaining groundwater levels for private and municipal wells. The Hydrogeological Study completed by Golder Associates Limited in 2008 for the HIP identified the site as being underlain by a shallow and deep aquifer separated by an impermeable rock layer. The upper aquifer provided subsurface groundwater flow to streams, while the lower aquifer was the main source for well water supply. Therefore, groundwater recharge for this site was intended to provide subsurface base flow into the receiving Findlay Creek.

Construction fill operations have been active for the HIP since 1994. The results of the geotechnical field investigation conducted by Inspec-Sol Incorporated in 2008 indicates that as much as 5.5 m of fill material (MW7-08) has been placed on parts of the site. The non-native heterogenous fill material is comprised mainly of silty clay and contains trace amounts of road and construction materials. Although the soil component of the fill material exhibits the characteristics of silty clay, the varying composition and density of the remaining portion of the fill affects its permeability in localized areas. Given the above existing conditions, it is difficult to determine how groundwater recharge will behave as subsurface flow in the existing fill matrix, particularly from individual sites within the HIP. The MOE expressed concerns about the use of infiltration strategies on the individual sites given the past history as a construction fill site. Furthermore, the MOE SWMPDM does not endorse the use of infiltration basins on lands zoned for industrial use as there is an increased risk of groundwater contamination should a spill occur on site.

An option was considered to provide infiltration for the entire site at the base of the end-of-pipe Dry Pond facility. Upon further investigation, the geotechnical report indicated

that there was a high groundwater table at the proposed pond location. In addition, in-situ soils in the area exhibited poor drainage properties which would have resulted in long retention times at the base of the pond, making it difficult to meet the water balance deficit requirements for the entire site while attempting to mimic the pre-development hydrological cycle.

Representatives from the City and SNC were consulted, and it was concluded that the SCSS groundwater balance targets for this site would be difficult to meet. It was also recognized that on-site infiltration strategies for this industrial subdivision could have a detrimental effect on groundwater quality and jeopardize the natural ecological integrity of receiving waters. In light of the above, it was decided by the approval authorities that the requirement for the water balance would be waived for the HIP development.

## **5.0 WATER QUALITY**

### **5.1 General**

Urbanization has been found to modify the hydrological regime of a receiving stream if inadequate stormwater management measures are implemented. The potential impacts associated with runoff arise primarily from the amount of urban area that is impervious to rain and snowmelt water. These impervious surfaces increase the amount of direct surface runoff that is generated and is conveyed more efficiently to the receiving stream. As part of the SCSS, fisheries resources have been inventoried along this watercourse, along with its associated tributaries. Given that the receiving watercourses were found to shelter fisheries, the approved document recommended that a "normal" level of protection be achieved. To fulfil this requirement, it is proposed that each individual site provide an oil/grit separator and infiltration storage be provided within the roadside open ditch system, as per the requirements presented in the SWMPDM.

### **5.2 Water Quality Requirement**

Stormwater servicing for the HIP has been developed in accordance with the water quality recommendations of the SCSS (70% TSS removal). To fulfil this requirement, individual sites will be required to provide an oil/grit separator be installed to provide quality treatment (i.e., 70% TSS removal) of surface runoff before entering the roadside open ditch/culvert system. In addition, the oil/grit separator will be able to capture and contain hydrocarbons in the event of an on-site accidental spill.

To fulfill the water quality objectives for the paved portion of the HIP internal roads, it is proposed to provide infiltration within the open roadside ditch system to meet the storage volume requirements presented in Table 3.2 of the SWMPDM. Based on the normal level of service required and an imperviousness of 100% for the internal roads, Table 3.2 yields an extrapolated storage volume requirement of 35 m<sup>3</sup>/ha. To achieve this storage volume, a clear stone envelope complete with a 200 mm diameter perforated pipe will be installed at the base of the roadside ditches to meet the required storage volume (Refer to Appendix C for calculations).

The following table presents the calculated infiltration volume required for water quality control and those provided by the roadside open ditch system to meet the recommended MOE Design Guidelines.

**Table 3 - Water Quality Infiltration Requirements**

Phase	Area (ha)	Infiltration Volume Requirement (m <sup>3</sup> )	Infiltration Method	Length of 200 mm diameter Perf. Pipe (m)	Infiltration Volume Provided (m <sup>3</sup> )
1	1.58	55.1	Open Ditch	1760	55.3
2	0.21	7.4	Open Ditch	240	7.5
Total	1.79	62.5	Open Ditch	2000	62.8

As shown in the above Table, the infiltration volume provided by the proposed open roadside ditch network (62.8 m<sup>3</sup>) exceeds that obtained from Table 3.2 (62.5 m<sup>3</sup>) of the SWMPDM. It should be noted that additional storage within the void space of the clear stone envelope was not accounted for and would increase the actual infiltration storage volume shown in Table 3.

## 6.0 HYDROLOGICAL ANALYSIS

### 6.1 General

To satisfy the surface water objectives presented in Subsections 1.3 and 2.2, a hydrological analysis was carried out to quantify peak flow rate variations resulting from the development of the proposed HIP. To quantify this variation, the SWMHYMO Stormwater Management Hydrological Model (Version 4.02, July, 1999) was utilized to calculate peak flows during severe storm events.

To carry out the hydrological analysis, three storm drainage plans were developed; one representing the pre-development drainage conditions, one representing the post-development conditions for the current study area, Phase 1, and the other for the post-development drainage conditions, including future development, Phase 2. For each of these plans, subwatershed boundaries were delineated based on existing topography of the site and the proposed overland flow direction following development of the site (refer to Figures 2, 3 and 4 for details).

## **6.2 Synthetic Design Storm Simulation and Hydrological Parameters**

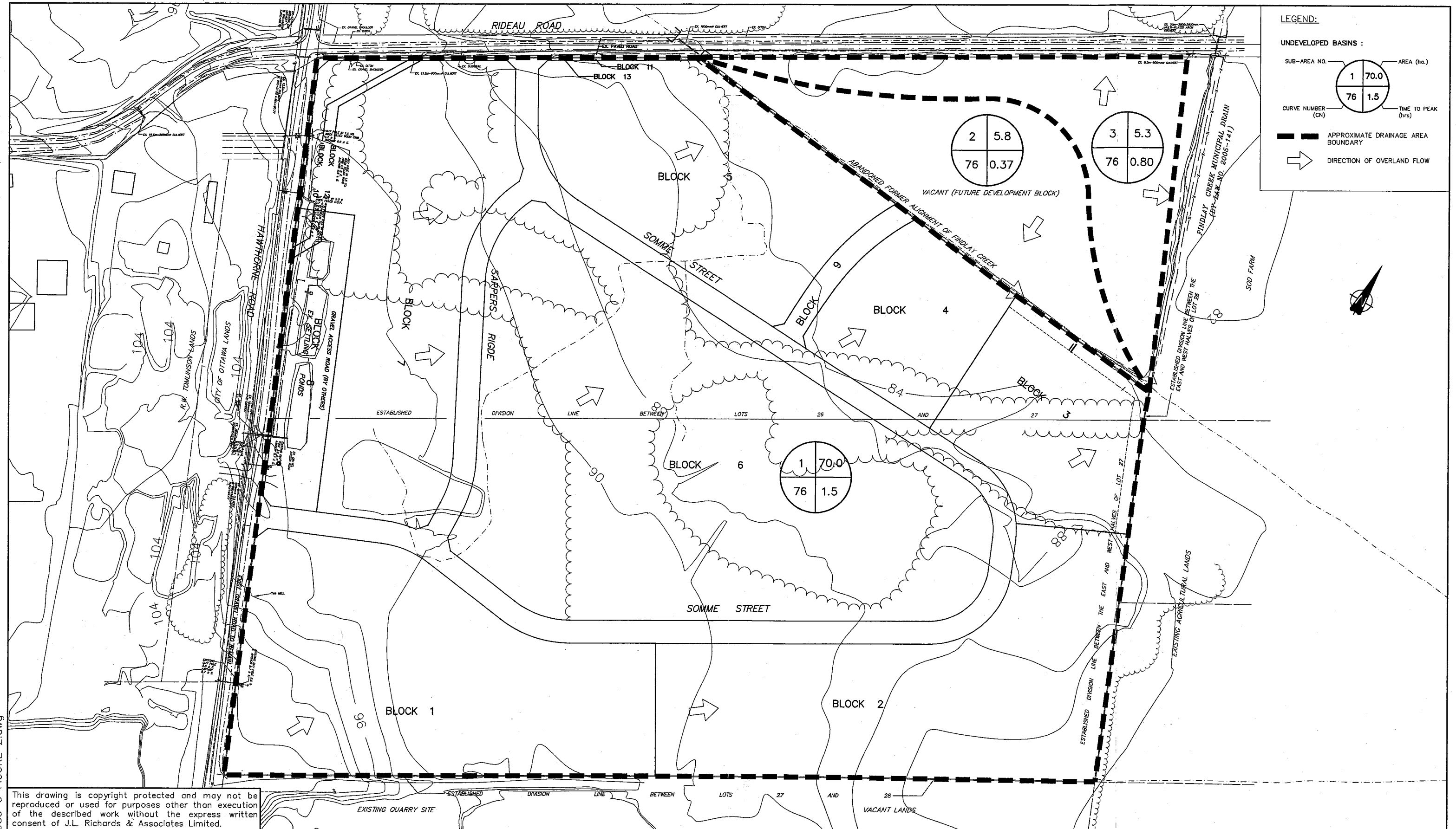
Peak runoff rates were calculated for both pre- and post-development conditions using synthetic design storm event modelling. Peak flow rates were estimated using the 3-hour Chicago Design Storm Event, as this synthetic storm event has been recognized as the most critical event for urban runoff applications (refer to Section 5.4.3.1 of the City of Ottawa's Sewer Design Guidelines). The design storm analysis was completed using volumes derived from the Intensity-Duration-Frequency (IDF) curve equation shown in Section 5.4.2 of the City of Ottawa Sewer Design Guidelines compiled using data from 1967 to 1997.

A SWMHYMO data file was developed to represent both pre- and post-development conditions of the subject area. Simulation of surficial runoff generated from undeveloped subwatersheds was carried out using the "DESIGN NASHYD" command along with the SCS procedure to compute rainfall losses. The SCS procedure uses the Curve Number (CN) method to compute rainfall losses and the Nash unit hydrograph to simulate the hydrological response from undeveloped watersheds. To simulate surface runoff from urban subwatersheds, the "CALIB STANDHYD" command was utilized. Hydrological parameter selection and methodology is described below:

### **Curve Number (CN)**

In order to estimate a Curve Number that represents pre-development conditions, the geotechnical investigation completed by Inspec-Sol, entitled "Geotechnical Study Subdivision Plan, Hawthorne Industrial Park, Lots 26 and 27 Concession 6, Southeast of Hawthorne and Rideau Roads, Ottawa, Ontario" dated December 19, 2008 was used. At the time of this investigation, large amounts of fill material were encountered over the majority of the site, which does not reflect the pre-development conditions. As such, only native soils encountered below fill material were used to establish pre-development condition Curve Numbers. The review of the geotechnical investigation shows native

120983.dwg 20983



**LEGEND:**

UNDEVELOPED BASINS :

SUB-AREA NO.	AREA (ha.)
1	70.0
76	1.5

CURVE NUMBER (CN)	TIME TO PEAK (hrs)
76	0.37
76	0.80

— — — — — APPROXIMATE DRAINAGE AREA BOUNDARY

➔ DIRECTION OF OVERLAND FLOW

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

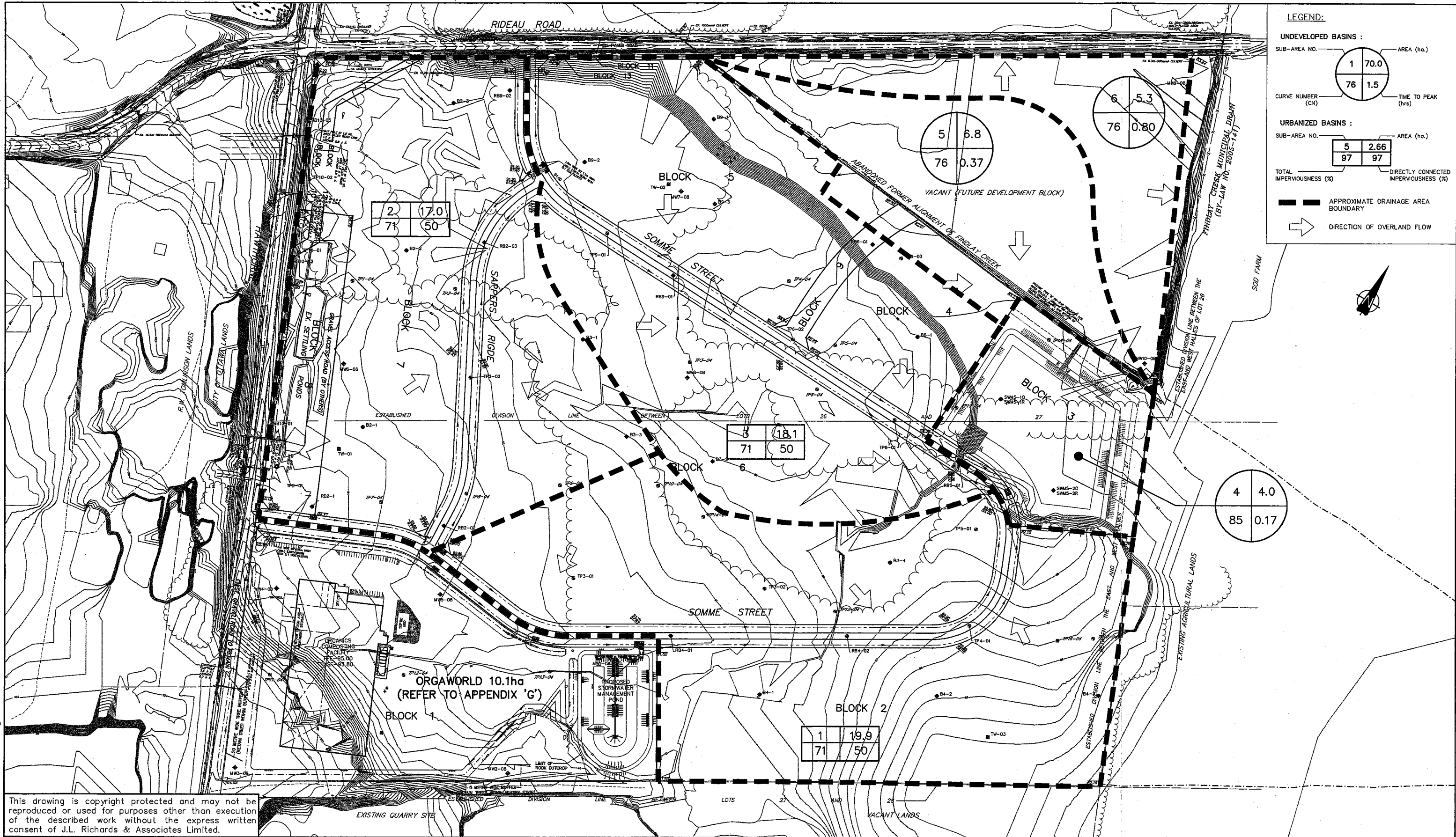
PROJECT: **HAWTHORNE INDUSTRIAL PARK**

DRAWING: **PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN**

**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

DESIGN: M.B.  
 DRAWN: ARM  
 CHECKED: G.F.  
 PLOTTED: Apr 30, 2009

DRAWING NO.: **FIGURE 2**  
 JLR NO.: 20983



**LEGEND:**

**UNDEVELOPED BASINS :**

SUB-AREA NO.	AREA (ha.)
1	70.0
76	1.5

TIME TO PEAK (hrs)

**URBANIZED BASINS :**

SUB-AREA NO.	AREA (ha.)
5	2.66
97	97

DIRECTLY CONNECTED IMPERVIOUSNESS (%)

APPROXIMATE DRAINAGE AREA BOUNDARY

DIRECTION OF OVERLAND FLOW

V:\20983\00\20983.dwg

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

PROJECT: **HAWTHORNE INDUSTRIAL PARK**

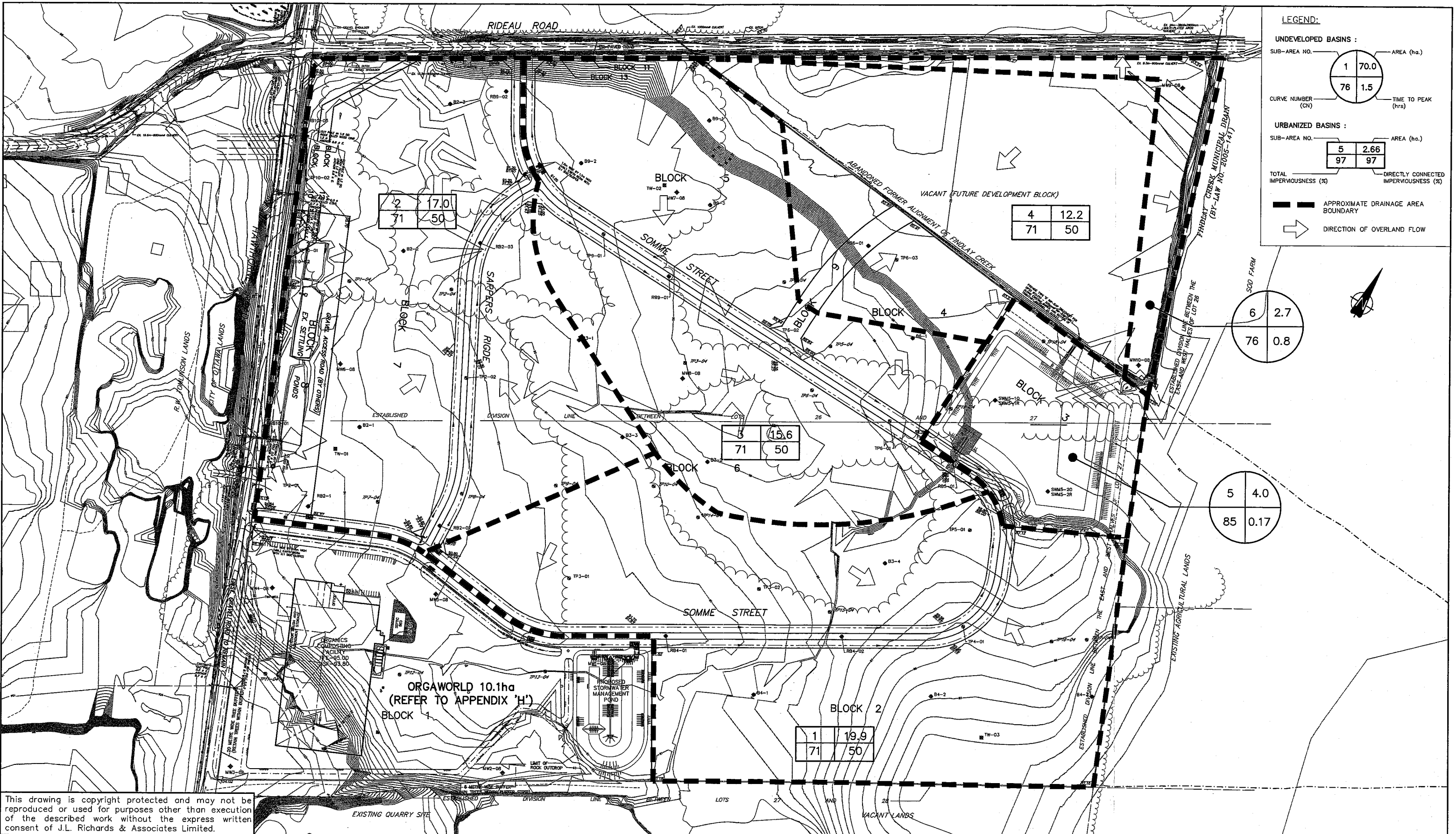
DRAWING: **POST DEVELOPMENT – PHASE 1 STORM DRAINAGE AREA PLAN**

**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

DESIGN: M.B.  
 DRAWN: ARM  
 CHECKED: G.F.  
 PLOTTED: Apr 30, 2009

DRAWING NO.: **FIGURE 3**  
 JLR NO.: 20983

v:\20983\20983.dwg



**LEGEND:**

UNDEVELOPED BASINS :

SUB-AREA NO.	AREA (ha.)
1	70.0
76	1.5

CURVE NUMBER (CN)      TIME TO PEAK (hrs)

URBANIZED BASINS :

SUB-AREA NO.	AREA (ha.)
5	2.66
97	97

TOTAL IMPERVIOUSNESS (%)      DIRECTLY CONNECTED IMPERVIOUSNESS (%)

— — — — — APPROXIMATE DRAINAGE AREA BOUNDARY

→ DIRECTION OF OVERLAND FLOW

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

PROJECT: **HAWTHORNE INDUSTRIAL PARK**

DRAWING: **POST DEVELOPMENT – PHASE 2 STORM DRAINAGE AREA PLAN**

**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

DESIGN: M.B.  
 DRAWN: ARM  
 CHECKED: G.F.  
 PLOTTED: Apr 30, 2009

DRAWING NO.: **FIGURE 4**  
 JLR NO.: 20983



soils ranging from silty sand in Blocks 4 and 5, to silty clay in Blocks 3, 5, 7 and 8, to sandstone and limestone in parts of Blocks 2 and 3. These soils have been classified by Inspec-Sol as being associated with hydrologic soil groups (HSG), ranging from "B" to "D" for silty sand to silty clay, respectively. Areas where rock was encountered (i.e., Sandstone and Limestone) were classified as "Rockland." Based on this information and current land usage, as interpreted from aerial photography, a pre-development Curve Number (CN) of 76 has been calculated using the Ministry of Transportation of Ontario (MTO) Chart H2-8. Detailed calculations for the HIP have been included in Appendix 'D'.

Under post-development conditions, it is proposed to provide sufficient grade differential to allow for positive drainage to meet City of Ottawa Design Standards. As the subject lands are to be developed as an Industrial Park with a significant increase in hard surfaces (i.e., buildings, asphalt and gravel), the post-development conditions were, therefore, analysed taking into consideration the low potential of these surfaces to infiltrate storm runoff.

### **Imperviousness**

Surface runoff under post-development conditions is greatly impacted by the imperviousness of its tributary area. Since the final development of the HIP is unknown, a conservative assumption for typical surfaces encountered in similar industrial parks was developed, as illustrated in Table 2. To determine the imperviousness based on the assumed breakdown presented in Table 2, an imperviousness calculation was carried out and is presented in Appendix 'D'. The imperviousness calculation was based on the following assumptions:

- an imperviousness of 100% was assigned for building footprints;
- an imperviousness of 100% was assigned for all asphalt parking surfaces.
- an imperviousness of 70% was assigned for all gravel surfaces; and
- it was assumed that 50% of the total imperviousness (TIMP) 50 % was modelled as directly connected imperviousness (XIMP).

Based on the above, a total imperviousness of 70% was calculated, which is equivalent to a runoff coefficient of 0.7. The hydrological analysis was, therefore, carried out using

a total imperviousness of 70%, consistent with the runoff coefficient used for sizing the open ditch/culvert system.

### **Time to Peak ( $T_p$ )**

Time to peak calculations were carried out under pre-development conditions. Time of concentration was first estimated using the Uplands Method Chart based on the various flow paths. Once calculated, the times to peak were set to 67% (i.e., 2/3) of the time of concentration ( $T_c$ ). Under pre-development conditions, a 90 minute time to peak was calculated (refer to Appendix 'D' for calculations). When modelling post-development conditions, the "CALIB STANDHYD" command was used to calculate the time to peak associated with the proposed site surfaces and grades (refer to Appendix 'E' for SWMHYMO outputs).

### **6.3 Simulation of Pre- and Post-Development (Uncontrolled) Conditions**

The hydrological analysis was carried over the entire HIP under both the pre- and post-development conditions. As stated in Section 6.1, two post-development conditions were investigated, namely, Phase 1 and Phase 2. Phase 1 evaluates servicing for the current Study area, while Phase 2 includes the current Study area along with servicing of an additional 11.2 ha of land to the north east, shown on drawings as "Future Development Block."

Peak flow rates were computed with SWMHYMO using the procedure and parameters described in Subsection 6.2. Table 4 presents the simulated peak runoff rates under a 3 hour Chicago design storm event for both the pre- and post- (uncontrolled) development conditions for the HIP (refer to Appendix 'E' for SWMHYMO data input and output files), along with those under a 4 hour - 25 mm storm.

**Table 4 - SWMHYMO Simulation Results**

Return Period or Storm Depth	Peak Flow Rates (L/s)		
	Pre-Development	Phase 1 Post-Development (Uncontrolled)	Phase 2 Post-Development (Uncontrolled)
25 mm	252	1,941	2,231
2	467	3,077	3,548
5	826	4,812	5,554
10	1,097	6,135	7,029
25	1,468	7,772	9,013
50	1,767	9,240	10,588
100	2,093	10,662	12,132

Simulation results presented in the above table show that uncontrolled post-development peak flows substantially exceed those obtained under pre-development conditions. Based on the design criterion for water quantity (refer to Subsections 1.3 and 2.2 for details), post-development peak flows should be maintained to their pre-development levels for storm events ranging from a 1:5 year to a 1:100 year recurrence. In addition, the 2-year post-development peak flow should be controlled to 50% of the 2-year pre-development peak flow to satisfy the erosion criterion. Water quantity control measures were, therefore, found to be necessary for the development of this site. Details and stormwater servicing approaches proposed to fulfil the design criteria listed in Subsections 1.3 and 2.2 are presented in the following Subsections.

#### **6.4 Simulation of Phase 1 Post-Development (Controlled) Conditions**

Development of the subject lands (i.e., 70 ha, as illustrated on Figure 3) will increase the imperviousness of the subject area. To achieve the surface water objectives listed in Subsections 1.3 and 2.2, it is proposed that an end-of-pipe facility be constructed that would provide storage volume for retention of runoff.

The stormwater management criteria for the development of the HIP consist of maintaining erosion potential and peak flow rates at the pre-development levels. Storm servicing of the Subdivision was, therefore, developed such that all of these requirements were fulfilled, along with the achievement of a "normal" protection level. It

is proposed to implement the following stormwater management servicing approach for the development of the HIP:

### **End-of-Pipe SWMF (Block 3)**

Based on the proposed grading, the end-of-pipe facility was found to generate a volume of 37,240 m<sup>3</sup> (3.25 m depth). A low flow ditch sized for 2 year storm events was also included in the bottom of the end-of-pipe facility to convey flows to the outlet structure. The configuration of the outlet structure would be as follows:

- 1 x 150 mm diameter orifice within a 200 mm diameter Polyvinyl Chloride (PVC) pipe at elevation 82.90 m, which serves as outlet to the facility;
- 2 x 600 mm diameter Corrugated Steel Pipe culvert at elevation 84.80 m, which also serves as outlet to the facility;
- One (1) emergency overflow spillway (6.0 m wide) at elevation 86.15 m, which serves as outlet to the facility during a storm event greater than 1:100 year.

The above configuration was used to develop a Stage-Storage-Discharge relationship that relates the storativity and outlet capabilities of the proposed facility at various geodetic elevations (refer to Appendix 'F' for copy of this Table). This data (storage-discharge table) was then used as input to the SWMHYMO's ROUTE RESERVOIR command.

A SWMHYMO file, representing the post-development controlled conditions of the HIP, was developed incorporating the storage volume and the outflow capability of the proposed end-of-pipe facility. The following table presents the simulated peak runoff rates for the three (3) hour Chicago design storm under the post-development controlled conditions (refer to Appendix 'G' for SWMHYMO data input and output files), along with those under the four (4) hour - 25 mm storm.

**Table 5 - SWMHYMO Simulation Results  
(Post-Development - Phase 1 Controlled Conditions)**

Return Period or Storm Depth	Peak Flow Rates (L/s)	
	Pre-Development	Phase 1 Post-Development (Controlled) <sup>(1)</sup>
25 mm	252	127
2 year	467	194 <sup>(2)</sup>
5 year	826	359
10 year	1,097	589
25 year	1,468	939
50 year	1,767	1,191
100 year	2,093	1,531

Note: (1) Post-development flow is the sum of flows from the end-of-pipe facility and two uncontrolled Sub-Areas totalling 12.1 ha.

(2) 2 year post-development peak flow less than half the 2-year pre-development peak flow (233 L/s).

Simulation results presented in Table 5 show that the Phase 1 post-development controlled peak flows will be maintained below pre-development levels for the HIP. Consequently, the water quantity objective defined in Subsections 1.3 and 2.2 will be met under Phase 1.

### 6.5 Simulation of Phase 2 Post-Development (Controlled) Conditions

Development of Phase 2, as depicted on Figure 4, includes the Future Development Block located in the northeast corner of the HIP. This additional land could be serviced by the previously proposed end-of-pipe <sup>facility</sup>, without any modifications to facility size or outlet structure. However, a second inlet would be required in the northeast corner of the facility, which could be designed during the detailed design stage of the Future Development Block.

A SWMHYMO file, representing the Phase 2 post-development controlled conditions of the HIP, was developed incorporating the storage volume and the outflow capability of the proposed end-of-pipe facility. The following table presents the simulated peak runoff rates for the three (3) hour Chicago design storm under the Phase 2 post-development

controlled conditions (refer to Appendix 'H' for SWMHYMO data input and output files), along with those under the four (4) hour - 25 mm storm.

**Table 6 - SWMHYMO Simulation Results  
(Post-Development - Phase 2 Controlled Conditions)**

Return Period or Storm Depth	Peak Flow Rates (L/s)	
	Pre-Development	Phase 2 Post-Development (Controlled) <sup>(1)</sup>
25 mm	252	73
2 year	467	156 <sup>(2)</sup>
5 year	826	457
10 year	1,097	729
25 year	1,468	1,051
50 year	1,767	1,348
100 year	2,093	1,515

Note: (1) Post-development flow is the sum of flows from the end-of-pipe facility and one uncontrolled Sub-Area totalling 2.7 ha.

(2) 2-year post-development peak flow less than half the 2 year pre-development peak flow (233 L/s).

Simulation results presented in Table 6 show that the Phase 2 post-development controlled peak flows will be maintained below pre-development levels for the HIP. Consequently, the water quantity objective defined in Subsections 1.3 and 2.2 will also be met under Phase 2.

## 6.6 Simulation of the July 1, 1979 Historical Storm Event and Flood Potential

### 6.6.1 Simulation of the July 1, 1979 Historical Storm Event

In addition to designing the major drainage system to convey the 1:100 year storm event, the performance of both the open ditch system and SWMF was also assessed under the July 1, 1979 historical storm event. This historical storm event is defined as a high volume / low intensity storm event (when compared to the 1:100 year event) which

occurred mostly over a three hour period (refer to Table 5.6 in the Ottawa Sewer Design Guidelines). As shown in Table 5.6, the maximum intensity of 106.7 mm/hr only occurred for a 10 minute period (i.e., between the 85 to 95 minute time interval). The 1:100 year storm event intensities used to size the open ditch system were found to exceed the highest intensity of 106.7 mm/hr (refer to Appendix 'A' for 1:100 year Rational Method Sheet) with the exception of the most downstream ditch section (i.e., from Node 19 to Pond) where an intensity of 101.69 mm/hr was rather utilized. If an intensity of 106.7 mm/hr was used, the overall peak flow would increase from 12,814 L/s to 13,430 L/s substantially less than the free-flowing capacity of 52,735 L/s for the proposed ditch configuration. Consequently, the proposed open ditch system has the ability to convey flows generated by the July 1, 1979 storm event.

To supplement the above open ditch analysis, a hydrological analysis was also conducted to assess the performance of the SWMF under the July 1, 1979 storm event. A SWMHYMO file was, therefore, developed for the controlled Phase 2 post-development conditions of the HIP. Simulation results show that the Phase 2 post-development runoff during the July 1, 1979 storm event will be contained within the SWMF with all three of the outlet culverts flowing full in addition to approximately 210 mm of flow depth over the emergency overflow channel (refer to Appendix 'K' for SWMHYMO data input and output files). Therefore, the outlet of the SWMF has sufficient capacity to convey the July 1, 1979 historical storm event via the designated overland flow route without overtopping the banks.

### 6.6.2 Flood Potential

Draft approval Condition 12 of the draft subdivision conditions by the former Region of Ottawa-Carleton requires that "The owner shall complete a study indicating the extent of potential flooding on the property from Findlay Creek. The study including all models and assumptions shall be to the satisfaction of the South Nation River Conservation Authority." This condition was included as part of the original February 10, 1998 draft conditions (Gloucester File: S-RU-94-03).

Many changes have occurred on-site and adjacent to the site since Condition 12 was included in the draft approval for this site. Improvements to the roadside ditch were made along Rideau Road, immediately adjacent to the site. Surface runoff generated by the lands north of Rideau Road and conveyed to the small tributary located within the HIP site has now been re-directed toward the northeast corner of the site where the existing 3.8 m wide x 2.8 m high multi plate arch culvert crosses Rideau Road. A

municipal drainage report was prepared by Stantec Consulting in 2004 for this section of Findlay Creek which assessed the overall geomorphological conditions and provided recommendations for future maintenance. In addition, the SCSS conducted a flood hazard analysis. The 100 year flows from the Stantec model were plotted along the creeks modelled. Floodlines were shown in Figure 6.2.3 of the report. No floodlines were indicated for the section of Findlay Creek adjacent to the HIP site.

As indicated previously in the Section 4 of this Report, as much as 5.5 m of construction fill has been added to the site since 1994. The placed fill material on the site has eliminated the natural low lying areas and raised the site grade approximately 4.5 m above the top of creek bank. The current site grades will be maintained as a minimum for the development of the HIP subdivision. Therefore, we have no concerns about flooding on the property from Findlay Creek given the above changes to the site and improvements to the adjacent drainage network. Consequently, Condition 12 of the draft approval should be considered as being satisfied on the basis that this condition is out of date based on the current site conditions.

## **7.0 EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION**

During construction of the roadway, the collection systems (i.e., ditches, culverts, sewers, etc.) and end-of-pipe facility, appropriate erosion and sediment control measures, as outlined in MNR's "Guidelines on Erosion and Sediment Control for Urban Construction Sites," will be implemented to trap sediment on site. To ensure proper implementation, the proposed measures have been incorporated onto Drawing ESC (Drawing entitled "Erosion and Sedimentation Control Plan"). The measures shown on this Drawing were developed based on topography and site constraints. As a minimum, the following measures will be implemented during construction:

- Supply and installation of straw bale flow check dams (as per OPSD 219.180) at the upstream end of each culvert. Proposed locations of straw bale barriers are indicated on Drawing ESC.
- Supply and installation of topsoil and hydroseed along the entire open ditch system once grading has been completed for a section. Mulching will be carried out immediately after hydroseeding. This will allow for immediate bank stabilization of the system and will prevent sediment laden from occurring from exposed ditch surfaces.



- Supply and installation of light duty silt fences (as per OPSD 219.110) at the toe of slope surrounding the proposed stormwater management pond (refer to Drawing ESC for details). It is recommended that silt fences also be used to enclose borrow and stockpile areas resulting from topsoil stripping activities or any excavating activities; locations to be determined in the field during grading operations.
- If dewatering and pumping operations become necessary, filtration is proposed using sediment dewatering bags prior to discharge off-site.

All control measures will be carried out in accordance with the following documents:


- i) "Guidelines on Erosion and Sediment Control for Urban Construction Sites" published by Ontario Ministries of Natural Resources, Environment, Municipal Affairs and Housing, and Transportation and Communication, Association of Construction Authorities of Ontario, and Urban Development Institute, Ontario, May 1987.
- ii) "Erosion and Sediment Control" Training Manual by Ministry of Environment, Spring 1998.
- iii) Applicable Regulations and Guidelines of the Ministry of Natural Resources. As a minimum, during the construction of the conveyance systems, the following Stormwater Management Practices will be used:

Any stockpiled material will be kept on flat areas during construction, well away from any natural flow paths. In the event that the stockpile is placed in other areas where potential washoff to the conveyance system is expected, silt fences will be installed to enclose the materials and prevent any washoff to the conveyance system.


## 8.0 SUMMARY AND CONCLUSION

1. This Stormwater Management Report has been prepared to present a complete approach in achieving the stormwater criteria developed as part of the approved document entitled "Shields Creek Subwatershed Study."
2. Stormwater servicing for the proposed HIP has been designed using the dual drainage concept. Storm servicing will be carried out with the use of an open ditch/culvert system. The open ditch system has been designed to convey the 1:00 year peak flow rates. Similarly, the culverts have been sized to convey the 1:10 year flow without any overtopping.
3. To fulfil the design criteria associated with water quality (as per the SCSS), it is proposed to provide both on-site oil/grit separators and infiltration storage volume within the roadside open ditch system. As per the requirements set out in Table 3.2 of the MOE SWMPDM, a total infiltration volume of 62.5 m<sup>3</sup> is required under Phase 2 to achieve a "normal" level of protection (i.e., TSS removal of 70%).
4. Water balance and infiltration requirements were not implemented due to existing site conditions and proposed industrial use development.
5. The 2-year post-development peak flow will be controlled to 50% of the 2-year pre-development peak flow. Therefore, meeting the SCSS recommendations associated with erosion potential.
6. Simulation results presented in Tables 5 and 6 show that proposed infrastructure will maintain peak flows below pre-development levels for both Phase 1 and Phase 2 of the HIP. Consequently, this design criterion (peak flow control) will be fulfilled.
7. A detailed Erosion and Sedimentation Control Plan has been prepared to reduce the impact of construction activities on Findlay Creek.

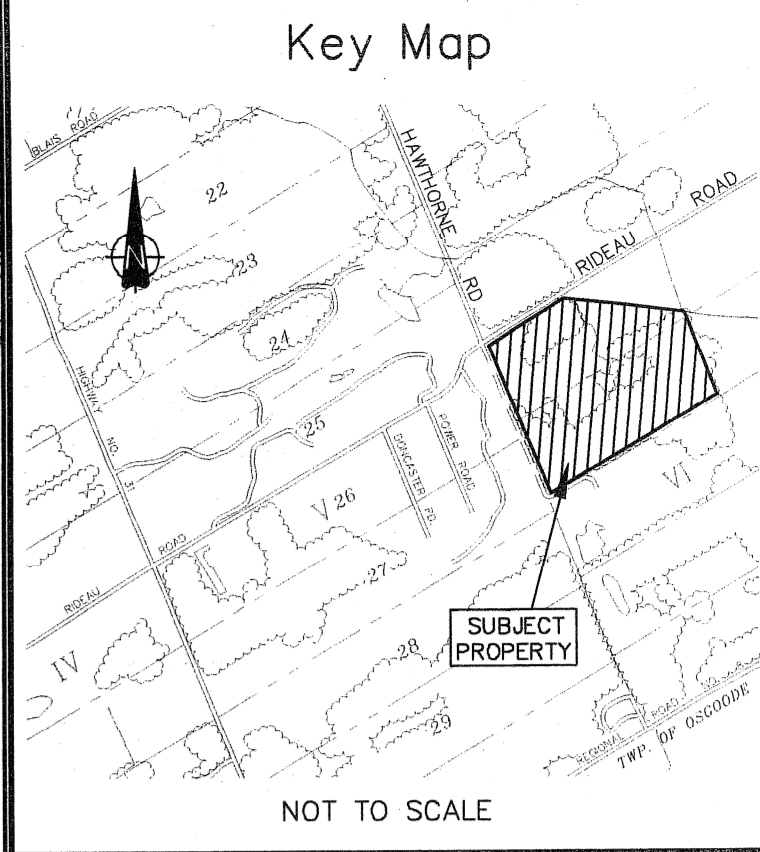
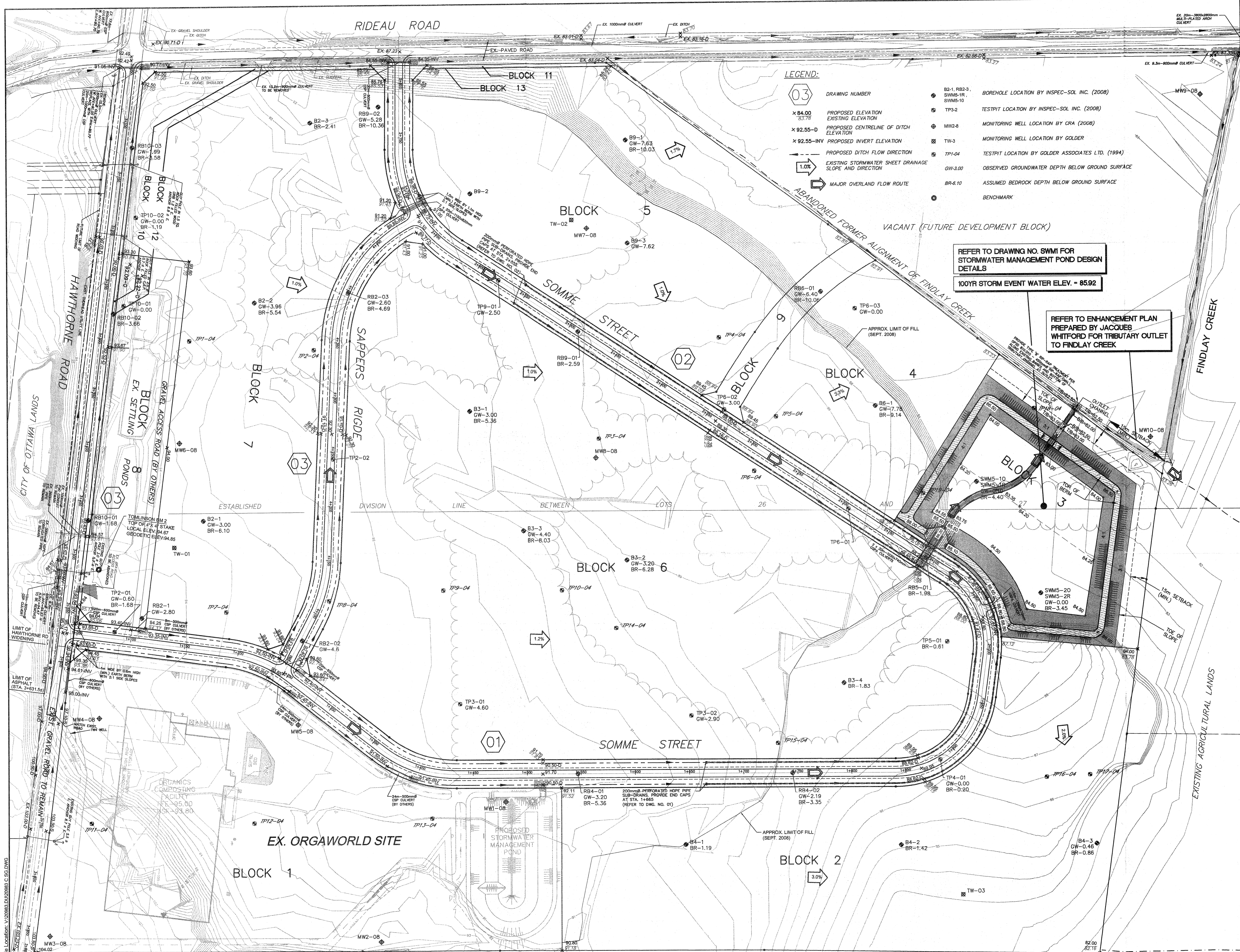
Prepared by: Mark Buchanan  
Mark Buchanan, E.I.T.

Reviewed by: J.S. Guy Forget  
 J.S. Guy Forget, P.Eng.

The seal is circular and blue. It contains the text "LICENSED PROFESSIONAL ENGINEER" at the top and "PROVINCE OF ONTARIO" at the bottom. In the center, it says "J. S. G. FORGET". There are two handwritten signatures and the date "May 29/09" on the seal.

Reviewed by: Derrick Upton  
 Derrick Upton, P.Eng.

The seal is circular and red. It contains the text "LICENSED PROFESSIONAL ENGINEER" at the top and "PROVINCE OF ONTARIO" at the bottom. In the center, it says "D. P. UPTON". There are two handwritten signatures and the date "May 29/09" on the seal.



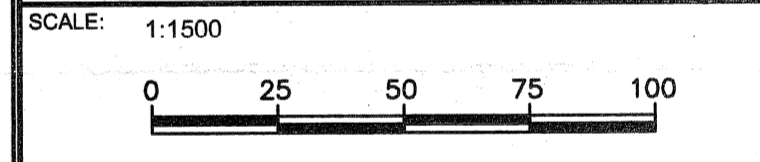
**GENERAL NOTES:**  
 1. HAWTHORNE INDUSTRIAL PARK DRAWINGS TO BE READ IN CONJUNCTION WITH THE GEOTECHNICAL INVESTIGATION REPORT No. T020556-A1 PREPARED BY INSPEC-SOL DATED JANUARY 30, 2009.  
 2. A GEOTECHNICAL ENGINEER LICENSED IN THE PROVINCE OF ONTARIO IS TO INSPECT ALL SUBGRADE SURFACES FOR FOOTINGS AND PAVEMENT STRUCTURES PRIOR TO CONSTRUCTION.  
 3. ALL MATERIAL AND CONSTRUCTION METHODS TO BE IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS (OPSS) AND CITY OF OTTAWA GUIDELINES.

REFER TO DRAWING NO. 8WMI FOR STORMWATER MANAGEMENT POND DESIGN DETAILS  
 100YR STORM EVENT WATER ELEV. = 85.92

REFER TO ENHANCEMENT PLAN PREPARED BY JACQUES WHITFORD FOR TRIBUTARY OUTLET TO FINDLAY CREEK

NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENTS	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.



**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

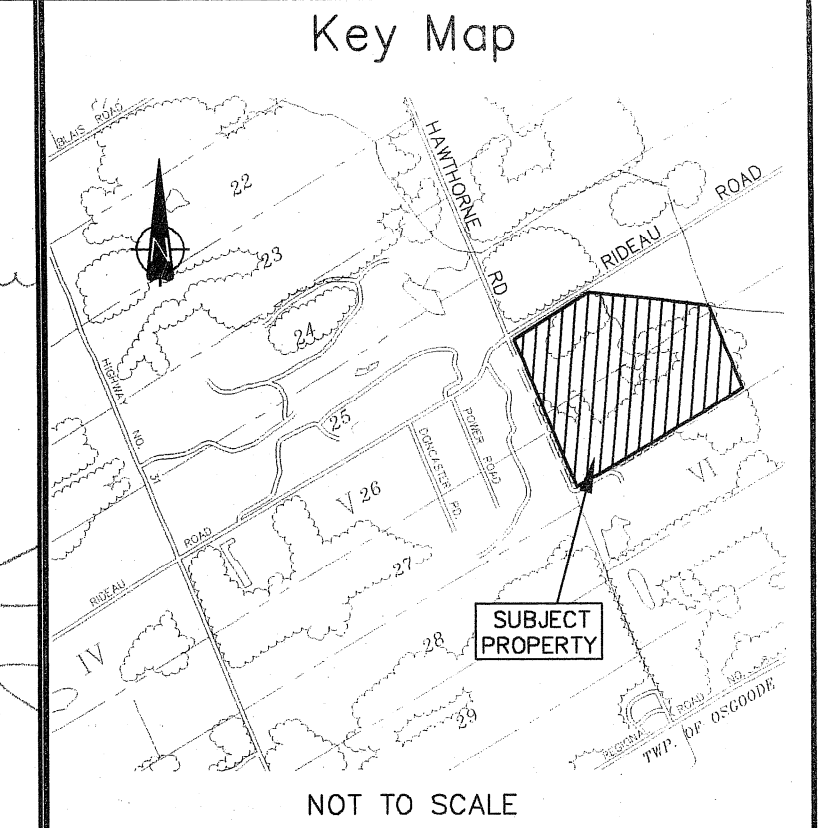
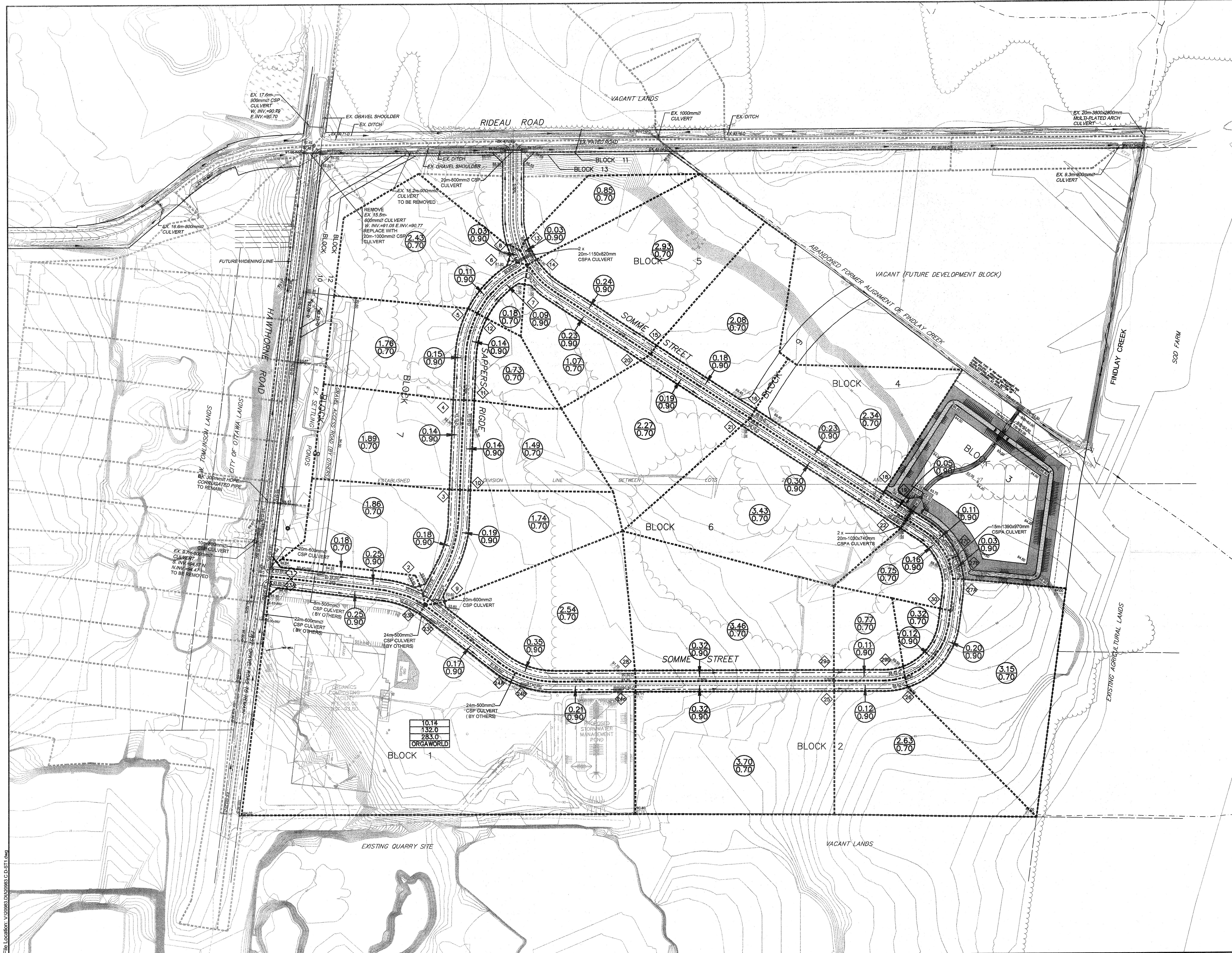
PROFESSIONAL STAMP  
  
 PROJECT NORTH

PROJECT: HAWTHORNE INDUSTRIAL PARK

DRAWING: SITE SERVICING AND GRADING

DESIGN: M.B.	DRAWING NO.: SG
DRAWN: T.S.	JLR NO.:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	

File Location: V:\2008\3.DWG



**LEGEND**

- DRAINAGE BOUNDARY
- 10.14  
132.0  
283.0  
ORGAWORLD AREA IN HECTARES  
\* RUNOFF COEFFICIENT (C)
- 10.14  
132.0  
283.0  
ORGAWORLD DRAINAGE AREA (ha)  
10 YEAR PEAK FLOW (l/s)  
100 YEAR PEAK FLOW (l/s)  
ORGAWORLD SITE
- 28 NODE LOCATION NUMBER
- PROPOSED DITCH AND FLOW DIRECTION

NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: 1:2000

**J.L. Richards & Associates Limited**  
 ENGINEERS ARCHITECTS PLANNERS

J.L. Richards & Associates Limited  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

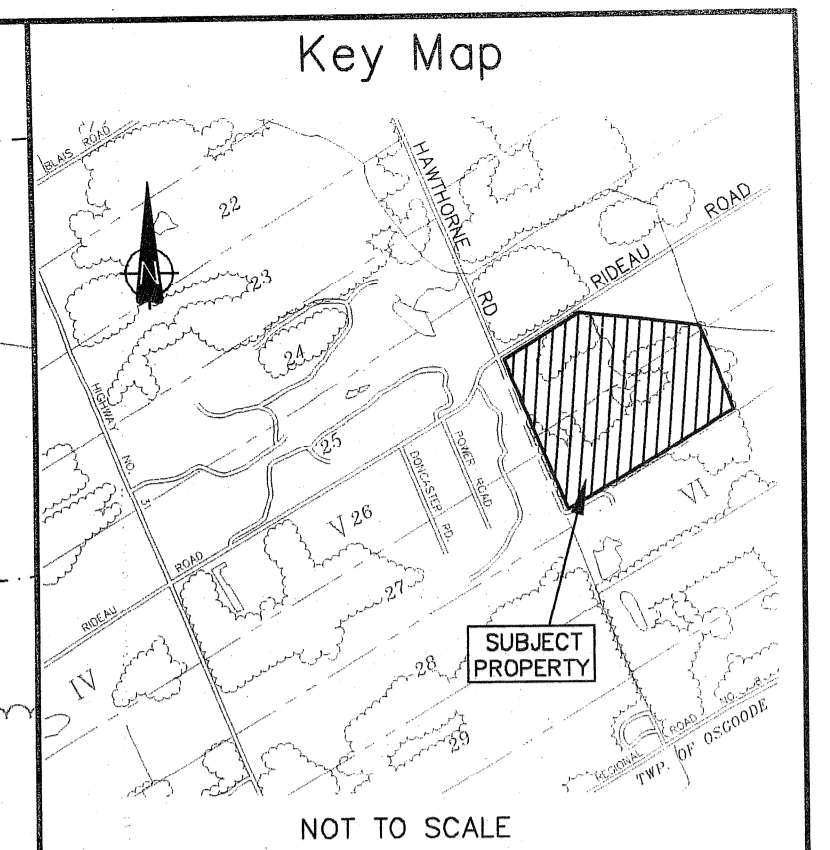
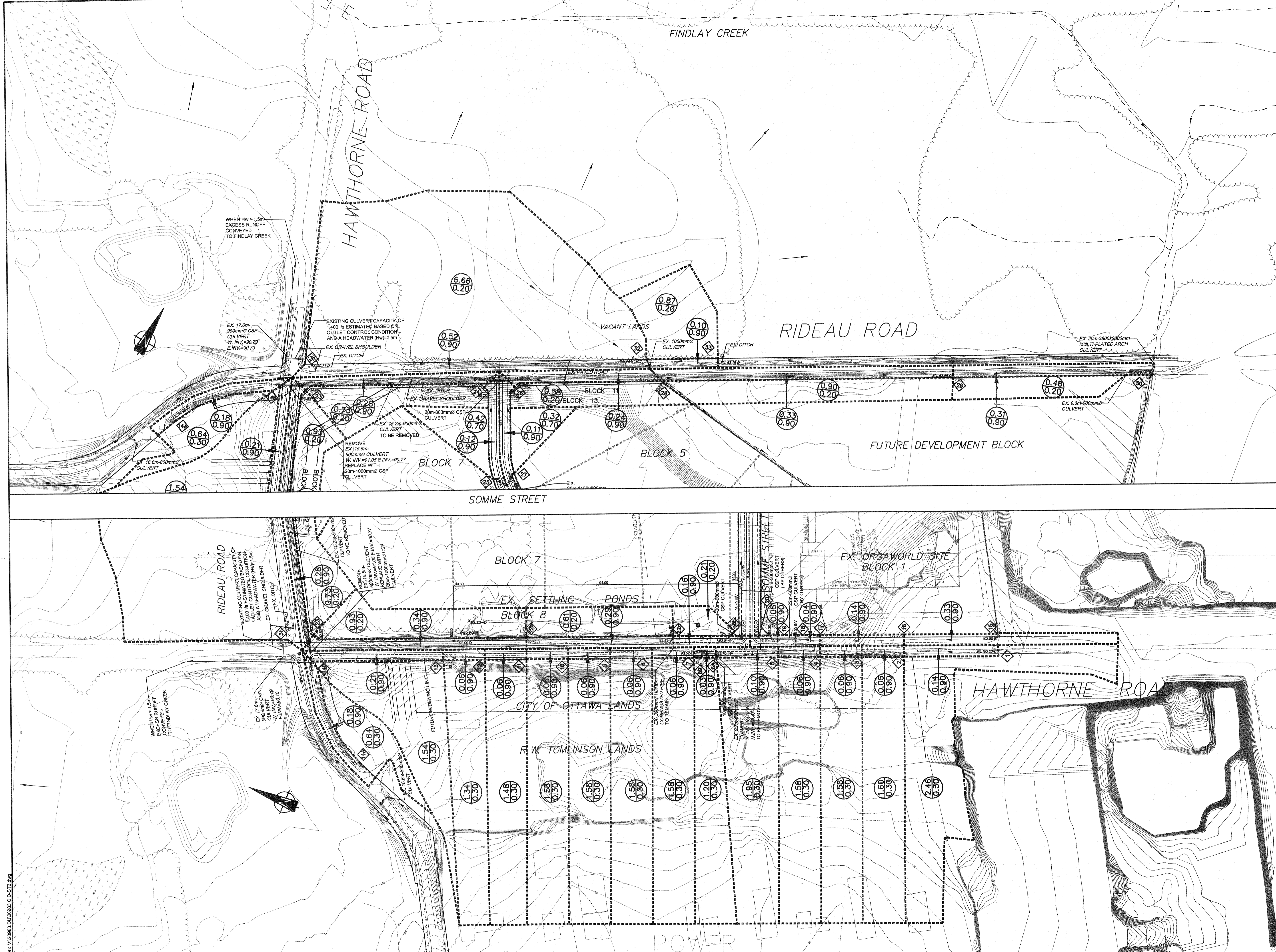
PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

DRAWING:  
**STORM DRAINAGE AREA PLAN**

DESIGN: M.B.	DRAWING NO.: <b>D-ST1</b>
DRAWN: T.S.	CHECKED: D.U.
PLOTTED: May 28, 2009	JLR NO.: 20983



NOT TO SCALE

**LEGEND**

- DRAINAGE BOUNDARY
- $\frac{0.91}{0.70}$  AREA IN HECTARES  
\* RUNOFF COEFFICIENT (C)
- ◇ 28 NODE LOCATION NUMBER
- PROPOSED DITCH AND FLOW DIRECTION
- ← EXISTING SURFACE FLOW DIRECTION

\* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: 1:2000

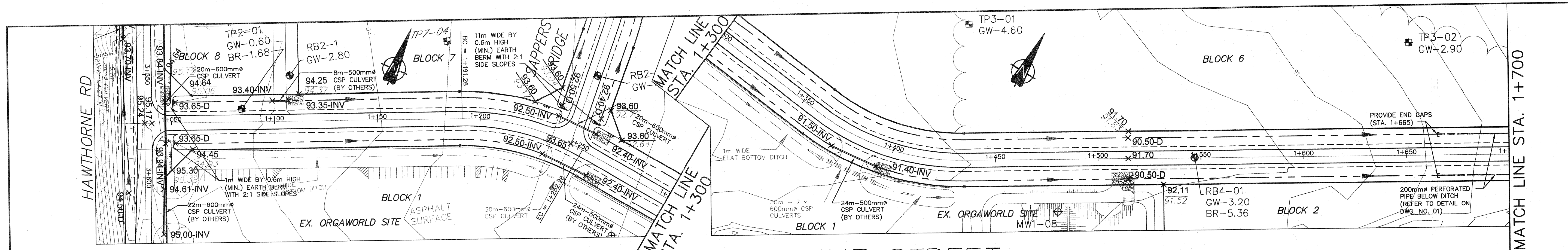
**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

PROFESSIONAL STAMP  
  
 PROJECT NORTH

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

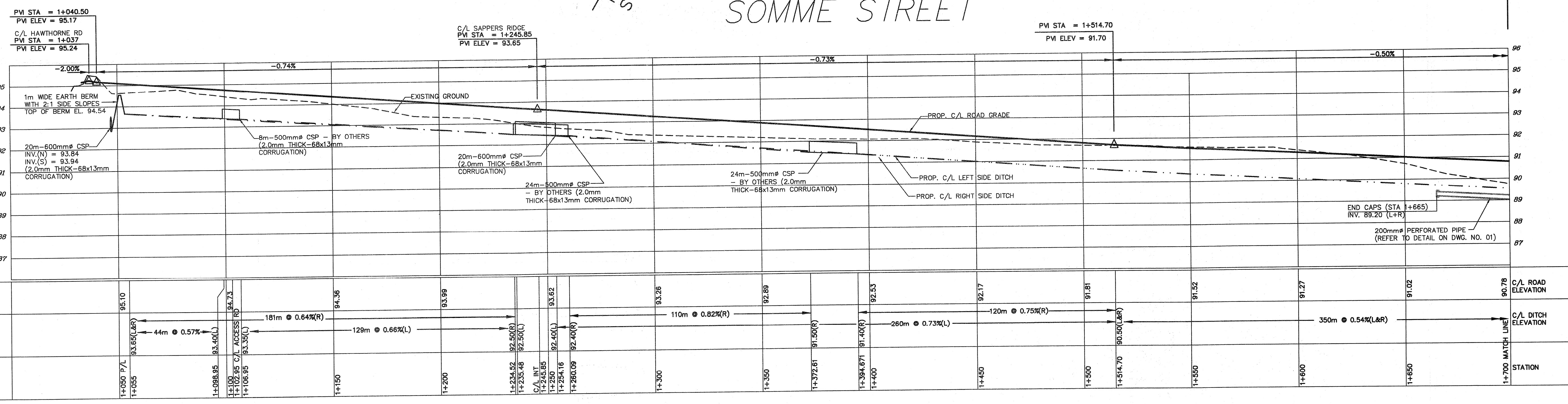
DRAWING:  
**STORM DRAINAGE AREA PLAN**

DESIGN: M.B.	DRAWING NO.: <b>D-ST2</b>
DRAWN: T.S.	JLR NO:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	



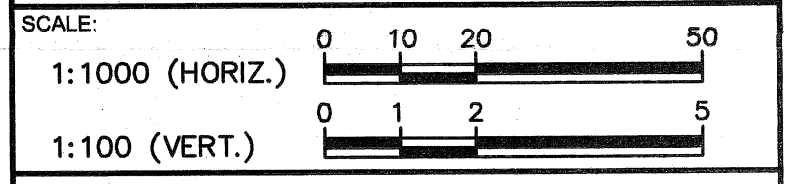
**LEGEND:**

- PROPOSED DITCH AND FLOW DIRECTION
- PROPOSED CULVERT
- PROPOSED RIP-RAP
- 93.50 PROPOSED C/L ELEVATION
- 92.55-D PROPOSED DITCH ELEVATION
- 92.55-INV PROPOSED INVERT
- 89.45 PROPOSED ELEVATION EXISTING ELEVATION
- B2-1, RB2-3, SWM5-1R, SWM5-10 BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
- TP3-2 TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
- MW2-8 MONITORING WELL LOCATION BY CRA (2008)
- TW-3 MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD. TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
- TP1-04
- GW-3.00 OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
- BR-8.10 ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE



NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENTS	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.



**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 8012

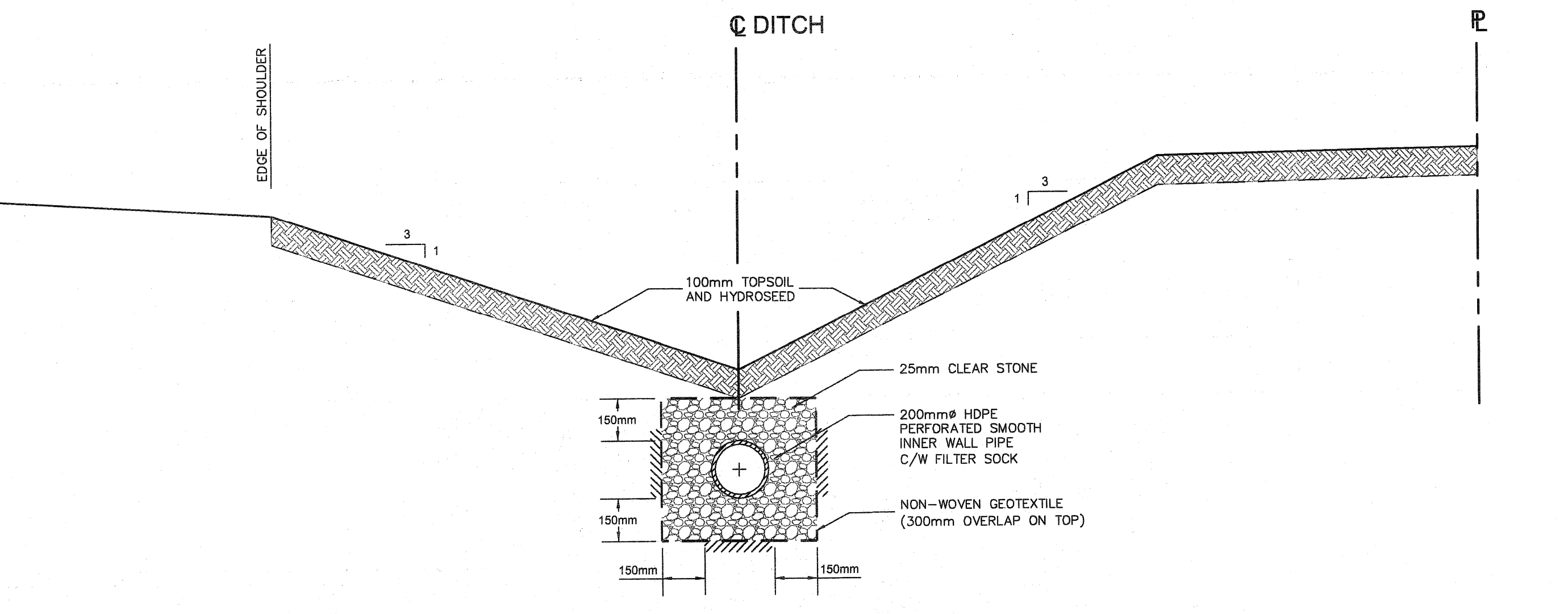
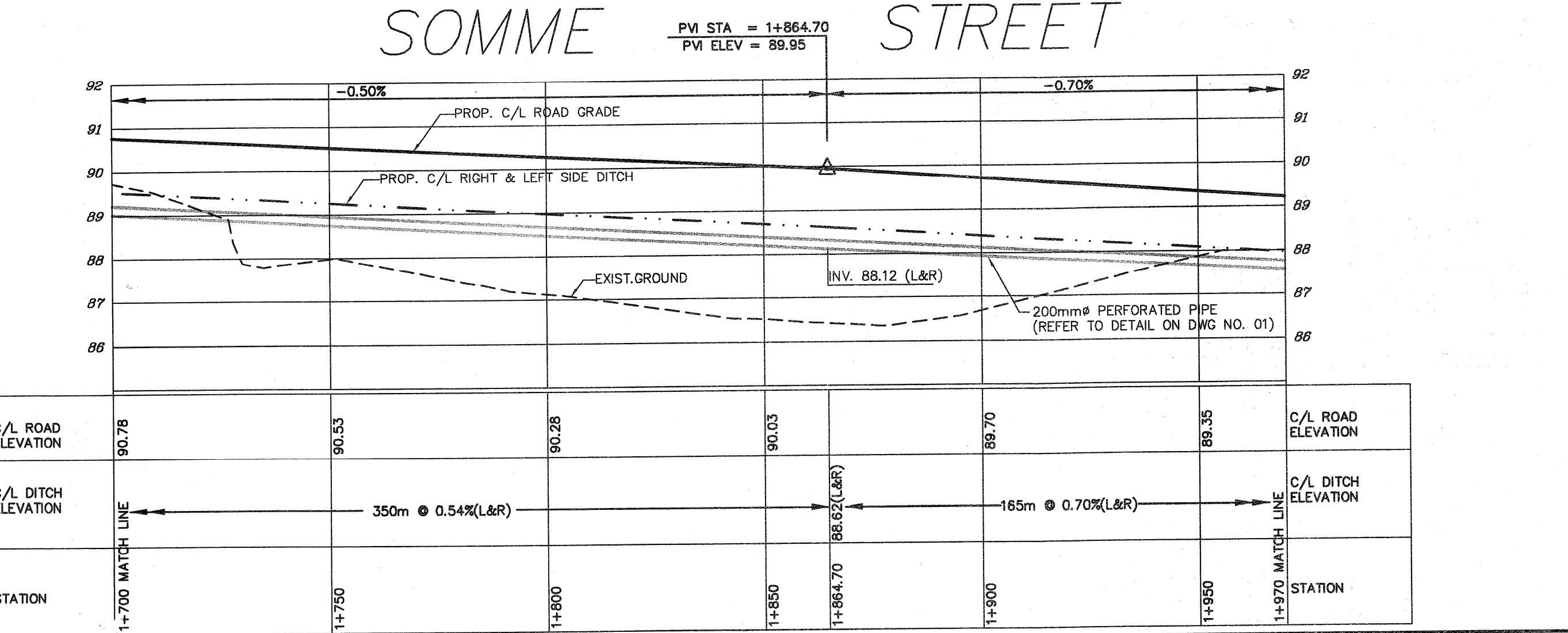
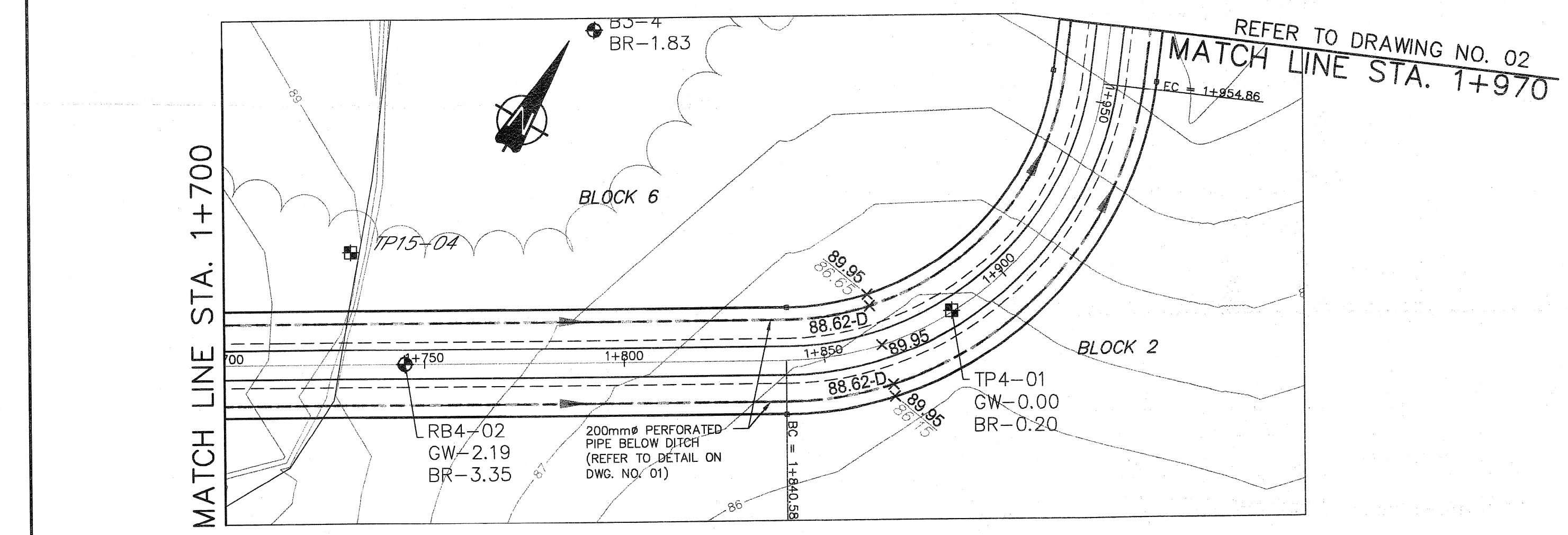
PROFESSIONAL STAMP  
  
 PROJECT NORTH

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

DRAWING:  
**PLAN & PROFILE SOMME STREET HAWTHORNE RD TO STA. 1+970**

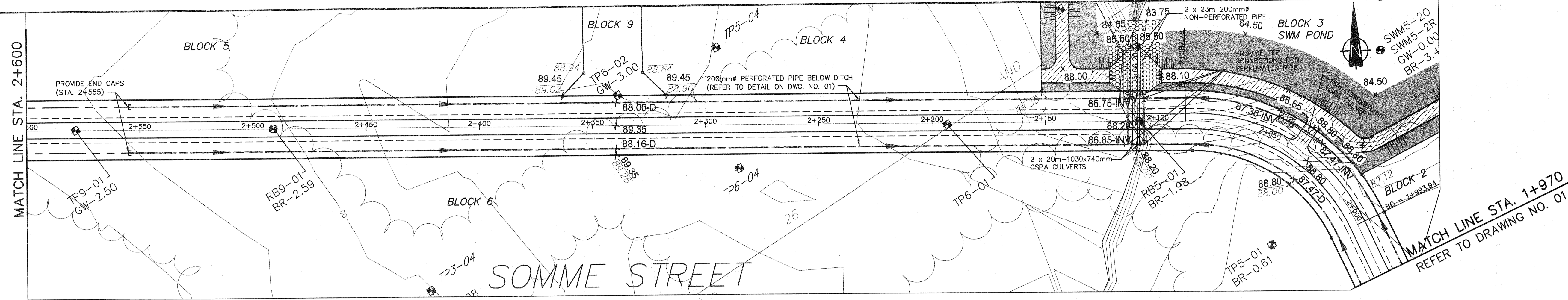
DESIGN: M.B.  
 DRAWN: T.S.  
 CHECKED: D.U.  
 PLOTTED: May 28, 2009

DRAWING NO.: **01**  
 JLR NO.: 20983

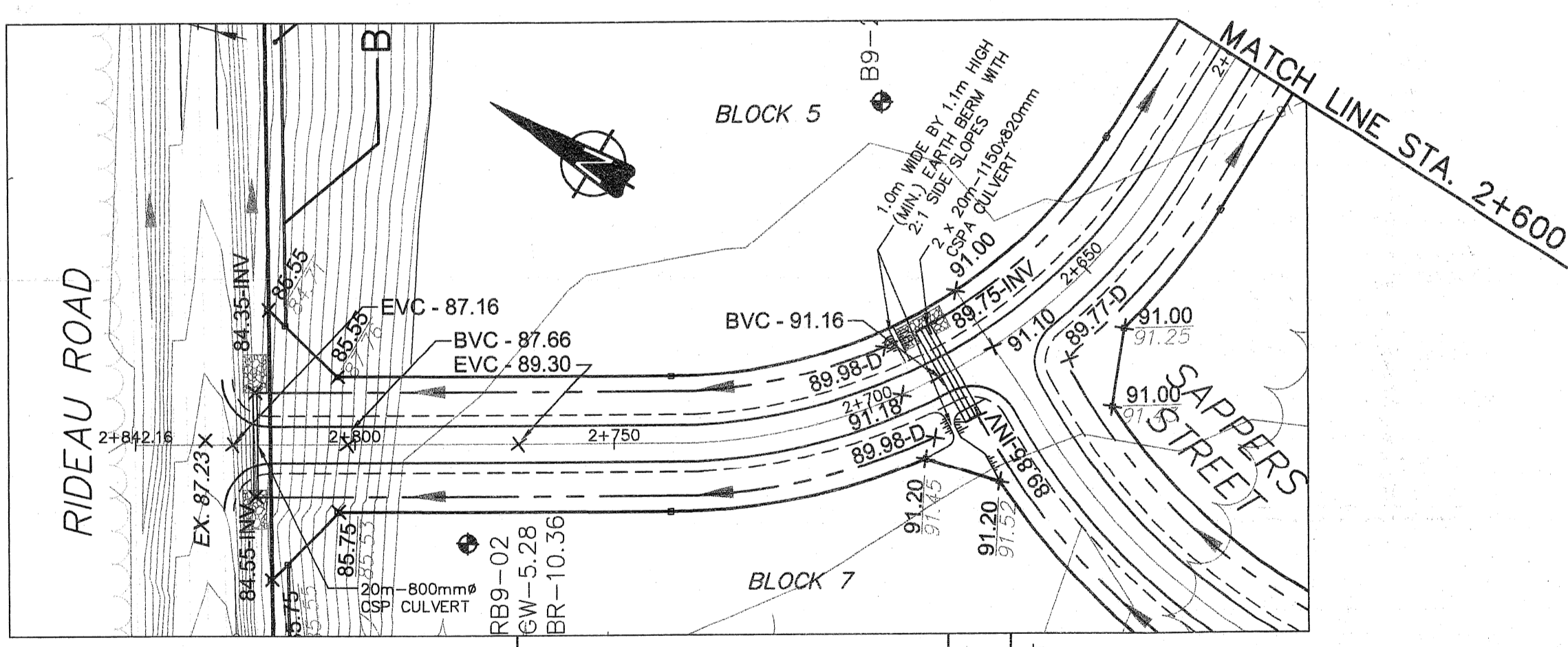
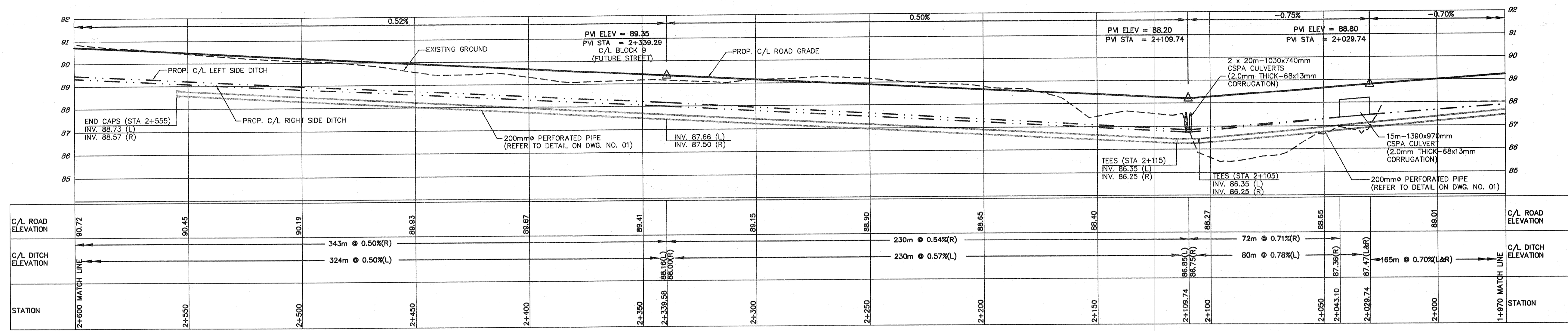


**ROADSIDE DITCH PERFORATED PIPE INSTALLATION (TYPICAL)**  
 N.T.S.

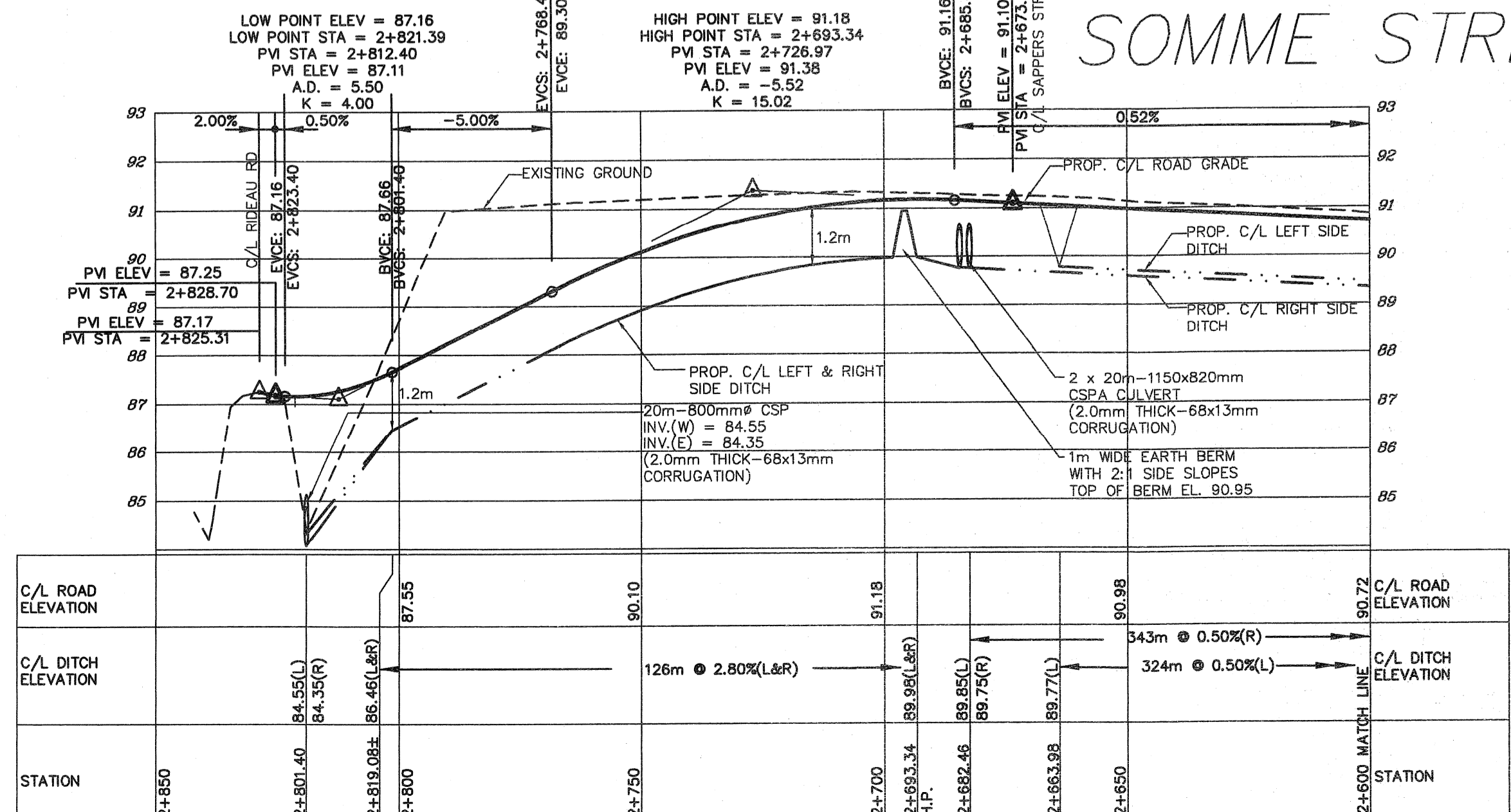
NOTE:  
 1. SUB-DRAIN TO BE NON-PERFORATED PIPE UNDER CULVERTS.  
 2. WORKS TO BE CONSTRUCTED AS PER CITY OF OTTAWA DETAIL DRAWING NO.s S9 AND S26.



- LEGEND:**
- ← PROPOSED DITCH AND FLOW DIRECTION
  - PROPOSED CULVERT
  - ▨ PROPOSED RIP-RAP
  - × 93.50 PROPOSED C/L ELEVATION
  - × 92.55-D PROPOSED DITCH ELEVATION
  - × 92.55-INV PROPOSED INVERT
  - + 89.45 PROPOSED ELEVATION
  - 88.90 EXISTING ELEVATION
  - B2-1, RB2-3, SWM5-1R, SWM5-10 BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
  - ⊕ TP3-2 TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
  - ⊕ MW2-8 MONITORING WELL LOCATION BY CRA (2008)
  - ⊕ TW-3 MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD. TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
  - ⊕ TP1-04 TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
  - GW-3.00 OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
  - BR-8.10 ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE

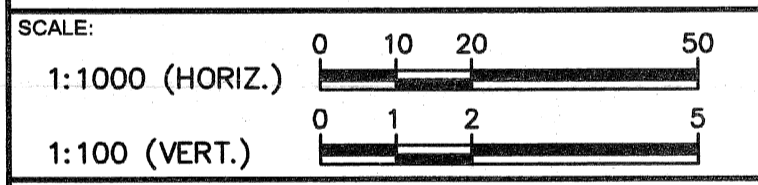


REFER TO DRAWING NO. 03



NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENTS	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.



**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

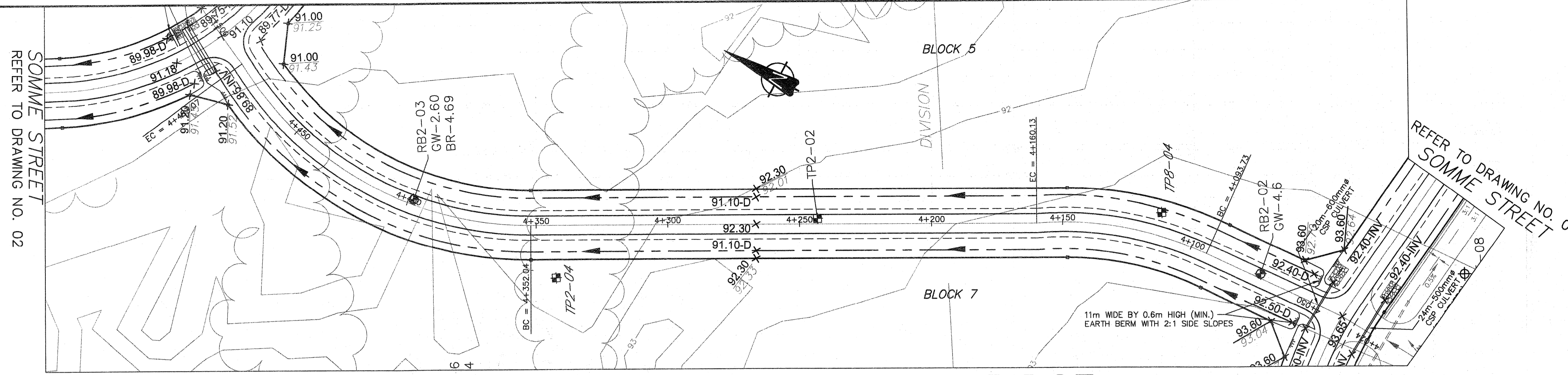
PROFESSIONAL STAMP  
  
 PROJECT NORTH

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

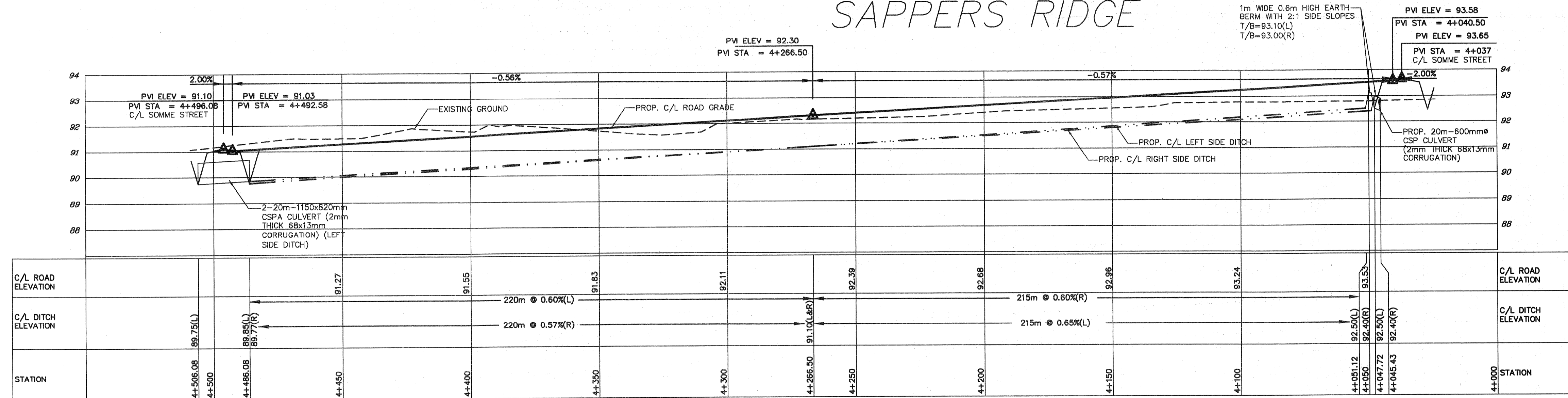
DRAWING:  
**PLAN & PROFILE SOMME STREET STA. 1+970 TO RIDEAU ROAD**

DESIGN: M.B.	DRAWING NO: <b>02</b>
DRAWN: T.S.	JLR NO:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	





### SAPPERS RIDGE



- LEGEND:**
- PROPOSED DITCH AND FLOW DIRECTION
  - PROPOSED CULVERT
  - ▨ PROPOSED RIP-RAP
  - X 93.50 PROPOSED C/L ELEVATION
  - X 92.55-D PROPOSED DITCH ELEVATION
  - X 92.55-INV PROPOSED INVERT
  - + 89.45 PROPOSED ELEVATION
  - 88.90 EXISTING ELEVATION
  - B2-1, RB2-3, SWM5-1R, SWM5-10 BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
  - TP3-2 TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
  - ⊕ MW2-8 MONITORING WELL LOCATION BY CRA (2008)
  - ⊗ TW-3 MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD.
  - TP1-04 TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
  - GW-3.00 OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
  - ▭ BR-6.10 ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE

NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENT	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE:  
 1:1000 (HORIZ.)  
 1:100 (VERT.)

**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

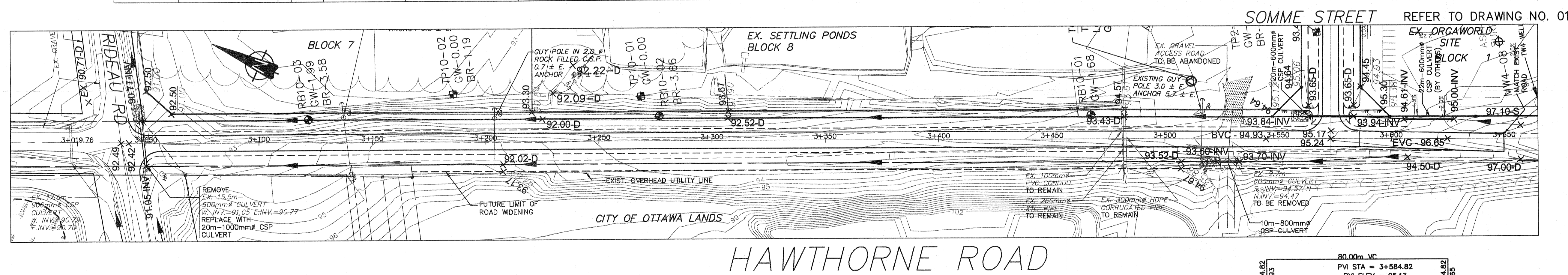
PROFESSIONAL STAMP  
 LICENSED PROFESSIONAL ENGINEER  
 D. P. UPTON  
 PROVINCE OF ONTARIO

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

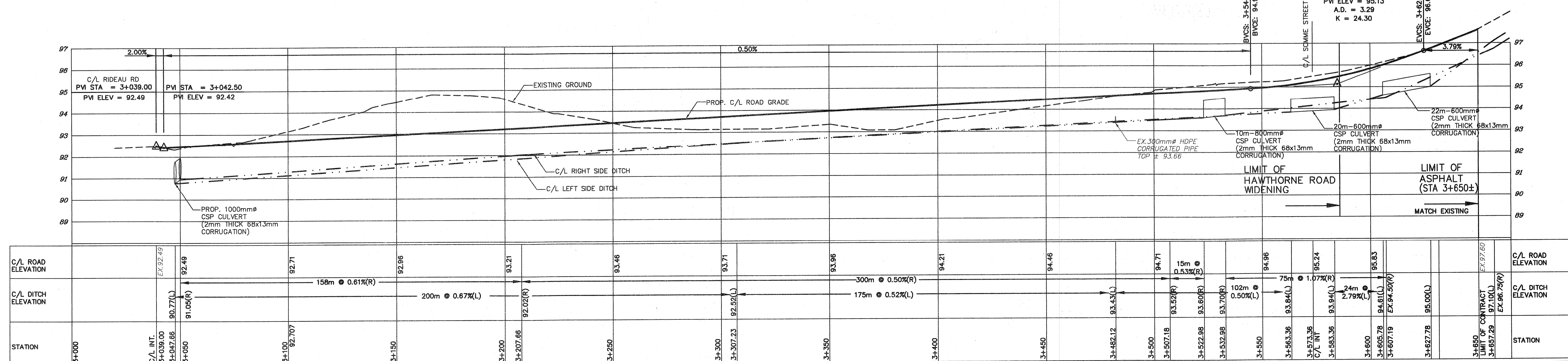
DRAWING:  
**PLAN & PROFILE SAPPERS RIDGE AND HAWTHORNE ROAD EXTENSION**

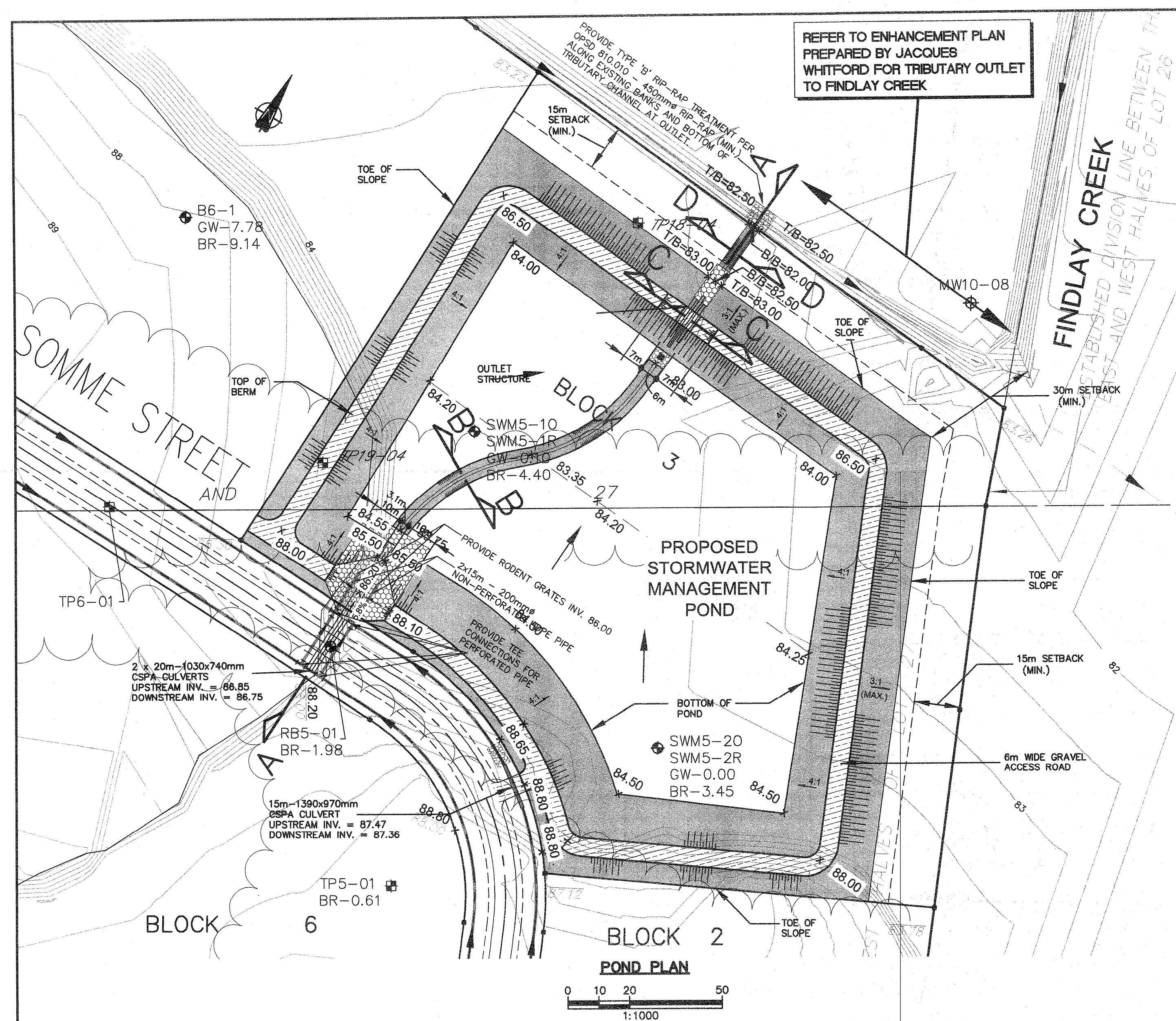
DESIGN: M.B.  
 DRAWN: T.S.  
 CHECKED: D.U.  
 PLOTTED: May 28, 2009

DRAWING NO.:  
**03**  
 JLR NO.:  
 20983



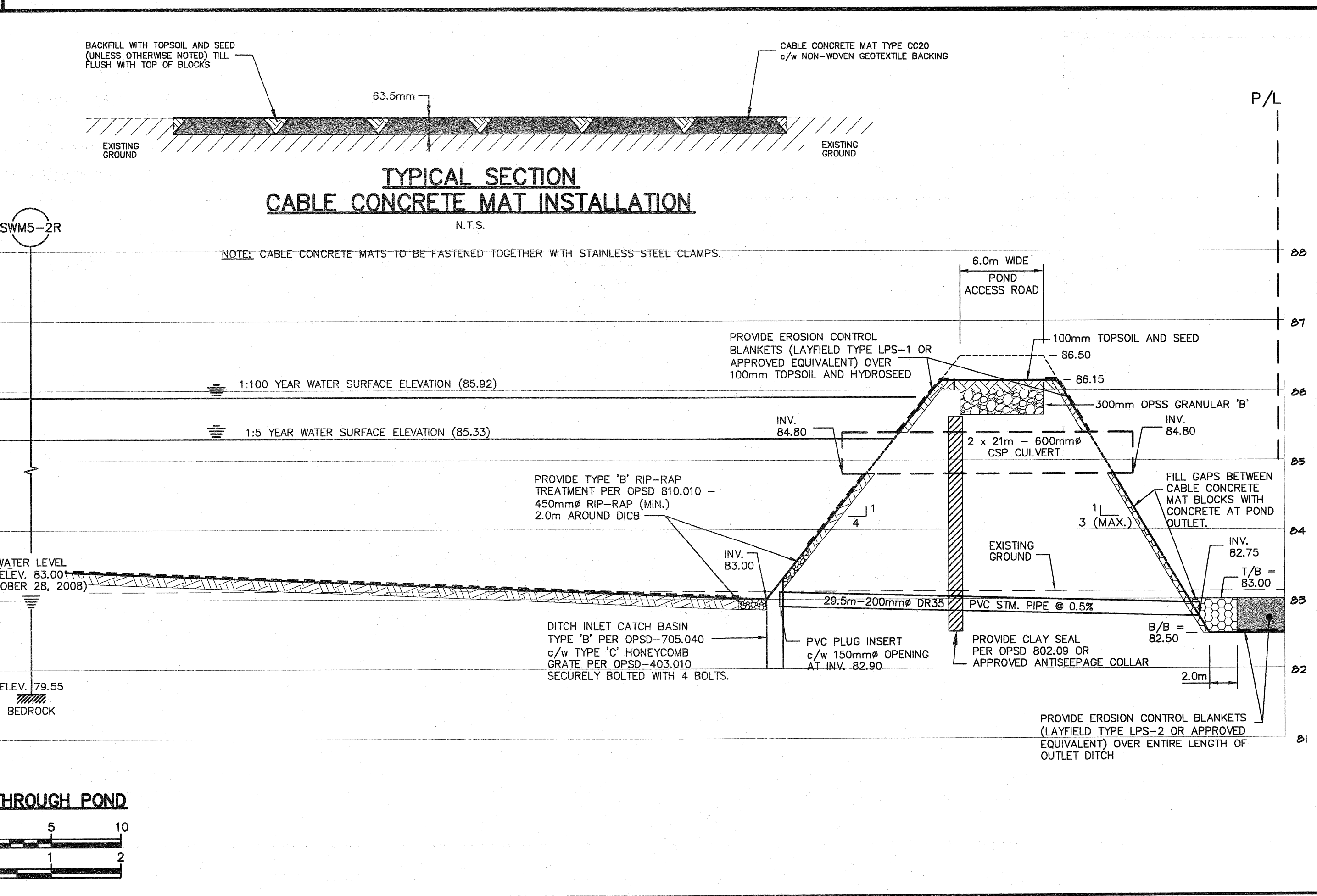
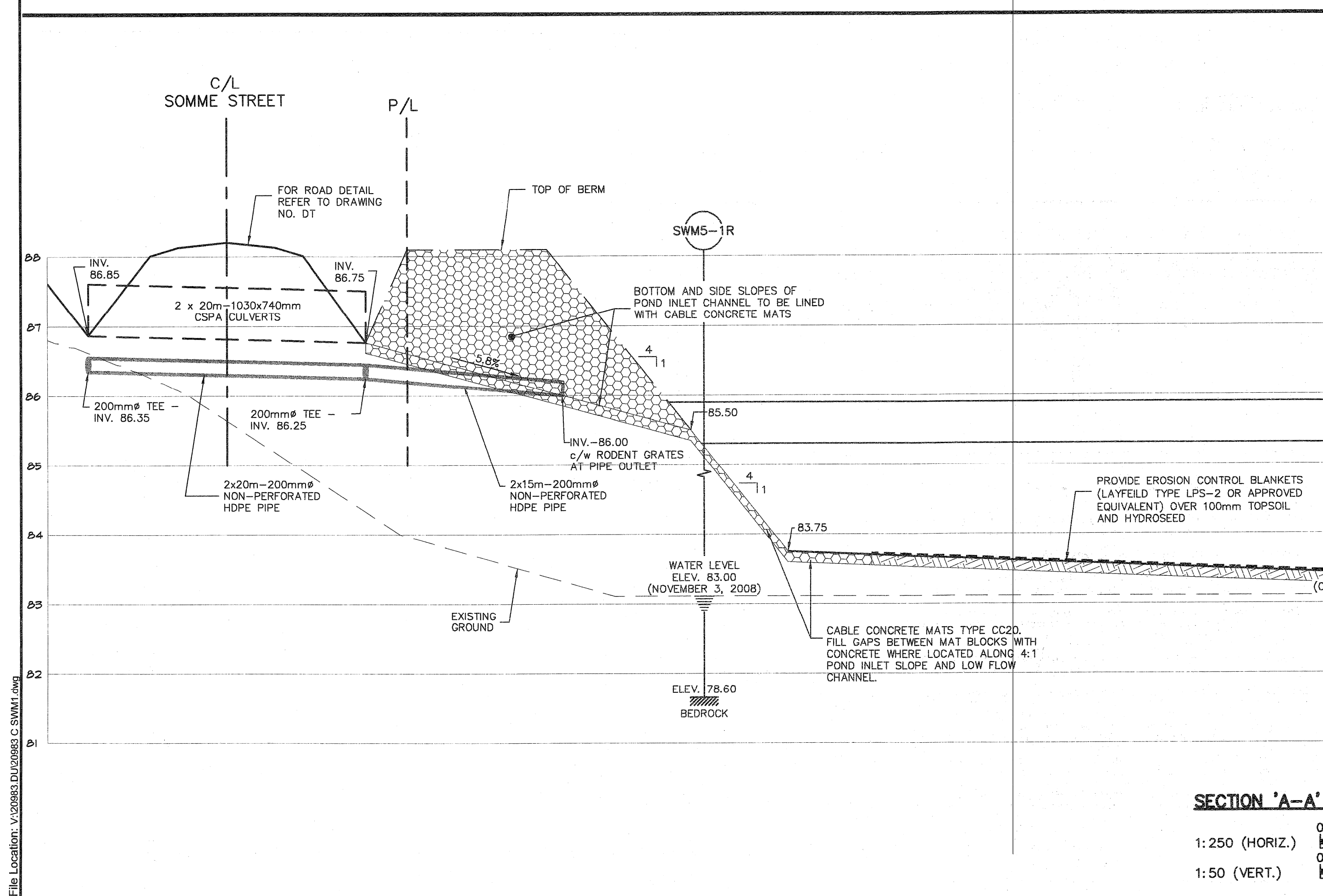
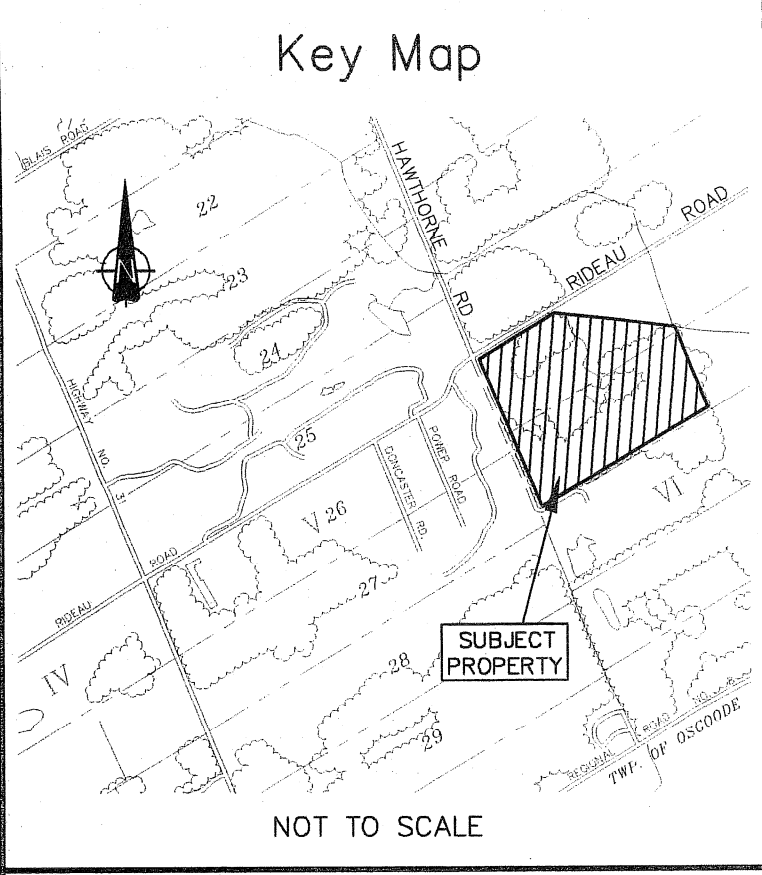
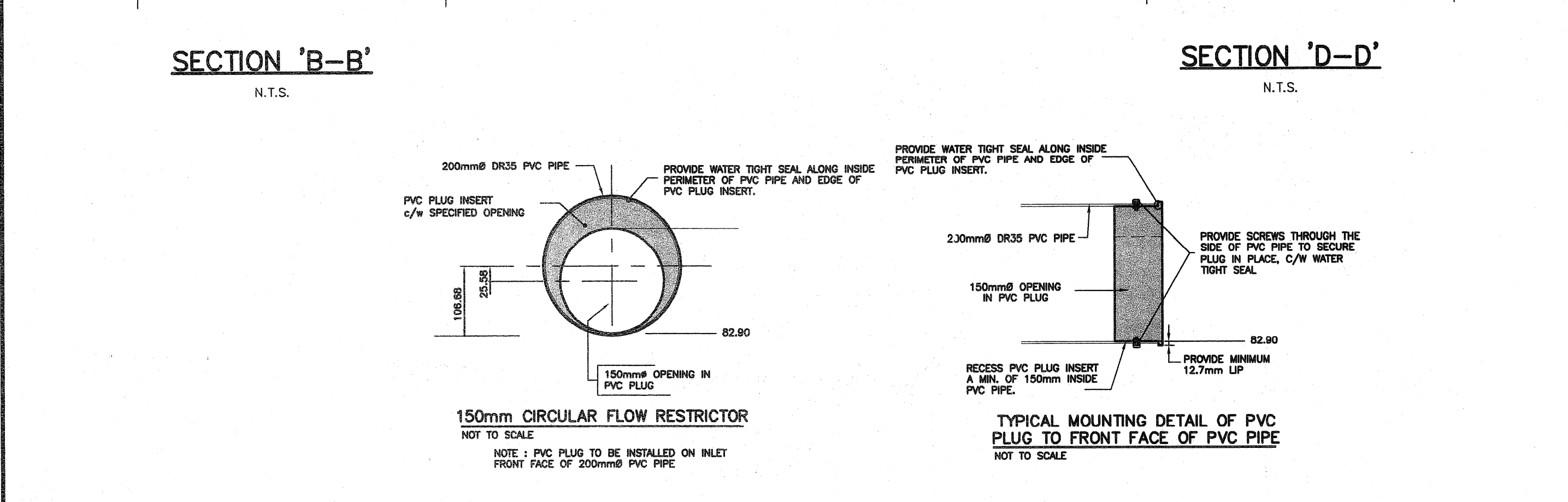
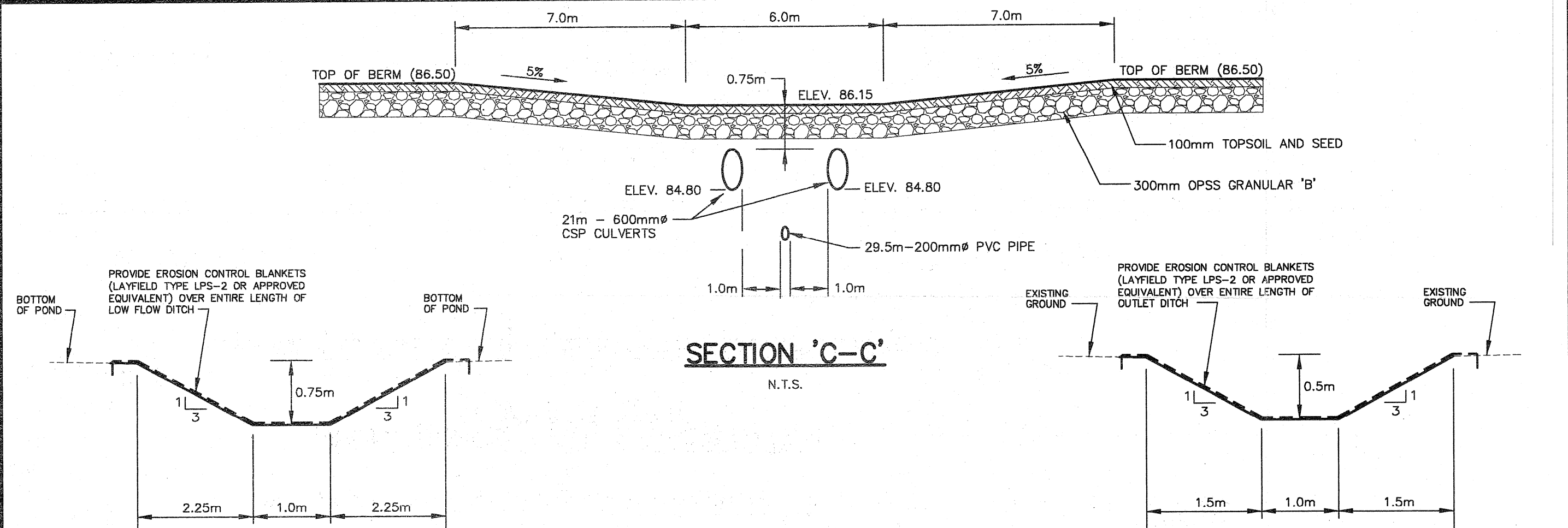
### HAWTHORNE ROAD





**LEGEND**

- X 91.70 PROPOSED ELEVATION
- PROPOSED CULVERT
- - - PROPOSED DITCH AND FLOW DIRECTION
- ||||| PROPOSED TERRACING
- ▨ PROPOSED POND ACCESS ROAD - 100mm TOPSOIL AND SEED - 300mm OPSS GRANULAR 'B'
- EROSION CONTROL BLANKET
- ▧ PROPOSED CABLE CONCRETE MATS
- B2-1, B2-3, SWM5-1R, SWM5-10 BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
- TP3-2 TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
- MW2-8 MONITORING WELL LOCATION BY CRA (2008)
- TW-3 MONITORING WELL LOCATION BY GOLDR
- TP1-04 TESTPIT LOCATION BY GOLDR ASSOCIATES LTD. (1994)
- GW-3.00 OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
- BR-8.10 ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE



NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENTS	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

NO. ISSUE DATE

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: AS SHOWN

**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

PROFESSIONAL STAMP  
 LICENSED PROFESSIONAL ENGINEER  
 D. P. UPTON  
 PROVINCE OF ONTARIO

PROJECT: HAWTHORNE INDUSTRIAL PARK

DRAWING: STORMWATER MANAGEMENT POND PLAN AND SECTIONS

DESIGN: M.B.	DRAWING NO.: SWM1
DRAWN: T.S.	JLR NO.:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	

**GENERAL NOTES FOR EROSION AND SEDIMENTATION CONTROL MEASURES DURING CONSTRUCTION**

During construction activities appropriate erosion and sediment control measures, as outlined in MNR's "Guidelines on Erosion and Sediment Control for Urban Construction Sites", shall be implemented to trap sediment on-site.

As a minimum, the following erosion and sedimentation control measures will be provided during construction:

- supply and install straw bale flow check dams (per OPSD 219.180) upstream of all culvert installations at locations shown on Drawing NO. ESC. Do not remove straw bale barriers until the upstream vegetation has been established;
- supply and install silt fence barrier (per OPSD 219.110) at locations shown on Drawing NO. ESC; and
- supply and install silt fence barrier (per OPSD 219.110) to enclose all borrow and stockpile areas resulting from topsoil stripping activities or any excavating activities (i.e. exact location to be determined during construction).

Furthermore, if dewatering and pumping operations become necessary, sediment dewatering bags shall be used to filter sediment prior to releasing groundwater into the receiving stream.

All control measures will be carried out in accordance with the following documents:

- 1) "Guidelines on Erosion and Sediment Control for Urban Construction Sites" published by Ontario Ministries of Natural Resources, Environment, Municipal Affairs, and Transportation & Communication, Association of Construction Authorities of Ontario and Urban Development Institute, Ontario, May 1987.
- 2) "Erosion and Sediment Control" Training Manual by Ministry of Environment, Spring 1998.
- 3) Applicable Regulations and guidelines of the Ministry of Natural Resources. As a minimum, during the construction of municipal services, the following Stormwater Management Practices will be used:

- Any stockpiled material will be kept on flat areas during construction, well away from any natural flow paths. In the event that the stockpile is placed in other areas where potential washoff to the conveyance system is expected, silt fences (per OPSD 219.110) will be installed to enclose the materials and prevent any washoff to the conveyance system.
- All pumped stormwater/groundwater will be filtered through sediment dewatering bags prior to its release to the receiving stream.

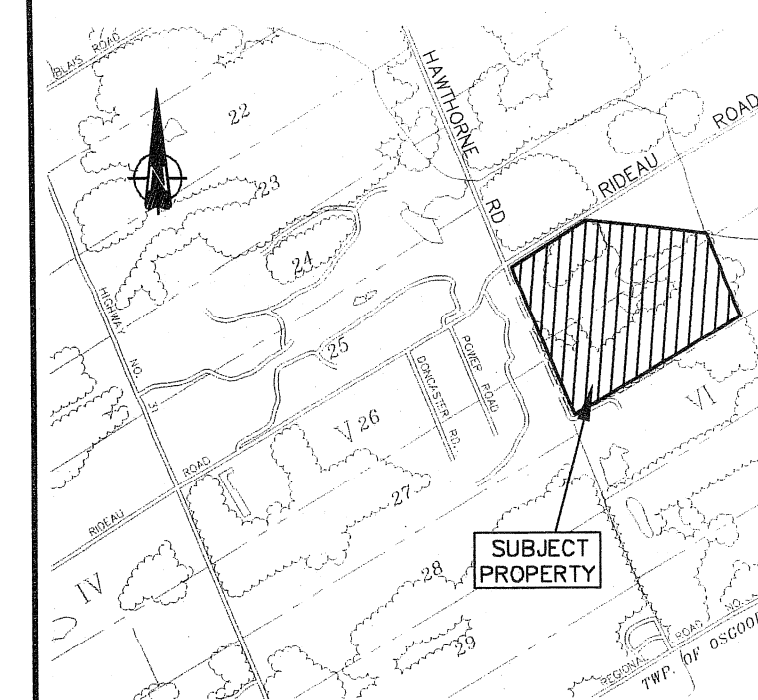
Sediment and Erosion control measures shall be implemented prior to work and maintained during the work phase by the general contractor to prevent entry of sediment into the receiving stream. All sediment and erosion control measures shall be inspected daily by the general contractor to ensure that they are functioning properly and are being maintained and/or upgraded as required. If the sediment and erosion control measures are not functioning properly, no further work shall occur until the problem has been addressed and rectified.

All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substances (i.e. petroleum products, silt, etc.) from entering the receiving stream. Vehicle and equipment re-fueling and maintenance shall be conducted away from drainage channels. Any part of equipment entering drainage channels shall be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substances from entering the receiving stream.

**GENERAL NOTES:**

1. ALL STOCKPILED EXCAVATED MATERIAL IS TO BE LOCATED A MINIMUM OF 10m FROM ALL WATERCOURSES AND IS TO BE ENCLOSED WITH A SILT SCREEN (PER OPSD 219.110) OR LIGHT-DUTY STRAW BALE BARRIER (PER OPSD 219.100).
2. ALL SILT CONTROL MEASURES ARE TO BE INSPECTED ONCE PER MONTH AND AFTER EACH SIGNIFICANT RAINFALL EVENT TOTALLING 10mm OR GREATER. GENERAL CONTRACTOR TO REPAIR AS REQUIRED.
3. HYDROSEEDING OF ALL DITCHES IS TO BE PROVIDED IMMEDIATELY FOLLOWING FINAL SHAPING/GRADING.
4. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING BEST MANAGEMENT PRACTICES TO PROVIDE PROTECTION OF THE RECEIVING WATERCOURSE DURING ALL PHASES OF CONSTRUCTION.
5. SEDIMENT AND EROSION CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR AND/OR THE LOCAL CONSERVATION AUTHORITY.

**Key Map**



NOT TO SCALE

**LEGEND**

- x 91.70 PROPOSED ELEVATION
- PROPOSED CULVERT
- PROPOSED DITCH AND FLOW DIRECTION
- PROPOSED TERRACING
- LIGHT-DUTY SILT FENCE BARRIER TO OPSD-219.110
- PROPOSED EROSION CONTROL BLANKET
- PROPOSED CABLE CONCRETE MATS
- ① PROPOSED LOCATION OF STRAW BALE FLOW CHECK DAM TO OPSD-219.180
- ② PROPOSED RIP-RAP TREATMENT TYPE 'B' TO OPSD-810.010

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: 1:2000



**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

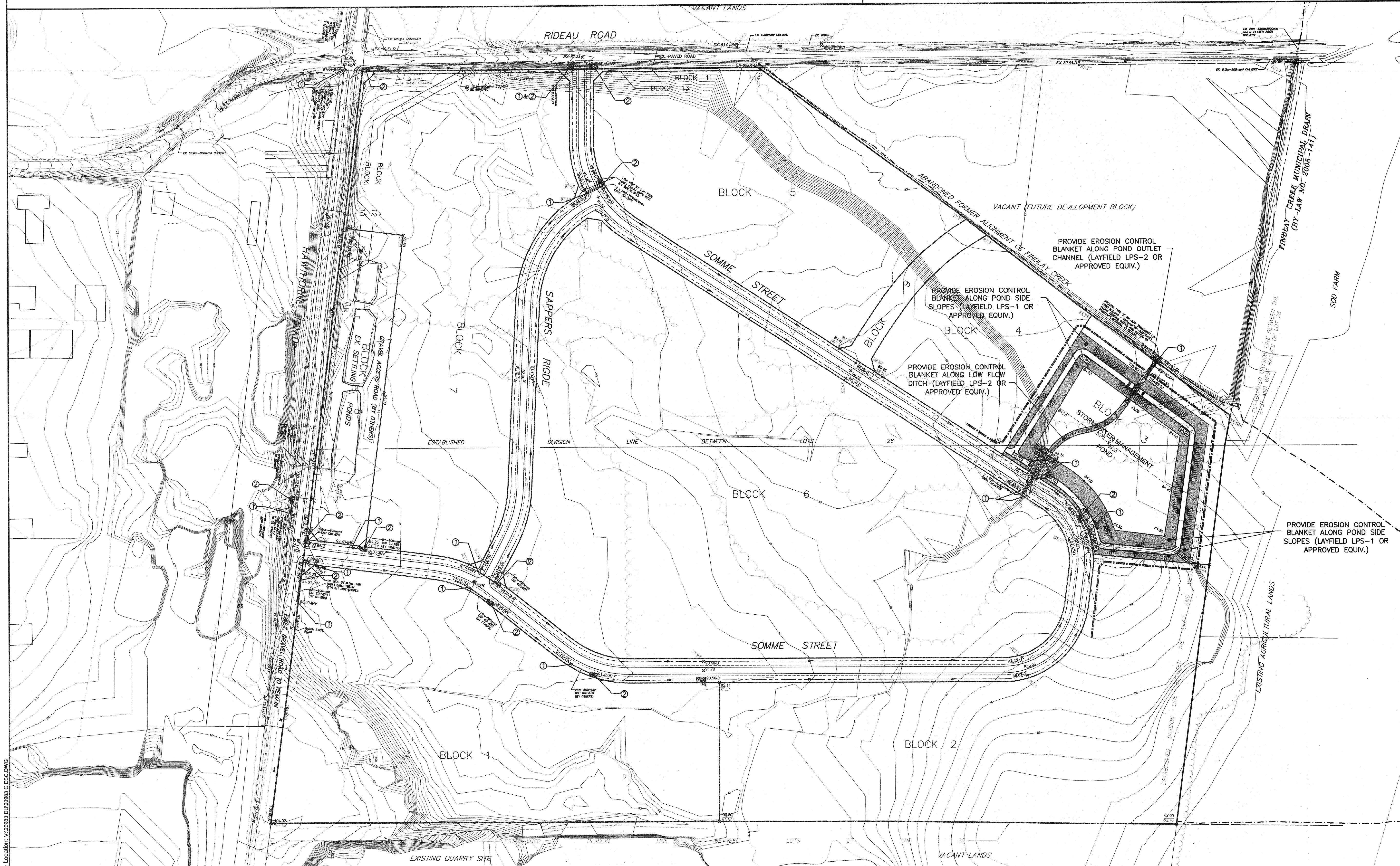
PROFESSIONAL STAMP: LICENSED PROFESSIONAL ENGINEER, D. P. UPTON, PROVINCE OF ONTARIO

PROJECT NORTH: [North Arrow]

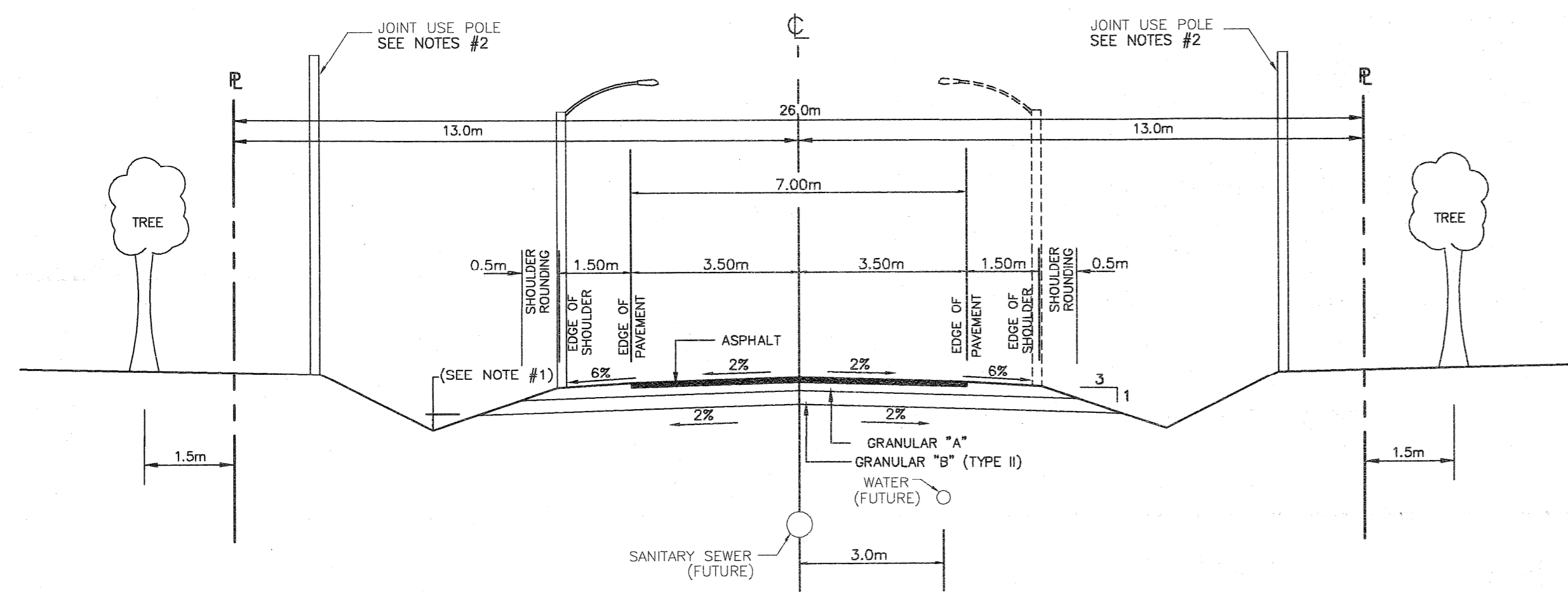
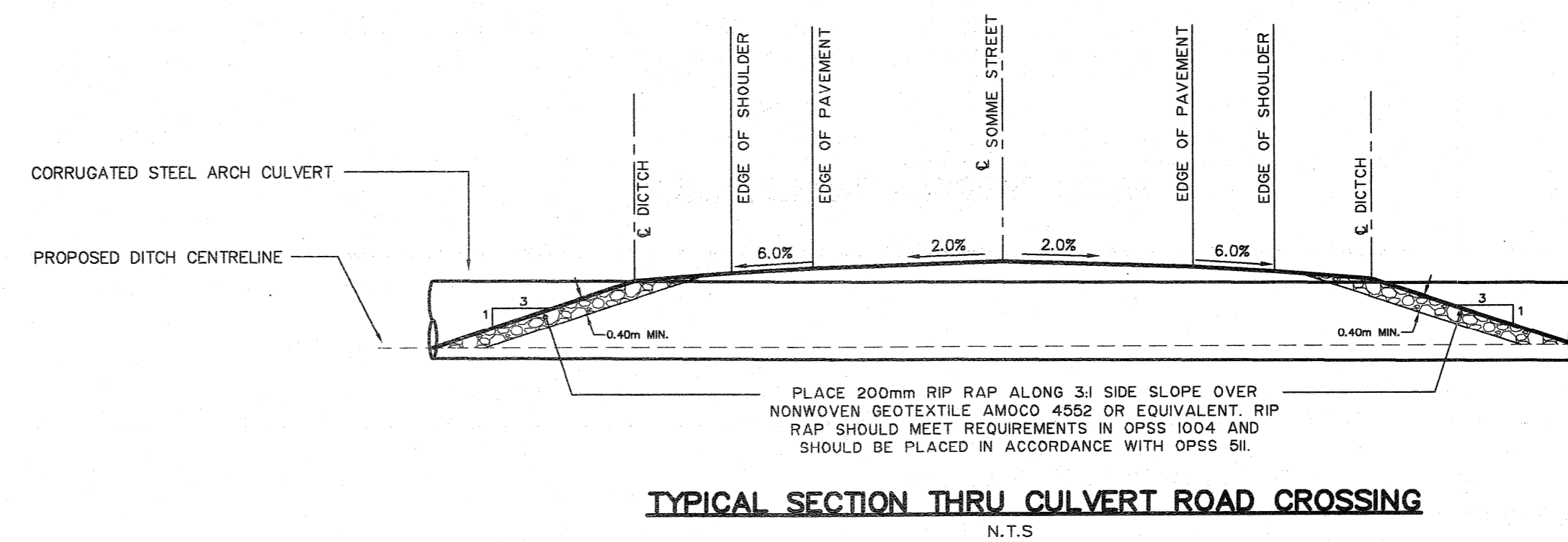
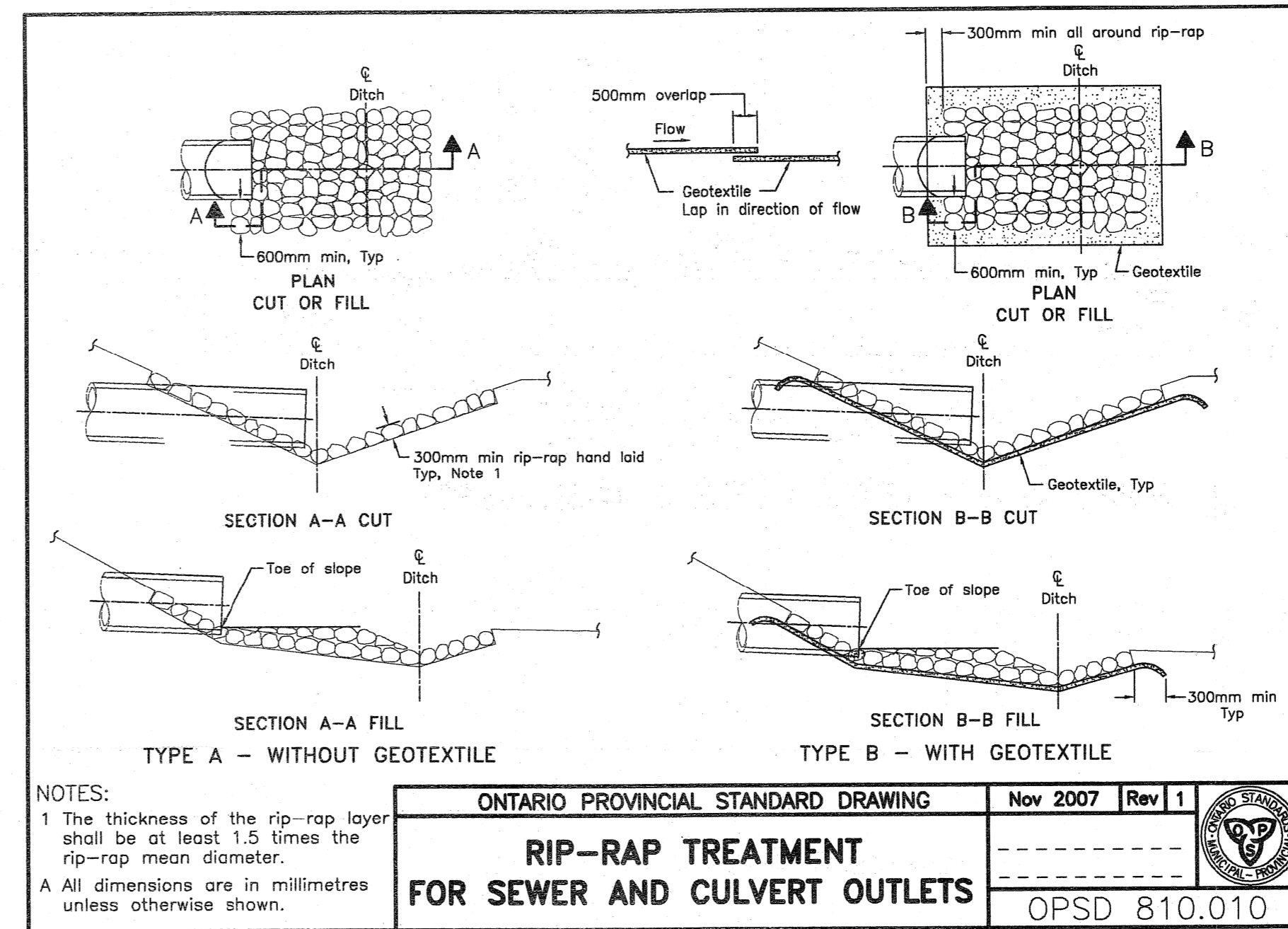
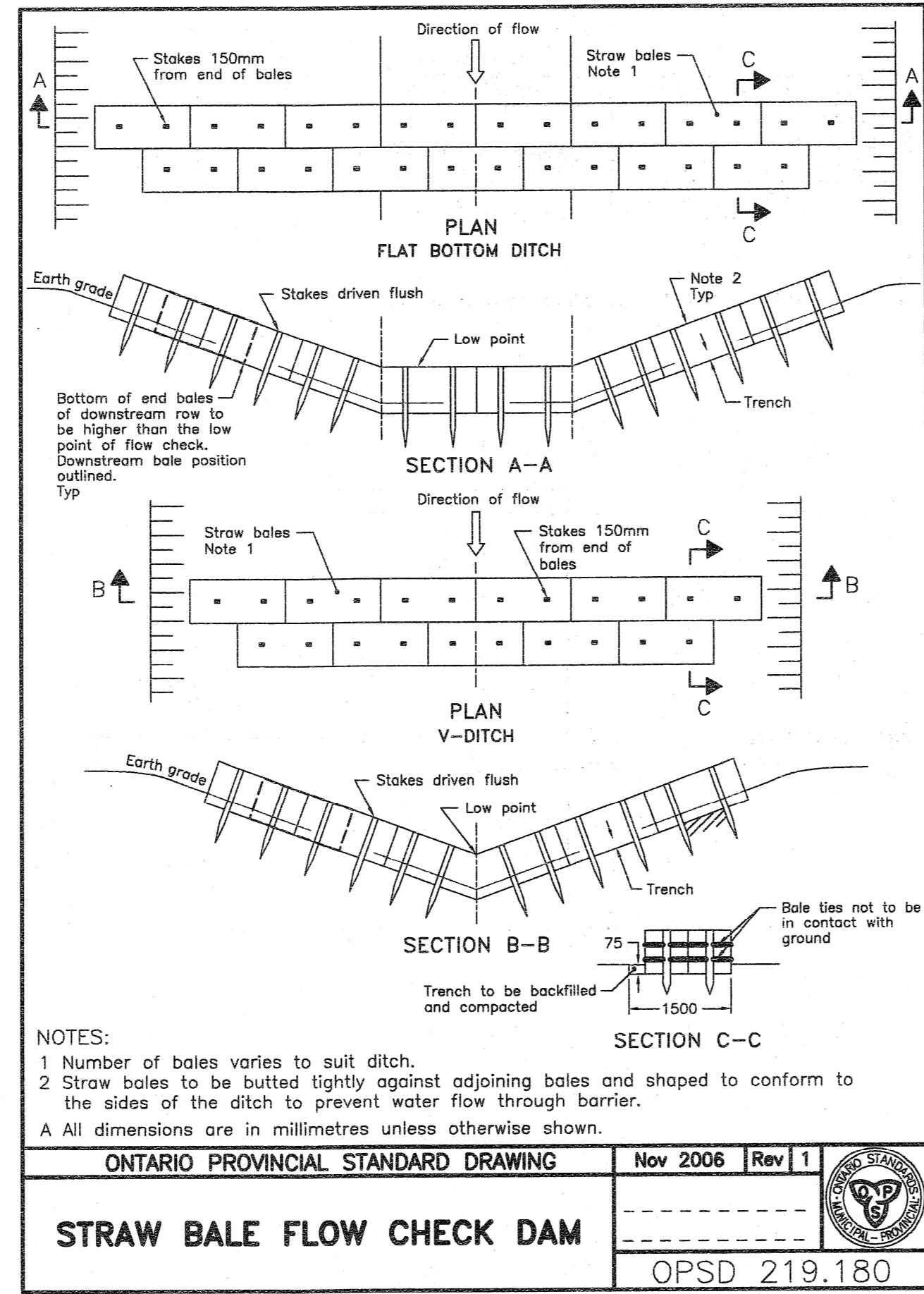
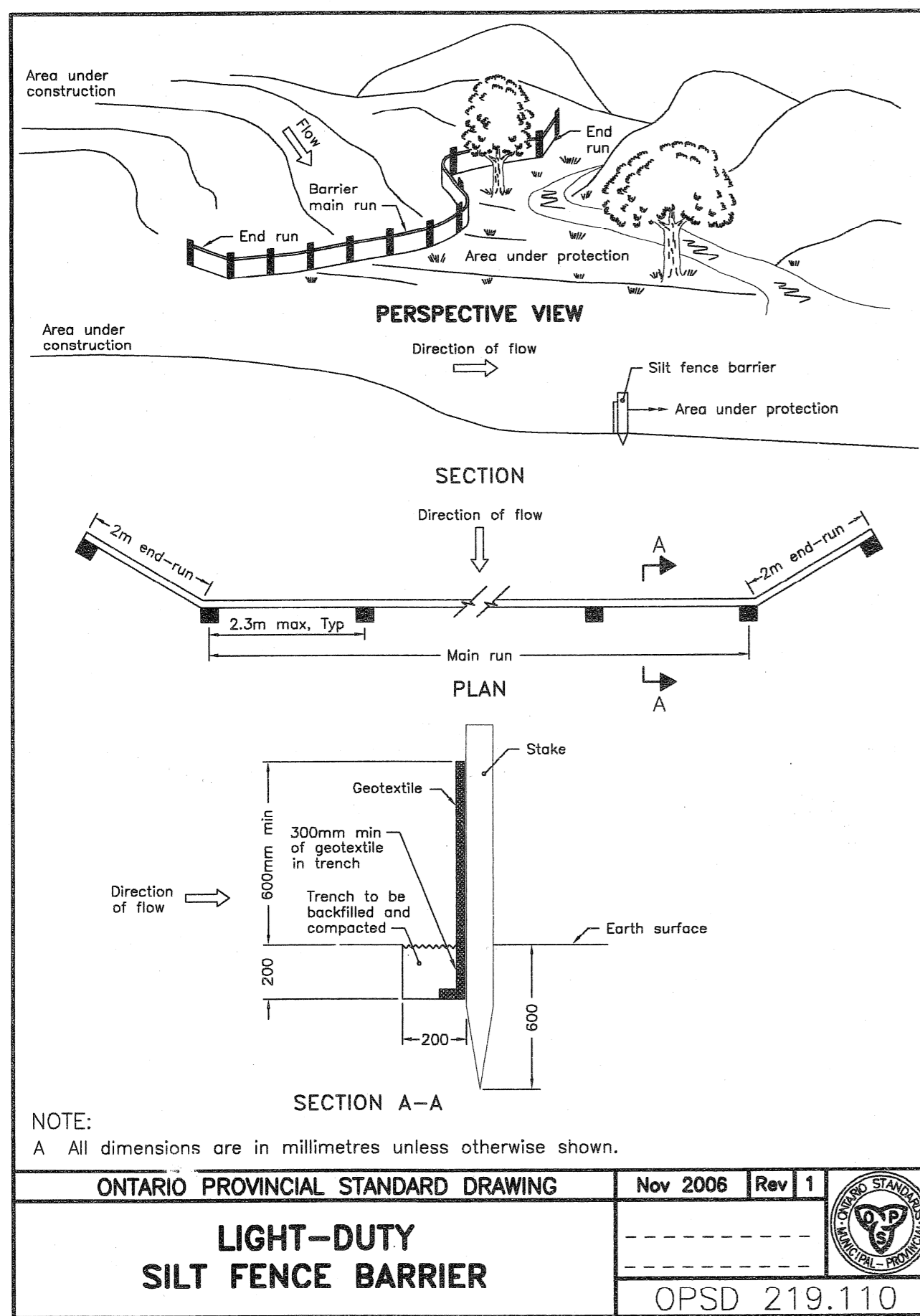
PROJECT: HAWTHORNE INDUSTRIAL PARK

DRAWING: EROSION AND SEDIMENT CONTROL PLAN

DESIGN: M.B.	DRAWING NO.: ESC
DRAWN: T.S.	JLR NO.:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	



File Location: V:\20983.DL\20983.ESC.DWG



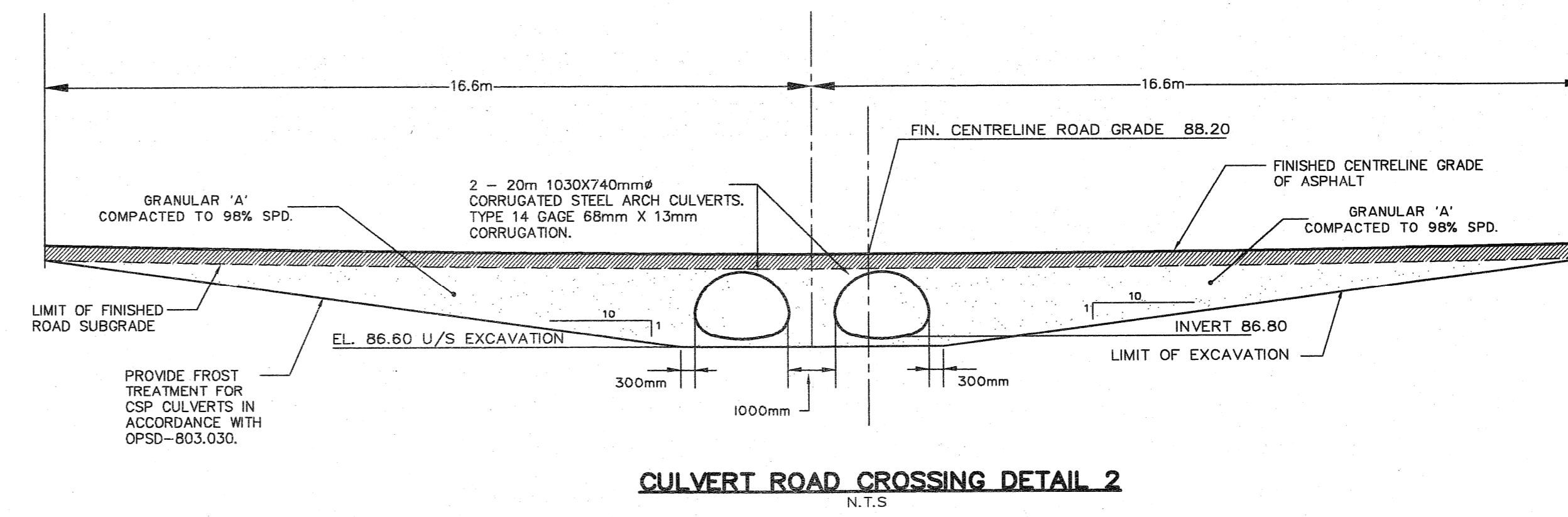
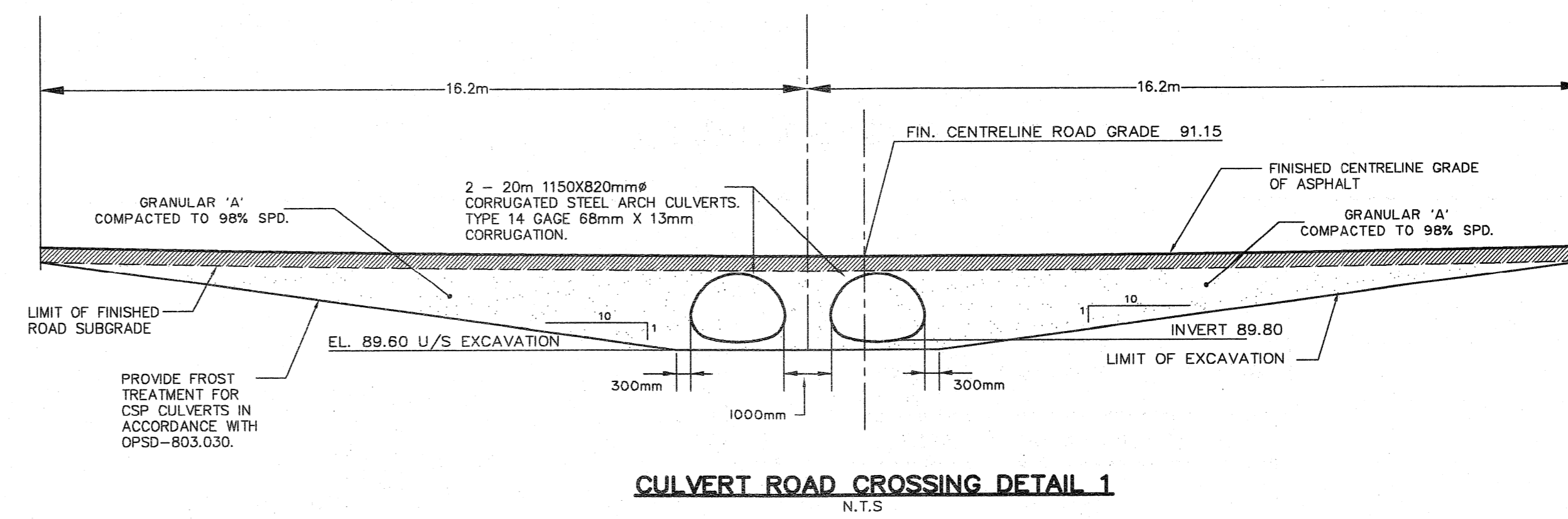
**26.0 METER ROAD ALLOWANCE RURAL SECTION**

**PAVEMENT STRUCTURE SCHEDULE**

- HAWTHORNE ROAD:**  
 - 50mm HL3 SURFACE COURSE (SUPERPAVE 12.5mm - PG58-34 LEVEL 3)  
 - 100mm HL8 BINDER COURSE (SUPERPAVE 19.0mm - PG58-34 LEVEL 3)  
 - 150mm OPSS GRANULAR "A" BASE  
 - 300mm OPSS GRANULAR "B" TYPE II SUB-BASE
- INTERNAL ACCESS ROADS:**  
 - 50mm HL3 SURFACE COURSE (SUPERPAVE 12.5mm - PG58-34 LEVEL 2)  
 - 75mm HL8 BINDER COURSE (SUPERPAVE 19.0mm - PG58-34 LEVEL 2)  
 - 150mm OPSS GRANULAR "A" BASE  
 - 300mm OPSS GRANULAR "B" TYPE II SUB-BASE

**NOTES:**

- DITCHES SHALL BE CONSTRUCTED TO A MINIMUM OF 500mm BELOW SUBGRADE ELEVATION.
- JOINT USE POLES WILL BE USED FOR OVERHEAD UTILITIES. THE POLES SHALL BE LOCATED 1.0m FROM PROPERTY LINE..
- SHOULDER ON COLLECTOR STREET TO BE SURFACE TREATED, WHERE REQUIRED BY CITY ENGINEER.
- SUB-EXCAVATE SOFT AREAS IN SUBBASE AND FILL WITH GRANULAR "B" COMPACTED IN 0.15m LAYERS.
- ALL MATERIALS TO BE SUPPLIED AND PLACED AS PER O.P.S.S. STANDARDS AND SPECIFICATIONS.
- DEPTH OF GRANULAR "B" TO BE INCREASED AS REQUIRED BY SOIL CONDITIONS.
- AREA FROM THE EDGE OF SHOULDER TO THE PROPERTY LINE IS TO BE SODDED OR SEEDED.
- ALL SERVICES INDICATED MAY NOT NECESSARILY APPLY AT THIS TIME.
- LIGHT STANDARDS TO BE LOCATED 1.5m FROM EDGE OF ASPHALT.
- TYPE II GRANULAR "B" IS CRUSHED ROCK.
- ALL DRIVEWAY CULVERTS TO BE 500mm DIA CSP UNLESS OTHERWISE NOTED.
- ALL INTERSECTION RADII TO BE PAVED PER OPSS 304.01
- ROADWAY CONSTRUCTION IS TO BE AS PER THE GEOTECHNICAL RECOMMENDATIONS PROVIDED BY INSPEC-SOL INC. (REPORT NO. T020556-A1 DATED JAN. 30, 2009)



NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: N.T.S.

**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

PROFESSIONAL STAMP  
 PROJECT NORTH  
 LICENSED PROFESSIONAL ENGINEER  
 D. P. UPTON  
 PROVINCE OF ONTARIO

PROJECT: **HAWTHORNE INDUSTRIAL PARK**

DRAWING: **DETAILS**

DESIGN: M.B.	DRAWING NO.: <b>DT</b>
DRAWN: T.S.	JLR NO.:
CHECKED: D.U.	PLOTTED: May 29, 2009
	20983

**APPENDIX 'A'**

**RATIONAL METHOD DESIGN SHEETS  
(1:10 year and 1:100 year Design Sheets)**



Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

Checked by: G. Forget, P.Eng.

1:10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW	U/S	D/S				
	FROM	TO	Area at C of		SUM(A)	SUM(A°C)	TOTAL A°C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)	TIME (min)	Inv (m)	Inv (m)	
			0.70 (ha)	0.90 (ha)																											
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.35	0.35	0.97	0.97	15.00	97.85	94.6	0.00	0.32	1.20	3.00	0.61	226.9	7702.7	0.74	189.60								4.28	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.35	0.00	0.97	19.28	84.12	81.3					0.50				20.00	1	600	----	NO	YES	0.52	1.16	92.50	92.40	
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.10	2.44	5.83	6.80	20.44	81.10	551.2	0.00	0.47	1.20	3.00	0.73	694.0	8450.7	1.05	272.58								4.34	92.40	90.41
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	2.71	5.15	7.53	14.33	24.77	71.65	1026.7	0.00	0.61	1.20	3.00	0.54	1198.8	7283.5	1.07	245.24								3.81	90.41	89.08
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.64	5.79	1.78	16.11	28.58	65.15	1049.5	0.00	0.62	1.20	3.00	0.53	1239.6	7212.0	1.07	86.51								1.34	89.08	88.62
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.33	6.13	0.92	17.03	29.92	63.16	1075.8	0.00	0.58	1.20	3.00	0.70	1191.6	8282.1	1.18	94.12								1.33	88.62	87.96
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.67	6.80	1.86	18.89	31.25	61.31	1158.5	0.00	0.58	1.20	3.00	0.97	1402.6	9748.4	1.39	124.55								1.49	87.96	86.75
										32.74																					
CULVERT CROSSING	22	19		0.00	0.00	0.00	15.59	0.00	43.33	32.74	59.38	2573.1					0.50				20.00	2	----	1.03 X 0.74	YES	NO	1.30	0.08	86.85	86.75	
										32.82																					
POND INLET	19	POND		0.00	0.00	0.00	35.97	0.00	100.06	38.67	52.87	5422.6	3.09	0.38	1.20	3.00	5.68	5629.1	13135.2	3.50	22.00								0.10	86.75	85.50
POND OUTLET DITCH	POND	DITCH	1:10 year controlled post development peak flow = 696 l/s, see SWMHYMO output of this Report										1.00	0.27	0.38	3.00	2.08	750.9	1506.6	1.54	24.00							0.26	82.50	82.00	

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030





Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA						CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT				FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)					
	FROM	TO	Area at C of		SUM(A)	SUM(A*1.25°C) 25% increase in C factor	TOTAL A°C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)				INLET CONTROL	OUTLET CONTROL			
			0.70 (ha)	0.90 (ha)																										
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.40	0.40	1.12	1.12	15.00	142.89	160.5	0.00	1.20	3.00	0.61	7702.7	1.78	189.60									1.77	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.40	0.00	1.12	16.77	133.71	150.2				0.50			20.00	1	600	----	NO	YES			0.63	92.50	92.40	
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.58	2.98	7.16	8.29	17.40	130.77	1083.6				0.73	8450.7	1.96	272.58								2.32	92.40	90.41	
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	3.35	6.33	9.31	17.59	19.72	121.01	2128.9				0.54	7283.5	1.69	245.24								2.42	90.41	89.08	
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.79	7.11	2.19	19.78	22.15	112.40	2223.0				0.53	7212.0	1.67	86.51								0.86	89.08	88.62	
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.40	7.51	1.11	20.89	23.01	109.65	2290.7				0.70	8282.1	1.92	94.12								0.82	88.62	87.96	
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.82	8.33	2.27	23.16	23.83	107.18	2482.3				0.97	9748.4	2.26	124.55								0.92	87.96	86.75	
										24.75																				
CULVERT CROSSING	22	19		0.00	0.00	0.00	19.16	0.00	53.26	24.75	104.53	5567.5				0.50			20.00	2	----	1.03 X 0.74	YES	NO			0.04	86.85	86.75	
										24.79																				
POND INLET	19	POND		0.00	0.00	0.00	44.32	0.00	123.22	25.80	101.69	12813.8				5.68	13135.2	4.09	22.00								0.09	86.75	85.50	
POND OUTLET DITCH	POND	DITCH	1:100 year controlled post development peak flow = 1,432 l/s, see SWMHYMO output of this Report																											

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030



Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983  
February 2009

Checked by: G. Forget, P.Eng.

10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA						PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA						CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)						
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels				DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)	
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																											
<b>NORTH CATCHMENT AREA</b>																																	
Existing 900 mm dia. culvert capacity before ditch flows to Findlay Creek																																	
														1400.0																			
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	1.80	1.80	5.00	5.00	20.00	97.26		0.00	0.58	1.50	3.00	1.93	1974.3	24880.1	1.96	400.00							3.41	90.71	83.01	
												23.41																					
EXISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.06	0.00	5.74	23.41	87.93																				
												23.55																					
<b>SOUTH CATCHMENT AREA</b>																																	
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.48	13.16	1.33	36.58	37.84	53.68	3363.5	0.00	1.17	2.20	3.00	0.14	3437.1	18513.7	0.84	347.24								6.91	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.38	13.53	1.04	37.62	44.76	47.64	3192.1	0.00	0.90	2.20	3.00	0.51	3287.0	35640.2	1.35	236.20								2.91	82.56	81.35

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030



Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA					CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT				FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)					
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*1.25 <sup>C</sup> ) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)				B x D (m)	INLET CONTROL	OUTLET CONTROL		
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																									
<b>NORTH CATCHMENT AREA</b>																															
Existing 900 mm dia. Culvert Capacity before ditch flows to Findlay Creek																															
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	2.19	2.19	6.07	6.07	20.00	119.95	2128.6	0.00	1.50	3.00	1.93	24880.1	3.69	400.00								1.81	90.71	83.01
												21.81																			
NORTH SIDE RIDEAU ROAD	33	32	0.87			0.10	0.97	0.32	0.32	0.88	0.88	15.00	142.89	126.1	0.00	1.50	3.00	0.16	7240.8	1.07	92.00								1.43	83.16	83.01
												16.43																			
EXISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.50	0.00	6.96	21.81	113.52	2189.7				-0.15			20.00	1	1000						0.12	83.01	83.04
												21.93																			
<b>SOUTH CATCHMENT AREA</b>																															
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.56	15.91	1.54	44.24	27.18	98.22	5745.1	0.00	2.20	3.00	0.14	18513.7	1.28	347.24								4.54	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.43	16.34	1.20	45.44	31.72	88.42	5417.3	0.00	2.20	3.00	0.51	35640.2	2.45	236.20								1.60	82.56	81.35

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

**HAWTHORNE INDUSTRIAL PARK**

**1:10 YEAR ROADSIDE CULVERT DESIGN**

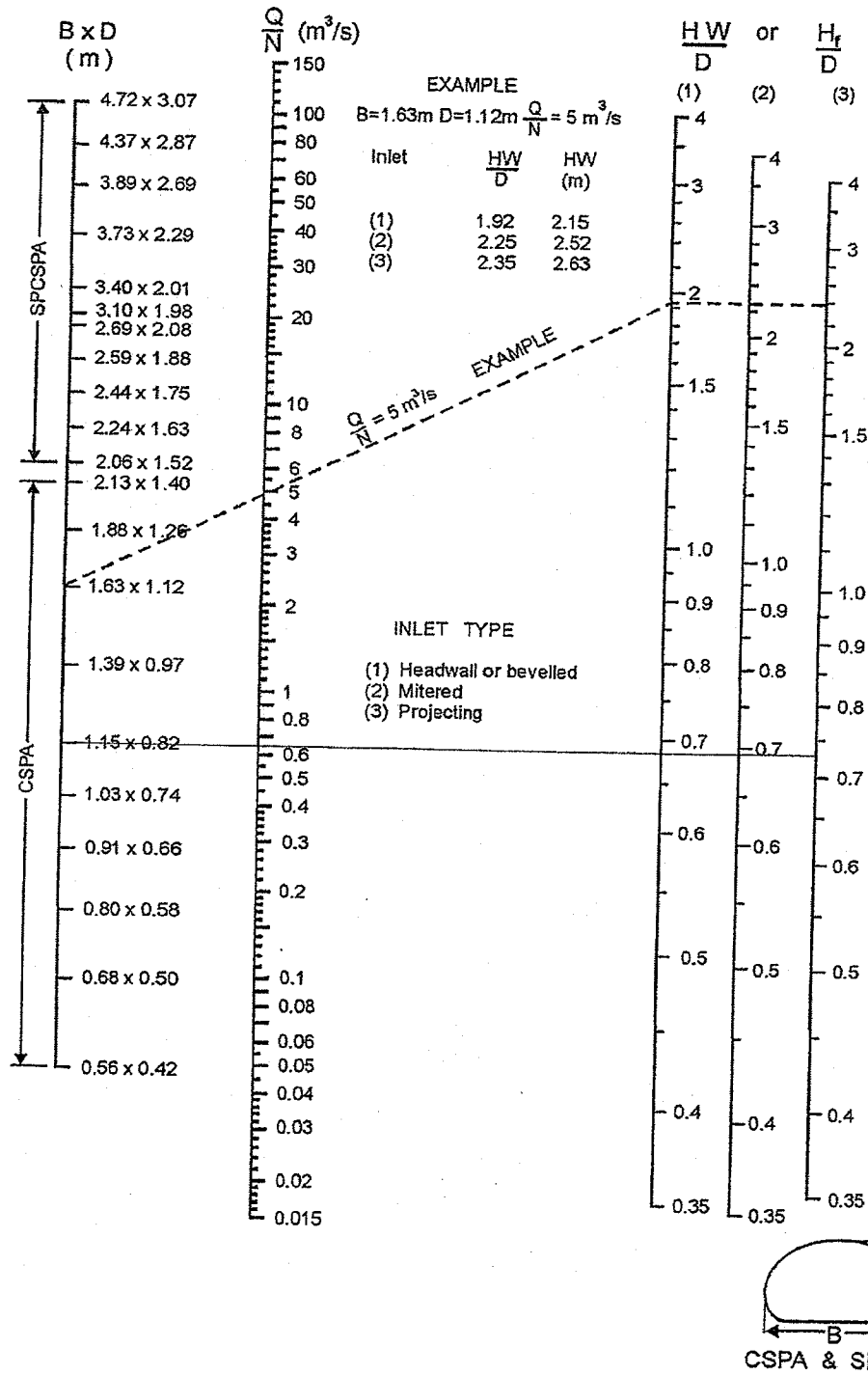
**CONVENTIONAL CULVERT DESIGN**

Prepared by: Mark Buchanan, E.I.T.  
 Reviewed by: Guy Forget, P.Eng.  
 Date: February 2009

Station	DESIGN DATA							CULVERT DATA						INLET CONTROL			OUTLET CONTROL					GOVERNING HW	VEL V <sub>o</sub>			
	Q (m <sup>3</sup> /s)	d (m)	d <sub>o</sub> (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	B (m)	D or H (m)	N	Q/N (m <sup>3</sup> /s)	A (each) (m <sup>2</sup> )	Q/NB (m <sup>3</sup> /s/m)	HW/D	HW (m)	K <sub>e</sub>	H (m)	d <sub>c</sub> (m)	(d <sub>c</sub> + D)/2 (m)	TW (m)			h <sub>o</sub> (m)	LS (m)	HW (m)
1	2	3	4	5	6	7	8	9	10a	10b	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6 to 14	1.296	0.67	0.05	1.1	0	20.0	0.005	CSPA 6	1.15	0.82	2	0.648	0.74	---	0.73	0.60	0.9	0.13	0.33	0.58	0.72	0.72	0.10	0.75	0.75	
23B to 23C	0.051	0.22	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.051	0.20	---	0.50	0.25	0.9	0.1	0.15	0.33	0.27	0.33	0.10	0.33	0.33	
24A to 24B	0.075	0.25	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.075	0.20	---	0.54	0.27	0.9	0.1	0.18	0.34	0.30	0.34	0.10	0.34	0.34	
2 to 9	0.081	0.47	0.05	1.15	0	20.0	0.005	CSP 600	N/A	0.6	1	0.081	0.28	---	0.50	0.30	0.9	0.1	0.19	0.40	0.52	0.52	0.10	0.52	0.52	
27B to 27C	1.304	0.61	0.05	1.23	0	15.0	0.007	CSPA 7	1.39	0.97	1	1.304	1.06	---	0.90	0.87	0.9	0.22	0.45	0.71	0.66	0.71	0.11	0.82	0.87	
22 to 19	2.573	0.38	0.05	1.35	0	20.0	0.005	CSPA 5	1.03	0.74	2	1.287	0.61	---	1.75	1.30	0.9	0.74	0.51	0.63	0.43	0.63	0.10	1.27	1.30	
<p>2 From Form PH-D-533, col. 12                      3 Flood Depth                      4 Embedment below channel invert                      5 Col. 3 + col. 4 + allowable backwater                      7 Allowance for skew if applicable</p> <p>8 Culvert Slope                      10a/b D (circular) or B x H (arch)                      11 Number of Barrels                      13 Area per barrel                      14 For box only</p> <p>15 Charts D5-1A to C and E to J                      16 HW = col. 15 x D (col. 10)                      17 Chart D5-8                      18 Charts D5-2A to G                      19 Charts D5-3A to F: (d<sub>c</sub> &gt; D)</p> <p>21 Col. 3 + col. 4                      22 H<sub>o</sub> = larger of cols. 20 and 21                      23 Col. 7 x col. 8                      24 HW = col. 18 + col. 22 - col. 23                      25 Larger of cols 16 and 24</p> <p>26 Outlet velocity if required (Subsection 3.2.3)</p>																										

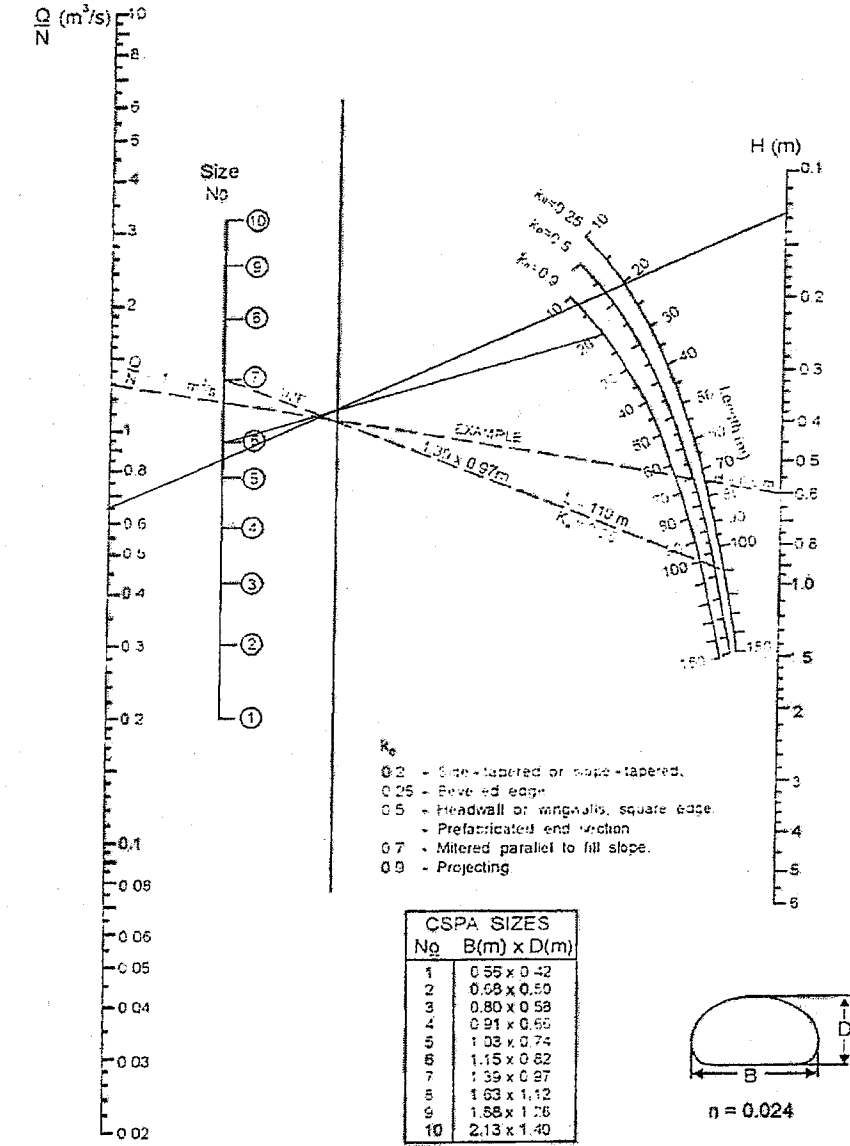
Culvert Crossing  $\diamond 6-14$   $2 \times 1.15 \text{ m} \times 0.82 \text{ m}$

**Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts**



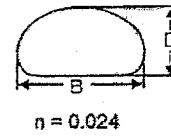
Source: Herr (1977)

**Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full**



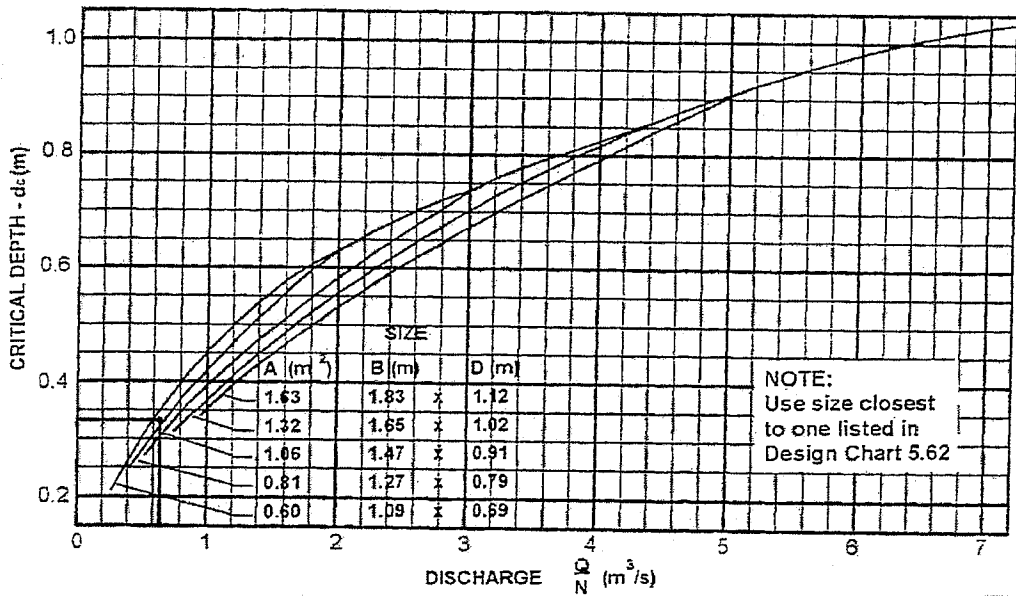
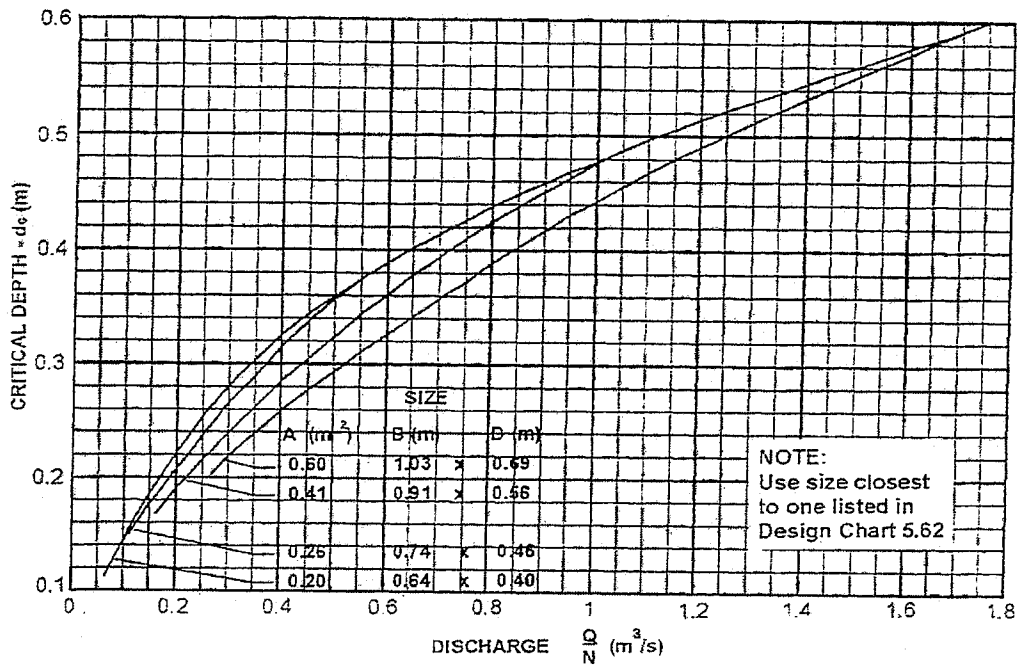
- $K_e$
- 0.2 - Side-tapered or slope-tapered.
  - 0.25 - Beveled edge.
  - 0.5 - Headwall or wingwalls, square edge.
  - Prefabricated end section.
  - 0.7 - Mitered parallel to fill slope.
  - 0.9 - Projecting.

CSPA SIZES	
No	B(m) x D(m)
1	0.55 x 0.42
2	0.68 x 0.50
3	0.80 x 0.58
4	0.91 x 0.65
5	1.03 x 0.74
6	1.15 x 0.82
7	1.35 x 0.97
8	1.63 x 1.12
9	1.88 x 1.26
10	2.13 x 1.40

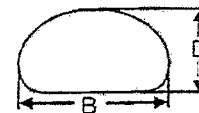




**Design Chart 5.53: CSP Pipe Arch Culverts**



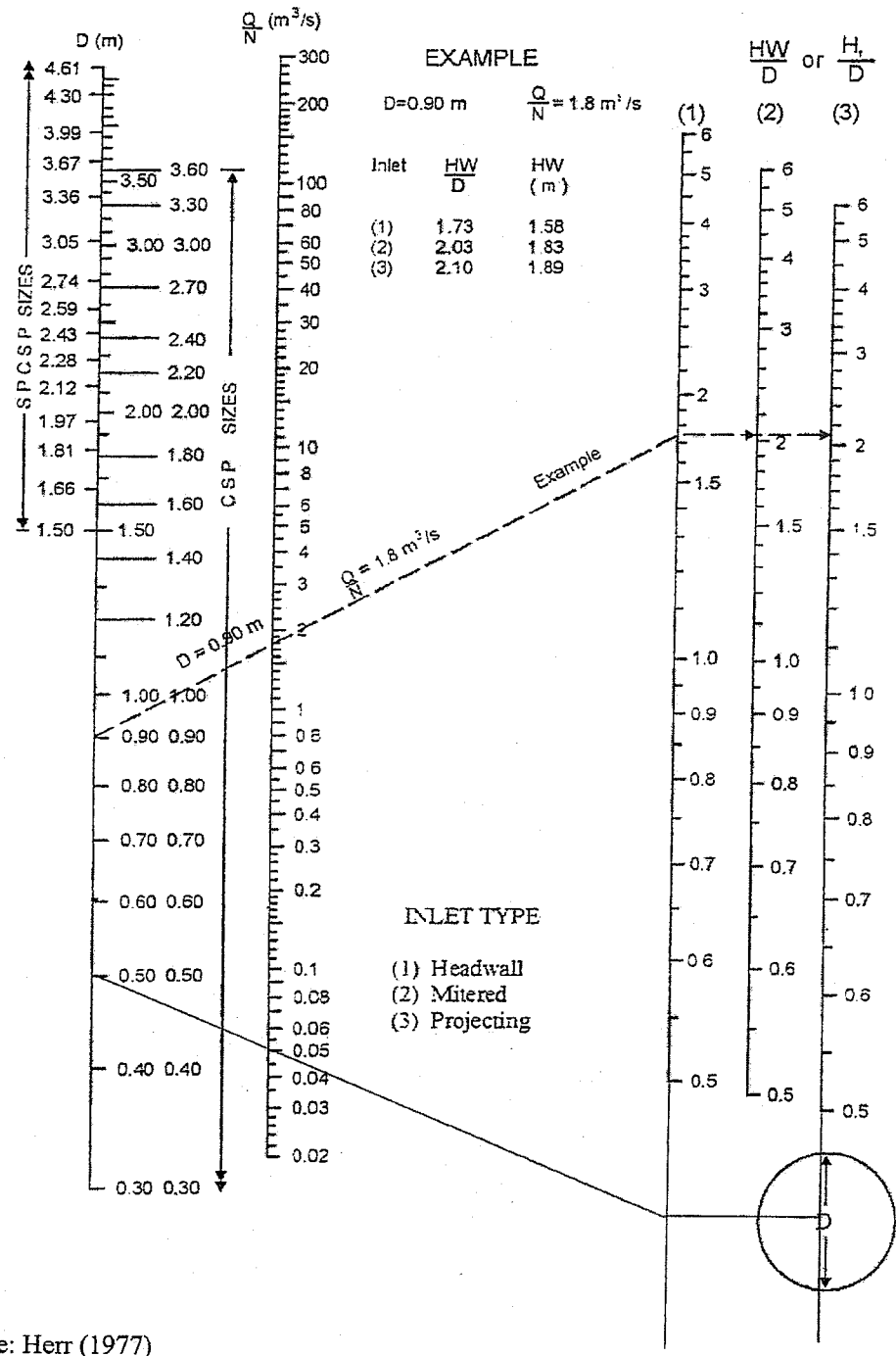
$(d_c \geq D)$   
 A = Cross-sectional area per barrel interpolated for other sizes



Source: Herr (1977)

Culvert Crossing  $\diamond 23b$  to  $\diamond 23c$  500mm  $\emptyset$

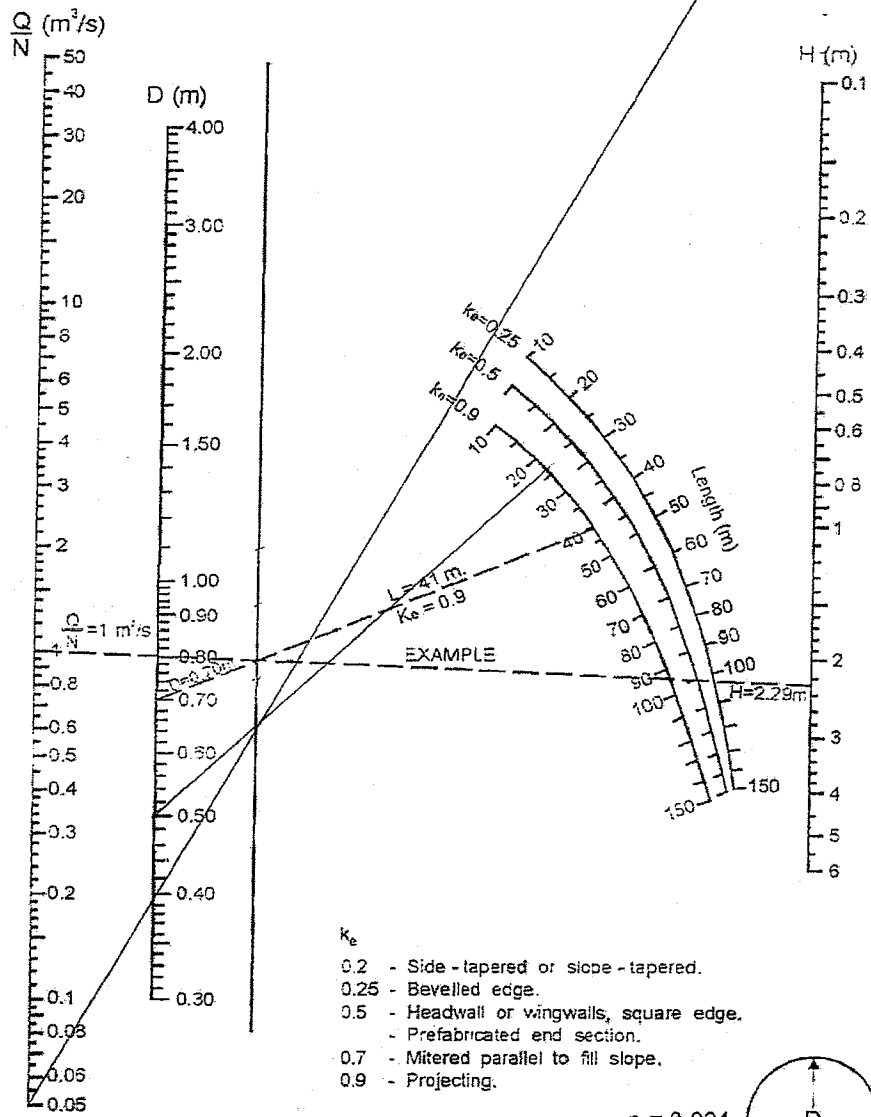
**Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts**



Source: Herr (1977)

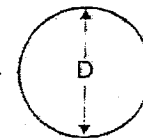
**Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full**

$H < 0.1 m$



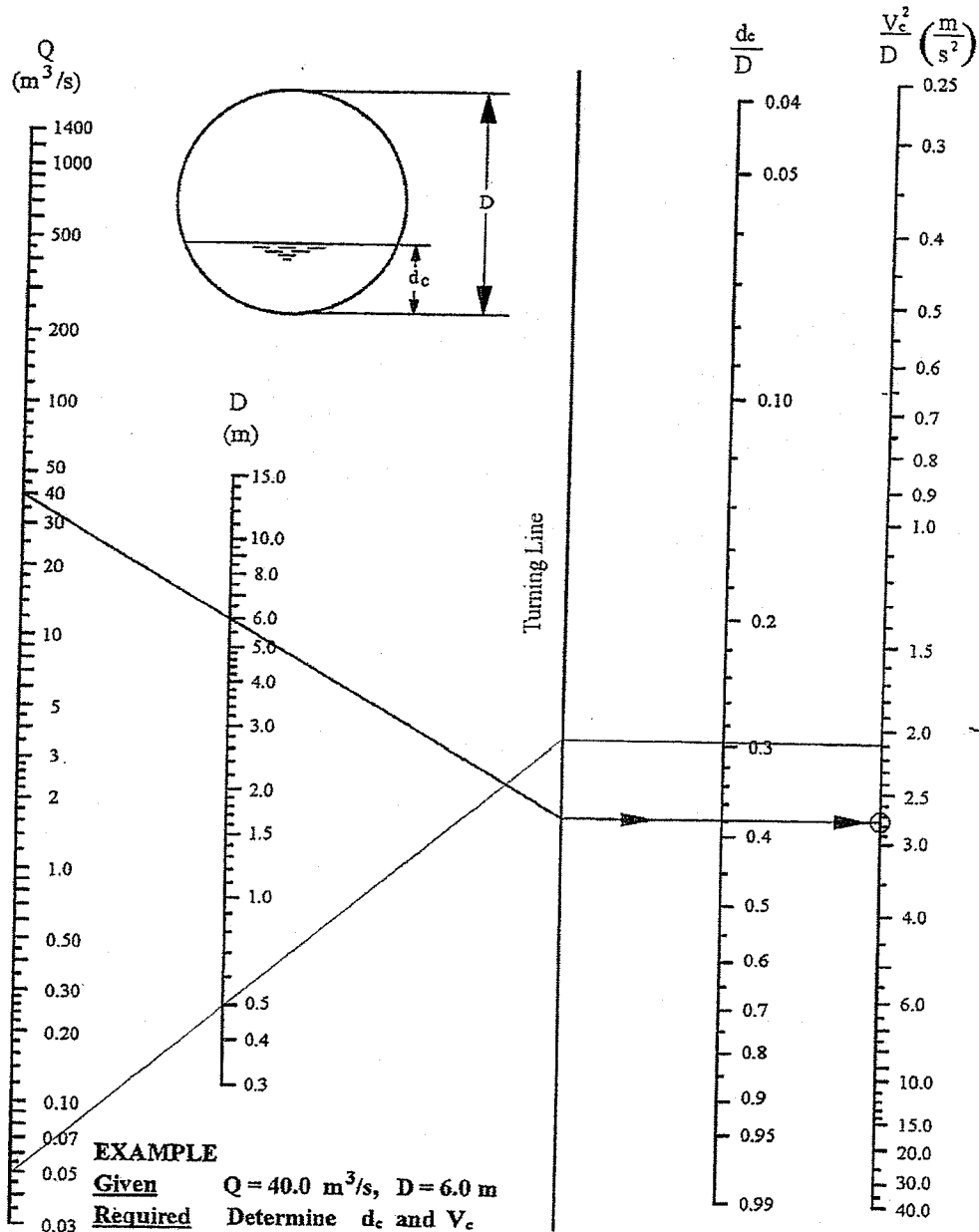
- $k_e$
- 0.2 - Side-tapered or slope-tapered.
  - 0.25 - Bevelled edge.
  - 0.5 - Headwall or wingwalls, square edge.
  - 0.7 - Prefabricated end section.
  - 0.9 - Mitered parallel to fill slope.
  - 0.9 - Projecting.

$n = 0.024$



Source: Herr (1977)

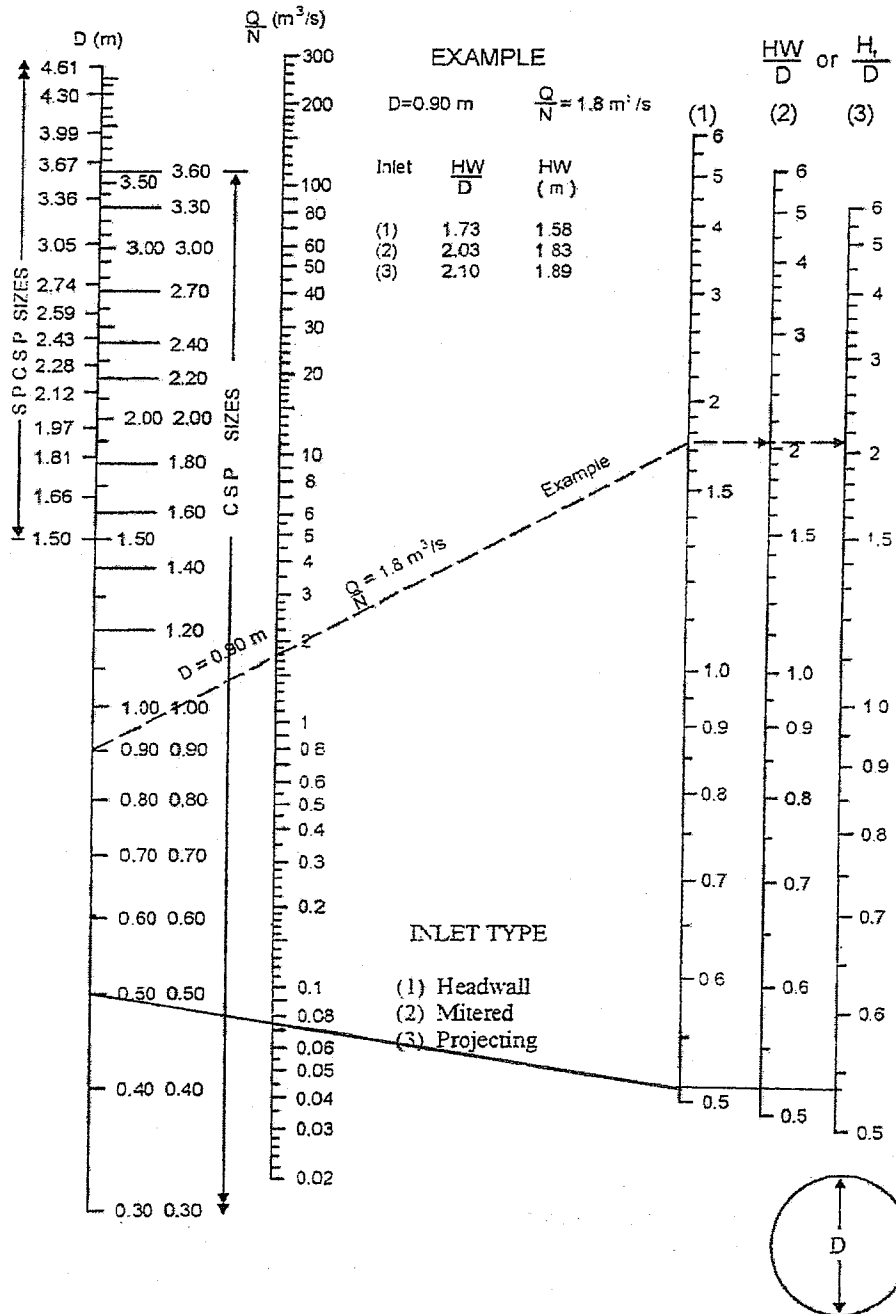
**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



Source: American Iron and Steel Institute

Culvert Crossing  $\diamond 24a$  to  $\diamond 24b$  500 mm  $\emptyset$

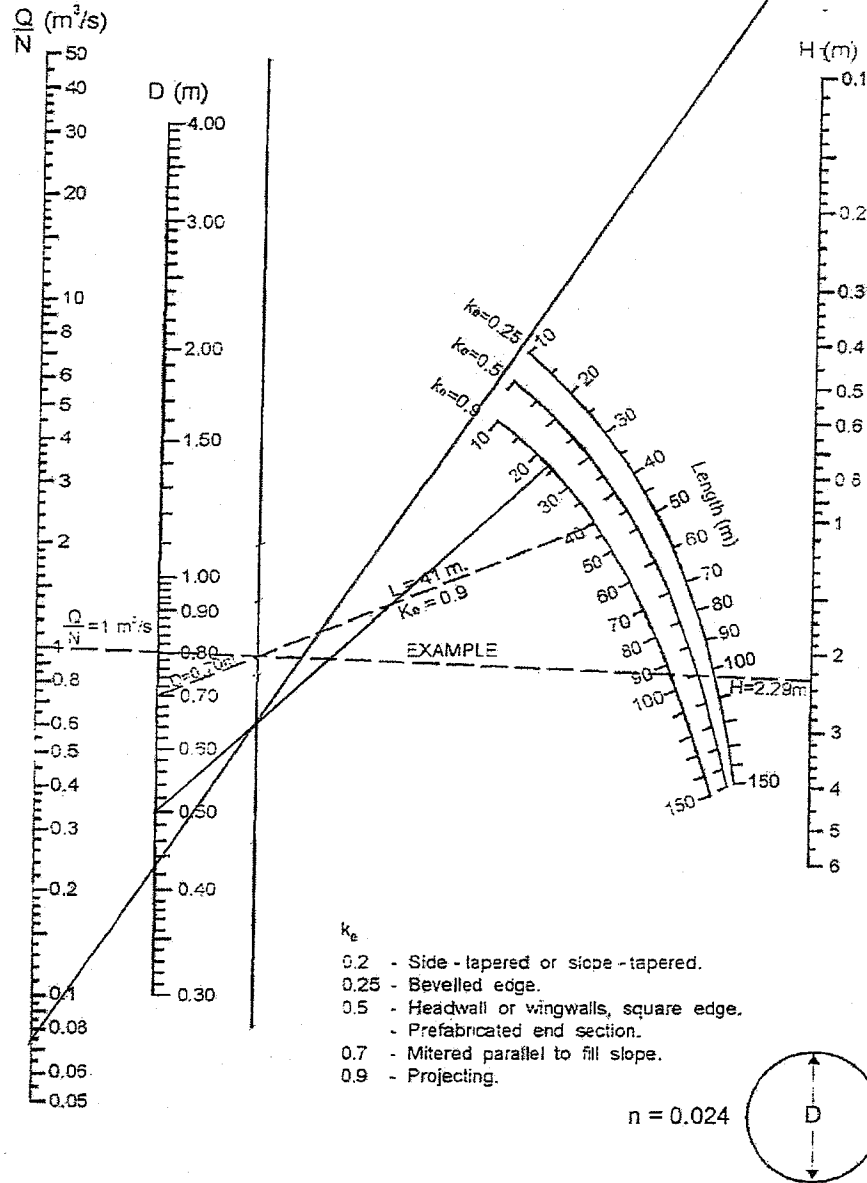
**Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts**



Source: Herr (1977)

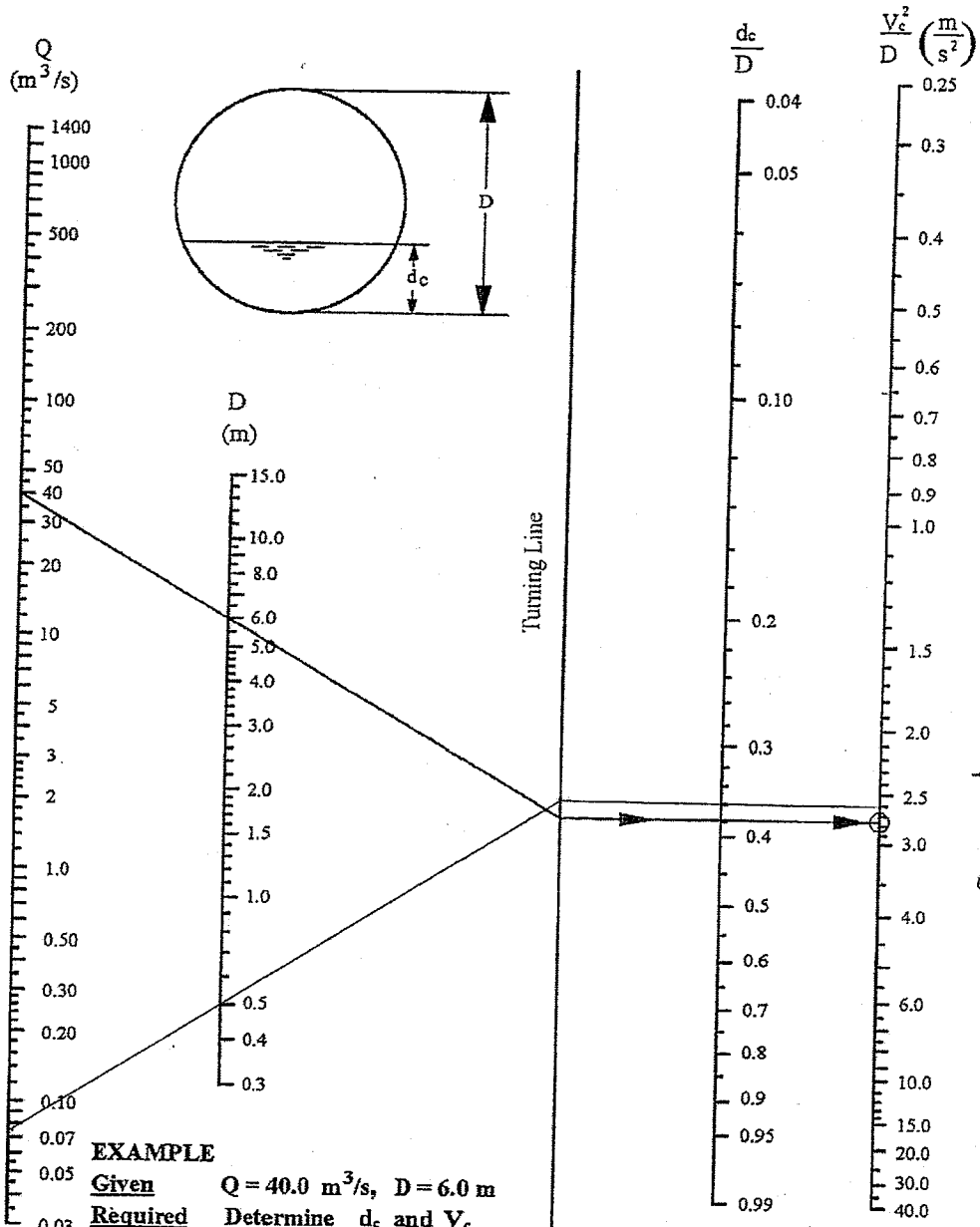
Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

$H < 0.1m$



Source: Herr (1977)

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



$\frac{d_c}{D} = 0.36$   
 $d_c = 0.36 \times 0.5$   
 $= 0.18$

**EXAMPLE**

**Given**  $Q = 40.0 \text{ m}^3/\text{s}$ ,  $D = 6.0 \text{ m}$

**Required** Determine  $d_c$  and  $V_c$ .

**Solution** Join  $Q = 40.0 \text{ m}^3/\text{s}$  to  $D = 6.0 \text{ m}$  and extend to turning line.

Draw a horizontal line perpendicular to the turning line to intersect  $d_c/D = 0.38$  and  $V_c^2/D = 2.76$

Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .

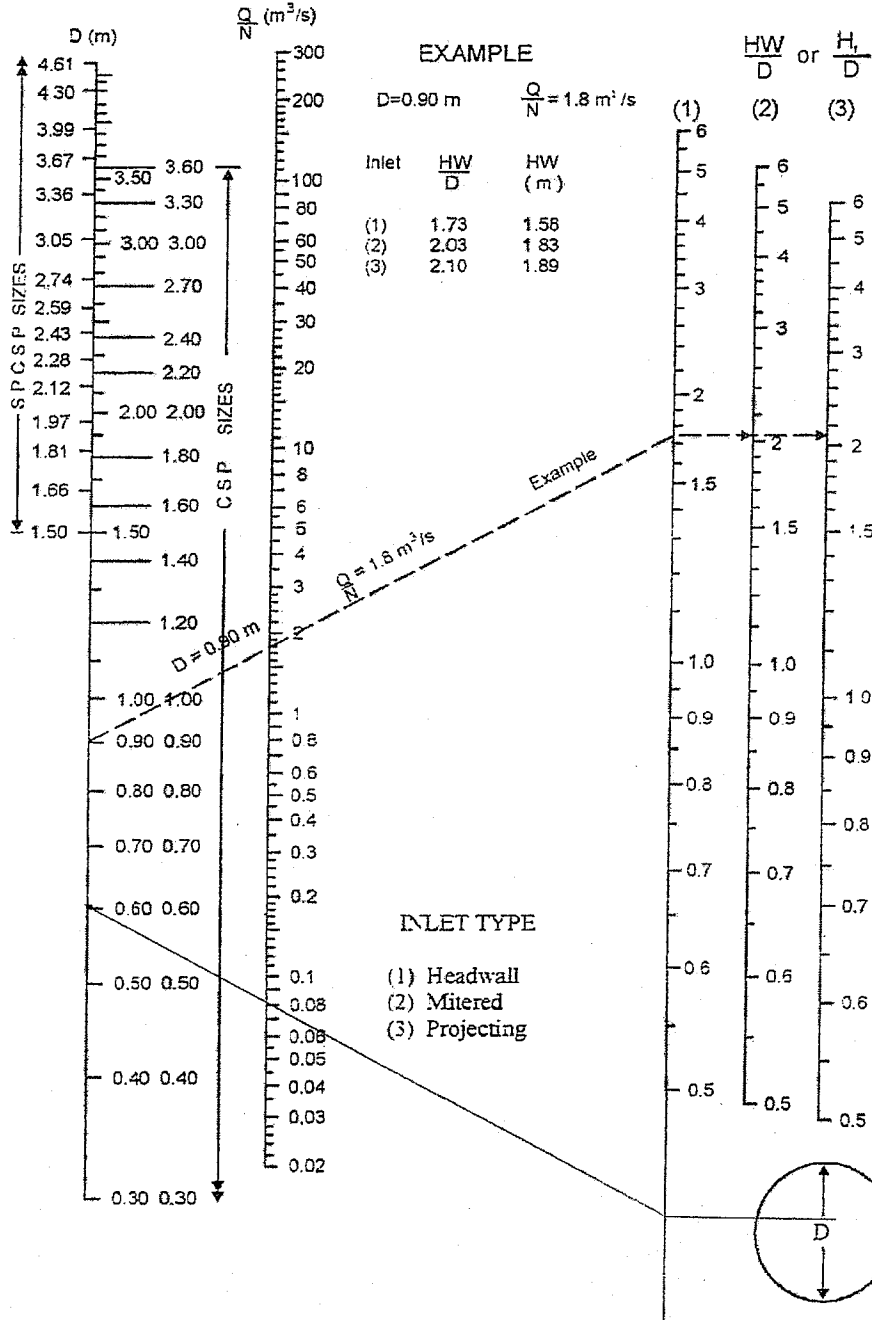
$V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

Source: American Iron and Steel Institute

# Culvert Crossing 2 - 9 600 mm $\phi$

MTO Drainage Management Manual

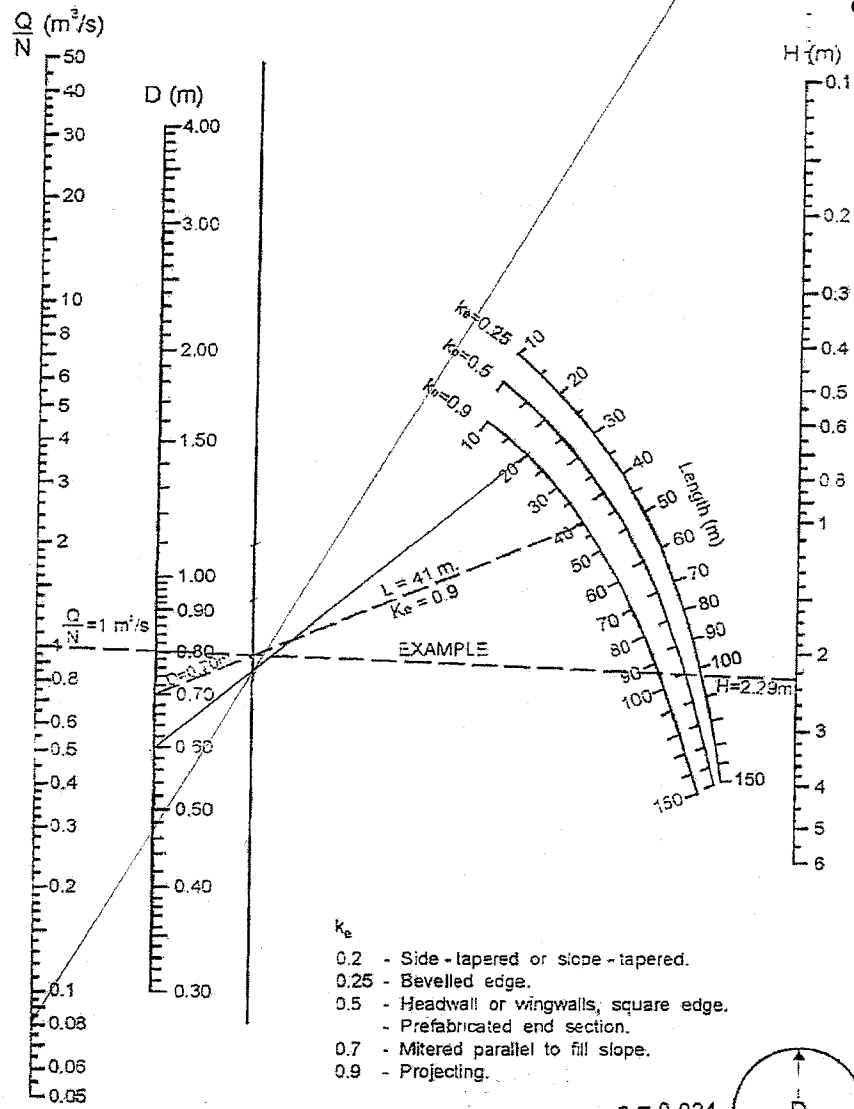
## Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



Source: Herr (1977)

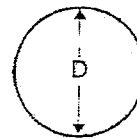


Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



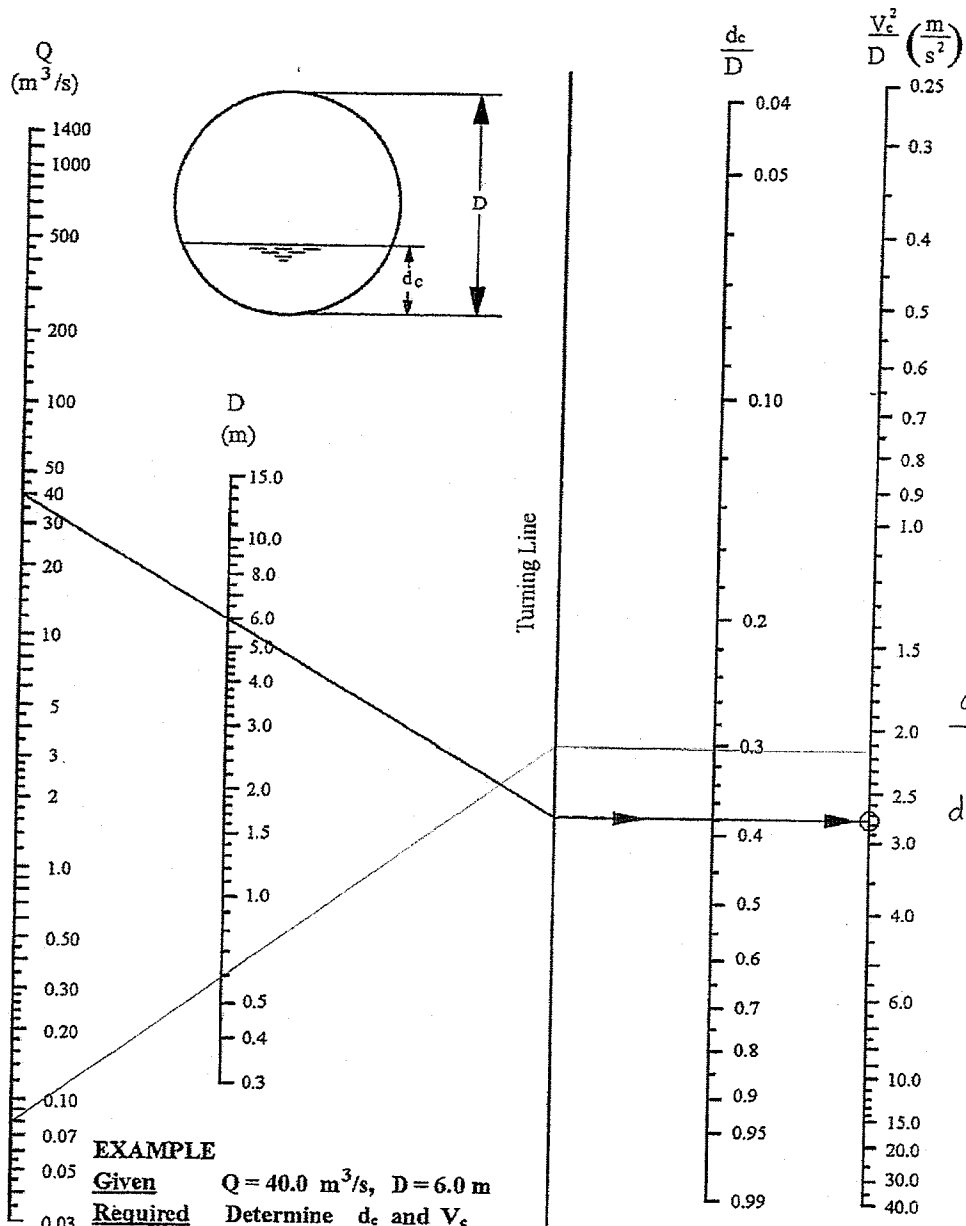
- $k_e$
- 0.2 - Side-tapered or side-tapered.
  - 0.25 - Bevelled edge.
  - 0.5 - Headwall or wingwalls, square edge.
  - Prefabricated end section.
  - 0.7 - Mitered parallel to fill slope.
  - 0.9 - Projecting.

$n = 0.024$



Source: Herr (1977)

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



**EXAMPLE**

Given  $Q = 40.0 \text{ m}^3/\text{s}$ ,  $D = 6.0 \text{ m}$

Required Determine  $d_c$  and  $V_c$

Solution Join  $Q = 40.0 \text{ m}^3/\text{s}$  to  $D = 6.0 \text{ m}$  and extend to turning line.

Draw a horizontal line perpendicular to the turning line to intersect

$d_c/D = 0.38$  and  $V_c^2/D = 2.76$

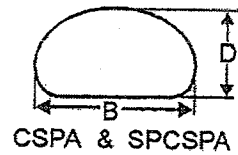
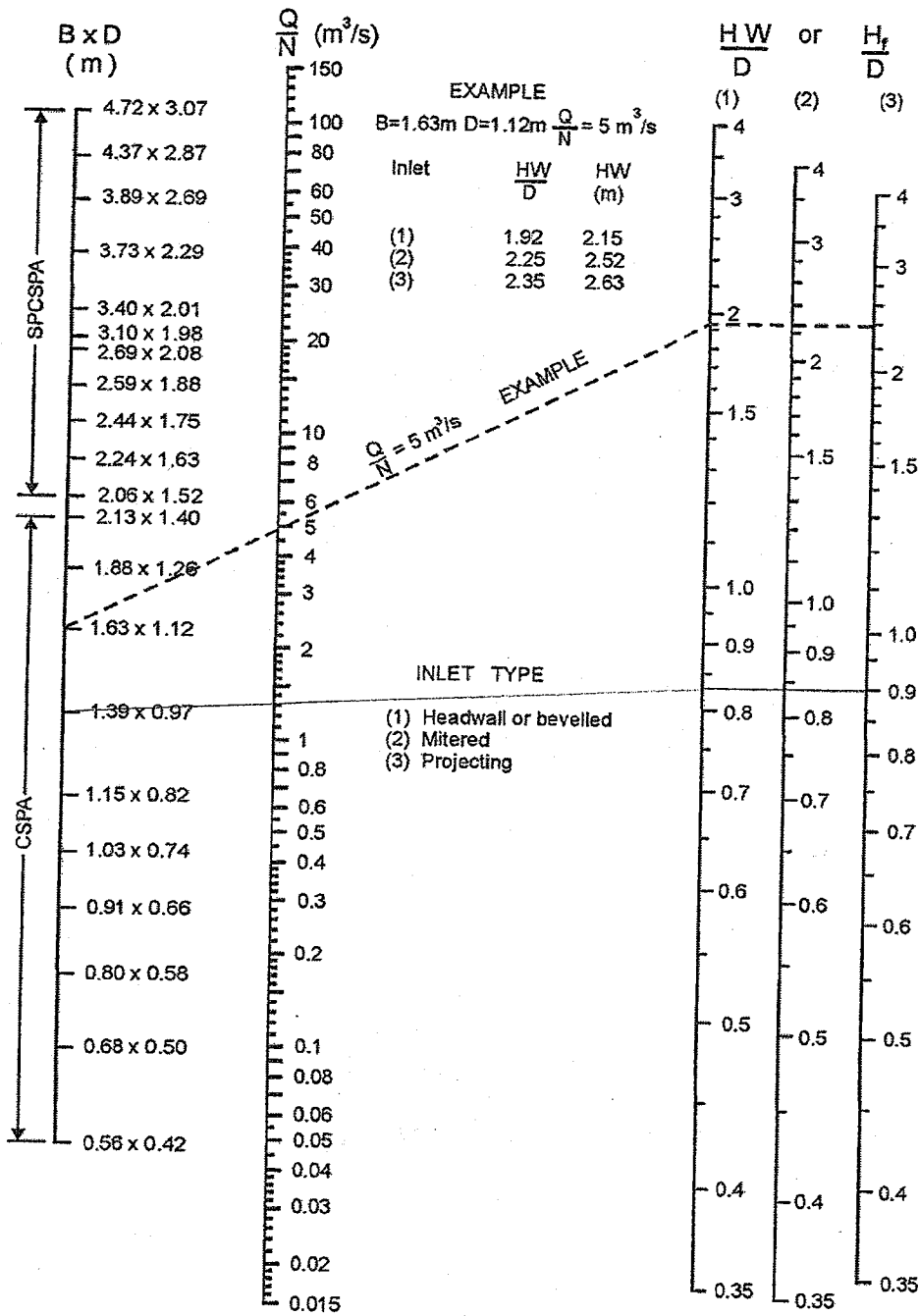
Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .

$V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

Source: American Iron and Steel Institute

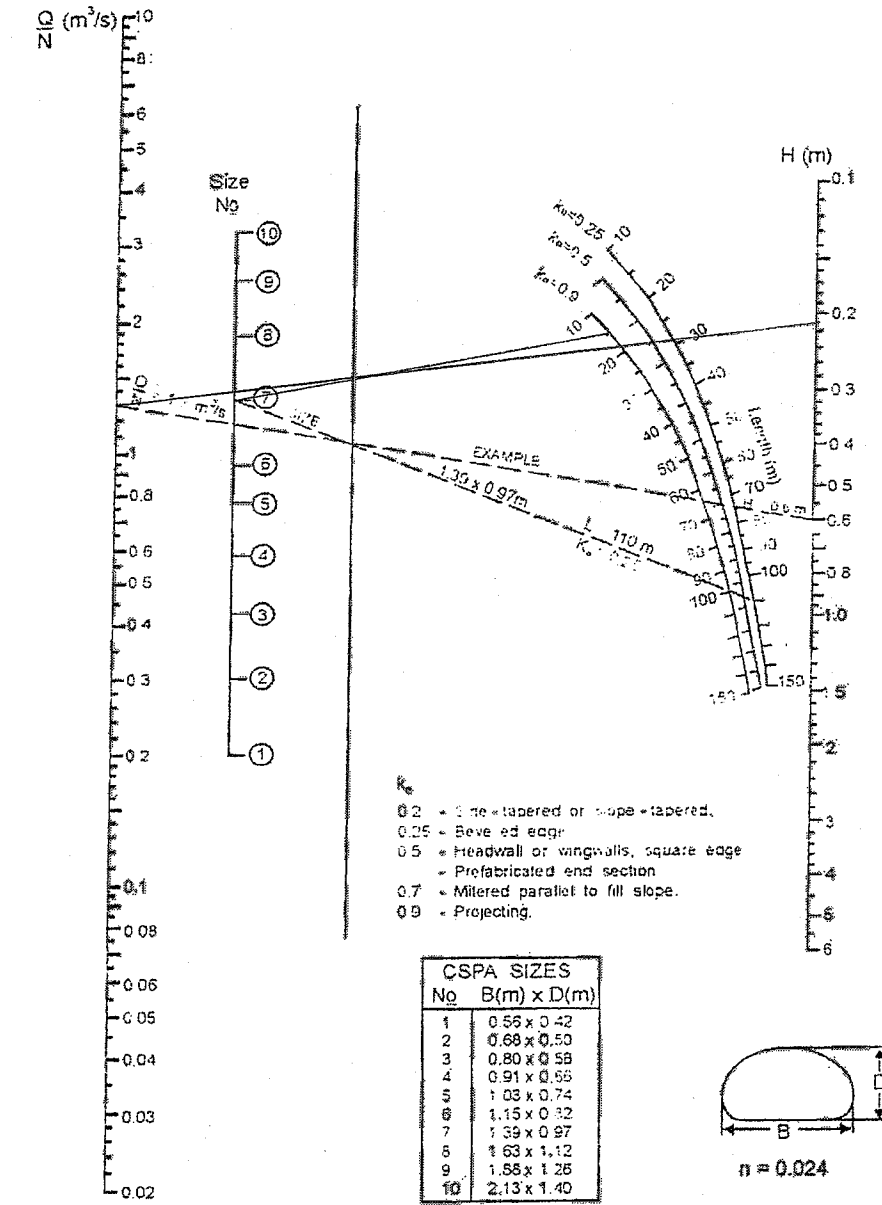
Culvert Crossing 27b to 27c 1.39 x 0.97 m

**Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts**



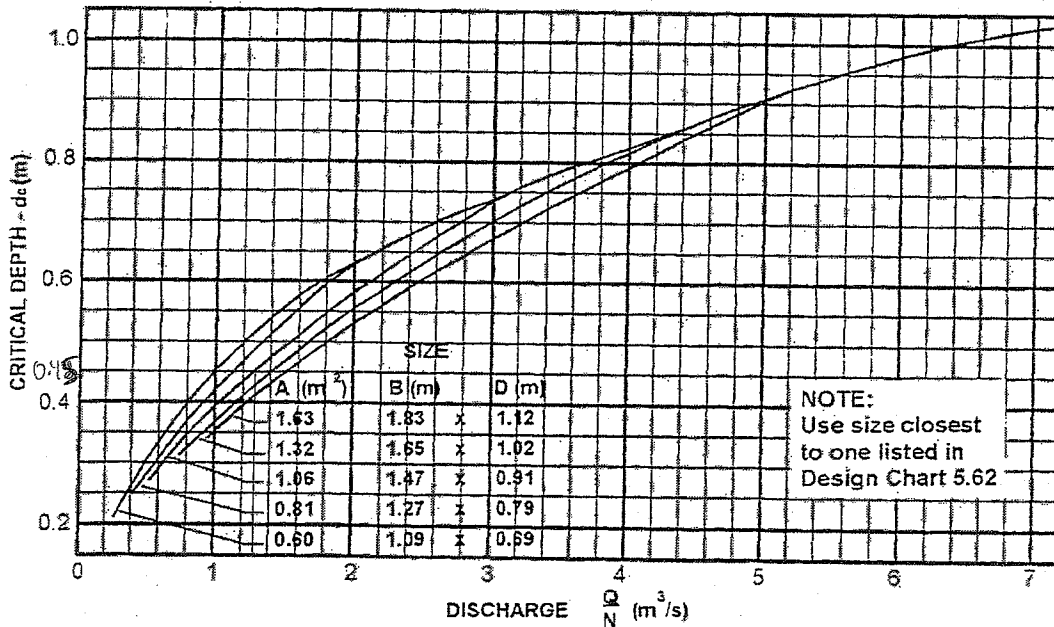
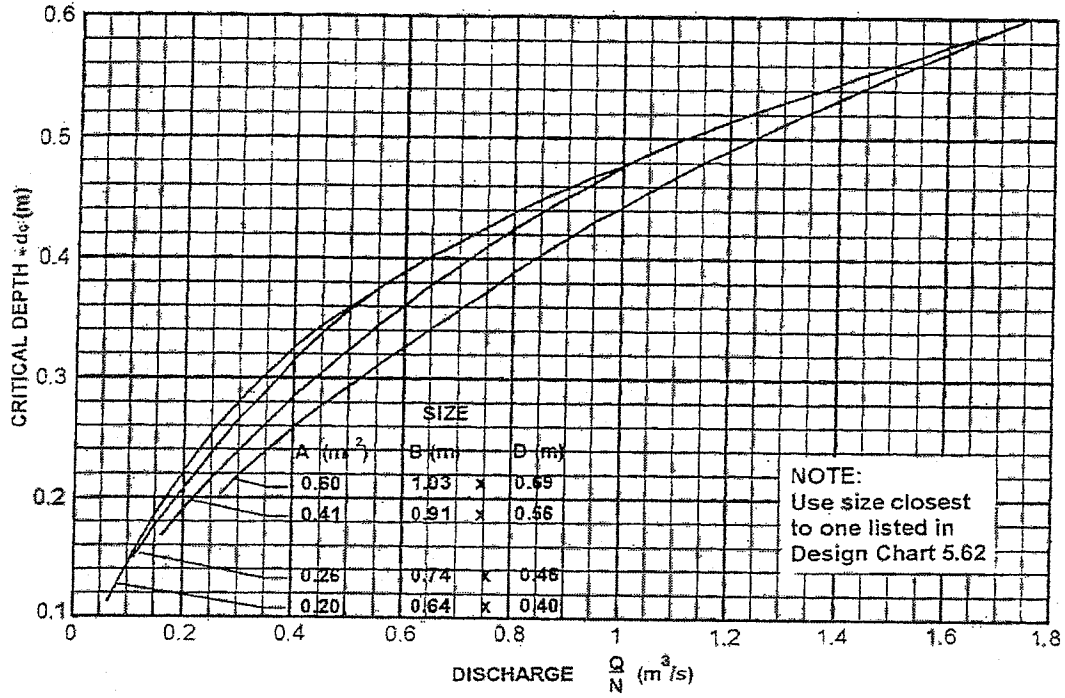
Source: Herr (1977)

**Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full**

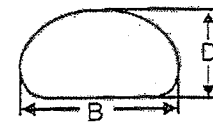


Source: Herr (1977)

**Design Chart 5.53: CSP Pipe Arch Culverts**



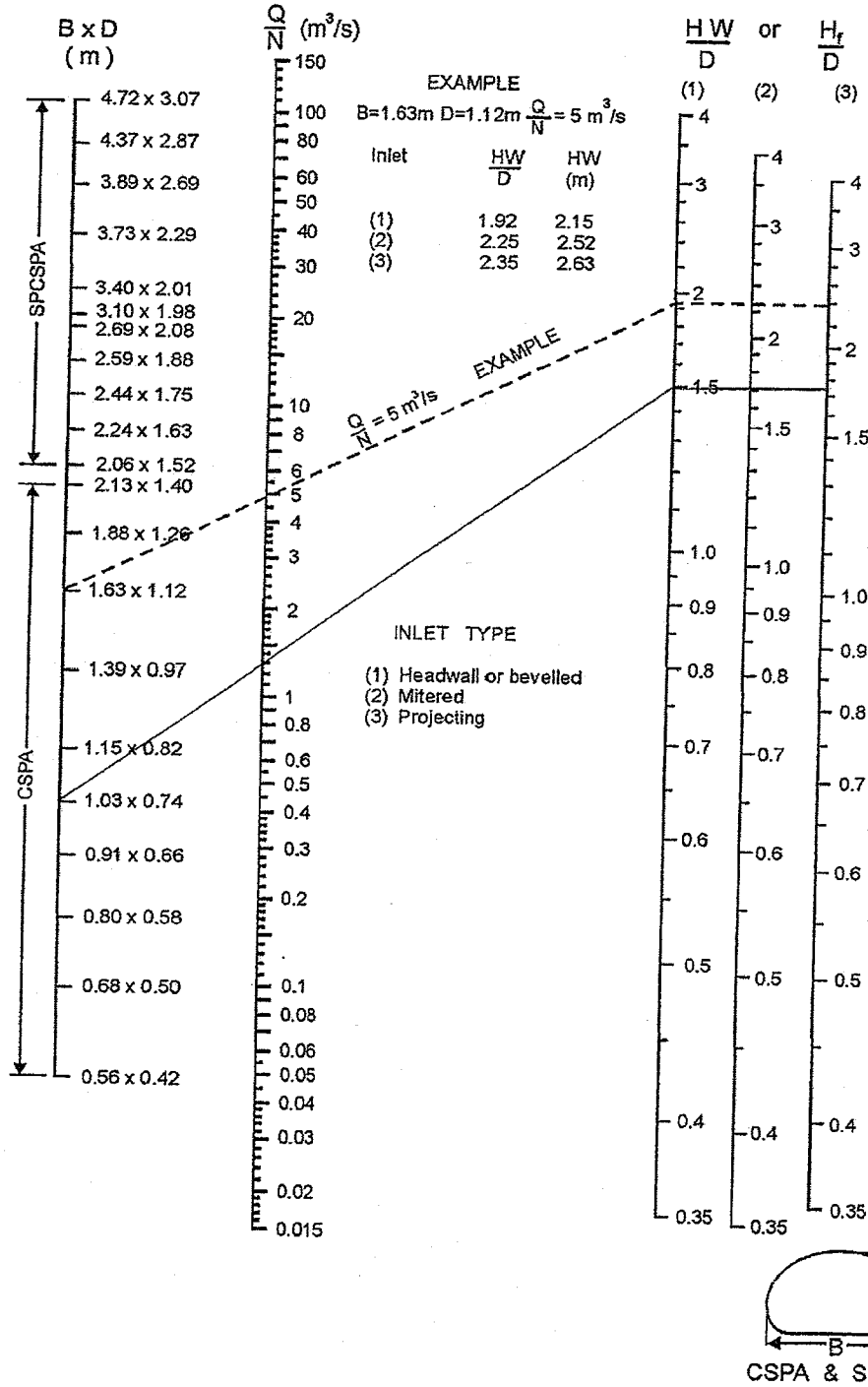
$(d_c \approx D)$   
 A = Cross-sectional area per barrel interpolated for other sizes



Source: Herr (1977)

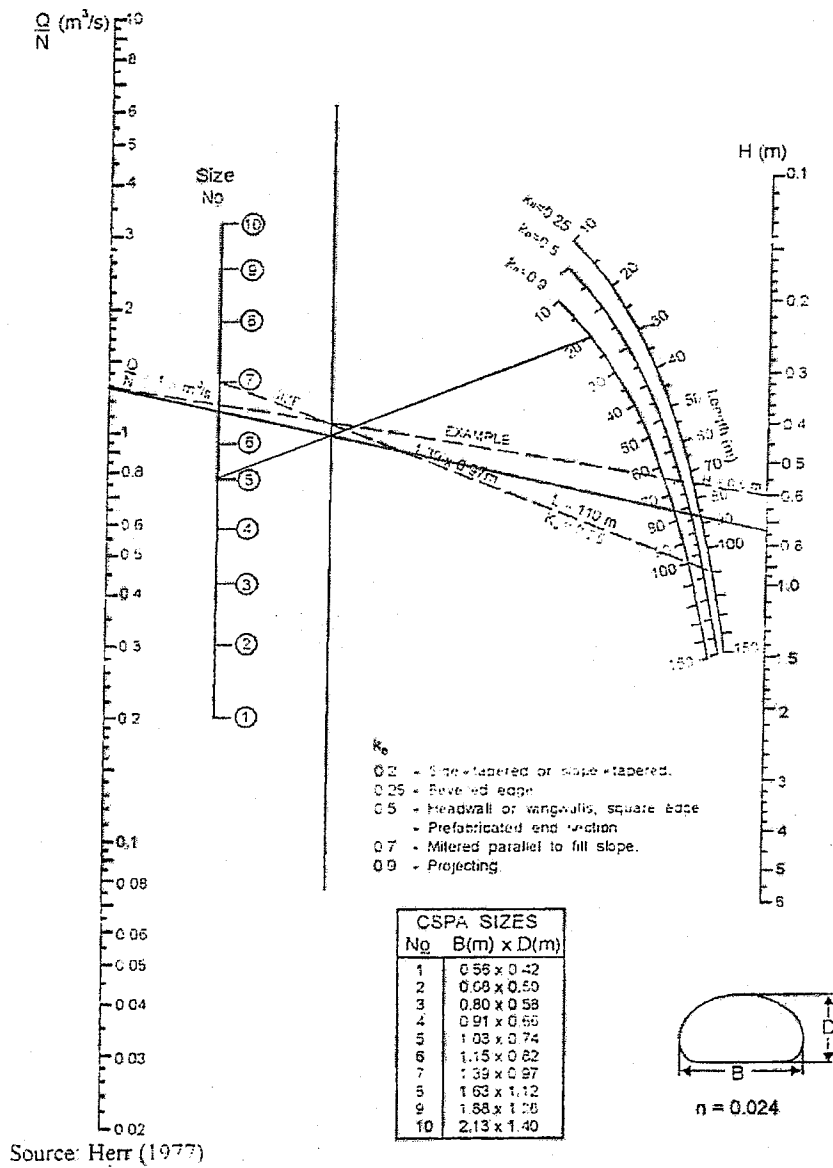
Culvert Crossing 22 - 79  $2 \times 1.03\text{m} \times 0.74\text{m}$

**Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts**



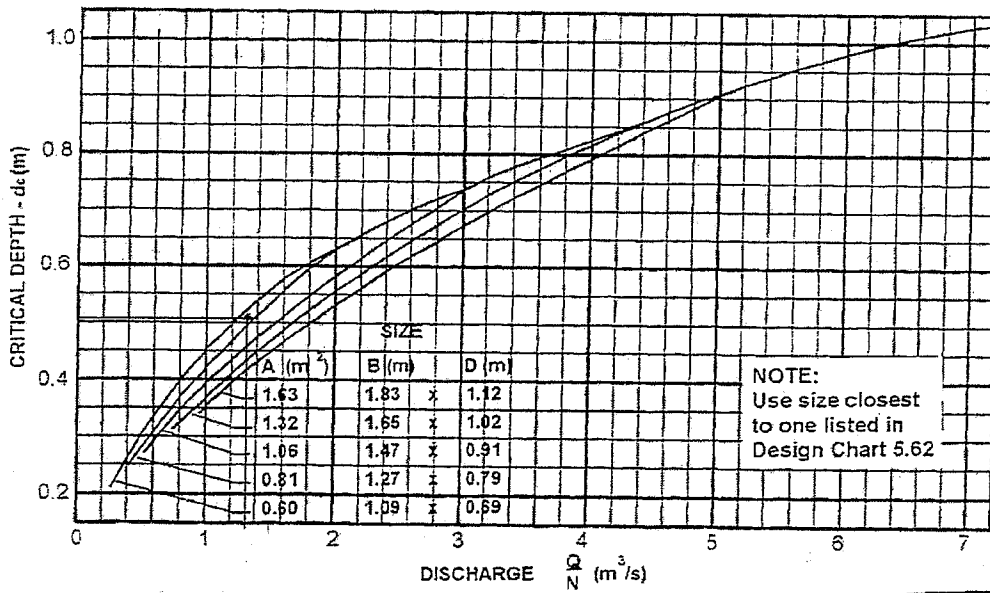
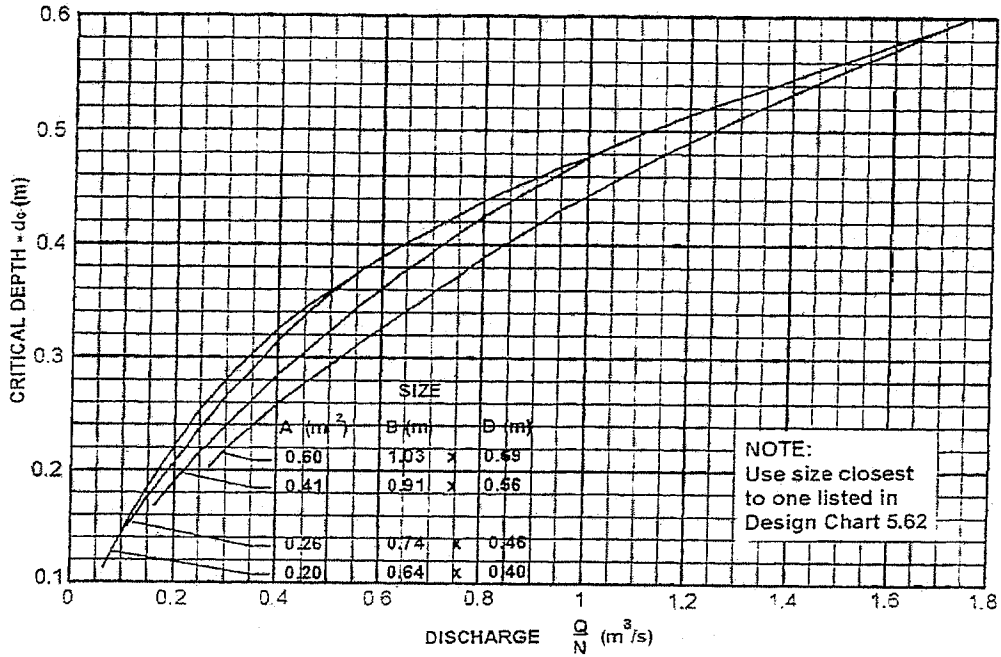
Source: Herr (1977)

**Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full**



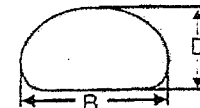
Source: Herr (1977)

**Design Chart 5.53: CSP Pipe Arch Culverts**



$(d_c \neq D)$

A = Cross-sectional area per barrel interpolated for other sizes



Source: Herr (1977)



**APPENDIX 'B'**

**CONVENTIONAL CULVERT DESIGN SHEET**

**HAWTHORNE ROAD & RIDEAU ROAD**

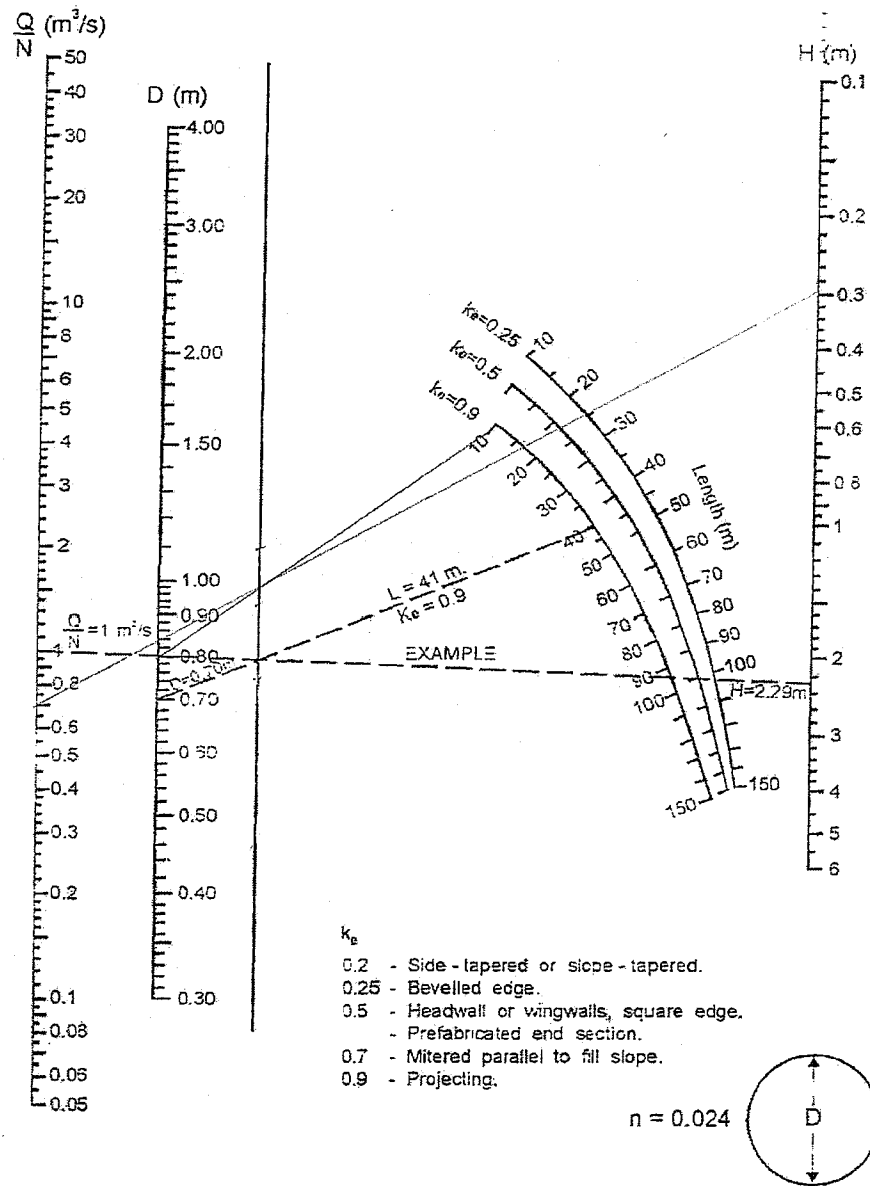
**1:10 YEAR ROADSIDE CULVERT DESIGN**

**CONVENTIONAL CULVERT DESIGN**

Prepared by: Mark Buchanan, E.I.T.  
 Reviewed by: Guy Forget, P.Eng.  
 Date: February 2009

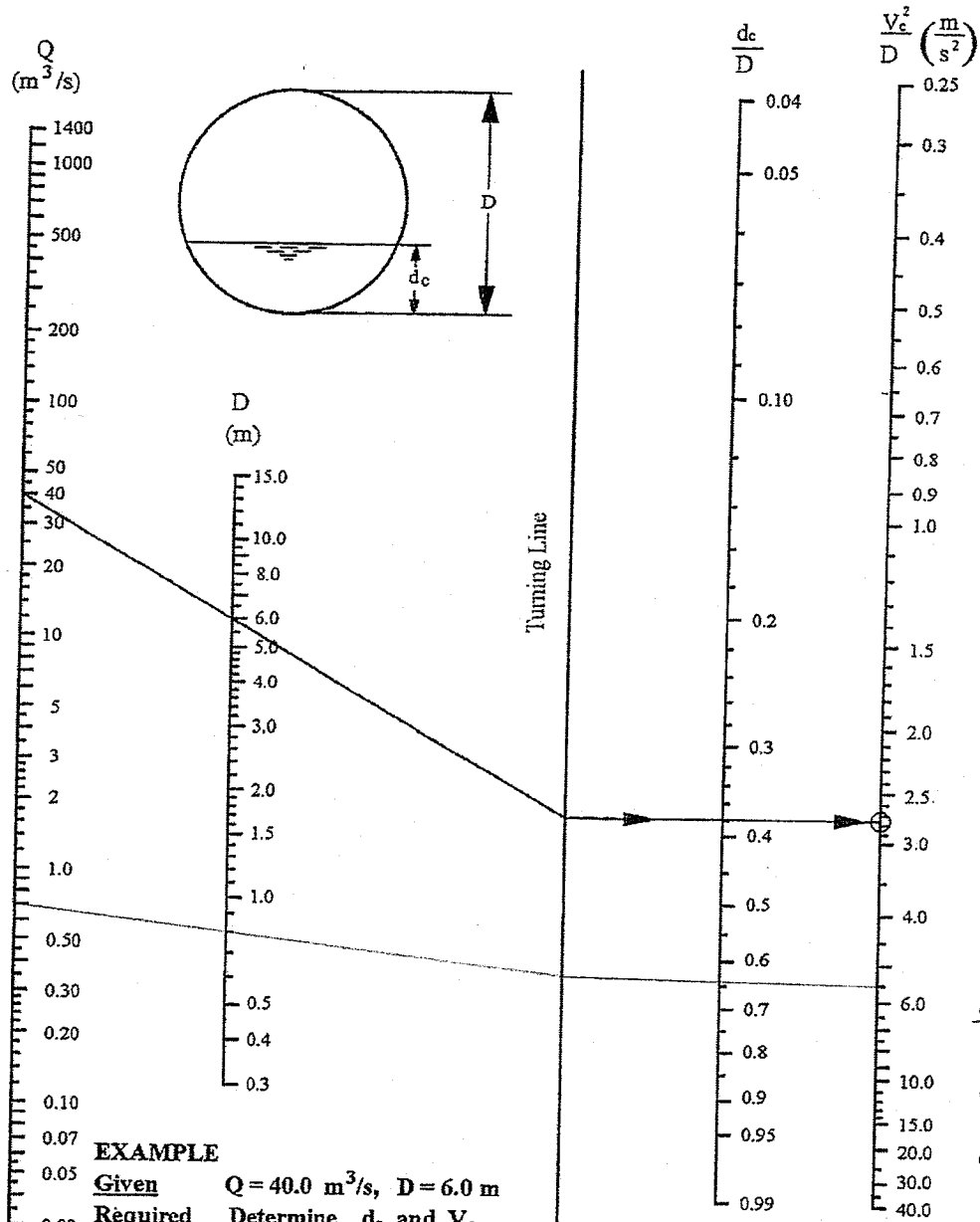
Station	DESIGN DATA							CULVERT DATA					INLET CONTROL			OUTLET CONTROL						GOVERNING HW	VEL V <sub>o</sub>		
	Q (m <sup>3</sup> /s)	d (m)	d <sub>e</sub> (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	D or B x D (m)	N	Q/N (m <sup>3</sup> /s)	A (each) (m <sup>2</sup> )	Q/NB (m <sup>3</sup> /s/m)	HW/D	HW (m)	K <sub>e</sub>	H (m)	d <sub>e</sub> (m)	(d <sub>e</sub> + D)/2 (m)	TW (m)	h <sub>o</sub> (m)			LS (m)	HW (m)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6A to 6B	0.694	0.53	0.05	1.13	0	10.0	0.010	CSP 800	0.8	1	0.694	0.50	---	1.05	0.84	0.9	0.30	0.44	0.62	0.58	0.62	0.10	0.82	0.84	
18 to 19	0.105	0.21	0.05	1.34	0	22.0	0.018	CSP 600	0.6	1	0.105	0.28	---	0.50	0.30	0.9	0.04	0.22	0.41	0.26	0.41	0.39	0.06	0.30	
20 to 21	0.113	0.29	0.05	0.81	0	20.0	0.005	CSP 600	0.6	1	0.113	0.28	---	0.52	0.31	0.9	0.05	0.26	0.43	0.34	0.43	0.10	0.37	0.37	
14B to 23	1.377	0.51	0.05	1.53	0	20.0	0.014	CSP 1000	1.0	1	1.377	0.79	---	1.14	1.14	0.9	0.55	0.68	0.84	0.56	0.84	0.28	1.11	1.14	
24 to 26	1.559	0.66	0.05	2.42	0	20.0	0.010	CSP 800	0.8	1	1.559	0.50	---	2.55	2.04	0.9	1.75	0.72	0.76	0.71	0.76	0.20	2.31	2.31	
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>2 From Form PH-D-533, col. 12</p> <p>3 Flood Depth</p> <p>4 Embedment below channel invert</p> <p>5 Col. 3 + col. 4 + allowable backwater</p> <p>7 Allowance for skew if applicable</p> </div> <div style="width: 20%;"> <p>8 Culvert Slope</p> <p>10 D (circular) or B x D (other)</p> <p>11 Number of Barrels</p> <p>13 Area per barrel</p> <p>14 For box only</p> </div> <div style="width: 20%;"> <p>15 Charts D5-1A to C and E to J</p> <p>16 HW = col. 15 x D (col. 10)</p> <p>17 Chart D5-8</p> <p>18 Charts D5-2A to G</p> <p>19 Charts D5-3A to F: (d<sub>e</sub> &gt; D)</p> </div> <div style="width: 20%;"> <p>21 Col. 3 + col. 4</p> <p>22 H<sub>o</sub> = larger of cols. 20 and 21</p> <p>23 Col. 7 x col. 8</p> <p>24 HW = col. 18 + col. 22 - col. 23</p> <p>25 Larger of cols 16 and 24</p> </div> <div style="width: 20%; text-align: right;"> <p>26 Outlet velocity if required (Subsection 3.2.3)</p> </div> </div>																									

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



Source: Herr (1977)

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



**EXAMPLE**

Given  $Q = 40.0 \text{ m}^3/s, D = 6.0 \text{ m}$

Required Determine  $d_c$  and  $V_c$

Solution Join  $Q = 40.0 \text{ m}^3/s$  to  $D = 6.0 \text{ m}$  and extend to turning line.

Draw a horizontal line perpendicular to the turning line to intersect

$d_c/D = 0.38$  and  $V_c^2/D = 2.76$

Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .

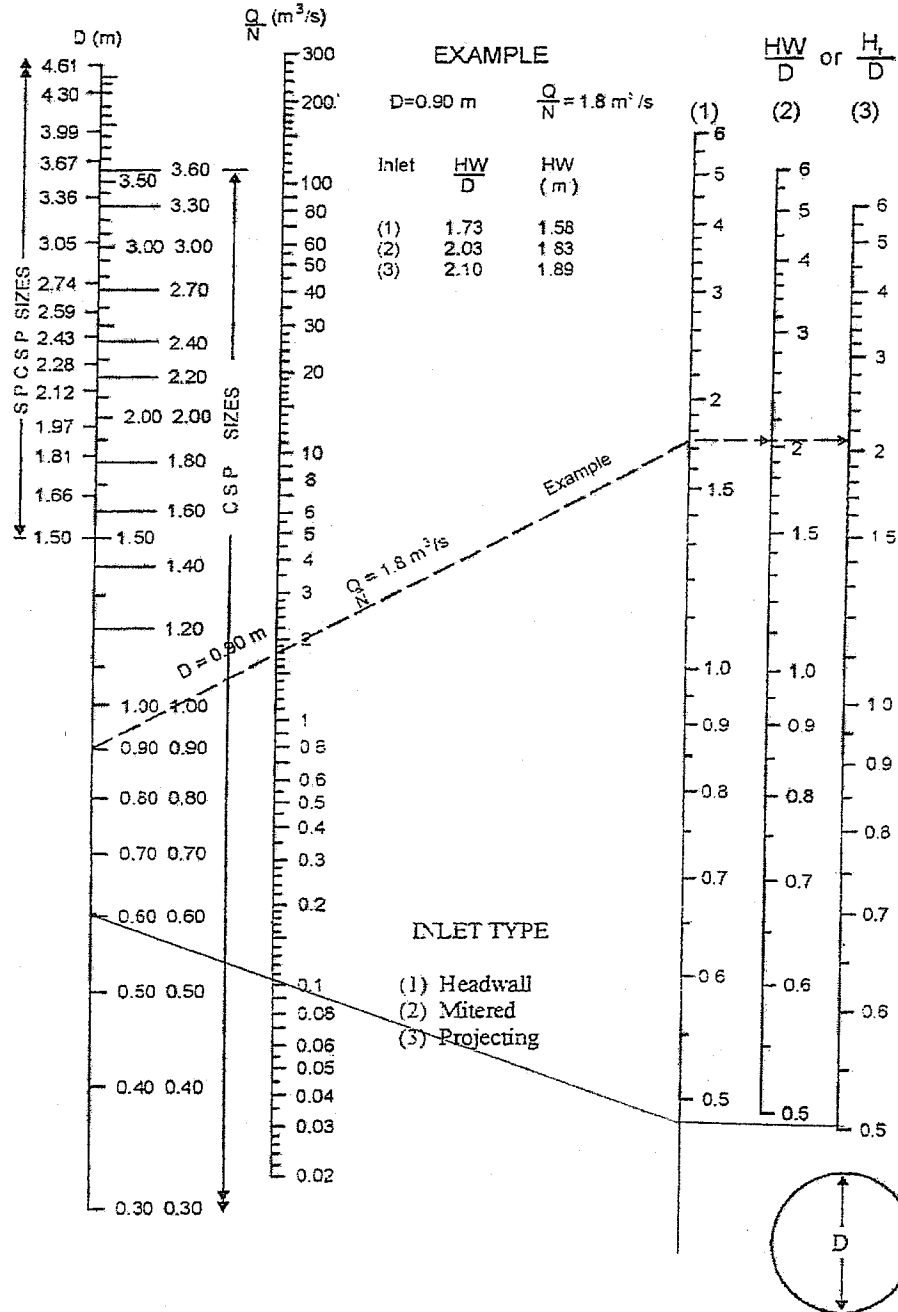
$V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

$\frac{d_c}{D} = 0.55$   
 $d_c = 0.55 \times 6.0$   
 $d_c = 3.3$

Source: American Iron and Steel Institute

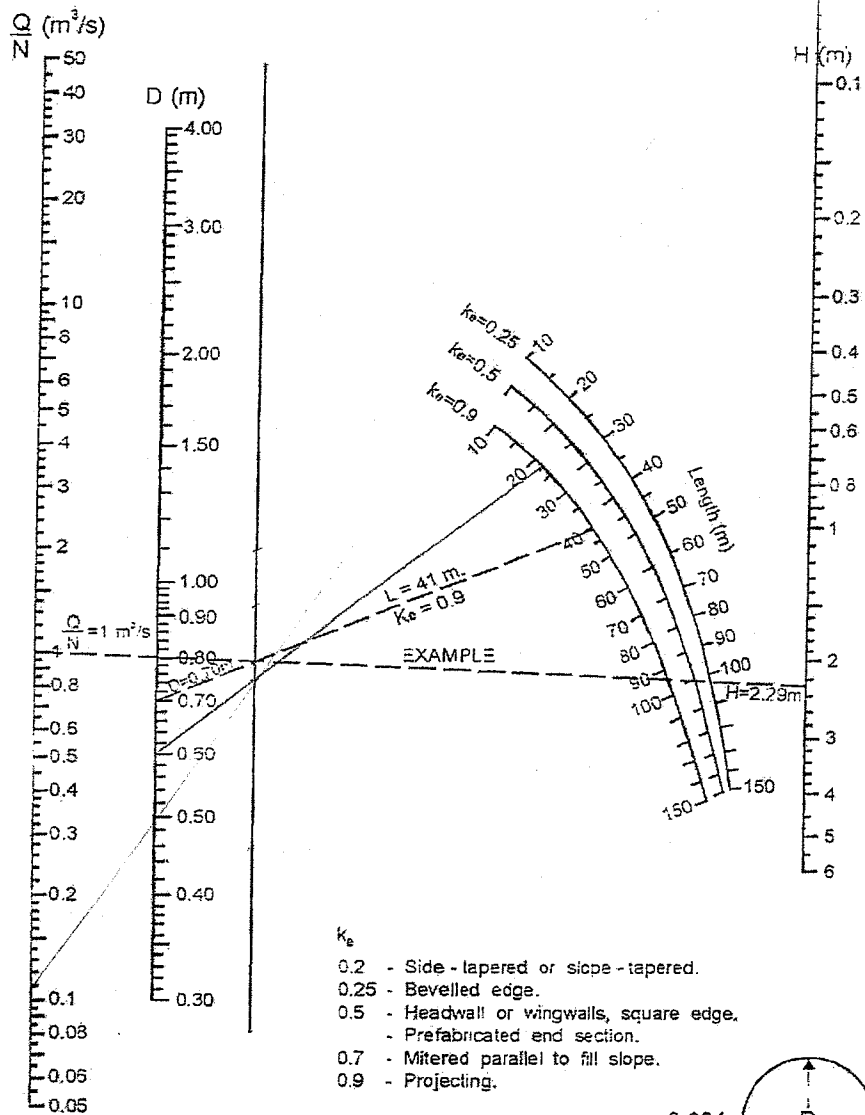
Culvert Crossing  $\diamond 18$  to  $\diamond 19$  600 mm  $\phi$

**Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts**



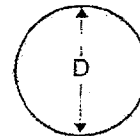
Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



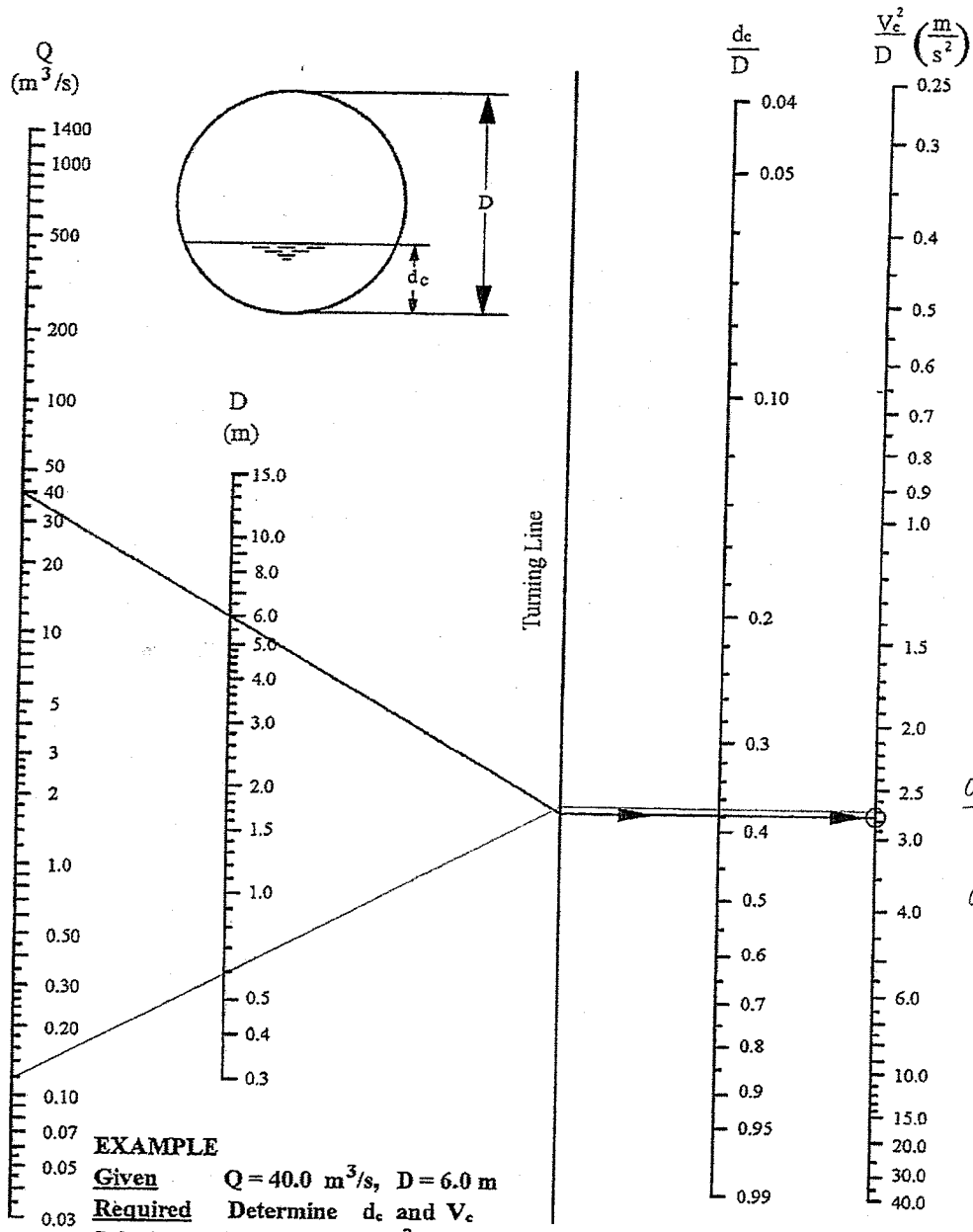
- $K_e$
- 0.2 - Side-tapered or slope-tapered.
  - 0.25 - Bevelled edge.
  - 0.5 - Headwall or wingwalls, square edge.  
- Prefabricated end section.
  - 0.7 - Mitered parallel to fill slope.
  - 0.9 - Projecting.

$n = 0.024$



Source: Herr (1977)

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



$\frac{d_c}{D} = 0.425$   
 $d_c = 0.425 \times 6$   
 $= 2.55$

**EXAMPLE**

**Given**  $Q = 40.0 \text{ m}^3/\text{s}$ ,  $D = 6.0 \text{ m}$

**Required** Determine  $d_c$  and  $V_c$

**Solution** Join  $Q = 40.0 \text{ m}^3/\text{s}$  to  $D = 6.0 \text{ m}$  and extend to turning line.

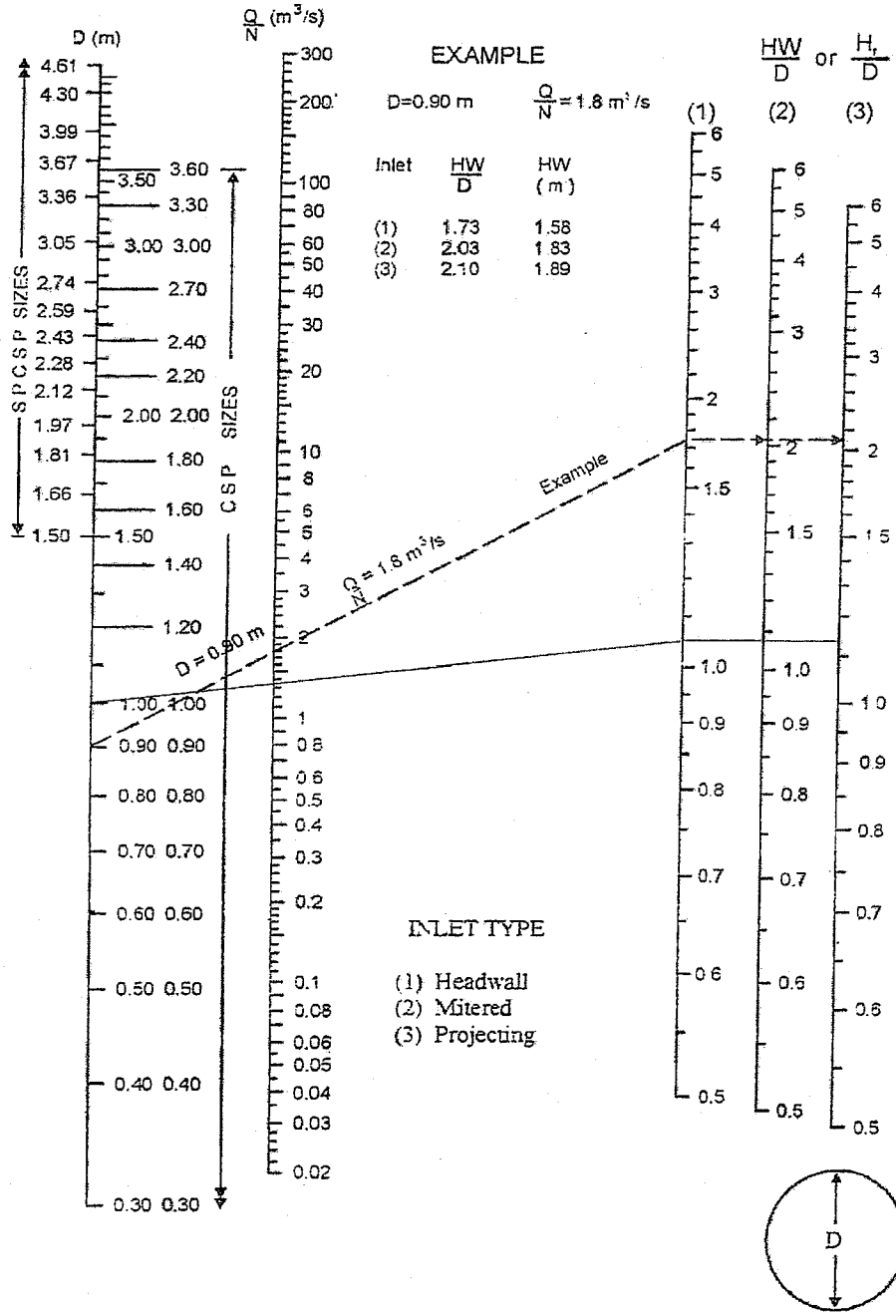
Draw a horizontal line perpendicular to the turning line to intersect  $d_c/D = 0.38$  and  $V_c^2/D = 2.76$

Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .  
 $V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

Source: American Iron and Steel Institute

Culvert Crossing 14 to 23 1000 mm  $\phi$

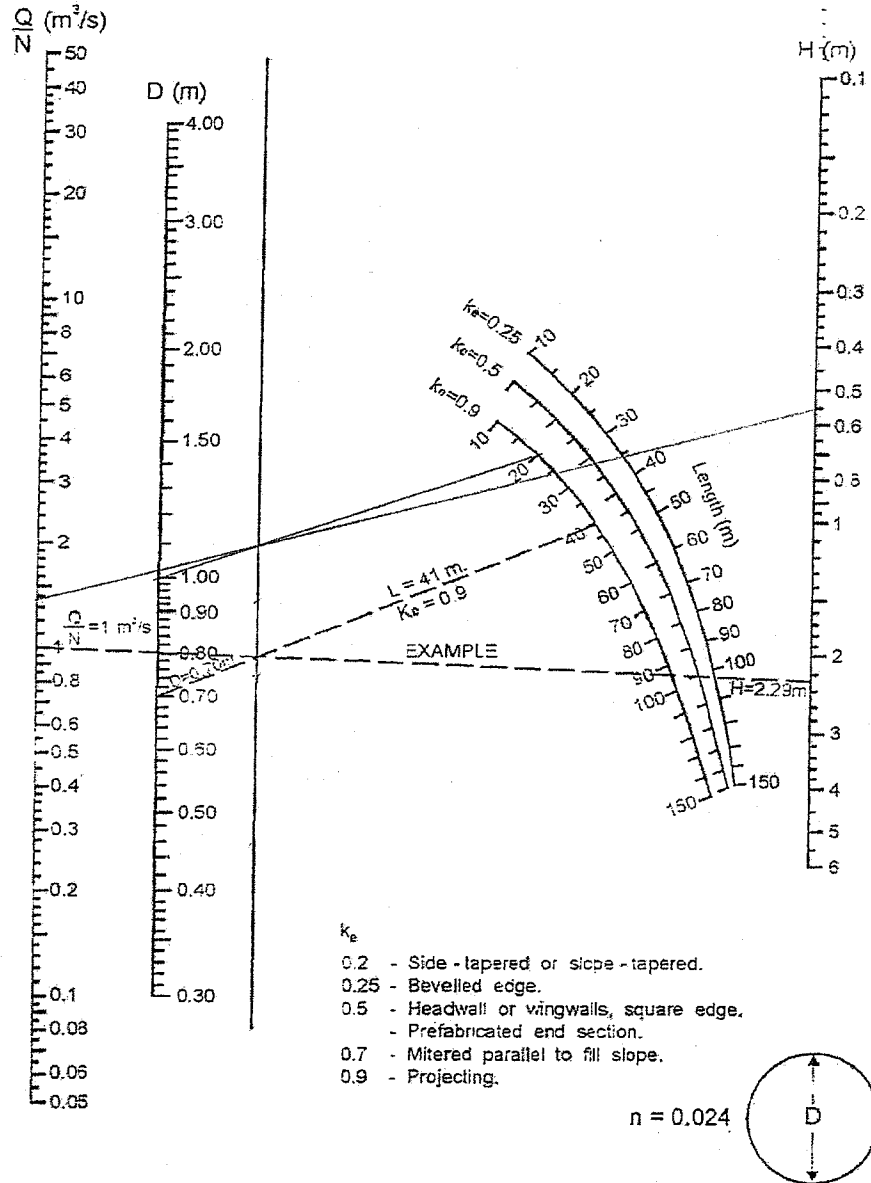
**Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts**



Source: Herr (1977)

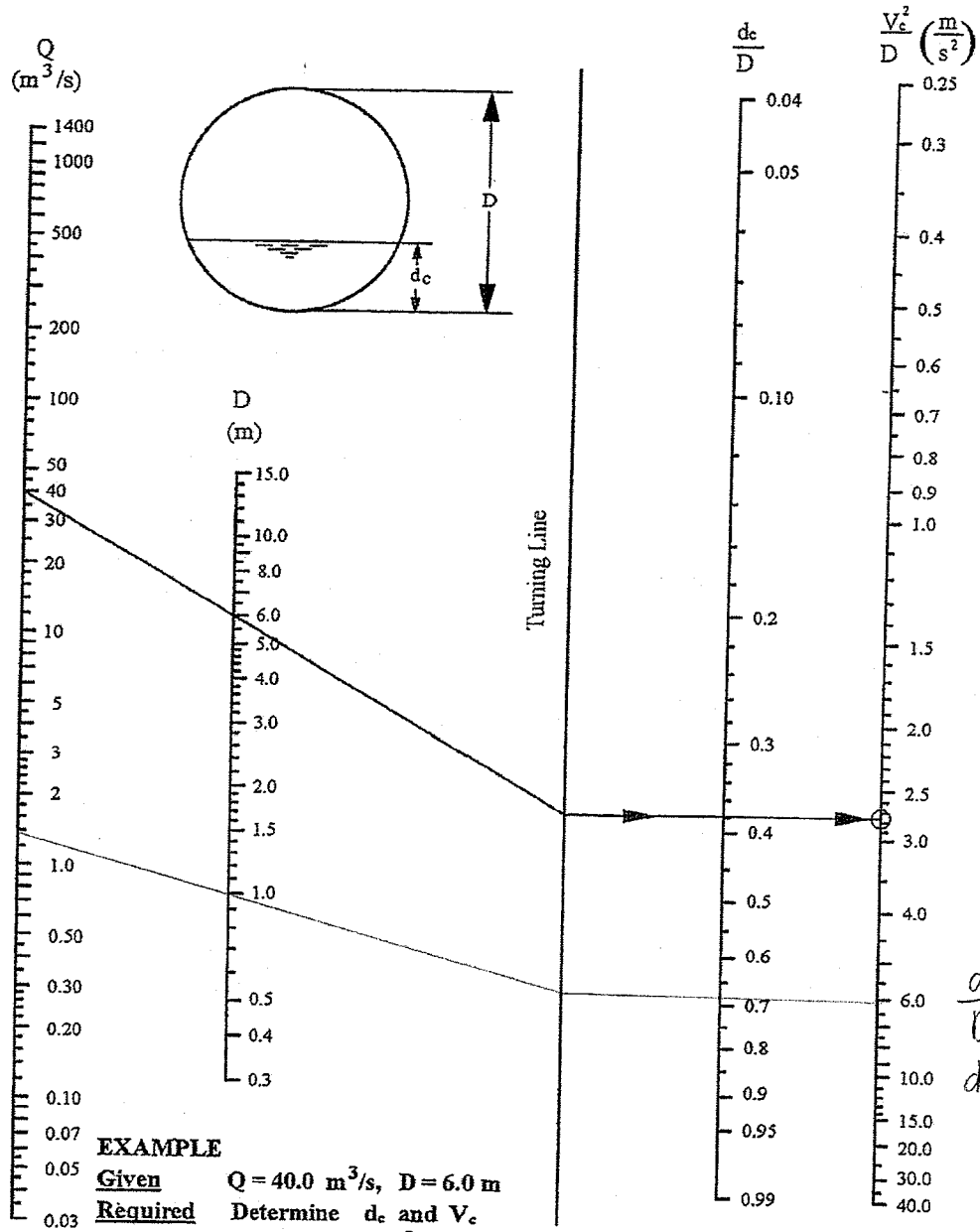


Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



Source: Herr (1977)

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



**EXAMPLE**

**Given**  $Q = 40.0 \text{ m}^3/s, D = 6.0 \text{ m}$

**Required** Determine  $d_c$  and  $V_c$

**Solution.** Join  $Q = 40.0 \text{ m}^3/s$  to  $D = 6.0 \text{ m}$  and extend to turning line.

Draw a horizontal line perpendicular to the turning line to intersect

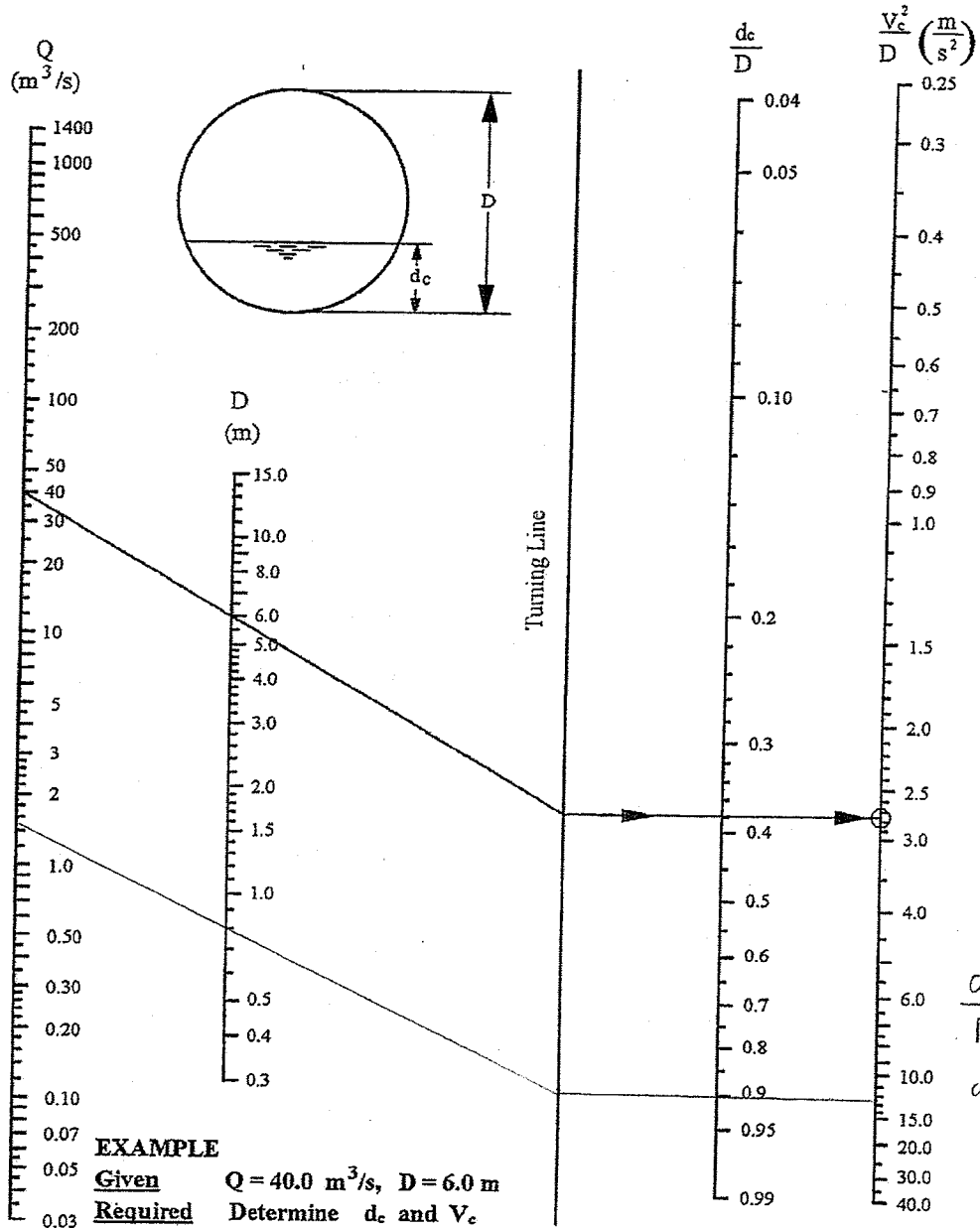
$d_c/D = 0.38$  and  $V_c^2/D = 2.76$

Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .

$V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

Source: American Iron and Steel Institute

**Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes**



**EXAMPLE**

**Given**  $Q = 40.0 \text{ m}^3/\text{s}$ ,  $D = 6.0 \text{ m}$

**Required** Determine  $d_c$  and  $V_c$

**Solution** Join  $Q = 40.0 \text{ m}^3/\text{s}$  to  $D = 6.0 \text{ m}$  and extend to turning line.

Draw a horizontal line perpendicular to the turning line to intersect

$d_c/D = 0.38$  and  $V_c^2/D = 2.76$

Calculate  $d_c = 0.38 \times 6.0 = 2.28 \text{ m}$ .

$V_c = (2.76 \times 6.0)^{0.5} = 4.07 \text{ m/s}$

Source: American Iron and Steel Institute

**APPENDIX 'C'**

**WATER QUALITY - INFILTRATION CALCULATION**

JOB NO. 20983

PROJECT Hawthorne Industrial Park

Length of Perforated Pipe in Ditches

BY MB DATE Apr 14/09

### Level of Service

Normal 70% TSS removal

Imperviousness 100% for internal roads

Extrapolating from Table 3.2 SWMPDM

water quality infiltration requirement =  $35 \text{ m}^3/\text{ha}$

### Area of Asphalt

#### Phase 1

$$\begin{array}{l} \text{Length} = 2250 \text{ m} \\ \text{width} = \frac{7 \text{ m}}{15750 \text{ m}^2} \end{array}$$

#### Required Storage

$$= 1.575 \text{ ha} \times \frac{35 \text{ m}^3}{\text{ha}}$$

$$= 55.1 \text{ m}^3$$

#### Phase 2

$$\begin{array}{l} 300 \text{ m} \\ 7 \text{ m} \\ \hline 2100 \text{ m}^2 \end{array}$$

$$= 0.21 \text{ ha} \times \frac{35 \text{ m}^3}{\text{ha}}$$

$$= 7.35 \text{ m}^3$$

Required Length of 200 mm  $\phi$  Perforated Pipe

$$\text{Length} = \frac{55.1 \text{ m}^3}{\pi (0.1)^2 \text{ m}^2}$$

$$= \underline{\underline{1755 \text{ m}}}$$

$$= \frac{7.35 \text{ m}^3}{\pi (0.1)^2 \text{ m}^2}$$

$$= \underline{\underline{234 \text{ m}}}$$



**A P P E N D I X 'D'**

**HYDROLOGICAL PARAMETERS**

**(CN<sub>pre</sub>, Imperviousness Calculation, Time to Peak Calculation)**

JOB NO. 20983

PROJECT Hawthorne Industrial Park

% Impervious Calculation

BY MB DATE Jan 22/09



Typical Site Development with  $C=0.7$

Building Footprint 10%

Asphalt Parking 35%

Gravel 35%

Grass 20%

100%

Building Foot print = 100% Impervious

Asphalt Parking = 100% Impervious

Gravel = 70% Impervious

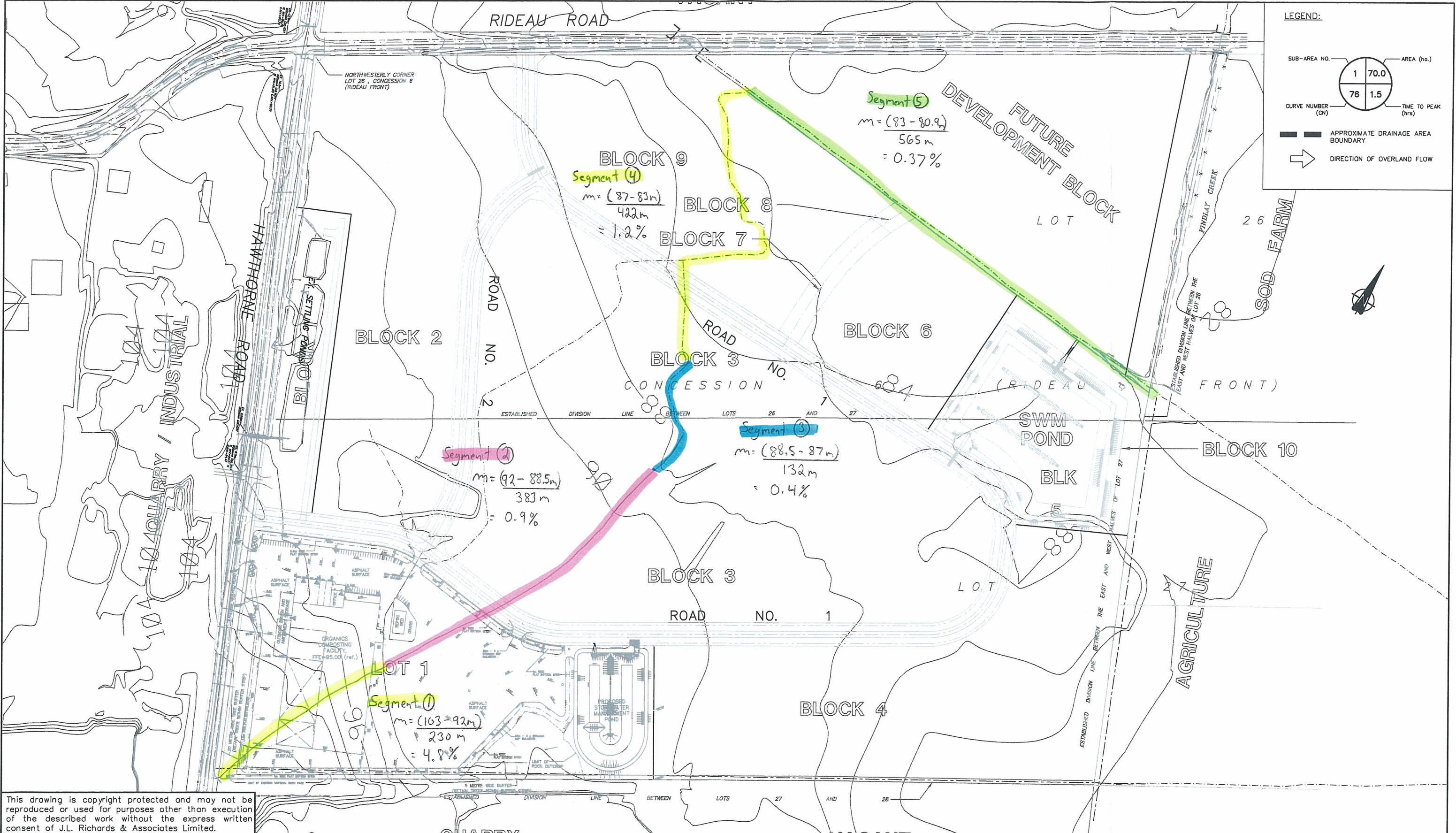
Grass = 0% Impervious

$$\% \text{ Imp.} = 10\% \times 1 + 35\% \times 1 + 35\% \times 0.7 + 20\% \times 0$$

$$= 70\%$$



V:\20983.DU\20983 C FIGURE 2A.dwg



This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

PROJECT: **HAWTHORNE INDUSTRIAL PARK**

DRAWING: **PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN**

**J.L. Richards & Associates Limited**  
 864 Lady Ellen Place  
 Ottawa, ON Canada  
 K1Z 5M2  
 Tel: 613 728 3571  
 Fax: 613 728 6012

DESIGN: M.B.  
 DRAWN: ARM  
 CHECKED: G.F.  
 PLOTTED: Jan 21, 2009

DRAWING NO.: **FIGURE 2**  
 JLR NO.: 20983



JOB NO. 20983

PROJECT Hawthorne Industrial Park

Time of Concentration - Pre-development

BY MB DATE Jan 22/09

Segment ①

$$\text{slope} = \frac{(103 - 92) \text{ m}}{230 \text{ m}}$$

$$= 4.8\%$$

Uplands Method Curve B - Woodland

$$\text{Velocity} = 0.32 \text{ m/s}$$

$$\text{Time} = \frac{230 \text{ m}}{0.32 \text{ m/s}}$$

$$= 719 \text{ sec}$$

Segment ②

$$\text{slope} = \frac{(92 - 88.5) \text{ m}}{383 \text{ m}}$$

$$= 0.9\%$$

Uplands Method Curve C - Pasture

$$\text{Velocity} = 0.21 \text{ m/s}$$

$$\text{Time} = \frac{383 \text{ m}}{0.21 \text{ m/s}}$$

$$= 1824 \text{ sec}$$



JOB NO. 20983

PROJECT Hawthorne Industrial Park

Time of Concentration - Pre-development

BY MB DATE Jan 22/09

Segment (3)

$$\text{slope} = \frac{(88.5 - 87) \text{ m}}{132 \text{ m}}$$

$$= 0.4 \%$$

Uplands Method Curve A - Forest (heavy litter)

$$\text{Velocity} = 0.05 \text{ m/s}$$

$$\text{Time} = \frac{132 \text{ m}}{0.05 \text{ m/s}}$$

$$= 2640 \text{ sec.}$$

Segment (4)

$$\text{slope} = \frac{(87 - 83) \text{ m}}{422 \text{ m}}$$

$$= 1.2 \%$$

Uplands Method Curve F - Grassed waterway

$$\text{Velocity} = 0.47 \text{ m/s}$$

$$\text{Time} = \frac{422 \text{ m}}{0.47 \text{ m/s}}$$

$$= 898 \text{ sec}$$



JOB NO. 20983

PROJECT Hawthorne Industrial Park

Time of Concentration - Pre-Development

BY MB DATE Jan 22/09

Segment ⑤

$$\text{slope} = \frac{(83 - 80.9) \text{ m}}{565 \text{ m}}$$

$$= 0.37\%$$

Uplands Method Curve F - Grassed Waterway

$$\text{Velocity} = 0.28 \text{ m/s}$$

$$\text{Time} = \frac{565 \text{ m}}{0.28 \text{ m/s}}$$

$$= 2018 \text{ sec}$$

$$\begin{aligned} \text{Total Time} &= \text{①} + \text{②} + \text{③} + \text{④} + \text{⑤} \\ &= 719 + 1824 + 2640 + 898 + 2018 \\ &= 8099 \text{ sec} \end{aligned}$$

$$\text{Time to Peak} = \frac{2}{3} \times 8099 \text{ sec}$$

$$= 5399 \text{ sec}$$

$$= 90 \text{ min}$$



**APPENDIX 'E'**

**SWMHYMO INPUT AND OUTPUT FILES  
(Pre - and Uncontrolled Post-Development Conditions)**

```

00001> 2 Metric units
00002> *****
00003> * Project Name : Hawthorne Industrial Park Project Number: [20983] *
00004> * Date : April, 2009 *
00005> * Rev: sed : N/A *
00006> * Developed by : Mark Buchanan, E.I.T. *
00007> * Reviewed by : Guy Forget, P.Eng. *
00008> * Company : J.L. Richards & Associates Limited *
00009> * License # : 4418403 *
00010> *****
00011> *
00012> *
00013> *****
00014> * FILENAME: V:\20983.DU\ENG\SWMHYMO\20983PST.DAT *
00015> * FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00016> * OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00017> *****
00018> *
00019> *****
00020> * SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE
00021> * PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00022> *****
00023> *
00024> *****
00025> * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00026> * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00027> *****
00028> *
00029> *****
00030> * POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00031> *****
00032> *
00033> *****
00034> * CALCULATION OF 4 HR 25 MM STORM EVENT *
00035> *****
00036> *
00037> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00038> * [ ] <- storm filename, one per line for NSTORM time
00039> READ STORM STORM_FILENAME=[4HR25-15.STM]
00040> *
00041> DEFAULT VALUES ICASEdef=[1], read and print values
00042> * DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
00043> *
00044> *
00045> *****
00046> * ORGAWORLD FILE *
00047> *****
00048> *
00049> * SUB-AREA No.1
00050> *
00051> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00052> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00053> SCS curve number CN=[81],
00054> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00055> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00056> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.52] (%),
00057> LGI=[204.72] (m), MNI=[0.03] (%), SCI=[0.0]
00058> RAINFALL=[ , , , ] (mm/hr), END=-1
00059> *
00060> *
00061> * SUB-AREA No.2
00062> *
00063> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00064> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00065> SCS curve number CN=[81],
00066> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00067> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00068> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.50] (%),
00069> LGI=[244.34] (m), MNI=[0.03] (%), SCI=[0.0]
00070> RAINFALL=[ , , , ] (mm/hr), END=-1
00071> *
00072> *
00073> * SUB-AREA No.3
00074> *
00075> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[ 1.4 ] (ha),
00076> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00077> SCS curve number CN=[81],
00078> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00079> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00080> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.51] (%),
00081> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0]
00082> RAINFALL=[ , , , ] (mm/hr), END=-1
00083> *
00084> ADD HYD IDsum=[4], NHYD=[ "040" ], IDs to add=[1+2]
00085> *
00086> ADD HYD IDsum=[5], NHYD=[ "050" ], IDs to add=[3+4]
00087> *
00088> *
00089> * SUB-AREA No.4
00090> *
00091> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[ 0.89 ] (ha),
00092> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00093> SCS curve number CN=[81],
00094> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00095> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00096> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.93] (%),
00097> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00098> RAINFALL=[ , , , ] (mm/hr), END=-1
00099> *
00100> *
00101> * SUB-AREA No.5
00102> *
00103> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[ 2.66 ] (ha),
00104> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00105> SCS curve number CN=[81],
00106> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
00107> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min)
00108> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.61] (%),
00109> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00110> RAINFALL=[ , , , ] (mm/hr), END=-1
00111> *
00112> ADD HYD IDsum=[8], NHYD=[ "080" ], IDs to add=[6+7]
00113> *
00114> ADD HYD IDsum=[9], NHYD=[ "090" ], IDs to add=[5+8]
00115> *
00116> *
00117> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00118> RDT=[1.0] (min),
00119> *****
00120> * TABLE of [ OUTFLOW-STORAGE ] values
00121> * (cms) - (ha-m)
00122> [ 0.000, 0.0000 ]
00123> [ 0.008, 0.0656 ]
00124> [ 0.017, 0.1311 ]
00125> [ 0.093, 0.2831 ]
00126> [ 0.233, 0.3971 ]
00127> [ 0.337, 0.4731 ]
00128> [ 0.465, 0.5491 ]
00129> [ 0.531, 0.5871 ]
00130> [ 0.599, 0.6251 ]
00131> [ 0.654, 0.6631 ]
00132> [ 0.797, 0.7391 ]
00133> [ 0.950, 0.8274 ]
00134> [ 1.304, 0.9157 ]
00135> [ 1.800, 1.0040 ]
00136> [ 2.577, 1.0923 ]

```

```

00137> [ -1, -1 ] (max twenty pts)
00138> *****
00139> * Remaining Hawthorne Industrial Park *
00140> *****
00141> *
00142> * SUB-AREA No.1
00143> *
00144> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00145> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00146> SCS curve number CN=[81],
00147> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
00148> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00149> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.6] (%),
00150> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00151> RAINFALL=[ , , , ] (mm/hr), END=-1
00152> *
00153> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00154> *
00155> *
00156> * SUB-AREA No.2
00157> *
00158> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00159> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00160> SCS curve number CN=[81],
00161> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
00162> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00163> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.65] (%),
00164> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00165> RAINFALL=[ , , , ] (mm/hr), END=-1
00166> *
00167> *
00168> * SUB-AREA No.3
00169> *
00170> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00171> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00172> SCS curve number CN=[81],
00173> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
00174> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00175> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.5] (%),
00176> LGI=[500] (m), MNI=[0.03], SCI=[0.0] (min)
00177> RAINFALL=[ , , , ] (mm/hr), END=-1
00178> *
00179> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00180> *
00181> *
00182> * SUB-AREA No.4
00183> *
00184> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00185> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00186> RAINFALL=[ , , , ] (mm/hr), END=-1
00187> *
00188> *
00189> *
00190> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00191> *
00192> *
00193> * SUB-AREA No.5
00194> *
00195> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5] min, AREA=[6.8] (ha),
00196> DWF=[0] (cms), CN/C=[76], TP=[0.37] hrs,
00197> RAINFALL=[ , , , ] (mm/hr), END=-1
00198> *
00199> *
00200> * SUB-AREA No.4
00201> *
00202> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[5.3] (ha),
00203> DWF=[0] (cms), CN/C=[76], TP=[0.804] hrs,
00204> RAINFALL=[ , , , ] (mm/hr), END=-1
00205> *
00206> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
00207> *
00208> *
00209> *****
00210> * CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00211> *****
00212> *
00213> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00214> * [ ] <- storm filename, one per line for NSTORM time
00215> *
00216> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00217> ICASEcs=[1],
00218> A=[732.951], B=[6.199], and C=[0.810],
00219> *
00220> DEFAULT VALUES ICASEdef=[1], read and print values
00221> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
00222> *
00223> *
00224> *****
00225> * ORGAWORLD FILE *
00226> *****
00227> *
00228> * SUB-AREA No.1
00229> *
00230> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00231> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00232> SCS curve number CN=[81],
00233> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00234> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00235> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.52] (%),
00236> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00237> RAINFALL=[ , , , ] (mm/hr), END=-1
00238> *
00239> *
00240> * SUB-AREA No.2
00241> *
00242> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00243> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00244> SCS curve number CN=[81],
00245> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00246> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00247> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.50] (%),
00248> LGI=[244.34] (m), MNI=[0.03] (%), SCI=[0.0]
00249> RAINFALL=[ , , , ] (mm/hr), END=-1
00250> *
00251> *
00252> * SUB-AREA No.3
00253> *
00254> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[ 1.4 ] (ha),
00255> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00256> SCS curve number CN=[81],
00257> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
00258> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00259> Impervious surfaces: IAIMP=[1.57] (mm), SLEP=[0.51] (%),
00260> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0]
00261> RAINFALL=[ , , , ] (mm/hr), END=-1
00262> *
00263> ADD HYD IDsum=[4], NHYD=[ "040" ], IDs to add=[1+2]
00264> *
00265> ADD HYD IDsum=[5], NHYD=[ "050" ], IDs to add=[3+4]
00266> *
00267> *
00268> * SUB-AREA No.4
00269> *
00270> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[ 0.89 ] (ha),

```

```

00271> XIMP={0.97}, TIMP={0.97}, DWF={0.0}(cms), LOSS={2},
00272> SCS curve number CN={81},
00273> Pervious surfaces: IAPER={4.67}(mm), SLP={0.7}(%),
00274> LGP={40}(m), MNP={0.25}, SCP={0.0}(min)
00275> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.93}(%),
00276> LGI={164.82}(m), MNI={0.03}, SCI={0.0}(
00277> RAINFALL=[ , , , ](mm/hr), END=-1
00278> *
00279> *
00280> * SUB-AREA No.5
00281>
00282> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT={2.5}(min), AREA={2.66}(ha),
00283> XIMP={0.97}, TIMP={0.97}, DWF={0.0}(cms), LOSS={2},
00284> SCS curve number CN={81},
00285> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00286> LGP={20.0}(m), MNP={0.25}, SCP={0.0}(min)
00287> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00288> LGI={207.25}(m), MNI={0.03}, SCI={0.0}(
00289> RAINFALL=[ , , , ](mm/hr), END=-1
00290> *
00291> ADD HYD IDsum={8}, NHYD=["080"], IDs to add={6+7}
00292> *
00293> ADD HYD IDsum={9}, NHYD=["090"], IDs to add={5+8}
00294> *
00295>
00296> ROUTE RESERVOIR IDout={10}, NHYD=["POND"], IDin={9},
00297> RDT={1.0}(min),
00298> TABLE of ( OUTFLOW-STORAGE ) values
00299> (cms) - (ha-m)
00300> [ 0.000, 0.0000]
00301> [ 0.008, 0.0656]
00302> [ 0.017, 0.1311]
00303> [ 0.093, 0.2831]
00304> [ 0.233, 0.3971]
00305> [ 0.337, 0.4731]
00306> [ 0.465, 0.5491]
00307> [ 0.531, 0.5871]
00308> [ 0.593, 0.6251]
00309> [ 0.654, 0.6631]
00310> [ 0.797, 0.7391]
00311> [ 0.950, 0.8274]
00312> [ 1.304, 0.9157]
00313> [ 1.880, 1.0040]
00314> [ 2.577, 1.0923]
00315> [ -1, -1 ] (max twenty pts)
00316>
00317> *****
00318> * Remaining Hawthorne Industrial Park *
00319> *
00320> *
00321> * SUB-AREA No.1
00322>
00323> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT={2.5}(min), AREA={19.9}(ha),
00324> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00325> SCS curve number CN={81},
00326> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00327> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00328> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00329> LGI={580}(m), MNI={0.03}, SCI={0.0}(min)
00330> RAINFALL=[ , , , ](mm/hr), END=-1
00331> *
00332> ADD HYD IDsum={ 2 }, NHYD=["HIP02"], IDs to add={10+1}
00333> *
00334> *
00335> * SUB-AREA No.2
00336>
00337> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT={2.5}(min), AREA={17}(ha),
00338> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00339> SCS curve number CN={81},
00340> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00341> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00342> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00343> LGI={450}(m), MNI={0.03}, SCI={0.0}(min)
00344> RAINFALL=[ , , , ](mm/hr), END=-1
00345> *
00346> *
00347> * SUB-AREA No.3
00348>
00349> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT={2.5}(min), AREA={18.1}(ha),
00350> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00351> SCS curve number CN={81},
00352> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00353> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00354> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00355> LGI={600}(m), MNI={0.03}, SCI={0.0}(min)
00356> RAINFALL=[ , , , ](mm/hr), END=-1
00357> *
00358> ADD HYD IDsum={ 5 }, NHYD=["HIP05"], IDs to add={3+4}
00359> *
00360> *
00361> * SUB-AREA No.4
00362>
00363> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT={2.5}min, AREA={4.0}(ha),
00364> DWF={0}(cms), CNC={ 85 }, TP={0.17}hrs,
00365> RAINFALL=[ , , , ](mm/hr), END=-1
00366> *
00367> *
00368> *
00369> ADD HYD IDsum={ 7 }, NHYD=["HIP06"], IDs to add={2+5+6}
00370> *
00371> *
00372> * SUB-AREA No.5
00373>
00374> DESIGN NASHYD ID = [10], NHYD=["A2"], DT={2.5}min, AREA={6.8}(ha),
00375> DWF={0}(cms), CNC={76}, TP={0.37}hrs,
00376> RAINFALL=[ , , , ](mm/hr), END=-1
00377> *
00378> *
00379> * SUB-AREA No.4
00380>
00381> DESIGN NASHYD ID = [1], NHYD=["A3"], DT={2.5}min, AREA={5.3}(ha),
00382> DWF={0}(cms), CNC={76}, TP={0.804}hrs,
00383> RAINFALL=[ , , , ](mm/hr), END=-1
00384> *
00385> ADD HYD IDsum={2}, NHYD=["0020"], IDs to add={7+10+1}
00386> *
00387> *
00388> *
00389> *****
00390> * CALCULATION OF 3HR - 1:5 YEAR STORM EVENT *
00391> *****
00392>
00393> START TZERO={0.0}, MROUT={2}, NSTORE={0}, NRUN={0}
00394> * [ ] <- storm filename, one per line for NSTORE time
00395> *
00396> CHICAGO STORM IUNITS={2}, TD={3.0}(hrs), TPRAT={0.333}, CSTDT={10.0}(min)
00397> ICASEC={1},
00398> A={998.071}, B={6.053}, and C={0.814},
00399> *
00400> DEFAULT VALUES ICASEDef={1}, read and print values
00401> * DEFVAL_FILENAME={V:\22973.DU\ENG\SWHYMO\ORGA.VAL}
00402> *
00403> *
00404> *
00405> * ORGAWORLD FILE *

```

```

00406> *****
00407>
00408> * SUB-AREA No.1
00409>
00410> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT={2.5}(min), AREA={2.07}(ha),
00411> XIMP={0.84}, TIMP={0.84}, DWF={0.0}(cms), LOSS={2},
00412> SCS curve number CN={81},
00413> Pervious surfaces: IAPER={4.67}(mm), SLP={1.0}(%),
00414> LGP={20}(m), MNP={0.25}, SCP={0.0}(min)
00415> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.52}(%),
00416> LGI={204.72}(m), MNI={0.03}, SCI={0.0}(
00417> RAINFALL=[ , , , ](mm/hr), END=-1
00418> *
00419> *
00420> * SUB-AREA No.2
00421>
00422> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT={2.5}(min), AREA={1.54}(ha),
00423> XIMP={0.92}, TIMP={0.92}, DWF={0.0}(cms), LOSS={2},
00424> SCS curve number CN={81},
00425> Pervious surfaces: IAPER={4.67}(mm), SLP={1.0}(%),
00426> LGP={5}(m), MNP={0.03}, SCP={0.0}(min),
00427> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.50}(%),
00428> LGI={244.34}(m), MNI={0.03}, SCI={0.0}(
00429> RAINFALL=[ , , , ](mm/hr), END=-1
00430> *
00431> *
00432> * SUB-AREA No.3
00433>
00434> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT={2.5}(min), AREA={1.4}(ha),
00435> XIMP={0.97}, TIMP={0.97}, DWF={0.0}(cms), LOSS={2},
00436> SCS curve number CN={81},
00437> Pervious surfaces: IAPER={4.67}(mm), SLP={1.0}(%),
00438> LGP={5}(m), MNP={0.03}, SCP={0.0}(min),
00439> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.51}(%),
00440> LGI={225.63}(m), MNI={0.03}, SCI={0.0}(
00441> RAINFALL=[ , , , ](mm/hr), END=-1
00442> *
00443> ADD HYD IDsum={4}, NHYD=["040"], IDs to add={1+2}
00444> *
00445> ADD HYD IDsum={5}, NHYD=["050"], IDs to add={3+4}
00446> *
00447> *
00448> * SUB-AREA No.4
00449>
00450> CALIB STANDHYD ID=[6], NHYD=["060"], DT={2.5}(min), AREA={0.89}(ha),
00451> XIMP={0.97}, TIMP={0.97}, DWF={0.0}(cms), LOSS={2},
00452> SCS curve number CN={81},
00453> Pervious surfaces: IAPER={4.67}(mm), SLP={0.7}(%),
00454> LGP={40}(m), MNP={0.25}, SCP={0.0}(min)
00455> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.93}(%),
00456> LGI={164.82}(m), MNI={0.03}, SCI={0.0}(
00457> RAINFALL=[ , , , ](mm/hr), END=-1
00458> *
00459> *
00460> * SUB-AREA No.5
00461>
00462> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT={2.5}(min), AREA={2.66}(ha),
00463> XIMP={0.97}, TIMP={0.97}, DWF={0.0}(cms), LOSS={2},
00464> SCS curve number CN={81},
00465> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00466> LGP={20.0}(m), MNP={0.25}, SCP={0.0}(min)
00467> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00468> LGI={207.25}(m), MNI={0.03}, SCI={0.0}(
00469> RAINFALL=[ , , , ](mm/hr), END=-1
00470> *
00471> ADD HYD IDsum={8}, NHYD=["080"], IDs to add={6+7}
00472> *
00473> ADD HYD IDsum={9}, NHYD=["090"], IDs to add={5+8}
00474> *
00475>
00476> ROUTE RESERVOIR IDout={10}, NHYD=["POND"], IDin={9},
00477> RDT={1.0}(min),
00478> TABLE of ( OUTFLOW-STORAGE ) values
00479> (cms) - (ha-m)
00480> [ 0.000, 0.0000]
00481> [ 0.008, 0.0656]
00482> [ 0.017, 0.1311]
00483> [ 0.093, 0.2831]
00484> [ 0.233, 0.3971]
00485> [ 0.337, 0.4731]
00486> [ 0.465, 0.5491]
00487> [ 0.531, 0.5871]
00488> [ 0.593, 0.6251]
00489> [ 0.654, 0.6631]
00490> [ 0.797, 0.7391]
00491> [ 0.950, 0.8274]
00492> [ 1.304, 0.9157]
00493> [ 1.880, 1.0040]
00494> [ 2.577, 1.0923]
00495> [ -1, -1 ] (max twenty pts)
00496>
00497> *****
00498> * Remaining Hawthorne Industrial Park *
00499> *
00500> *
00501> * SUB-AREA No.1
00502>
00503> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT={2.5}(min), AREA={19.9}(ha),
00504> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00505> SCS curve number CN={81},
00506> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00507> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00508> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00509> LGI={580}(m), MNI={0.03}, SCI={0.0}(min)
00510> RAINFALL=[ , , , ](mm/hr), END=-1
00511> *
00512> ADD HYD IDsum={ 2 }, NHYD=["HIP02"], IDs to add={10+1}
00513> *
00514> *
00515> * SUB-AREA No.2
00516>
00517> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT={2.5}(min), AREA={17}(ha),
00518> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00519> SCS curve number CN={81},
00520> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00521> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00522> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00523> LGI={450}(m), MNI={0.03}, SCI={0.0}(min)
00524> RAINFALL=[ , , , ](mm/hr), END=-1
00525> *
00526> *
00527> * SUB-AREA No.3
00528>
00529> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT={2.5}(min), AREA={18.1}(ha),
00530> XIMP={0.50}, TIMP={0.71}, DWF={0.0}(cms), LOSS={2},
00531> SCS curve number CN={81},
00532> Pervious surfaces: IAPER={4.67}(mm), SLP={1.5}(%),
00533> LGP={100.0}(m), MNP={0.25}, SCP={0.0}(min)
00534> Impervious surfaces: IAIMP={1.57}(mm), SLP={0.61}(%),
00535> LGI={600}(m), MNI={0.03}, SCI={0.0}(min)
00536> RAINFALL=[ , , , ](mm/hr), END=-1
00537> *
00538> ADD HYD IDsum={ 5 }, NHYD=["HIP05"], IDs to add={3+4}
00539> *
00540> *

```

```

00541> *SUB-AREA No.4
00542>
00543> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
00544> DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
00545> RAINFALL=[ , , , ](mm/hr), END=-1
00546> *%-----|
00547>
00548>
00549> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00550> *%-----|
00551>
00552> * SUB-AREA No. 5
00553>
00554> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
00555> DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
00556> RAINFALL=[ , , , ](mm/hr), END=-1
00557> *%-----|
00558>
00559> * SUB-AREA No.4
00560>
00561> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
00562> DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
00563> RAINFALL=[ , , , ](mm/hr), END=-1
00564> *%-----|
00565>
00566> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
00567> *%-----|
00568>
00569> * CALCULATION OF 3HR - 1:10 YEAR STORM EVENT
00570> *%-----|
00571>
00572> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00573> *%-----|
00574> [ ] <- storm filename, one per line for NSTORM time
00575>
00576> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TPAT=[0.333], CSDF=[10.0] (min)
00577> ICASEcs=[1],
00578> A=[1174.184], B=[6.014], and C=[0.816],
00579> *%-----|
00580>
00581> DEFAULT VALUES ICASEDef=[1], read and print values
00582> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWHYMO\ORGA.VAL]
00583> *%-----|
00584>
00585> * ORGAWORLD FILE
00586> *%-----|
00587>
00588> * SUB-AREA No.1
00589> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00590> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00591> SCS curve number CN=[81],
00592> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00593> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (mi)
00594> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00595> LGI=[204.72] (m), MNI=[0.03 ], SCI=[0.0]
00596> RAINFALL=[ , , , ](mm/hr), END=-1
00597> *%-----|
00598>
00599> * SUB-AREA No.2
00600>
00601> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00602> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00603> SCS curve number CN=[81],
00604> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00605> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00606> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
00607> LGI=[244.34] (m), MNI=[0.03 ], SCI=[0.0]
00608> RAINFALL=[ , , , ](mm/hr), END=-1
00609> *%-----|
00610>
00611> * SUB-AREA No.3
00612>
00613> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00614> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00615> SCS curve number CN=[81],
00616> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00617> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00618> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00619> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
00620> RAINFALL=[ , , , ](mm/hr), END=-1
00621> *%-----|
00622>
00623> ADD HYD IDsum=[4], NHYD=[ "040" ], IDs to add=[1+2]
00624> *%-----|
00625>
00626> ADD HYD IDsum=[5], NHYD=[ "050" ], IDs to add=[3+4]
00627> *%-----|
00628>
00629> * SUB-AREA No.4
00630> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00631> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00632> SCS curve number CN=[81],
00633> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00634> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00635> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
00636> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00637> RAINFALL=[ , , , ](mm/hr), END=-1
00638> *%-----|
00639>
00640> * SUB-AREA No.5
00641> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00642> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00643> SCS curve number CN=[81],
00644> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00645> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00646> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00647> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00648> RAINFALL=[ , , , ](mm/hr), END=-1
00649> *%-----|
00650>
00651> ADD HYD IDsum=[8], NHYD=[ "080" ], IDs to add=[6+7]
00652> *%-----|
00653>
00654> ADD HYD IDsum=[9], NHYD=[ "090" ], IDs to add=[5+8]
00655> *%-----|
00656>
00657> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00658> RDT=[1.0] (min),
00659> TABLE of ( OUTFLOW-STORAGE ) values
00660> (cms) = (ha-m)
00661> [ 0.000, 0.0000]
00662> [ 0.008, 0.0663]
00663> [ 0.017, 0.1311]
00664> [ 0.093, 0.2831]
00665> [ 0.233, 0.3971]
00666> [ 0.337, 0.4731]
00667> [ 0.465, 0.5491]
00668> [ 0.531, 0.5871]
00669> [ 0.593, 0.6251]
00670> [ 0.654, 0.6631]
00671> [ 0.797, 0.7391]
00672> [ 0.950, 0.8274]
00673> [ 1.304, 0.9157]
00674> [ 1.880, 1.0040]
00675> [ 2.577, 1.0923]
00676> [ -1, -1 ] (max twenty pts)

```

```

00676> *****
00677> * Remaining Hawthorne Industrial Park *
00678> *****
00679>
00680> * SUB-AREA No.1
00681>
00682> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00683> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00684> SCS curve number CN=[81],
00685> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00686> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00687> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00688> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00689> RAINFALL=[ , , , ](mm/hr), END=-1
00690> *%-----|
00691>
00692> ADD HYD IDsum=[ 2 ], NHYD=["HIPO2"], IDs to add=[10+1]
00693> *%-----|
00694>
00695> * SUB-AREA No.2
00696>
00697> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00698> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00699> SCS curve number CN=[81],
00700> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00701> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00702> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00703> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00704> RAINFALL=[ , , , ](mm/hr), END=-1
00705> *%-----|
00706>
00707> * SUB-AREA No.3
00708> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00709> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00710> SCS curve number CN=[81],
00711> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00712> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00713> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00714> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00715> RAINFALL=[ , , , ](mm/hr), END=-1
00716> *%-----|
00717>
00718> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00719> *%-----|
00720>
00721> * SUB-AREA No.4
00722> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
00723> DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
00724> RAINFALL=[ , , , ](mm/hr), END=-1
00725> *%-----|
00726>
00727>
00728> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00729> *%-----|
00730>
00731> * SUB-AREA No. 5
00732>
00733> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
00734> DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
00735> RAINFALL=[ , , , ](mm/hr), END=-1
00736> *%-----|
00737>
00738> * SUB-AREA No.4
00739>
00740> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
00741> DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
00742> RAINFALL=[ , , , ](mm/hr), END=-1
00743> *%-----|
00744>
00745> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
00746> *%-----|
00747>
00748> * CALCULATION OF 3HR - 1:25 YEAR STORM EVENT
00749> *%-----|
00750>
00751> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00752> *%-----|
00753> [ ] <- storm filename, one per line for NSTORM time
00754>
00755> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TPAT=[0.333], CSDF=[10.0] (min)
00756> ICASEcs=[1],
00757> A=[1402.884], B=[6.018], and C=[0.819],
00758> *%-----|
00759>
00760> DEFAULT VALUES ICASEDef=[1], read and print values
00761> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWHYMO\ORGA.VAL]
00762> *%-----|
00763>
00764> * ORGAWORLD FILE
00765> *%-----|
00766>
00767> * SUB-AREA No.1
00768> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00769> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00770> SCS curve number CN=[81],
00771> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00772> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (mi)
00773> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00774> LGI=[204.72] (m), MNI=[0.03 ], SCI=[0.0]
00775> RAINFALL=[ , , , ](mm/hr), END=-1
00776> *%-----|
00777>
00778> * SUB-AREA No.2
00779>
00780> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00781> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00782> SCS curve number CN=[81],
00783> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00784> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00785> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
00786> LGI=[244.34] (m), MNI=[0.03 ], SCI=[0.0]
00787> RAINFALL=[ , , , ](mm/hr), END=-1
00788> *%-----|
00789>
00790> * SUB-AREA No.3
00791>
00792> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00793> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00794> SCS curve number CN=[81],
00795> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00796> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00797> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00798> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
00799> RAINFALL=[ , , , ](mm/hr), END=-1
00800> *%-----|
00801>
00802> ADD HYD IDsum=[4], NHYD=[ "040" ], IDs to add=[1+2]
00803> *%-----|
00804>
00805> ADD HYD IDsum=[5], NHYD=[ "050" ], IDs to add=[3+4]
00806> *%-----|
00807>
00808> * SUB-AREA No.4
00809> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00810> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00811> SCS curve number CN=[81],

```

```

00811> Pervious surfaces: IApex=[4.67] (mm), SLPP=[0.7] (%),
00812> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00813> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.93] (%),
00814> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
00815> RAINFALL=[ , , , ] (mm/hr), END=-1
00816> *%-----|
00817> *
00818> * SUB-AREA No.5
00819>
00820> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00821> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00822> SCS curve number CN=[81],
00823> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
00824> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min)
00825> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
00826> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
00827> RAINFALL=[ , , , ] (mm/hr), END=-1
00828> *%-----|
00829> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00830> *%-----|
00831> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00832> *%-----|
00833>
00834> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00835> RDT=[1.0] (min),
00836> TABLE of ( OUTFLOW-STORAGE ) values
00837> ( cms ) - ( ha-m )
00838> [ 0.000, 0.0000 ]
00839> [ 0.008, 0.0656 ]
00840> [ 0.017, 0.1311 ]
00841> [ 0.093, 0.2831 ]
00842> [ 0.233, 0.3971 ]
00843> [ 0.337, 0.4731 ]
00844> [ 0.465, 0.5491 ]
00845> [ 0.531, 0.5871 ]
00846> [ 0.593, 0.6251 ]
00847> [ 0.654, 0.6631 ]
00848> [ 0.797, 0.7391 ]
00849> [ 0.950, 0.8274 ]
00850> [ 1.304, 0.9157 ]
00851> [ 1.880, 1.0040 ]
00852> [ 2.577, 1.0923 ]
00853> [ -1, -1 ] (max twenty pts)
00854>
00855> *****
00856> * Remaining Hawthorne Industrial Park *
00857> *****
00858> *
00859> * SUB-AREA No.1
00860>
00861> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00862> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00863> SCS curve number CN=[81],
00864> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
00865> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00866> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
00867> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00868> RAINFALL=[ , , , ] (mm/hr), END=-1
00869> *%-----|
00870> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00871> *%-----|
00872> *
00873> * SUB-AREA No.2
00874>
00875> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00876> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00877> SCS curve number CN=[81],
00878> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
00879> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00880> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
00881> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00882> RAINFALL=[ , , , ] (mm/hr), END=-1
00883> *%-----|
00884> *
00885> * SUB-AREA No.3
00886>
00887> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00888> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00889> SCS curve number CN=[81],
00890> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
00891> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00892> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.5] (%),
00893> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00894> RAINFALL=[ , , , ] (mm/hr), END=-1
00895> *%-----|
00896> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00897> *%-----|
00898> *
00899> * SUB-AREA No.4
00900>
00901> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00902> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00903> RAINFALL=[ , , , ] (mm/hr), END=-1
00904> *%-----|
00905>
00906>
00907> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00908> *%-----|
00909>
00910> * SUB-AREA No. 5
00911>
00912> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5] min, AREA=[6.8] (ha),
00913> DWF=[0] (cms), CNC=[76], TP=[0.37] hrs,
00914> RAINFALL=[ , , , ] (mm/hr), END=-1
00915> *%-----|
00916>
00917> * SUB-AREA No 4
00918>
00919> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[5.3] (ha),
00920> DWF=[0] (cms), CNC=[76], TP=[0.80] hrs,
00921> RAINFALL=[ , , , ] (mm/hr), END=-1
00922> *%-----|
00923> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
00924> *%-----|
00925>
00926> *****
00927> ***** CALCULATION OF 3HR - 1:50 YEAR STORM EVENT *****
00928> *****
00929> *****
00930>
00931> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00932> *%-----|
00933> [ ] <- storm filename, one per line for NSTORM time
00934> CHICAGO STORM IUNIT=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00935> ICASRCS=[1], A=[1569.580], B=[6.014], and C=[0.820],
00936>
00937> *%-----|
00938> DEFAULT VALUES ICASEdef=[1], read and print values
00939> DEVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\ORGA.VAL"]
00940> *%-----|
00941>
00942> *****
00943> * ORGAWORLD FILE *
00944> *****
00945>

```

```

00946> * SUB-AREA No.1
00947>
00948> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00949> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00950> SCS curve number CN=[81],
00951> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.0] (%),
00952> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00953> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.52] (%),
00954> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0] (min)
00955> RAINFALL=[ , , , ] (mm/hr), END=-1
00956> *%-----|
00957> *
00958> * SUB-AREA No.2
00959>
00960> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00961> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00962> SCS curve number CN=[81],
00963> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.0] (%),
00964> LGP=[5] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00965> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.50] (%),
00966> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0] (min)
00967> RAINFALL=[ , , , ] (mm/hr), END=-1
00968> *%-----|
00969> *
00970> * SUB-AREA No.3
00971>
00972> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00973> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00974> SCS curve number CN=[81],
00975> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.0] (%),
00976> LGP=[5] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00977> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.51] (%),
00978> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0] (min)
00979> RAINFALL=[ , , , ] (mm/hr), END=-1
00980> *%-----|
00981> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00982> *%-----|
00983> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00984> *%-----|
00985> *
00986> * SUB-AREA No.4
00987>
00988> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00989> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00990> SCS curve number CN=[81],
00991> Pervious surfaces: IApex=[4.67] (mm), SLPP=[0.7] (%),
00992> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00993> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.93] (%),
00994> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
00995> RAINFALL=[ , , , ] (mm/hr), END=-1
00996> *%-----|
00997> *
00998> * SUB-AREA No.5
00999>
01000> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
01001> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01002> SCS curve number CN=[81],
01003> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
01004> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min)
01005> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01006> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
01007> RAINFALL=[ , , , ] (mm/hr), END=-1
01008> *%-----|
01009> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
01010> *%-----|
01011> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
01012> *%-----|
01013>
01014> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
01015> RDT=[1.0] (min),
01016> TABLE of ( OUTFLOW-STORAGE ) values
01017> ( cms ) - ( ha-m )
01018> [ 0.000, 0.0000 ]
01019> [ 0.008, 0.0656 ]
01020> [ 0.017, 0.1311 ]
01021> [ 0.093, 0.2831 ]
01022> [ 0.233, 0.3971 ]
01023> [ 0.337, 0.4731 ]
01024> [ 0.465, 0.5491 ]
01025> [ 0.531, 0.5871 ]
01026> [ 0.593, 0.6251 ]
01027> [ 0.654, 0.6631 ]
01028> [ 0.797, 0.7391 ]
01029> [ 0.950, 0.8274 ]
01030> [ 1.304, 0.9157 ]
01031> [ 1.880, 1.0040 ]
01032> [ 2.577, 1.0923 ]
01033> [ -1, -1 ] (max twenty pts)
01034>
01035> *****
01036> * Remaining Hawthorne Industrial Park *
01037> *****
01038> *
01039> * SUB-AREA No.1
01040>
01041> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
01042> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01043> SCS curve number CN=[81],
01044> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
01045> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
01046> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01047> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01048> RAINFALL=[ , , , ] (mm/hr), END=-1
01049> *%-----|
01050> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01051> *%-----|
01052> *
01053> * SUB-AREA No.2
01054>
01055> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
01056> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01057> SCS curve number CN=[81],
01058> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
01059> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
01060> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01061> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01062> RAINFALL=[ , , , ] (mm/hr), END=-1
01063> *%-----|
01064> *
01065> * SUB-AREA No.3
01066>
01067> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
01068> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01069> SCS curve number CN=[81],
01070> Pervious surfaces: IApex=[4.67] (mm), SLPP=[1.5] (%),
01071> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
01072> ImperVIOUS surfaces: IAimp=[1.57] (mm), SLPI=[0.5] (%),
01073> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01074> RAINFALL=[ , , , ] (mm/hr), END=-1
01075> *%-----|
01076> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01077> *%-----|
01078> *
01079> * SUB-AREA No.4
01080>

```



```

01081> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
01082> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17]hrs,
01083> RAINFALL=[ , , , ] (mm/hr), END=-1
01084> *%-----|
01085>
01086>
01087> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
01088> *%-----|
01089>
01090> * SUB-AREA No. 5
01091>
01092> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
01093> DWF=[0] (cms), CNC=[76], TP=[0.37]hrs,
01094> RAINFALL=[ , , , ] (mm/hr), END=-1
01095> *%-----|
01096>
01097> * SUB-AREA No. 4
01098>
01099> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
01100> DWF=[0] (cms), CNC=[76], TP=[0.804]hrs,
01101> RAINFALL=[ , , , ] (mm/hr), END=-1
01102> *%-----|
01103>
01104> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
01105> *%-----|
01106>
01107> * CALCULATION OF 3HR - 1:100 YEAR STORM EVENT *
01108> *-----|
01109>
01110> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
01111> [ ] <-storm filename, one per line for NSTORM time
01112> *%-----|
01113> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
01114> ICASE=[1],
01115> A=[1735.688], B=[6.014], and Ca=[0.820].
01116> *%-----|
01117> DEFAULT VALUES ICASEdef=[1], read and print values
01118> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\ORGA.VAL"]
01119> *%-----|
01120>
01121> *-----|
01122> * ORGAWORLD FILE *
01123> *-----|
01124>
01125> * SUB-AREA No. 1
01126>
01127> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
01128> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
01129> SCS curve number CN=[81],
01130> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01131> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (m)
01132> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.52] (%),
01133> LGI=[204.72] (m), MNI=[0.03 ], SCI=[0.0]
01134> RAINFALL=[ , , , ] (mm/hr), END=-1
01135> *%-----|
01136>
01137> * SUB-AREA No. 2
01138>
01139> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
01140> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
01141> SCS curve number CN=[81],
01142> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01143> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01144> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.50] (%),
01145> LGI=[244.34] (m), MNI=[0.03 ], SCI=[0.0]
01146> RAINFALL=[ , , , ] (mm/hr), END=-1
01147> *%-----|
01148>
01149> * SUB-AREA No. 3
01150>
01151> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
01152> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01153> SCS curve number CN=[81],
01154> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01155> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01156> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.51] (%),
01157> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0]
01158> RAINFALL=[ , , , ] (mm/hr), END=-1
01159> *%-----|
01160>
01161> ADD HYD IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
01162> *%-----|
01163>
01164> ADD HYD IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
01165> *%-----|
01166>
01167> * SUB-AREA No. 4
01168>
01169> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
01170> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01171> SCS curve number CN=[81],
01172> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
01173> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
01174> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.93] (%),
01175> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
01176> RAINFALL=[ , , , ] (mm/hr), END=-1
01177> *%-----|
01178>
01179> * SUB-AREA No. 5
01180>
01181> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
01182> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01183> SCS curve number CN=[81],
01184> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01185> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
01186> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01187> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
01188> RAINFALL=[ , , , ] (mm/hr), END=-1
01189> *%-----|
01190>
01191> ADD HYD IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
01192> *%-----|
01193>
01194> ADD HYD IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
01195> *%-----|
01196>
01197> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
01198> RDT=[1.0] (min),
01199> TABLE of ( OUTFLOW-STORAGE ) values
01200> (cms) - (ha-m)
01201> [ 0.000, 0.0000]
01202> [ 0.008, 0.0656]
01203> [ 0.017, 0.1311]
01204> [ 0.033, 0.2621]
01205> [ 0.233, 0.3971]
01206> [ 0.337, 0.4731]
01207> [ 0.465, 0.5491]
01208> [ 0.531, 0.5871]
01209> [ 0.593, 0.6251]
01210> [ 0.654, 0.6631]
01211> [ 0.797, 0.7391]
01212> [ 0.950, 0.8274]
01213> [ 1.304, 0.9157]
01214> [ 1.880, 1.0040]
01215> [ 2.577, 1.0923]
01216> [ -1, -1 ] (max twenty pts)
01217> *%-----|
01218>
01219> * Remaining Hawthorne Industrial Park *

```

```

01216> *****|
01217> * SUB-AREA No. 1
01218>
01219> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
01220> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01221> SCS curve number CN=[81],
01222> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01223> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01224> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01225> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01226> RAINFALL=[ , , , ] (mm/hr), END=-1
01227> *%-----|
01228>
01229> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01230> *%-----|
01231>
01232> * SUB-AREA No. 2
01233>
01234> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
01235> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01236> SCS curve number CN=[81],
01237> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01238> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01239> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.65] (%),
01240> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01241> RAINFALL=[ , , , ] (mm/hr), END=-1
01242> *%-----|
01243>
01244> * SUB-AREA No. 3
01245>
01246> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
01247> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01248> SCS curve number CN=[81],
01249> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01250> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01251> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.5] (%),
01252> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01253> RAINFALL=[ , , , ] (mm/hr), END=-1
01254> *%-----|
01255>
01256> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01257> *%-----|
01258>
01259> * SUB-AREA No. 4
01260>
01261> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
01262> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17]hrs,
01263> RAINFALL=[ , , , ] (mm/hr), END=-1
01264> *%-----|
01265>
01266> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
01267> *%-----|
01268>
01269> * SUB-AREA No. 5
01270>
01271> DESIGN NASHYD ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
01272> DWF=[0] (cms), CNC=[76], TP=[0.37]hrs,
01273> RAINFALL=[ , , , ] (mm/hr), END=-1
01274> *%-----|
01275>
01276> * SUB-AREA No. 4
01277>
01278> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
01279> DWF=[0] (cms), CNC=[76], TP=[0.804]hrs,
01280> RAINFALL=[ , , , ] (mm/hr), END=-1
01281> *%-----|
01282>
01283> ADD HYD IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
01284> *%-----|
01285>
01286> FINISH
01287>
01288> *****Rough Pond 1.87 ha x 1.4 m deep*****
01289> TABLE of ( OUTFLOW-STORAGE ) values
01290> (cms) - (ha-m)
01291> [ 0.0, 0.0 ]
01292> [ 0.10, 0.374 ]
01293> [ 0.25, 0.748 ]
01294> [ 0.50, 1.122 ]
01295> [ 0.85, 1.496 ]
01296> [ 1.20, 1.870 ]
01297> [ 1.30, 2.244 ]
01298> [ 1.50, 2.618 ]
01299> [ -1, -1 ]
01300>
01301> *****Rough Pond 150x150 x 1.4 m deep*****
01302> (cms) - (ha-m)
01303> [ 0.0, 0.0 ]
01304> [ 0.16, 0.45 ]
01305> [ 0.31, 0.900 ]
01306> [ 0.60, 1.350 ]
01307> [ 0.95, 1.800 ]
01308> [ 1.40, 2.25 ]
01309> [ 1.45, 2.700 ]
01310> [ 1.50, 3.150 ]
01311> [ -1, -1 ] (max twenty pts)
01312>
01313>
01314>
01315>
01316>
01317>
01318>
01319>
01320>
01321>
01322>
01323>
01324>
01325>
01326>
01327>
01328>
01329>
01330>
01331>
01332>
01333>
01334>
01335>
01336>
01337>
01338>
01339>
01340>
01341>
01342>
01343>
01344>
01345>
01346>
01347>
01348>
01349>
01350>

```

```

00001>
00002>
00003> SSSS W W M M H H Y Y M M O O 999 999
00004> S W W M M H H Y Y M M O O 9 9 9
00005> SSSS W W M M H H H H Y Y M M O O # 9 9 9 Ver. 4.02
00006> S W W M M H H Y Y M M O O 9999 9999 July 1999
00007> SSSS W W M M H H Y Y M M O O 9 9 9
00008> StormWater Management Hydrologic Model 9 9 9 # 4418403
00009>
00010>
00011>
00012> ***** SWMHYMO-99 Ver/4.02 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> ***** OTTHMO-83 and OTTHMO-89. *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: swmhyo@fsa.com *****
00021> *****
00022>
00023>
00024> ***** Licensed user: J. L. Richards & Associates Limited *****
00025> ***** Ottawa SERIAL#:4418403 *****
00026> *****
00027>
00028>
00029> ***** PROGRAM ARRAY DIMENSIONS *****
00030> ***** Maximum value for ID numbers : 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034>
00035>
00036> ***** DETAILED OUTPUT *****
00037> *****
00038> * DATE: TIME: 10:30:14 RUN COUNTER: 000173
00039> *****
00040> * Input filename: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\PSTPH1.dat
00041> * Output filename: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\PSTPH1.out
00042> * Summary filename: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\PSTPH1.sum
00043> * User comments:
00044> * 1:
00045> * 2:
00046> * 3:
00047> *****
00048>
00049>
00050> 001:0001-
00051> *****
00052> * Project Name : Hawthorne Industrial Park Project Number: [20983] *
00053> * Date : April, 2009 *
00054> * Revised : N/A *
00055> * Developed by : Mark Buchanan, E.I.T. *
00056> * Reviewed by : Guy Forget, P.Eng *
00057> * Company : J.L. Richards & Associates Limited *
00058> * License # : 4418403 *
00059> *****
00060> *
00061> *
00062> *****
00063> * FILENAME: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\20983PST.DAT
00064> * FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00065> * OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00066> *****
00067> *
00068> *****
00069> * SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE
00070> * PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00071> *****
00072> *
00073> * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00074> * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00075> *****
00076> *
00077> * POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00078> *****
00079> *
00080> * CALCULATION OF 4 HR 25 MM STORM EVENT *
00081> *****
00082> *
00083> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\
00084> | TZERO = .00 hrs on | Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\
00085> | METOUT= 2 (output = METRIC)
00086> | NRUN = 001
00087> | NSTORM= 0
00088> *****
00089>
00090> 001:0002-
00091>
00092> | READ STORM | Filename: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\4HR25-1
00093> | Ptotal= 25.00 mm | Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
00094> *****
00095>
00096> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00097> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00098> .25 1.777 | 1.25 45.631 | 2.25 3.138 | 3.25 1.675
00099> .50 2.357 | 1.50 11.911 | 2.50 2.555 | 3.50 1.509
00100> .75 3.518 | 1.75 6.051 | 2.75 2.165 | 3.75 1.376
00101> 1.00 9.975 | 2.00 4.108 | 3.00 1.885 | 4.00 1.266
00102> *****
00103> 001:0003-
00104> *****
00105> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWMHYMO\ORGA.VAL
00106> | ICASEdv = 1 (read and print data)
00107> | Filetitle= ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
00108> | Horton's infiltration equation parameters:
00109> | [F0= 50.00 mm/hr] [F0= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
00110> | Parameters for PERVIOUS surfaces in STANDHYD:
00111> | [IAPER= 4.67 mm] [LGR=40.00 mm] [MNP= .250]
00112> | Parameters for IMPERVIOUS surfaces in STANDHYD:
00113> | [IRIMP= 1.57 mm] [CLL= 1.50] [MNI= .035]
00114> | Parameters used in NASHYD:
00115> | [Ia= 4.67 mm] [N= 3.00]
00116> *****
00117>
00118> 001:0004-
00119> *****
00120> * ORGAWORLD FILE *
00121> *****
00122> * SUB-AREA No.1
00123> *****
00124> | CALIB STANDHYD | Area (ha)= 2.07
00125> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00126> *****
00127>
00128> IMPERVIOUS PERVIOUS (i)
00129> Surface Area (ha)= 1.74 .33
00130> Dep. Storage (mm)= 1.57 4.67
00131> Average Slope (%)= 1.52 1.00
00132> Length (m)= 204.72 20.00
00133> Mannings n = .030 .250
00134>
00135> Max.eff.Inten.(mm/hr)= 45.63 5.37
over (min) 10.00 30.00

```

```

00136> Storage Coeff. (min)= 10.80 (ii) 29.27 (ii)
00137> Unit Hyd. Tpeak (min)= 10.00 30.00
00138> Unit Hyd. peak (cms)= .11 .04
00139> *****
00140> *TOTALS*
00141> PEAK FLOW (cms)= .16 .00 .158 (iii)
00142> TIME TO PEAK (hrs)= 1.29 1.75 1.292
00143> RUNOFF VOLUME (mm)= 23.43 5.17 20.508
00144> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00145> RUNOFF COEFFICIENT = .94 .21 .820
00146> *****
00147> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00148> CN* = 81.0 Ia = Dep. Storage (Above)
00149> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00150> THAN THE STORAGE COEFFICIENT.
00151> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00152> *****
00153>
00154> 001:0005-
00155> * SUB-AREA No.2
00156> *****
00157> | CALIB STANDHYD | Area (ha)= 1.54
00158> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00159> *****
00160>
00161> IMPERVIOUS PERVIOUS (i)
00162> Surface Area (ha)= 1.42 .12
00163> Dep. Storage (mm)= 1.57 4.67
00164> Average Slope (%)= 1.50 1.00
00165> Length (m)= 244.34 5.00
00166> Mannings n = .030 .030
00167>
00168> Max.eff.Inten.(mm/hr)= 45.63 7.24
00169> over (min) 12.50 15.00
00170> Storage Coeff. (min)= 12.15 (ii) 14.15 (ii)
00171> Unit Hyd. Tpeak (min)= 12.50 15.00
00172> Unit Hyd. peak (cms)= .09 .08
00173> *****
00174> *TOTALS*
00175> PEAK FLOW (cms)= .12 .00 .121 (iii)
00176> TIME TO PEAK (hrs)= 1.33 1.46 1.333
00177> RUNOFF VOLUME (mm)= 23.43 5.17 21.969
00178> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00179> RUNOFF COEFFICIENT = .94 .21 .879
00180> *****
00181> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00182> CN* = 81.0 Ia = Dep. Storage (Above)
00183> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00184> THAN THE STORAGE COEFFICIENT.
00185> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00186> *****
00187>
00188> 001:0006-
00189> * SUB-AREA No.3
00190> *****
00191> | CALIB STANDHYD | Area (ha)= 1.40
00192> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00193> *****
00194>
00195> IMPERVIOUS PERVIOUS (i)
00196> Surface Area (ha)= 1.36 .04
00197> Dep. Storage (mm)= 1.57 4.67
00198> Average Slope (%)= .51 1.00
00199> Length (m)= 225.63 5.00
00200> Mannings n = .030 .030
00201>
00202> Max.eff.Inten.(mm/hr)= 45.63 7.97
00203> over (min) 12.50 12.50
00204> Storage Coeff. (min)= 11.52 (ii) 13.44 (ii)
00205> Unit Hyd. Tpeak (min)= 12.50 12.50
00206> Unit Hyd. peak (cms)= .10 .09
00207> *****
00208> *TOTALS*
00209> PEAK FLOW (cms)= .12 .00 .118 (iii)
00210> TIME TO PEAK (hrs)= 1.33 1.42 1.333
00211> RUNOFF VOLUME (mm)= 23.43 5.17 22.881
00212> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00213> RUNOFF COEFFICIENT = .94 .21 .915
00214> *****
00215> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00216> CN* = 81.0 Ia = Dep. Storage (Above)
00217> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00218> THAN THE STORAGE COEFFICIENT.
00219> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00220> *****
00221>
00222> 001:0007-
00223> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00224> (ha) (cms) (hrs) (mm) (cms)
00225> ID1 01:010 2.07 .158 1.29 20.51 .000
00226> +ID2 02:020 1.54 .121 1.33 21.97 .000
00227> SUM 04:040 3.61 .278 1.33 21.13 .000
00228> *****
00229> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00230> *****
00231>
00232> 001:0008-
00233> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00234> (ha) (cms) (hrs) (mm) (cms)
00235> ID1 03:030 1.40 .118 1.33 22.88 .000
00236> +ID2 04:040 3.61 .278 1.33 21.13 .000
00237> *****
00238> SUM 05:050 5.01 .396 1.33 21.62 .000
00239> *****
00240> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00241> *****
00242>
00243> 001:0009-
00244> *****
00245> * SUB-AREA No.4
00246> *****
00247> | CALIB STANDHYD | Area (ha)= .89
00248> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00249> *****
00250>
00251> IMPERVIOUS PERVIOUS (i)
00252> Surface Area (ha)= .86 .03
00253> Dep. Storage (mm)= 1.57 4.67
00254> Average Slope (%)= .93 .70
00255> Length (m)= 164.82 40.00
00256> Mannings n = .030 .250
00257>
00258> Max.eff.Inten.(mm/hr)= 45.63 4.42
00259> over (min) 7.50 42.50
00260> Storage Coeff. (min)= 7.97 (ii) 41.62 (ii)
00261> Unit Hyd. Tpeak (min)= 7.50 42.50
00262> Unit Hyd. peak (cms)= .14 .03
00263> *****
00264> *TOTALS*
00265> PEAK FLOW (cms)= .09 .00 .089 (iii)
00266> TIME TO PEAK (hrs)= 1.25 2.00 1.250
00267> RUNOFF VOLUME (mm)= 23.43 5.17 22.882
00268> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00269> RUNOFF COEFFICIENT = .94 .21 .915
00270> *****
00271> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00272> CN* = 81.0 Ia = Dep. Storage (Above)

```

00271> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00272> THAN THE STORAGE COEFFICIENT.  
00273> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00274>  
00275>  
00276> 001:0010-----  
00277> \* SUB-AREA No.5  
00278> | CALIB STANDHYD | Area (ha)= 2.66  
00279> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
00280>-----  
00281> IMPERVIOUS PERVIOUS (i)  
00282> Surface Area (ha)= 2.58 .08  
00283> Dep. Storage (mm)= 1.57 4.67  
00284> Average Slope (%)= .61 1.50  
00285> Length (m)= 207.25 20.00  
00286> Mannings n = .030 .250  
00287>  
00288> Max. eff. Inten. (mm/hr)= 45.63 5.66  
00289> over (min)= 10.00 27.50  
00290> Storage Coeff. (min)= 10.37 (ii) 26.38 (iii)  
00291> Unit Hyd. Tpeak (min)= 10.00 27.50  
00292> Unit Hyd. peak (cms)= .11 .04 \*TOTALS\*  
00293> PEAK FLOW (cms)= .24 .00  
00294> TIME TO PEAK (hrs)= 1.29 1.67 1.292  
00295> RUNOFF VOLUME (mm)= 23.43 5.17 22.882  
00296> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00297> RUNOFF COEFFICIENT = .94 .21 .915  
00298>  
00299> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00300> CN\* = 81.0 Ia = Dep. Storage (Above)  
00301> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00302> THAN THE STORAGE COEFFICIENT.  
00303> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00304>  
00305>  
00306> 001:0011-----  
00307> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00308> | (ha) (cms) (hrs) (mm) (cms)  
00309> ID1 05:060 2.66 .089 1.25 22.88 .000  
00310> +ID2 07:070 2.66 .238 1.29 22.88 .000  
00311>-----  
00312> SUM 08:080 3.55 .327 1.29 22.88 .000  
00313>  
00314> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00315>  
00316>  
00317>  
00318>  
00319>  
00320> 001:0012-----  
00321> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00322> | (ha) (cms) (hrs) (mm) (cms)  
00323> ID1 05:050 5.01 .396 1.33 21.62 .000  
00324> +ID2 08:080 3.55 .327 1.29 22.88 .000  
00325>-----  
00326> SUM 09:090 8.56 .716 1.29 22.14 .000  
00327>  
00328> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00329>  
00330>  
00331>  
00332> 001:0013-----  
00333> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
00334> | IN>09: (090 ) |  
00335> | OUT<10: (POND ) |  
00336>-----  
00337> OUTFLOW STORAGE TABLE  
00338> (cms) (ha.m.) (cms) (ha.m.)  
00339> .000 .0000E+00 | .593 .6251E+00  
00340> .008 .6560E-01 | .654 .6631E+00  
00341> .017 .1311E+00 | .797 .7391E+00  
00342> .093 .2831E+00 | .950 .8274E+00  
00343> .233 .5971E+00 | 1.304 .9157E+00  
00344> .337 .4731E+00 | 1.880 .1004E+01  
00345> .465 .5491E+00 | 2.577 .1092E+01  
00346> .531 .5871E+00 | .000 .0000E+00  
00347>  
00348> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
00349> (ha) (cms) (hrs) (mm)  
00350> INFLOW >09: (090 ) 8.56 .716 1.292 22.143  
00351> OUTFLOW <10: (POND ) 8.56 .032 3.875 22.141  
00352>  
00353> PEAK FLOW REDUCTION (Qout/Qin) (%) = 4.470  
00354> TIME SHIFT OF PEAK FLOW (min) = 155.00  
00355> MAXIMUM STORAGE USED (ha.m.) = .1611E+00  
00356>  
00357>  
00358> 001:0014-----  
00359> \*\*\*\*\*  
00360> \* Remaining Hawthorne Industrial Park \*  
00361> \*\*\*\*\*  
00362> \* SUB-AREA No.1  
00363>-----  
00364> | CALIB STANDHYD | Area (ha)= 19.90  
00365> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00366>-----  
00367> IMPERVIOUS PERVIOUS (i)  
00368> Surface Area (ha)= 14.13 5.77  
00369> Dep. Storage (mm)= 1.57 4.67  
00370> Average Slope (%)= .60 1.50  
00371> Length (m)= 580.00 100.00  
00372> Mannings n = .030 .250  
00373>  
00374> Max. eff. Inten. (mm/hr)= 34.39 11.90  
00375> over (min)= 22.50 52.50  
00376> Storage Coeff. (min)= 21.64 (ii) 52.08 (ii)  
00377> Unit Hyd. Tpeak (min)= 22.50 52.50  
00378> Unit Hyd. peak (cms)= .05 .02 \*TOTALS\*  
00379> PEAK FLOW (cms)= .60 .11 .642 (iii)  
00380> TIME TO PEAK (hrs)= 1.50 2.13 1.542  
00381> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00382> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00383> RUNOFF COEFFICIENT = .94 .35 .643  
00384>  
00385> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00386> CN\* = 81.0 Ia = Dep. Storage (Above)  
00387> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00388> THAN THE STORAGE COEFFICIENT.  
00389> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00390>  
00391>  
00392> 001:0015-----  
00393> | ADD HYD (HIPO2 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00394> | (ha) (cms) (hrs) (mm) (cms)  
00395> ID1 10:POND 8.56 .032 3.88 22.14 .000  
00396> +ID2 01:HIP01 19.90 .642 1.54 16.08 .000  
00397>-----  
00398> SUM 02:HIPO2 28.46 .655 1.54 17.91 .000  
00399>  
00400> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00401>  
00402>  
00403>  
00404>  
00405>

00406>-----  
00407> 001:0016-----  
00408> \* SUB-AREA No.2  
00409>-----  
00410> | CALIB STANDHYD | Area (ha)= 17.00  
00411> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00412>-----  
00413> IMPERVIOUS PERVIOUS (i)  
00414> Surface Area (ha)= 12.07 4.93  
00415> Dep. Storage (mm)= 1.57 4.67  
00416> Average Slope (%)= .65 1.50  
00417> Length (m)= 450.00 100.00  
00418> Mannings n = .030 .250  
00419>  
00420> Max. eff. Inten. (mm/hr)= 40.81 12.73  
00421> over (min)= 17.50 47.50  
00422> Storage Coeff. (min)= 16.94 (ii) 47.35 (iii)  
00423> Unit Hyd. Tpeak (min)= 17.50 47.50  
00424> Unit Hyd. peak (cms)= .07 .02 \*TOTALS\*  
00425> PEAK FLOW (cms)= .60 .10 .625 (iii)  
00426> TIME TO PEAK (hrs)= 1.42 2.00 1.458  
00427> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00428> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00429> RUNOFF COEFFICIENT = .94 .35 .643  
00430>  
00431> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00432> CN\* = 81.0 Ia = Dep. Storage (Above)  
00433> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00434> THAN THE STORAGE COEFFICIENT.  
00435> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00436>  
00437>  
00438> 001:0017-----  
00439> \* SUB-AREA No.3  
00440>-----  
00441> | CALIB STANDHYD | Area (ha)= 18.10  
00442> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00443>-----  
00444> IMPERVIOUS PERVIOUS (i)  
00445> Surface Area (ha)= 12.85 5.25  
00446> Dep. Storage (mm)= 1.57 4.67  
00447> Average Slope (%)= .50 1.50  
00448> Length (m)= 600.00 100.00  
00449> Mannings n = .030 .250  
00450>  
00451> Max. eff. Inten. (mm/hr)= 34.39 11.54  
00452> over (min)= 22.50 55.00  
00453> Storage Coeff. (min)= 23.33 (ii) 54.95 (ii)  
00454> Unit Hyd. Tpeak (min)= 22.50 55.00  
00455> Unit Hyd. peak (cms)= .05 .02 \*TOTALS\*  
00456> PEAK FLOW (cms)= .53 .09 1.542 (iii)  
00457> TIME TO PEAK (hrs)= 1.50 2.17 1.542  
00458> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00459> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00460> RUNOFF COEFFICIENT = .94 .35 .643  
00461>  
00462> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00463> CN\* = 81.0 Ia = Dep. Storage (Above)  
00464> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00465> THAN THE STORAGE COEFFICIENT.  
00466> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00467>  
00468>  
00469> 001:0018-----  
00470> | ADD HYD (HIPO5 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00471> | (ha) (cms) (hrs) (mm) (cms)  
00472> ID1 03:HIP03 17.00 .625 1.46 16.08 .000  
00473> +ID2 04:HIP04 18.10 .562 1.54 16.08 .000  
00474>-----  
00475> SUM 05:HIPO5 35.10 1.166 1.46 16.08 .000  
00476>  
00477> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00478>  
00479>  
00480>  
00481>  
00482>  
00483> 001:0019-----  
00484> \* SUB-AREA No.4  
00485>-----  
00486> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
00487> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
00488> | U.H. Tp (hrs)= .170  
00489>-----  
00490> Unit Hyd Qpeak (cms)= .899  
00491>  
00492> PEAK FLOW (cms)= .077 (i)  
00493> TIME TO PEAK (hrs)= 1.375  
00494> RUNOFF VOLUME (mm)= 6.343  
00495> TOTAL RAINFALL (mm)= 24.999  
00496> RUNOFF COEFFICIENT = .254  
00497>  
00498> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00499>  
00500>  
00501>  
00502> 001:0020-----  
00503> | ADD HYD (HIPO6 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00504> | (ha) (cms) (hrs) (mm) (cms)  
00505> ID1 02:HIP02 28.46 .655 1.54 17.91 .000  
00506> +ID2 05:HIPO5 35.10 1.166 1.46 16.08 .000  
00507> +ID3 06:Pond-B 4.00 .077 1.38 6.34 .000  
00508>-----  
00509> SUM 07:HIPO6 67.56 1.887 1.50 16.28 .000  
00510>  
00511> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00512>  
00513>  
00514>  
00515>  
00516> 001:0021-----  
00517> \* SUB-AREA NO. 5  
00518>-----  
00519> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00  
00520> | 10:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
00521> | U.H. Tp (hrs)= .370  
00522>-----  
00523> Unit Hyd Qpeak (cms)= .702  
00524>  
00525> PEAK FLOW (cms)= .053 (i)  
00526> TIME TO PEAK (hrs)= 1.708  
00527> RUNOFF VOLUME (mm)= 4.111  
00528> TOTAL RAINFALL (mm)= 24.999  
00529> RUNOFF COEFFICIENT = .164  
00530>  
00531> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00532>  
00533>  
00534> 001:0022-----  
00535> \* SUB-AREA NO 4  
00536>-----  
00537> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00  
00538> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
00539> | U.H. Tp (hrs)= .804  
00540>-----

```

00541> Unit Hyd Qpeak (cms) = .252
00542>
00543>
00544> PEAK FLOW (cms) = .025 (i)
00545> TIME TO PEAK (hrs) = 2.333
00546> RUNOFF VOLUME (mm) = 4.110
00547> TOTAL RAINFALL (mm) = 24.999
00548> RUNOFF COEFFICIENT = .164
00549>
00550> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00551>
00552>
00553> 001:0023-----
00554>
00555> | ADD HYD (0020 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00556> | (ha) (cms) (hrs) (mm) (cms)
00557> | ID1 07:HIP06 67.56 1.887 1.50 16.28 .000
00558> | +ID2 10:A2 6.80 .053 1.71 4.11 .000
00559> | +ID3 01:A3 5.30 .025 2.33 4.11 .000
00560>
00561> |-----|
00562> | SUM 02:0020 79.66 1.941 1.50 14.43 .000
00563>
00564> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00565>
00566> 001:0024-----
00567> *****
00568> * CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00569> *****
00570>
00571> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWHM\MO
00572> | Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SWHM\MO
00573> | TZERO = .00 hrs on 0
00574> | METOD = 2 (output = METRIC)
00575> | NRUN = 001
00576> | NSTORM = 0
00577>
00578> 001:0002-----
00579>
00580> | CHICAGO STORM | IDF curve parameters: A= 732.951
00581> | Ptotal= 31.86 mm | B= 6.199
00582> | C= .810
00583>
00584> | used in: INTENSITY = A / (t + B)^C
00585>
00586> | Duration of storm = 3.00 hrs
00587> | Storm time step = 10.00 min
00588> | Time to peak ratio = .33
00589>
00590> |-----|
00591> | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
00592> | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
00593> |.17 2.815 | 1.00 76.805 | 1.83 5.095 | 2.67 2.684
00594> |.33 3.498 | 1.17 24.079 | 2.00 4.291 | 2.83 2.463
00595> |.50 4.687 | 1.33 12.364 | 2.17 3.718 | 3.00 2.279
00596> |.67 7.305 | 1.50 8.324 | 2.33 3.268 |
00597> |.83 18.209 | 1.67 6.303 | 2.50 2.953 |
00598>
00599> 001:0003-----
00600>
00601> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWHM\MO\ORGA.VAL
00602> | ICASEdv = 1 (read and print data)
00603>
00604> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
00605> |-----|
00606> | Horton's infiltration equation parameters:
00607> | [F= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCRY= 2.00 /hr] [F= .00 mm]
00608> | Parameters for PEROVIOUS surfaces in STANDHYD:
00609> | [Laper= 4.67 mm] [LGP=40.00 mm] [MNP=.250]
00610> | Parameters for IMPERVIOUS surfaces in STANDHYD:
00611> | [Ximp= 1.57 mm] [CII= 1.50] [MVI=.035]
00612> | Parameters used in NASHDY:
00613> | [Ia= 4.67 mm] [N= 3.00]
00614>
00615> 001:0004-----
00616> *****
00617> * SUB-AREA No.1 *
00618>
00619> | CALIB STANDHYD | Area (ha)= 2.07
00620> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00621>
00622> |-----|
00623> | IMPERVIOUS PEROVIOUS (i)
00624> | Surface Area (ha)= 1.74 .33
00625> | Dep. Storage (mm)= 1.57 4.67
00626> | Average Slope (%)= 1.52 1.00
00627> | Length (m)= 204.72 20.00
00628> | Mannings n = .030 .250
00629>
00630> | Max.eff.Inten.(mm/hr)= 76.81 11.88
00631> | over (min) 10.00 22.50
00632> | Storage Coeff. (min)= 8.77 (ii) 22.21 (ii)
00633> | Unit Hyd. Tpeak (min)= 10.00 22.50
00634> | Unit Hyd. peak (cms)= .12 .05
00635>
00636> | PEAK FLOW (cms)= .24 .01 *TOTALS*
00637> | TIME TO PEAK (hrs)= 1.08 1.38 1.083 (iii)
00638> | RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00639> | TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00640> | RUNOFF COEFFICIENT = .95 .27 .841
00641>
00642> (i) CN PROCEDURE SELECTED FOR PEROVIOUS LOSSES:
00643> CN* = 81.0 Ia = Dep. Storage (Above)
00644> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00645> THAN THE STORAGE COEFFICIENT.
00646> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00647>
00648> 001:0005-----
00649> *****
00650> * SUB-AREA No.2 *
00651>
00652> | CALIB STANDHYD | Area (ha)= 1.54
00653> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00654>
00655> |-----|
00656> | IMPERVIOUS PEROVIOUS (i)
00657> | Surface Area (ha)= 1.42 .12
00658> | Dep. Storage (mm)= 1.57 4.67
00659> | Average Slope (%)= .50 1.00
00660> | Length (m)= 244.34 5.00
00661> | Mannings n = .030 .030
00662>
00663> | Max.eff.Inten.(mm/hr)= 76.81 15.07
00664> | over (min) 10.00 12.50
00665> | Storage Coeff. (min)= 9.87 (ii) 11.36 (ii)
00666> | Unit Hyd. Tpeak (min)= 10.00 12.50
00667> | Unit Hyd. peak (cms)= .11 .10
00668>
00669> | PEAK FLOW (cms)= .19 .00 *TOTALS*
00670> | TIME TO PEAK (hrs)= 1.08 1.17 1.083 (iii)
00671> | RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00672> | TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00673> | RUNOFF COEFFICIENT = .95 .27 .896
00674>
00675> (i) CN PROCEDURE SELECTED FOR PEROVIOUS LOSSES:
00676> CN* = 81.0 Ia = Dep. Storage (Above)

```

```

00677> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00678> THAN THE STORAGE COEFFICIENT.
00679> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00680>
00681> 001:0006-----
00682> *****
00683> * SUB-AREA No.3 *
00684>
00685> | CALIB STANDHYD | Area (ha)= 1.40
00686> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00687>
00688> |-----|
00689> | IMPERVIOUS PEROVIOUS (i)
00690> | Surface Area (ha)= 1.36 .04
00691> | Dep. Storage (mm)= 1.57 4.67
00692> | Average Slope (%)= .51 1.00
00693> | Length (m)= 225.63 5.00
00694> | Mannings n = .030 .030
00695>
00696> | Max.eff.Inten.(mm/hr)= 76.81 16.59
00697> | over (min) 10.00 10.00
00698> | Storage Coeff. (min)= 9.35 (ii) 10.79 (ii)
00699> | Unit Hyd. Tpeak (min)= 10.00 10.00
00700> | Unit Hyd. peak (cms)= .12 .11
00701>
00702> | PEAK FLOW (cms)= .18 .00 *TOTALS*
00703> | TIME TO PEAK (hrs)= 1.08 1.13 1.083 (iii)
00704> | RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00705> | TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00706> | RUNOFF COEFFICIENT = .95 .27 .930
00707>
00708> (i) CN PROCEDURE SELECTED FOR PEROVIOUS LOSSES:
00709> CN* = 81.0 Ia = Dep. Storage (Above)
00710> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00711> THAN THE STORAGE COEFFICIENT.
00712> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00713>
00714> 001:0007-----
00715> *****
00716> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00717> | (ha) (cms) (hrs) (mm) (cms)
00718> | ID1 01:010 2.07 .245 1.08 26.81 .000
00719> | +ID2 02:020 1.54 .192 1.08 28.55 .000
00720>
00721> |-----|
00722> | SUM 04:040 3.61 .436 1.08 27.55 .000
00723>
00724> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00725>
00726> 001:0008-----
00727> *****
00728> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00729> | (ha) (cms) (hrs) (mm) (cms)
00730> | ID1 03:030 1.40 .186 1.08 29.64 .000
00731> | +ID2 04:040 3.61 .436 1.08 27.55 .000
00732>
00733> |-----|
00734> | SUM 05:050 5.01 .623 1.08 28.13 .000
00735>
00736> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00737>
00738> 001:0009-----
00739> *****
00740> * SUB-AREA No.4 *
00741>
00742> | CALIB STANDHYD | Area (ha)= .89
00743> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00744>
00745> |-----|
00746> | IMPERVIOUS PEROVIOUS (i)
00747> | Surface Area (ha)= .86 .03
00748> | Dep. Storage (mm)= 1.57 4.67
00749> | Average Slope (%)= .93 .70
00750> | Length (m)= 164.82 40.00
00751> | Mannings n = .030 .250
00752>
00753> | Max.eff.Inten.(mm/hr)= 76.81 10.24
00754> | over (min) 7.50 30.00
00755> | Storage Coeff. (min)= 6.47 (ii) 30.53 (ii)
00756> | Unit Hyd. Tpeak (min)= 7.50 30.00
00757> | Unit Hyd. peak (cms)= .16 .04
00758>
00759> | PEAK FLOW (cms)= .14 .00 *TOTALS*
00760> | TIME TO PEAK (hrs)= 1.04 1.54 1.042 (iii)
00761> | RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00762> | TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00763> | RUNOFF COEFFICIENT = .95 .27 .930
00764>
00765> (i) CN PROCEDURE SELECTED FOR PEROVIOUS LOSSES:
00766> CN* = 81.0 Ia = Dep. Storage (Above)
00767> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00768> THAN THE STORAGE COEFFICIENT.
00769> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00770>
00771> 001:0010-----
00772> *****
00773> * SUB-AREA No.5 *
00774>
00775> | CALIB STANDHYD | Area (ha)= 2.66
00776> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00777>
00778> |-----|
00779> | IMPERVIOUS PEROVIOUS (i)
00780> | Surface Area (ha)= 2.58 .08
00781> | Dep. Storage (mm)= 1.57 4.67
00782> | Average Slope (%)= .61 1.50
00783> | Length (m)= 207.25 20.00
00784> | Mannings n = .030 .250
00785>
00786> | Max.eff.Inten.(mm/hr)= 76.81 12.71
00787> | over (min) 7.50 20.00
00788> | Storage Coeff. (min)= 8.42 (ii) 20.00 (ii)
00789> | Unit Hyd. Tpeak (min)= 7.50 20.00
00790> | Unit Hyd. peak (cms)= .14 .06
00791>
00792> | PEAK FLOW (cms)= .38 .00 *TOTALS*
00793> | TIME TO PEAK (hrs)= 1.04 1.33 1.042 (iii)
00794> | RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00795> | TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00796> | RUNOFF COEFFICIENT = .95 .27 .930
00797>
00798> (i) CN PROCEDURE SELECTED FOR PEROVIOUS LOSSES:
00799> CN* = 81.0 Ia = Dep. Storage (Above)
00800> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00801> THAN THE STORAGE COEFFICIENT.
00802> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00803>
00804> 001:0011-----
00805> *****
00806> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00807> | (ha) (cms) (hrs) (mm) (cms)
00808> | ID1 06:060 .89 .139 1.04 29.64 .000
00809> | +ID2 07:070 2.66 .379 1.04 29.64 .000
00810>

```

00811> SUM 08:080 3.55 .518 1.04 29.64 .000  
00812>  
00813> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00814>  
00815>  
00816> 001:0012-----  
00817> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
00818> | IN:09: (090 ) | (ha) (cms) (hrs) (mm) (cms)  
00819> ID1 05:050 5.01 .623 1.08 28.13 .000  
00820> +ID2 08:080 3.55 .518 1.04 29.64 .000  
00821> SUM 09:090 8.56 1.118 1.08 28.76 .000  
00822>  
00823> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00824>  
00825>  
00826>  
00827> 001:0013-----  
00828> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
00829> | IN:09: (090 ) |  
00830> | OUT<10: (POND ) |  
00831> \*\*\*\*\* OUTFLOW STORAGE TABLE \*\*\*\*\*  
00832> OUTFLOW STORAGE | OUTFLOW STORAGE  
00833> (ha.m.) | (cms) (ha.m.)  
00834> .000 .0000E+00 | .593 .6251E+00  
00835> .008 .6560E-01 | .654 .6631E+00  
00836> .017 .1311E+00 | .797 .7391E+00  
00837> .093 .2831E+00 | .950 .8274E+00  
00838> .233 .5971E+00 | 1.304 .9157E+00  
00839> .337 .4731E+00 | 1.880 .1004E+01  
00840> .465 .5491E+00 | 2.577 .1092E+01  
00841> .531 .5871E+00 | .000 .0000E+00  
00842>  
00843> ROUTING RESULTS AREA OPEAK TPEAK R.V.  
00844> (ha) (cms) (hrs) (mm)  
00845> INFLOW >09: (090 ) 8.56 1.118 1.083 28.757  
00846> OUTFLOW<10: (POND ) 8.56 .056 3.000 28.754  
00847>  
00848> PEAK FLOW REDUCTION (Qout/Qin) (%) = 5.030  
00849> TIME SHIFT OF PEAK FLOW (min) = 115.00  
00850> MAXIMUM STORAGE USED (ha.m.) = .2095E+00  
00851>  
00852>  
00853> 001:0014-----  
00854> \*\*\*\*\*  
00855> \* Remaining Hawthorne Industrial Park \*  
00856> \*\*\*\*\*  
00857> \* SUB-AREA No.1  
00858>  
00859> | CALIB STANDHYD | Area (ha) = 19.90  
00860> | 01:H1P01 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
00861>  
00862> IMPERVIOUS PERVIOUS (i)  
00863> Surface Area (ha) = 14.13 5.77  
00864> Dep. Storage (mm) = 1.57 4.67  
00865> Average Slope (%) = .60 1.50  
00866> Length (m) = 580.00 100.00  
00867> Mannings n = .030 .250  
00868>  
00869> Max.eff.Inten.(mm/hr) = 54.21 23.06  
00870> over (min) = 17.50 42.50  
00871> Storage Coeff. (min) = 18.04 (ii) 42.02 (ii)  
00872> Unit Hyd. Tpeak (min) = 17.50 42.50  
00873> Unit Hyd. peak (cms) = .06 .03  
00874>  
00875> PEAK FLOW (cms) = .95 .21 \*TOTALS\*  
00876> TIME TO PEAK (hrs) = 1.21 1.71 1.250 (iii)  
00877> RUNOFF VOLUME (mm) = 31.86 13.34 21.814  
00878> TOTAL RAINFALL (mm) = 31.86 31.86 31.860  
00879> RUNOFF COEFFICIENT = .95 .42 .685  
00880>  
00881> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00882> CN\* = 81.0 Ia = Dep. Storage (Above)  
00883> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00884> THAN THE STORAGE COEFFICIENT.  
00885> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00886>  
00887>  
00888>  
00889>  
00890> 001:0015-----  
00891> | ADD HYD (HIPO2 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
00892> | IN:10: (POND ) | (ha) (cms) (hrs) (mm) (cms)  
00893> ID1 10:POND 8.56 .056 3.00 28.75 .000  
00894> +ID2 01:H1P01 19.90 1.020 1.25 21.81 .000  
00895> SUM 02:HIPO2 28.46 1.039 1.25 23.90 .000  
00896>  
00897> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00898>  
00899>  
00900>  
00901>  
00902> 001:0016-----  
00903> \* SUB-AREA No.2  
00904>  
00905> | CALIB STANDHYD | Area (ha) = 17.00  
00906> | 03:H1P03 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
00907>  
00908> IMPERVIOUS PERVIOUS (i)  
00909> Surface Area (ha) = 12.07 4.93  
00910> Dep. Storage (mm) = 1.57 4.67  
00911> Average Slope (%) = .65 1.50  
00912> Length (m) = 450.00 100.00  
00913> Mannings n = .030 .250  
00914>  
00915> Max.eff.Inten.(mm/hr) = 59.23 25.04  
00916> over (min) = 15.00 37.50  
00917> Storage Coeff. (min) = 14.60 (ii) 37.80 (ii)  
00918> Unit Hyd. Tpeak (min) = 15.00 37.50  
00919> Unit Hyd. peak (cms) = .08 .03  
00920>  
00921> PEAK FLOW (cms) = .91 .19 \*TOTALS\*  
00922> TIME TO PEAK (hrs) = 1.17 1.63 1.167 (iii)  
00923> RUNOFF VOLUME (mm) = 30.29 13.34 21.814  
00924> TOTAL RAINFALL (mm) = 31.86 31.86 31.860  
00925> RUNOFF COEFFICIENT = .95 .42 .685  
00926>  
00927> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00928> CN\* = 81.0 Ia = Dep. Storage (Above)  
00929> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00930> THAN THE STORAGE COEFFICIENT.  
00931> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00932>  
00933>  
00934>  
00935> 001:0017-----  
00936> \* SUB-AREA No.3  
00937>  
00938> | CALIB STANDHYD | Area (ha) = 18.10  
00939> | 04:H1P04 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
00940>  
00941> IMPERVIOUS PERVIOUS (i)  
00942> Surface Area (ha) = 12.85 5.25  
00943> Dep. Storage (mm) = 1.57 4.67  
00944> Average Slope (%) = .50 1.50

00945> Length (m) = 600.00 100.00  
00946> Mannings n = .030 .250  
00947>  
00948> Max.eff.Inten.(mm/hr) = 50.44 22.17  
00949> over (min) = 20.00 45.00  
00950> Storage Coeff. (min) = 20.01 (ii) 44.37 (ii)  
00951> Unit Hyd. Tpeak (min) = 20.00 45.00  
00952> Unit Hyd. peak (cms) = .06 .03  
00953>  
00954> PEAK FLOW (cms) = .80 .18 \*TOTALS\*  
00955> TIME TO PEAK (hrs) = 1.25 1.79 1.292 (iii)  
00956> RUNOFF VOLUME (mm) = 30.29 13.34 21.814  
00957> TOTAL RAINFALL (mm) = 31.86 31.86 31.860  
00958> RUNOFF COEFFICIENT = .95 .42 .685  
00959>  
00960> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00961> CN\* = 81.0 Ia = Dep. Storage (Above)  
00962> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00963> THAN THE STORAGE COEFFICIENT.  
00964> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00965>  
00966>  
00967>  
00968> 001:0018-----  
00969> | ADD HYD (HIPO5 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
00970> | IN:03: (POND ) | (ha) (cms) (hrs) (mm) (cms)  
00971> ID1 03:H1P03 17.00 .978 1.17 21.81 .000  
00972> +ID2 04:H1P04 18.10 .874 1.29 21.81 .000  
00973> SUM 05:HIPO5 35.10 1.814 1.21 21.81 .000  
00974>  
00975> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00976>  
00977>  
00978>  
00979> 001:0019-----  
00980> \* SUB-AREA No.4  
00981>  
00982> | DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN)=85.00  
00983> | 06:POND-B DT= 2.50 | Ia (mm) = 4.570 # of Linear Res. (N)= 3.00  
00984> U.H. Tp(hrs)= .170  
00985>  
00986> Unit Hyd Opeak (cms) = .899  
00987>  
00988> PEAK FLOW (cms) = .145 (i)  
00989> TIME TO PEAK (hrs) = 1.167  
00990> RUNOFF VOLUME (mm) = 10.266  
00991> TOTAL RAINFALL (mm) = 31.860  
00992> RUNOFF COEFFICIENT = .322  
00993>  
00994> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00995>  
00996>  
00997>  
00998> 001:0020-----  
00999> | ADD HYD (HIPO6 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
10000> | IN:02: (POND ) | (ha) (cms) (hrs) (mm) (cms)  
10001> ID1 02:H1P02 28.46 1.039 1.25 23.90 .000  
10002> +ID2 05:HIPO5 35.10 1.814 1.21 21.81 .000  
10003> +ID3 06:POND-B 4.00 .145 1.17 10.27 .000  
10004> SUM 07:HIPO6 67.56 2.992 1.21 22.01 .000  
10005>  
10006> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
10007>  
10008>  
10009>  
10010>  
10011> 001:0021-----  
10012> \* SUB-AREA No. 5  
10013>  
10014> | DESIGN NASHYD | Area (ha) = 6.80 Curve Number (CN)=76.00  
10015> | 10:A2 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
10016> U.H. Tp(hrs)= .370  
10017>  
10018> Unit Hyd Opeak (cms) = .702  
10019>  
10020> PEAK FLOW (cms) = .102 (i)  
10021> TIME TO PEAK (hrs) = 1.458  
10022> RUNOFF VOLUME (mm) = 6.883  
10023> TOTAL RAINFALL (mm) = 31.860  
10024> RUNOFF COEFFICIENT = .216  
10025>  
10026> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
10027>  
10028>  
10029>  
10030> 001:0022-----  
10031> \* SUB-AREA No 4  
10032>  
10033> | DESIGN NASHYD | Area (ha) = 5.30 Curve Number (CN)=76.00  
10034> | 01:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
10035> U.H. Tp(hrs)= .804  
10036>  
10037> Unit Hyd Opeak (cms) = .252  
10038>  
10039> PEAK FLOW (cms) = .048 (i)  
10040> TIME TO PEAK (hrs) = 2.083  
10041> RUNOFF VOLUME (mm) = 6.883  
10042> TOTAL RAINFALL (mm) = 31.860  
10043> RUNOFF COEFFICIENT = .216  
10044>  
10045> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
10046>  
10047>  
10048> 001:0023-----  
10049> | ADD HYD (0020 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
10050> | IN:07: (POND ) | (ha) (cms) (hrs) (mm) (cms)  
10051> ID1 07:H1P06 67.56 2.992 1.21 22.01 .000  
10052> +ID2 10:A2 6.80 .102 1.46 6.88 .000  
10053> +ID3 01:A3 5.30 .048 2.08 6.88 .000  
10054> SUM 02:0020 79.66 3.077 1.21 19.71 .000  
10055>  
10056> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
10057>  
10058>  
10059>  
10060>  
10061> 001:0024-----  
10062> \*\*\*\*\*  
10063> \* CALCULATION OF 3HR - 1:5 YEAR STORM EVENT \*  
10064> \*\*\*\*\*  
10065>  
10066> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SRMHWMO\  
10067> Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SRMHWMO\  
10068> TZERO = .00 hrs on 0  
10069> METOUT= 2 (output = METRIC)  
10070> NRUN = 001  
10071> NSTORM= 0  
10072>  
10073> 001:0002-----  
10074> | CHICAGO STORM | IDF curve parameters: A= 998.071  
10075> | Ptotal= 42.51 mm | B= 6.053  
10076> | C= .814  
10077> used in: INTENSITY = A / (t + B)^C  
10078>  
10079> Duration of storm = 3.00 hrs  
10080>

```

01081> Storm time step = 10.00 min
01082> Time to peak ratio = .33
01083>
01084> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
01085> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
01086> .17 3.682 | 1.00 104.193 | 1.83 6.689 | 2.67 3.510
01087> .33 4.582 | 1.17 32.037 | 2.00 5.628 | 2.83 3.220
01088> .50 6.151 | 1.33 16.337 | 2.17 4.872 | 3.00 2.978
01089> .67 9.614 | 1.50 10.965 | 2.33 4.305 |
01090> .83 24.170 | 1.67 8.287 | 2.50 3.864 |
01091>
01092>
01093> 001:0003-----
01094>
01095> | DEFAULT VALUES | Filename: V:\20983.DUVENG\3RDSUB-1\SWHYMO\ORGA.VAL
01096> | ICASedv = 1 (read and print data)
01097> | FileTitle = ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
01098> | ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----
01099> Horton's infiltration equation parameters:
01100> [F= 50.00 mm/hr] [F0= 7.50 mm/hr] [DCX= 2.00 /hr] [F= .00 mm]
01101> Parameters for PERVIOUS surfaces in STANDHYD:
01102> [Laper= 4.67 mm] [LGP=40.00 m] [MNP= .250]
01103> Parameters for IMPERVIOUS surfaces in STANDHYD:
01104> [IaImp= 1.57 mm] [CLIE=1.50] [MNI= .035]
01105> Parameters used in RSHYD:
01106> [Ia= 4.67 mm] [N= 3.00]
01107>
01108> 001:0004-----
01109> *-----
01110> * ORGAWORLD FILE *
01111> *-----
01112> * SUB-AREA No.1
01113>
01114> | CALIB STANDHYD | Area (ha)= 2.07
01115> | Cl:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
01116>
01117> IMPERVIOUS PERVIOUS (i)
01118> Surface Area (ha)= 1.74 .33
01119> Dep. Storage (mm)= 1.57 4.67
01120> Average Slope (%)= .52 1.00
01121> Length (m)= 204.72 20.00
01122> Mannings n = .030 .250
01123>
01124> Max.eff.Inten.(mm/hr)= 104.19 24.26
01125> over (min) = 7.50 17.50
01126> Storage Coeff. (min)= 7.76 (ii) 17.86 (ii)
01127> Unit Hyd. Tpeak (min)= 7.50 17.50
01128> Unit Hyd. peak (cms)= .15 .06
01129>
01130> PEAK FLOW (cms)= .36 .01 *TOTALS*
01131> TIME TO PEAK (hrs)= 1.04 1.25 1.042 (iii)
01132> RUNOFF VOLUME (mm)= 40.94 14.70 36.745
01133> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01134> RUNOFF COEFFICIENT = .96 .35 .864
01135>
01136> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01137> CN* = 81.0 Ia = Dep. Storage (Above)
01138> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01139> THAN THE STORAGE COEFFICIENT.
01140> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01141>
01142>
01143> 001:0005-----
01144> *
01145> * SUB-AREA No.2
01146>
01147> | CALIB STANDHYD | Area (ha)= 1.54
01148> | O2:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
01149>
01150> IMPERVIOUS PERVIOUS (i)
01151> Surface Area (ha)= 1.42 .12
01152> Dep. Storage (mm)= 1.57 4.67
01153> Average Slope (%)= .50 1.00
01154> Length (m)= 244.34 5.00
01155> Mannings n = .030 .030
01156>
01157> Max.eff.Inten.(mm/hr)= 104.19 31.02
01158> over (min) = 7.50 10.00
01159> Storage Coeff. (min)= 8.73 (ii) 9.85 (ii)
01160> Unit Hyd. Tpeak (min)= 7.50 10.00
01161> Unit Hyd. peak (cms)= .14 .11
01162>
01163> PEAK FLOW (cms)= .28 .01 *TOTALS*
01164> TIME TO PEAK (hrs)= 1.04 1.13 1.042 (iii)
01165> RUNOFF VOLUME (mm)= 40.94 14.70 38.845
01166> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01167> RUNOFF COEFFICIENT = .96 .35 .914
01168>
01169> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01170> CN* = 81.0 Ia = Dep. Storage (Above)
01171> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01172> THAN THE STORAGE COEFFICIENT.
01173> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01174>
01175>
01176> 001:0006-----
01177> *
01178> * SUB-AREA No.3
01179>
01180> | CALIB STANDHYD | Area (ha)= 1.40
01181> | O3:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01182>
01183> IMPERVIOUS PERVIOUS (i)
01184> Surface Area (ha)= 1.36 .04
01185> Dep. Storage (mm)= 1.57 4.67
01186> Average Slope (%)= .51 1.00
01187> Length (m)= 225.63 5.00
01188> Mannings n = .030 .030
01189>
01190> Max.eff.Inten.(mm/hr)= 104.19 31.02
01191> over (min) = 7.50 10.00
01192> Storage Coeff. (min)= 8.28 (ii) 9.39 (ii)
01193> Unit Hyd. Tpeak (min)= 7.50 10.00
01194> Unit Hyd. peak (cms)= .14 .12
01195>
01196> PEAK FLOW (cms)= .27 .00 *TOTALS*
01197> TIME TO PEAK (hrs)= 1.04 1.13 1.042 (iii)
01198> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01199> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01200> RUNOFF COEFFICIENT = .96 .35 .945
01201>
01202> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01203> CN* = 81.0 Ia = Dep. Storage (Above)
01204> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01205> THAN THE STORAGE COEFFICIENT.
01206> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01207>
01208>
01209> 001:0007-----
01210>
01211> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01212> (ha) (cms) (hrs) (mm) (cms)
01213> ID1 01:010 2.07 .362 1.04 36.75 .000
01214> +ID2 02:020 1.54 .283 1.04 38.84 .000
01215>

```

```

01216> SUM 04:040 3.61 .645 1.04 37.64 .000
01217>
01218> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01219>
01220>
01221> 001:0008-----
01222>
01223> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01224> (ha) (cms) (hrs) (mm) (cms)
01225> ID1 03:030 1.40 .274 1.04 40.16 .000
01226> +ID2 04:040 3.61 .645 1.04 37.64 .000
01227>
01228> SUM 05:050 5.01 .918 1.04 38.34 .000
01229>
01230> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01231>
01232>
01233> 001:0009-----
01234> *
01235> * SUB-AREA No.4
01236>
01237> | CALIB STANDHYD | Area (ha)= .89
01238> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01239>
01240> IMPERVIOUS PERVIOUS (i)
01241> Surface Area (ha)= 0.84 .03
01242> Dep. Storage (mm)= 1.57 4.67
01243> Average Slope (%)= .93 .70
01244> Length (m)= 164.82 40.00
01245> Mannings n = .030 .250
01246>
01247> Max.eff.Inten.(mm/hr)= 104.19 20.32
01248> over (min) = 5.00 25.00
01249> Storage Coeff. (min)= 5.72 (ii) 24.02 (ii)
01250> Unit Hyd. Tpeak (min)= 5.00 25.00
01251> Unit Hyd. peak (cms)= .20 .05
01252>
01253> PEAK FLOW (cms)= .20 .00 *TOTALS*
01254> TIME TO PEAK (hrs)= 1.00 1.38 1.000
01255> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01256> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01257> RUNOFF COEFFICIENT = .96 .35 .945
01258>
01259> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01260> CN* = 81.0 Ia = Dep. Storage (Above)
01261> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01262> THAN THE STORAGE COEFFICIENT.
01263> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01264>
01265>
01266> 001:0010-----
01267> *
01268> * SUB-AREA No.5
01269>
01270> | CALIB STANDHYD | Area (ha)= 2.66
01271> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01272>
01273> IMPERVIOUS PERVIOUS (i)
01274> Surface Area (ha)= 2.58 .08
01275> Dep. Storage (mm)= 1.57 4.67
01276> Average Slope (%)= .51 1.50
01277> Length (m)= 207.25 20.00
01278> Mannings n = .030 .250
01279>
01280> Max.eff.Inten.(mm/hr)= 104.19 24.26
01281> over (min) = 7.50 17.50
01282> Storage Coeff. (min)= 7.45 (ii) 16.40 (ii)
01283> Unit Hyd. Tpeak (min)= 7.50 17.50
01284> Unit Hyd. peak (cms)= .15 .07
01285>
01286> PEAK FLOW (cms)= .54 .00 *TOTALS*
01287> TIME TO PEAK (hrs)= 1.04 1.25 1.042 (iii)
01288> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01289> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01290> RUNOFF COEFFICIENT = .96 .35 .945
01291>
01292> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01293> CN* = 81.0 Ia = Dep. Storage (Above)
01294> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01295> THAN THE STORAGE COEFFICIENT.
01296> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01297>
01298>
01299> 001:0011-----
01300>
01301> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01302> (ha) (cms) (hrs) (mm) (cms)
01303> ID1 06:060 .89 .205 1.00 40.16 .000
01304> +ID2 07:070 2.66 .538 1.04 40.16 .000
01305>
01306> SUM 08:080 3.55 .733 1.04 40.16 .000
01307>
01308> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01309>
01310>
01311> 001:0012-----
01312>
01313> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
01314> (ha) (cms) (hrs) (mm) (cms)
01315> ID1 05:050 5.01 .918 1.04 38.34 .000
01316> +ID2 08:080 3.55 .733 1.04 40.16 .000
01317>
01318> SUM 09:090 8.56 1.651 1.04 39.10 .000
01319>
01320> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01321>
01322>
01323> 001:0013-----
01324>
01325> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01326> | IMP:090 ( ) |
01327> | OUT:10: (POND ) |
01328> ===== OUTFLOW STORAGE TABLE =====
01329> OUTFLOW STORAGE | OUTFLOW STORAGE
01330> (cms) (ha.m.) | (cms) (ha.m.)
01331> .000 .0000E+00 | .593 .625E+00
01332> .008 .6560E-01 | .654 .663E+00
01333> .017 .131E+00 | .797 .739E+00
01334> .093 .2831E+00 | .950 .827E+00
01335> .233 .3971E+00 | 1.304 .9157E+00
01336> .337 .4731E+00 | 1.880 .1004E+01
01337> .465 .5491E+00 | 2.577 .1092E+01
01338> .531 .5871E+00 | .000 .0000E+00
01339>
01340> ROUTING RESULTS AREA QPEAK TPEAK R.V.
01341> (ha) (cms) (hrs) (mm)
01342> INFLOW >09: (090 ) 8.56 1.651 1.042 39.096
01343> OUTFLOW<10: (POND ) 8.56 .089 2.625 39.093
01344>
01345> PEAK FLOW REDUCTION [Qout/Qin] (%) = 5.413
01346> TIME SHIFT OF PEAK FLOW (min) = 95.00
01347> MAXIMUM STORAGE USED (ha.m.) = 2758E+00
01348>
01349> 001:0014-----
01350> *-----

```

01351> \* Remaining Hawthorne Industrial Park \*

01352> \*\*\*\*\*

01353> \* SUB-AREA No.1

01354> | CALIB STANDHYD | Area (ha)= 19.90

01355> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

01358> IMPERVIOUS PERVIOUS (i)

01360> Surface Area (ha)= 14.13 5.77

01361> Dep. Storage (mm)= 1.57 4.67

01362> Average Slope (%)= .60 1.50

01363> Length (m)= 580.00 100.00

01364> Mannings n = .030 .250

01365> Max.eff.Inten.(mm/hr)= 80.14 42.65

01366> over (min)= 15.00 35.00

01367> Storage Coeff. (min)= 15.43 (ii) 34.18 (ii)

01368> Unit Hyd. Tpeak (min)= 15.00 35.00

01369> Unit Hyd. peak (cms)= .07 .03

01370> \*TOTALS\*

01371> PEAK FLOW (cms)= 1.41 1.40 1.572 (iii)

01372> TIME TO PEAK (hrs)= 1.17 1.54 1.208

01373> RUNOFF VOLUME (mm)= 40.94 21.31 31.126

01374> TOTAL RAINFALL (mm)= 42.51 42.51 42.514

01375> RUNOFF COEFFICIENT = .96 .50 .732

01376> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 Ia = Dep. Storage (Above)

01377> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

01378> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01385> 001:0015-----

01386> \* SUB-AREA No.1

01387> | ADD HYD (H1P02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF

01388> | (ha) (cms) (hrs) (mm) (cms)

01389> ID1 10:POND 8.56 .089 2.63 39.09 .000

01390> +ID2 01:H1P01 19.90 1.572 1.21 31.13 .000

01391> SUM 02:H1P02 28.46 1.615 1.21 33.52 .000

01392> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01396> 001:0016-----

01397> \* SUB-AREA No.2

01400> | CALIB STANDHYD | Area (ha)= 17.00

01401> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

01403> IMPERVIOUS PERVIOUS (i)

01404> Surface Area (ha)= 12.07 4.93

01405> Dep. Storage (mm)= 1.57 4.67

01406> Average Slope (%)= .65 1.50

01407> Length (m)= 450.00 100.00

01408> Mannings n = .030 .250

01409> Max.eff.Inten.(mm/hr)= 89.76 47.48

01410> over (min)= 12.50 30.00

01411> Storage Coeff. (min)= 12.36 (ii) 30.32 (ii)

01412> Unit Hyd. Tpeak (min)= 12.50 30.00

01413> Unit Hyd. peak (cms)= .09 .04

01414> \*TOTALS\*

01415> PEAK FLOW (cms)= 1.36 .37 1.504 (iii)

01416> TIME TO PEAK (hrs)= 1.13 1.46 1.167

01417> RUNOFF VOLUME (mm)= 42.94 21.31 31.126

01418> TOTAL RAINFALL (mm)= 42.51 42.51 42.514

01419> RUNOFF COEFFICIENT = .96 .50 .732

01420> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 Ia = Dep. Storage (Above)

01421> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

01422> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01427> 001:0017-----

01428> \* SUB-AREA No.3

01430> | CALIB STANDHYD | Area (ha)= 18.10

01431> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

01433> IMPERVIOUS PERVIOUS (i)

01434> Surface Area (ha)= 12.85 5.25

01435> Dep. Storage (mm)= 1.57 4.67

01436> Average Slope (%)= .50 1.50

01437> Length (m)= 600.00 100.00

01438> Mannings n = .030 .250

01439> Max.eff.Inten.(mm/hr)= 73.27 42.65

01440> over (min)= 17.50 35.00

01441> Storage Coeff. (min)= 17.24 (ii) 35.98 (ii)

01442> Unit Hyd. Tpeak (min)= 17.50 35.00

01443> Unit Hyd. peak (cms)= .07 .03

01444> \*TOTALS\*

01445> PEAK FLOW (cms)= 1.19 .35 1.364 (iii)

01446> TIME TO PEAK (hrs)= 1.21 1.54 1.250

01447> RUNOFF VOLUME (mm)= 40.94 21.31 31.126

01448> TOTAL RAINFALL (mm)= 42.51 42.51 42.514

01449> RUNOFF COEFFICIENT = .96 .50 .732

01450> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 Ia = Dep. Storage (Above)

01451> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

01452> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01456> 001:0018-----

01457> | ADD HYD (H1P05 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF

01458> | (ha) (cms) (hrs) (mm) (cms)

01459> ID1 03:H1P03 17.00 1.504 1.17 31.13 .000

01460> +ID2 04:H1P04 18.10 1.364 1.25 31.13 .000

01461> SUM 05:H1P05 35.10 2.800 1.17 31.13 .000

01462> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01475> 001:0019-----

01476> \* SUB-AREA No.4

01477> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00

01478> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.570 # of Linear Res. (N)= 3.00

01479> U.H. Tp(hrs)= .170

01480> Unit Hyd Qpeak (cms)= .899

01481> PEAK FLOW (cms)= .260 (i)

01486> TIME TO PEAK (hrs)= 1.167

01487> RUNOFF VOLUME (mm)= 17.325

01488> TOTAL RAINFALL (mm)= 42.514

01489> RUNOFF COEFFICIENT = .408

01490> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01492> 001:0020-----

01493> \* SUB-AREA No.5

01494> | ADD HYD (H1P06 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF

01495> | (ha) (cms) (hrs) (mm) (cms)

01496> ID1 02:H1P02 28.46 1.615 1.21 33.52 .000

01497> +ID2 05:H1P05 35.10 2.800 1.17 31.13 .000

01498> +ID3 06:Pond-B 4.00 .260 1.17 17.32 .000

01499> SUM 07:H1P06 67.56 4.661 1.17 31.32 .000

01500> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01501> 001:0021-----

01502> \* SUB-AREA No.6

01503> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00

01504> | 10:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00

01505> U.H. Tp(hrs)= .370

01506> Unit Hyd Qpeak (cms)= .702

01507> PEAK FLOW (cms)= .187 (i)

01508> TIME TO PEAK (hrs)= 1.458

01509> RUNOFF VOLUME (mm)= 12.131

01510> TOTAL RAINFALL (mm)= 42.514

01511> RUNOFF COEFFICIENT = .285

01512> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01522> 001:0022-----

01523> \* SUB-AREA No.4

01524> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00

01525> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00

01526> U.H. Tp(hrs)= .804

01527> Unit Hyd Qpeak (cms)= .252

01528> PEAK FLOW (cms)= .086 (i)

01529> TIME TO PEAK (hrs)= 2.042

01530> RUNOFF VOLUME (mm)= 12.131

01531> TOTAL RAINFALL (mm)= 42.514

01532> RUNOFF COEFFICIENT = .285

01533> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01543> 001:0023-----

01544> | ADD HYD (0020 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF

01545> | (ha) (cms) (hrs) (mm) (cms)

01546> ID1 07:H1P06 67.56 4.661 1.17 31.32 .000

01547> +ID2 10:A2 6.80 .187 1.46 12.13 .000

01548> +ID3 01:A3 5.30 .086 2.04 12.13 .000

01549> SUM 02:0020 79.66 4.812 1.21 28.40 .000

01550> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01555> 001:0024-----

01556> \*\*\*\*\*

01557> \* CALCULATION OF 3HR - 1:10 YEAR STORM EVENT \*

01558> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWHYM\

01559> | TZERO = .00 hrs on 0

01560> | METOUT= 2 (output = METRIC)

01561> | NRUN = 001

01562> | NSTORM= 0

01563> 001:0002-----

01564> | CHICAGO STORM | IDF curve parameters: A=1174.184

01565> | Ptotal= 49.50 mm | B= 6.014

01566> | C= .816

01567> used in: INTENSITY = A / (t + B)<sup>C</sup>

01568> Duration of storm = 3.00 hrs

01569> Storm time step = 10.00 min

01570> Time to peak ratio = 1.33

01571> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

01572> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr

01573> .17 4.248 | 1.00 122.142 | 1.83 7.733 | 2.67 4.049

01574> .33 5.290 | 1.17 37.285 | 2.00 6.502 | 2.83 3.714

01575> .50 7.108 | 1.33 18.954 | 2.17 5.625 | 3.00 3.434

01576> .67 11.130 | 1.50 12.700 | 2.33 4.969 |

01577> .83 28.100 | 1.67 9.588 | 2.50 4.458 |

01578> 001:0003-----

01579> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWHYM\ORGA.VAL

01580> | ICASEdv = 1 (read and print data)

01581> FileTitle= ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---

01582> PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ----

01583> Horton's infiltration equation parameters:

01584> [F= 50.00 mm/hr] [F= 7.50 mm/hr] [ICAY= 2.00 /hr] [F= .00 mm]

01585> Parameters for PERVIOUS surfaces in STANDHYD:

01586> [IAper= 4.67 mm] [LGP=40.00 m] [MNP= .250]

01587> Parameters for IMPERVIOUS surfaces in STANDHYD:

01588> [IAimp= 1.57 mm] [CI= 1.50] [MNI= .035]

01589> Parameters used in NASHYD:

01590> [Ia= 4.67 mm] [N= 3.00]

01603> 001:0004-----

01604> \*\*\*\*\*

01605> \* ORGANIZED FILE \*

01606> \* SUB-AREA No.1

01607> | CALIB STANDHYD | Area (ha)= 2.07

01608> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00

01609> IMPERVIOUS PERVIOUS (i)

01610> Surface Area (ha)= 1.74 .33

01611> Dep. Storage (mm)= 1.57 4.67

01612> Average Slope (%)= .52 1.00

01613> Length (m)= 204.72 20.00

01614> Mannings n = .030 .250

01615> Max.eff.Inten.(mm/hr)= 122.14 34.69

01616> over (min)= 7.50 15.00

01621> Storage Coeff. (min)= 7.28 (ii) 16.04 (ii)  
01622> Unit Hyd. Tpeak (min)= 7.50 15.00  
01623> Unit Hyd. peak (cms)= .15 .07  
01624> \*TOTALS\*  
01625> PEAK FLOW (cms)= .43 .02 .437 (iii)  
01626> TIME TO PEAK (hrs)= 1.04 1.21 1.042  
01627> RUNOFF VOLUME (mm)= 47.93 19.25 43.345  
01628> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01629> RUNOFF COEFFICIENT = .97 .39 .976  
01630>  
01631> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01632> CN\* = 81.0 Ia = Dep. Storage (Above)  
01633> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01634> THAN THE STORAGE COEFFICIENT.  
01635> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01636>  
01637>-----  
01638> \* 001:0005  
01639> \* SUB-AREA No.2  
01640>  
01641> | CALIB STANDHYD | Area (ha)= 1.54  
01642> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00  
01643>  
01644>-----  
01645> IMPERVIOUS PERVIOUS (i)  
01646> Surface Area (ha)= 1.42 .12  
01647> Dep. Storage (mm)= 1.57 4.67  
01648> Average Slope (%)= .50 1.00  
01649> Length (m)= 244.34 5.00  
01650> Mannings n = .030 .030  
01651>  
01652> Max.eff.Inten.(mm/hr)= 122.14 42.32  
01653> over (min) = 7.50 10.00  
01654> Storage Coeff. (min)= 8.20 (ii) 9.19 (ii)  
01655> Unit Hyd. Tpeak (min)= 7.50 10.00  
01656> Unit Hyd. peak (cms)= .14 .12  
01657> \*TOTALS\*  
01658> PEAK FLOW (cms)= .33 .01 .341 (iii)  
01659> TIME TO PEAK (hrs)= 1.04 1.13 1.042  
01660> RUNOFF VOLUME (mm)= 47.93 19.25 45.640  
01661> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01662> RUNOFF COEFFICIENT = .97 .39 .922  
01663>  
01664> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01665> CN\* = 81.0 Ia = Dep. Storage (Above)  
01666> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01667> THAN THE STORAGE COEFFICIENT.  
01668> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01669>  
01670>-----  
01671> \* 001:0006  
01672> \* SUB-AREA No.3  
01673>  
01674> | CALIB STANDHYD | Area (ha)= 1.40  
01675> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
01676>  
01677>-----  
01678> IMPERVIOUS PERVIOUS (i)  
01679> Surface Area (ha)= 1.36 .04  
01680> Dep. Storage (mm)= 1.57 4.67  
01681> Average Slope (%)= .51 1.00  
01682> Length (m)= 225.63 5.00  
01683> Mannings n = .030 .030  
01684>  
01685> Max.eff.Inten.(mm/hr)= 122.14 48.18  
01686> over (min) = 7.50 7.50  
01687> Storage Coeff. (min)= 7.77 (ii) 8.70 (ii)  
01688> Unit Hyd. Tpeak (min)= 7.50 7.50  
01689> Unit Hyd. peak (cms)= .15 .14  
01690> \*TOTALS\*  
01691> PEAK FLOW (cms)= .33 .00 .329 (iii)  
01692> TIME TO PEAK (hrs)= 1.04 1.08 1.042  
01693> RUNOFF VOLUME (mm)= 47.93 19.25 47.074  
01694> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01695> RUNOFF COEFFICIENT = .97 .39 .951  
01696>  
01697> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01698> CN\* = 81.0 Ia = Dep. Storage (Above)  
01699> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01700> THAN THE STORAGE COEFFICIENT.  
01701> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01702>  
01703>-----  
01704> \* 001:0007  
01705>  
01706> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01707> |-----| | (ha) (cms) (hrs) (mm) (cms)  
01708> ID1 01:010 2.07 .437 1.04 43.35 .000  
01709> +ID2 02:020 1.54 .341 1.04 45.64 .000  
01710>-----  
01711> SUM 04:040 3.61 .778 1.04 44.32 .000  
01712>  
01713> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01714>  
01715>-----  
01716> \* 001:0008  
01717>  
01718> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01719> |-----| | (ha) (cms) (hrs) (mm) (cms)  
01720> ID1 03:030 1.40 .329 1.04 47.07 .000  
01721> +ID2 04:040 3.61 .778 1.04 44.32 .000  
01722>-----  
01723> SUM 05:050 5.01 1.107 1.04 45.09 .000  
01724>  
01725> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01726>  
01727>-----  
01728> \* 001:0009  
01729> \* SUB-AREA No.4  
01730>  
01731> | CALIB STANDHYD | Area (ha)= .89  
01732> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
01733>  
01734>-----  
01735> IMPERVIOUS PERVIOUS (i)  
01736> Surface Area (ha)= .86 .03  
01737> Dep. Storage (mm)= 1.57 4.67  
01738> Average Slope (%)= .93 .70  
01739> Length (m)= 168.82 40.00  
01740> Mannings n = .030 .250  
01741>  
01742> Max.eff.Inten.(mm/hr)= 122.14 31.19  
01743> over (min) = 5.00 20.00  
01744> Storage Coeff. (min)= 5.37 (ii) 20.78 (ii)  
01745> Unit Hyd. Tpeak (min)= 5.00 20.00  
01746> Unit Hyd. peak (cms)= .21 .06  
01747> \*TOTALS\*  
01748> PEAK FLOW (cms)= .24 .00 .245 (iii)  
01749> TIME TO PEAK (hrs)= 1.00 1.29 1.000  
01750> RUNOFF VOLUME (mm)= 47.93 19.25 47.074  
01751> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01752> RUNOFF COEFFICIENT = .97 .39 .951  
01753>  
01754> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01755> CN\* = 81.0 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.  
01756>  
01757>-----  
01758> \* 001:0010  
01759> \* SUB-AREA No.5  
01760>  
01761> | CALIB STANDHYD | Area (ha)= 2.66  
01762> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
01763>  
01764>-----  
01765> IMPERVIOUS PERVIOUS (i)  
01766> Surface Area (ha)= 2.58 .08  
01767> Dep. Storage (mm)= 1.57 4.67  
01768> Average Slope (%)= .61 1.50  
01769> Length (m)= 207.25 20.00  
01770> Mannings n = .030 .250  
01771>  
01772> Max.eff.Inten.(mm/hr)= 122.14 34.69  
01773> over (min) = 7.50 15.00  
01774> Storage Coeff. (min)= 7.00 (ii) 14.75 (ii)  
01775> Unit Hyd. Tpeak (min)= 7.50 15.00  
01776> Unit Hyd. peak (cms)= .16 .08  
01777> \*TOTALS\*  
01778> PEAK FLOW (cms)= .64 .00 .645 (iii)  
01779> TIME TO PEAK (hrs)= 1.04 1.21 1.042  
01780> RUNOFF VOLUME (mm)= 47.93 19.25 47.074  
01781> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01782> RUNOFF COEFFICIENT = .97 .39 .951  
01783>  
01784> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01785> CN\* = 81.0 Ia = Dep. Storage (Above)  
01786> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01787> THAN THE STORAGE COEFFICIENT.  
01788> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01789>  
01790>-----  
01791> \* 001:0011  
01792>  
01793> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01794> |-----| | (ha) (cms) (hrs) (mm) (cms)  
01795> ID1 06:060 .89 .245 1.00 47.07 .000  
01796> +ID2 07:070 2.66 .645 1.04 47.07 .000  
01797>-----  
01798> SUM 08:080 3.55 .876 1.04 47.07 .000  
01799>  
01800> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01801>  
01802>-----  
01803> \* 001:0012  
01804>  
01805> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01806> |-----| | (ha) (cms) (hrs) (mm) (cms)  
01807> ID1 05:050 5.01 1.107 1.04 45.09 .000  
01808> +ID2 08:080 3.55 .876 1.04 47.07 .000  
01809>-----  
01810> SUM 09:090 8.56 1.984 1.04 45.91 .000  
01811>  
01812> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01813>  
01814>-----  
01815> \* 001:0013  
01816>  
01817> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
01818> | IN:09: (090 ) |  
01819> | OUT:10: (POND ) |  
01820>-----  
01821> OUTFLOW STORAGE TABLE  
01822> OUTFLOW STORAGE OUTFLOW STORAGE  
01823> (cms) (ha.m.) (cms) (ha.m.)  
01824> 0.00 0.000E+00 0.593 6231E+00  
01825> .008 6560E-01 .654 6631E+00  
01826> .017 1311E+00 .797 7391E+00  
01827> .093 2831E+00 .950 8274E+00  
01828> .233 3971E+00 1.304 9157E+00  
01829> .337 4731E+00 1.880 1004E+01  
01830> .465 5491E+00 2.577 1092E+01  
01831> .531 5871E+00 1.000 0000E+00  
01832>  
01833> ROUTING RESULTS AREA OPEAK TPEAK R.V.  
01834> (ha) (cms) (hrs) (mm)  
01835> INFLOW >09: (090 ) 8.56 1.984 1.042 45.914  
01836> OUTFLOW <10: (POND ) 8.56 .132 2.278 45.912  
01837>  
01838> PEAK FLOW REDUCTION [Qout/Qin] (%) = 6.640  
01839> TIME SHIFT OF PEAK FLOW (min) = 74.17  
01840> MAXIMUM STORAGE USED (ha.m.) = .3146E+00  
01841>  
01842>-----  
01843> \* 001:0014  
01844> \* Remaining Hawthorne Industrial Park \*  
01845> \*-----  
01846> \* SUB-AREA No.1  
01847>  
01848> | CALIB STANDHYD | Area (ha)= 19.90  
01849> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01850>  
01851>-----  
01852> IMPERVIOUS PERVIOUS (i)  
01853> Surface Area (ha)= 14.13 5.77  
01854> Dep. Storage (mm)= 1.57 4.67  
01855> Average Slope (%)= .60 1.50  
01856> Length (m)= 580.00 100.00  
01857> Mannings n = .030 .250  
01858>  
01859> Max.eff.Inten.(mm/hr)= 93.86 60.56  
01860> over (min) = 15.00 30.00  
01861> Storage Coeff. (min)= 14.48 (ii) 30.78 (ii)  
01862> Unit Hyd. Tpeak (min)= 15.00 30.00  
01863> Unit Hyd. peak (cms)= .08 .04  
01864> \*TOTALS\*  
01865> PEAK FLOW (cms)= 1.70 .55 1.983 (iii)  
01866> TIME TO PEAK (hrs)= 1.17 1.46 1.208  
01867> RUNOFF VOLUME (mm)= 47.93 26.92 37.426  
01868> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01869> RUNOFF COEFFICIENT = .97 .54 .756  
01870>  
01871> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01872> CN\* = 81.0 Ia = Dep. Storage (Above)  
01873> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01874> THAN THE STORAGE COEFFICIENT.  
01875> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01876>  
01877>-----  
01878> \* 001:0015  
01879>  
01880> | ADD HYD (H1P02 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01881> |-----| | (ha) (cms) (hrs) (mm) (cms)  
01882> ID1 10:POND 8.56 .132 2.28 45.91 .000  
01883> +ID2 01:H1P01 19.90 1.983 1.21 37.43 .000  
01884>-----  
01885> SUM 02:H1P02 28.46 2.044 1.21 39.98 .000  
01886>  
01887> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01888>  
01889>-----  
01890>



01891>-----  
01892> 001:0016-----  
01893> \*  
01894> \* SUB-AREA No.2  
01895>-----  
01896> | CALIB STANDHYD | Area (ha)= 17.00  
01897> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01898>-----  
01899> IMPERVIOUS PERVIOUS (i)  
01900> Surface Area (ha)= 12.07 4.93  
01901> Dep. Storage (mm)= 1.57 4.67  
01902> Average Slope (%)= .65 1.50  
01903> Length (m)= 450.00 100.00  
01904> Mannings n = .030 .250  
01905>-----  
01906> Max.eff.Inten.(mm/hr)= 105.17 63.81  
01907> over (min) 12.50 27.50  
01908> Storage Coeff. (min)= 11.60 (ii) 27.56 (ii)  
01909> Unit Hyd. Tpeak (min)= 12.50 27.50  
01910> Unit Hyd. peak (cms)= .09 .04  
01911>-----  
01912> PEAK FLOW (cms)= 1.63 .51 \*TOTALS\*  
01913> TIME TO PEAK (hrs)= 1.13 1.42 1.167  
01914> RUNOFF VOLUME (mm)= 47.93 26.92 37.426  
01915> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01916> RUNOFF COEFFICIENT = .97 .54 .756  
01917>-----  
01918> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01919> CN\* = 81.0 Ia = Dep. Storage (Above)  
01920> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01921> THAN THE STORAGE COEFFICIENT.  
01922> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01923>-----  
01924> 001:0017-----  
01925> \*  
01926> \* SUB-AREA No.3  
01927>-----  
01928> | CALIB STANDHYD | Area (ha)= 18.10  
01929> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01930>-----  
01931> IMPERVIOUS PERVIOUS (i)  
01932> Surface Area (ha)= 12.85 5.25  
01933> Dep. Storage (mm)= 1.57 4.67  
01934> Average Slope (%)= .65 1.50  
01935> Length (m)= 600.00 100.00  
01936> Mannings n = .030 .250  
01937>-----  
01938> Max.eff.Inten.(mm/hr)= 93.86 57.19  
01939> over (min) 15.00 32.50  
01940> Storage Coeff. (min)= 15.61 (ii) 32.28 (ii)  
01941> Unit Hyd. Tpeak (min)= 15.00 32.50  
01942> Unit Hyd. peak (cms)= .07 .03  
01943>-----  
01944> PEAK FLOW (cms)= 1.49 .48 \*TOTALS\*  
01945> TIME TO PEAK (hrs)= 1.17 1.50 1.208 (iii)  
01946> RUNOFF VOLUME (mm)= 47.93 26.92 37.426  
01947> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
01948> RUNOFF COEFFICIENT = .97 .54 .756  
01949>-----  
01950> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01951> CN\* = 81.0 Ia = Dep. Storage (Above)  
01952> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01953> THAN THE STORAGE COEFFICIENT.  
01954> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01955>-----  
01956> 001:0018-----  
01957> \*  
01958> | ADD HYD (HIPO5) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01959> | (ha) (cms) (hrs) (mm) (cms)  
01960> ID1 03:HIP03 17.00 1.865 1.17 37.43 .000  
01961> +ID2 04:HIP04 18.10 1.723 1.21 37.43 .000  
01962>-----  
01963> SUM 05:HIPO5 35.10 3.572 1.17 37.43 .000  
01964>-----  
01965> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01966>-----  
01967> 001:0019-----  
01968> \*  
01969> \* SUB-AREA No.4  
01970>-----  
01971> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
01972> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
01973> | U.H. Tp(hrs)= .170  
01974>-----  
01975> Unit Hyd Qpeak (cms)= .899  
01976>-----  
01977> PEAK FLOW (cms)= .345 (i)  
01978> TIME TO PEAK (hrs)= 1.167  
01979> RUNOFF VOLUME (mm)= 22.420  
01980> TOTAL RAINFALL (mm)= 49.505  
01981> RUNOFF COEFFICIENT = .453  
01982>-----  
01983> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01984>-----  
01985> 001:0020-----  
01986> \*  
01987> | ADD HYD (HIPO6) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01988> | (ha) (cms) (hrs) (mm) (cms)  
01989> ID1 02:HIP02 28.46 2.044 1.21 39.98 .000  
01990> +ID2 05:HIPO5 35.10 3.572 1.17 37.43 .000  
01991> +ID3 06:Pond-B 4.00 .345 1.17 22.42 .000  
01992>-----  
01993> SUM 07:HIPO6 67.56 5.939 1.17 37.61 .000  
01994>-----  
01995> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01996>-----  
01997> 001:0021-----  
01998> \*  
01999> \* SUB-AREA No.5  
02000>-----  
02001> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00  
02002> | 10:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02003> | U.H. Tp(hrs)= .370  
02004>-----  
02005> Unit Hyd Qpeak (cms)= .702  
02006>-----  
02007> PEAK FLOW (cms)= .252 (i)  
02008> TIME TO PEAK (hrs)= 1.417  
02009> RUNOFF VOLUME (mm)= 16.075  
02010> TOTAL RAINFALL (mm)= 49.505  
02011> RUNOFF COEFFICIENT = .325  
02012>-----  
02013> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02014>-----  
02015> 001:0022-----  
02016> \*  
02017> \* SUB-AREA No.4  
02018>-----  
02019> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00  
02020> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02021> | U.H. Tp(hrs)= .804

02022>-----  
02023> Unit Hyd Qpeak (cms)= .252  
02024>-----  
02025> PEAK FLOW (cms)= .115 (i)  
02026> TIME TO PEAK (hrs)= 2.000  
02027> RUNOFF VOLUME (mm)= 16.075  
02028> TOTAL RAINFALL (mm)= 49.505  
02029> RUNOFF COEFFICIENT = .325  
02030>-----  
02031> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02032>-----  
02033> 001:0023-----  
02034> \*  
02035> | ADD HYD (0020) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02036> | (ha) (cms) (hrs) (mm) (cms)  
02037> ID1 07:HIP06 67.56 5.939 1.17 37.61 .000  
02038> +ID2 10:A2 6.80 .252 1.42 16.08 .000  
02039> +ID3 01:A3 5.30 .115 2.00 16.08 .000  
02040>-----  
02041> SUM 02:0020 79.66 6.135 1.17 34.34 .000  
02042>-----  
02043> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02044>-----  
02045> 001:0024-----  
02046> \*  
02047> \* CALCULATION OF 3HR - 1.25 YEAR STORM EVENT \*  
02048>-----  
02049> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWHYM\O  
02050> | Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SWHYM\O  
02051>-----  
02052> TZERO = .00 hrs on 0  
02053> METOUT= 2 (output = METRIC)  
02054> NRUN = 001  
02055> NSTORM= 0  
02056>-----  
02057> 001:0002-----  
02058> \*  
02059> | CHICAGO STORM | IDF curve parameters: A=1402.884  
02060> | Total= 58.23 mm | B= 6.018  
02061> C= .819  
02062> used in: INTENSITY = A / (t + B)^C  
02063>-----  
02064> Duration of storm = 3.00 hrs  
02065> Storm time step = 10.00 min  
02066> Time to peak ratio = .33  
02067>-----  
02068> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
02069> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
02070> .17 4.934 | 1.00 144.693 | 1.83 9.014 | 2.67 4.701  
02071> .33 6.152 | 1.17 43.904 | 2.00 7.571 | 2.83 4.310  
02072> .50 8.282 | 1.33 22.224 | 2.17 6.544 | 3.00 3.983  
02073> .67 13.006 | 1.50 14.852 | 2.33 5.776 |  
02074> .83 33.041 | 1.67 11.192 | 2.50 5.179 |  
02075>-----  
02076> 001:0003-----  
02077> \*  
02078> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWHYM\ORGA.VAL  
02079> | ICRSEV = 1 (read and print data)  
02080> FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ----  
02081> ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ----  
02082> Horton's infiltration equation parameters:  
02083> [P= 50.00 mm/hr] [T= 7.50 mm/hr] [DCA= 2.00 /hr] [F= .00 mm]  
02084> Parameters for PERVIOUS surfaces in STANDHYD:  
02085> [Iaper= 4.67 mm] [LGP=40.00 m] [MNP= .250]  
02086> Parameters for IMPERVIOUS surfaces in STANDHYD:  
02087> [Irimp= 1.57 mm] [CLI= 1.50] [MNI= .035]  
02088> Parameters used in NASHYD:  
02089> [Ia= 4.67 mm] [N= 3.00]  
02090>-----  
02091> 001:0004-----  
02092> \*  
02093> | ORGARORLD FILE  
02094>-----  
02095> \* SUB-AREA No.1  
02096>-----  
02097> | CALIB STANDHYD | Area (ha)= 2.07  
02098> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00  
02099>-----  
02100> IMPERVIOUS PERVIOUS (i)  
02101> Surface Area (ha)= 1.74 .33  
02102> Dep. Storage (mm)= 1.57 4.67  
02103> Average Slope (%)= .52 1.00  
02104> Length (m)= 204.72 20.00  
02105> Mannings n = .030 .250  
02106>-----  
02107> Max.eff.Inten.(mm/hr)= 144.69 47.07  
02108> over (min) 7.50 15.00  
02109> Storage Coeff. (min)= 6.81 (ii) 14.56 (ii)  
02110> Unit Hyd. Tpeak (min)= 7.50 15.00  
02111> Unit Hyd. peak (cms)= .16 .08  
02112>-----  
02113> PEAK FLOW (cms)= .52 .03 \*TOTALS\*  
02114> TIME TO PEAK (hrs)= 1.04 1.21 1.042  
02115> RUNOFF VOLUME (mm)= 56.66 25.35 51.647  
02116> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02117> RUNOFF COEFFICIENT = .97 .44 .887  
02118>-----  
02119> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02120> CN\* = 81.0 Ia = Dep. Storage (Above)  
02121> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02122> THAN THE STORAGE COEFFICIENT.  
02123> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02124>-----  
02125> 001:0005-----  
02126> \*  
02127> \* SUB-AREA No.2  
02128>-----  
02129> | CALIB STANDHYD | Area (ha)= 1.54  
02130> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00  
02131>-----  
02132> IMPERVIOUS PERVIOUS (i)  
02133> Surface Area (ha)= 1.42 .12  
02134> Dep. Storage (mm)= 1.57 4.67  
02135> Average Slope (%)= .50 1.00  
02136> Length (m)= 244.34 5.00  
02137> Mannings n = .030 .030  
02138>-----  
02139> Max.eff.Inten.(mm/hr)= 144.69 65.19  
02140> over (min) 7.50 7.50  
02141> Storage Coeff. (min)= 7.66 (ii) 8.49 (ii)  
02142> Unit Hyd. Tpeak (min)= 7.50 7.50  
02143> Unit Hyd. peak (cms)= .15 .14  
02144>-----  
02145> PEAK FLOW (cms)= .40 .01 \*TOTALS\*  
02146> TIME TO PEAK (hrs)= 1.04 1.08 .418 (iii)  
02147> RUNOFF VOLUME (mm)= 56.66 25.35 54.152  
02148> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02149> RUNOFF COEFFICIENT = .97 .44 .930  
02150>-----  
02151> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02152> CN\* = 81.0 Ia = Dep. Storage (Above)

02161> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02162> THAN THE STORAGE COEFFICIENT.  
02163> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02164>  
02165>  
02166> 001:0006-----  
02167> \* SUB-AREA No.3  
02169>  
02170> | CALIB STANDHYD | Area (ha)= 1.40  
02171> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02172>  
02173> IMPERVIOUS PERVIOUS (i)  
02174> Surface Area (ha)= 1.36 .04  
02175> Dep. Storage (mm)= 1.57 4.67  
02176> Average Slope (%)= .51 1.00  
02177> Length (m)= 225.63 5.00  
02178> Mannings n = .030 .030  
02179>  
02180> Max. eff. Inten. (mm/hr)= 144.69 65.19  
02181> over (min) 7.50 7.50  
02182> Storage Coeff. (min)= 7.26 (ii) 8.09 (iii)  
02183> Unit Hyd. Tpeak (min)= 7.50 7.50  
02184> Unit Hyd. peak (cms)= .15 .14  
02185>  
02186> PEAK FLOW (cms)= .40 .00 \*TOTALS\*  
02187> TIME TO PEAK (hrs)= 1.04 1.08 4.00 (iii)  
02188> RUNOFF VOLUME (mm)= 56.66 25.35 58.717  
02189> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02190> RUNOFF COEFFICIENT = .97 .44 .957  
02191>  
02192> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02193> CN\* = 81.0 Ia = Dep. Storage (Above)  
02194> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02195> THAN THE STORAGE COEFFICIENT.  
02196> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02197>  
02198>  
02199> 001:0007-----  
02200>  
02201> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02202> (ha) (cms) (hrs) (mm) (cms)  
02203> ID1 01:010 2.07 .532 1.04 51.65 .000  
02204> +ID2 02:020 1.54 .418 1.04 54.15 .000  
02205>  
02206> SUM 04:040 3.61 .950 1.04 52.72 .000  
02207>  
02208> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02209>  
02210>  
02211> 001:0008-----  
02212>  
02213> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02214> (ha) (cms) (hrs) (mm) (cms)  
02215> ID1 03:030 1.40 .400 1.04 55.72 .000  
02216> +ID2 04:040 3.61 .950 1.04 52.72 .000  
02217>  
02218> SUM 05:050 5.01 1.350 1.04 53.55 .000  
02219>  
02220> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02221>  
02222>  
02223> 001:0009-----  
02224> \* SUB-AREA No.4  
02226>  
02227> | CALIB STANDHYD | Area (ha)= .89  
02228> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02229>  
02230> IMPERVIOUS PERVIOUS (i)  
02231> Surface Area (ha)= .86 .03  
02232> Dep. Storage (mm)= 1.57 4.67  
02233> Average Slope (%)= .93 .70  
02234> Length (m)= 169.82 40.00  
02235> Mannings n = .030 .250  
02236>  
02237> Max. eff. Inten. (mm/hr)= 144.69 44.12  
02238> over (min) 5.00 17.50  
02239> Storage Coeff. (min)= 5.02 (ii) 18.44 (iii)  
02240> Unit Hyd. Tpeak (min)= 5.00 17.50  
02241> Unit Hyd. peak (cms)= .22 .06  
02242>  
02243> PEAK FLOW (cms)= .30 .00 \*TOTALS\*  
02244> TIME TO PEAK (hrs)= 1.00 1.25 1.000  
02245> RUNOFF VOLUME (mm)= 56.66 25.35 55.717  
02246> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02247> RUNOFF COEFFICIENT = .97 .44 .957  
02248>  
02249> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02250> CN\* = 81.0 Ia = Dep. Storage (Above)  
02251> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02252> THAN THE STORAGE COEFFICIENT.  
02253> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02254>  
02255>  
02256> 001:0010-----  
02257> \* SUB-AREA No.5  
02259>  
02260> | CALIB STANDHYD | Area (ha)= 2.66  
02261> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02262>  
02263> IMPERVIOUS PERVIOUS (i)  
02264> Surface Area (ha)= 2.58 .08  
02265> Dep. Storage (mm)= 1.57 4.67  
02266> Average Slope (%)= .61 1.50  
02267> Length (m)= 207.25 20.00  
02268> Mannings n = .030 .250  
02269>  
02270> Max. eff. Inten. (mm/hr)= 144.69 51.33  
02271> over (min) 7.50 12.50  
02272> Storage Coeff. (min)= 6.54 (ii) 13.16 (ii)  
02273> Unit Hyd. Tpeak (min)= 7.50 12.50  
02274> Unit Hyd. peak (cms)= .16 .09  
02275>  
02276> PEAK FLOW (cms)= .78 .01 \*TOTALS\*  
02277> TIME TO PEAK (hrs)= 1.04 1.17 1.042  
02278> RUNOFF VOLUME (mm)= 56.66 25.35 55.717  
02279> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02280> RUNOFF COEFFICIENT = .97 .44 .957  
02281>  
02282> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02283> CN\* = 81.0 Ia = Dep. Storage (Above)  
02284> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02285> THAN THE STORAGE COEFFICIENT.  
02286> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02287>  
02288>  
02289> 001:0011-----  
02290>  
02291> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02292> (ha) (cms) (hrs) (mm) (cms)  
02293> ID1 06:060 .89 .296 1.00 55.72 .000  
02294> +ID2 07:070 2.66 .783 1.04 55.72 .000  
02295>

02296> SUM 08:080 3.55 1.060 1.04 55.72 .000  
02297>  
02298> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02299>  
02300>  
02301> 001:0012-----  
02302>  
02303> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02304> (ha) (cms) (hrs) (mm) (cms)  
02305> ID1 05:050 5.01 1.350 1.04 53.55 .000  
02306> +ID2 08:080 3.55 1.060 1.04 55.72 .000  
02307>  
02308> SUM 09:090 8.56 2.410 1.04 54.45 .000  
02309>  
02310> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02311>  
02312>  
02313> 001:0013-----  
02314>  
02315> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
02316> | IN:09: (090 ) |  
02317> | OUT:10: (POND ) |  
02318>  
02319> |=====| OUTFLOW STORAGE TABLE |=====|  
02320> | OUTFLOW STORAGE | OUTFLOW STORAGE |  
02321> (cms) (ha.m.) (cms) (ha.m.)  
02322> .000 .000E+00 | .593 .625E+00  
02323> .008 .650E-01 | .654 .663E+00  
02324> .017 .131E+00 | .797 .739E+00  
02325> .093 .283E+00 | .950 .827E+00  
02326> .233 .397E+00 | 1.304 .915E+00  
02327> .337 .473E+00 | 1.880 .100E+01  
02328> .465 .549E+00 | 2.577 .109E+01  
02329> .531 .587E+00 | .000 .000E+00  
02330>  
02331> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
02332> TIME SHIFT OF PEAK FLOW (min)= 60.83  
02333> INFLOW >09: (090 ) 8.56 2.410 1.042 54.451  
02334> OUTFLOW<10: (POND ) 8.56 .189 2.056 54.449  
02335>  
02336> PEAK FLOW REDUCTION (Qout/Qin) (%)= 7.838  
02337> TIME SHIFT OF PEAK FLOW (min)= 60.83  
02338> MAXIMUM STORAGE USED (ha.m.)=.3612E+00  
02339>  
02340> 001:0014-----  
02341> \* Remaining Hawthorne Industrial Park \*  
02342> \*  
02343> \*  
02344> \* SUB-AREA No.1  
02346>  
02347> | CALIB STANDHYD | Area (ha)= 19.90  
02348> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02349>  
02350> IMPERVIOUS PERVIOUS (i)  
02351> Surface Area (ha)= 14.13 5.77  
02352> Dep. Storage (mm)= 1.57 4.67  
02353> Average Slope (%)= .60 1.50  
02354> Length (m)= 580.00 100.00  
02355> Mannings n = .030 .250  
02356>  
02357> Max. eff. Inten. (mm/hr)= 124.54 81.98  
02358> over (min) 12.50 27.50  
02359> Storage Coeff. (min)= 12.93 (ii) 27.37 (ii)  
02360> Unit Hyd. Tpeak (min)= 12.50 27.50  
02361> Unit Hyd. peak (cms)= .09 .04  
02362>  
02363> PEAK FLOW (cms)= 2.16 .77 \*TOTALS\*  
02364> TIME TO PEAK (hrs)= 1.13 1.42 1.167  
02365> RUNOFF VOLUME (mm)= 56.66 34.22 45.437  
02366> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02367> RUNOFF COEFFICIENT = .97 .59 .780  
02368>  
02369> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02370> CN\* = 81.0 Ia = Dep. Storage (Above)  
02371> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02372> THAN THE STORAGE COEFFICIENT.  
02373> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02374>  
02375>  
02376> 001:0015-----  
02377>  
02378> | ADD HYD (H1P02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02379> (ha) (cms) (hrs) (mm) (cms)  
02380> ID1 10:POND 8.56 .189 2.06 54.45 .000  
02381> +ID2 01:H1P01 19.90 2.548 1.17 45.44 .000  
02382>  
02383> SUM 02:H1P02 28.46 2.622 1.17 48.15 .000  
02384>  
02385> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02386>  
02387>  
02388> 001:0016-----  
02389> \* SUB-AREA No.2  
02391>  
02392> | CALIB STANDHYD | Area (ha)= 17.00  
02393> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02394>  
02395> IMPERVIOUS PERVIOUS (i)  
02396> Surface Area (ha)= 12.07 4.93  
02397> Dep. Storage (mm)= 1.57 4.67  
02398> Average Slope (%)= .65 1.50  
02399> Length (m)= 450.00 100.00  
02400> Mannings n = .030 .250  
02401>  
02402> Max. eff. Inten. (mm/hr)= 144.69 87.13  
02403> over (min) 10.00 25.00  
02404> Storage Coeff. (min)= 10.21 (ii) 24.30 (ii)  
02405> Unit Hyd. Tpeak (min)= 10.00 25.00  
02406> Unit Hyd. peak (cms)= .11 .05  
02407>  
02408> PEAK FLOW (cms)= 2.10 .71 \*TOTALS\*  
02409> TIME TO PEAK (hrs)= 1.08 1.38 1.125  
02410> RUNOFF VOLUME (mm)= 56.66 34.22 45.437  
02411> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02412> RUNOFF COEFFICIENT = .97 .59 .780  
02413>  
02414> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02415> CN\* = 81.0 Ia = Dep. Storage (Above)  
02416> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02417> THAN THE STORAGE COEFFICIENT.  
02418> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02419>  
02420>  
02421> 001:0017-----  
02422> \* SUB-AREA No.3  
02423>  
02424> | CALIB STANDHYD | Area (ha)= 18.10  
02425> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02426>  
02427> IMPERVIOUS PERVIOUS (i)  
02428> Surface Area (ha)= 12.85 5.25  
02429> Dep. Storage (mm)= 1.57 4.67  
02430> Average Slope (%)= .50 1.50

```

02431> Length (m) = 600.00 100.00
02432> Mannings n = .030 .250
02434> Max. eff. Inten. (mm/hr) = 111.10 77.71
02435> over (min) = 15.00 30.00
02436> Storage Coeff. (min) = 14.59 (ii) 29.34 (ii)
02437> Unit Hyd. Tpeak (min) = 15.00 30.00
02438> Unit Hyd. peak (cms) = .08 .04
02439>
02440> PEAK FLOW (cms) = 1.82 .67 *TOTALS*
02441> TIME TO PEAK (hrs) = 1.17 1.46 1.208
02442> RUNOFF VOLUME (mm) = 56.66 34.22 45.437
02443> TOTAL RAINFALL (mm) = 58.23 58.23 58.226
02444> RUNOFF COEFFICIENT = .97 .59 780
02445>
02446> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02447> CN* = 81.0 Ia = Dep. Storage (Above)
02448> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02449> THAN THE STORAGE COEFFICIENT.
02450> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02451>
02452>
02453> 001:0018-----
02454>
02455> | ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02456> | (ha) (cms) (hrs) (mm) (cms)
02457> | ID1 03:HIP03 17.00 2.398 1.13 45.44 .000
02458> | +ID2 04:HIP04 18.10 2.180 1.21 45.44 .000
02459> |
02460> | SUM 05:HIP05 35.10 4.439 1.13 45.44 .000
02461>
02462> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02463>
02464>
02465> 001:0019-----
02466> *
02467> *SUB-AREA No.4
02468>
02469> | DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN)=85.00
02470> | 06:Pond-B DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00
02471> | U.H. Tp(hrs) = .170
02472>
02473> Unit Hyd Qpeak (cms) = .899
02474>
02475> PEAK FLOW (cms) = .459 (i)
02476> TIME TO PEAK (hrs) = 1.167
02477> RUNOFF VOLUME (mm) = 29.155
02478> TOTAL RAINFALL (mm) = 58.226
02479> RUNOFF COEFFICIENT = .501
02480>
02481> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02482>
02483>
02484> 001:0020-----
02485>
02486> | ADD HYD (HIP06) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02487> | (ha) (cms) (hrs) (mm) (cms)
02488> | ID1 02:HIP02 28.46 2.622 1.17 48.15 .000
02489> | +ID2 05:HIP05 35.10 4.439 1.13 45.44 .000
02490> | +ID3 06:Pond-B 4.00 .459 1.17 29.15 .000
02491> |
02492> | SUM 07:HIP06 67.56 7.499 1.17 45.61 .000
02493>
02494> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02495>
02496>
02497> 001:0021-----
02498> * SUB-AREA NO. 5
02499>
02500> | DESIGN NASHYD | Area (ha) = 6.80 Curve Number (CN)=76.00
02501> | 10:A2 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00
02502> | U.H. Tp(hrs) = .370
02503>
02504> Unit Hyd Qpeak (cms) = .702
02505>
02506> PEAK FLOW (cms) = .343 (i)
02507> TIME TO PEAK (hrs) = 1.417
02508> RUNOFF VOLUME (mm) = 21.442
02509> TOTAL RAINFALL (mm) = 58.226
02510> RUNOFF COEFFICIENT = .368
02511>
02512> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02513>
02514>
02515> 001:0022-----
02516> * SUB-AREA NO 4
02517>
02518> | DESIGN NASHYD | Area (ha) = 5.30 Curve Number (CN)=76.00
02519> | 01:A2 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00
02520> | U.H. Tp(hrs) = .804
02521>
02522> Unit Hyd Qpeak (cms) = .252
02523>
02524> PEAK FLOW (cms) = .155 (i)
02525> TIME TO PEAK (hrs) = 2.000
02526> RUNOFF VOLUME (mm) = 21.442
02527> TOTAL RAINFALL (mm) = 58.226
02528> RUNOFF COEFFICIENT = .368
02529>
02530> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02531>
02532>
02533> 001:0023-----
02534>
02535> | ADD HYD (0020) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02536> | (ha) (cms) (hrs) (mm) (cms)
02537> | ID1 07:HIP06 67.56 7.499 1.17 45.61 .000
02538> | +ID2 10:A2 6.80 .343 1.42 21.44 .000
02539> | +ID3 01:A3 5.30 .155 2.00 21.44 .000
02540> |
02541> | SUM 02:0020 79.66 7.772 1.17 41.94 .000
02542>
02543> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02544>
02545>
02546> 001:0024-----
02547> *****
02548> CALCULATION OF 3HR - 1:50 YEAR STORM EVENT *
02549> *****
02550>
02551> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWM\HYMO\
02552> | Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SWM\HYMO\
02553> | TZERO = .00 hrs on 0
02554> | METOUT= 2 (output = METRIC)
02555> | NRUN = 001
02556> | NSTORM= 0
02557>
02558> 001:0002-----
02559>
02560> | CHICAGO STORM | IDF curve parameters: A=1569.580
02561> | Ptotal= 64.81 mm | B= 6.014
02562> | C= .820
02563> used in: INTENSITY = A / (t + B)^C
02564>
02565> Duration of storm = 3.00 hrs

```

```

02566> Storm time step = 10.00 min
02567> Time to peak ratio = .33
02568>
02569> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
02570> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
02571> .17 5.467 | 1.00 161.471 | 1.83 10.000 | 2.67 5.209
02572> .33 6.820 | 1.17 48.876 | 2.00 8.397 | 2.83 4.774
02573> .50 9.187 | 1.33 24.704 | 2.17 7.256 | 3.00 4.412
02574> .67 14.441 | 1.50 16.495 | 2.33 6.403 |
02575> .83 36.764 | 1.67 12.422 | 2.50 5.740 |
02576>
02577>
02578> 001:0003-----
02579>
02580> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWM\HYMO\ORGA.VAL
02581> | ICASEGv = 1 (read and print data)
02582> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
02583> | Horton's infiltration equation parameters:
02584> | [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [P= .00 mm]
02585> | Parameters for PERVIOUS surfaces in STANDHYD:
02586> | [IAPER= 4.67 mm] [LGP=40.00 m] [MNP= .250]
02587> | Parameters for IMPERVIOUS surfaces in STANDHYD:
02588> | [IAPER= 1.57 mm] [CLI= 1.50] [MNI= .035]
02589> | Parameters used in NASHYD:
02590> | [Ia= 4.67 mm] [N= 3.00]
02591>
02592>
02593> 001:0004-----
02594> *****
02595> * ORGAWORLD FILE *
02596> *****
02597> * SUB-AREA No.1
02598>
02599> | CALIB STANDHYD | Area (ha) = 2.07
02600> | 01:010 DT= 2.50 | Total Imp(%) = 84.00 Dir. Conn.(%) = 84.00
02601>
02602> IMPERVIOUS PERVIOUS (i)
02603> Surface Area (ha) = 1.74 .33
02604> Dep. Storage (mm) = 1.57 4.67
02605> Average Slope (%) = .52 1.00
02606> Length (m) = 204.72 20.00
02607> Mannings n = .030 .250
02608>
02609> Max. eff. Inten. (mm/hr) = 161.47 62.27
02610> over (min) = 7.50 12.50
02611> Storage Coeff. (min) = 6.51 (ii) 13.44 (ii)
02612> Unit Hyd. Tpeak (min) = 7.50 12.50
02613> Unit Hyd. peak (cms) = .16 .09
02614>
02615> PEAK FLOW (cms) = .59 .03 *TOTALS*
02616> TIME TO PEAK (hrs) = 1.04 1.17 1.042
02617> RUNOFF VOLUME (mm) = 63.24 30.21 57.952
02618> TOTAL RAINFALL (mm) = 64.81 64.81 64.806
02619> RUNOFF COEFFICIENT = .98 .47 .894
02620>
02621> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02622> CN* = 81.0 Ia = Dep. Storage (Above)
02623> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02624> THAN THE STORAGE COEFFICIENT.
02625> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02626>
02627>
02628> 001:0005-----
02629> *
02630> * SUB-AREA No.2
02631>
02632> | CALIB STANDHYD | Area (ha) = 1.54
02633> | 02:020 DT= 2.50 | Total Imp(%) = 92.00 Dir. Conn.(%) = 92.00
02634>
02635> IMPERVIOUS PERVIOUS (i)
02636> Surface Area (ha) = 1.42 .12
02637> Dep. Storage (mm) = 1.57 4.67
02638> Average Slope (%) = .50 1.00
02639> Length (m) = 244.34 5.00
02640> Mannings n = .030 .030
02641>
02642> Max. eff. Inten. (mm/hr) = 161.47 78.73
02643> over (min) = 7.50 7.50
02644> Storage Coeff. (min) = 7.33 (ii) 8.10 (ii)
02645> Unit Hyd. Tpeak (min) = 7.50 7.50
02646> Unit Hyd. peak (cms) = .15 .14
02647>
02648> PEAK FLOW (cms) = .46 .02 *TOTALS*
02649> TIME TO PEAK (hrs) = 1.04 1.08 .475 (iii)
02650> RUNOFF VOLUME (mm) = 63.24 30.21 60.594
02651> TOTAL RAINFALL (mm) = 64.81 64.81 64.806
02652> RUNOFF COEFFICIENT = .98 .47 .935
02653>
02654> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02655> CN* = 81.0 Ia = Dep. Storage (Above)
02656> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02657> THAN THE STORAGE COEFFICIENT.
02658> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02659>
02660>
02661> 001:0006-----
02662> *
02663> * SUB-AREA No.3
02664>
02665> | CALIB STANDHYD | Area (ha) = 1.40
02666> | 03:030 D2= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00
02667>
02668> IMPERVIOUS PERVIOUS (i)
02669> Surface Area (ha) = 1.36 .04
02670> Dep. Storage (mm) = 1.57 4.67
02671> Average Slope (%) = .51 1.00
02672> Length (m) = 225.63 5.00
02673> Mannings n = .030 .030
02674>
02675> Max. eff. Inten. (mm/hr) = 161.47 78.73
02676> over (min) = 7.50 7.50
02677> Storage Coeff. (min) = 6.95 (ii) 7.72 (ii)
02678> Unit Hyd. Tpeak (min) = 7.50 7.50
02679> Unit Hyd. peak (cms) = .16 .15
02680>
02681> PEAK FLOW (cms) = .45 .01 *TOTALS*
02682> TIME TO PEAK (hrs) = 1.04 1.08 .454 (iii)
02683> RUNOFF VOLUME (mm) = 63.24 30.21 62.245
02684> TOTAL RAINFALL (mm) = 64.81 64.81 64.806
02685> RUNOFF COEFFICIENT = .98 .47 .960
02686>
02687> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02688> CN* = 81.0 Ia = Dep. Storage (Above)
02689> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02690> THAN THE STORAGE COEFFICIENT.
02691> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02692>
02693>
02694> 001:0007-----
02695>
02696> | ADD HYD (040) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02697> | (ha) (cms) (hrs) (mm) (cms)
02698> | ID1 01:010 2.07 .609 1.04 57.95 .000
02699> | +ID2 02:020 1.54 .475 1.04 60.59 .000
02700>

```

02701> SUM 04:040 3.61 1.084 1.04 59.08 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02706> 001:0008-----

02707> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02708> (ha) (cms) (hrs) (mm) (cms)
02710> ID1 03:030 1.40 .454 1.04 62.25 .000
02711> +ID2 04:040 3.61 1.084 1.04 59.08 .000
SUM 05:050 5.01 1.538 1.04 59.96 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02718> 001:0009-----

02720> \* SUB-AREA No.4

02722> | CALIB STANDHYD | Area (ha)= .89
02723> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00

02724> IMPERVIOUS PERVIOUS (i)
02726> Surface Area (ha)= .86 .03
02727> Dep. Storage (mm)= 1.57 4.67
02728> Average Slope (%)= .93 .70
02729> Length (m)= 164.82 40.00
02730> Mannings n = .030 .250
02731>
02732> Max.eff.Inten.(mm/hr)= 161.47 53.28
02733> over (min) 5.00 17.50
02734> Storage Coeff. (min)= 4.80 (ii) 17.24 (ii)
02735> Unit Hyd. Tpeak (min)= 5.00 17.50
02736> Unit Hyd. peak (cms)= .23 .07
02737> \*TOTALS\*
02738> PEAK FLOW (cms)= .33 .00 .335 (iii)
02739> TIME TO PEAK (hrs)= 1.00 1.25 1.000
02740> RUNOFF VOLUME (mm)= 63.24 30.21 62.245
02741> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02742> RUNOFF COEFFICIENT = .98 .47 .960

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

02751> 001:0010-----

02753> \* SUB-AREA No.5

02755> | CALIB STANDHYD | Area (ha)= 2.66
02756> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00

02757> IMPERVIOUS PERVIOUS (i)
02758> Surface Area (ha)= 2.58 .08
02759> Dep. Storage (mm)= 1.57 4.67
02760> Average Slope (%)= .61 1.50
02761> Length (m)= 207.25 20.00
02762> Mannings n = .030 .250
02763>
02764> Max.eff.Inten.(mm/hr)= 161.47 62.27
02765> over (min) 7.50 12.50
02766> Storage Coeff. (min)= 6.26 (ii) 12.39 (ii)
02767> Unit Hyd. Tpeak (min)= 7.50 12.50
02768> Unit Hyd. peak (cms)= .17 .09
02769> \*TOTALS\*
02770> PEAK FLOW (cms)= .88 .01 .886 (iii)
02771> TIME TO PEAK (hrs)= 1.04 1.17 1.042
02772> RUNOFF VOLUME (mm)= 63.24 30.21 62.245
02773> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02774> RUNOFF COEFFICIENT = .98 .47 .960

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

02784> 001:0011-----

02785> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02786> (ha) (cms) (hrs) (mm) (cms)
02787> ID1 06:060 .89 .335 1.00 62.25 .000
02788> +ID2 07:070 2.66 .866 1.04 62.25 .000
02789>
02790> SUM 08:080 3.55 1.197 1.04 62.25 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02795> 001:0012-----

02797> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02798> (ha) (cms) (hrs) (mm) (cms)
02800> ID1 05:050 5.01 1.538 1.04 59.96 .000
02801> +ID2 08:080 3.55 1.197 1.04 62.25 .000
02802>
02803> SUM 09:090 8.56 2.735 1.04 60.91 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02807> 001:0013-----

02810> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.

02811> | IN>09: (090 ) |
02812> | OUT<10: (POND ) |

Table with columns: STORAGE (ha.m.), OUTFLOW (cms), STORAGE (ha.m.), OUTFLOW (cms). Rows include values for 000, 008, 017, 023, 033, 037, 046, 053.

ROUTING RESULTS table with columns: AREA (ha), OPEAK (cms), TPEAK (hrs), R.V. (mm).

02829> PEAK FLOW REDUCTION [Qout/Qin] (%)= 8.503
02830> TIME SHIFT OF PEAK FLOW (min)= 54.17
02831> MAXIMUM STORAGE USED (ha.m.)=.3967E+00

02834> 001:0014-----

02836> \* Remaining Hawthorne Industrial Park \*
02837> \*\*\*\*\*
02838> \* SUB-AREA No.1

02840> | CALIB STANDHYD | Area (ha)= 19.90
02842> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

02843> IMPERVIOUS PERVIOUS (i)
02844> Surface Area (ha)= 14.12 5.77
02845> Dep. Storage (mm)= 1.57 4.67
02847> Average Slope (%)= .60 1.50
02848> Length (m)= 580.00 100.00
02849> Mannings n = .030 .250
02850>
02851> Max.eff.Inten.(mm/hr)= 138.95 102.13
02852> over (min) 12.50 25.00
02853> Storage Coeff. (min)= 12.38 (ii) 25.60 (ii)
02854> Unit Hyd. Tpeak (min)= 12.50 25.00
02855> Unit Hyd. peak (cms)= .09 .04
02856> \*TOTALS\*
02857> PEAK FLOW (cms)= 2.46 .95 3.001 (iii)
02858> TIME TO PEAK (hrs)= 1.13 1.38 1.167
02859> RUNOFF VOLUME (mm)= 63.24 39.90 51.566
02860> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02861> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

02871> 001:0015-----

02872> | ADD HYD (HIP02 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02873> (ha) (cms) (hrs) (mm) (cms)
02874> ID1 10:POND 8.56 .233 1.94 60.91 .000
02875> +ID2 01:HIP01 19.90 3.001 1.17 51.57 .000
02876>
02877> SUM 02:HIP02 28.46 3.092 1.17 54.37 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02882> 001:0016-----

02883> \* SUB-AREA No.2

02885> | CALIB STANDHYD | Area (ha)= 17.00
02887> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

02888> IMPERVIOUS PERVIOUS (i)
02889> Surface Area (ha)= 12.07 4.93
02891> Dep. Storage (mm)= 1.57 4.67
02892> Average Slope (%)= .65 1.50
02893> Length (m)= 450.00 100.00
02894> Mannings n = .030 .250
02895>
02896> Max.eff.Inten.(mm/hr)= 161.47 109.61
02897> over (min) 10.00 22.50
02898> Storage Coeff. (min)= 9.77 (ii) 22.63 (ii)
02899> Unit Hyd. Tpeak (min)= 10.00 22.50
02900> Unit Hyd. peak (cms)= .11 .05
02901> \*TOTALS\*
02902> PEAK FLOW (cms)= 2.38 .88 2.819 (iii)
02903> TIME TO PEAK (hrs)= 1.08 1.33 1.125
02904> RUNOFF VOLUME (mm)= 63.24 39.90 51.566
02905> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02906> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

02914> 001:0017-----

02916> \* SUB-AREA No.3

02918> | CALIB STANDHYD | Area (ha)= 18.10
02920> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

02921> IMPERVIOUS PERVIOUS (i)
02922> Surface Area (ha)= 12.85 5.25
02924> Dep. Storage (mm)= 1.57 4.67
02925> Average Slope (%)= .50 1.50
02926> Length (m)= 600.00 100.00
02927> Mannings n = .030 .250
02928>
02929> Max.eff.Inten.(mm/hr)= 138.95 96.02
02930> over (min) 12.50 27.50
02931> Storage Coeff. (min)= 13.34 (ii) 26.90 (ii)
02932> Unit Hyd. Tpeak (min)= 12.50 27.50
02933> Unit Hyd. peak (cms)= .09 .04
02934> \*TOTALS\*
02935> PEAK FLOW (cms)= 2.16 .83 2.596 (iii)
02936> TIME TO PEAK (hrs)= 1.13 1.42 1.167
02937> RUNOFF VOLUME (mm)= 63.24 39.90 51.566
02938> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02939> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

02947> 001:0018-----

02949> | ADD HYD (HIP05 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02950> (ha) (cms) (hrs) (mm) (cms)
02951> ID1 03:HIP03 17.00 2.819 1.13 51.57 .000
02952> +ID2 04:HIP04 18.10 2.596 1.17 51.57 .000
02953>
02954> SUM 05:HIP05 35.10 5.372 1.13 51.57 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02958> 001:0019-----

02962> \*SUB-AREA No.4

02964> | DESIGN NASHDY | Area (ha)= 4.00 Curve Number (CN)=85.00
02965> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
02966> U.H. Tp(hrs)= .170

02967> Unit Hyd Tpeak (cms)= .899
02968> PEAK FLOW (cms)= .551 (i)

02971> TIME TO PEAK (hrs)= 1.125  
02972> RUNOFF VOLUME (mm)= 34.455  
02973> TOTAL RAINFALL (mm)= 64.806  
02974> RUNOFF COEFFICIENT = .532  
02975>  
02976> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02977>  
02978>-----  
02979> 001:0020-----  
02980>  
02981> | ADD HYD (HIPO6 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02982> | (ha) (cms) (hrs) (mm) (cms)  
02983> | ID1 02:HIPO2 28.46 3.092 1.17 54.37 .000  
02984> | +ID2 05:HIPO5 35.10 5.372 1.13 51.57 .000  
02985> | +ID3 06:Pond-B 4.00 .551 1.13 34.45 .000  
02986>-----  
02987> | SUM 07:HIPO6 67.56 8.958 1.13 51.73 .000  
02988>  
02989> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02990>  
02991>-----  
02992> 001:0021-----  
02993> \* SUB-AREA NO. 5  
02994>  
02995> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00  
02996> | 10:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02997> | U.H. Tp(hrs)= .370  
02998>  
02999> Unit Hyd Qpeak (cms)= .702  
03000>  
03001> PEAK FLOW (cms)= .417 (i)  
03002> TIME TO PEAK (hrs)= 1.417  
03003> RUNOFF VOLUME (mm)= 25.767  
03004> TOTAL RAINFALL (mm)= 64.806  
03005> RUNOFF COEFFICIENT = .398  
03006>  
03007> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03008>  
03009>-----  
03010> 001:0022-----  
03011> \* SUB-AREA NO 4  
03012>  
03013> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00  
03014> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
03015> | U.H. Tp(hrs)= .804  
03016>  
03017> Unit Hyd Qpeak (cms)= .252  
03018>  
03019> PEAK FLOW (cms)= .188 (i)  
03020> TIME TO PEAK (hrs)= 2.000  
03021> RUNOFF VOLUME (mm)= 25.767  
03022> TOTAL RAINFALL (mm)= 64.806  
03023> RUNOFF COEFFICIENT = .398  
03024>  
03025> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03026>  
03027>-----  
03028> 001:0023-----  
03029>  
03030> | ADD HYD (0020 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03031> | (ha) (cms) (hrs) (mm) (cms)  
03032> | ID1 07:HIPO6 67.56 8.958 1.13 51.73 .000  
03033> | +ID2 10:A2 6.80 .417 1.42 25.77 .000  
03034> | +ID3 01:A3 5.30 .198 2.00 25.77 .000  
03035>-----  
03036> | SUM 02:0020 79.66 9.240 1.17 47.79 .000  
03037>  
03038> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03039>  
03040>-----  
03041> 001:0024-----  
03042> \*\*\*\*\*  
03043> \* CALCULATION OF 3HR = 1:100 YEAR STORM EVENT \*  
03044> \*\*\*\*\*  
03045>  
03046> | START | Project dir.: V:\20983.DU\ENG\3RDSUB-1\SWHMYMO  
03047> | Rainfall dir.: V:\20983.DU\ENG\3RDSUB-1\SWHMYMO  
03048> | TZERO = .00 hrs on 0  
03049> | METOUT= 2 (output = METRIC)  
03050> | NRUN = 001  
03051> | NSTORM= 0  
03052>  
03053> 001:0002-----  
03054>  
03055> | CHICAGO STORM | IDF curve parameters: A=1735.688  
03056> | Ptotal= 71.66 mm | B= 6.014  
03057> | C= .820  
03058> used in: INTENSITY = A / (t + B)<sup>C</sup>  
03059>  
03060> Duration of storm = 3.00 hrs  
03061> Storm time step = 10.00 min  
03062> Time to peak ratio = .33  
03063>  
03064> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
03065> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
03066> .17 6.046 | 1.00 178.559 | 1.83 11.059 | 2.67 5.760  
03067> .33 7.542 | 1.17 54.049 | 2.00 9.285 | 2.83 5.280  
03068> .50 10.159 | 1.33 27.319 | 2.17 8.024 | 3.00 4.879  
03069> .67 15.969 | 1.50 18.240 | 2.33 7.080 |  
03070> .83 40.655 | 1.67 13.737 | 2.50 6.347 |  
03071>  
03072>-----  
03073> 001:0003-----  
03074>  
03075> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\3RDSUB-1\SWHMYMO\ORGA.VAL  
03076> | ICASEdv = 1 (read and print data)  
03077> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ----  
03078> | Horton's infiltration equation parameters:  
03079> | [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]  
03080> | Parameters for PERVIOUS surfaces in STANDHYD:  
03081> | [Iaper= 4.67 mm] [LGP=40.00 m] [MNP= .250]  
03082> | Parameters for IMPERVIOUS surfaces in STANDHYD:  
03083> | [Iimp= 1.57 mm] [CIR= 1.50] [MNI= .035]  
03084> | Parameters used in NASHYD:  
03085> | [Ia= 4.67 mm] [N= 3.00]  
03086>  
03087>-----  
03088> 001:0004-----  
03089> \*\*\*\*\*  
03090> \* ORGAWORLD FILE \*  
03091> \*\*\*\*\*  
03092> \* SUB-AREA No.1  
03093>  
03094> | CALIB STANDHYD | Area (ha)= 2.07  
03095> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00  
03096>  
03097>  
03098> IMPERVIOUS PERVIOUS (i)  
03099> Surface Area (ha)= 1.74 .33  
03100> Dep. Storage (mm)= 1.57 4.67  
03101> Average Slope (%)= 1.52 1.00  
03102> Length (m)= 204.72 20.00  
03103> Mannings n = .030 .250  
03104>  
03105> Max. eff. Inten. (mm/hr)= 178.56 74.05  
over (min) 7.50 12.50

03106> Storage Coeff. (min)= 6.26 (ii) 12.72 (ii)  
03107> Unit Hyd. Tpeak (min)= 7.50 12.50  
03108> Unit Hyd. peak (cms)= .17 .09  
03109>  
03110> PEAK FLOW (cms)= .66 .04 \*TOTALS\*  
03111> TIME TO PEAK (hrs)= 1.04 1.17 1.042 (iii)  
03112> RUNOFF VOLUME (mm)= 70.09 35.46 64.553  
03113> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03114> RUNOFF COEFFICIENT = .98 .49 .901  
03115>  
03116> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03117> CN\* = 81.0 Ia = Dep. Storage (Above)  
03118> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03119> THAN THE STORAGE COEFFICIENT.  
03120> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03121>  
03122>-----  
03123> 001:0005-----  
03124>  
03125> \* SUB-AREA No.2  
03126>  
03127> | CALIB STANDHYD | Area (ha)= 1.54  
03128> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00  
03129>  
03130> IMPERVIOUS PERVIOUS (i)  
03131> Surface Area (ha)= 1.42 .12  
03132> Dep. Storage (mm)= 1.57 4.67  
03133> Average Slope (%)= .50 1.00  
03134> Length (m)= 244.34 5.00  
03135> Mannings n = .030 .030  
03136>  
03137> Max. eff. Inten. (mm/hr)= 178.56 93.23  
03138> over (min) 7.50 7.50  
03139> Storage Coeff. (min)= 7.04 (ii) 7.76 (ii)  
03140> Unit Hyd. Tpeak (min)= 7.50 7.50  
03141> Unit Hyd. peak (cms)= .16 .15  
03142>  
03143> PEAK FLOW (cms)= .51 .02 \*TOTALS\*  
03144> TIME TO PEAK (hrs)= 1.04 1.08 .534 (iii)  
03145> RUNOFF VOLUME (mm)= 70.09 35.46 67.324  
03146> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03147> RUNOFF COEFFICIENT = .98 .49 .939  
03148>  
03149> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03150> CN\* = 81.0 Ia = Dep. Storage (Above)  
03151> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03152> THAN THE STORAGE COEFFICIENT.  
03153> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03154>  
03155>-----  
03156> 001:0006-----  
03157>  
03158> \* SUB-AREA No.3  
03159>  
03160> | CALIB STANDHYD | Area (ha)= 1.40  
03161> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
03162>  
03163> IMPERVIOUS PERVIOUS (i)  
03164> Surface Area (ha)= 1.36 .04  
03165> Dep. Storage (mm)= 1.57 4.67  
03166> Average Slope (%)= .51 1.00  
03167> Length (m)= 225.63 5.00  
03168> Mannings n = .030 .030  
03169>  
03170> Max. eff. Inten. (mm/hr)= 178.56 93.23  
03171> over (min) 7.50 7.50  
03172> Storage Coeff. (min)= 6.67 (ii) 7.39 (ii)  
03173> Unit Hyd. Tpeak (min)= 7.50 7.50  
03174> Unit Hyd. peak (cms)= .16 .15  
03175>  
03176> PEAK FLOW (cms)= .50 .01 \*TOTALS\*  
03177> TIME TO PEAK (hrs)= 1.04 1.08 .509 (iii)  
03178> RUNOFF VOLUME (mm)= 70.09 35.46 69.056  
03179> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03180> RUNOFF COEFFICIENT = .98 .49 .964  
03181>  
03182> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03183> CN\* = 81.0 Ia = Dep. Storage (Above)  
03184> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03185> THAN THE STORAGE COEFFICIENT.  
03186> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03187>  
03188>-----  
03189> 001:0007-----  
03190>  
03191> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03192> | (ha) (cms) (hrs) (mm) (cms)  
03193> | ID1 01:010 2.07 .685 1.04 64.55 .000  
03194> | +ID2 02:020 1.54 .534 1.04 67.32 .000  
03195>-----  
03196> | SUM 04:040 3.61 1.220 1.04 65.74 .000  
03197>  
03198> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03199>  
03200>-----  
03201> 001:0008-----  
03202>  
03203> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03204> | (ha) (cms) (hrs) (mm) (cms)  
03205> | ID1 03:030 1.40 .509 1.04 69.06 .000  
03206> | +ID2 04:040 3.61 1.220 1.04 65.74 .000  
03207>-----  
03208> | SUM 05:050 5.01 1.729 1.04 66.66 .000  
03209>  
03210> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03211>  
03212>-----  
03213> 001:0009-----  
03214>  
03215> \* SUB-AREA No.4  
03216>  
03217> | CALIB STANDHYD | Area (ha)= .89  
03218> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
03219>  
03220> IMPERVIOUS PERVIOUS (i)  
03221> Surface Area (ha)= .86 .03  
03222> Dep. Storage (mm)= 1.57 4.67  
03223> Average Slope (%)= .93 .70  
03224> Length (m)= 164.82 40.00  
03225> Mannings n = .030 .250  
03226>  
03227> Max. eff. Inten. (mm/hr)= 178.56 67.61  
03228> over (min) 5.00 15.00  
03229> Storage Coeff. (min)= 4.62 (ii) 15.92 (ii)  
03230> Unit Hyd. Tpeak (min)= 5.00 15.00  
03231> Unit Hyd. peak (cms)= .24 .07  
03232>  
03233> PEAK FLOW (cms)= .37 .00 \*TOTALS\*  
03234> TIME TO PEAK (hrs)= 1.00 1.21 .374 (iii)  
03235> RUNOFF VOLUME (mm)= 70.09 35.46 69.056  
03236> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03237> RUNOFF COEFFICIENT = .98 .49 .964  
03238>  
03239> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03240> CN\* = 81.0 Ia = Dep. Storage (Above)

```

03511>
03512> Unit Hyd Opeak (cms) = .252
03513>
03514> PEAK FLOW (cms) = .223 (i)
03515> TIME TO PEAK (hrs) = 1.958
03516> RUNOFF VOLUME (mm) = 30.490
03517> TOTAL RAINFALL (mm) = 71.665
03518> RUNOFF COEFFICIENT = .425
03519>
03520> (i.) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03521>
03522>
-----
03523> 001:0023
03524>
03525> | ADD HYD (0020 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
03526> | (ha) (cms) (hrs) (mm) (cms)
03527> | ID1 07:H1P06 67.56 10.299 1.13 58.18 .000
03528> | +ID2 10:A2 6.80 .497 1.42 30.49 .000
03529> | +ID3 01:A3 5.30 .223 1.96 30.49 .000
03530> |-----|
03531> | SUM 02:0020 79.66 10.662 1.17 53.97 .000
03532>
03533> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03534>
03535>
-----
03536> 001:0024
03537> FINISH
03538>
03539> *****
03540> WARNINGS / ERRORS / NOTES
03541>
03542> Simulation ended on 2009-04-21 at 10:30:17
03543>
03544>
03545>

```

```

00001> 2 Metric units
00002> *****
00003> # Project Name : Hawthorne Industrial Park Project Number: [20983] *
00004> # Date : January, 2009
00005> # Revisd : WA
00006> # Developed by : Mark Buchanan, E.I.T.
00007> # Reviewed by : Guy Forget, P.Eng.
00008> # Company : J.L. Richards & Associates Limited
00009> # License # : 4418403
00010> *****
00011> *
00012> *
00013> *****
00014> # FILENAME: V:\20983.DU\ENG\SWM\HYMO\20983PST.DAT
00015> # FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00016> # OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00017> *****
00018> *
00019> *****
00020> # SWM HYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE
00021> # PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00022> *****
00023> *
00024> *****
00025> # HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00026> # FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00027> *****
00028> *
00029> *****
00030> # POST-DEVELOPMENT UNCONTROLLED CONDITIONS
00031> *****
00032> *
00033> *****
00034> # CALCULATION OF 4 HR 25 MM STORM EVENT
00035> *****
00036> *
00037> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00038> # [ ] <- storm filename, one per line for NSTORM time
00039> # READ STORM STORM_FILENAME=[\"4HR25-15.STM\"]
00040> *****
00041> # DEFAULT VALUES ICASEDEF=[1], read and print values
00042> # DEFVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\\"ORGA.VAL\"]
00043> *****
00044> *
00045> *****
00046> # ORGAWORLD FILE *
00047> *****
00048> *
00049> *****
00050> # SUB-AREA No.1
00051> CALIB STANDHYD ID=[ 1 ], NHYD=[\"010\"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00052> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00053> SCS curve number CN=[81],
00054> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00055> LGP=[20] (m), MNP=[0.25], SCP=[0.0] (min)
00056> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00057> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00058> RAINFALL=[ , , , ] (mm/hr), END=-1
00059> *****
00060> #
00061> # SUB-AREA No.2
00062> *****
00063> CALIB STANDHYD ID=[ 2 ], NHYD=[\"020\"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00064> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00065> SCS curve number CN=[81],
00066> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00067> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00068> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00069> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00070> RAINFALL=[ , , , ] (mm/hr), END=-1
00071> *****
00072> #
00073> # SUB-AREA No.3
00074> *****
00075> CALIB STANDHYD ID=[ 3 ], NHYD=[\"030\"], DT=[2.5] (min), AREA=[1.4] (ha),
00076> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00077> SCS curve number CN=[81],
00078> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00079> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00080> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00081> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
00082> RAINFALL=[ , , , ] (mm/hr), END=-1
00083> *****
00084> ADD HYD IDsum=[4], NHYD=[\"040\"], IDs to add=[1+2]
00085> *****
00086> ADD HYD IDsum=[5], NHYD=[\"050\"], IDs to add=[3+4]
00087> *****
00088> #
00089> # SUB-AREA No.4
00090> *****
00091> CALIB STANDHYD ID=[6], NHYD=[\"060\"], DT=[2.5] (min), AREA=[0.89] (ha),
00092> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00093> SCS curve number CN=[81],
00094> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00095> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00096> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
00097> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00098> RAINFALL=[ , , , ] (mm/hr), END=-1
00099> *****
00100> #
00101> # SUB-AREA No.5
00102> *****
00103> CALIB STANDHYD ID=[ 7 ], NHYD=[\"070\"], DT=[2.5] (min), AREA=[2.66] (ha),
00104> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00105> SCS curve number CN=[81],
00106> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00107> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min)
00108> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00109> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00110> RAINFALL=[ , , , ] (mm/hr), END=-1
00111> *****
00112> ADD HYD IDsum=[8], NHYD=[\"080\"], IDs to add=[6+7]
00113> *****
00114> ADD HYD IDsum=[9], NHYD=[\"090\"], IDs to add=[5+8]
00115> *****
00116> #
00117> ROUTE RESERVOIR IDout=[10], NHYD=[\"POND\"], IDin=[9],
00118> RDT=[1.0] (min),
00119> *****
00120> # TABLE of ( OUTFLOW-STORAGE ) values
00121> # (cms) (ha-m)
00122> [ 0.000, 0.0000 ]
00123> [ 0.008, 0.0656 ]
00124> [ 0.017, 0.1311 ]
00125> [ 0.093, 0.2831 ]
00126> [ 0.233, 0.3971 ]
00127> [ 0.337, 0.4731 ]
00128> [ 0.465, 0.5491 ]
00129> [ 0.531, 0.5871 ]
00130> [ 0.593, 0.6251 ]
00131> [ 0.654, 0.6631 ]
00132> [ 0.797, 0.7991 ]
00133> [ 0.950, 0.8274 ]
00134> [ 1.304, 0.9157 ]
00135> [ 1.880, 1.0040 ]
00136> [ 2.577, 1.0923 ]

```

```

00136> [ -1, -1 ] (max twenty pts)
00137> *****
00138> *****
00139> # Remaining Hawthorne Industrial Park *
00140> *****
00141> *
00142> # SUB-AREA No.1
00143> *****
00144> CALIB STANDHYD ID=[ 1 ], NHYD=[\"HIP01\"], DT=[2.5] (min), AREA=[19.9] (ha),
00145> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00146> SCS curve number CN=[81],
00147> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00148> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00149> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00150> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00151> RAINFALL=[ , , , ] (mm/hr), END=-1
00152> *****
00153> ADD HYD IDsum=[ 2 ], NHYD=[\"HIP02\"], IDs to add=[10+1]
00154> *****
00155> #
00156> # SUB-AREA No.2
00157> *****
00158> CALIB STANDHYD ID=[ 3 ], NHYD=[\"HIP03\"], DT=[2.5] (min), AREA=[17] (ha),
00159> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00160> SCS curve number CN=[81],
00161> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00162> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00163> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.65] (%),
00164> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00165> RAINFALL=[ , , , ] (mm/hr), END=-1
00166> *****
00167> #
00168> # SUB-AREA No.3
00169> *****
00170> CALIB STANDHYD ID=[ 4 ], NHYD=[\"HIP04\"], DT=[2.5] (min), AREA=[15.6] (ha),
00171> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00172> SCS curve number CN=[81],
00173> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00174> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00175> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00176> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00177> RAINFALL=[ , , , ] (mm/hr), END=-1
00178> *****
00179> ADD HYD IDsum=[ 5 ], NHYD=[\"HIP05\"], IDs to add=[3+4]
00180> *****
00181> ADD HYD IDsum=[ 6 ], NHYD=[\"HIP06\"], IDs to add=[5+2]
00182> *****
00183> #
00184> # SUB-AREA No.4
00185> *****
00186> CALIB STANDHYD ID=[ 7 ], NHYD=[\"HIP07\"], DT=[2.5] (min), AREA=[12.2] (ha),
00187> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00188> SCS curve number CN=[81],
00189> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00190> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min)
00191> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
00192> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00193> RAINFALL=[ , , , ] (mm/hr), END=-1
00194> *****
00195> #
00196> # SUB-AREA No.5
00197> *****
00198> *****
00199> DESIGN NASHYD ID=[ 8 ], NHYD=[\"Pond-Block\"], DT=[2.5] min, AREA=[4.0] (ha),
00200> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00201> RAINFALL=[ , , , ] (mm/hr), END=-1
00202> *****
00203> #
00204> *****
00205> ADD HYD IDsum=[ 9 ], NHYD=[\"HIP08\"], IDs to add=[6+7+8]
00206> *****
00207> #
00208> # SUB-AREA No. 6
00209> *****
00210> DESIGN NASHYD ID = [1], NHYD=[\"A3\"], DT=[2.5] min, AREA=[2.7] (ha),
00211> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
00212> RAINFALL=[ , , , ] (mm/hr), END=-1
00213> *****
00214> *****
00215> ADD HYD IDsum=[2], NHYD=[\"Ultimate\"], IDs to add=[9+1]
00216> *****
00217> #
00218> *****
00219> *****
00220> # CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00221> *****
00222> *****
00223> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00224> # [ ] <- storm filename, one per line for NSTORM time
00225> *****
00226> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TFRAT=[0.333], CSDT=[10.0] (min)
00227> ICASECS=[1],
00228> A=[732.951], B=[6.199], and C=[0.810],
00229> *****
00230> # DEFAULT VALUES ICASEDEF=[1], read and print values
00231> # DEFVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\\"ORGA.VAL\"]
00232> *****
00233> *****
00234> *****
00235> # ORGAWORLD FILE *
00236> *****
00237> *****
00238> # SUB-AREA No.1
00239> *****
00240> CALIB STANDHYD ID=[ 1 ], NHYD=[\"010\"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00241> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00242> SCS curve number CN=[81],
00243> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00244> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (min)
00245> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00246> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00247> RAINFALL=[ , , , ] (mm/hr), END=-1
00248> *****
00249> #
00250> # SUB-AREA No.2
00251> *****
00252> CALIB STANDHYD ID=[ 2 ], NHYD=[\"020\"], DT=[2.5] (min), AREA=[1.54] (ha),
00253> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00254> SCS curve number CN=[81],
00255> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00256> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00257> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00258> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00259> RAINFALL=[ , , , ] (mm/hr), END=-1
00260> *****
00261> #
00262> # SUB-AREA No.3
00263> *****
00264> CALIB STANDHYD ID=[ 3 ], NHYD=[\"030\"], DT=[2.5] (min), AREA=[1.4] (ha),
00265> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00266> SCS curve number CN=[81],
00267> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00268> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00269> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[ 0.51 ] (%),
00270> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]

```

```

00271> RAINFALL=[ , , , ](mm/hr) , END=-1
00272> *%-----
00273> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00274> *%-----
00275> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00276> *%-----
00277> *
00278> * SUB-AREA No.4
00279>
00280> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.93](%),
LGI=[164.82](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00288> *%-----
00289> *
00290> * SUB-AREA No.5
00291>
00292> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[207.25](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00299> *%-----
00300> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00302> *%-----
00303> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00304> *%-----
00305>
00306> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RDT=[1.0](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
[ 0.000, 0.0000]
[ 0.008, 0.0656]
[ 0.017, 0.1311]
[ 0.093, 0.2831]
[ 0.233, 0.3971]
[ 0.337, 0.4731]
[ 0.465, 0.5491]
[ 0.531, 0.5871]
[ 0.593, 0.6251]
[ 0.654, 0.6631]
[ 0.797, 0.7391]
[ 0.950, 0.8274]
[ 1.304, 0.9157]
[ 1.880, 1.0040]
[ 2.577, 1.0923]
[ -1, -1 ] (max twenty pts)
00327> *****
00328> * Remaining Hawthorne Industrial Park *
00329> *****
00330> *
00331> * SUB-AREA No.1
00332>
00333> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[580](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00341> *%-----
00342> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00343> *%-----
00344> *
00345> * SUB-AREA No.2
00346>
00347> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[600](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00354> *%-----
00355> *
00356> * SUB-AREA No.3
00357>
00358>
00359> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[600](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00367> *%-----
00368> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00369> *%-----
00370> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00371> *%-----
00372> *
00373> * SUB-AREA No.4
00374>
00375> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[210](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00383> *%-----
00384> *
00385> * SUB-AREA No.5
00386>
00387>
00388> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
00392> *%-----
00393>
00394> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00395> *%-----
00396> *
00397> * SUB-AREA No. 6
00398> *
00399> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
DWF=[0](cms), CN=[76], TP=[0.80]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
04002> *%-----
04003>
04004> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
04005> *%-----

```

```

00406> *****
00407> *****
00408> * CALCULATION OF 3HR - 1.5 YEAR STORM EVENT *
00409> *****
00410>
00411> START TZERO=[0.0], MFTOUT=[2], NSTORM=[0], NRUN=[0]
00412> *%-----
00413> * [ ] <-storm filename, one per line for NSTORM time
00414> CHICAGO STORM IUNITS=[2], TD=[3.0](hrs), TPRAT=[0.333], CSDT=[10.0](min)
00415> ICASECS=[1],
A=[596.071], B=[6.053], and C=[0.814],
00417> *%-----
00418> DEFAULT VALUES ICASDef=[1], read and print values
00419> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\ORGA.VAL"]
00420> *%-----
00421> *****
00422> *****
00423> * ORGAWORLD FILE *
00424> *****
00425>
00426> * SUB-AREA No.1
00427>
00428> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.0](%),
LGP=[20](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.52](%),
LGI=[204.72](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00437> *
00438> * SUB-AREA No.2
00439>
00440> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.50](%),
LGI=[244.34](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00449> *
00450> * SUB-AREA No.3
00451>
00452> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.41](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.51](%),
LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00459> *%-----
00460> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00462> *%-----
00463> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00464> *%-----
00465> *
00466> * SUB-AREA No.4
00467>
00468> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[0.7](%),
LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.93](%),
LGI=[164.82](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00477> *
00478> * SUB-AREA No.5
00479>
00480> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[207.25](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00488> *%-----
00489> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00491> *%-----
00492> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00493>
00494> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RDT=[1.0](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
[ 0.000, 0.0000]
[ 0.008, 0.0656]
[ 0.017, 0.1311]
[ 0.093, 0.2831]
[ 0.233, 0.3971]
[ 0.337, 0.4731]
[ 0.465, 0.5491]
[ 0.531, 0.5871]
[ 0.593, 0.6251]
[ 0.654, 0.6631]
[ 0.797, 0.7391]
[ 0.950, 0.8274]
[ 1.304, 0.9157]
[ 1.880, 1.0040]
[ 2.577, 1.0923]
[ -1, -1 ] (max twenty pts)
00515> *****
00516> * Remaining Hawthorne Industrial Park *
00517> *****
00518> *
00519> * SUB-AREA No.1
00520>
00521> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[580](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00529> *%-----
00530> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00531> *%-----
00532> *
00533> * SUB-AREA No.2
00534>
00535> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPF=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLPF=[0.61](%),
LGI=[600](m), MNI=[0.03], SCI=[0.0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
00539> *%-----
00540>

```



```

00541> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00542> RAINFALL=[ , , , ] (mm/hr), END=-1
00543> *%-----
00544> * SUB-AREA No.3
00545>
00546>
00547> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
00548> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00549> SCS curve number CN=[81],
00550> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00551> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00552> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00553> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00554> RAINFALL=[ , , , ] (mm/hr), END=-1
00555> *%-----
00556> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00557> *%-----
00558> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00559> *%-----
00560> *
00561> * SUB-AREA No.4
00562>
00563> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
00564> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00565> SCS curve number CN=[81],
00566> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00567> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00568> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
00569> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00570> RAINFALL=[ , , , ] (mm/hr), END=-1
00571> *%-----
00572> *%-----
00573> *
00574> * SUB-AREA No.5
00575>
00576> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00577> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00578> RAINFALL=[ , , , ] (mm/hr), END=-1
00579> *%-----
00580> *
00581>
00582> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00583> *%-----
00584> *
00585> * SUB-AREA No. 6
00586> *
00587> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[2.7] (ha),
00588> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
00589> RAINFALL=[ , , , ] (mm/hr), END=-1
00590> *%-----
00591> *
00592> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
00593> *%-----
00594> *
00595> *****
00596> * CALCULATION OF 3HR - 1:10 YEAR STORM EVENT *
00597> *****
00598>
00599> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00600> *%-----
00601> * [ ] <- storm filename, one per line for NSTORM time
00602> CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00603> ICASDef=[1],
00604> A=[1174.184], B=[6.014], and C=[0.816],
00605> *%-----
00606> DEFAULT VALUES ICASDef=[1], read and print values
00607> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWHYMO\ORGA.VAL]
00608> *%-----
00609> *
00610> *****
00611> * ORGAWORLD FILE *
00612> *****
00613> *
00614> * SUB-AREA No.1
00615>
00616> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00617> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00618> SCS curve number CN=[81],
00619> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00620> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00621> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00622> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0] (min)
00623> RAINFALL=[ , , , ] (mm/hr), END=-1
00624> *%-----
00625> *
00626> * SUB-AREA No.2
00627>
00628> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00629> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00630> SCS curve number CN=[81],
00631> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00632> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00633> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00634> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0] (min)
00635> RAINFALL=[ , , , ] (mm/hr), END=-1
00636> *%-----
00637> *
00638> * SUB-AREA No.3
00639>
00640> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00641> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00642> SCS curve number CN=[81],
00643> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00644> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00645> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00646> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0] (min)
00647> RAINFALL=[ , , , ] (mm/hr), END=-1
00648> *%-----
00649> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00650> *%-----
00651> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00652> *%-----
00653> *
00654> * SUB-AREA No.4
00655>
00656> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00657> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00658> SCS curve number CN=[81],
00659> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00660> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00661> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
00662> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
00663> RAINFALL=[ , , , ] (mm/hr), END=-1
00664> *%-----
00665> *
00666> * SUB-AREA No.5
00667>
00668> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00669> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00670> SCS curve number CN=[81],
00671> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00672> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
00673> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00674> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
00675> RAINFALL=[ , , , ] (mm/hr), END=-1

```

```

00676> *%-----
00677> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00678> *%-----
00679> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00680> *%-----
00681>
00682> ROUTE RESERVOIR Idout=[10], NHYD=["POND"], Idin=[9],
00683> RDT=[1.0] (min),
00684>
00685> TABLE of ( OUTFLOW-STORAGE ) values
00686> ( cms ) ( ha-m )
00687> [ 0.00, 0.0000 ]
00688> [ 0.008, 0.0656 ]
00689> [ 0.017, 0.1311 ]
00690> [ 0.092, 0.2831 ]
00691> [ 0.233, 0.3971 ]
00692> [ 0.337, 0.4731 ]
00693> [ 0.465, 0.5491 ]
00694> [ 0.531, 0.5871 ]
00695> [ 0.593, 0.6251 ]
00696> [ 0.654, 0.6631 ]
00697> [ 0.717, 0.7391 ]
00698> [ 0.950, 0.8274 ]
00699> [ 1.304, 0.9157 ]
00700> [ 1.880, 1.0040 ]
00701> [ 2.577, 1.0923 ]
00702> [ -1, -1 ] (max twenty pts)
00703> *****
00704> * Remaining Hawthorne Industrial Park *
00705> *****
00706> *
00707> * SUB-AREA No.1
00708>
00709> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00710> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00711> SCS curve number CN=[81],
00712> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00713> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00714> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00715> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00716> RAINFALL=[ , , , ] (mm/hr), END=-1
00717> *%-----
00718> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00719> *%-----
00720> *
00721> * SUB-AREA No.2
00722>
00723> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00724> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00725> SCS curve number CN=[81],
00726> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00727> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00728> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00729> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00730> RAINFALL=[ , , , ] (mm/hr), END=-1
00731> *%-----
00732> *
00733> * SUB-AREA No.3
00734>
00735> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
00736> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00737> SCS curve number CN=[81],
00738> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00739> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00740> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00741> LGI=[500] (m), MNI=[0.03], SCI=[0.0] (min)
00742> RAINFALL=[ , , , ] (mm/hr), END=-1
00743> *%-----
00744> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00745> *%-----
00746> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00747> *%-----
00748> *
00749> * SUB-AREA No.4
00750>
00751> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
00752> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00753> SCS curve number CN=[81],
00754> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00755> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00756> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
00757> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00758> RAINFALL=[ , , , ] (mm/hr), END=-1
00759> *%-----
00760> *
00761> * SUB-AREA No.5
00762>
00763> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00764> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00765> RAINFALL=[ , , , ] (mm/hr), END=-1
00766> *%-----
00767> *
00768>
00769> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00770> *%-----
00771> *
00772> * SUB-AREA No. 6
00773>
00774> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[2.7] (ha),
00775> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
00776> RAINFALL=[ , , , ] (mm/hr), END=-1
00777> *%-----
00778> *
00779>
00780> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
00781> *%-----
00782>
00783> *****
00784> * CALCULATION OF 3HR - 1:25 YEAR STORM EVENT *
00785> *****
00786>
00787> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00788> *%-----
00789> * [ ] <- storm filename, one per line for NSTORM time
00790> CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00791> ICASDef=[1],
00792> A=[1402.884], B=[6.018], and C=[0.819],
00793> *%-----
00794> DEFAULT VALUES ICASDef=[1], read and print values
00795> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWHYMO\ORGA.VAL]
00796> *%-----
00797> *
00798> *****
00799> * ORGAWORLD FILE *
00800> *****
00801> *
00802> * SUB-AREA No.1
00803>
00804> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00805> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00806> SCS curve number CN=[81],
00807> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00808> LGP=[20] (m), MNP=[0.25], SCP=[0.0] (m)
00809> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00810> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0] (min)

```

```

00811> RAINFALL=[ , , , ](mm/hr) , END=-1
00812> *
00813>
00814> * SUB-AREA No.2
00815>
00816> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=(2.5)(min), AREA=[ 1.54 ](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.51](%),
LGI=[244.34](m), MNI=[0.03], SCI=[0.0]
00822> RAINFALL=[ , , , ](mm/hr) , END=-1
00823> *
00824>
00825> *
00826> * SUB-AREA No.3
00827>
00828> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=(2.5)(min), AREA=[1.4](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.51](%),
LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0]
00834> RAINFALL=[ , , , ](mm/hr) , END=-1
00835> *
00836> *
00837> ADD HYD IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
00838> *
00839> ADD HYD IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
00840> *
00841>
00842> * SUB-AREA No.4
00843>
00844> CALIB STANDHYD ID=[5], NHYD=["060"], DT=(2.5)(min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[0.7](%),
LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.93](%),
LGI=[164.82](m), MNI=[0.03], SCI=[0.0]
00851> RAINFALL=[ , , , ](mm/hr) , END=-1
00852> *
00853> *
00854> * SUB-AREA No.5
00855>
00856> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=(2.5)(min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.61](%),
LGI=[207.25](m), MNI=[0.03], SCI=[0.0]
00862> RAINFALL=[ , , , ](mm/hr) , END=-1
00863> *
00864>
00865> ADD HYD IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
00866> *
00867> ADD HYD IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
00868> *
00869>
00870> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RDT=[1.0](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
00873> [ 0.000, 0.0000]
00874> [ 0.008, 0.0656]
00875> [ 0.017, 0.1311]
00876> [ 0.093, 0.2831]
00877> [ 0.233, 0.3971]
00878> [ 0.337, 0.4731]
00879> [ 0.465, 0.5491]
00880> [ 0.531, 0.5871]
00881> [ 0.593, 0.6251]
00882> [ 0.654, 0.6631]
00883> [ 0.797, 0.7391]
00884> [ 0.950, 0.8274]
00885> [ 1.304, 0.9157]
00886> [ 1.880, 1.0040]
00887> [ 2.577, 1.0923]
00888> [ -1, -1 ] (max twenty pts)
00889>
00890>
00891> *****
00892> * Remaining Hawthorne Industrial Park *
00893> *****
00894>
00895> * SUB-AREA No.1
00896>
00897> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=(2.5)(min), AREA=[19.9](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.6](%),
LGI=[580](m), MNI=[0.03], SCI=[0.0](min)
00904> RAINFALL=[ , , , ](mm/hr) , END=-1
00905> *
00906> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00907> *
00908> *
00909> * SUB-AREA No.2
00910>
00911> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=(2.5)(min), AREA=[17](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.61](%),
LGI=[450](m), MNI=[0.03], SCI=[0.0](min)
00917> RAINFALL=[ , , , ](mm/hr) , END=-1
00918> *
00919>
00920> *
00921> * SUB-AREA No.3
00922>
00923> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=(2.5)(min), AREA=[15.6](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.5](%),
LGI=[600](m), MNI=[0.03], SCI=[0.0](min)
00929> RAINFALL=[ , , , ](mm/hr) , END=-1
00930> *
00931> *
00932> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00933> *
00934> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00935> *
00936> *
00937> * SUB-AREA No.4
00938>
00939> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=(2.5)(min), AREA=[12.2](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.7](%),
LGI=[210](m), MNI=[0.03], SCI=[0.0](min)

```

```

00946> RAINFALL=[ , , , ](mm/hr) , END=-1
00947>
00948> *
00949>
00950> * SUB-AREA No.5
00951>
00952> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
00954> *
00955>
00956> *
00957>
00958> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00959> *
00960>
00961> * SUB-AREA No. 6
00962> *
00963> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
00966> *
00967>
00968> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
00969> *
00970>
00971> *****
00972> * CALCULATION OF 3HR - 1:50 YEAR STORM EVENT *
00973> *****
00974>
00975> START TZERO=[0.0], MROUT=[2], NSTORM=[0], NRUN=[0]
00976> [ ] <-- storm filename, one per line for NSTORM time
00977> *
00978> CHICAGO STORM IUNITS=[2], TD=[3.0](hrs), TPRAT=[0.333], CSDT=[10.0](min)
00979> ICASEC=[1],
A=[1569.580], B=[6.014], and C=[0.820],
00981> *
00982> DEFAULT VALUES ICASEDef=[1], read and print values
00983> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWM\HYMO\ORGA.VAL"]
00984> *
00985>
00986> *****
00987> * ORGAWORLD FILE *
00988> *****
00989>
00990> * SUB-AREA No.1
00991>
00992> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%),
LGP=[20](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.52](%),
LGI=[204.72](m), MNI=[0.03], SCI=[0.0]
00999> RAINFALL=[ , , , ](mm/hr) , END=-1
01001> *
01002> * SUB-AREA No.2
01003>
01004> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.50](%),
LGI=[244.34](m), MNI=[0.03], SCI=[0.0]
01011> RAINFALL=[ , , , ](mm/hr) , END=-1
01012> *
01013> *
01014> * SUB-AREA No.3
01015>
01016> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%),
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.51](%),
LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0]
01022> RAINFALL=[ , , , ](mm/hr) , END=-1
01023> *
01024>
01025> ADD HYD IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
01026> *
01027> ADD HYD IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
01028> *
01029>
01030> * SUB-AREA No.4
01031>
01032> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[0.7](%),
LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.93](%),
LGI=[164.82](m), MNI=[0.03], SCI=[0.0]
01039> RAINFALL=[ , , , ](mm/hr) , END=-1
01041> *
01042> * SUB-AREA No.5
01043>
01044> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=(2.5)(min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%),
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min)
Impervious surfaces: IAIMP=[1.57](mm), SLEI=[0.61](%),
LGI=[207.25](m), MNI=[0.03], SCI=[0.0]
01051> RAINFALL=[ , , , ](mm/hr) , END=-1
01052> *
01053> ADD HYD IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
01054> *
01055> ADD HYD IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
01056> *
01057>
01058> ROUTE RESERVOIR IDout=[9], NHYD=["POND"], IDin=[9],
RDT=[1.0](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
01062> [ 0.000, 0.0000]
01063> [ 0.008, 0.0656]
01064> [ 0.017, 0.1311]
01065> [ 0.093, 0.2831]
01066> [ 0.233, 0.3971]
01067> [ 0.337, 0.4731]
01068> [ 0.465, 0.5491]
01069> [ 0.531, 0.5871]
01070> [ 0.593, 0.6251]
01071> [ 0.654, 0.6631]
01072> [ 0.797, 0.7391]
01073> [ 0.950, 0.8274]
01074> [ 1.304, 0.9157]
01075> [ 1.880, 1.0040]
01076> [ 2.577, 1.0923]
01077> [ -1, -1 ] (max twenty pts)
01078>
01079> *****
01080> * Remaining Hawthorne Industrial Park *

```

```

01081> *****
01082> *
01083> * SUB-AREA No.1
01084>
01085> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01086> SCS curve number CN=[81],
01087> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01088> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01089> RAINFALL=[ , , , ] (mm/hr), END=-1
01090>
01091> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01092> *
01093> * SUB-AREA No.2
01094>
01095> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01096> SCS curve number CN=[81],
01097> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01098> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01099> RAINFALL=[ , , , ] (mm/hr), END=-1
01100>
01101> *
01102> * SUB-AREA No.3
01103>
01104> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01105> SCS curve number CN=[81],
01106> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01107> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01108> RAINFALL=[ , , , ] (mm/hr), END=-1
01109>
01110> *
01111> * SUB-AREA No.4
01112>
01113> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01114> SCS curve number CN=[81],
01115> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01116> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01117> RAINFALL=[ , , , ] (mm/hr), END=-1
01118>
01119> *
01120> * SUB-AREA No.5
01121>
01122> CALIB STANDHYD ID=[ 8 ], NHYD=["HIP08"], DT=[2.5] (min), AREA=[4.0] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01123> SCS curve number CN=[81],
01124> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01125> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01126> RAINFALL=[ , , , ] (mm/hr), END=-1
01127>
01128> *
01129> * SUB-AREA No.6
01130>
01131> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01132> RAINFALL=[ , , , ] (mm/hr), END=-1
01133>
01134> *
01135> * SUB-AREA No.7
01136>
01137> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01138> RAINFALL=[ , , , ] (mm/hr), END=-1
01139>
01140> *
01141> * SUB-AREA No.8
01142>
01143> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01144> RAINFALL=[ , , , ] (mm/hr), END=-1
01145>
01146> *
01147> * SUB-AREA No.9
01148>
01149> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01150> RAINFALL=[ , , , ] (mm/hr), END=-1
01151>
01152> *
01153> * SUB-AREA No.10
01154>
01155> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01156> RAINFALL=[ , , , ] (mm/hr), END=-1
01157>
01158> *
01159> * SUB-AREA No.11
01160>
01161> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01162> RAINFALL=[ , , , ] (mm/hr), END=-1
01163>
01164> *
01165> * SUB-AREA No.12
01166>
01167> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01168> RAINFALL=[ , , , ] (mm/hr), END=-1
01169>
01170> *
01171> * SUB-AREA No.13
01172>
01173> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01174> RAINFALL=[ , , , ] (mm/hr), END=-1
01175>
01176> *
01177> * SUB-AREA No.14
01178>
01179> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01180> RAINFALL=[ , , , ] (mm/hr), END=-1
01181>
01182> *
01183> * SUB-AREA No.15
01184>
01185> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01186> RAINFALL=[ , , , ] (mm/hr), END=-1
01187>
01188> *
01189> * SUB-AREA No.16
01190>
01191> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01192> RAINFALL=[ , , , ] (mm/hr), END=-1
01193>
01194> *
01195> * SUB-AREA No.17
01196>
01197> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01198> RAINFALL=[ , , , ] (mm/hr), END=-1
01199>
01200> *
01201> * SUB-AREA No.18
01202>
01203> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01204> RAINFALL=[ , , , ] (mm/hr), END=-1
01205>
01206> *
01207> * SUB-AREA No.19
01208>
01209> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01210> RAINFALL=[ , , , ] (mm/hr), END=-1
01211>
01212> *
01213> * SUB-AREA No.20
01214>
01215> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
RAINFALL=[ , , , ] (mm/hr), END=-1

```

```

01216> *
01217> * SUB-AREA No.4
01218>
01219> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01220> SCS curve number CN=[81],
01221> Pervious surfaces: IAPER=[4.67] (mm), SLP=[0.7] (%),
LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
01222> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
01223> RAINFALL=[ , , , ] (mm/hr), END=-1
01224>
01225> *
01226> * SUB-AREA No.5
01227>
01228> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01229> SCS curve number CN=[81],
01230> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
01231> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
01232> RAINFALL=[ , , , ] (mm/hr), END=-1
01233>
01234> *
01235> * SUB-AREA No.6
01236>
01237> CALIB STANDHYD ID=[ 8 ], NHYD=["080"], IDs to add=[6+7]
01238>
01239> *
01240> * SUB-AREA No.7
01241>
01242> CALIB STANDHYD ID=[ 9 ], NHYD=["090"], IDs to add=[5+8]
01243>
01244> *
01245> * SUB-AREA No.8
01246>
01247> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RTD=[1.0] (min),
01248> TABLE of ( OUTFLOW-STORAGE ) values
01249> ( cms ) - ( ha-m )
01250> [ 0.00, 0.0000 ]
01251> [ 0.008, 0.0566 ]
01252> [ 0.017, 0.1311 ]
01253> [ 0.093, 0.2831 ]
01254> [ 0.233, 0.3971 ]
01255> [ 0.337, 0.4731 ]
01256> [ 0.465, 0.5491 ]
01257> [ 0.531, 0.5871 ]
01258> [ 0.593, 0.6251 ]
01259> [ 0.654, 0.6631 ]
01260> [ 0.797, 0.7391 ]
01261> [ 0.950, 0.874 ]
01262> [ 1.304, 0.9157 ]
01263> [ 1.880, 1.0040 ]
01264> [ 2.577, 1.0923 ]
01265> [ -1, -1 ] (max twenty pts)
01266>
01267> *****
01268> * Remaining Hawthorne Industrial Park *
01269> *****
01270>
01271> * SUB-AREA No.1
01272>
01273> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01274> SCS curve number CN=[81],
01275> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01276> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01277> RAINFALL=[ , , , ] (mm/hr), END=-1
01278>
01279> *
01280> * SUB-AREA No.2
01281>
01282> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01283> SCS curve number CN=[81],
01284> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01285> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01286> RAINFALL=[ , , , ] (mm/hr), END=-1
01287>
01288> *
01289> * SUB-AREA No.3
01290>
01291> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01292> SCS curve number CN=[81],
01293> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01294> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01295> RAINFALL=[ , , , ] (mm/hr), END=-1
01296>
01297> *
01298> * SUB-AREA No.4
01299>
01300> CALIB STANDHYD ID=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01301>
01302> *
01303> * SUB-AREA No.5
01304>
01305> CALIB STANDHYD ID=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
01306>
01307> *
01308> * SUB-AREA No.6
01309>
01310> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01311> SCS curve number CN=[81],
01312> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01313> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01314> RAINFALL=[ , , , ] (mm/hr), END=-1
01315>
01316> *
01317> * SUB-AREA No.7
01318>
01319> CALIB STANDHYD ID=[ 8 ], NHYD=["HIP08"], DT=[2.5] (min), AREA=[4.0] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01320> SCS curve number CN=[81],
01321> Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01322> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01323> RAINFALL=[ , , , ] (mm/hr), END=-1
01324>
01325> *
01326> * SUB-AREA No.8
01327>
01328> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] (min), AREA=[4.0] (ha),
DWF=[0] (cms), CN/C=[85], TP=[0.17] (hrs),
01329> RAINFALL=[ , , , ] (mm/hr), END=-1
01330>
01331> *
01332> * SUB-AREA No.9
01333>
01334> DESIGN NASHYD ID=[ 9 ], NHYD=["Ultimate"], IDs to add=[9+1]
01335>
01336> *
01337> * SUB-AREA No.10
01338>
01339> DESIGN NASHYD ID=[ 1 ], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
DWF=[0] (cms), CN/C=[76], TP=[0.80] (hrs),
01340> RAINFALL=[ , , , ] (mm/hr), END=-1
01341>
01342> *
01343> * SUB-AREA No.11
01344>
01345> DESIGN NASHYD ID=[ 2 ], NHYD=["Ultimate"], IDs to add=[9+1]
01346>
01347> *
01348> * SUB-AREA No.12
01349>
01350> ***** 600 mm culverts @ 84.5 + 2 600 mm culverts @ 85.25 10% Pond reduction*****

```

```

00001>-----
00002>
00003> SSSSS W W M M H H Y Y M M O O 999 999 -----
00004> S W W M M H H Y Y M M O O 9 9 9 9
00005> SSSSS W W M M H H H H Y Y M M O O ## 9 9 9 Ver. 4.02
00006> S W W M M H H H Y Y M M O O 9999 9999 July 1999
00007> SSSSS W W M M H H H Y Y M M O O 9 9 9 -----
00008> 9 9 9 9 # 418403
00009> StormWater Management Hydrologic Model 999 999 -----
00010>
00011> *****
00012> ***** SWHYMO-99 Ver/4.02 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HMO and its successors *****
00015> *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: sumhymo@jifa.com *****
00021> *****
00022>
00023> *****
00024> ***** Licensed user: J. L. Richards & Associates Limited *****
00025> ***** Ottawa SERIAL#418403 *****
00026> *****
00027> *****
00028> *****
00029> ***** PROGRAM ARRAY DIMENSIONS *****
00030> ***** Maximum value for ID number: 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034>
00035> ***** DETAILED OUTPUT *****
00036> *****
00037> *****
00038> ***** DATE: 2009-02-09 TIME: 14:59:31 RUN COUNTER: 000154 *****
00039> *****
00040> ***** * Input filename: V:\20983.DU\ENG\SWHYMO\PSTPH2.dat *****
00041> ***** * Output filename: V:\20983.DU\ENG\SWHYMO\PSTPH2.out *****
00042> ***** * Summary filename: V:\20983.DU\ENG\SWHYMO\PSTPH2.sum *****
00043> ***** * User comments: *****
00044> ***** * 1: *****
00045> ***** * 2: *****
00046> ***** * 3: *****
00047> *****
00048>
00049>
00050> 001:0001-----
00051> # *****
00052> # Project Name : Hawthorne Industrial Park Project Number: [20983] *
00053> # Date : January, 2009 *
00054> # Revised : N/A *
00055> # Developed by : Mark Buchanan, E.I.T. *
00056> # Reviewed by : Guy Forget, P.Eng. *
00057> # Company : J.L. Richards & Associates Limited *
00058> # License # : 418403 *
00059> # *****
00060> *
00061> *
00062> *
00063> * FILENAME: V:\20983.DU\ENG\SWHYMO\20983PST.DAT *
00064> * FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00065> * OF A FACILITY ASSOCIATED WITH THE OTHER COMPOSING SITE *
00066> * *****
00067> *
00068> *
00069> * SWHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE *
00070> * PROPOSED COMPOSING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00071> * *****
00072> *
00073> * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00074> * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00075> * *****
00076> *
00077> * POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00078> * *****
00079> *
00080> * CALCULATION OF 4 HR 25 MM STORM EVENT *
00081> * *****
00082> *
00083> | START | Project dir.: V:\20983.DU\ENG\SWHYMO\
00084> | Rainfall dir.: V:\20983.DU\ENG\SWHYMO\
00085> | TZERO = .00 hrs on
00086> | METOUT= 2 (output = METRIC)
00087> | NRUN = 001
00088> | NSTORM= 0
00089> |
00090> 001:0002-----
00091> |
00092> | READ STORM | Filename: V:\20983.DU\ENG\SWHYMO\4HR25-15.STM
00093> | Ptotal= 25.00 mm | Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
00094> |
00095> | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00096> | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00097> | .25 1.777 | 1.25 45.631 | 2.25 3.138 | 3.25 1.675
00098> | .50 2.357 | 1.50 11.911 | 2.50 2.555 | 3.50 1.509
00099> | .75 3.618 | 1.75 6.051 | 2.75 2.165 | 3.75 1.376
00100> | 1.00 9.975 | 2.00 4.108 | 3.00 1.885 | 4.00 1.266
00101> |
00102> |
00103> 001:0003-----
00104> |
00105> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWHYMO\ORGA.VAL
00106> | ICASEdv = 1 (read and print data)
00107> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
00108> | *****
00109> | *****
00110> | ***** Norton's infiltration equation parameters: *****
00111> | [F0= 50.00 mm/hr] [F= 7.50 mm/hr] [ICAE= 2.00 /hr] [F= .00 mm]
00112> | *****
00113> | ***** Parameters for PERVIOUS surfaces in STANDHYD: *****
00114> | [LAImp= 1.57 mm] [LI= 1.50] [MNI= .035]
00115> | *****
00116> | ***** Parameters used in RASBY: *****
00117> | [Ia= 4.67 mm] [N= 3.00]
00118> |
00119> |
00120> | ***** ORGAWORLD FILE *****
00121> | *****
00122> | ***** SUB-AREA No.1 *****
00123> | *****
00124> | CALIB STANDHYD | Area (ha)= 2.07
00125> | 01:010 | DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00126> |
00127> |
00128> | IMPERVIOUS PERVIOUS (i)
00129> | Surface Area (ha)= 1.74 .33
00130> | Dep. Storage (mm)= 1.57 4.67
00131> | Average Slope (%)= .52 1.00
00132> | Length (m)= 204.72 20.00
00133> | Mannings n = .030 .250
00134> |
00135> | Max. eff. Inten. (mm/hr)= 45.63 5.37
| over (min) 10.00 30.00

```

```

00136> Storage Coeff. (min)= 10.80 (ii) 29.27 (ii)
00137> Unit Hyd. Tpeak (min)= 10.00 30.00
00138> Unit Hyd. peak (cms)= .11 .04
00139>
00140>
00141> PEAK FLOW (cms)= .16 .00 *TOTALS*
00142> TIME TO PEAK (hrs)= 1.29 1.75 .158 (iii)
00143> RUNOFF VOLUME (mm)= 23.43 5.17 20.508
00144> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00145> RUNOFF COEFFICIENT = .94 .21 .820
00146>
00147> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00148> CN* = 81.0 Ia = Dep. Storage (Above)
00149> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00150> THAN THE STORAGE COEFFICIENT.
00151> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00152>
00153>-----
00154> 001:0005-----
00155> * SUB-AREA No.2
00156>
00157> | CALIB STANDHYD | Area (ha)= 1.54
00158> | 02:020 | DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00159> |
00160> |
00161> | IMPERVIOUS PERVIOUS (i)
00162> | Surface Area (ha)= 1.42 .12
00163> | Dep. Storage (mm)= 1.57 4.67
00164> | Average Slope (%)= .50 1.00
00165> | Length (m)= 244.34 5.00
00166> | Mannings n = .030 .030
00167> |
00168> | Max. eff. Inten. (mm/hr)= 45.63 7.24
00169> | over (min) 12.50 15.00
00170> | Storage Coeff. (min)= 12.15 (ii) 14.15 (ii)
00171> | Unit Hyd. Tpeak (min)= 12.50 15.00
00172> | Unit Hyd. peak (cms)= .09 .08
00173>
00174> PEAK FLOW (cms)= .12 .00 *TOTALS*
00175> TIME TO PEAK (hrs)= 1.33 1.46 .121 (iii)
00176> RUNOFF VOLUME (mm)= 23.43 5.17 21.969
00177> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00178> RUNOFF COEFFICIENT = .94 .21 .879
00179>
00180> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00181> CN* = 81.0 Ia = Dep. Storage (Above)
00182> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00183> THAN THE STORAGE COEFFICIENT.
00184> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00185>
00186>-----
00187> 001:0006-----
00188> * SUB-AREA No.3
00189>
00190> | CALIB STANDHYD | Area (ha)= 1.40
00191> | 03:030 | DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00192> |
00193> |
00194> | IMPERVIOUS PERVIOUS (i)
00195> | Surface Area (ha)= 1.36 .04
00196> | Dep. Storage (mm)= 1.57 4.67
00197> | Average Slope (%)= .51 1.00
00198> | Length (m)= 225.63 5.00
00199> | Mannings n = .030 .030
00200> |
00201> | Max. eff. Inten. (mm/hr)= 45.63 7.97
00202> | over (min) 12.50 12.50
00203> | Storage Coeff. (min)= 11.52 (ii) 13.44 (ii)
00204> | Unit Hyd. Tpeak (min)= 12.50 12.50
00205> | Unit Hyd. peak (cms)= .10 .09
00206>
00207> PEAK FLOW (cms)= .12 .00 *TOTALS*
00208> TIME TO PEAK (hrs)= 1.33 1.42 .118 (iii)
00209> RUNOFF VOLUME (mm)= 23.43 5.17 22.881
00210> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00211> RUNOFF COEFFICIENT = .94 .21 .915
00212>
00213> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00214> CN* = 81.0 Ia = Dep. Storage (Above)
00215> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00216> THAN THE STORAGE COEFFICIENT.
00217> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00218>
00219>-----
00220> 001:0007-----
00221> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00222> | (ha) (cms) (hrs) (mm) (cms)
00223> | ID1 01:010 2.07 .158 1.29 20.51 .000
00224> | +ID2 02:020 1.54 .121 1.33 21.97 .000
00225> |
00226> | SUM 04:040 3.61 .278 1.33 21.13 .000
00227> |
00228> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00229> |
00230>-----
00231> 001:0008-----
00232> |
00233> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00234> | (ha) (cms) (hrs) (mm) (cms)
00235> | ID1 03:030 1.40 .118 1.33 22.88 .000
00236> | +ID2 04:040 3.61 .278 1.33 21.13 .000
00237> |
00238> | SUM 05:050 5.01 .396 1.33 21.62 .000
00239> |
00240> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00241> |
00242>-----
00243> 001:0009-----
00244> *
00245> * SUB-AREA No.4
00246>
00247> | CALIB STANDHYD | Area (ha)= .89
00248> | 06:060 | DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00249> |
00250> |
00251> | IMPERVIOUS PERVIOUS (i)
00252> | Surface Area (ha)= .86 .03
00253> | Dep. Storage (mm)= 1.57 4.67
00254> | Average Slope (%)= .93 .70
00255> | Length (m)= 164.82 40.00
00256> | Mannings n = .030 .250
00257> |
00258> | Max. eff. Inten. (mm/hr)= 45.63 4.42
00259> | over (min) 7.50 42.50
00260> | Storage Coeff. (min)= 7.97 (ii) 41.62 (ii)
00261> | Unit Hyd. Tpeak (min)= 7.50 42.50
00262> | Unit Hyd. peak (cms)= .14 .03
00263>
00264> PEAK FLOW (cms)= .09 .00 *TOTALS*
00265> TIME TO PEAK (hrs)= 1.25 2.00 .089 (iii)
00266> RUNOFF VOLUME (mm)= 23.43 5.17 22.882
00267> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00268> RUNOFF COEFFICIENT = .94 .21 .915
00269>
00270> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00271> CN* = 81.0 Ia = Dep. Storage (Above)

```

00271> (i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00272> THAN THE STORAGE COEFFICIENT.  
00273> (i.i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00274>  
00275>  
00276> 001:001C  
00277> \* SUB-AREA No.5  
00278>  
00279> CALIB STANDHYD | Area (ha)= 2.66  
00280> | 07:07C DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
00281>  
00282>  
00283>  
00284> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
00285> Dep. Storage (mm)= 1.57 4.67  
00286> Average Slope (%)= .61 1.50  
00287> Length (m)= 207.25 100.00  
00288> Mannings n = .030 .250  
00289>  
00290> Max. eff. Inten. (mm/hr)= 45.63 5.66  
00291> over (min)= 10.00 27.50  
00292> Storage Coeff. (min)= 10.37 (ii) 26.38 (ii)  
00293> Unit Hyd. Tpeak (min)= 10.00 27.50  
00294> Unit Hyd. peak (cms)= .11 .04  
00295>  
00296> PEAK FLOW (cms)= .24 .00 \*TOTALS\*  
00297> TIME TO PEAK (hrs)= 1.29 1.67 1.292  
00298> RUNOFF VOLUME (mm)= 23.43 8.74 22.882  
00299> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00300> RUNOFF COEFFICIENT = .94 .35 .915  
00301>  
00302> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00303> CN\* = 81.0 Ia = Dep. Storage (Above)  
00304> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00305> THAN THE STORAGE COEFFICIENT.  
00306> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00307>  
00308>  
00309> 001:0011  
00310>  
00311> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00312> |-----|----|-----|-----|-----|-----|  
00313> | ID1 06:050 | | (ha) (cms) (hrs) (mm) (cms)  
00314> | +ID2 07:070 | | .89 .089 1.25 22.88 .000  
00315> |-----|----|-----|-----|-----|-----|  
00316> | SUM 08:080 | | 3.55 .327 1.29 22.88 .000  
00317>  
00318> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00319>  
00320>  
00321> 001:0012  
00322> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00323> |-----|----|-----|-----|-----|-----|  
00324> | ID1 05:050 | | 5.01 .396 1.33 21.62 .000  
00325> | +ID2 08:080 | | 3.55 .327 1.29 22.88 .000  
00326> |-----|----|-----|-----|-----|-----|  
00327> | SUM 09:090 | | 8.56 .716 1.29 22.14 .000  
00328>  
00329> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00330>  
00331>  
00332> 001:0013  
00333> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
00334> | IN>09 : (090 ) |  
00335> | OUT<10 : (POND ) |  
00336>  
00337> |-----|-----|-----|-----|-----|-----|  
00338> | OUTFLOW STORAGE | OUTFLOW STORAGE | OUTFLOW STORAGE |  
00339> | (cms) (ha.m.) | (cms) (ha.m.) | (cms) (ha.m.) |  
00340> | .000 .0000E+00 | .593 .6251E+00 | .654 .6631E+00 |  
00341> | .008 .6560E+01 | .797 .7391E+00 | .550 .8274E+00 |  
00342> | .017 .1311E+00 | .304 .9157E+00 | .180 .1004E+01 |  
00343> | .093 .2831E+00 | .257 .1092E+01 | .000 .0000E+00 |  
00344> | .233 .3071E+00 | .593 .6251E+00 | .654 .6631E+00 |  
00345> | .337 .4731E+00 | 1.880 .1004E+01 | 2.577 .1092E+01 |  
00346> | .465 .5491E+00 | 2.577 .1092E+01 | .000 .0000E+00 |  
00347> | .531 .5871E+00 | .000 .0000E+00 | .000 .0000E+00 |  
00348>  
00349> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
00350> (ha) (cms) (hrs) (mm)  
00351> INFLOW >09 : (090 ) 8.56 .716 1.292 22.143  
00352> OUTFLOW <10 : (POND ) 8.56 .032 3.875 22.141  
00353>  
00354> PEAK FLOW REDUCTION (Qout/Qin) (%) = 4.470  
00355> TIME SHIFT OF PEAK FLOW (min) = 155.00  
00356> MAXIMUM STORAGE USED (ha.m.) = .1611E+00  
00357>  
00358>  
00359> 001:0014  
00360> \*\*\*\*\*  
00361> \* Remaining Hawthorne Industrial Park \*  
00362> \*\*\*\*\*  
00363>  
00364> \* SUB-AREA No.1  
00365>  
00366> CALIB STANDHYD | Area (ha)= 19.90  
00367> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00368>  
00369>  
00370> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
00371> Dep. Storage (mm)= 1.57 4.67  
00372> Average Slope (%)= .60 1.50  
00373> Length (m)= 580.00 100.00  
00374> Mannings n = .030 .250  
00375>  
00376> Max. eff. Inten. (mm/hr)= 34.39 11.90  
00377> over (min)= 22.50 52.50  
00378> Storage Coeff. (min)= 21.64 (ii) 52.88 (ii)  
00379> Unit Hyd. Tpeak (min)= 22.50 52.50  
00380> Unit Hyd. peak (cms)= .05 .02  
00381>  
00382> PEAK FLOW (cms)= .60 .11 .642 (iii)  
00383> TIME TO PEAK (hrs)= 1.50 2.13 1.542  
00384> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00385> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00386> RUNOFF COEFFICIENT = .94 .35 .643  
00387>  
00388> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00389> CN\* = 81.0 Ia = Dep. Storage (Above)  
00390> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00391> THAN THE STORAGE COEFFICIENT.  
00392> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00393>  
00394>  
00395> 001:0015  
00396>  
00397> | ADD HYD (H1P02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00398> |-----|----|-----|-----|-----|-----|  
00399> | ID1 10:POND | | 8.56 .032 3.88 22.14 .000  
00400> | +ID2 01:H1P01 | | 19.90 .642 1.54 16.08 .000  
00401> |-----|----|-----|-----|-----|-----|  
00402> | SUM 02:H1P02 | | 28.46 .655 1.54 17.91 .000  
00403>  
00404> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00405>

00406>  
00407> 001:0016  
00408>  
00409> \* SUB-AREA No.2  
00410>  
00411> CALIB STANDHYD | Area (ha)= 17.00  
00412> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00413>  
00414>  
00415> IMPERVIOUS PERVIOUS (i)  
00416> Surface Area (ha)= 12.07 4.93  
00417> Dep. Storage (mm)= 1.57 4.67  
00418> Average Slope (%)= .65 1.50  
00419> Length (m)= 450.00 100.00  
00420> Mannings n = .030 .250  
00421>  
00422> Max. eff. Inten. (mm/hr)= 40.81 12.73  
00423> over (min)= 17.50 47.50  
00424> Storage Coeff. (min)= 16.94 (ii) 47.35 (ii)  
00425> Unit Hyd. Tpeak (min)= 17.50 47.50  
00426> Unit Hyd. peak (cms)= .07 .02 \*TOTALS\*  
00427> PEAK FLOW (cms)= .60 .10 .625 (iii)  
00428> TIME TO PEAK (hrs)= 1.42 2.00 1.458  
00429> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00430> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00431> RUNOFF COEFFICIENT = .94 .35 .643  
00432>  
00433> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00434> CN\* = 81.0 Ia = Dep. Storage (Above)  
00435> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00436> THAN THE STORAGE COEFFICIENT.  
00437> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00438>  
00439>  
00440> 001:0017  
00441> \* SUB-AREA No.3  
00442>  
00443> CALIB STANDHYD | Area (ha)= 15.60  
00444> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00445>  
00446>  
00447> IMPERVIOUS PERVIOUS (i)  
00448> Surface Area (ha)= 11.08 4.52  
00449> Dep. Storage (mm)= 1.57 4.67  
00450> Average Slope (%)= .50 1.50  
00451> Length (m)= 600.00 100.00  
00452> Mannings n = .030 .250  
00453>  
00454> Max. eff. Inten. (mm/hr)= 34.39 11.54  
00455> over (min)= 22.50 55.00  
00456> Storage Coeff. (min)= 23.33 (ii) 54.95 (ii)  
00457> Unit Hyd. Tpeak (min)= 22.50 55.00  
00458> Unit Hyd. peak (cms)= .05 .02 \*TOTALS\*  
00459> PEAK FLOW (cms)= .45 .08 .542 (iii)  
00460> TIME TO PEAK (hrs)= 1.50 2.17 1.542  
00461> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00462> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00463> RUNOFF COEFFICIENT = .94 .35 .643  
00464>  
00465> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00466> CN\* = 81.0 Ia = Dep. Storage (Above)  
00467> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00468> THAN THE STORAGE COEFFICIENT.  
00469> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00470>  
00471>  
00472>  
00473> 001:0018  
00474> | ADD HYD (H1P05 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00475> |-----|----|-----|-----|-----|-----|  
00476> | ID1 03:H1P03 | | 17.00 .625 1.46 16.08 .000  
00477> | +ID2 04:H1P04 | | 15.60 .484 1.54 16.08 .000  
00478> |-----|----|-----|-----|-----|-----|  
00479> | SUM 05:H1P05 | | 32.60 1.091 1.46 16.08 .000  
00480>  
00481> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00482>  
00483>  
00484>  
00485> 001:0019  
00486> | ADD HYD (H1P06 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00487> |-----|----|-----|-----|-----|-----|  
00488> | ID1 05:H1P05 | | 32.60 1.091 1.46 16.08 .000  
00489> | +ID2 02:H1P02 | | 28.46 .655 1.54 17.91 .000  
00490> |-----|----|-----|-----|-----|-----|  
00491> | SUM 06:H1P06 | | 61.06 1.740 1.50 16.93 .000  
00492>  
00493> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00494>  
00495>  
00496>  
00497> 001:0020  
00498> \* SUB-AREA No.4  
00499>  
00500>  
00501> CALIB STANDHYD | Area (ha)= 12.20  
00502> | 07:H1P07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00503>  
00504>  
00505> IMPERVIOUS PERVIOUS (i)  
00506> Surface Area (ha)= 8.66 3.54  
00507> Dep. Storage (mm)= 1.57 4.67  
00508> Average Slope (%)= .70 1.50  
00509> Length (m)= 210.00 100.00  
00510> Mannings n = .030 .250  
00511>  
00512> Max. eff. Inten. (mm/hr)= 45.63 14.15  
00513> over (min)= 10.00 40.00  
00514> Storage Coeff. (min)= 10.03 (ii) 39.18 (ii)  
00515> Unit Hyd. Tpeak (min)= 10.00 40.00  
00516> Unit Hyd. peak (cms)= .11 .03 \*TOTALS\*  
00517> PEAK FLOW (cms)= .57 .08 .585 (iii)  
00518> TIME TO PEAK (hrs)= 1.29 1.88 1.292  
00519> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00520> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00521> RUNOFF COEFFICIENT = .94 .35 .643  
00522>  
00523> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00524> CN\* = 81.0 Ia = Dep. Storage (Above)  
00525> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00526> THAN THE STORAGE COEFFICIENT.  
00527> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00528>  
00529>  
00530> 001:0021  
00531> \* SUB-AREA No.5  
00532>  
00533> DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)= 85.00  
00534> | 08:Pond-B DT= 2.50 | Ia = 4.670 # of Linear Res. (N)= 3.00  
00535> |-----|-----|-----|-----|-----|-----|  
00536> | U.H. Tp(hrs)= .170  
00537>  
00538> Unit Hyd. Tpeak (cms)= .899  
00539>  
00540> PEAK FLOW (cms)= .077 (i)

```

00541> TIME TO PEAK (hrs)= 1.375
00542> RUNOFF VOLUME (mm)= 6.343
00543> TOTAL RAINFALL (mm)= 24.999
00544> RUNOFF COEFFICIENT = .254
00545>
00546> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00547>
00548>
00549> 001:0022-----
00550>
00551> | ADD HYD (HIPO8 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00552> | | (ha) (cms) (hrs) (mm) (cms)
00553> | ID1 06:HIPO8 61.06 1.740 1.50 16.93 .000
00554> | +ID2 07:HIPO7 12.20 .585 1.29 16.08 .000
00555> | +ID3 08:Pond-B 4.00 .077 1.38 6.34 .000
00556>
00557> SUM 09:HIPO8 77.26 2.227 1.46 16.25 .000
00558>
00559> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00560>
00561>
00562> 001:0023-----
00563> *
00564> * SUB-AREA No. 6
00565> *
00566>
00567> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
00568> | O1:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
00569> | U.H. Tp(hrs)= .800
00570>
00571> Unit Hyd Qpeak (cms)= .129
00572>
00573> PEAK FLOW (cms)= .013 (i)
00574> TIME TO PEAK (hrs)= 2.292
00575> RUNOFF VOLUME (mm)= 4.110
00576> TOTAL RAINFALL (mm)= 24.999
00577> RUNOFF COEFFICIENT = .164
00578>
00579> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00580>
00581>
00582> 001:0024-----
00583>
00584> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00585> | | (ha) (cms) (hrs) (mm) (cms)
00586> | ID1 09:HIPO8 77.26 2.227 1.46 16.25 .000
00587> | +ID2 01:A3 2.70 .013 2.29 4.11 .000
00588>
00589> SUM 02:Ultima 79.96 2.231 1.46 15.84 .000
00590>
00591> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00592>
00593>
00594> 001:0025-----
00595> *****
00596> * CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00597> *****
00598>
00599> | START | Project dir.: V:\20983.DU\ENG\SWM\HYM\
00600> | Rainfall dir.: V:\20983.DU\ENG\SWM\HYM\
00601> TZERO = .00 hrs on 0
00602> METOUT = 2 (output = METRIC)
00603> NRUN = 01
00604> NSTORM = 0
00605>
00606> 001:0002-----
00607>
00608> | CHICAGO STORM | IDF curve parameters: A= 732.951
00609> | Ptotal= 31.86 mm | B= 6.199
00610> | | C= .810
00611> used in: INTENSITY = A / (t + B)^C
00612>
00613> Duration of storm = 3.00 hrs
00614> Storm time step = 10.00 min
00615> Time to peak ratio = .33
00616>
00617> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00618> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00619> .17 2.815 | 1.00 76.805 | 1.83 5.095 | 2.87 2.684
00620> .33 3.498 | 1.17 24.079 | 2.00 4.291 | 2.83 2.463
00621> .50 4.687 | 1.33 12.364 | 2.17 3.718 | 3.00 2.279
00622> .67 7.305 | 1.50 8.324 | 2.33 3.288 |
00623> .83 18.209 | 1.67 6.303 | 2.50 2.953 |
00624>
00625>
00626> 001:0003-----
00627>
00628> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWM\HYM\ORGA.VAL
00629> | ICASEDv = 1 (read and print data)
00630> | FileTitle= ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE
00631> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60
00632> Horton's infiltration equation parameters:
00633> [F= 50.00 mm/hr] [P= 7.50 mm/hr] [ICAE= 2.00 /hr] [P= .00 mm]
00634> Parameters for PERVIOUS surfaces in STANDHYD:
00635> [IAper= 4.67 mm] [LGP=40.00 mm] [MNP=.250]
00636> Parameters for IMPERVIOUS surfaces in STANDHYD:
00637> [IAimp= 1.57 mm] [CLI= 1.50] [MNI=.035]
00638> Parameters used in NASHYD:
00639> [Ia= 4.67 mm] [N= 3.00]
00640>
00641> 001:0004-----
00642> *****
00643> *
00644> *
00645> * SUB-AREA No.1
00646>
00647> | CALIB STANDHYD | Area (ha)= 2.07
00648> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00649>
00650> IMPERVIOUS PERVIOUS (i)
00651> Surface Area (ha)= 1.74 .33
00652> Dep. Storage (mm)= 1.57 4.67
00653> Average Slope (%)= .52 1.00
00654> Length (m)= 204.72 20.00
00655> Mannings n = .030 .250
00656>
00657> Max. eff. Inten. (mm/hr)= 76.81 11.88
00658> over (min)= 10.00 22.50
00659> Storage Coeff. (min)= 8.77 (ii) 22.21 (ii)
00660> Unit Hyd. Tpeak (min)= 10.00 22.50
00661> Unit Hyd. peak (cms)= .12 .05
00662>
00663> *TOTALS*
00664> PEAK FLOW (cms)= .24 .01 .245 (iii)
00665> TIME TO PEAK (hrs)= 1.08 1.38 1.083
00666> RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00667> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00668> RUNOFF COEFFICIENT = .95 .27 .841
00669>
00670> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00671> CN* = 81.0 Ia = Dep. Storage (Above)
00672> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00673> THAN THE STORAGE COEFFICIENT.
00674> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00675>

```

```

00676> 001:0005-----
00677> *
00678> * SUB-AREA No.2
00679>
00680> | CALIB STANDHYD | Area (ha)= 1.54
00681> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00682>
00683> IMPERVIOUS PERVIOUS (i)
00684> Surface Area (ha)= 1.42 .12
00685> Dep. Storage (mm)= 1.57 4.67
00686> Average Slope (%)= .50 1.00
00687> Length (m)= 244.34 5.00
00688> Mannings n = .030 .030
00689>
00690> Max. eff. Inten. (mm/hr)= 76.81 15.07
00691> over (min)= 10.00 12.50
00692> Storage Coeff. (min)= 9.87 (ii) 11.36 (ii)
00693> Unit Hyd. Tpeak (min)= 10.00 12.50
00694> Unit Hyd. peak (cms)= .11 .10
00695>
00696> *TOTALS*
00697> PEAK FLOW (cms)= .19 .00 .192 (iii)
00698> TIME TO PEAK (hrs)= 1.08 1.17 1.083
00699> RUNOFF VOLUME (mm)= 30.29 8.52 28.548
00700> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00701> RUNOFF COEFFICIENT = .95 .27 .896
00702>
00703> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00704> CN* = 81.0 Ia = Dep. Storage (Above)
00705> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00706> THAN THE STORAGE COEFFICIENT.
00707> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00708>
00709>
00710> 001:0006-----
00711> *
00712> * SUB-AREA No.3
00713>
00714> | CALIB STANDHYD | Area (ha)= 1.40
00715> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00716>
00717> IMPERVIOUS PERVIOUS (i)
00718> Surface Area (ha)= 1.36 .04
00719> Dep. Storage (mm)= 1.57 4.67
00720> Average Slope (%)= .51 1.00
00721> Length (m)= 225.63 5.00
00722> Mannings n = .030 .030
00723>
00724> Max. eff. Inten. (mm/hr)= 76.81 16.59
00725> over (min)= 10.00 10.00
00726> Storage Coeff. (min)= 9.35 (ii) 10.79 (ii)
00727> Unit Hyd. Tpeak (min)= 10.00 10.00
00728> Unit Hyd. peak (cms)= .12 .11
00729>
00730> *TOTALS*
00731> PEAK FLOW (cms)= .18 .00 .186 (iii)
00732> TIME TO PEAK (hrs)= 1.08 1.13 1.083
00733> RUNOFF VOLUME (mm)= 30.29 8.52 29.637
00734> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00735> RUNOFF COEFFICIENT = .95 .27 .930
00736>
00737> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00738> CN* = 81.0 Ia = Dep. Storage (Above)
00739> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00740> THAN THE STORAGE COEFFICIENT.
00741> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00742>
00743>
00744> 001:0007-----
00745> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00746> | | (ha) (cms) (hrs) (mm) (cms)
00747> | ID1 01:010 2.07 .245 1.08 26.81 .000
00748> | +ID2 02:020 1.54 .192 1.08 28.55 .000
00749>
00750> SUM 04:040 3.61 .436 1.08 27.55 .000
00751>
00752> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00753>
00754>
00755> 001:0008-----
00756> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00757> | | (ha) (cms) (hrs) (mm) (cms)
00758> | ID1 03:030 1.40 .186 1.08 29.64 .000
00759> | +ID2 04:040 3.61 .436 1.08 27.55 .000
00760>
00761> SUM 05:050 5.01 .623 1.08 28.13 .000
00762>
00763> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00764>
00765>
00766> 001:0009-----
00767> *
00768> * SUB-AREA No.4
00769>
00770> | CALIB STANDHYD | Area (ha)= .89
00771> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00772>
00773> IMPERVIOUS PERVIOUS (i)
00774> Surface Area (ha)= .86 .03
00775> Dep. Storage (mm)= 1.57 4.67
00776> Average Slope (%)= .93 .70
00777> Length (m)= 164.82 40.00
00778> Mannings n = .030 .250
00779>
00780> Max. eff. Inten. (mm/hr)= 76.81 10.24
00781> over (min)= 7.50 30.00
00782> Storage Coeff. (min)= 6.47 (ii) 30.53 (ii)
00783> Unit Hyd. Tpeak (min)= 7.50 30.00
00784> Unit Hyd. peak (cms)= .16 .04
00785>
00786> *TOTALS*
00787> PEAK FLOW (cms)= .14 .00 .139 (iii)
00788> TIME TO PEAK (hrs)= 1.04 1.54 1.042
00789> RUNOFF VOLUME (mm)= 30.29 8.52 29.637
00790> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00791> RUNOFF COEFFICIENT = .95 .27 .930
00792>
00793> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00794> CN* = 81.0 Ia = Dep. Storage (Above)
00795> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00796> THAN THE STORAGE COEFFICIENT.
00797> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00798>
00799>
00800> 001:0010-----
00801> *
00802> * SUB-AREA No.5
00803>
00804> | CALIB STANDHYD | Area (ha)= 2.66
00805> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00806>
00807> IMPERVIOUS PERVIOUS (i)
00808> Surface Area (ha)= 2.58 .08
00809> Dep. Storage (mm)= 1.57 4.67
00810> Average Slope (%)= .61 1.50
00811> Length (m)= 207.25 20.00

```

00811> Mannings n = .030 .250  
 00812>  
 00813> Max. eff. Inten. (mm/hr)= 76.81 12.71  
 00814> over (min) = 7.50 20.00  
 00815> Storage Coeff. (min)= 8.42 (ii) 20.00 (ii)  
 00816> Unit Hyd. Tpeak (min)= 7.50 20.00  
 00817> Unit Hyd. peak (cms)= .14 .06  
 00818>  
 00819> PEAK FLOW (cms)= .38 .00 \*TOTALS\*  
 00820> TIME TO PEAK (hrs)= 1.04 1.33 .379 (iii)  
 00821> RUNOFF VOLUME (mm)= 30.29 8.52 29.637  
 00822> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
 00823> RUNOFF COEFFICIENT = .95 .27 .930  
 00824>  
 00825> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 00826> CN\* = 81.0 Ia = Dep. Storage (Above)  
 00827> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 00828> THAN THE STORAGE COEFFICIENT.  
 00829> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 00830>  
 00831>

00832> 001:0011  
 00833> | ADD HYD (080) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 00834> (ha) (cms) (hrs) (mm) (cms)  
 00835> ID1 06:060 .89 .139 1.04 29.64 .000  
 00836> +ID2 07:070 2.66 .379 1.04 29.64 .000  
 00837>-----  
 00838> SUM 08:080 3.55 .518 1.04 29.64 .000  
 00839>  
 00840> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

00844> 001:0012  
 00845> | ADD HYD (090) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 00846> (ha) (cms) (hrs) (mm) (cms)  
 00847> ID1 05:050 5.01 .623 1.08 28.13 .000  
 00848> +ID2 08:090 3.55 .518 1.04 29.64 .000  
 00849>-----  
 00850> SUM 09:090 8.56 1.118 1.08 28.76 .000  
 00851>  
 00852> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 00853>  
 00854>  
 00855>  
 00856> 001:0013

00857> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
 00858> | IN>09 (090) |  
 00859> | OUT<10 (POND) |  
 00860>-----  
 00861> | OUTFLOW STORAGE | OUTFLOW STORAGE  
 00862> (cms) (ha.m.) (cms) (ha.m.)  
 00863> .000 .0000E+00 | .593 .6251E+00  
 00864> .008 .8360E-01 | .654 .6631E+00  
 00865> .017 .1311E+00 | .797 .7391E+00  
 00866> .093 .2831E+00 | .950 .8274E+00  
 00867> .233 .3971E+00 | 1.304 .9157E+00  
 00868> .337 .4731E+00 | 1.880 .1004E+01  
 00869> .465 .5491E+00 | 2.577 .1092E+01  
 00870> .531 .5871E+00 | .000 .0000E+00  
 00871>  
 00872> ROUTING RESULTS  
 00873> | DEP. STORAGE | AREA QPEAK TPEAK R.V.  
 00874> (mm) (ha) (cms) (hrs) (mm)  
 00875> INFLOW<09: (090) 8.56 1.118 1.08 28.757  
 00876> | OUTFLOW<10: (POND) 8.56 .056 3.000 28.754  
 00877>  
 00878> PEAK FLOW REDUCTION (Qout/Qin) (%) = 5.030  
 00879> TIME SHIFT OF PEAK FLOW (min) = 115.000  
 00880> MAXIMUM STORAGE USED (ha.m.) = .2095E+00  
 00881>

00882> 001:0014  
 00883> \*\*\*\*\*  
 00884> \* Remaining Hawthorne Industrial Park \*  
 00885> \*\*\*\*\*  
 00886> \*  
 00887> \* SUB-AREA No.1  
 00888> | CALIB STANDHYD | Area (ha)= 19.90  
 00889> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 00890>  
 00891> | IMPERVIOUS | PERVIOUS (i)  
 00892> Surface Area (ha)= 14.13 5.77  
 00893> Dep. Storage (mm)= 1.57 4.67  
 00894> Average Slope (%)= .60 1.50  
 00895> Length (m)= 580.00 100.00  
 00896> Mannings n = .030 .250  
 00897>  
 00898> Max. eff. Inten. (mm/hr)= 54.21 23.06  
 00899> over (min) = 17.50 42.50  
 00900> Storage Coeff. (min)= 18.04 (ii) 42.02 (ii)  
 00901> Unit Hyd. Tpeak (min)= 17.50 42.50  
 00902> Unit Hyd. peak (cms)= .06 .03  
 00903>  
 00904> PEAK FLOW (cms)= .95 .21 \*TOTALS\*  
 00905> TIME TO PEAK (hrs)= 1.21 1.71 1.250  
 00906> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
 00907> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
 00908> RUNOFF COEFFICIENT = .95 .42 .685  
 00909>  
 00910> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 00911> CN\* = 81.0 Ia = Dep. Storage (Above)  
 00912> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 00913> THAN THE STORAGE COEFFICIENT.  
 00914> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 00915>  
 00916>  
 00917>

00918> 001:0015  
 00919> | ADD HYD (H1P02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 00920> (ha) (cms) (hrs) (mm) (cms)  
 00921> ID1 10: POND 8.56 .056 3.00 28.75 .000  
 00922> +ID2 01:H1P01 19.90 1.020 1.25 21.81 .000  
 00923>-----  
 00924> SUM 02:H1P02 28.46 1.039 1.25 23.90 .000  
 00925>  
 00926> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 00927>  
 00928>  
 00929>

00930> 001:0016  
 00931> \*  
 00932> \* SUB-AREA No.2  
 00933> | CALIB STANDHYD | Area (ha)= 17.00  
 00934> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 00935>  
 00936> | IMPERVIOUS | PERVIOUS (i)  
 00937> Surface Area (ha)= 12.07 4.93  
 00938> Dep. Storage (mm)= 1.57 4.67  
 00939> Average Slope (%)= .65 1.50  
 00940> Length (m)= 450.00 100.00  
 00941> Mannings n = .030 .250  
 00942>  
 00943> Max. eff. Inten. (mm/hr)= 59.23 25.04  
 00944> over (min) = 15.00 37.50  
 00945>

00946> Storage Coeff. (min)= 14.60 (ii) 37.80 (ii)  
 00947> Unit Hyd. Tpeak (min)= 15.00 37.50  
 00948> Unit Hyd. peak (cms)= .08 .03  
 00949>  
 00950> PEAK FLOW (cms)= .91 .19 \*TOTALS\*  
 00951> TIME TO PEAK (hrs)= 1.17 1.63 .978 (iii)  
 00952> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
 00953> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
 00954> RUNOFF COEFFICIENT = .95 .42 .685  
 00955>  
 00956> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 00957> CN\* = 81.0 Ia = Dep. Storage (Above)  
 00958> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 00959> THAN THE STORAGE COEFFICIENT.  
 00960> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 00961>  
 00962>

00963> 001:0017  
 00964> \*  
 00965> \* SUB-AREA No.3  
 00966> | CALIB STANDHYD | Area (ha)= 15.60  
 00967> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 00968>  
 00969> | IMPERVIOUS | PERVIOUS (i)  
 00970> Surface Area (ha)= 11.08 4.52  
 00971> Dep. Storage (mm)= 1.57 4.67  
 00972> Average Slope (%)= .50 1.50  
 00973> Length (m)= 600.00 100.00  
 00974> Mannings n = .030 .250  
 00975>  
 00976> Max. eff. Inten. (mm/hr)= 50.44 22.17  
 00977> over (min) = 20.00 45.00  
 00978> Storage Coeff. (min)= 20.01 (ii) 44.37 (ii)  
 00979> Unit Hyd. Tpeak (min)= 20.00 45.00  
 00980> Unit Hyd. peak (cms)= .06 .03  
 00981>  
 00982> PEAK FLOW (cms)= .69 .16 \*TOTALS\*  
 00983> TIME TO PEAK (hrs)= 1.25 1.79 .753 (iii)  
 00984> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
 00985> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
 00986> RUNOFF COEFFICIENT = .95 .42 .685  
 00987>  
 00988> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 00989> CN\* = 81.0 Ia = Dep. Storage (Above)  
 00990> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 00991> THAN THE STORAGE COEFFICIENT.  
 00992> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 00993>  
 00994>

00996> 001:0018  
 00997> | ADD HYD (H1P05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 00998> (ha) (cms) (hrs) (mm) (cms)  
 00999> ID1 03:H1P03 15.60 .753 1.29 21.81 .000  
 01000> +ID2 04:H1P04 15.60 .753 1.29 21.81 .000  
 01001>-----  
 01002> SUM 05:H1P05 32.60 1.698 1.21 21.81 .000  
 01003>  
 01004> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 01005>  
 01006>  
 01007>  
 01008> 001:0019

01009> | ADD HYD (H1P06) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 01010> (ha) (cms) (hrs) (mm) (cms)  
 01011> ID1 05:H1P05 32.60 1.698 1.21 21.81 .000  
 01012> +ID2 02:H1P02 28.46 1.039 1.25 23.90 .000  
 01013>-----  
 01014> SUM 06:H1P06 61.06 2.733 1.21 22.79 .000  
 01015>  
 01016> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 01017>  
 01018>

01020> 001:0020  
 01021> \*  
 01022> \* SUB-AREA No.4  
 01023> | CALIB STANDHYD | Area (ha)= 12.20  
 01024> | 07:H1P07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 01025>  
 01026> | IMPERVIOUS | PERVIOUS (i)  
 01027> Surface Area (ha)= 8.66 3.54  
 01028> Dep. Storage (mm)= 1.57 4.67  
 01029> Average Slope (%)= .70 1.50  
 01030> Length (m)= 210.00 100.00  
 01031> Mannings n = .030 .250  
 01032>  
 01033> Max. eff. Inten. (mm/hr)= 76.81 29.02  
 01034> over (min) = 7.50 30.00  
 01035> Storage Coeff. (min)= 8.15 (ii) 30.01 (ii)  
 01036> Unit Hyd. Tpeak (min)= 7.50 30.00  
 01037> Unit Hyd. peak (cms)= .14 .04  
 01038>  
 01039> PEAK FLOW (cms)= .91 .16 \*TOTALS\*  
 01040> TIME TO PEAK (hrs)= 1.04 1.50 1.042 (iii)  
 01041> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
 01042> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
 01043> RUNOFF COEFFICIENT = .95 .42 .685  
 01044>  
 01045> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 01046> CN\* = 81.0 Ia = Dep. Storage (Above)  
 01047> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 01048> THAN THE STORAGE COEFFICIENT.  
 01049> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 01050>  
 01051>

01052> 001:0021  
 01053> \* SUB-AREA No.5  
 01054> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
 01055> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
 01056> U.H. Tp (hrs)= 1.70  
 01057>  
 01058> Unit Hyd Opeak (cms)= .899  
 01059>  
 01060> PEAK FLOW (cms)= .145 (i)  
 01061> TIME TO PEAK (hrs)= 1.167  
 01062> RUNOFF VOLUME (mm)= 10.266  
 01063> TOTAL RAINFALL (mm)= 31.860  
 01064> RUNOFF COEFFICIENT = .322  
 01065>  
 01066> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 01067>  
 01068>

01070> 001:0022  
 01071> | ADD HYD (H1P08) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 01072> (ha) (cms) (hrs) (mm) (cms)  
 01073> ID1 06:H1P06 61.06 2.733 1.21 22.79 .000  
 01074> +ID2 07:H1P07 12.20 .941 1.04 21.81 .000  
 01075> +ID3 08:Pond-B 4.00 .145 1.17 10.27 .000  
 01076>-----  
 01077> SUM 09:H1P08 77.26 3.542 1.21 21.98 .000  
 01078>  
 01079>  
 01080>

01081> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01082>  
01083>  
01084>  
01085> 001:0023  
01086> \*  
01087> \*SUB-AREA No. 6  
01088> \*  
01089>  
01090> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00  
01091> | 01:A3 DT= 2.50 | Ia = 4.670 # of Linear Res. (N) = 3.00  
01092> | U.H. Tp (hrs)= .800  
01093>  
01094> Unit Hyd. Tpeak (cms) = .129  
01095>  
01096> PEPAK FLOW (cms) = .024 (i)  
01097> TIME TO PEAK (hrs) = 2.083  
01098> RUNOFF VOLUME (mm) = 6.883  
01099> TOTAL RAINFALL (mm) = 31.860  
01100> RUNOFF COEFFICIENT = .216  
01101>  
01102> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01103>  
01104>  
01105> 001:0024  
01106>  
01107> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
01108> | ID1 09:HIP08 | (ha) (cms) (hrs) (mm) (cms)  
01109> | ID2 01:A3 | 2.70 .024 2.08 6.88 .000  
01110> | SUM 02:Ultima | 79.96 3.548 1.21 21.47 .000  
01111>  
01112>  
01113> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01114>  
01115>  
01116>  
01117> 001:0025  
01118> \*\*\*\*\*  
01119> \* CALCULATION OF 3HR - 1.5 YEAR STORM EVENT \*  
01120> \*\*\*\*\*  
01121>  
01122> | START | Project dir.: V:\20983.DU\ENG\SWM\HYMO\  
01123> | Rainfall dir.: V:\20983.DU\ENG\SWM\HYMO\  
01124> | TZERO = .00 hrs on  
01125> | METOUT= 2 (output = METRIC)  
01126> | NRUN = 001  
01127> | NSTORM = 0  
01128>  
01129> 001:0002  
01130>  
01131> | CHICAGO STORM | IDF curve parameters: A= 998.071  
01132> | Ptotal = 42.51 mm | B= 6.053  
01133> | C= .814  
01134> used in: INTENSITY = A / (t + B)^C  
01135>  
01136> Duration of storm = 3.00 hrs  
01137> Storm time step = 10.00 min  
01138> Time to peak ratio = .33  
01139>  
01140> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
01141> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
01142> 17 3.682 | 1.00 104.193 | 1.83 6.689 | 2.67 3.510  
01143> 33 4.582 | 1.17 32.037 | 2.00 5.628 | 2.83 3.220  
01144> 50 6.151 | 1.33 16.337 | 2.17 4.872 | 3.00 2.978  
01145> 67 9.614 | 1.50 10.965 | 2.33 3.405 |  
01146> 83 24.170 | 1.67 8.287 | 2.50 3.864 |  
01147>  
01148>  
01149> 001:0003  
01150>  
01151> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWM\HYMO\ORGA.VAL  
01152> | ICASEDv = 1 (read and print data)  
01153> | FileTitle = ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---  
01154> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ---  
01155> | Horton's infiltration equation parameters:  
01156> | [F0 = 50.00 mm/hr] [F1 = 7.50 mm/hr] [DCAY = 2.00 /hr] [P = .00 mm]  
01157> | Parameters for PERVIOUS surfaces in STANDHYD:  
01158> | [LPage = 4.67 mm] [LGP=40.00 mm] [MFP= .250]  
01159> | Parameters for IMPERVIOUS surfaces in STANDHYD:  
01160> | [IAimp = 1.57 mm] [CLI = 1.50] [MNI = .035]  
01161> | Parameters used in NASHYD:  
01162> | [Ia = 4.67 mm] [N = 3.00]  
01163>  
01164> 001:0004  
01165> \*\*\*\*\*  
01166> \* ORGAWORLD FILE \*  
01167> \* SUB-AREA No.1  
01168> \*  
01169>  
01170> | CALIB STANDHYD | Area (ha)= 2.07  
01171> | 01:010 DT= 2.50 | Total Imp(%) = 84.00 Dir. Conn. (%) = 84.00  
01172>  
01173>  
01174> | IMPERVIOUS PERVIOUS (i)  
01175> Surface Area (ha) = 1.74 .33  
01176> Dep. Storage (mm) = 1.57 4.67  
01177> Average Slope (%) = .52 1.00  
01178> Length (m) = 204.72 20.00  
01179> Mannings n = .030 .250  
01180> Max. eff. Inten. (mm/hr) = 104.19 24.26  
01181> over (min) = 7.50 17.50  
01182> Storage Coeff. (min) = 7.76 (ii) 17.86 (ii)  
01183> Unit Hyd. Tpeak (min) = 7.50 17.50  
01184> Unit Hyd. peak (cms) = .15 .06  
01185> \*TOTALS\*  
01186> PEAK FLOW (cms) = .36 .01 .362 (iii)  
01187> TIME TO PEAK (hrs) = 1.04 1.25 1.042  
01188> RUNOFF VOLUME (mm) = 40.94 14.70 36.745  
01189> TOTAL RAINFALL (mm) = 42.51 42.51 42.514  
01190> RUNOFF COEFFICIENT = .96 .35 .914  
01191>  
01192> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01193> CN\* = 81.0 Ia = Dep. Storage (Above)  
01194> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01195> THAN THE STORAGE COEFFICIENT.  
01196> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01197>  
01198>  
01199> 001:0005  
01200> \*  
01201> \* SUB-AREA No.2  
01202>  
01203> | CALIB STANDHYD | Area (ha)= 1.54  
01204> | 02:020 DT= 2.50 | Total Imp(%) = 92.00 Dir. Conn. (%) = 92.00  
01205>  
01206> | IMPERVIOUS PERVIOUS (i)  
01207> Surface Area (ha) = 1.42 .12  
01208> Dep. Storage (mm) = 1.57 4.67  
01209> Average Slope (%) = .50 1.00  
01210> Length (m) = 244.34 5.00  
01211> Mannings n = .030 .030  
01212>  
01213> Max. eff. Inten. (mm/hr) = 104.19 31.02  
01214> over (min) = 7.50 10.00  
01215> Storage Coeff. (min) = 8.73 (ii) 9.85 (ii)

01216> Unit Hyd. Tpeak (min) = 7.50 10.00  
01217> Unit Hyd. peak (cms) = .14 .11  
01218> \*TOTALS\*  
01219> PEAK FLOW (cms) = .28 .01 .283 (iii)  
01220> TIME TO PEAK (hrs) = 1.04 1.13 1.042  
01221> RUNOFF VOLUME (mm) = 40.94 14.70 36.845  
01222> TOTAL RAINFALL (mm) = 42.51 42.51 42.514  
01223> RUNOFF COEFFICIENT = .96 .35 .914  
01224>  
01225> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01226> CN\* = 81.0 Ia = Dep. Storage (Above)  
01227> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01228> THAN THE STORAGE COEFFICIENT.  
01229> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01230>  
01231>  
01232> 001:0006  
01233> \*  
01234> \* SUB-AREA No.3  
01235>  
01236> | CALIB STANDHYD | Area (ha)= 1.40  
01237> | 03:030 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn. (%) = 97.00  
01238>  
01239> | IMPERVIOUS PERVIOUS (i)  
01240> Surface Area (ha) = 1.36 .04  
01241> Dep. Storage (mm) = 1.57 4.67  
01242> Average Slope (%) = .51 1.00  
01243> Length (m) = 225.63 5.00  
01244> Mannings n = .030 .030  
01245>  
01246> Max. eff. Inten. (mm/hr) = 104.19 31.02  
01247> over (min) = 7.50 10.00  
01248> Storage Coeff. (min) = 8.28 (ii) 9.39 (ii)  
01249> Unit Hyd. Tpeak (min) = 7.50 10.00  
01250> Unit Hyd. peak (cms) = .14 .12  
01251> \*TOTALS\*  
01252> PEAK FLOW (cms) = .27 .00 .274 (iii)  
01253> TIME TO PEAK (hrs) = 1.04 1.13 1.042  
01254> RUNOFF VOLUME (mm) = 40.94 14.70 40.157  
01255> TOTAL RAINFALL (mm) = 42.51 42.51 42.514  
01256> RUNOFF COEFFICIENT = .96 .35 .945  
01257>  
01258> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01259> CN\* = 81.0 Ia = Dep. Storage (Above)  
01260> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01261> THAN THE STORAGE COEFFICIENT.  
01262> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01263>  
01264>  
01265> 001:0007  
01266>  
01267> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
01268> | ID1 01:010 | (ha) (cms) (hrs) (mm) (cms)  
01269> | ID2 02:020 | 1.54 .362 1.04 36.75 .000  
01270> | SUM 04:040 | 3.61 .645 1.04 37.64 .000  
01271>  
01272>  
01273> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01274>  
01275>  
01276>  
01277> 001:0008  
01278>  
01279> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
01280> | ID1 03:030 | (ha) (cms) (hrs) (mm) (cms)  
01281> | ID2 04:040 | 3.61 .645 1.04 37.64 .000  
01282> | SUM 05:050 | 5.01 .918 1.04 38.34 .000  
01283>  
01284>  
01285> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01286>  
01287>  
01288>  
01289> 001:0009  
01290>  
01291> \* SUB-AREA No.4  
01292>  
01293> | CALIB STANDHYD | Area (ha)= .89  
01294> | 06:060 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn. (%) = 97.00  
01295>  
01296> | IMPERVIOUS PERVIOUS (i)  
01297> Surface Area (ha) = .86 .03  
01298> Dep. Storage (mm) = 1.57 4.67  
01299> Average Slope (%) = .52 1.00  
01300> Length (m) = 164.82 40.00  
01301> Mannings n = .030 .250  
01302>  
01303> Max. eff. Inten. (mm/hr) = 104.19 20.32  
01304> over (min) = 5.00 25.00  
01305> Storage Coeff. (min) = 5.72 (ii) 24.02 (ii)  
01306> Unit Hyd. Tpeak (min) = 5.00 25.00  
01307> Unit Hyd. peak (cms) = .20 .05  
01308> \*TOTALS\*  
01309> PEAK FLOW (cms) = .20 .00 .205 (iii)  
01310> TIME TO PEAK (hrs) = 1.00 1.38 1.000  
01311> RUNOFF VOLUME (mm) = 40.94 14.70 40.157  
01312> TOTAL RAINFALL (mm) = 42.51 42.51 42.514  
01313> RUNOFF COEFFICIENT = .96 .35 .945  
01314>  
01315> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01316> CN\* = 81.0 Ia = Dep. Storage (Above)  
01317> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01318> THAN THE STORAGE COEFFICIENT.  
01319> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01320>  
01321>  
01322> 001:0010  
01323> \*  
01324> \* SUB-AREA No.5  
01325>  
01326> | CALIB STANDHYD | Area (ha)= 2.66  
01327> | 07:070 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn. (%) = 97.00  
01328>  
01329> | IMPERVIOUS PERVIOUS (i)  
01330> Surface Area (ha) = 2.58 .08  
01331> Dep. Storage (mm) = 1.57 4.67  
01332> Average Slope (%) = .61 1.50  
01333> Length (m) = 207.25 20.00  
01334> Mannings n = .030 .250  
01335>  
01336> Max. eff. Inten. (mm/hr) = 104.19 24.26  
01337> over (min) = 7.50 17.50  
01338> Storage Coeff. (min) = 7.45 (ii) 16.40 (ii)  
01339> Unit Hyd. Tpeak (min) = 7.50 17.50  
01340> Unit Hyd. peak (cms) = .15 .07  
01341> \*TOTALS\*  
01342> PEAK FLOW (cms) = .54 .00 .538 (iii)  
01343> TIME TO PEAK (hrs) = 1.04 1.25 1.042  
01344> RUNOFF VOLUME (mm) = 40.94 14.70 40.157  
01345> TOTAL RAINFALL (mm) = 42.51 42.51 42.514  
01346> RUNOFF COEFFICIENT = .96 .35 .945  
01347>  
01348> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01349> CN\* = 81.0 Ia = Dep. Storage (Above)  
01350> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL



01351> THAN THE STORAGE COEFFICIENT.  
01352> (i.ii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01353>  
01354>  
01355> 001:0011

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 06:060	.89	.205	1.00	40.16	.000
+ID2 07:070	2.66	.538	1.04	40.16	.000
SUM 08:080	3.55	.733	1.04	40.16	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01366> 001:0012

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 05:050	5.01	.918	1.04	38.34	.000
+ID2 08:080	3.55	.733	1.04	40.16	.000
SUM 09:090	8.56	1.651	1.04	39.10	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01379> 001:0013

01381> ROUTE RESERVOIR Requested routing time step = 1.0 min.  
01382> IN>09: (09) )  
01383> OUT<10: (POND) )

OUTFLOW STORAGE (cms)	OUTFLOW STORAGE (ha.m.)	OUTFLOW STORAGE (cms)	OUTFLOW STORAGE (ha.m.)
.000	.0000E+00	.593	.625E+00
.008	.6560E-01	.654	.663E+00
.017	.131E+00	.797	.739E+00
.093	.283E+00	.950	.827E+00
.233	.397E+00	1.304	.915E+00
.337	.473E+00	1.880	.100E+01
.463	.549E+00	2.577	.1092E+01
.531	.587E+00	.000	.0000E+00

ROUTING RESULTS

INFLW>09: (09)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
OUTFLOW<10: (POND)	8.56	1.651	1.042	39.096
	8.56	.089	2.625	39.093

PEAK FLOW REDUCTION [Qout/Qin] (%) = 5.413  
TIME SHIFT OF PEAK FLOW (min) = 95.00  
MAXIMUM STORAGE USED (ha.m.) = .2758E+00

01405> 001:0014

01406> \*\*\*\*\*  
01407> \* Remaining Hawthorne Industrial Park \*  
01408> \*  
01409> \*  
01410> \* SUB-AREA No.1

CALIB STANDHYD	Area (ha)	Total Imp (%)	Dir. Conn. (%)
01:HIP01 DT= 2.50	19.90	71.00	50.00

Surface Area (ha)	IMPERVIOUS	PERVIOUS (i)
14.13	5.77	
Dep. Storage (mm)	1.57	4.67
Average Slope (%)	1.50	1.50
Length (m)	580.00	100.00
Mannings n	.030	.250
Max. eff. Inten. (mm/hr)	80.14	42.65
over (min)	15.00	35.00
Storage Coeff. (min)	15.43 (ii)	34.18 (ii)
Unit Hyd. Tpeak (min)	15.00	35.00
Unit Hyd. peak (cms)	.07	.03
PEAK FLOW (cms)	1.41	.40
TIME TO PEAK (hrs)	1.17	1.54
RUNOFF VOLUME (mm)	40.94	21.31
TOTAL RAINFALL (mm)	42.51	42.51
RUNOFF COEFFICIENT	.96	.50

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 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.

01441> 001:0015

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 10:POND	8.56	.089	2.63	39.09	.000
+ID2 01:HIP01	19.90	1.572	1.21	31.13	.000
SUM 02:HIP02	28.46	1.615	1.21	33.52	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01452> 001:0016

01453> \*  
01454> \*  
01455> \* SUB-AREA No.2

CALIB STANDHYD	Area (ha)	Total Imp (%)	Dir. Conn. (%)
03:HIP03 DT= 2.50	17.00	71.00	50.00

Surface Area (ha)	IMPERVIOUS	PERVIOUS (i)
12.07	4.93	
Dep. Storage (mm)	1.57	4.67
Average Slope (%)	1.50	1.50
Length (m)	450.00	100.00
Mannings n	.030	.250
Max. eff. Inten. (mm/hr)	89.76	47.48
over (min)	12.50	30.00
Storage Coeff. (min)	12.36 (ii)	30.32 (ii)
Unit Hyd. Tpeak (min)	12.50	30.00
Unit Hyd. peak (cms)	.09	.04
PEAK FLOW (cms)	1.36	.37
TIME TO PEAK (hrs)	1.13	1.46
RUNOFF VOLUME (mm)	40.94	21.31
TOTAL RAINFALL (mm)	42.51	42.51
RUNOFF COEFFICIENT	.96	.50

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 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.

01486> 001:0017

01487> \*  
01488> \* SUB-AREA No.3

CALIB STANDHYD	Area (ha)	Total Imp (%)	Dir. Conn. (%)
04:HIP04 DT= 2.50	15.60	71.00	50.00

Surface Area (ha)	IMPERVIOUS	PERVIOUS (i)
11.08	4.52	
Dep. Storage (mm)	1.57	4.67
Average Slope (%)	.50	1.50
Length (m)	600.00	100.00
Mannings n	.030	.250
Max. eff. Inten. (mm/hr)	73.27	42.65
over (min)	17.50	35.00
Storage Coeff. (min)	17.24 (ii)	35.98 (ii)
Unit Hyd. Tpeak (min)	17.50	35.00
Unit Hyd. peak (cms)	.07	.03
PEAK FLOW (cms)	1.03	.30
TIME TO PEAK (hrs)	1.21	1.54
RUNOFF VOLUME (mm)	40.94	21.31
TOTAL RAINFALL (mm)	42.51	42.51
RUNOFF COEFFICIENT	.96	.50

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 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.

01518> 001:0018

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 03:HIP03	17.00	1.504	1.17	31.13	.000
+ID2 04:HIP04	15.60	1.176	1.25	31.13	.000
SUM 05:HIP05	32.60	2.621	1.17	31.13	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01530> 001:0019

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 05:HIP05	32.60	1.615	1.21	33.52	.000
+ID2 02:HIP02	28.46	1.615	1.21	33.52	.000
SUM 06:HIP06	61.06	4.222	1.17	32.24	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01542> 001:0020

01543> \*  
01544> \*  
01545> \* SUB-AREA No.4

CALIB STANDHYD	Area (ha)	Total Imp (%)	Dir. Conn. (%)
07:HIP07 DT= 2.50	12.20	71.00	50.00

Surface Area (ha)	IMPERVIOUS	PERVIOUS (i)
8.66	3.54	
Dep. Storage (mm)	1.57	4.67
Average Slope (%)	.70	1.50
Length (m)	210.00	100.00
Mannings n	.030	.250
Max. eff. Inten. (mm/hr)	104.19	52.96
over (min)	7.50	25.00
Storage Coeff. (min)	7.21 (ii)	24.40 (ii)
Unit Hyd. Tpeak (min)	7.50	25.00
Unit Hyd. peak (cms)	.15	.05
PEAK FLOW (cms)	1.28	.31
TIME TO PEAK (hrs)	1.04	1.38
RUNOFF VOLUME (mm)	40.94	21.31
TOTAL RAINFALL (mm)	42.51	42.51
RUNOFF COEFFICIENT	.96	.50

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 81.0 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.

01575> 001:0021

01576> \*  
01577> \*  
01578> \* SUB-AREA No.5

DESIGN NASHYD	Area (ha)	Curve Number (CN)	Curve Number (N)
08:Pond-B DT= 2.50	4.00	85.00	3.00

U.H. Tp (hrs) = .170

Unit Hyd Qpeak (cms) = .899

PEAK FLOW (cms) = .260 (i)  
TIME TO PEAK (hrs) = 1.167  
RUNOFF VOLUME (mm) = 17.325  
TOTAL RAINFALL (mm) = 42.514  
RUNOFF COEFFICIENT = .408

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

01595> 001:0022

ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 06:HIP06	61.06	4.222	1.17	32.24	.000
+ID2 07:HIP07	12.20	1.375	1.04	31.13	.000
+ID3 08:Pond-B	4.00	.260	1.17	17.32	.000
SUM 09:HIP08	77.26	5.845	1.17	31.29	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01607> 001:0023

01608> \*  
01609> \*  
01610> \* SUB-AREA No. 6

DESIGN NASHYD	Area (ha)	Curve Number (CN)	Curve Number (N)
01:A3 DT= 2.50	2.70	76.00	3.00

U.H. Tp (hrs) = .800

Unit Hyd Qpeak (cms) = .129

PEAK FLOW (cms) = .044 (i)  
TIME TO PEAK (hrs) = 2.042

```

01621> RUNOFF VOLUME (mm) = 12.131
01622> TOTAL RAINFALL (mm) = 42.514
01623> RUNOFF COEFFICIENT = .285
01624>
01625> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01627>
01628> 001:002 4-----
01629>
01630> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01631> | Pctal= 45.50 mm | (ha) (cms) (hrs) (mm) (cms)
01632> | ID1 09:HIF08 77.26 5.545 1.17 31.29 .000
01633> | +ID2 01:A3 2.70 .044 2.04 12.13 .000
01634>
01635> SUM 02:Ultima 79.96 5.554 1.17 30.65 .000
01637>
01638> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01639>
01640> 001:002 5-----
01641> *****
01642> * CALCULATION OF 3HR - 1:10 YEAR STORM EVENT *
01643> *****
01644>
01645> | START | Project dir.: V:\20983.DU\ENG\SWHYMO\
01646> | Rainfall dir.: V:\20983.DU\ENG\SWHYMO\
01647>
01648> TZERO = .00 hrs on 0
01649> METCUT= 2 (output = METRIC)
01650> NRUN = 001
01651> NSTCRM= 0
01652>
01653> 001:000 2-----
01654> | CHICAGO STORM | IDF curve parameters: A=1174.184
01655> | Pctal= 45.50 mm | B= 6.014
01656> | Rf= 816 C= .816
01657> used in: INTENSITY = A / (t + B)^C
01658>
01659> Duration of storm = 3.00 hrs
01660> Storm time step = 10.00 min
01661> Time to peak ratio = .33
01662>
01663> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
01664> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
01665> .17 4.248 | 1.00 122.142 | 1.83 7.733 | 2.67 4.049
01666> .33 5.290 | 1.17 37.285 | 2.00 6.502 | 2.83 3.719
01667> .50 7.108 | 1.33 18.954 | 2.17 5.625 | 3.00 3.434
01668> .67 11.130 | 1.50 12.700 | 2.33 4.969 |
01669> .83 28.100 | 1.67 9.588 | 2.50 4.458 |
01670>
01671>
01672> 001:000 3-----
01673>
01674> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWHYMO\ORGA.VAL
01675> | ICRSEV = 1 (read and print data)
01676>
01677> Filetitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
01678> ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----
01679> Horton's infiltration equation parameters:
01680> [F0= 50.00 mm/hr] [F= 7.50 mm/hr] [DCA= 2.00 /hr] [F = .00 mm]
01681> Parameters for PERVIOUS surfaces in STANDHYD:
01682> [LApex= 4.67 mm] [LGP=40.00 mm] [MNP= 250]
01683> Parameters for IMPERVIOUS surfaces in STANDHYD:
01684> [LAlnp= 1.57 mm] [CLI= 1.50] [MNI= .035]
01685> Parameters used in WASHYD:
01686> [Lash 4.67 mm] [N= 3.00]
01687>
01688> 001:000 4-----
01689> *****
01690> * ORGAWORLD FILE *****
01691> * SUB-AREA No.1 *****
01692>
01693> | CALIB STANDHYD | Area (ha)= 2.07 Dir. Conn.(%)= 84.00
01694> | 01:010 DT= 2.50 | Total Imp(%)= 84.00
01695>
01696> IMPERVIOUS PERVIOUS (i)
01697> Surface Area (ha)= 1.74 .33
01698> Dep. Storage (mm)= 1.57 4.67
01699> Average Slope (%)= .52 1.00
01700> Length (m)= 204.72 20.00
01701> Mannings n = .030 .250
01702>
01703> Max. eff. Inten. (mm/hr)= 122.14 34.69
01704> over (min)= 7.50 15.00
01705> Storage Coeff. (min)= 7.28 (ii) 15.04 (ii)
01706> Unit Hyd. Tpeak (min)= 7.50 15.00
01707> Unit Hyd. peak (cms)= .15 .07
01708>
01709> PEAK FLOW (cms)= .43 .02 *TOTALS*
01710> TIME TO PEAK (hrs)= 1.04 1.21 1.437 (iii)
01711> RUNOFF VOLUME (mm)= 47.93 19.25 43.345
01712> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01713> RUNOFF COEFFICIENT = .97 .39 .876
01714>
01715> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01716> CN* = 81.0 Ia = Dep. Storage (Above)
01717> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01718> THAN THE STORAGE COEFFICIENT.
01719> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01720>
01721>
01722> 001:000 5-----
01723> *
01724> * SUB-AREA No.2 *****
01725>
01726> | CALIB STANDHYD | Area (ha)= 1.54 Dir. Conn.(%)= 92.00
01727> | 02:020 DT= 2.50 | Total Imp(%)= 92.00
01728>
01729> IMPERVIOUS PERVIOUS (i)
01730> Surface Area (ha)= 1.42 .12
01731> Dep. Storage (mm)= 1.57 4.67
01732> Average Slope (%)= .50 1.00
01733> Length (m)= 244.34 5.00
01734> Mannings n = .030 .030
01735>
01736> Max. eff. Inten. (mm/hr)= 122.14 42.32
01737> over (min)= 7.50 10.00
01738> Storage Coeff. (min)= 8.20 (ii) 9.18 (ii)
01739> Unit Hyd. Tpeak (min)= 7.50 10.00
01740> Unit Hyd. peak (cms)= .14 .12
01741>
01742> PEAK FLOW (cms)= .33 .01 *TOTALS*
01743> TIME TO PEAK (hrs)= 1.04 1.13 1.042
01744> RUNOFF VOLUME (mm)= 47.93 19.25 45.640
01745> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01746> RUNOFF COEFFICIENT = .97 .39 .922
01747>
01748> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01749> CN* = 81.0 Ia = Dep. Storage (Above)
01750> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01751> THAN THE STORAGE COEFFICIENT.
01752> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01753>
01754>
01755> 001:000 6-----

```

```

01756> *
01757> * SUB-AREA No.3 *****
01758>
01759> | CALIB STANDHYD | Area (ha)= 1.40 Dir. Conn.(%)= 97.00
01760> | 03:030 DT= 2.50 | Total Imp(%)= 97.00
01761>
01762> IMPERVIOUS PERVIOUS (i)
01763> Surface Area (ha)= 1.36 .04
01764> Dep. Storage (mm)= 1.57 4.67
01765> Average Slope (%)= .51 1.00
01766> Length (m)= 225.63 5.00
01767> Mannings n = .030 .030
01768>
01769> Max. eff. Inten. (mm/hr)= 122.14 48.18
01770> over (min)= 7.50 7.50
01771> Storage Coeff. (min)= 7.77 (ii) 8.70 (ii)
01772> Unit Hyd. Tpeak (min)= 7.50 7.50
01773> Unit Hyd. peak (cms)= .15 .14
01774>
01775> PEAK FLOW (cms)= .33 .00 *TOTALS*
01776> TIME TO PEAK (hrs)= 1.04 1.08 1.042 (iii)
01777> RUNOFF VOLUME (mm)= 47.93 19.25 47.074
01778> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01779> RUNOFF COEFFICIENT = .97 .39 .951
01780>
01781> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01782> CN* = 81.0 Ia = Dep. Storage (Above)
01783> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01784> THAN THE STORAGE COEFFICIENT.
01785> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01786>
01787>
01788> 001:000 7-----
01789>
01790> | ADD HYD (040) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01791> | (ha) (cms) (hrs) (mm) (cms)
01792> | ID1 01:010 2.07 .437 1.04 43.35 .000
01793> | +ID2 02:020 1.54 .341 1.04 45.64 .000
01794>
01795> SUM 04:040 3.61 .778 1.04 44.32 .000
01797>
01798> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01799>
01800> 001:000 8-----
01801>
01802> | ADD HYD (050) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01803> | (ha) (cms) (hrs) (mm) (cms)
01804> | ID1 03:030 1.40 .329 1.04 47.07 .000
01805> | +ID2 04:040 3.61 .778 1.04 44.32 .000
01806>
01807> SUM 05:050 5.01 1.107 1.04 45.09 .000
01808>
01809> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01810>
01811>
01812> 001:000 9-----
01813> *
01814> * SUB-AREA No.4 *****
01815>
01816> | CALIB STANDHYD | Area (ha)= .89 Dir. Conn.(%)= 97.00
01817> | 06:060 DT= 2.50 | Total Imp(%)= 97.00
01818>
01819> IMPERVIOUS PERVIOUS (i)
01820> Surface Area (ha)= .86 .03
01821> Dep. Storage (mm)= 1.57 4.67
01822> Average Slope (%)= .93 .70
01823> Length (m)= 164.82 40.00
01824> Mannings n = .030 .250
01825>
01826> Max. eff. Inten. (mm/hr)= 122.14 31.19
01827> over (min)= 5.00 20.00
01828> Storage Coeff. (min)= 5.37 (ii) 20.78 (ii)
01829> Unit Hyd. Tpeak (min)= 5.00 20.00
01830> Unit Hyd. peak (cms)= .21 .06
01831>
01832> PEAK FLOW (cms)= .24 .00 *TOTALS*
01833> TIME TO PEAK (hrs)= 1.00 1.29 1.245 (iii)
01834> RUNOFF VOLUME (mm)= 47.93 19.25 47.074
01835> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01836> RUNOFF COEFFICIENT = .97 .39 .951
01837>
01838> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01839> CN* = 81.0 Ia = Dep. Storage (Above)
01840> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01841> THAN THE STORAGE COEFFICIENT.
01842> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01843>
01844>
01845> 001:001 0-----
01846>
01847> * SUB-AREA No.5 *****
01848>
01849> | CALIB STANDHYD | Area (ha)= 2.66 Dir. Conn.(%)= 97.00
01850> | 07:070 DT= 2.50 | Total Imp(%)= 97.00
01851>
01852> IMPERVIOUS PERVIOUS (i)
01853> Surface Area (ha)= 2.58 .08
01854> Dep. Storage (mm)= 1.57 4.67
01855> Average Slope (%)= .61 1.50
01856> Length (m)= 207.25 20.00
01857> Mannings n = .030 .250
01858>
01859> Max. eff. Inten. (mm/hr)= 122.14 34.69
01860> over (min)= 7.50 15.00
01861> Storage Coeff. (min)= 7.00 (ii) 14.75 (ii)
01862> Unit Hyd. Tpeak (min)= 7.50 15.00
01863> Unit Hyd. peak (cms)= .16 .08
01864>
01865> PEAK FLOW (cms)= .64 .00 *TOTALS*
01866> TIME TO PEAK (hrs)= 1.04 1.21 1.042 (iii)
01867> RUNOFF VOLUME (mm)= 47.93 19.25 47.074
01868> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01869> RUNOFF COEFFICIENT = .97 .39 .951
01870>
01871> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01872> CN* = 81.0 Ia = Dep. Storage (Above)
01873> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01874> THAN THE STORAGE COEFFICIENT.
01875> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01876>
01877>
01878> 001:001 1-----
01879>
01880> | ADD HYD (080) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01881> | (ha) (cms) (hrs) (mm) (cms)
01882> | ID1 06:060 .89 .645 1.04 47.07 .000
01883> | +ID2 07:070 2.66 .645 1.04 47.07 .000
01884>
01885> SUM 08:080 3.55 .876 1.04 47.07 .000
01887>
01888> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01889>
01890> 001:001 2-----

```

01891>-----  
01892> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01893> | | | (ha) (cms) (hrs) (mm) (cms)  
01894> | ID1 05:050 | 5.01 1.107 1.04 45.09 .000  
01895> | +ID2 08:080 | 3.55 .876 1.04 47.07 .000  
01896> |-----  
01897> | SUM 09:090 | 8.56 1.984 1.04 45.91 .000  
01898>-----  
01899> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01900>-----  
01901>-----  
01902> 001:0013-----  
01903>-----  
01904> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
01905> | IN>09: (090 ) |  
01906> | OUT<10: (POND ) |  
01907>-----  
01908> |=====  
01909> | OUTFLOW STORAGE TABLE |=====  
01910> | (cms) (ha.m.) | (cms) (ha.m.) |  
01911> | .000 .000E+00 | .593 .6251E+00 |  
01912> | .008 .6560E-01 | .654 .6631E+00 |  
01913> | .017 .1311E+00 | .797 .7391E+00 |  
01914> | .093 .2831E+00 | .950 .8274E+00 |  
01915> | .233 .3971E+00 | 1.304 .9157E+00 |  
01916> | .337 .4731E+00 | 1.880 .1004E+01 |  
01917> | .465 .5491E+00 | 2.577 .1002E+01 |  
01918> | .531 .5871E+00 | .000 .0000E+00 |  
01919>-----  
01920> | ROUTING RESULTS | AREA OPEAK TPEAK R.V. |  
01921> | (ha) (cms) (hrs) (mm) |  
01922> | INFLOW >09: (090 ) | 8.56 1.984 1.042 45.914 |  
01923> | OUTFLOW <10: (POND ) | 8.56 .132 2.278 45.912 |  
01924>-----  
01925> | PEAK FLOW REDUCTION [Qout/Qin] (%) = 6.640 |  
01926> | TIME SHIFT OF PEAK FLOW (min) = 74.17 |  
01927> | MAXIMUM STORAGE USED (ha.m.) = 314.6E+00 |  
01928>-----  
01929> 001:0014-----  
01930> \*\*\*\*\*  
01931> \* Remaining Hawthorne Industrial Park \*  
01932> \*\*\*\*\*  
01933> \* SUB-AREA No.1  
01934>-----  
01935> | CALIB STANDHYD | Area (ha)= 19.90  
01936> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01937>-----  
01938> | IMPERVIOUS PERVIOUS (i) |  
01939> | Surface Area (ha)= 14.13 5.77 |  
01940> | Dep. Storage (mm)= 1.57 4.67 |  
01941> | Average Slope (%)= .60 1.50 |  
01942> | Length (m)= 580.00 100.00 |  
01943> | Mannings n = .030 .250 |  
01944>-----  
01945> | Max. eff. Inten. (mm/hr)= 93.86 60.56 |  
01946> | over (min) 15.00 30.00 |  
01947> | Storage Coeff. (min)= 14.48 (ii) 30.78 (ii) |  
01948> | Unit Hyd. Tpeak (min)= 15.00 30.00 |  
01949> | Unit Hyd. peak (cms)= .08 .04 |  
01950>-----  
01951> | PEAK FLOW (cms)= 1.70 .55 \*TOTALS\* |  
01952> | TIME TO PEAK (hrs)= 1.17 1.46 1.983 (iii) |  
01953> | RUNOFF VOLUME (mm)= 47.93 26.92 37.426 |  
01954> | TOTAL RAINFALL (mm)= 49.50 49.50 49.505 |  
01955> | RUNOFF COEFFICIENT = .97 .54 .756 |  
01956>-----  
01957> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01958> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01959> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01960> | THAN THE STORAGE COEFFICIENT.  
01961> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01962>-----  
01963>-----  
01964> 001:0015-----  
01965>-----  
01966> | ADD HYD (H1P02 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01967> | | | (ha) (cms) (hrs) (mm) (cms)  
01968> | ID1 10:POND | 8.56 .132 2.28 45.91 .000  
01969> | +ID2 01:H1P01 | 19.90 1.983 1.21 37.43 .000  
01970> |-----  
01971> | SUM 02:H1P02 | 28.46 2.044 1.21 39.98 .000  
01972>-----  
01973> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01974>-----  
01975>-----  
01976> 001:0016-----  
01977> \* SUB-AREA No.2  
01978>-----  
01979> | CALIB STANDHYD | Area (ha)= 17.00  
01980> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01981>-----  
01982> | IMPERVIOUS PERVIOUS (i) |  
01983> | Surface Area (ha)= 12.00 4.93 |  
01984> | Dep. Storage (mm)= 1.57 4.67 |  
01985> | Average Slope (%)= .65 1.50 |  
01986> | Length (m)= 450.00 100.00 |  
01987> | Mannings n = .030 .250 |  
01988>-----  
01989> | Max. eff. Inten. (mm/hr)= 105.17 63.81 |  
01990> | over (min) 12.50 27.50 |  
01991> | Storage Coeff. (min)= 11.60 (ii) 27.56 (ii) |  
01992> | Unit Hyd. Tpeak (min)= 12.50 27.50 |  
01993> | Unit Hyd. peak (cms)= .09 .04 |  
01994>-----  
01995> | PEAK FLOW (cms)= 1.63 .51 \*TOTALS\* |  
01996> | TIME TO PEAK (hrs)= 1.13 1.42 1.167 |  
01997> | RUNOFF VOLUME (mm)= 47.93 26.92 37.426 |  
01998> | TOTAL RAINFALL (mm)= 49.50 49.50 49.505 |  
01999> | RUNOFF COEFFICIENT = .97 .54 .756 |  
02000>-----  
02001> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02002> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02003> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02004> | THAN THE STORAGE COEFFICIENT.  
02005> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02006>-----  
02007>-----  
02008>-----  
02009> 001:0017-----  
02010> \* SUB-AREA No.3  
02011>-----  
02012> | CALIB STANDHYD | Area (ha)= 15.60  
02013> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02014>-----  
02015> | IMPERVIOUS PERVIOUS (i) |  
02016> | Surface Area (ha)= 11.08 4.52 |  
02017> | Dep. Storage (mm)= 1.57 4.67 |  
02018> | Average Slope (%)= .50 1.50 |  
02019> | Length (m)= 600.00 100.00 |  
02020> | Mannings n = .030 .250 |  
02021>-----  
02022> | Max. eff. Inten. (mm/hr)= 93.86 57.19 |  
02023> | over (min) 15.00 32.50 |  
02024> | Storage Coeff. (min)= 15.61 (ii) 32.28 (ii) |  
02025>-----

02026> Unit Hyd. Tpeak (min)= 15.00 32.50  
02027> Unit Hyd. peak (cms)= .07 .03 \*TOTALS\*  
02028> PEAK FLOW (cms)= 1.29 .42 1.485 (iii)  
02029> TIME TO PEAK (hrs)= 1.17 1.50  
02030> RUNOFF VOLUME (mm)= 47.93 26.92 37.426  
02031> TOTAL RAINFALL (mm)= 49.50 49.50 49.505  
02032> RUNOFF COEFFICIENT = .97 .54 .756  
02033>-----  
02034> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02035> CN\* = 81.0 Ia = Dep. Storage (Above)  
02036> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02037> THAN THE STORAGE COEFFICIENT.  
02038> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02039>-----  
02040>-----  
02041> 001:0018-----  
02042>-----  
02043> | ADD HYD (H1P05 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02044> | | | (ha) (cms) (hrs) (mm) (cms)  
02045> | ID1 03:H1P03 | 17.00 1.865 1.17 37.43 .000  
02046> | +ID2 04:H1P04 | 15.60 1.485 1.21 37.43 .000  
02047> |-----  
02048> | SUM 05:H1P05 | 32.60 3.336 1.17 37.43 .000  
02049>-----  
02050> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02051>-----  
02052>-----  
02053> 001:0019-----  
02054>-----  
02055> | ADD HYD (H1P06 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02056> | | | (ha) (cms) (hrs) (mm) (cms)  
02057> | ID1 05:H1P05 | 32.60 3.336 1.17 37.43 .000  
02058> | +ID2 02:H1P02 | 28.46 2.044 1.21 39.98 .000  
02059> |-----  
02060> | SUM 06:H1P06 | 61.06 5.358 1.17 38.61 .000  
02061>-----  
02062> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02063>-----  
02064>-----  
02065> 001:0020-----  
02066> \* SUB-AREA No.4  
02067>-----  
02068> | CALIB STANDHYD | Area (ha)= 12.20  
02069> | 07:H1P07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02070>-----  
02071> | IMPERVIOUS PERVIOUS (i) |  
02072> | Surface Area (ha)= 8.66 3.84 |  
02073> | Dep. Storage (mm)= 1.57 4.67 |  
02074> | Average Slope (%)= .70 1.50 |  
02075> | Length (m)= 210.00 100.00 |  
02076> | Mannings n = .030 .250 |  
02077>-----  
02078> | Max. eff. Inten. (mm/hr)= 122.14 72.53 |  
02079> | over (min) 7.50 22.50 |  
02080> | Storage Coeff. (min)= 6.77 (ii) 21.93 (ii) |  
02081> | Unit Hyd. Tpeak (min)= 7.50 22.50 |  
02082> | Unit Hyd. peak (cms)= .16 .05 \*TOTALS\* |  
02083> | PEAK FLOW (cms)= 1.54 .42 1.687 (iii) |  
02084> | TIME TO PEAK (hrs)= 1.04 1.33 1.042 |  
02085> | RUNOFF VOLUME (mm)= 47.93 26.92 37.426 |  
02086> | TOTAL RAINFALL (mm)= 49.50 49.50 49.505 |  
02087> | RUNOFF COEFFICIENT = .97 .54 .756 |  
02088>-----  
02089> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02090> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02091> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02092> | THAN THE STORAGE COEFFICIENT.  
02093> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02094>-----  
02095>-----  
02096> 001:0021-----  
02097> \* SUB-AREA No.5  
02098>-----  
02099> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
02100> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02101> | U.H. Tp(hrs)= .170 |  
02102>-----  
02103> | Unit Hyd Tpeak (cms)= .899 |  
02104>-----  
02105> | PEAK FLOW (cms)= .345 (i) |  
02106> | TIME TO PEAK (hrs)= 1.157 |  
02107> | RUNOFF VOLUME (mm)= 22.420 |  
02108> | TOTAL RAINFALL (mm)= 49.505 |  
02109> | RUNOFF COEFFICIENT = .453 |  
02110>-----  
02111> | (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02112>-----  
02113> 001:0022-----  
02114>-----  
02115> | ADD HYD (H1P08 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02116> | | | (ha) (cms) (hrs) (mm) (cms)  
02117> | ID1 06:H1P06 | 61.06 5.358 1.17 38.61 .000  
02118> | +ID2 07:H1P07 | 12.20 1.687 1.04 37.43 .000  
02119> | +ID3 08:Pond-B | 4.00 .345 1.17 22.42 .000  
02120> |-----  
02121> | SUM 09:H1P08 | 77.26 7.016 1.17 37.59 .000  
02122>-----  
02123> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02124>-----  
02125>-----  
02126> 001:0023-----  
02127> \* SUB-AREA No.6  
02128>-----  
02129> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00  
02130> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02131> | U.H. Tp(hrs)= .800 |  
02132>-----  
02133> | Unit Hyd Tpeak (cms)= .129 |  
02134>-----  
02135> | PEAK FLOW (cms)= .059 (i) |  
02136> | TIME TO PEAK (hrs)= 2.000 |  
02137> | RUNOFF VOLUME (mm)= 16.075 |  
02138> | TOTAL RAINFALL (mm)= 49.505 |  
02139> | RUNOFF COEFFICIENT = .325 |  
02140>-----  
02141> | (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02142>-----  
02143> 001:0024-----  
02144>-----  
02145> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02146> | | | (ha) (cms) (hrs) (mm) (cms)  
02147> | ID1 09:H1P08 | 77.26 7.016 1.17 37.59 .000  
02148> | +ID2 01:A3 | 2.70 .059 2.00 16.08 .000  
02149> |-----  
02150> | SUM 02:Ultima | 79.96 7.029 1.17 36.86 .000  
02151>-----  
02152> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02153>-----  
02154>-----  
02155> 001:0025-----  
02156>-----  
02157> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02158> | | | (ha) (cms) (hrs) (mm) (cms)  
02159> | ID1 09:H1P08 | 77.26 7.016 1.17 37.59 .000  
02160> | +ID2 01:A3 | 2.70 .059 2.00 16.08 .000  
02161> |-----  
02162> | SUM 02:Ultima | 79.96 7.029 1.17 36.86 .000  
02163>-----  
02164> NOTE : PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

02161>
02162>
02163> 001:0025-----
02164> *****
02165> * CALCULATION OF 3HR - 125 YEAR STORM EVENT *
02166> *****
02167>
02168> | START | Project dir.: V:\20983.DU\ENG\SWM\HYMO\
02169> | Rainfall dir.: V:\20983.DU\ENG\SWM\HYMO\
02170> T2EFO = .00 hrs on 0
02171> METOUT= 2 (output = METRIC)
02172> NRUN = 001
02173> NSTCRM= 0
02174>
02175> 001:0002-----
02176>
02177> | CHICAGO STORM | IDF curve parameters: A=1402.884
02178> | Ptotal= 58.23 mm | B= 6.018
02179> | C= .819
02180> used in: INTENSITY = A / (t + B)^C
02181>
02182> Duration of storm = 3.00 hrs
02183> Storm time step = 10.00 min
02184> Time to peak ratio = .33
02185>
02186> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
02187> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
02188> .17 4.934 | 1.00 144.693 | 1.83 9.014 | 2.67 4.701
02189> .33 6.152 | 1.17 43.904 | 2.00 7.571 | 2.83 4.310
02190> .50 8.282 | 1.33 22.224 | 2.17 6.344 | 3.00 3.983
02191> .67 13.006 | 1.50 14.852 | 2.33 5.776 |
02192> .83 33.041 | 1.67 11.192 | 2.50 5.179 |
02193>
02195> 001:0003-----
02196>
02197> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWM\HYMO\ORGA.VAL
02198> | ICASBdv = 1 (read and print data)
02199> | FileTitle=----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02200> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ---|
02201> Horton's infiltration equation parameters:
02202> [F0= 50.00 mm/hr] [F0= 7.50 mm/hr] [DCAY= 2.00 /hr] [E= .00 mm]
02203> Parameters for PERVIOUS surfaces in STANHYD:
02204> [Ia= 4.67 mm] [LCS=4.00 m] [NFI= .250]
02205> Parameters for IMPERVIOUS surface in STANHYD:
02206> [Ia= 1.57 mm] [CLI= 1.50] [NFI= .035]
02207> Parameters used in NASHYD:
02208> [Ia = 4.67 mm] [N= 3.00]
02209>
02210> 001:0004-----
02211> *****
02212> * ORGAWORLD FILE *
02213> * SUB-AREA No.1
02214>
02215> | CALIB STANHYD | Area (ha)= 2.07
02216> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
02217>
02218> IMPERVIOUS PERVIOUS (i)
02219> Surface Area (ha)= 1.74 .33
02220> Dep. Storage (mm)= 1.57 4.67
02221> Average Slope (%)= .52 1.00
02222> Length (m)= 204.72 20.00
02223> Mannings n = .030 .250
02224>
02225> Max. eff. Inten. (mm/hr)= 144.69 47.07
02226> over (min)= 7.50 15.00
02227> Storage Coeff. (min)= 6.81 (ii) 14.56 (ii)
02228> Unit Hyd. Tpeak (min)= 7.50 15.00
02229> Unit Hyd. peak (cms)= .16 .08
02230>
02231> *TOTALS*
02232> PEAK FLOW (cms)= .52 .03 .532 (iii)
02233> TIME TO PEAK (hrs)= 1.04 1.21 1.042
02234> RUNOFF VOLUME (mm)= 56.66 25.35 51.647
02235> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02236> RUNOFF COEFFICIENT = .97 .44 .887
02237>
02238> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02239> CN* = 81.0 Ia = Dep. Storage (Above)
02240> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02241> THAN THE STORAGE COEFFICIENT.
02242> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02243>
02244>
02245> 001:0005-----
02246> *
02247> * SUB-AREA No.2
02248>
02249> | CALIB STANHYD | Area (ha)= 1.54
02250> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
02251>
02252> IMPERVIOUS PERVIOUS (i)
02253> Surface Area (ha)= 1.42 .12
02254> Dep. Storage (mm)= 1.57 4.67
02255> Average Slope (%)= .50 1.00
02256> Length (m)= 244.34 5.00
02257> Mannings n = .030 .030
02258>
02259> Max. eff. Inten. (mm/hr)= 144.69 65.19
02260> over (min)= 7.50 7.50
02261> Storage Coeff. (min)= 7.66 (ii) 8.49 (ii)
02262> Unit Hyd. Tpeak (min)= 7.50 7.50
02263> Unit Hyd. peak (cms)= .15 .14
02264>
02265> *TOTALS*
02266> PEAK FLOW (cms)= .40 .01 .418 (iii)
02267> TIME TO PEAK (hrs)= 1.04 1.08 1.042
02268> RUNOFF VOLUME (mm)= 56.66 25.35 54.152
02269> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02270> RUNOFF COEFFICIENT = .97 .44 .930
02271>
02272> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02273> CN* = 81.0 Ia = Dep. Storage (Above)
02274> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02275> THAN THE STORAGE COEFFICIENT.
02276> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02277>
02278> 001:0006-----
02279>
02280> * SUB-AREA No.3
02281>
02282> | CALIB STANHYD | Area (ha)= 1.40
02283> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02284>
02285> IMPERVIOUS PERVIOUS (i)
02286> Surface Area (ha)= 1.36 .04
02287> Dep. Storage (mm)= 1.57 4.67
02288> Average Slope (%)= .51 1.00
02289> Length (m)= 225.63 5.00
02290> Mannings n = .030 .030
02291>
02292> Max. eff. Inten. (mm/hr)= 144.69 65.19
02293> over (min)= 7.50 7.50
02294> Storage Coeff. (min)= 7.26 (ii) 8.09 (ii)
02295> Unit Hyd. Tpeak (min)= 7.50 7.50

```

```

02296> Unit Hyd. peak (cms)= .15 .14
02297>
02298> PEAK FLOW (cms)= .40 .00 .400 (iii)
02299> TIME TO PEAK (hrs)= 1.04 1.08 1.042
02300> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02301> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02302> RUNOFF COEFFICIENT = .97 .44 .957
02303>
02304> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02305> CN* = 81.0 Ia = Dep. Storage (Above)
02306> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02307> THAN THE STORAGE COEFFICIENT.
02308> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02309>
02310>
02311> 001:0007-----
02312>
02313> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02314> | (ha) (cms) (hrs) (mm) (cms)
02315> +ID1 01:010 2.07 .532 1.04 51.65 .000
02316> +ID2 02:020 1.54 418 1.04 54.15 .000
02317>
02318> SUM 04:040 3.61 .950 1.04 52.72 .000
02319>
02320> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02321>
02322>
02323> 001:0008-----
02324>
02325> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02326> | (ha) (cms) (hrs) (mm) (cms)
02327> +ID1 03:030 1.40 .400 1.04 55.72 .000
02328> +ID2 04:040 3.61 .950 1.04 52.72 .000
02329>
02330> SUM 05:050 5.01 1.350 1.04 53.55 .000
02331>
02332> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02333>
02334>
02335> 001:0009-----
02336> *
02337> * SUB-AREA No.4
02338>
02339> | CALIB STANHYD | Area (ha)= .89
02340> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02341>
02342> IMPERVIOUS PERVIOUS (i)
02343> Surface Area (ha)= .86 .03
02344> Dep. Storage (mm)= 1.57 4.67
02345> Average Slope (%)= .52 .70
02346> Length (m)= 164.82 40.00
02347> Mannings n = .030 .250
02348>
02349> Max. eff. Inten. (mm/hr)= 144.69 44.12
02350> over (min)= 5.00 17.50
02351> Storage Coeff. (min)= 5.02 (ii) 18.44 (ii)
02352> Unit Hyd. Tpeak (min)= 5.00 17.50
02353> Unit Hyd. peak (cms)= .22 .06
02354>
02355> *TOTALS*
02356> PEAK FLOW (cms)= .30 .00 .296 (iii)
02357> TIME TO PEAK (hrs)= 1.00 1.25 1.000
02358> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02359> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02360> RUNOFF COEFFICIENT = .97 .44 .957
02361>
02362> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02363> CN* = 81.0 Ia = Dep. Storage (Above)
02364> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02365> THAN THE STORAGE COEFFICIENT.
02366> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02367>
02368> 001:0010-----
02369>
02370> * SUB-AREA No.5
02371>
02372> | CALIB STANHYD | Area (ha)= 2.66
02373> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02374>
02375> IMPERVIOUS PERVIOUS (i)
02376> Surface Area (ha)= 2.58 .08
02377> Dep. Storage (mm)= 1.57 4.67
02378> Average Slope (%)= .61 1.50
02379> Length (m)= 207.25 20.00
02380> Mannings n = .030 .250
02381>
02382> Max. eff. Inten. (mm/hr)= 144.69 51.33
02383> over (min)= 7.50 12.50
02384> Storage Coeff. (min)= 6.54 (ii) 13.16 (ii)
02385> Unit Hyd. Tpeak (min)= 7.50 12.50
02386> Unit Hyd. peak (cms)= .16 .09
02387>
02388> *TOTALS*
02389> PEAK FLOW (cms)= .78 .01 .783 (iii)
02390> TIME TO PEAK (hrs)= 1.04 1.17 1.042
02391> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02392> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02393> RUNOFF COEFFICIENT = .97 .44 .957
02394>
02395> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02396> CN* = 81.0 Ia = Dep. Storage (Above)
02397> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02398> THAN THE STORAGE COEFFICIENT.
02399> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02400>
02401> 001:0011-----
02402>
02403> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02404> | (ha) (cms) (hrs) (mm) (cms)
02405> +ID1 06:060 .89 .296 1.00 55.72 .000
02406> +ID2 07:070 2.66 .783 1.04 55.72 .000
02407>
02408> SUM 08:080 3.55 1.060 1.04 55.72 .000
02409>
02410> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02411>
02412>
02413> 001:0012-----
02414>
02415> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02416> | (ha) (cms) (hrs) (mm) (cms)
02417> +ID1 05:050 5.01 1.350 1.04 53.55 .000
02418> +ID2 08:080 3.55 1.060 1.04 55.72 .000
02419>
02420> SUM 09:090 8.56 2.410 1.04 54.45 .000
02421>
02422> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02423>
02424>
02425> 001:0013-----
02426>
02427> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
02428> | IN>09: (090 ) |
02429> | OUT<10: (POND ) |
02430>
02431> ***** OUTFLOW STORAGE TABLE *****
02432> OUTFLOW STORAGE | OUTFLOW STORAGE

```

02431> (cms) (ha.m.) | (cms) (ha.m.)  
02432> .000 .0000E+00 | .593 .6251E+00  
02433> .008 .6560E-01 | .654 .6631E+00  
02434> .017 .1311E+00 | .797 .7391E+00  
02435> .093 .2831E+00 | .950 .8274E+00  
02436> .233 .3971E+00 | 1.304 .5157E+00  
02437> .337 .4731E+00 | 1.880 .1004E+01  
02438> .465 .5491E+00 | 2.577 .1092E+01  
02439> .531 .5871E+00 | .000 .0000E+00  
02440>  
02441> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
02442> (ha) (cms) (hrs) (mm)  
02443> INFLOW>09: (090 ) 8.56 2.410 1.042 54.451  
02444> OUTFLOW>10: (POND ) 8.56 .189 2.056 54.449  
02445>  
02446> PEAK FLOW REDUCTION [Qout/Qin] (%) = 7.838  
02447> TIME SHIFT OF PEAK FLOW (min) = 60.83  
02448> MAXIMUM STORAGE USED (ha.m.) = .3612E+00  
02449>  
02450>  
02451> 001:0014  
02452> \*\*\*\*\*  
02453> \* Remaining Hawthorne Industrial Park \*  
02454> \*\*\*\*\*  
02455> \* SUB-AREA No.1  
02456>  
02457>  
02458> | CALIB STANDHYD | Area (ha)= 19.90  
02459> | 01:HIF01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02460>  
02461> IMPERVIOUS PERVIOUS (i)  
02462> Surface Area (ha)= 14.13 5.77  
02463> Dep. Storage (mm)= 1.57 4.67  
02464> Average Slope (%)= .60 1.50  
02465> Length (m)= 580.00 100.00  
02466> Mannings n = .030 .250  
02467>  
02468> Max. eff. Inten. (mm/hr)= 124.54 81.98  
02469> over (min) 12.50 27.50  
02470> Storage Coeff. (min)= 12.93 (ii) 27.37 (ii)  
02471> Unit Hyd. Tpeak (min)= 12.50 27.50  
02472> Unit Hyd. peak (cms)= .09 .04  
02473>  
02474> PEAK FLOW (cms)= 2.16 .77 \*TOTALS\*  
02475> TIME TO PEAK (hrs)= 1.13 1.42 2.548 (iii)  
02476> RUNOFF VOLUME (mm)= 56.66 34.22 1.167  
02477> TOTAL RAINFALL (mm)= 58.23 58.23 45.437  
02478> RUNOFF COEFFICIENT = .97 .59 58.226  
02479>  
02480> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02481> CN\* = 81.0 Ia = Dep. Storage (Above)  
02482> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02483> THAN THE STORAGE COEFFICIENT.  
02484> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02485>  
02486>  
02487> 001:0015  
02488> \*  
02489> | ADD HYD (HIPO2 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02490> (ha) (cms) (hrs) (mm) (cms)  
02491> ID1 10:POND 8.56 .189 2.06 54.45 .000  
02492> +ID2 01:HIF01 19.90 2.548 1.17 45.44 .000  
02493> SUM 02:HIPO2 28.46 2.622 1.17 48.15 .000  
02494>  
02495> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02496>  
02497>  
02498>  
02499> 001:0016  
02500> \* SUB-AREA No.2  
02501>  
02502>  
02503> | CALIB STANDHYD | Area (ha)= 17.00  
02504> | 03:HIF03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02505>  
02506> IMPERVIOUS PERVIOUS (i)  
02507> Surface Area (ha)= 12.07 4.93  
02508> Dep. Storage (mm)= 1.57 4.67  
02509> Average Slope (%)= .65 1.50  
02510> Length (m)= 450.00 100.00  
02511> Mannings n = .030 .250  
02512>  
02513> Max. eff. Inten. (mm/hr)= 144.69 87.13  
02514> over (min) 10.00 25.00  
02515> Storage Coeff. (min)= 10.21 (ii) 24.30 (ii)  
02516> Unit Hyd. Tpeak (min)= 10.00 25.00  
02517> Unit Hyd. peak (cms)= .11 .05  
02518>  
02519> PEAK FLOW (cms)= 2.10 .71 \*TOTALS\*  
02520> TIME TO PEAK (hrs)= 1.08 1.38 2.398 (iii)  
02521> RUNOFF VOLUME (mm)= 56.66 34.22 1.125  
02522> TOTAL RAINFALL (mm)= 58.23 58.23 45.437  
02523> RUNOFF COEFFICIENT = .97 .59 58.226  
02524>  
02525> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02526> CN\* = 81.0 Ia = Dep. Storage (Above)  
02527> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02528> THAN THE STORAGE COEFFICIENT.  
02529> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02530>  
02531>  
02532> 001:0017  
02533> \* SUB-AREA No.3  
02534>  
02535> | CALIB STANDHYD | Area (ha)= 15.60  
02536> | 04:HIF04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02537>  
02538> IMPERVIOUS PERVIOUS (i)  
02539> Surface Area (ha)= 11.08 4.52  
02540> Dep. Storage (mm)= 1.57 4.67  
02541> Average Slope (%)= .50 1.50  
02542> Length (m)= 600.00 100.00  
02543> Mannings n = .030 .250  
02544>  
02545> Max. eff. Inten. (mm/hr)= 111.10 77.71  
02546> over (min) 15.00 34.00  
02547> Storage Coeff. (min)= 14.59 (ii) 29.34 (ii)  
02548> Unit Hyd. Tpeak (min)= 15.00 30.00  
02549> Unit Hyd. peak (cms)= .08 .04  
02550>  
02551> PEAK FLOW (cms)= 1.57 .57 \*TOTALS\*  
02552> TIME TO PEAK (hrs)= 1.17 1.46 1.208 (iii)  
02553> RUNOFF VOLUME (mm)= 56.66 34.22 45.437  
02554> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02555> RUNOFF COEFFICIENT = .97 .59 58.226  
02556>  
02557> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02558> CN\* = 81.0 Ia = Dep. Storage (Above)  
02559> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02560> THAN THE STORAGE COEFFICIENT.  
02561> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02562>  
02563>  
02564>  
02565> 001:0018

02566>  
02567> | ADD HYD (HIPO5 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02568> (ha) (cms) (hrs) (mm) (cms)  
02569> ID1 03:HIF03 17.00 2.398 1.13 45.44 .000  
02570> +ID2 04:HIF04 15.60 1.879 1.21 45.44 .000  
02571> SUM 05:HIPO5 32.60 4.157 1.13 45.44 .000  
02572>  
02573> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02574>  
02575>  
02576>  
02577> 001:0019  
02578> \*  
02579> | ADD HYD (HIPO6 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02580> (ha) (cms) (hrs) (mm) (cms)  
02581> ID1 05:HIF05 32.60 4.157 1.13 45.44 .000  
02582> +ID2 02:HIF02 28.46 2.622 1.17 48.15 .000  
02583> SUM 06:HIPO6 61.06 6.741 1.17 46.70 .000  
02584>  
02585> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02586>  
02587>  
02588>  
02589> 001:0020  
02590> \* SUB-AREA No.4  
02591>  
02592>  
02593> | CALIB STANDHYD | Area (ha)= 12.20  
02594> | 07:HIF07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
02595>  
02596> IMPERVIOUS PERVIOUS (i)  
02597> Surface Area (ha)= 8.66 3.54  
02598> Dep. Storage (mm)= 1.57 4.67  
02599> Average Slope (%)= .70 1.50  
02600> Length (m)= 210.00 100.00  
02601> Mannings n = .030 .250  
02602>  
02603> Max. eff. Inten. (mm/hr)= 144.69 101.36  
02604> over (min) 7.50 20.00  
02605> Storage Coeff. (min)= 6.32 (ii) 19.58 (ii)  
02606> Unit Hyd. Tpeak (min)= 7.50 20.00  
02607> Unit Hyd. peak (cms)= .17 .06  
02608>  
02609> PEAK FLOW (cms)= 1.86 .59 \*TOTALS\*  
02610> TIME TO PEAK (hrs)= 1.04 1.29 1.042  
02611> RUNOFF VOLUME (mm)= 56.66 34.22 45.437  
02612> TOTAL RAINFALL (mm)= 58.23 58.23 58.226  
02613> RUNOFF COEFFICIENT = .97 .59 780  
02614>  
02615> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02616> CN\* = 81.0 Ia = Dep. Storage (Above)  
02617> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02618> THAN THE STORAGE COEFFICIENT.  
02619> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02620>  
02621>  
02622> 001:0021  
02623> \* SUB-AREA No.5  
02624>  
02625> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
02626> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02627> U.H. Tp(hrs)= .170  
02628>  
02629> Unit Hyd Qpeak (cms) = .899  
02630>  
02631> PEAK FLOW (cms)= .459 (i)  
02632> TIME TO PEAK (hrs)= 1.167  
02633> RUNOFF VOLUME (mm)= 29.155  
02634> TOTAL RAINFALL (mm)= 58.226  
02635> RUNOFF COEFFICIENT = .501  
02636>  
02637> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02638>  
02639>  
02640>  
02641> 001:0022  
02642> \*  
02643> | ADD HYD (HIPO8 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02644> (ha) (cms) (hrs) (mm) (cms)  
02645> ID1 06:HIF06 61.06 6.741 1.17 46.70 .000  
02646> +ID2 07:HIF07 12.20 2.109 1.04 45.44 .000  
02647> +ID3 08:Pond-B 4.00 .459 1.17 29.15 .000  
02648> SUM 09:HIPO8 77.26 8.998 1.13 45.59 .000  
02649>  
02650> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02651>  
02652>  
02653>  
02654> 001:0023  
02655> \* SUB-AREA No. 6  
02656>  
02657> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00  
02658> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
02659> U.H. Tp(hrs)= .800  
02660>  
02661> Unit Hyd Qpeak (cms) = .129  
02662>  
02663> PEAK FLOW (cms)= .079 (i)  
02664> TIME TO PEAK (hrs)= 2.000  
02665> RUNOFF VOLUME (mm)= 21.442  
02666> TOTAL RAINFALL (mm)= 58.226  
02667> RUNOFF COEFFICIENT = .368  
02668>  
02669> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02670>  
02671>  
02672>  
02673> 001:0024  
02674> \*  
02675> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02676> (ha) (cms) (hrs) (mm) (cms)  
02677> ID1 09:HIF08 77.26 8.998 1.13 45.59 .000  
02678> +ID2 01:A3 2.70 .079 2.00 21.44 .000  
02679> SUM 02:Ultima 79.96 9.013 1.13 44.78 .000  
02680>  
02681> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02682>  
02683>  
02684>  
02685>  
02686> 001:0025  
02687> \*\*\*\*\*  
02688> \* CALCULATION OF SHR - 1:50 YEAR STORM EVENT \*  
02689> \*\*\*\*\*  
02690>  
02691> | START | Project dir.: V:\20983.DU\ENG\SWMHYM\  
02692> | | Rainfall dir.: V:\20983.DU\ENG\SWMHYM\  
02693> TZERO = .00 hrs on 0  
02694> METOUT= 2 (output = METRIC)  
02695> NRUN = 001  
02696> NSTORM= 0  
02697>  
02698> 001:0002  
02699>  
02700> | CHICAGO STORM | IDF curve parameters: A=1569.580

02701> | Ptotal = 64.81 mm | B= 6.014  
02702> | C= .820  
02703> | used in: INTENSITY = A / (t + B)^C  
02704>  
02705> | Duration of storm = 3.00 hrs  
02706> | Storm time step = 10.00 min  
02707> | Time to peak ratio = .33  
02708>  
02709>  
02710> | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
02711> | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
02712> | .17 5.467 | 1.00 161.471 | 1.83 10.000 | 2.67 5.209  
02713> | .33 6.820 | 1.17 48.876 | 2.00 8.397 | 2.83 4.774  
02714> | .50 9.187 | 1.33 24.704 | 2.17 7.256 | 3.00 4.412  
02715> | .67 14.441 | 1.50 16.495 | 2.33 6.403 |  
02716> | .83 36.764 | 1.67 12.422 | 2.50 5.740 |  
02717>  
02718> 001:0003-----  
02719> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWHYMO\ORGA.VAL  
02720> | CASE\$V = 1 (read and print data)  
02721> | Filetitle = ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----  
02722> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----  
02723> | Horton's infiltration equation parameters:  
02724> | [F= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]  
02725> | Parameters for PERVIOUS surfaces in STANDHYD:  
02726> | [I.Aper= 4.67 mm] [LGP=40.00 mm] [MNI= .250]  
02727> | Parameters for IMPERVIOUS surfaces in STANDHYD:  
02728> | [I.Aimp= 1.57 mm] [CLI= 1.50] [MNI= .035]  
02729> | Parameters used in WASHYD:  
02730> | [I.a= 4.67 mm] [N= 3.00]  
02731>  
02732>  
02733> 001:0004-----  
02734> | \*\*\*\*\* ORGAWORLD FILE \*\*\*\*\*  
02735> | \*\*\*\*\*  
02736> | \*\*\*\*\*  
02737> \* SUB-AREA No.1  
02738>  
02739> | CALIB STANDHYD | Area (ha)= 2.07  
02740> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00  
02741>  
02742> | IMPERVIOUS PERVIOUS (i)  
02743> | Surface Area (ha)= 1.74 .33  
02744> | Dep. Storage (mm)= 1.57 4.67  
02745> | Average Slope (%)= .52 1.00  
02746> | Length (m)= 204.72 20.00  
02747> | Mannings n = .030 .250  
02748>  
02749> | Max. eff. Inten. (mm/hr)= 161.47 62.27  
02750> | over (min)= 7.50 12.50  
02751> | Storage Coeff. (min)= 6.51 (ii) 13.44 (ii)  
02752> | Unit Hyd. Tpeak (min)= .16 .09  
02753> | Unit Hyd. peak (cms)= .59 .03 \*TOTALS\*  
02754> | PEAK FLOW (cms)= 1.04 1.17 1.609 (iii)  
02755> | TIME TO PEAK (hrs)= 63.24 30.21 57.952  
02756> | RUNOFF VOLUME (mm)= 64.81 64.81 64.806  
02757> | TOTAL RAINFALL (mm)= .98 .47 894  
02758> | RUNOFF COEFFICIENT = .98 .47 .894  
02759>  
02760> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02761> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02762> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02763> | THAN THE STORAGE COEFFICIENT.  
02764> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02765>  
02766>  
02767>  
02768> 001:0005-----  
02769> \* SUB-AREA No.2  
02770>  
02771> | CALIB STANDHYD | Area (ha)= 1.54  
02772> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00  
02773>  
02774> | IMPERVIOUS PERVIOUS (i)  
02775> | Surface Area (ha)= 1.42 .12  
02776> | Dep. Storage (mm)= 1.57 4.67  
02777> | Average Slope (%)= .50 1.00  
02778> | Length (m)= 244.34 5.00  
02779> | Mannings n = .030 .030  
02780>  
02781> | Max. eff. Inten. (mm/hr)= 161.47 78.73  
02782> | over (min)= 7.50 7.50  
02783> | Storage Coeff. (min)= 7.33 (ii) 8.10 (ii)  
02784> | Unit Hyd. Tpeak (min)= 7.50 7.50  
02785> | Unit Hyd. peak (cms)= .15 .14 \*TOTALS\*  
02786> | PEAK FLOW (cms)= .46 .02 1.475 (iii)  
02787> | TIME TO PEAK (hrs)= 1.04 1.08 1.042  
02788> | RUNOFF VOLUME (mm)= 63.24 30.21 60.594  
02789> | TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02790> | RUNOFF COEFFICIENT = .98 .47 .935  
02791>  
02792> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02793> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02794> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02795> | THAN THE STORAGE COEFFICIENT.  
02796> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02797>  
02798>  
02799>  
02800> 001:0006-----  
02801> \* SUB-AREA No.3  
02802>  
02803> | CALIB STANDHYD | Area (ha)= 1.40  
02804> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02805>  
02806> | IMPERVIOUS PERVIOUS (i)  
02807> | Surface Area (ha)= 1.36 .04  
02808> | Dep. Storage (mm)= 1.57 4.67  
02809> | Average Slope (%)= .51 1.00  
02810> | Length (m)= 225.83 5.00  
02811> | Mannings n = .030 .030  
02812>  
02813> | Max. eff. Inten. (mm/hr)= 161.47 78.73  
02814> | over (min)= 7.50 7.50  
02815> | Storage Coeff. (min)= 6.95 (ii) 7.72 (ii)  
02816> | Unit Hyd. Tpeak (min)= 7.50 7.50  
02817> | Unit Hyd. peak (cms)= .16 .15 \*TOTALS\*  
02818> | PEAK FLOW (cms)= .45 .01 .454 (iii)  
02819> | TIME TO PEAK (hrs)= 1.04 1.08 1.042  
02820> | RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02821> | TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02822> | RUNOFF COEFFICIENT = .98 .47 .960  
02823>  
02824> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02825> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02826> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02827> | THAN THE STORAGE COEFFICIENT.  
02828> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02829>  
02830>  
02831>  
02832>  
02833>  
02834> 001:0007-----  
02835>

02835> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02836> | (ha) (cms) (hrs) (mm) (cms)  
02837> | ID1 01:010 2.07 .609 1.04 57.95 .000  
02838> | +ID2 02:020 1.54 .475 1.04 60.59 .000  
02839> | \*\*\*\*\*  
02840> | SUM 04:040 3.61 1.084 1.04 59.08 .000  
02841>  
02842> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02843>  
02844>  
02845> 001:0008-----  
02846> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02847> | (ha) (cms) (hrs) (mm) (cms)  
02848> | ID1 03:030 1.40 .454 1.04 62.25 .000  
02849> | +ID2 04:040 3.61 1.084 1.04 59.08 .000  
02850> | \*\*\*\*\*  
02851> | SUM 05:050 5.01 1.538 1.04 59.96 .000  
02852>  
02853> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02854>  
02855>  
02856>  
02857> 001:0009-----  
02858> \* SUB-AREA No.4  
02859>  
02860> | CALIB STANDHYD | Area (ha)= .89  
02861> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02862>  
02863> | IMPERVIOUS PERVIOUS (i)  
02864> | Surface Area (ha)= .86 .03  
02865> | Dep. Storage (mm)= 1.57 4.67  
02866> | Average Slope (%)= .93 .70  
02867> | Length (m)= 164.82 40.00  
02868> | Mannings n = .030 .250  
02869>  
02870> | Max. eff. Inten. (mm/hr)= 161.47 53.28  
02871> | over (min)= 5.00 17.50  
02872> | Storage Coeff. (min)= 4.80 (ii) 17.24 (ii)  
02873> | Unit Hyd. Tpeak (min)= 5.00 17.50  
02874> | Unit Hyd. peak (cms)= .23 .07 \*TOTALS\*  
02875> | PEAK FLOW (cms)= .33 .00 .335 (iii)  
02876> | TIME TO PEAK (hrs)= 1.00 1.25 1.000  
02877> | RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02878> | TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02879> | RUNOFF COEFFICIENT = .98 .47 .960  
02880>  
02881> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02882> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02883> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02884> | THAN THE STORAGE COEFFICIENT.  
02885> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02886>  
02887>  
02888>  
02889>  
02890> 001:0010-----  
02891> \* SUB-AREA No.5  
02892>  
02893> | CALIB STANDHYD | Area (ha)= 2.66  
02894> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02895>  
02896> | IMPERVIOUS PERVIOUS (i)  
02897> | Surface Area (ha)= 2.58 .08  
02898> | Dep. Storage (mm)= 1.57 4.67  
02899> | Average Slope (%)= .61 1.50  
02900> | Length (m)= 207.25 20.00  
02901> | Mannings n = .030 .250  
02902>  
02903> | Max. eff. Inten. (mm/hr)= 161.47 62.27  
02904> | over (min)= 7.50 12.50  
02905> | Storage Coeff. (min)= 6.26 (ii) 12.39 (ii)  
02906> | Unit Hyd. Tpeak (min)= 7.50 12.50  
02907> | Unit Hyd. peak (cms)= .17 .09 \*TOTALS\*  
02908> | PEAK FLOW (cms)= .88 .01 .886 (iii)  
02909> | TIME TO PEAK (hrs)= 1.04 1.17 1.042  
02910> | RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02911> | TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02912> | RUNOFF COEFFICIENT = .98 .47 .960  
02913>  
02914> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02915> | CN\* = 81.0 Ia = Dep. Storage (Above)  
02916> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02917> | THAN THE STORAGE COEFFICIENT.  
02918> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02919>  
02920>  
02921>  
02922>  
02923> 001:0011-----  
02924> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02925> | (ha) (cms) (hrs) (mm) (cms)  
02926> | ID1 06:060 .89 .335 1.04 62.25 .000  
02927> | +ID2 07:070 2.66 .886 1.04 62.25 .000  
02928> | \*\*\*\*\*  
02929> | SUM 08:080 3.55 1.197 1.04 62.25 .000  
02930>  
02931> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02932>  
02933>  
02934>  
02935> 001:0012-----  
02936> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
02937> | (ha) (cms) (hrs) (mm) (cms)  
02938> | ID1 05:050 5.01 1.538 1.04 59.96 .000  
02939> | +ID2 08:080 3.55 1.197 1.04 62.25 .000  
02940> | \*\*\*\*\*  
02941> | SUM 09:090 8.56 2.735 1.04 60.91 .000  
02942>  
02943> | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02944>  
02945>  
02946>  
02947> 001:0013-----  
02948> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
02949> | IN>09: (090 ) |  
02950> | OUT<10: (POND ) |  
02951> | \*\*\*\*\*  
02952> | \*\*\*\*\*  
02953> | \*\*\*\*\*  
02954> | \*\*\*\*\*  
02955> | \*\*\*\*\*  
02956> | \*\*\*\*\*  
02957> | \*\*\*\*\*  
02958> | \*\*\*\*\*  
02959> | \*\*\*\*\*  
02960> | \*\*\*\*\*  
02961> | \*\*\*\*\*  
02962> | \*\*\*\*\*  
02963> | \*\*\*\*\*  
02964> | \*\*\*\*\*  
02965> | \*\*\*\*\*  
02966> | \*\*\*\*\*  
02967> | \*\*\*\*\*  
02968> | \*\*\*\*\*  
02969> | \*\*\*\*\*  
02970> | \*\*\*\*\*

02971> MAXIMUM STORAGE USED (ha.m.)=.3967E+00  
 02972>  
 02973>-----  
 02974> 001:001-4-----  
 02975> \*\*\*\*\*  
 02976> \* Remaining Hawthorne Industrial Park \*  
 02977> \*\*\*\*\*  
 02978> \*  
 02979> \* SUB-AREA No. 1  
 02980>-----  
 02981> | CALIB STANDHYD | Area (ha)= 19.90  
 02982> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 02983>-----  
 02984> IMPERVIOUS PERVIOUS (i)  
 02985> Surface Area (ha)= 14.13 5.77  
 02986> Dep. Storage (mm)= 1.57 4.67  
 02987> Average Slope (%)= .60 1.50  
 02988> Length (m)= 580.00 100.00  
 02989> Mannings n = .030 .250  
 02990>-----  
 02991> Max. eff. Inten. (mm/hr)= 138.95 102.13  
 02992> over (min) 12.50 25.00  
 02993> Storage Coeff. (min)= 12.38 (ii) 25.60 (ii)  
 02994> Unit Hyd. Tpeak (min)= 12.50 25.00  
 02995> Unit Hyd. peak (cms)= .09 .04  
 02996>-----  
 02997> PEAK FLOW (cms)= 2.46 .95 \*TOTALS\*  
 02998> TIME TO PEAK (hrs)= 1.13 1.38 1.167 (iii)  
 02999> RUNOFF VOLUME (mm)= 63.24 39.90 51.566  
 03000> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
 03001> RUNOFF COEFFICIENT = .98 .62 .796  
 03002>-----  
 03003> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03004> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03005> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03006> THAN THE STORAGE COEFFICIENT.  
 03007> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03008>-----  
 03009> 001:0015-----  
 03010>-----  
 03011> | ADD HYD (HIP02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03012> (ha) (cms) (hrs) (mm) (mm) (cms)  
 03013>-----  
 03014> ID1 10:POND 8.56 .233 1.94 60.91 .000  
 03015> +ID2 01:HIP01 19.90 3.001 1.17 51.57 .000  
 03016>-----  
 03017> SUM 02:HIP02 28.46 3.092 1.17 54.37 .000  
 03018>-----  
 03019> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03020>-----  
 03021>-----  
 03022> 001:0016-----  
 03023> \*  
 03024> \* SUB-AREA No. 2  
 03025>-----  
 03026> | CALIB STANDHYD | Area (ha)= 17.00  
 03027> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 03028>-----  
 03029> IMPERVIOUS PERVIOUS (i)  
 03030> Surface Area (ha)= 12.07 4.93  
 03031> Dep. Storage (mm)= 1.57 4.67  
 03032> Average Slope (%)= .65 1.50  
 03033> Length (m)= 450.00 100.00  
 03034> Mannings n = .030 .250  
 03035>-----  
 03036> Max. eff. Inten. (mm/hr)= 161.47 109.61  
 03037> over (min) 10.00 22.50  
 03038> Storage Coeff. (min)= 9.77 (ii) 22.63 (ii)  
 03039> Unit Hyd. Tpeak (min)= 10.00 22.50  
 03040> Unit Hyd. peak (cms)= .11 .05  
 03041>-----  
 03042> PEAK FLOW (cms)= 2.38 .88 \*TOTALS\*  
 03043> TIME TO PEAK (hrs)= 1.08 1.33 1.125  
 03044> RUNOFF VOLUME (mm)= 63.24 39.90 51.566  
 03045> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
 03046> RUNOFF COEFFICIENT = .98 .62 .796  
 03047>-----  
 03048> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03049> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03050> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03051> THAN THE STORAGE COEFFICIENT.  
 03052> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03053>-----  
 03054>-----  
 03055> 001:0017-----  
 03056> \*  
 03057> \* SUB-AREA No. 3  
 03058>-----  
 03059> | CALIB STANDHYD | Area (ha)= 15.60  
 03060> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 03061>-----  
 03062> IMPERVIOUS PERVIOUS (i)  
 03063> Surface Area (ha)= 11.08 4.52  
 03064> Dep. Storage (mm)= 1.57 4.67  
 03065> Average Slope (%)= .50 1.50  
 03066> Length (m)= 600.00 100.00  
 03067> Mannings n = .030 .250  
 03068>-----  
 03069> Max. eff. Inten. (mm/hr)= 138.95 96.02  
 03070> over (min) 12.50 27.50  
 03071> Storage Coeff. (min)= 13.34 (ii) 26.90 (ii)  
 03072> Unit Hyd. Tpeak (min)= 12.50 27.50  
 03073> Unit Hyd. peak (cms)= .09 .04  
 03074>-----  
 03075> PEAK FLOW (cms)= 1.86 .72 \*TOTALS\*  
 03076> TIME TO PEAK (hrs)= 1.13 1.42 1.167 (iii)  
 03077> RUNOFF VOLUME (mm)= 63.24 39.90 51.566  
 03078> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
 03079> RUNOFF COEFFICIENT = .98 .62 .796  
 03080>-----  
 03081> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03082> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03083> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03084> THAN THE STORAGE COEFFICIENT.  
 03085> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03086>-----  
 03087>-----  
 03088> 001:0018-----  
 03089>-----  
 03090> | ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03091> (ha) (cms) (hrs) (mm) (mm) (cms)  
 03092> ID1 03:HIP03 17.00 2.819 1.13 51.57 .000  
 03093> +ID2 04:HIP04 15.60 2.237 1.17 51.57 .000  
 03094>-----  
 03095> SUM 05:HIP05 32.60 5.019 1.13 51.57 .000  
 03096>-----  
 03097> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03098>-----  
 03099>-----  
 03100> 001:0019-----  
 03101>-----  
 03102> | ADD HYD (HIP06) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03103> (ha) (cms) (hrs) (mm) (mm) (cms)  
 03104> ID1 05:HIP05 32.60 5.019 1.13 51.57 .000  
 03105> +ID2 02:HIP02 28.46 3.092 1.17 54.37 .000

03106>-----  
 03107> SUM 06:HIP06 61.06 8.054 1.13 52.87 .000  
 03108>-----  
 03109> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03110>-----  
 03111>-----  
 03112> 001:0020-----  
 03113> \*  
 03114> \* SUB-AREA No. 4  
 03115>-----  
 03116> | CALIB STANDHYD | Area (ha)= 12.20  
 03117> | 07:HIP07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
 03118>-----  
 03119> IMPERVIOUS PERVIOUS (i)  
 03120> Surface Area (ha)= 8.66 3.54  
 03121> Dep. Storage (mm)= 1.57 4.67  
 03122> Average Slope (%)= .70 1.50  
 03123> Length (m)= 210.00 100.00  
 03124> Mannings n = .030 .250  
 03125>-----  
 03126> Max. eff. Inten. (mm/hr)= 161.47 126.32  
 03127> over (min) 5.00 17.50  
 03128> Storage Coeff. (min)= 6.05 (ii) 18.19 (ii)  
 03129> Unit Hyd. Tpeak (min)= 5.00 17.50  
 03130> Unit Hyd. peak (cms)= .20 .06  
 03131>-----  
 03132> PEAK FLOW (cms)= 2.19 .73 \*TOTALS\*  
 03133> TIME TO PEAK (hrs)= 1.00 1.25 1.042 (iii)  
 03134> RUNOFF VOLUME (mm)= 63.24 39.90 51.566  
 03135> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
 03136> RUNOFF COEFFICIENT = .98 .62 .796  
 03137>-----  
 03138> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03139> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03140> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03141> THAN THE STORAGE COEFFICIENT.  
 03142> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03143>-----  
 03144>-----  
 03145> 001:0021-----  
 03146> \*  
 03147> \* SUB-AREA No. 5  
 03148>-----  
 03149> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
 03150> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
 03151> U.H. Tp (hrs)= .170  
 03152>-----  
 03153> Unit Hyd. Qpeak (cms)= .899  
 03154>-----  
 03155> PEAK FLOW (cms)= .551 (i)  
 03156> TIME TO PEAK (hrs)= 1.125  
 03157> RUNOFF VOLUME (mm)= 34.455  
 03158> TOTAL RAINFALL (mm)= 64.806  
 03159> RUNOFF COEFFICIENT = .532  
 03160>-----  
 03161> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03162>-----  
 03163>-----  
 03164> 001:0022-----  
 03165> | ADD HYD (HIP08) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03166> (ha) (cms) (hrs) (mm) (mm) (cms)  
 03167> ID1 06:HIP06 61.06 8.054 1.13 52.87 .000  
 03168> +ID2 07:HIP07 12.20 2.470 1.04 51.57 .000  
 03169> +ID3 08:Pond-B 4.00 .551 1.13 34.45 .000  
 03170>-----  
 03171> SUM 09:HIP08 77.26 10.570 1.13 51.71 .000  
 03172>-----  
 03173> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03174>-----  
 03175>-----  
 03176> 001:0023-----  
 03177> \*  
 03178> \* SUB-AREA No. 6  
 03179>-----  
 03180> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00  
 03181> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
 03182> U.H. Tp (hrs)= .800  
 03183>-----  
 03184> Unit Hyd. Qpeak (cms)= .129  
 03185>-----  
 03186> PEAK FLOW (cms)= .096 (i)  
 03187> TIME TO PEAK (hrs)= 1.958  
 03188> RUNOFF VOLUME (mm)= 25.767  
 03189> TOTAL RAINFALL (mm)= 64.806  
 03190> RUNOFF COEFFICIENT = .398  
 03191>-----  
 03192> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03193>-----  
 03194>-----  
 03195> 001:0024-----  
 03196> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03197> (ha) (cms) (hrs) (mm) (mm) (cms)  
 03198> ID1 09:HIP08 77.26 10.570 1.13 51.71 .000  
 03199> +ID2 01:A3 2.70 .096 1.96 25.77 .000  
 03200>-----  
 03201> SUM 02:Ultima 79.96 10.588 1.13 50.84 .000  
 03202>-----  
 03203> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03204>-----  
 03205>-----  
 03206> 001:0025-----  
 03207> \*  
 03208> \* CALCULATION OF SHR - 1:100 YEAR STORM EVENT \*  
 03209> \*\*\*\*\*  
 03210>-----  
 03211> | START | Project dir.: V:\20983.DU\ENG\SWHYMO\  
 03212> | TZERO = .00 hrs on 0  
 03213> | METOP = 2 (output = METRIC)  
 03214> | NRUN = 001  
 03215> | NSTORM = 0  
 03216>-----  
 03217> 001:0002-----  
 03218> | CHICAGO STORM | IDF curve parameters: A=1735.688  
 03219> | Ptotal= 71.66 mm | B= 6.014  
 03220> C= .820  
 03221>-----  
 03222> used in: INTENSITY = A / (t + B)^C  
 03223>-----  
 03224> Duration of storm = 3.00 hrs  
 03225> Storm time step = 10.00 min  
 03226> Time to peak ratio = .33  
 03227>-----  
 03228> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
 03229> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
 03230>-----  
 03231> .17 6.046 | 1.00 178.559 | 1.83 11.059 | 2.67 5.760  
 03232> .33 7.542 | 1.17 54.049 | 2.00 9.285 | 2.83 5.280  
 03233> .50 10.159 | 1.33 27.319 | 2.17 8.024 | 3.00 4.879  
 03234> .67 15.969 | 1.50 18.240 | 2.33 7.080  
 03235> .83 40.655 | 1.67 13.737 | 2.50 6.347

```

03241> 001:0003-----
03242>
03243> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\SWHYMO\ORGA.VAL
03244> |-----| ICASEBdy = 1 (read and print data)
03245> |-----| ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
03246> |-----| PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ---->
03247> Horton's infiltration equation parameters:
03248> [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
03249> Parameters for PERVIOUS surfaces in STANDHYD:
03250> [LAgpe= 4.67 mm] [LAg=10.00 mm] [MNP= .250]
03251> Parameters for IMPERVIOUS surfaces in STANDHYD:
03252> [LAImp= 1.57 mm] [CLI= 1.50] [MNI= .035]
03253> Parameters used in NASHYD:
03254> [La= 4.67 mm] [N= 3.00]
03255>
03256> 001:0004-----
03257> *****
03258> * ORGAWORLD FILE *
03259> *****
03260> * SUB-AREA No.1
03261>
03262> | CALIB STANDHYD | Area (ha)= 2.07
03263> | 01:01O DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
03264>
03265> IMPERVIOUS PERVIOUS (i)
03266> Surface Area (ha)= 1.74 0.33
03267> Dep. Storage (mm)= 1.57 4.67
03268> Average Slope (%)= .52 1.00
03269> Length (m)= 204.72 20.00
03270> Mannings n = .030 .250
03271>
03272> Max.eff.Inten.(mm/hr)= 178.56 74.05
03273> over (min) = 7.50 12.50
03274> Storage Coeff. (min)= 6.26 (ii) 12.72 (ii)
03275> Unit Hyd. Tpeak (min)= 7.50 12.50
03276> Unit Hyd. peak (cms)= .17 .09
03277>
03278> PEAK FLOW (cms)= .66 .04 *TOTALS*
03279> TIME TO PEAK (hrs)= 1.04 1.17 1.042
03280> RUNOFF VOLUME (mm)= 70.09 35.46 64.553
03281> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03282> RUNOFF COEFFICIENT = .98 .49 .901
03283>
03284> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03285> CN* = 81.0 Ia = Dep. Storage (Above)
03286> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03287> THAN THE STORAGE COEFFICIENT.
03288> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03289>
03290>
03291> 001:0005-----
03292> *
03293> * SUB-AREA No.2
03294>
03295> | CALIB STANDHYD | Area (ha)= 1.54
03296> | 02:02O DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
03297>
03298> IMPERVIOUS PERVIOUS (i)
03299> Surface Area (ha)= 1.42 .12
03300> Dep. Storage (mm)= 1.57 4.67
03301> Average Slope (%)= 1.50 1.00
03302> Length (m)= 244.34 5.00
03303> Mannings n = .030 .030
03304>
03305> Max.eff.Inten.(mm/hr)= 178.56 93.23
03306> over (min) = 7.50 12.50
03307> Storage Coeff. (min)= 7.04 (ii) 7.76 (ii)
03308> Unit Hyd. Tpeak (min)= 7.50 7.50
03309> Unit Hyd. peak (cms)= .16 .15
03310>
03311> PEAK FLOW (cms)= .51 .02 *TOTALS*
03312> TIME TO PEAK (hrs)= 1.04 1.08 1.042
03313> RUNOFF VOLUME (mm)= 70.09 35.46 67.324
03314> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03315> RUNOFF COEFFICIENT = .98 .49 .939
03316>
03317> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03318> CN* = 81.0 Ia = Dep. Storage (Above)
03319> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03320> THAN THE STORAGE COEFFICIENT.
03321> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03322>
03323>
03324> 001:0006-----
03325> *
03326> * SUB-AREA No.3
03327>
03328> | CALIB STANDHYD | Area (ha)= 1.40
03329> | 03:03O DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03330>
03331> IMPERVIOUS PERVIOUS (i)
03332> Surface Area (ha)= 1.36 .04
03333> Dep. Storage (mm)= 1.57 4.67
03334> Average Slope (%)= .51 1.00
03335> Length (m)= 225.63 5.00
03336> Mannings n = .030 .030
03337>
03338> Max.eff.Inten.(mm/hr)= 178.56 93.23
03339> over (min) = 7.50 12.50
03340> Storage Coeff. (min)= 6.67 (ii) 7.39 (ii)
03341> Unit Hyd. Tpeak (min)= 7.50 7.50
03342> Unit Hyd. peak (cms)= .16 .15
03343>
03344> PEAK FLOW (cms)= .50 .01 *TOTALS*
03345> TIME TO PEAK (hrs)= 1.04 1.08 1.042
03346> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03347> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03348> RUNOFF COEFFICIENT = .98 .49 .964
03349>
03350> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03351> CN* = 81.0 Ia = Dep. Storage (Above)
03352> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03353> THAN THE STORAGE COEFFICIENT.
03354> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03355>
03356>
03357> 001:0007-----
03358> *
03359> * ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03360> |-----| (ha) (cms) (hrs) (mm) (cms)
03361> | ID1 01:010 | 2.07 .685 1.04 64.55 .000
03362> | +ID2 02:020 | 1.54 .534 1.04 67.32 .000
03363> |-----|
03364> | SUM 04:040 | 3.61 1.220 1.04 65.74 .000
03365>
03366> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03367>
03368>
03369> 001:0008-----
03370> *
03371> * ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03372> |-----| (ha) (cms) (hrs) (mm) (cms)
03373> | ID1 03:030 | 1.40 .509 1.04 69.06 .000
03374> | +ID2 04:040 | 3.61 1.220 1.04 65.74 .000
03375> |-----|

```

```

03376> SUM 05:050 5.01 1.729 1.04 66.66 .000
03377>
03378> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03379>
03380>
03381> 001:0009-----
03382> *
03383> * SUB-AREA No.4
03384>
03385> | CALIB STANDHYD | Area (ha)= .89
03386> | 06:06O DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03387>
03388> IMPERVIOUS PERVIOUS (i)
03389> Surface Area (ha)= .86 .03
03390> Dep. Storage (mm)= 1.57 4.67
03391> Average Slope (%)= .93 .70
03392> Length (m)= 164.82 40.00
03393> Mannings n = .030 .250
03394>
03395> Max.eff.Inten.(mm/hr)= 178.56 67.61
03396> over (min) = 5.00 15.00
03397> Storage Coeff. (min)= 4.52 (ii) 15.92 (ii)
03398> Unit Hyd. Tpeak (min)= 5.00 15.00
03399> Unit Hyd. peak (cms)= .24 .07
03400>
03401> PEAK FLOW (cms)= .27 .00 *TOTALS*
03402> TIME TO PEAK (hrs)= 1.00 1.21 1.000
03403> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03404> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03405> RUNOFF COEFFICIENT = .98 .49 .964
03406>
03407> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03408> CN* = 81.0 Ia = Dep. Storage (Above)
03409> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03410> THAN THE STORAGE COEFFICIENT.
03411> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03412>
03413>
03414> 001:0010-----
03415> *
03416> * SUB-AREA No.5
03417>
03418> | CALIB STANDHYD | Area (ha)= 2.66
03419> | 07:07O DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03420>
03421> IMPERVIOUS PERVIOUS (i)
03422> Surface Area (ha)= 2.58 .08
03423> Dep. Storage (mm)= 1.57 4.67
03424> Average Slope (%)= .61 1.50
03425> Length (m)= 207.25 20.00
03426> Mannings n = .030 .250
03427>
03428> Max.eff.Inten.(mm/hr)= 178.56 74.05
03429> over (min) = 5.00 12.50
03430> Storage Coeff. (min)= 6.01 (ii) 11.73 (ii)
03431> Unit Hyd. Tpeak (min)= 5.00 12.50
03432> Unit Hyd. peak (cms)= .20 .09
03433>
03434> PEAK FLOW (cms)= 1.03 .01 *TOTALS*
03435> TIME TO PEAK (hrs)= 1.00 1.17 1.000
03436> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03437> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03438> RUNOFF COEFFICIENT = .98 .49 .964
03439>
03440> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03441> CN* = 81.0 Ia = Dep. Storage (Above)
03442> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03443> THAN THE STORAGE COEFFICIENT.
03444> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03445>
03446>
03447> 001:0011-----
03448> *
03449> * ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03450> |-----| (ha) (cms) (hrs) (mm) (cms)
03451> | ID1 06:060 | .89 .374 1.00 69.06 .000
03452> | +ID2 07:070 | 2.66 1.034 1.00 69.06 .000
03453> |-----|
03454> | SUM 08:080 | 3.55 1.408 1.00 69.06 .000
03455>
03456> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03457>
03458>
03459> 001:0012-----
03460> *
03461> * ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03462> |-----| (ha) (cms) (hrs) (mm) (cms)
03463> | ID1 05:050 | 5.01 1.729 1.04 66.66 .000
03464> | +ID2 08:080 | 3.55 1.408 1.00 69.06 .000
03465> |-----|
03466> | SUM 09:090 | 8.56 3.067 1.04 67.66 .000
03467>
03468> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03469>
03470>
03471> 001:0013-----
03472> *
03473> * ROUTE RESERVOIR | Requested routing time step = 1.0 min.
03474> | IN>09: (090 ) |
03475> | OUT<10: (POND ) | ===== OUTFLOW STORAGE TABLE =====
03476> |-----| OUTFLOW STORAGE | OUTFLOW STORAGE
03477> | (cms) (ha.m.) | (cms) (ha.m.)
03478> | .000 .0000E+00 | .593 .6251E+00
03479> | .008 .6560E-01 | .654 .6631E+00
03480> | .017 .1311E+00 | .797 .7391E+00
03481> | .093 .2831E+00 | .950 .8274E+00
03482> | .233 .3971E+00 | 1.304 .9157E+00
03483> | .337 .4731E+00 | 1.880 .1004E+01
03484> | .465 .5491E+00 | 2.577 .1092E+01
03485> | .531 .5871E+00 | .000 .0000E+00
03486>
03487>
03488> ROUTING RESULTS AREA QPEAK TPEAK R.V.
03489> |-----| (ha) (cms) (hrs) (mm)
03490> | INFLOW>09: (090 ) | 8.56 3.067 1.042 67.655
03491> | OUTFLOW<10: (POND ) | 8.56 .283 1.861 67.653
03492>
03493> PEAK FLOW REDUCTION (Qout/Qin) (%) = 9.214
03494> TIME SHIFT OF PEAK FLOW (min) = 49.17
03495> MAXIMUM STORAGE USED (ha.m.) = .4333E+00
03496>
03497> 001:0014-----
03498> *****
03499> * Remaining Hawthorne Industrial Park *
03500> *****
03501> *
03502> * SUB-AREA No.1
03503>
03504> | CALIB STANDHYD | Area (ha)= 19.90
03505> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
03506>
03507> IMPERVIOUS PERVIOUS (i)
03508> Surface Area (ha)= 14.13 5.77
03509> Dep. Storage (mm)= 1.57 4.67
03510> Average Slope (%)= .60 1.50

```



03511> Length (m) = 580.00 100.00  
 03512> Mannings n = .030 .250  
 03513>  
 03514> Max. eff. Inten. (mm/hr) = 153.66 117.89  
 03515> over (min) = 12.50 25.00  
 03516> Storage Coeff. (min) = 11.89 (ii) 24.37 (ii)  
 03517> Unit Hyd. Tpeak (min) = 12.50 25.00  
 03518> Unit Hyd. peak (cms) = .09 .05  
 03519>  
 03520> PEAK FLOW (cms) = 2.77 1.13 3.419 (iii)  
 03521> TIME TO PEAK (hrs) = 1.13 1.38 1.167  
 03522> RUNOFF VOLUME (mm) = 70.09 45.94 58.015  
 03523> TOTAL RAINFALL (mm) = 71.66 71.66 71.665  
 03524> RUNOFF COEFFICIENT = .98 .64 .810  
 03525>  
 03526> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03527> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03528> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03529> THAN THE STORAGE COEFFICIENT.  
 03530> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03531>

03532> 001:0015  
 03533> \*  
 03534> | ADD HYD (HIP02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03535> | (ha) (cms) (hrs) (mm) (cms)  
 03536> ID1 10:POND 8.56 .283 1.86 67.65 .000  
 03537> +ID2 01:HIP01 19.90 3.419 1.17 58.02 .000  
 03538> =====  
 03539> SUM 02:HIP02 28.46 3.554 1.17 60.91 .000  
 03540>  
 03541> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03542>  
 03543>  
 03544>  
 03545> 001:0016  
 03546> \*  
 03547> \* SUB-AREA No.2

03548> | CALIB STANDHYD | Area (ha) = 17.00  
 03549> | 03:HIP03 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
 03550>  
 03551>

03552> Surface Area (ha) = IMPERVIOUS PERVIOUS (i)  
 03553> 12.07 4.93  
 03554> Dep. Storage (mm) = 1.57 4.67  
 03555> Average Slope (%) = .65 1.50  
 03556> Length (m) = 450.00 100.00  
 03557> Mannings n = .030 .250  
 03558>  
 03559> Max. eff. Inten. (mm/hr) = 178.56 126.60  
 03560> over (min) = 10.00 22.50  
 03561> Storage Coeff. (min) = 9.39 (ii) 21.52 (ii)  
 03562> Unit Hyd. Tpeak (min) = 10.00 22.50  
 03563> Unit Hyd. peak (cms) = .12 .05  
 03564>  
 03565> PEAK FLOW (cms) = 2.68 1.05 3.203 (iii)  
 03566> TIME TO PEAK (hrs) = 1.08 1.33 1.125  
 03567> RUNOFF VOLUME (mm) = 70.09 45.94 58.015  
 03568> TOTAL RAINFALL (mm) = 71.66 71.66 71.665  
 03569> RUNOFF COEFFICIENT = .98 .64 .810  
 03570>  
 03571> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03572> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03573> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03574> THAN THE STORAGE COEFFICIENT.  
 03575> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03576>  
 03577>  
 03578> 001:0017  
 03579> \*  
 03580> \* SUB-AREA No.3

03581> | CALIB STANDHYD | Area (ha) = 15.60  
 03582> | 04:HIP04 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
 03583>  
 03584>

03586> Surface Area (ha) = IMPERVIOUS PERVIOUS (i)  
 03587> 11.08 4.52  
 03588> Dep. Storage (mm) = 1.57 4.67  
 03589> Average Slope (%) = .50 1.50  
 03590> Length (m) = 600.00 100.00  
 03591> Mannings n = .030 .250  
 03592>  
 03593> Max. eff. Inten. (mm/hr) = 153.66 117.89  
 03594> over (min) = 12.50 25.00  
 03595> Storage Coeff. (min) = 12.82 (ii) 25.30 (ii)  
 03596> Unit Hyd. Tpeak (min) = 12.50 25.00  
 03597> Unit Hyd. peak (cms) = .09 .04  
 03598>  
 03599> PEAK FLOW (cms) = 2.10 .87 2.612 (iii)  
 03600> TIME TO PEAK (hrs) = 1.13 1.38 1.167  
 03601> RUNOFF VOLUME (mm) = 70.09 45.94 58.015  
 03602> TOTAL RAINFALL (mm) = 71.66 71.66 71.665  
 03603> RUNOFF COEFFICIENT = .98 .64 .810  
 03604>  
 03605> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03606> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03607> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03608> THAN THE STORAGE COEFFICIENT.  
 03609> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03610>  
 03611> 001:0018  
 03612> | ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03613> | (ha) (cms) (hrs) (mm) (cms)  
 03614> ID1 03:HIP03 17.00 3.203 1.13 58.02 .000  
 03615> +ID2 04:HIP04 15.60 2.612 1.17 58.02 .000  
 03616> =====  
 03617> SUM 05:HIP05 32.60 5.767 1.13 58.02 .000  
 03618>  
 03619> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03620>  
 03621>  
 03622> 001:0019  
 03623> | ADD HYD (HIP06) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03624> | (ha) (cms) (hrs) (mm) (cms)  
 03625> ID1 05:HIP05 32.60 5.767 1.13 58.02 .000  
 03626> +ID2 02:HIP02 28.46 3.554 1.17 60.91 .000  
 03627> =====  
 03628> SUM 06:HIP06 61.06 9.239 1.13 59.36 .000  
 03629>  
 03630> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03631>  
 03632>  
 03633>  
 03634> 001:0020  
 03635> \*  
 03636> \* SUB-AREA No.4  
 03637> | CALIB STANDHYD | Area (ha) = 12.20  
 03638> | 07:HIP07 DT= 2.50 | Total Imp(%) = 71.00 Dir. Conn.(%) = 50.00  
 03639>  
 03640>  
 03641>

03643> Surface Area (ha) = IMPERVIOUS PERVIOUS (i)  
 03644> 8.66 3.54  
 03645> Dep. Storage (mm) = 1.57 4.67  
 03646> Average Slope (%) = .70 1.50

03646> Length (m) = 210.00 100.00  
 03647> Mannings n = .030 .250  
 03648>  
 03649> Max. eff. Inten. (mm/hr) = 178.56 146.17  
 03650> over (min) = 5.00 17.50  
 03651> Storage Coeff. (min) = 5.81 (ii) 17.27 (ii)  
 03652> Unit Hyd. Tpeak (min) = 5.00 17.50  
 03653> Unit Hyd. peak (cms) = .20 .07  
 03654>  
 03655> PEAK FLOW (cms) = 2.46 .87 2.793 (iii)  
 03656> TIME TO PEAK (hrs) = 1.00 1.25 1.042  
 03657> RUNOFF VOLUME (mm) = 70.09 45.94 58.015  
 03658> TOTAL RAINFALL (mm) = 71.66 71.66 71.665  
 03659> RUNOFF COEFFICIENT = .98 .64 .810  
 03660>  
 03661> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 03662> CN\* = 81.0 Ia = Dep. Storage (Above)  
 03663> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 03664> THAN THE STORAGE COEFFICIENT.  
 03665> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03666>  
 03667>  
 03668> 001:0021  
 03669> \*  
 03670> \*SUB-AREA No.5

03671> | DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN)=85.00  
 03672> | 08:Pond-B DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
 03673> | U.H. Tp(hrs) = .170  
 03674>  
 03675>  
 03676> Unit Hyd Qpeak (cms) = .899  
 03677>  
 03678> PEAK FLOW (cms) = .649 (i)  
 03679> TIME TO PEAK (hrs) = 1.125  
 03680> RUNOFF VOLUME (mm) = 40.139  
 03681> TOTAL RAINFALL (mm) = 71.665  
 03682> RUNOFF COEFFICIENT = .560  
 03683>  
 03684> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03685>  
 03686> 001:0022

03687> | ADD HYD (HIP08) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03688> | (ha) (cms) (hrs) (mm) (cms)  
 03689> ID1 06:HIP06 61.06 9.239 1.13 59.36 .000  
 03690> +ID2 07:HIP07 12.20 2.793 1.04 58.02 .000  
 03691> +ID3 08:Pond-B 4.00 .649 1.13 40.14 .000  
 03692> =====  
 03693> SUM 09:HIP08 77.26 12.109 1.13 58.16 .000  
 03694>  
 03695> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03696>  
 03697>  
 03698> 001:0023  
 03699> \*  
 03700> \*SUB-AREA No. 6

03701> | DESIGN NASHYD | Area (ha) = 2.70 Curve Number (CN)=76.00  
 03702> | 01:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
 03703> | U.H. Tp(hrs) = .800  
 03704>  
 03705>  
 03706> Unit Hyd Qpeak (cms) = .129  
 03707>  
 03708> PEAK FLOW (cms) = .114 (i)  
 03709> TIME TO PEAK (hrs) = 1.958  
 03710> RUNOFF VOLUME (mm) = 30.490  
 03711> TOTAL RAINFALL (mm) = 71.665  
 03712> RUNOFF COEFFICIENT = .425  
 03713>  
 03714> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
 03715>  
 03716> 001:0024  
 03717> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
 03718> | (ha) (cms) (hrs) (mm) (cms)  
 03719> ID1 09:HIP08 77.26 12.109 1.13 58.16 .000  
 03720> +ID2 01:A3 2.70 .114 1.96 30.49 .000  
 03721> =====  
 03722> SUM 02:Ultima 79.96 12.132 1.13 57.22 .000  
 03723>  
 03724> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
 03725>  
 03726>  
 03727> 001:0025  
 03728> FINISH  
 03729>  
 03730> \*\*\*\*\*  
 03731> WARNINGS / ERRORS / NOTES  
 03732>  
 03733> Simulation ended on 2009-02-09 at 14:59:34  
 03734>  
 03735>  
 03736>  
 03737>  
 03738>  
 03739>  
 03740>  
 03741>  
 03742>

**APPENDIX 'F'**

**STAGE-STORAGE-DISCHARGE TABLE**

### Hawthorne Industrial Park Configuration of Storage Facility

	RESTRICTOR FLOW (L/S)	RESTRICTOR FLOW (L/S)	WEIR FLOW (L/S)	TOTAL OUTFLOW (L/S)	Storage Cell Configuration		
					AREA m <sup>2</sup>	VOLUME m <sup>3</sup>	VOLUME ha-m
	SWMHYMO DATA						
Invert Elevation (m):	82.90	84.80	86.15	0	0	0	0.0000
Dia. or Width (mm):	150	600	6000	0.0	3093	574	0.0574
# of restrictors/weirs:	1	2	1	0.0	11192	2434	0.2434
Discharge Coeff. (C <sub>d</sub> ):	0.61	0.61	1.87	0.0	16913	5834	0.5834
ELEV. (m)	DISCH. (L/S)	DISCH. (L/S)	DISCH. (L/S)				
82.900	0.0	0.0	0.0	0	0	0	0.0000
84.000	48.3	0.0	0.0	48	3093	574	0.0574
84.250	53.9	0.0	0.0	54	11192	2434	0.2434
84.500	59.0	0.0	0.0	59	16913	5834	0.5834
84.650	61.8	0.0	0.0	62	17299	8400	0.8400
84.800	64.5	0.0	0.0	64	17684	11024	1.1024
84.950	67.1	80.0	0.0	147	18070	13705	1.3705
85.100	69.6	210.0	0.0	280	18456	16444	1.6444
85.250	72.0	400.0	0.0	472	18842	19242	1.9242
85.400	74.3	650.0	0.0	724	19227	22097	2.2097
85.550	76.6	860.0	0.0	937	19613	25010	2.5010
85.700	78.8	1183.3	0.0	1262	19999	27981	2.7981
85.850	80.9	1323.0	0.0	1404	20384	31009	3.1009
86.000	83.0	1449.3	0.0	1532	20770	34096	3.4096
86.150	85.1	1565.4	0.0	1650	21156	37240	3.7240
86.300	87.1	1673.5	648.6	2409	21541	40442	4.0442
86.450	89.0	1775.0	1825.2	3689	21927	43702	4.3702

Note: Restrictor flows estimated by MTO Design Chart 2.32: Inlet Control for elevations ≤ 85.55 for double 600 mm culverts.

**A P P E N D I X ' G '**

**SWMHYMO INPUT AND OUTPUT FILES  
(Post-Development Controlled Phase 1 Conditions)**



```

00271> SCS curve number CN=[81],
00272> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.0] (%),
00273> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00274> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.50] (%),
00275> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00276> RAINFALL=[ , , , ] (mm/hr), END=-1
00277> *%
00278> * SUB-AREA No.3
00280>
00281> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00282> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00283> SCS curve number CN=[81],
00284> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.0] (%),
00285> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00286> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.5] (%),
00287> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
00288> RAINFALL=[ , , , ] (mm/hr), END=-1
00289> *%
00290> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00291> *%
00292> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00293> *%
00294>
00295> * SUB-AREA No.4
00296>
00297> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00298> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00299> SCS curve number CN=[81],
00300> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[0.7] (%),
00301> LGP=[40] (m), MNP=[0.03], SCP=[0.0] (min)
00302> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.93] (%),
00303> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00304> RAINFALL=[ , , , ] (mm/hr), END=-1
00305> *%
00306> * SUB-AREA No.5
00307>
00308>
00309> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00310> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00311> SCS curve number CN=[81],
00312> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.5] (%),
00313> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00314> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.61] (%),
00315> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00316> RAINFALL=[ , , , ] (mm/hr), END=-1
00317> *%
00318> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00319> *%
00320> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00321> *%
00322>
00323> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00324> RDT=[1.0] (min),
00325> TABLE of ( OUTFLOW-STORAGE ) values
00326> (cms) - (ha-m)
00327> [ 0.000, 0.0000]
00328> [ 0.008, 0.0656]
00329> [ 0.017, 0.1311]
00330> [ 0.093, 0.2831]
00331> [ 0.233, 0.3971]
00332> [ 0.337, 0.4731]
00333> [ 0.465, 0.5491]
00334> [ 0.531, 0.5871]
00335> [ 0.593, 0.6251]
00336> [ 0.654, 0.6631]
00337> [ 0.797, 0.7391]
00338> [ 0.950, 0.8274]
00339> [ 1.304, 0.9157]
00340> [ 1.880, 1.0040]
00341> [ 2.577, 1.0923]
00342> [ -1, -1 ] (max twenty pts)
00343> *%
00344> *****
00345> * Remaining Hawthorne Industrial Park *
00346> *****
00347> *
00348> * SUB-AREA No.1
00349>
00350> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00351> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00352> SCS curve number CN=[81],
00353> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.5] (%),
00354> LGP=[100.91] (m), MNP=[0.25], SCP=[0.0] (m)
00355> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.61] (%),
00356> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00357> RAINFALL=[ , , , ] (mm/hr), END=-1
00358> *%
00359> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00360> *%
00361>
00362> * SUB-AREA No.2
00363>
00364> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00365> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00366> SCS curve number CN=[81],
00367> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.5] (%),
00368> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00369> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.65] (%),
00370> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00371> RAINFALL=[ , , , ] (mm/hr), END=-1
00372> *%
00373>
00374> * SUB-AREA No.3
00375>
00376> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00377> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00378> SCS curve number CN=[81],
00379> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.5] (%),
00380> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00381> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.5] (%),
00382> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00383> RAINFALL=[ , , , ] (mm/hr), END=-1
00384> *%
00385> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00386> *%
00387>
00388> * SUB-AREA No.4
00389>
00390> DESIGN WASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00391> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00392> RAINFALL=[ , , , ] (mm/hr), END=-1
00393> *%
00394>
00395>
00396> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00397> *%
00398>
00399> ROUTE RESERVOIR IDout=[ 8 ], NHYD=["HIP-POND"], IDin=[ 7 ],
00400> RDT=[1.0] (min),
00401> TABLE of ( OUTFLOW-STORAGE ) values
00402> (cms) - (ha-m)
00403> [ 0.0, 0.0 ]
00404> [ 0.048, 0.0574 ]
00405> [ 0.054, 0.2434 ]

```

```

00406> [ 0.059, 0.5834 ]
00407> [ 0.062, 0.8400 ]
00408> [ 0.064, 1.1024 ]
00409> [ 0.147, 1.3705 ]
00410> [ 0.280, 1.6444 ]
00411> [ 0.472, 1.9242 ]
00412> [ 0.724, 2.2097 ]
00413> [ 0.937, 2.5010 ]
00414> [ 1.262, 2.7981 ]
00415> [ 1.404, 3.1099 ]
00416> [ 1.532, 3.4096 ]
00417> [ 1.650, 3.7240 ]
00418> [ 2.409, 4.0442 ]
00419> [ 3.689, 4.3702 ]
00420> [ -1, -1 ] (max twenty pts)
00422> *%
00423> *
00424> *SUB-AREA No. 5
00425> *
00426> DESIGN WASHYD ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
00427> DWF=[0] (cms), CNC=[76], TP=[0.37]hrs,
00428> RAINFALL=[ , , , ](mm/hr), END=-1
00429> *%
00430>
00431> *SUB-AREA No. 6
00432> *
00433> DESIGN WASHYD ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
00434> DWF=[0] (cms), CNC=[76], TP=[0.804]hrs,
00435> RAINFALL=[ , , , ](mm/hr), END=-1
00436> *%
00437> ADD HYD IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
00438> *%
00439>
00440>
00441> *****
00442> * CALCULATION OF 3HR - 1:5 YEAR STORM EVENT *
00443> *****
00444>
00445> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00446> [ ] <- storm filename, one per line for NSTORM time
00447> *%
00448> CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDET=[10.0] (min)
00449> ICASEcs=[1],
00450> R=[998.071], B=[6.053], and C=[0.814],
00451> *%
00452> DEFAULT VALUES ICASDef=[1], read and print values
00453> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMOV\ORGA.VAL"]
00454> *%
00455>
00456> *****
00457> * ORGAWORLD FILE *
00458> *****
00459>
00460> * SUB-AREA No.1
00461>
00462> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00463> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00464> SCS curve number CN=[81],
00465> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.0] (%),
00466> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (mi)
00467> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.52] (%),
00468> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00469> RAINFALL=[ , , , ] (mm/hr), END=-1
00470> *%
00471>
00472> * SUB-AREA No.2
00473>
00474> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00475> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00476> SCS curve number CN=[81],
00477> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.0] (%),
00478> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00479> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.50] (%),
00480> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00481> RAINFALL=[ , , , ] (mm/hr), END=-1
00482> *%
00483> * SUB-AREA No.3
00484>
00485> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00486> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00487> SCS curve number CN=[81],
00488> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.0] (%),
00489> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00490> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.5] (%),
00491> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
00492> RAINFALL=[ , , , ] (mm/hr), END=-1
00493> *%
00494>
00495> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00496> *%
00497> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00498> *%
00499>
00500> * SUB-AREA No.4
00501>
00502> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00503> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00504> SCS curve number CN=[81],
00505> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[0.7] (%),
00506> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min)
00507> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.93] (%),
00508> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00509> RAINFALL=[ , , , ] (mm/hr), END=-1
00510> *%
00511>
00512> * SUB-AREA No.5
00513>
00514> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00515> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00516> SCS curve number CN=[81],
00517> Pervious surfaces: IAPER=[4.67] (mm), SLEPP=[1.5] (%),
00518> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00519> Impervious surfaces: IAIMP=[1.57] (mm), SLEPI=[0.61] (%),
00520> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00521> RAINFALL=[ , , , ] (mm/hr), END=-1
00522> *%
00523> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00524> *%
00525> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00526> *%
00527>
00528> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00529> RDT=[1.0] (min),
00530> TABLE of ( OUTFLOW-STORAGE ) values
00531> (cms) - (ha-m)
00532> [ 0.000, 0.0000]
00533> [ 0.008, 0.0656]
00534> [ 0.017, 0.1311]
00535> [ 0.093, 0.2831]
00536> [ 0.233, 0.3971]
00537> [ 0.337, 0.4731]
00538> [ 0.465, 0.5491]
00539> [ 0.531, 0.5871]
00540> [ 0.593, 0.6251]

```

```

00541> [ 0.654, 0.6631 ]
00542> [ 0.797, 0.7391 ]
00543> [ 0.950, 0.8274 ]
00544> [ 1.304, 0.8157 ]
00545> [ 1.880, 1.0040 ]
00546> [ 2.577, 1.0923 ]
00547> [ -1, -1 ] (max twenty pts)
00548>
00549> *****
00550> * Remaining Hawthorne Industrial Park *
00551> *****
00552> *
00553> * SUB-AREA No.1
00554>
00555> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00556> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00557> SCS curve number CN=[81],
00558> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00559> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00560> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00561> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00562> RAINFALL=[ , , , ] (mm/hr), END=-1
00563> *
00564> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00565> *
00566> *
00567> * SUB-AREA No.2
00568>
00569> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00570> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00571> SCS curve number CN=[81],
00572> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00573> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00574> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00575> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00576> RAINFALL=[ , , , ] (mm/hr), END=-1
00577> *
00578> * SUB-AREA No.3
00579>
00580>
00581> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00582> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00583> SCS curve number CN=[81],
00584> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00585> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00586> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00587> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00588> RAINFALL=[ , , , ] (mm/hr), END=-1
00589> *
00590> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00591> *
00592> *
00593> * SUB-AREA No.4
00594>
00595> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00596> DWF=[0] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00597> RAINFALL=[ , , , ] (mm/hr), END=-1
00598> *
00599> *
00600>
00601> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00602> *
00603>
00604> ROUTE RESERVOIR IDout=[ 8 ], NHYD=["HIP-POND"], IDin=[ 7 ],
00605> RDT=[1.0] (min)
00606>
00607> TABLE of ( OUTFLOW-STORAGE ) values
00608> (cms) - (ha-m)
00609> [ 0.048, 0.0 ]
00610> [ 0.054, 0.2434 ]
00611> [ 0.059, 0.5834 ]
00612> [ 0.062, 0.8400 ]
00613> [ 0.064, 1.1024 ]
00614> [ 0.147, 1.3705 ]
00615> [ 0.280, 1.6484 ]
00616> [ 0.472, 1.9242 ]
00617> [ 0.724, 2.2097 ]
00618> [ 0.937, 2.5010 ]
00619> [ 1.262, 2.7981 ]
00620> [ 1.404, 3.1009 ]
00621> [ 1.532, 3.4096 ]
00622> [ 1.650, 3.7240 ]
00623> [ 2.409, 4.0442 ]
00624> [ 3.689, 4.3702 ]
00625> [ -1, -1 ] (max twenty pts)
00626> *
00627> *
00628> *
00629> * SUB-AREA No.5
00630>
00631> DESIGN NASHYD ID = [ 9 ], NHYD=["A2"], DT=[2.5] min, AREA=[6.8] (ha),
00632> DWF=[0] (cms), CNC=[76], TP=[0.37] hrs,
00633> RAINFALL=[ , , , ] (mm/hr), END=-1
00634> *
00635> *
00636> * SUB-AREA No.6
00637> *
00638> DESIGN NASHYD ID = [ 10 ], NHYD=["A3"], DT=[2.5] min, AREA=[5.3] (ha),
00639> DWF=[0] (cms), CNC=[76], TP=[0.804] hrs,
00640> RAINFALL=[ , , , ] (mm/hr), END=-1
00641> *
00642> ADD HYD IDsum=[ 1 ], NHYD=["Interim"], IDs to add=[8+9+10]
00643> *
00644>
00645> *****
00646> * CALCULATION OF 3HR - 1:10 YEAR STORM EVENT *
00647> *****
00648>
00649> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUM=[0]
00650> *
00651> [ ] <- storm filename, one per line for NSTORM time
00652> CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TRPAT=[0.333], CSD=[10.0] (min)
00653> ICASRcs=[1],
00654> A=[1174.184], B=[6.014], and C=[0.816],
00655> *
00656> DEFAULT VALUES ICASedef=[1], read and print values
00657> DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
00658> *
00659> *
00660> *****
00661> * ORGAWORLD FILE *
00662> *****
00663> *
00664> * SUB-AREA No.1
00665>
00666> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00667> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00668> SCS curve number CN=[81],
00669> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00670> LGP=[20] (m), MNP=[0.25], SCP=[0.0] (m)
00671> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00672> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0] (min)
00673> RAINFALL=[ , , , ] (mm/hr), END=-1
00674> *
00675> *

```

```

00676> * SUB-AREA No.2
00677>
00678> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00679> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00680> SCS curve number CN=[81],
00681> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00682> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min)
00683> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
00684> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0] (min)
00685> RAINFALL=[ , , , ] (mm/hr), END=-1
00686> *
00687> *
00688> * SUB-AREA No.3
00689>
00690> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00691> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00692> SCS curve number CN=[81],
00693> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00694> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min)
00695> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00696> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0] (min)
00697> RAINFALL=[ , , , ] (mm/hr), END=-1
00698> *
00699> ADD HYD IDsum=[ 4 ], NHYD=["040"], IDs to add=[1+2]
00700> *
00701> ADD HYD IDsum=[ 5 ], NHYD=["050"], IDs to add=[3+4]
00702> *
00703> *
00704> * SUB-AREA No.4
00705>
00706> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00707> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00708> SCS curve number CN=[81],
00709> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00710> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00711> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.53] (%),
00712> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
00713> RAINFALL=[ , , , ] (mm/hr), END=-1
00714> *
00715> *
00716> * SUB-AREA No.5
00717>
00718> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00719> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00720> SCS curve number CN=[81],
00721> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00722> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
00723> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00724> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
00725> RAINFALL=[ , , , ] (mm/hr), END=-1
00726> *
00727> ADD HYD IDsum=[ 8 ], NHYD=["080"], IDs to add=[6+7]
00728> *
00729> ADD HYD IDsum=[ 9 ], NHYD=["090"], IDs to add=[5+8]
00730> *
00731> *
00732> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00733> RDT=[1.0] (min),
00734>
00735> TABLE of ( OUTFLOW-STORAGE ) values
00736> (cms) - (ha-m)
00737> [ 0.008, 0.0000 ]
00738> [ 0.008, 0.0656 ]
00739> [ 0.017, 0.1311 ]
00740> [ 0.093, 0.2831 ]
00741> [ 0.233, 0.3971 ]
00742> [ 0.337, 0.4731 ]
00743> [ 0.465, 0.5491 ]
00744> [ 0.531, 0.5871 ]
00745> [ 0.593, 0.6251 ]
00746> [ 0.654, 0.6631 ]
00747> [ 0.797, 0.7391 ]
00748> [ 0.950, 0.8274 ]
00749> [ 1.304, 0.8157 ]
00750> [ 1.880, 1.0040 ]
00751> [ 2.577, 1.0923 ]
00752> [ -1, -1 ] (max twenty pts)
00753> *****
00754> * Remaining Hawthorne Industrial Park *
00755> *****
00756> *
00757> * SUB-AREA No.1
00758>
00759> CALIB STANDHYD ID=[ 2 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00760> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00761> SCS curve number CN=[81],
00762> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00763> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00764> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00765> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00766> RAINFALL=[ , , , ] (mm/hr), END=-1
00767> *
00768> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00769> *
00770> *
00771> * SUB-AREA No.2
00772>
00773> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00774> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00775> SCS curve number CN=[81],
00776> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00777> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00778> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00779> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00780> RAINFALL=[ , , , ] (mm/hr), END=-1
00781> *
00782> *
00783> * SUB-AREA No.3
00784>
00785> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
00786> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00787> SCS curve number CN=[81],
00788> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00789> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00790> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00791> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00792> RAINFALL=[ , , , ] (mm/hr), END=-1
00793> *
00794> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00795> *
00796> *
00797> * SUB-AREA No.4
00798>
00799> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00800> DWF=[0] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00801> RAINFALL=[ , , , ] (mm/hr), END=-1
00802> *
00803> *
00804>
00805> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00806> *
00807> *
00808> ROUTE RESERVOIR IDout=[ 8 ], NHYD=["HIP-POND"], IDin=[ 7 ],
00809> RDT=[1.0] (min),
00810>
00811> TABLE of ( OUTFLOW-STORAGE ) values

```





```

01081> RAINFALL=[ , , , ](mm/hr) , END=-1
01082> *
01083> * SUB-AREA No.2
01085>
01086> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[1.54 ](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
01090> RAINFALL=[ , , , ](mm/hr) , END=-1
01093> *
01095> *
01096> * SUB-AREA No.3
01097>
01098> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
01104> RAINFALL=[ , , , ](mm/hr) , END=-1
01105> *
01106> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
01108> *
01109> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
01111> *
01112> * SUB-AREA No.4
01113>
01114> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[0.7] (%),
LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
01122> RAINFALL=[ , , , ](mm/hr) , END=-1
01123> *
01124> * SUB-AREA No.5
01125>
01126> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
01133> RAINFALL=[ , , , ](mm/hr) , END=-1
01134> *
01135> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
01136> *
01137> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
01138> *
01139>
01140> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RDT=[1.0] (min),
TABLE of ( OUTFLOW-STORAGE ) values
01143> ( cms) - (ha-m)
01144> [ 0.000, 0.0000 ]
01145> [ 0.008, 0.0656 ]
01146> [ 0.017, 0.1311 ]
01147> [ 0.093, 0.2831 ]
01148> [ 0.233, 0.3971 ]
01149> [ 0.337, 0.4731 ]
01150> [ 0.465, 0.5491 ]
01151> [ 0.531, 0.5871 ]
01152> [ 0.593, 0.6251 ]
01153> [ 0.654, 0.6631 ]
01154> [ 0.797, 0.731 ]
01155> [ 0.950, 0.8271 ]
01156> [ 1.304, 0.9157 ]
01157> [ 1.880, 1.0040 ]
01158> [ 2.577, 1.0923 ]
01159> [ -1, -1 ] (max twenty pts)
01160>
01161> *****
01162> * Remaining Hawthorne Industrial Park *
01163> *****
01164> *
01165> * SUB-AREA No.1
01166>
01167> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01174> RAINFALL=[ , , , ](mm/hr) , END=-1
01175> *
01176> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01177> *
01178> *
01179> * SUB-AREA No.2
01180>
01181> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01189> RAINFALL=[ , , , ](mm/hr) , END=-1
01190> *
01191> * SUB-AREA No.3
01192>
01193> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01200> RAINFALL=[ , , , ](mm/hr) , END=-1
01201> *
01202> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01203> *
01204> *
01205> * SUB-AREA No.4
01206>
01207> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17]hrs,
RAINFALL=[ , , , ](mm/hr), END=-1
01209> *
01210> *
01211> *
01212> *
01213> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
01214> *
01215> *

```

```

01216> ROUTE RESERVOIR IDout=[ 8 ], NHYD=["HIP-POND"], IDin=[ 7 ],
RDT=[1.0] (min),
TABLE of ( OUTFLOW-STORAGE ) values
01219> ( cms) - (ha-m)
01220> [ 0.0, 0.0 ]
01221> [ 0.048, 0.0574 ]
01222> [ 0.054, 0.2434 ]
01223> [ 0.059, 0.5834 ]
01224> [ 0.062, 0.8400 ]
01225> [ 0.064, 1.1024 ]
01226> [ 0.147, 1.3706 ]
01227> [ 0.280, 1.6444 ]
01228> [ 0.472, 1.9242 ]
01229> [ 0.724, 2.2097 ]
01230> [ 0.937, 2.5010 ]
01231> [ 1.262, 2.7981 ]
01232> [ 1.404, 3.1009 ]
01233> [ 1.532, 3.4096 ]
01234> [ 1.650, 3.7240 ]
01235> [ 2.409, 4.0442 ]
01236> [ 3.689, 4.3702 ]
01237> [ -1, -1 ] (max twenty pts)
01239> *
01240> *
01241> * SUB-AREA No. 5
01242> *
01243> DESIGN NASHYD ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
DWF=[0] (cms), CNC=[76], TP=[0.37]hrs,
RAINFALL=[ , , , ](mm/hr), END=-1
01246> *
01247> *
01248> * SUB-AREA No. 6
01249> *
01250> DESIGN NASHYD ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
DWF=[0] (cms), CNC=[76], TP=[0.804]hrs,
RAINFALL=[ , , , ](mm/hr), END=-1
01253> *
01254> ADD HYD IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
01255> *
01256> *****
01257> * CALCULATION OF 3HR - 1:100 YEAR STORM EVENT *
01258> *****
01259>
01260>
01261> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
01262> *
01263> * [ ] <- storm filename, one per line for NSTORM time
01264> CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
ICASE=[1],
A=[1735.689], B=[6.014], and C=[0.820].
01266> *
01267> *
01268> DEFAULT VALUES ICASEDef=[1], read and print values
DEFVAL_FILENAME=[V:\22973.DU\ENG\SWHYMO\ORGA.VAL]
01269> *
01270> *
01271> *
01272> *****
01273> * ORGAWORLD FILE *
01274> *****
01275> *
01276> * SUB-AREA No.1
01277> *
01278> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
LGI=[204.72] (m), MNI=[0.03 ], SCI=[0.0]
01286> RAINFALL=[ , , , ](mm/hr) , END=-1
01287> *
01288> * SUB-AREA No.2
01289> *
01290> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
LGI=[244.34] (m), MNI=[0.03 ], SCI=[0.0]
01297> RAINFALL=[ , , , ](mm/hr) , END=-1
01298> *
01299> *
01300> * SUB-AREA No.3
01301> *
01302> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
01309> RAINFALL=[ , , , ](mm/hr) , END=-1
01310> *
01311> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
01312> *
01313> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
01314> *
01315> *
01316> * SUB-AREA No.4
01317> *
01318> CALIB STANDHYD ID=[ 6 ], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.0] (%),
LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
01326> RAINFALL=[ , , , ](mm/hr) , END=-1
01327> *
01328> * SUB-AREA No.5
01329> *
01330> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67] (mm), SLP=[1.5] (%),
LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (min),
Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
01337> RAINFALL=[ , , , ](mm/hr) , END=-1
01338> *
01339> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
01340> *
01341> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
01342> *
01343> *
01344> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
RDT=[1.0] (min),
TABLE of ( OUTFLOW-STORAGE ) values
01345> ( cms) - (ha-m)
01346> [ 0.000, 0.0000 ]
01347> [ 0.008, 0.0656 ]
01348> [ 0.017, 0.1311 ]
01349> *
01350> *

```

```

01351> [ 0.093, 0.2831]
01352> [ 0.233, 0.3971]
01353> [ 0.337, 0.4731]
01354> [ 0.465, 0.5491]
01355> [ 0.531, 0.5871]
01356> [ 0.593, 0.6251]
01357> [ 0.654, 0.6631]
01358> [ 0.797, 0.7331]
01359> [ 0.950, 0.8271]
01360> [ 1.304, 0.9157]
01361> [ 1.880, 1.0040]
01362> [ 2.577, 1.0923]
01363> [ -1, -1 ] (max twenty pts)
01364>
01365> *****
01366> * Remaining Hawthorne Industrial Park *
01367> *****
01368> *
01369> * SUB-AREA No.1
01370>
01371> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
01372> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01373> SCS curve number CN=[81],
01374> Pervious surfaces: IAPer=[4.67] (mm), SLPP=[1.5] (%),
01375> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01376> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.6] (%),
01377> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01378> RAINFALL=[ , , , ] (mm/hr), END=-1
01379> *%-----|
01380> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01381> *%-----|
01382> *
01383> * SUB-AREA No.2
01384>
01385> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
01386> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01387> SCS curve number CN=[81],
01388> Pervious surfaces: IAPer=[4.67] (mm), SLPP=[1.5] (%),
01389> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01390> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.65] (%),
01391> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01392> RAINFALL=[ , , , ] (mm/hr), END=-1
01393> *%-----|
01394> *
01395> * SUB-AREA No.3
01396>
01397> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[18.1] (ha),
01398> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01399> SCS curve number CN=[81],
01400> Pervious surfaces: IAPer=[4.67] (mm), SLPP=[1.5] (%),
01401> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01402> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.5] (%),
01403> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01404> RAINFALL=[ , , , ] (mm/hr), END=-1
01405> *%-----|
01406> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01407> *%-----|
01408> *
01409> *SUB-AREA No.4
01410>
01411> DESIGN NASHYD ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
01412> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17]hrs,
01413> RAINFALL=[ , , , ] (mm/hr), END=-1
01414> *%-----|
01415> *
01416>
01417> ADD HYD IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
01418> *%-----|
01419> *
01420> ROUTE RESERVOIR IDout=[ 8 ], NHYD=["HIP-POND"], IDin=[ 7 ],
01421> RDT=[1.0] (min),
01422> TABLE of ( OUTFLOW-STORAGE ) values
01423> ( cms ) ( ha-m )
01424> [ 0.0 0.0 ]
01425> [ 0.048, 0.0574 ]
01426> [ 0.054, 0.2434 ]
01427> [ 0.059, 0.5834 ]
01428> [ 0.062, 0.8400 ]
01429> [ 0.064, 1.1024 ]
01430> [ 0.147, 1.3705 ]
01431> [ 0.280, 1.6444 ]
01432> [ 0.472, 1.9242 ]
01433> [ 0.724, 2.2097 ]
01434> [ 0.937, 2.5010 ]
01435> [ 1.262, 2.7981 ]
01436> [ 1.404, 3.1009 ]
01437> [ 1.532, 3.4096 ]
01438> [ 1.650, 3.7240 ]
01439> [ 2.409, 4.0442 ]
01440> [ 3.689, 4.3702 ]
01441> [ -1, -1 ] (max twenty pts)
01442>
01443> *%-----|
01444> *
01445> *SUB-AREA No. 5
01446> *
01447> DESIGN NASHYD ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8] (ha),
01448> DWF=[0] (cms), CNC=[76], TP=[0.37]hrs,
01449> RAINFALL=[ , , , ] (mm/hr), END=-1
01450> *%-----|
01451> *
01452> *SUB-AREA No. 6
01453> *
01454> DESIGN NASHYD ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3] (ha),
01455> DWF=[0] (cms), CNC=[76], TP=[0.804]hrs,
01456> RAINFALL=[ , , , ] (mm/hr), END=-1
01457> *%-----|
01458> ADD HYD IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
01459> *%-----|
01460>
01461>
01462> FINISH

```

```

00001>-----
00002>
00003> SSSS W W M M H H Y Y M M O O 999 999 -----
00004> S W W M M M H H Y Y M M O O 9 9 9 9 9
00005> SSSS W W M M M H H H H Y Y M M O O ## 9 9 9 9 9 Ver. 4.02
00006> S W W M M M H H R Y M M O O 9999 9999 July 1999
00007> SSSS W W M M M H H Y Y M M O O 9 9 9
00008>          StormWater Management Hydrologic Model 999 999 -----
00009>
00010>
00011> *****
00012> ***** SWHYMO-99 Ver/4.02 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> *****
00021> *****
00022> *****
00023> *****
00024> ***** Licensed user: J. L. Richards & Associates Limited *****
00025> ***** Ottawa SERIAL#4418403 *****
00026> *****
00027> *****
00028> *****
00029> ***** PROGRAM ARRAY DIMENSIONS *****
00030> ***** Maximum value for ID number: 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034> *****
00035> *****
00036> ***** DETAILED O U P P U T *****
00037> *****
00038> *****
00039> ***** DATE: 2009-05-15 TIME: 08:57:02 RUN COUNTER: 000199 *****
00040> *****
00041> ***** Input filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\SWM-INT.out *****
00042> ***** Output filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\SWM-INT.out *****
00043> ***** Summary filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\SWM-INT.sum *****
00044> ***** User comments: *****
00045> ***** 1: *****
00046> ***** 2: *****
00047> ***** 3: *****
00048> *****
00049> *****
00050> 001:0001-----
00051> *****
00052> *****
00053> *****
00054> *****
00055> *****
00056> *****
00057> *****
00058> *****
00059> *****
00060> *****
00061> *****
00062> *****
00063> *****
00064> *****
00065> *****
00066> *****
00067> *****
00068> *****
00069> *****
00070> *****
00071> *****
00072> *****
00073> *****
00074> *****
00075> *****
00076> *****
00077> *****
00078> *****
00079> *****
00080> *****
00081> *****
00082> *****
00083> *****
00084> *****
00085> *****
00086> *****
00087> *****
00088> *****
00089> *****
00090> *****
00091> *****
00092> *****
00093> *****
00094> *****
00095> *****
00096> *****
00097> *****
00098> *****
00099> *****
01000> *****
01001> *****
01002> *****
01003> *****
01004> *****
01005> *****
01006> *****
01007> *****
01008> *****
01009> *****
01010> *****
01011> *****
01012> *****
01013> *****
01014> *****
01015> *****
01016> *****
01017> *****
01018> *****
01019> *****
01020> *****
01021> *****
01022> *****
01023> *****
01024> *****
01025> *****
01026> *****
01027> *****
01028> *****
01029> *****
01030> *****
01031> *****
01032> *****
01033> *****
01034> *****
01035> *****

```

```

00136> over (min) 10.00 30.00
00137> Storage Coeff. (min)= 10.80 (ii) 29.27 (ii)
00138> Unit Hyd. Tpeak (min)= 10.00 30.00
00139> Unit Hyd. peak (cms)= .11 .04
00140>
00141> PEAK FLOW (cms)= .16 .00 *TOTALS*
00142> TIME TO PEAK (hrs)= 1.29 1.75 1.58 (iii)
00143> RUNOFF VOLUME (mm)= 23.43 5.17 20.508
00144> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00145> RUNOFF COEFFICIENT = .94 .21 .820
00146>
00147> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00148> CN* = 81.0 Ia = Dep. Storage (Above)
00149> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00150> THAN THE STORAGE COEFFICIENT.
00151> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00152>-----
00153>-----
00154> 001:0005-----
00155> *****
00156> ***** SUB-AREA No.2 *****
00157> *****
00158> *****
00159> *****
00160> *****
00161> *****
00162> *****
00163> *****
00164> *****
00165> *****
00166> *****
00167> *****
00168> *****
00169> *****
00170> *****
00171> *****
00172> *****
00173> *****
00174> *****
00175> *****
00176> *****
00177> *****
00178> *****
00179> *****
00180> *****
00181> *****
00182> *****
00183> *****
00184> *****
00185> *****
00186> *****
00187> *****
00188> *****
00189> *****
00190> *****
00191> *****
00192> *****
00193> *****
00194> *****
00195> *****
00196> *****
00197> *****
00198> *****
00199> *****
00200> *****
00201> *****
00202> *****
00203> *****
00204> *****
00205> *****
00206> *****
00207> *****
00208> *****
00209> *****
00210> *****
00211> *****
00212> *****
00213> *****
00214> *****
00215> *****
00216> *****
00217> *****
00218> *****
00219> *****
00220> *****
00221> *****
00222> *****
00223> *****
00224> *****
00225> *****
00226> *****
00227> *****
00228> *****
00229> *****
00230> *****
00231> *****
00232> *****
00233> *****
00234> *****
00235> *****
00236> *****
00237> *****
00238> *****
00239> *****
00240> *****
00241> *****
00242> *****
00243> *****
00244> *****
00245> *****
00246> *****
00247> *****
00248> *****
00249> *****
00250> *****
00251> *****
00252> *****
00253> *****
00254> *****
00255> *****
00256> *****
00257> *****
00258> *****
00259> *****
00260> *****
00261> *****
00262> *****
00263> *****
00264> *****
00265> *****
00266> *****
00267> *****
00268> *****
00269> *****
00270> *****

```

```

00271> CN* = 81.0 Ia = Dep. Storage (Above)
00272> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00273> THAN THE STORAGE COEFFICIENT.
00274> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00275>
00276>
00277> 001:0010
00278> * SUB-AREA No.5
00280>
00281> | CALIB STANDHYD | Area (ha)= 2.66
00282> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00283>
00284> IMPERVIOUS PERVIOUS (i)
00285> Surface Area (ha)= 2.58 08
00286> Dep. Storage (mm)= 1.57 4.67
00287> Average Slope (%)= .61 1.50
00288> Length (m)= 207.25 20.00
00289> Mannings n = .030 .250
00290>
00291> Max.eff.Inten.(mm/hr)= 45.63 5.66
00292> over (min) 10.00 27.50
00293> Storage Coeff. (min)= 10.37 (ii) 26.38 (ii)
00294> Unit Hyd. Tpeak (min)= 10.00 27.50
00295> Unit Hyd. peak (cms)= .11 .94
00296>
00297> *TOTALS*
00298> PEAK FLOW (cms)= .24 .00 .238 (iii)
00299> TIME TO PEAK (hrs)= 1.29 1.67 1.292
00300> RUNOFF VOLUME (mm)= 23.43 5.17 22.892
00301> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00302> RUNOFF COEFFICIENT = .94 .21 .915
00303>
00304> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00305> CN* = 81.0 Ia = Dep. Storage (Above)
00306> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00307> THAN THE STORAGE COEFFICIENT.
00308> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00309>
00310> 001:0011
00311>
00312> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00313> | | | (ha) (cms) (hrs) (mm) (cms)
00314> ID1 06:060 .89 .089 1.25 22.88 .000
00315> +ID2 07:070 2.66 .238 1.29 22.88 .000
00316>
00317> -----
00318> SUM 08:080 3.55 .327 1.29 22.88 .000
00319>
00320> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00321>
00322> 001:0012
00323>
00324> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00325> | | | (ha) (cms) (hrs) (mm) (cms)
00326> ID1 05:050 5.01 .396 1.33 21.62 .000
00327> +ID2 08:080 3.55 .327 1.29 22.88 .000
00328>
00329> -----
00330> SUM 09:090 8.56 .716 1.29 22.14 .000
00331>
00332> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00333>
00334> 001:0013
00335>
00336> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00337> | IN>09: (090 ) |
00338> | OUT<10: (POND ) |
00339>
00340>
00341> ===== OUTFLOW STORAGE TABLE =====
00342> OUTFLOW STORAGE | OUTFLOW STORAGE
00343> (cms) (ha.m.) | (cms) (ha.m.)
00344> .000 .0000E+00 | .593 .6251E+00
00345> .008 .6560E-01 | .654 .6631E+00
00346> .017 .1311E+00 | .797 .7391E+00
00347> .093 .2831E+00 | .950 .8274E+00
00348> .233 .3971E+00 | 1.304 .9157E+00
00349> .337 .4731E+00 | 1.880 .1004E+01
00350> .465 .5491E+00 | 2.577 .1092E+01
00351> .531 .5871E+00 | .000 .0000E+00
00352>
00353>
00354> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00355> (ha) (cms) (hrs) (mm)
00356> INFLOW >09: (090 ) 8.56 .716 1.292 22.143
00357> OUTFLOW<10: (POND ) 8.56 .032 3.875 22.141
00358>
00359>
00360> PEAK FLOW REDUCTION [Qout/Qin] (%)= 4.470
00361> TIME SHIFT OF PEAK FLOW (min)= 155.00
00362> MAXIMUM STORAGE USED (ha.m.)=.1611E+00
00363>
00364>
00365> 001:0014
00366> *****
00367> * Remaining Hawthorne Industrial Park *
00368> *****
00369> *
00370> * SUB-AREA No.1
00371>
00372> | CALIB STANDHYD | Area (ha)= 19.90
00373> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00374>
00375> IMPERVIOUS PERVIOUS (i)
00376> Surface Area (ha)= 14.13 5.77
00377> Dep. Storage (mm)= 1.57 4.67
00378> Average Slope (%)= .60 1.50
00379> Length (m)= 580.00 100.00
00380> Mannings n = .030 .250
00381>
00382> Max.eff.Inten.(mm/hr)= 34.39 11.90
00383> over (min) 22.50 52.50
00384> Storage Coeff. (min)= 21.64 (ii) 52.88 (ii)
00385> Unit Hyd. Tpeak (min)= 22.50 52.50
00386> Unit Hyd. peak (cms)= .05 .02
00387>
00388> *TOTALS*
00389> PEAK FLOW (cms)= .60 .11 .642 (iii)
00390> TIME TO PEAK (hrs)= 1.50 2.13 1.542
00391> RUNOFF VOLUME (mm)= 23.43 8.74 16.085
00392> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00393> RUNOFF COEFFICIENT = .94 .35 .643
00394>
00395> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00396> CN* = 81.0 Ia = Dep. Storage (Above)
00397> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00398> THAN THE STORAGE COEFFICIENT.
00399> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00400>
00401> 001:0015
00402>
00403> | ADD HYD (HIP02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00404> | | | (ha) (cms) (hrs) (mm) (cms)
00405> ID1 10:POND 8.56 .032 3.88 22.14 .000
00406> +ID2 01:HIP01 19.90 .642 1.54 17.91 .000
00407>
00408> -----
00409> SUM 02:HIP02 28.46 .655 1.54 17.91 .000
00410>
00411> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

```

00406>
00407>
00408> 001:0016
00409>
00410> * SUB-AREA No.2
00411>
00412> | CALIB STANDHYD | Area (ha)= 17.00
00413> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00414>
00415> IMPERVIOUS PERVIOUS (i)
00416> Surface Area (ha)= 12.07 4.93
00417> Dep. Storage (mm)= 1.57 4.67
00418> Average Slope (%)= .65 1.50
00419> Length (m)= 450.00 100.00
00420> Mannings n = .030 .250
00421>
00422> Max.eff.Inten.(mm/hr)= 40.81 12.73
00423> over (min) 17.50 47.50
00424> Storage Coeff. (min)= 16.94 (ii) 47.35 (ii)
00425> Unit Hyd. Tpeak (min)= 17.50 47.50
00426> Unit Hyd. peak (cms)= .07 .02
00427>
00428> *TOTALS*
00429> PEAK FLOW (cms)= .60 .10 .625 (iii)
00430> TIME TO PEAK (hrs)= 1.42 2.00 1.458
00431> RUNOFF VOLUME (mm)= 23.43 8.74 16.085
00432> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00433> RUNOFF COEFFICIENT = .94 .35 .643
00434>
00435> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00436> CN* = 81.0 Ia = Dep. Storage (Above)
00437> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00438> THAN THE STORAGE COEFFICIENT.
00439> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00440>
00441> 001:0017
00442> *
00443> * SUB-AREA No.3
00444>
00445> | CALIB STANDHYD | Area (ha)= 18.10
00446> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00447>
00448> IMPERVIOUS PERVIOUS (i)
00449> Surface Area (ha)= 12.85 5.25
00450> Dep. Storage (mm)= 1.57 4.67
00451> Average Slope (%)= 1.50 1.50
00452> Length (m)= 600.00 100.00
00453> Mannings n = .030 .250
00454>
00455> Max.eff.Inten.(mm/hr)= 34.39 11.54
00456> over (min) 22.50 55.00
00457> Storage Coeff. (min)= 23.33 (ii) 54.95 (ii)
00458> Unit Hyd. Tpeak (min)= 22.50 55.00
00459> Unit Hyd. peak (cms)= .05 .02
00460>
00461> *TOTALS*
00462> PEAK FLOW (cms)= .53 .09 .562 (iii)
00463> TIME TO PEAK (hrs)= 1.50 2.17 1.542
00464> RUNOFF VOLUME (mm)= 23.43 8.74 16.085
00465> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00466> RUNOFF COEFFICIENT = .94 .35 .643
00467>
00468> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00469> CN* = 81.0 Ia = Dep. Storage (Above)
00470> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00471> THAN THE STORAGE COEFFICIENT.
00472> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00473>
00474> 001:0018
00475>
00476> | ADD HYD (HIP05 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00477> | | | (ha) (cms) (hrs) (mm) (cms)
00478> ID1 03:HIP03 17.00 .625 1.46 16.08 .000
00479> +ID2 04:HIP04 18.10 .562 1.54 16.08 .000
00480>
00481> -----
00482> SUM 05:HIP05 35.10 1.166 1.46 16.08 .000
00483>
00484> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00485>
00486> 001:0019
00487> *
00488> * SUB-AREA No.4
00489>
00490> | DESIGN WASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
00491> | 06:Pond-B DT= 2.50 | Ia (min)= 4.670 # of Linear Res. (N)= 3.00
00492> | U.H. Tp(hrs)= .170
00493>
00494> Unit Hyd Qpeak (cms)= .899
00495>
00496> PEAK FLOW (cms)= .077 (i)
00497> TIME TO PEAK (hrs)= 1.375
00498> RUNOFF VOLUME (mm)= 6.343
00499> TOTAL RAINFALL (mm)= 24.999
00500> RUNOFF COEFFICIENT = .294
00501>
00502> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00503>
00504>
00505> 001:0020
00506>
00507> | ADD HYD (HIP06 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00508> | | | (ha) (cms) (hrs) (mm) (cms)
00509> ID1 02:HIP02 28.46 .655 1.54 17.91 .000
00510> +ID2 05:HIP05 35.10 1.166 1.46 16.08 .000
00511> +ID3 06:Pond-B 4.00 .077 1.38 6.34 .000
00512>
00513> -----
00514> SUM 07:HIP06 67.56 1.887 1.50 16.28 .000
00515>
00516> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00517>
00518> 001:0021
00519>
00520> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00521> | IN>07: (HIP06 ) |
00522> | OUT<08: (HIP-PO) |
00523>
00524> ===== OUTFLOW STORAGE TABLE =====
00525> OUTFLOW STORAGE | OUTFLOW STORAGE
00526> (cms) (ha.m.) | (cms) (ha.m.)
00527> .000 .0000E+00 | .724 .2210E+01
00528> .048 .5740E-01 | .937 .2501E+01
00529> .054 .2434E+00 | 1.262 .2798E+01
00530> .059 .5834E+00 | 1.404 .3101E+01
00531> .062 .8400E+00 | 1.532 .3410E+01
00532> .064 .1102E+01 | 1.650 .3724E+01
00533> .147 .1370E+01 | 2.409 .4044E+01
00534> .280 .1644E+01 | 3.689 .4370E+01
00535> .472 .1924E+01 | .000 .0000E+00
00536>
00537>
00538> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00539> (ha) (cms) (hrs) (mm)
00540> INFLOW >07: (HIP06 ) 67.56 1.887 1.500 16.275
00541> OUTFLOW<08: (HIP-PO) 67.56 .062 5.417 16.275
00542>
00543>
00544> PEAK FLOW REDUCTION [Qout/Qin] (%)= 3.289

```

```

00541> TIME SHIFT OF PEAK FLOW (min)= 235.00
00542> MAXIMUM STORAGE USED (ha.m.)=.8484E+00
-----
00545> 001:0022-----
00546> *
00547> *SUB-AREA No. 5
00548> *
00549> *
00550> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00
00551> | 10:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
00552> | U.H. Tp (hrs)= .370
00553>
00554> Unit Hyd. Peak (cms)= .702
00555>
00556> PEAK FLOW (cms)= .053 (i)
00557> TIME TO PEAK (hrs)= 1.708
00558> RUNOFF VOLUME (mm)= 4.111
00559> TOTAL RAINFALL (mm)= 24.999
00560> RUNOFF COEFFICIENT = .164
00561>
00562> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00563>
00564>
00565> 001:0023-----
00566> *
00567> *SUB-AREA No. 6
00568> *
00569> *
00570> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00
00571> | 10:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
00572> | U.H. Tp (hrs)= .804
00573>
00574> Unit Hyd. Peak (cms)= .252
00575>
00576> PEAK FLOW (cms)= .025 (i)
00577> TIME TO PEAK (hrs)= 2.333
00578> RUNOFF VOLUME (mm)= 4.110
00579> TOTAL RAINFALL (mm)= 24.999
00580> RUNOFF COEFFICIENT = .164
00581>
00582> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00583>
00584>
00585> 001:0024-----
00586> *
00587> | ADD HYD (Interi) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00588> | 08:HIP-PO (ha) (ha) (cms) (hrs) (mm) (mm) (cms)
00589> | +ID2 09:A2 67.56 .052 5.42 16.28 .000
00590> | +ID3 10:A3 5.30 .025 2.33 4.11 .000
00591> | +ID3 10:A3 5.30 .025 2.33 4.11 .000
00592>
00593> SUM 01:Interi 79.66 .127 1.83 14.43 .000
00594>
00595> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00596>
00597>
00598> 001:0025-----
00599> *****
00600> * CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00601> *****
00602>
00603> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\
00604> | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\
00605> | TZERO = .00 hrs on 0
00606> | METOUT= 2 (output = METRIC)
00607> | NRUN = 001
00608> | NSTORM = 0
00609>
00610> 001:0002-----
00611> *
00612> | CHICAGO STORM | IDF curve parameters: A= 732.951
00613> | Ptotal= 31.86 mm | B= 6.199
00614> | C= .810
00615> used in: INTENSITY = A / (t + B)^C
00616>
00617> Duration of storm = 3.00 hrs
00618> Storm time step = 10.00 min
00619> Time to peak ratio = .33
00620>
00621> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00622> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00623> .17 2.815 | 1.00 76.805 | 1.83 5.095 | 2.67 2.684
00624> .33 3.498 | 1.17 24.079 | 2.00 4.291 | 2.83 2.463
00625> .50 4.687 | 1.33 12.364 | 2.17 3.718 | 3.00 2.279
00626> .67 7.305 | 1.50 8.324 | 2.33 3.288
00627> .83 18.209 | 1.67 6.303 | 2.50 2.953 |
00628>
00629>
00630> 001:0003-----
00631> *
00632> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\ORGA.VAL
00633> | ICASEdv = 1 (read and print data)
00634> | ***** ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE *****
00635> | ***** PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 *****
00636> | Horton's infiltration equation parameters:
00637> | [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [Fw = .00 mm]
00638> | Parameters for PERVIOUS surfaces in STANDHYD:
00639> | [Timp= 4.67 mm] [LGSF=40.00 mm] [MNF= .250]
00640> | Parameters for IMPERVIOUS surfaces in STANDHYD:
00641> | [Iaimp= 1.57 mm] [CII= 1.50] [NII= .035]
00642> | Parameters used in NASHYD:
00643> | [Ia = 4.67 mm] [N= 3.00]
00644>
00645> 001:0004-----
00646> *****
00647> * ORGAWORLD FILE *
00648> *****
00649> *
00650> * SUB-AREA No.1
00651> *
00652> | CALIB STANDHYD | Area (ha)= 2.07
00653> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00654>
00655>
00656> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
00657> Dep. Storage (mm)= 1.74 .33
00658> Average Slope (%)= 1.57 4.67
00659> Length (m)= .52 1.00
00660> Mannings n = 204.72 20.00
00661>
00662> Max.eff.Inten.(mm/hr)= 76.81 11.88
00663> over (min) 10.00 22.50
00664> Storage Coeff. (min)= 8.77 (ii) 22.21 (ii)
00665> Unit Hyd. Tpeak (min)= 10.00 22.50
00666> Unit Hyd. peak (cms)= .12 .05
00667>
00668> PEAK FLOW (cms)= .24 .01 *TOTALS*
00669> TIME TO PEAK (hrs)= 1.08 1.38 .245 (iii)
00670> RUNOFF VOLUME (mm)= 30.29 8.52 26.807
00671> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00672> RUNOFF COEFFICIENT = .95 .27 .841
00673>
00674> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00675> CN* = 81.0 Ia = Dep. Storage (Above)

```

```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00676> THAN THE STORAGE COEFFICIENT.
00677>
00678> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00679>
00680>
00681> 001:0005-----
00682> *
00683> * SUB-AREA No.2
00684> *
00685> | CALIB STANDHYD | Area (ha)= 1.54
00686> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00687>
00688>
00689> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
00690> Dep. Storage (mm)= 1.42 .12
00691> Average Slope (%)= 1.57 4.67
00692> Length (m)= .50 1.00
00693> Mannings n = 244.34 5.00
00694>
00695> Max.eff.Inten.(mm/hr)= 76.81 15.07
00696> over (min) 10.00 12.50
00697> Storage Coeff. (min)= 9.87 (ii) 11.36 (ii)
00698> Unit Hyd. Tpeak (min)= 10.00 12.50
00699> Unit Hyd. peak (cms)= .11 .10
00700>
00701> PEAK FLOW (cms)= .19 .00 *TOTALS*
00702> TIME TO PEAK (hrs)= 1.08 1.17 .192 (iii)
00703> RUNOFF VOLUME (mm)= 30.29 8.52 28.548
00704> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00705> RUNOFF COEFFICIENT = .95 .27 .896
00706>
00707> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00708> CN* = 81.0 Ia = Dep. Storage (Above)
00709> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00710> THAN THE STORAGE COEFFICIENT.
00711> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00712>
00713>
00714> 001:0006-----
00715> *
00716> * SUB-AREA No.3
00717> *
00718> | CALIB STANDHYD | Area (ha)= 1.40
00719> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00720>
00721>
00722> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
00723> Dep. Storage (mm)= 1.36 .04
00724> Average Slope (%)= 1.57 4.67
00725> Length (m)= .51 1.00
00726> Mannings n = 225.63 5.00
00727>
00728> Max.eff.Inten.(mm/hr)= 76.81 16.59
00729> over (min) 10.00 10.00
00730> Storage Coeff. (min)= 9.25 (ii) 10.78 (ii)
00731> Unit Hyd. Tpeak (min)= 10.00 10.00
00732> Unit Hyd. peak (cms)= .12 .11
00733>
00734> PEAK FLOW (cms)= .18 .00 *TOTALS*
00735> TIME TO PEAK (hrs)= 1.08 1.13 .186 (iii)
00736> RUNOFF VOLUME (mm)= 30.29 8.52 29.637
00737> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00738> RUNOFF COEFFICIENT = .95 .27 .930
00739>
00740> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00741> CN* = 81.0 Ia = Dep. Storage (Above)
00742> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00743> THAN THE STORAGE COEFFICIENT.
00744> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00745>
00746>
00747> 001:0007-----
00748> *
00749> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00750> | (ha) (ha) (cms) (hrs) (mm) (mm) (cms)
00751> | ID1 01:010 2.07 .245 1.08 26.81 .000
00752> | +ID2 02:020 1.54 .192 1.08 28.55 .000
00753>
00754> SUM 04:040 3.61 .436 1.08 27.55 .000
00755>
00756> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00757>
00758>
00759> 001:0008-----
00760> *
00761> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
00762> | (ha) (ha) (cms) (hrs) (mm) (mm) (cms)
00763> | ID1 03:030 1.40 .186 1.08 29.64 .000
00764> | +ID2 04:040 3.61 .436 1.08 27.55 .000
00765>
00766> SUM 05:050 5.01 .623 1.08 28.13 .000
00767>
00768> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00769>
00770>
00771> 001:0009-----
00772> *
00773> * SUB-AREA No.4
00774> *
00775> | CALIB STANDHYD | Area (ha)= .89
00776> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00777>
00778>
00779> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
00780> Dep. Storage (mm)= .86 .03
00781> Average Slope (%)= 1.57 4.67
00782> Length (m)= .93 .70
00783> Mannings n = 164.82 40.00
00784>
00785> Max.eff.Inten.(mm/hr)= 76.81 10.24
00786> over (min) 7.50 30.00
00787> Storage Coeff. (min)= 6.47 (ii) 30.53 (ii)
00788> Unit Hyd. Tpeak (min)= 7.50 30.00
00789> Unit Hyd. peak (cms)= .16 .04
00790>
00791> PEAK FLOW (cms)= .14 .00 *TOTALS*
00792> TIME TO PEAK (hrs)= 1.04 1.54 .139 (iii)
00793> RUNOFF VOLUME (mm)= 30.29 8.52 29.637
00794> TOTAL RAINFALL (mm)= 31.86 31.86 31.860
00795> RUNOFF COEFFICIENT = .95 .27 .930
00796>
00797> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00798> CN* = 81.0 Ia = Dep. Storage (Above)
00799> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00800> THAN THE STORAGE COEFFICIENT.
00801> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00802>
00803>
00804> 001:0010-----
00805> *
00806> * SUB-AREA No.5
00807> *
00808> | CALIB STANDHYD | Area (ha)= 2.66
00809> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00810>

```



```

01081> Unit Hyd Qpeak (cms)= .702
01082>
01083> PEAK FLOW (cms)= .102 (i)
01084> TIME TO PEAK (hrs)= 1.458
01085> RUNOFF VOLUME (mm)= 5.883
01086> TOTAL RAINFALL (mm)= 31.860
01087> RUNOFF COEFFICIENT = .216
01088>
01089> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01092> 001:0023-----
01093> *
01094> *SUB-AREA No. 6
01095>
01096>
01097> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00
01098> | 10:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
01099> | U.H. Tp (hrs)= .804
01100>
01101> Unit Hyd Qpeak (cms)= .252
01102>
01103> PEAK FLOW (cms)= .048 (i)
01104> TIME TO PEAK (hrs)= 2.083
01105> RUNOFF VOLUME (mm)= 6.883
01106> TOTAL RAINFALL (mm)= 31.860
01107> RUNOFF COEFFICIENT = .216
01108>
01109> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01112> 001:0024-----
01113> | ADD HYD (Interi) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01114> | (ha) (cms) (hrs) (mm) (cms)
01115> ID1 08:H1P-PO 67.56 .093 4.44 22.01 .000
01116> +ID2 09:A2 6.80 .102 1.46 6.88 .000
01117> +ID3 10:A3 5.30 .048 2.08 6.88 .000
01118>
01119> SUM 01:Interi 79.66 .194 1.58 19.71 .000
01120>
01121> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-----
01125> 001:0025-----
01126> *****
01127> * CALCULATION OF 3HR - 1.5 YEAR STORM EVENT *
01128> *****
01129> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\
01130> | | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\
01131>
01132> TZERO = .00 hrs on 0
01133> METOUT= 2 (output = METRIC)
01134> NRUN = 001
01135> NSTORM= 0
01136>
01137> 001:0002-----
01138> | CHICAGO STORM | IDF curve parameters: A= 998.071
01139> | Protal= 42.51 mm | B= 6.053
01140> | | C= .814
01141> | used in: INTENSITY = A / (t + B)^C
01142>
01143> Duration of storm = 3.00 hrs
01144> Storm time step = 10.00 min
01145> Time to peak ratio = .33
01146>
01147>
01148>
01149>
01150>
01151>
01152>
01153>
01154>
01155>
01156>
01157> 001:0003-----
01158> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\ORGA.VAL
01159> | ICASEv = 1 (read and print data)
01160> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01161> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ---|
01162>
01163> Horton's infiltration equation parameters:
01164> [F= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
01165> Parameters for PERVIOUS surfaces in STANDHYD:
01166> [IAspr= 4.67 mm] [LGP=40.00 ml] [MNI= .250]
01167> Parameters for IMPERVIOUS surfaces in STANDHYD:
01168> [IAimp= 1.57 mm] [CLI= 1.50] [MNI= .035]
01169> Parameters used in NASHYD:
01170> [Ia= 4.67 mm] [I= 3.00]
01171>
01172> 001:0004-----
01173> *****
01174> * ORGAWORD FILE *
01175> *****
01176> *
01177> * SUB-AREA No. 1
01178>
01179> | CALIB STANDHYD | Area (ha)= 2.07
01180> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
01181>
01182>
01183> IMPERVIOUS PERVIOUS (i)
01184> Surface Area (ha)= 1.74 .33
01185> Dep. Storage (mm)= 1.57 4.67
01186> Average Slope (%)= .52 1.00
01187> Length (m)= 204.72 20.00
01188> Mannings n = .030 .250
01189>
01190> Max.eff.Inten.(mm/hr)= 104.19 24.26
01191> over (min)= 7.50 17.50
01192> Storage Coeff. (min)= 7.76 (ii) 17.96 (ii)
01193> Unit Hyd. Tpeak (min)= 7.50 17.50
01194> Unit Hyd. peak (cms)= .15 .06
01195>
01196> PEAK FLOW (cms)= .36 .01 *TOTALS*
01197> TIME TO PEAK (hrs)= 1.04 1.25 1.042 (iii)
01198> RUNOFF VOLUME (mm)= 40.94 14.70 36.745
01199> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01200> RUNOFF COEFFICIENT = .96 .35 .864
01201>
01202> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01203> CN* = 81.0 Ia = Dep. Storage (Above)
01204> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01205> THAN THE STORAGE COEFFICIENT.
01206> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01208> 001:0005-----
01209> *
01210> * SUB-AREA No. 2
01211>
01212> | CALIB STANDHYD | Area (ha)= 1.54
01213> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
01214>
01215>
01216> IMPERVIOUS PERVIOUS (i)

```

```

01216> Surface Area (ha)= 1.42 .12
01217> Dep. Storage (mm)= 1.57 4.67
01218> Average Slope (%)= .50 1.00
01219> Length (m)= 244.34 5.00
01220> Mannings n = .030 .030
01221>
01222> Max.eff.Inten.(mm/hr)= 104.19 31.02
01223> over (min)= 7.50 10.00
01224> Storage Coeff. (min)= 8.73 (ii) 9.85 (ii)
01225> Unit Hyd. Tpeak (min)= 7.50 10.00
01226> Unit Hyd. peak (cms)= .14 .11
01227>
01228> PEAK FLOW (cms)= .28 .01 *TOTALS*
01229> TIME TO PEAK (hrs)= 1.04 1.13 1.042
01230> RUNOFF VOLUME (mm)= 40.94 14.70 38.845
01231> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01232> RUNOFF COEFFICIENT = .96 .35 .914
01233>
01234> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01235> CN* = 81.0 Ia = Dep. Storage (Above)
01236> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01237> THAN THE STORAGE COEFFICIENT.
01238> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01242> 001:0006-----
01243> * SUB-AREA No.3
01244>
01245> | CALIB STANDHYD | Area (ha)= 1.40
01246> | 02:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01247>
01248>
01249> IMPERVIOUS PERVIOUS (i)
01250> Surface Area (ha)= 1.36 .04
01251> Dep. Storage (mm)= 1.57 4.67
01252> Average Slope (%)= .51 1.00
01253> Length (m)= 225.63 5.00
01254> Mannings n = .030 .030
01255>
01256> Max.eff.Inten.(mm/hr)= 104.19 31.02
01257> over (min)= 7.50 10.00
01258> Storage Coeff. (min)= 8.28 (ii) 9.39 (ii)
01259> Unit Hyd. Tpeak (min)= 7.50 10.00
01260> Unit Hyd. peak (cms)= .14 .12
01261>
01262> PEAK FLOW (cms)= .27 .00 *TOTALS*
01263> TIME TO PEAK (hrs)= 1.04 1.13 .274 (iii)
01264> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01265> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01266> RUNOFF COEFFICIENT = .96 .35 .945
01267>
01268> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01269> CN* = 81.0 Ia = Dep. Storage (Above)
01270> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01271> THAN THE STORAGE COEFFICIENT.
01272> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01274> 001:0007-----
01275> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01276> | (ha) (cms) (hrs) (mm) (cms)
01277> ID1 01:010 2.07 .362 1.04 36.75 .000
01278> +ID2 02:020 1.54 .283 1.04 38.84 .000
01279>
01280> SUM 04:040 3.61 .645 1.04 37.64 .000
01281>
01282>
01283> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-----
01287> 001:0008-----
01288> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01289> | (ha) (cms) (hrs) (mm) (cms)
01290> ID1 03:030 1.40 .274 1.04 40.16 .000
01291> +ID2 04:040 3.61 .645 1.04 37.64 .000
01292>
01293> SUM 05:050 5.01 .918 1.04 38.34 .000
01294>
01295>
01296> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-----
01298> 001:0009-----
01299> *
01300> * SUB-AREA No.4
01301>
01302> | CALIB STANDHYD | Area (ha)= .89
01303> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01304>
01305>
01306> IMPERVIOUS PERVIOUS (i)
01307> Surface Area (ha)= .86 .03
01308> Dep. Storage (mm)= 1.57 4.67
01309> Average Slope (%)= .93 .70
01310> Length (m)= 164.82 40.00
01311> Mannings n = .030 .250
01312>
01313> Max.eff.Inten.(mm/hr)= 104.19 20.32
01314> over (min)= 5.00 25.00
01315> Storage Coeff. (min)= 5.72 (ii) 24.02 (ii)
01316> Unit Hyd. Tpeak (min)= 5.00 25.00
01317> Unit Hyd. peak (cms)= .20 .05
01318>
01319> PEAK FLOW (cms)= .20 .00 *TOTALS*
01320> TIME TO PEAK (hrs)= 1.00 1.38 1.000
01321> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01322> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01323> RUNOFF COEFFICIENT = .96 .35 .945
01324>
01325> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01326> CN* = 81.0 Ia = Dep. Storage (Above)
01327> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01328> THAN THE STORAGE COEFFICIENT.
01329> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
01332> 001:0010-----
01333> * SUB-AREA No.5
01334>
01335> | CALIB STANDHYD | Area (ha)= 2.66
01336> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01337>
01338>
01339> IMPERVIOUS PERVIOUS (i)
01340> Surface Area (ha)= 2.58 .08
01341> Dep. Storage (mm)= 1.57 4.67
01342> Average Slope (%)= .61 1.50
01343> Length (m)= 207.25 20.00
01344> Mannings n = .030 .250
01345>
01346> Max.eff.Inten.(mm/hr)= 104.19 24.26
01347> over (min)= 7.50 17.50
01348> Storage Coeff. (min)= 7.45 (ii) 16.40 (ii)
01349> Unit Hyd. Tpeak (min)= 7.50 17.50
01350> Unit Hyd. peak (cms)= .15 .07
01351>
01352> *TOTALS*

```





01621> \*SUB-AREA No. 6  
01622> \*  
01623> | DESIGN WASHYD | Area (ha) = 5.30 Curve Number (CN)=76.00  
01624> | 10:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
01625> | U.H. Tp(hrs) = .804  
01626> |  
01627> Unit Hyd Qpeak (cms) = .252  
01628> |  
01629> |  
01630> PEAK FLOW (cms) = .086 (i)  
01631> TIME TO PEAK (hrs) = 2.042  
01632> RUNOFF VOLUME (mm) = 12.131  
01633> TOTAL RAINFALL (mm) = 42.514  
01634> RUNOFF COEFFICIENT = .285  
01635> |  
01636> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01637> |  
01638> |  
01639> 001:0024-----  
01640> |  
01641> | ADD HYD (Interi) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01642> | (ha) (cms) (hrs) (mm) (cms)  
01643> | ID1 08:HIP-PO 67.56 .288 3.60 31.32 .000  
01644> | +ID2 09:A2 6.80 .187 1.46 12.13 .000  
01645> | +ID3 10:A3 5.30 .086 2.04 12.13 .000  
01646> |-----  
01647> | SUM 01:Interi 79.66 .359 3.08 28.40 .000  
01648> |  
01649> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01650> |  
01651> |  
01652> 001:0025-----  
01653> \*  
01654> \* CALCULATION OF 3HR - 1:10 YEAR STORM EVENT \*  
01655> \*  
01656> \*  
01657> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWHMYM-1\  
01658> | TZERO = .00 hrs on 0  
01659> | METOUT= 2 (output= METRIC)  
01660> | NRUN = 001  
01661> | NSTORM= 0  
01662> |-----  
01663> 001:0002-----  
01664> | CHICAGO STORM | IDF curve parameters: A=1174.184  
01665> | Ptotal= 49.50 mm | B= 6.014  
01666> | | C= .816  
01667> | used in: INTENSITY = A / (t + B)^C  
01668> |  
01669> | Duration of storm = 3.00 hrs  
01670> | Storm time step = 10.00 min  
01671> | Time to peak ratio = .33  
01672> |  
01673> |  
01674> |  
01675> |  
01676> |  
01677> |  
01678> |  
01679> |  
01680> |  
01681> |  
01682> |  
01683> |  
01684> |  
01685> |  
01686> |  
01687> |  
01688> |  
01689> |  
01690> |  
01691> |  
01692> |  
01693> |  
01694> |  
01695> |  
01696> |  
01697> |  
01698> |  
01699> |  
01700> 001:0003-----  
01701> \*  
01702> \*  
01703> \*  
01704> \* SUB-AREA No.1  
01705> |  
01706> | CALIB STANDHYD | Area (ha) = 2.07  
01707> | 01:010 DT= 2.50 | Total Imp(%) = 84.00 Dir. Conn.(%) = 84.00  
01708> |  
01709> | IMPERVIOUS PERVIOUS (i)  
01710> | Surface Area (ha) = 1.74 .23  
01711> | Dep. Storage (mm) = 1.57 4.67  
01712> | Average Slope (%) = .52 1.00  
01713> | Length (m) = 204.72 20.00  
01714> | Mannings n = .030 .250  
01715> |  
01716> | Max.eff.Inten.(mm/hr) = 122.14 34.69  
01717> | over (min) = 7.50 15.00  
01718> | Storage Coeff. (min) = 7.28 (ii) 16.04 (ii)  
01719> | Unit Hyd. Tpeak (min) = 7.50 15.00  
01720> | Unit Hyd. peak (cms) = .15 .07  
01721> |-----  
01722> | PEAK FLOW (cms) = .43 .02 \*TOTALS\*  
01723> | TIME TO PEAK (hrs) = 1.04 1.21 .437 (iii)  
01724> | RUNOFF VOLUME (mm) = 47.93 19.25 43.345  
01725> | TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
01726> | RUNOFF COEFFICIENT = .97 .39 .876  
01727> |  
01728> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01729> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01730> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01731> | THAN THE STORAGE COEFFICIENT.  
01732> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01733> |  
01734> |  
01735> 001:0005-----  
01736> \*  
01737> \* SUB-AREA No.2  
01738> |  
01739> | CALIB STANDHYD | Area (ha) = 1.54  
01740> | 02:020 DT= 2.50 | Total Imp(%) = 92.00 Dir. Conn.(%) = 92.00  
01741> |  
01742> | IMPERVIOUS PERVIOUS (i)  
01743> | Surface Area (ha) = 1.42 .12  
01744> | Dep. Storage (mm) = 1.57 4.67  
01745> | Average Slope (%) = .50 1.00  
01746> | Length (m) = 244.34 5.00  
01747> | Mannings n = .030 .030  
01748> |  
01749> | Max.eff.Inten.(mm/hr) = 122.14 42.32  
01750> | over (min) = 7.50 10.00  
01751> | Storage Coeff. (min) = 8.20 (ii) 9.18 (ii)  
01752> | Unit Hyd. Tpeak (min) = 7.50 10.00  
01753> | Unit Hyd. peak (cms) = .14 .12  
01754> |-----  
01755> | PEAK FLOW (cms) = .33 .01 \*TOTALS\*  
01756> | TIME TO PEAK (hrs) = 1.04 1.13 1.042  
01757> | RUNOFF VOLUME (mm) = 47.93 19.25 45.640  
01758> | TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
01759> | RUNOFF COEFFICIENT = .97 .39 .922  
01760> |  
01761> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01762> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01763> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01764> | THAN THE STORAGE COEFFICIENT.  
01765> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01766> |  
01767> |  
01768> 001:0006-----  
01769> \*  
01770> \* SUB-AREA No.3  
01771> |  
01772> | CALIB STANDHYD | Area (ha) = 1.40  
01773> | 03:030 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00  
01774> |  
01775> | IMPERVIOUS PERVIOUS (i)  
01776> | Surface Area (ha) = 1.36 .04  
01777> | Dep. Storage (mm) = 1.57 4.67  
01778> | Average Slope (%) = .51 1.00  
01779> | Length (m) = 225.63 5.00  
01780> | Mannings n = .030 .030  
01781> |  
01782> | Max.eff.Inten.(mm/hr) = 122.14 48.18  
01783> | over (min) = 7.50 7.50  
01784> | Storage Coeff. (min) = 7.77 (ii) 8.70 (ii)  
01785> | Unit Hyd. Tpeak (min) = 7.50 7.50  
01786> | Unit Hyd. peak (cms) = .15 .14  
01787> |-----  
01788> | PEAK FLOW (cms) = .33 .00 \*TOTALS\*  
01789> | TIME TO PEAK (hrs) = 1.04 1.08 .329 (iii)  
01790> | RUNOFF VOLUME (mm) = 47.93 19.25 47.074  
01791> | TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
01792> | RUNOFF COEFFICIENT = .97 .39 .951  
01793> |  
01794> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01795> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01796> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01797> | THAN THE STORAGE COEFFICIENT.  
01798> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01799> |  
01800> 001:0007-----  
01801> |  
01802> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01803> | (ha) (cms) (hrs) (mm) (cms)  
01804> | ID1 01:010 2.07 .437 1.04 43.35 .000  
01805> | +ID2 02:020 1.54 .341 1.04 45.64 .000  
01806> |-----  
01807> | SUM 04:040 3.61 .778 1.04 44.32 .000  
01808> |  
01809> |  
01810> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01811> |  
01812> |  
01813> 001:0008-----  
01814> |  
01815> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01816> | (ha) (cms) (hrs) (mm) (cms)  
01817> | ID1 03:030 1.40 .329 1.04 47.07 .000  
01818> | +ID2 04:040 3.61 .778 1.04 44.32 .000  
01819> |-----  
01820> | SUM 05:050 5.01 1.107 1.04 45.09 .000  
01821> |  
01822> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01823> |  
01824> |  
01825> 001:0009-----  
01826> \*  
01827> \* SUB-AREA No.4  
01828> |  
01829> | CALIB STANDHYD | Area (ha) = .89  
01830> | 06:060 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00  
01831> |  
01832> | IMPERVIOUS PERVIOUS (i)  
01833> | Surface Area (ha) = .86 .03  
01834> | Dep. Storage (mm) = 1.57 4.67  
01835> | Average Slope (%) = .53 .70  
01836> | Length (m) = 164.82 40.00  
01837> | Mannings n = .030 .250  
01838> |  
01839> | Max.eff.Inten.(mm/hr) = 122.14 31.19  
01840> | over (min) = 5.00 20.00  
01841> | Storage Coeff. (min) = 5.37 (ii) 20.78 (ii)  
01842> | Unit Hyd. Tpeak (min) = 5.00 20.00  
01843> | Unit Hyd. peak (cms) = .21 .06  
01844> |-----  
01845> | PEAK FLOW (cms) = .24 .00 \*TOTALS\*  
01846> | TIME TO PEAK (hrs) = 1.00 1.29 1.000  
01847> | RUNOFF VOLUME (mm) = 47.93 19.25 47.074  
01848> | TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
01849> | RUNOFF COEFFICIENT = .97 .39 .951  
01850> |  
01851> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01852> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01853> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01854> | THAN THE STORAGE COEFFICIENT.  
01855> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01856> |  
01857> |  
01858> 001:0010-----  
01859> \*  
01860> \* SUB-AREA No.5  
01861> |  
01862> | CALIB STANDHYD | Area (ha) = 2.66  
01863> | 07:070 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00  
01864> |  
01865> | IMPERVIOUS PERVIOUS (i)  
01866> | Surface Area (ha) = 2.58 .08  
01867> | Dep. Storage (mm) = 1.57 4.67  
01868> | Average Slope (%) = .61 1.50  
01869> | Length (m) = 207.25 20.00  
01870> | Mannings n = .030 .250  
01871> |  
01872> | Max.eff.Inten.(mm/hr) = 122.14 34.69  
01873> | over (min) = 7.50 15.00  
01874> | Storage Coeff. (min) = 7.00 (ii) 14.75 (ii)  
01875> | Unit Hyd. Tpeak (min) = 7.50 15.00  
01876> | Unit Hyd. peak (cms) = .16 .08  
01877> |-----  
01878> | PEAK FLOW (cms) = .64 .00 \*TOTALS\*  
01879> | TIME TO PEAK (hrs) = 1.04 1.21 .645 (iii)  
01880> | RUNOFF VOLUME (mm) = 47.93 19.25 47.074  
01881> | TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
01882> | RUNOFF COEFFICIENT = .97 .39 .951  
01883> |  
01884> | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01885> | CN\* = 81.0 Ia = Dep. Storage (Above)  
01886> | (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01887> | THAN THE STORAGE COEFFICIENT.  
01888> | (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01889> |  
01890> |

01891> 001:0011-----

01892> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

01893> | ID1 06:060 | .89 .245 1.00 47.07 .000

01894> | +ID2 07:070 | 2.66 .645 1.04 47.07 .000

01895> |-----

01896> | SUM 08:080 | 3.55 .876 1.04 47.07 .000

01897> |-----

01898> |-----

01899> |-----

01900> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01901> |-----

01902> |-----

01903> 001:0012-----

01904> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

01905> | ID1 05:050 | 5.01 1.107 1.04 45.09 .000

01906> | +ID2 08:080 | 3.55 .876 1.04 47.07 .000

01907> |-----

01908> |-----

01909> |-----

01910> | SUM 09:090 | 8.56 1.984 1.04 45.91 .000

01911> |-----

01912> |-----

01913> |-----

01914> |-----

01915> 001:0013-----

01916> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.

01917> | IN>09: (090 ) |

01918> | OUT<10: (POND ) |

01919> |-----

01920> |-----

01921> |-----

01922> |-----

01923> |-----

01924> |-----

01925> |-----

01926> |-----

01927> |-----

01928> |-----

01929> |-----

01930> |-----

01931> |-----

01932> |-----

01933> |-----

01934> |-----

01935> |-----

01936> |-----

01937> |-----

01938> |-----

01939> |-----

01940> |-----

01941> 001:0014-----

01942> |-----

01943> |-----

01944> |-----

01945> |-----

01946> |-----

01947> |-----

01948> | CALIB STANDHYD | Area (ha)= 19.90

01949> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

01950> |-----

01951> |-----

01952> |-----

01953> |-----

01954> |-----

01955> |-----

01956> |-----

01957> |-----

01958> |-----

01959> |-----

01960> |-----

01961> |-----

01962> |-----

01963> |-----

01964> |-----

01965> |-----

01966> |-----

01967> |-----

01968> |-----

01969> |-----

01970> |-----

01971> |-----

01972> |-----

01973> |-----

01974> |-----

01975> |-----

01976> |-----

01977> 001:0015-----

01978> | ADD HYD (HIP02 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

01979> | ID1 10:POND | 8.56 .132 2.28 45.91 .000

01980> | +ID2 01:HIP01 | 19.90 1.983 1.21 37.43 .000

01981> |-----

01982> |-----

01983> |-----

01984> |-----

01985> |-----

01986> |-----

01987> |-----

01988> |-----

01989> |-----

01990> |-----

01991> |-----

01992> |-----

01993> | CALIB STANDHYD | Area (ha)= 17.00

01994> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

01995> |-----

01996> |-----

01997> |-----

01998> |-----

01999> |-----

02000> |-----

02001> |-----

02002> |-----

02003> |-----

02004> |-----

02005> |-----

02006> |-----

02007> |-----

02008> |-----

02009> |-----

02010> |-----

02011> |-----

02012> |-----

02013> |-----

02014> |-----

02015> |-----

02016> |-----

02017> |-----

02018> |-----

02019> |-----

02020> |-----

02021> |-----

02022> 001:0017-----

02023> |-----

02024> |-----

02025> |-----

02026> | CALIB STANDHYD | Area (ha)= 18.10

02027> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

02028> |-----

02029> |-----

02030> |-----

02031> |-----

02032> |-----

02033> |-----

02034> |-----

02035> |-----

02036> |-----

02037> |-----

02038> |-----

02039> |-----

02040> |-----

02041> |-----

02042> |-----

02043> |-----

02044> |-----

02045> |-----

02046> |-----

02047> |-----

02048> |-----

02049> |-----

02050> |-----

02051> |-----

02052> |-----

02053> |-----

02054> |-----

02055> |-----

02056> |-----

02057> | ADD HYD (HIP05 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02058> | ID1 03:HIP03 | 17.00 1.865 1.17 37.43 .000

02059> | +ID2 04:HIP04 | 18.10 1.723 1.21 37.43 .000

02060> |-----

02061> |-----

02062> |-----

02063> |-----

02064> |-----

02065> |-----

02066> |-----

02067> 001:0019-----

02068> |-----

02069> |-----

02070> |-----

02071> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00

02072> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00

02073> | U.H. Tp(hrs)= .170

02074> |-----

02075> |-----

02076> |-----

02077> |-----

02078> |-----

02079> |-----

02080> |-----

02081> |-----

02082> |-----

02083> |-----

02084> |-----

02085> |-----

02086> 001:0020-----

02087> |-----

02088> | ADD HYD (HIP06 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF

02089> | ID1 02:HIP02 | 28.46 2.044 1.21 39.98 .000

02090> | +ID2 05:HIP05 | 35.10 3.572 1.17 37.43 .000

02091> | +ID3 06:Pond-B | 4.00 .345 1.17 22.42 .000

02092> |-----

02093> |-----

02094> |-----

02095> |-----

02096> |-----

02097> |-----

02098> |-----

02099> |-----

02100> |-----

02101> |-----

02102> |-----

02103> |-----

02104> |-----

02105> |-----

02106> |-----

02107> |-----

02108> |-----

02109> |-----

02110> |-----

02111> |-----

02112> |-----

02113> |-----

02114> |-----

02115> |-----

02116> |-----

02117> |-----

02118> |-----

02119> |-----

02120> |-----

02121> |-----

02122> |-----

02123> |-----

02124> |-----

02125> |-----

02126> 001:0022-----

02127> |-----

02128> |-----

02129> |-----

02130> |-----

02131> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00

02132> | 09:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00

02133> | U.H. Tp(hrs)= .370

02134> |-----

02135> |-----

02136> |-----

02137> |-----

02138> |-----

02139> |-----

02140> |-----

02141> |-----

02142> |-----

02143> |-----

02144> |-----

02145> |-----

02146> |-----

02147> |-----

02148> |-----

02149> |-----

02150> |-----

02151> |-----

02152> |-----

02153> |-----

02154> |-----

02155> |-----

02156> |-----

02157> |-----

02158> |-----

02159> |-----

02160> |-----

```

02161> RUNOFF COEFFICIENT = .325
02162>
02163> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02164>
02165>
02166> 001:0024-----
02167>
02168> | ADD HYD (Interi) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02169> | (ha) (cms) (hrs) (mm) (cms)
02170> | ID1 08:HIP-PO 67.56 .487 3.36 37.61 .000
02171> | +ID2 09:A2 6.80 .252 1.42 16.08 .000
02172> | +ID3 10:A3 5.30 .115 2.00 16.08 .000
02173>
02174> |-----|
02175> | SUM 01:Interi 79.66 .589 3.04 34.34 .000
02176>
02177> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02178>
02179> 001:0025-----
02180>
02181> *****
02182> ***** CALCULATION OF 3HR - 1:25 YEAR STORM EVENT *****
02183> *****
02184> | SEPART | Project dir.: V:\20983.DU\ENG\FINALS-1\SWMHY-1\
02185> | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWMHY-1\
02186> | TZERO = .00 hrs on 0
02187> | METOUT= 2 (output = METRIC)
02188> | NRUN= 001
02189> | NSTORM= 0
02190>
02191> 001:0002-----
02192>
02193> | CHICAGO STORM | IDF curve parameters: A=1402.884
02194> | Total= 58.23 mm | B= 6.018
02195> | C= .819
02196> | used in: INTENSITY = A / (t + B)^C
02197>
02198> | Duration of storm = 3.00 hrs
02199> | Storm time step = 10.00 min
02200> | Time to peak ratio = .33
02201>
02202>
02203>
02204>
02205>
02206>
02207>
02208>
02209>
02210>
02211> 001:0003-----
02212>
02213> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWMHY-1\ORGA.VAL
02214> | ICRSEdy = 1 (read and print data)
02215> | Filetitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
02216> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----|
02217> | Horton's infiltration equation parameters:
02218> | [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
02219> | Parameters for PERVIOUS surfaces in STANDHYD:
02220> | [IApex= 4.67 mm] [LGP=40.00 mm] [MNI= .250]
02221> | Parameters for IMPVIOUS surfaces in STANDHYD:
02222> | [IAIm= 1.57 mm] [CLI= 1.50] [MNI= .035]
02223> | Parameters used in NASHYD:
02224> | [Ia= 4.67 mm] [N= 3.00]
02225>
02226> 001:0004-----
02227> *****
02228> ***** ORGAWORD FILE *****
02229> *****
02230> *
02231> * SUB-AREA No.1
02232>
02233> | CALIB STANDHYD | Area (ha)= 2.07
02234> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
02235>
02236> IMPVIOUS PERVIOUS (i)
02237> Surface Area (ha)= 1.74 .33
02238> Dep. Storage (mm)= 1.57 4.67
02239> Average Slope (%)= .52 1.00
02240> Length (m)= 204.72 20.00
02241> Mannings n = .030 .250
02242>
02243> Max.eff.Inten.(mm/hr)= 144.69 47.07
02244> over (min)= 7.50 15.00
02245> Storage Coeff. (min)= 6.81 (ii) 14.56 (ii)
02246> Unit Hyd. Tpeak (min)= 7.50 15.00
02247> Unit Hyd. peak (cms)= .16 .08
02248>
02249> PEAK FLOW (cms)= .52 .03 *TOTALS*
02250> TIME TO PEAK (hrs)= 1.04 1.21 1.042 (iii)
02251> RUNOFF VOLUME (mm)= 56.66 25.35 51.647
02252> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02253> RUNOFF COEFFICIENT = .97 .44 .887
02254>
02255> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02256> CN* = 81.0 Ia = Dep. Storage (Above)
02257> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02258> THAN THE STORAGE COEFFICIENT.
02259> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02260>
02261>
02262> 001:0005-----
02263> * SUB-AREA No.2
02264>
02265> | CALIB STANDHYD | Area (ha)= 1.54
02266> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
02267>
02268> IMPVIOUS PERVIOUS (i)
02269> Surface Area (ha)= 1.42 .12
02270> Dep. Storage (mm)= 1.57 4.67
02271> Average Slope (%)= .50 1.00
02272> Length (m)= 244.34 5.00
02273> Mannings n = .030 .030
02274>
02275> Max.eff.Inten.(mm/hr)= 144.69 65.19
02276> over (min)= 7.50 7.50
02277> Storage Coeff. (min)= 7.66 (ii) 8.49 (ii)
02278> Unit Hyd. Tpeak (min)= 7.50 7.50
02279> Unit Hyd. peak (cms)= .15 .14
02280>
02281> PEAK FLOW (cms)= .40 .01 *TOTALS*
02282> TIME TO PEAK (hrs)= 1.04 1.08 1.042 (iii)
02283> RUNOFF VOLUME (mm)= 56.66 25.35 54.152
02284> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02285> RUNOFF COEFFICIENT = .97 .44 .930
02286>
02287> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02288> CN* = 81.0 Ia = Dep. Storage (Above)
02289> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02290> THAN THE STORAGE COEFFICIENT.
02291> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02292>
02293>
02294> 001:0006-----
02295>

```

```

02296> *
02297> * SUB-AREA No.3
02298>
02299> | CALIB STANDHYD | Area (ha)= 1.40
02300> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02301>
02302> IMPVIOUS PERVIOUS (i)
02303> Surface Area (ha)= 1.36 .04
02304> Dep. Storage (mm)= 1.57 4.67
02305> Average Slope (%)= .51 1.00
02306> Length (m)= 225.63 5.00
02307> Mannings n = .030 .030
02308>
02309> Max.eff.Inten.(mm/hr)= 144.69 65.19
02310> over (min)= 7.50 7.50
02311> Storage Coeff. (min)= 7.26 (ii) 8.09 (ii)
02312> Unit Hyd. Tpeak (min)= 7.50 7.50
02313> Unit Hyd. peak (cms)= .15 .14
02314>
02315> PEAK FLOW (cms)= .40 .00 *TOTALS*
02316> TIME TO PEAK (hrs)= 1.04 1.08 1.042 (iii)
02317> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02318> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02319> RUNOFF COEFFICIENT = .97 .44 .957
02320>
02321> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02322> CN* = 81.0 Ia = Dep. Storage (Above)
02323> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02324> THAN THE STORAGE COEFFICIENT.
02325> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02326>
02327>
02328> 001:0007-----
02329>
02330> | ADD HYD (040) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02331> | (ha) (cms) (hrs) (mm) (cms)
02332> | ID1 01:010 2.07 .532 1.04 51.65 .000
02333> | +ID2 02:020 1.54 .418 1.04 54.15 .000
02334> |-----|
02335> | SUM 04:040 3.61 .950 1.04 52.72 .000
02336>
02337> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02338>
02339> 001:0008-----
02340>
02341> | ADD HYD (050) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02342> | (ha) (cms) (hrs) (mm) (cms)
02343> | ID1 03:030 1.40 .400 1.04 55.72 .000
02344> | +ID2 04:040 3.61 .950 1.04 52.72 .000
02345> |-----|
02346> | SUM 05:050 5.01 1.350 1.04 53.55 .000
02347>
02348> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02349>
02350>
02351> 001:0009-----
02352> * SUB-AREA No.4
02353>
02354> | CALIB STANDHYD | Area (ha)= .89
02355> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02356>
02357> IMPVIOUS PERVIOUS (i)
02358> Surface Area (ha)= 1.86 .03
02359> Dep. Storage (mm)= 1.57 4.67
02360> Average Slope (%)= .93 .70
02361> Length (m)= 164.82 40.00
02362> Mannings n = .030 .250
02363>
02364> Max.eff.Inten.(mm/hr)= 144.69 44.12
02365> over (min)= 5.00 17.50
02366> Storage Coeff. (min)= 5.02 (ii) 18.44 (ii)
02367> Unit Hyd. Tpeak (min)= 5.00 17.50
02368> Unit Hyd. peak (cms)= .22 .06
02369>
02370> PEAK FLOW (cms)= .30 .00 *TOTALS*
02371> TIME TO PEAK (hrs)= 1.00 1.25 1.000
02372> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02373> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02374> RUNOFF COEFFICIENT = .97 .44 .957
02375>
02376> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02377> CN* = 81.0 Ia = Dep. Storage (Above)
02378> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02379> THAN THE STORAGE COEFFICIENT.
02380> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02381>
02382>
02383> 001:0010-----
02384> * SUB-AREA No.5
02385>
02386> | CALIB STANDHYD | Area (ha)= 2.66
02387> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
02388>
02389> IMPVIOUS PERVIOUS (i)
02390> Surface Area (ha)= 2.58 .08
02391> Dep. Storage (mm)= 1.57 4.67
02392> Average Slope (%)= .61 1.50
02393> Length (m)= 207.25 20.00
02394> Mannings n = .030 .250
02395>
02396> Max.eff.Inten.(mm/hr)= 144.69 51.33
02397> over (min)= 7.50 12.50
02398> Storage Coeff. (min)= 6.54 (ii) 13.16 (ii)
02399> Unit Hyd. Tpeak (min)= 7.50 12.50
02400> Unit Hyd. peak (cms)= .16 .09
02401>
02402> PEAK FLOW (cms)= .78 .01 *TOTALS*
02403> TIME TO PEAK (hrs)= 1.04 1.17 1.042 (iii)
02404> RUNOFF VOLUME (mm)= 56.66 25.35 55.717
02405> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02406> RUNOFF COEFFICIENT = .97 .44 .957
02407>
02408> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02409> CN* = 81.0 Ia = Dep. Storage (Above)
02410> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02411> THAN THE STORAGE COEFFICIENT.
02412> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02413>
02414>
02415> 001:0011-----
02416>
02417> | ADD HYD (080) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02418> | (ha) (cms) (hrs) (mm) (cms)
02419> | ID1 06:060 2.89 .296 1.00 55.72 .000
02420> | +ID2 07:070 1.69 .783 1.04 55.72 .000
02421> |-----|
02422> | SUM 08:080 3.55 1.060 1.04 55.72 .000
02423>
02424> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02425>
02426>
02427> 001:0012-----
02428>
02429>
02430>

```



SUM 01:Interi 79.66 .939 2.60 41.94 .000

02701>  
02702>  
02703> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02704>  
02705>  
02706> 001:0025-----  
02707>  
02708> \* CALCULATION OF 3HR - 1:50 YEAR STORM EVENT \*  
02709> \*\*\*\*\*

---

02710> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\  
02711> | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\  
02712>  
02713> TZERO = .00 hrs on 0  
02714> METOD= 2 (output= METRIC)  
02715> NRUM = 001  
02716> NSTORM= 0  
02717>  
02718> 001:0002-----  
02719>  
02720> | CHICAGO STORM | IDF curve parameters: A=1569.580  
02721> | Ptotal= 64.81 mm | B= 6.014  
02722> | C= .820  
02723> used in: INTENSITY = A / (t + B)^C  
02724>  
02725> Duration of storm = 3.00 hrs  
02726> Storm time step = 10.00 min  
02727> Time to peak ratio = .33  
02728>  
02729> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |  
02730> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |  
02731> .17 5.467 | 1.00 161.471 | 1.83 10.000 | 2.67 5.209 |  
02732> .33 6.820 | 1.17 48.876 | 2.00 8.397 | 2.83 4.774 |  
02733> .50 9.187 | 1.33 24.704 | 2.17 7.256 | 3.00 4.412 |  
02734> .67 14.441 | 1.50 16.495 | 2.33 6.403 |  
02735> .83 36.764 | 1.67 12.422 | 2.50 5.740 |  
02736>  
02737> 001:0003-----  
02738>  
02739> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWM\HYM-1\ORGA.VAL  
02740> | ICASEdv = 1 (read and print data)  
02741> | FileTitle= ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE  
02742> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ----D  
02743>  
02744> Horton's infiltration equation parameters:  
02745> [F= 50.00 mm/hr] [F0= 7.50 mm/hr] [CEAK= 2.00 /hr] [F= .00 mm]  
02746> Parameters for PERVIOUS surfaces in STANDHYD:  
02747> [IAper= 4.67 mm] [LGP=40.00 mm] [MNP=.250]  
02748> Parameters for IMPERVIOUS surfaces in STANDHYD:  
02749> [XIngs= 1.57 mm] [CL= 1.50] [MNI=.035]  
02750> Parameters used in NASHYD:  
02751> [Ia= 4.67 mm] [N= 3.00]  
02752>  
02753> 001:0004-----  
02754> \*\*\*\*\*  
02755> \* ORGAWORLD FILE \*  
02756> \*\*\*\*\*  
02757> \*  
02758> \* SUB-AREA No.1

---

02759> | CALIB STANDHYD | Area (ha)= 2.07  
02760> | 01:01:00 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00  
02761>  
02762>  
02763> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
02764> Dep. Storage (mm)= 1.74 .33  
02765> Average Slope (%)= .52 1.00  
02766> Length (m)= 204.72 20.00  
02767> Mannings n = .030 .250  
02768>  
02769> Max.eff.Inten.(mm/hr)= 161.47 62.27  
02770> over (min) 7.50 12.50  
02771> Storage Coeff. (min)= 6.51 (ii) 13.44 (iii)  
02772> Unit Hyd. Tpeak (min)= 7.50 12.50  
02773> Unit Hyd. peak (cms)= .16 .09  
02774>  
02775> \*TOTALS\*  
02776> PEAK FLOW (cms)= .59 .03 .609 (iii)  
02777> TIME TO PEAK (hrs)= 1.04 1.17 1.042  
02778> RUNOFF VOLUME (mm)= 63.24 30.21 57.952  
02779> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02780> RUNOFF COEFFICIENT = .98 .47 .894  
02781>  
02782> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02783> CN\* = 81.0 Ia = Dep. Storage (Above)  
02784> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02785> THAN THE STORAGE COEFFICIENT.  
02786> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02787>  
02788> 001:0005-----  
02789> \*  
02790> \* SUB-AREA No.2

---

02791> | CALIB STANDHYD | Area (ha)= 1.54  
02792> | 02:02:00 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00  
02793>  
02794>  
02795>  
02796> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
02797> Dep. Storage (mm)= 1.42 .12  
02798> Average Slope (%)= 1.57 4.67  
02799> Length (m)= 24.34 5.00  
02800> Mannings n = .030 .030  
02801>  
02802> Max.eff.Inten.(mm/hr)= 161.47 78.73  
02803> over (min) 7.50 7.50  
02804> Storage Coeff. (min)= 7.33 (ii) 8.10 (ii)  
02805> Unit Hyd. Tpeak (min)= 7.50 7.50  
02806> Unit Hyd. peak (cms)= .15 .14  
02807>  
02808> \*TOTALS\*  
02809> PEAK FLOW (cms)= .46 .02 .475 (iii)  
02810> TIME TO PEAK (hrs)= 1.04 1.08 1.042  
02811> RUNOFF VOLUME (mm)= 63.24 30.21 60.594  
02812> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02813> RUNOFF COEFFICIENT = .98 .47 .935  
02814>  
02815> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02816> CN\* = 81.0 Ia = Dep. Storage (Above)  
02817> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02818> THAN THE STORAGE COEFFICIENT.  
02819> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02820>  
02821> 001:0006-----  
02822> \*  
02823> \* SUB-AREA No.3

---

02824> | CALIB STANDHYD | Area (ha)= 1.40  
02825> | 03:03:00 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02826>  
02827>  
02828>  
02829> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
02830> Dep. Storage (mm)= 1.36 .04  
02831> Average Slope (%)= 1.57 4.67  
02832> Length (m)= .51 1.00  
02833> Mannings n = 225.63 5.00  
02834>  
02835>

02836> Max.eff.Inten.(mm/hr)= 161.47 78.73  
02837> over (min) 7.50 7.50  
02838> Storage Coeff. (min)= 6.95 (ii) 7.72 (ii)  
02839> Unit Hyd. Tpeak (min)= 7.50 7.50  
02840> Unit Hyd. peak (cms)= .16 .15 \*TOTALS\*  
02841>  
02842> PEAK FLOW (cms)= .45 .01 .454 (iii)  
02843> TIME TO PEAK (hrs)= 1.04 1.08 1.042  
02844> RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02845> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02846> RUNOFF COEFFICIENT = .98 .47 .960  
02847>  
02848> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02849> CN\* = 81.0 Ia = Dep. Storage (Above)  
02850> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02851> THAN THE STORAGE COEFFICIENT.  
02852> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02853>  
02854> 001:0007-----  
02855>  
02856> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02857> (ha) (cms) (hrs) (mm) (cms)  
02858> ID1 01:010 2.07 .609 1.04 57.95 .000  
02859> +ID2 02:020 1.54 .475 1.04 60.59 .000  
02860>  
02861> SUM 04:040 3.61 1.084 1.04 59.08 .000  
02862>  
02863> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02864>  
02865> 001:0008-----  
02866>  
02867> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02868> (ha) (cms) (hrs) (mm) (cms)  
02869> ID1 03:030 1.40 .454 1.04 62.25 .000  
02870> +ID2 04:040 3.61 1.084 1.04 59.08 .000  
02871>  
02872> SUM 05:050 5.01 1.538 1.04 59.96 .000  
02873>  
02874> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02875>  
02876> 001:0009-----  
02877>  
02878> \* SUB-AREA No.4

---

02879> | CALIB STANDHYD | Area (ha)= .89  
02880> | 06:06:00 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02881>  
02882>  
02883> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
02884> Dep. Storage (mm)= 1.86 .03  
02885> Average Slope (%)= .93 .70  
02886> Length (m)= 164.82 40.00  
02887> Mannings n = .030 .250  
02888>  
02889> Max.eff.Inten.(mm/hr)= 161.47 53.28  
02890> over (min) 5.00 17.50  
02891> Storage Coeff. (min)= 4.80 (ii) 17.24 (ii)  
02892> Unit Hyd. Tpeak (min)= 5.00 17.50  
02893> Unit Hyd. peak (cms)= .23 .07 \*TOTALS\*  
02894>  
02895> PEAK FLOW (cms)= .33 .00 .335 (iii)  
02896> TIME TO PEAK (hrs)= 1.00 1.25 1.000  
02897> RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02898> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02899> RUNOFF COEFFICIENT = .98 .47 .960  
02900>  
02901> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02902> CN\* = 81.0 Ia = Dep. Storage (Above)  
02903> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02904> THAN THE STORAGE COEFFICIENT.  
02905> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02906>  
02907> 001:0010-----  
02908> \*  
02909> \* SUB-AREA No.5

---

02910> | CALIB STANDHYD | Area (ha)= 2.66  
02911> | 07:07:00 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
02912>  
02913>  
02914>  
02915> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)  
02916> Dep. Storage (mm)= 2.58 .08  
02917> Average Slope (%)= .61 1.50  
02918> Length (m)= 207.25 20.00  
02919> Mannings n = .030 .250  
02920>  
02921> Max.eff.Inten.(mm/hr)= 161.47 62.27  
02922> over (min) 7.50 12.50  
02923> Storage Coeff. (min)= 6.26 (ii) 12.39 (ii)  
02924> Unit Hyd. Tpeak (min)= 7.50 12.50  
02925> Unit Hyd. peak (cms)= .17 .09 \*TOTALS\*  
02926>  
02927> PEAK FLOW (cms)= .88 .01 .886 (iii)  
02928> TIME TO PEAK (hrs)= 1.04 1.17 1.042  
02929> RUNOFF VOLUME (mm)= 63.24 30.21 62.245  
02930> TOTAL RAINFALL (mm)= 64.81 64.81 64.806  
02931> RUNOFF COEFFICIENT = .98 .47 .960  
02932>  
02933> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02934> CN\* = 81.0 Ia = Dep. Storage (Above)  
02935> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02936> THAN THE STORAGE COEFFICIENT.  
02937> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
02938>  
02939> 001:0011-----  
02940>  
02941> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02942> (ha) (cms) (hrs) (mm) (cms)  
02943> ID1 06:060 .89 .335 1.04 62.25 .000  
02944> +ID2 07:070 2.66 .886 1.04 62.25 .000  
02945>  
02946> SUM 08:080 3.55 1.197 1.04 62.25 .000  
02947>  
02948> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02949>  
02950> 001:0012-----  
02951>  
02952> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02953> (ha) (cms) (hrs) (mm) (cms)  
02954> ID1 05:050 5.01 1.538 1.04 59.96 .000  
02955> +ID2 08:080 3.55 1.197 1.04 62.25 .000  
02956>  
02957> SUM 09:090 8.56 2.735 1.04 60.91 .000  
02958>  
02959> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
02960>  
02961> 001:0013-----  
02962>  
02963>  
02964>  
02965>  
02966>  
02967>  
02968>  
02969>  
02970>

02971> ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
02972> IN>09: (090 ) |  
02973> OUT>10: (POND ) |

===== OUTFLOW STORAGE TABLE =====  
02974> OUTFLOW STORAGE | OUTFLOW STORAGE |  
02975> (cms) (ha.m.) | (cms) (ha.m.) |  
02976> .000 .0000E+00 | .593 .6251E+00 |  
02977> .008 .6560E-01 | .654 .6631E+00 |  
02978> .017 .1311E+00 | .797 .7391E+00 |  
02979> .093 .2831E+00 | 1.350 .8274E+00 |  
02980> .233 .3971E+00 | 1.304 .9157E+00 |  
02981> .337 .4731E+00 | 1.880 .1004E+01 |  
02982> .465 .5491E+00 | 2.577 .1092E+01 |  
02983> .531 .5871E+00 | .000 .0000E+00 |

ROUTING RESULTS AREA QPEAK TPEAK R.V.  
02986> (ha) (cms) (hrs) (mm)  
02987> INFLOW >09: (090 ) 8.56 2.735 1.042 60.910  
02988> OUTFLOW>10: (POND ) 8.56 .233 1.944 60.908

PEAK FLOW REDUCTION [Qout/Qin] (%) = 8.503  
02991> TIME SHIFT OF PEAK FLOW (min) = 54.17  
02992> MAXIMUM STORAGE USED (ha.m.) = 3967E+00

02994> \* SUB-AREA No. 1  
03001> CALIB STANDHYD | Area (ha) = 19.90  
03002> | 01:HIP01 DT= 2.50 | Total Imp (%) = 71.00 Dir. Conn. (%) = 50.00

IMPERVIOUS PERVIOUS (i)  
03006> Surface Area (ha) = 14.13 5.77  
03007> Dep. Storage (mm) = 1.57 4.67  
03008> Average Slope (%) = .60 1.50  
03009> Length (m) = 580.00 100.00  
03010> Mannings n = .030 .250

Max. eff. Inten. (mm/hr) = 138.95 102.13  
03012> over (min) 12.50 25.00  
03013> Storage Coeff. (min) = 12.38 (ii) 25.60 (ii)  
03014> Unit Hyd. Tpeak (min) = 12.50 25.00  
03016> Unit Hyd. peak (cms) = .09 .04

PEAK FLOW (cms) = 2.46 .95 \*TOTALS\*  
03018> TIME TO PEAK (hrs) = 1.13 1.38 3.001 (iii)  
03020> RUNOFF VOLUME (mm) = 63.24 39.90 1.167  
03021> TOTAL RAINFALL (mm) = 64.81 64.81 64.806  
03022> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03024> CN\* = 81.0 Ia = Dep. Storage (Above)  
03026> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03027> THAN THE STORAGE COEFFICIENT.  
03028> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03031> 001:0015  
03032> ADD HYD (HIP02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03033> (ha) (cms) (hrs) (mm) (cms)  
03034> ID1 10:POND 8.56 2.735 1.042 60.910  
03036> +ID2 01:HIP01 19.90 3.001 1.17 51.57 .000  
03037> SUM 02:HIP02 28.46 3.092 1.17 54.37 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03041> 001:0016  
03042> CALIB STANDHYD | Area (ha) = 17.00  
03043> | 03:HIP03 DT= 2.50 | Total Imp (%) = 71.00 Dir. Conn. (%) = 50.00

IMPERVIOUS PERVIOUS (i)  
03051> Surface Area (ha) = 12.07 4.93  
03052> Dep. Storage (mm) = 1.57 4.67  
03053> Average Slope (%) = .65 1.50  
03054> Length (m) = 450.00 100.00  
03055> Mannings n = .030 .250

Max. eff. Inten. (mm/hr) = 161.47 109.61  
03057> over (min) 10.00 22.50  
03058> Storage Coeff. (min) = 9.77 (ii) 22.63 (ii)  
03059> Unit Hyd. Tpeak (min) = 10.00 25.00  
03061> Unit Hyd. peak (cms) = .11 .05

PEAK FLOW (cms) = 2.38 .88 \*TOTALS\*  
03063> TIME TO PEAK (hrs) = 1.08 1.33 2.819 (iii)  
03065> RUNOFF VOLUME (mm) = 61.24 39.90 1.125  
03066> TOTAL RAINFALL (mm) = 64.81 64.81 64.806  
03067> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03069> CN\* = 81.0 Ia = Dep. Storage (Above)  
03071> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03072> THAN THE STORAGE COEFFICIENT.  
03073> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03076> 001:0017  
03077> \* SUB-AREA No. 3  
03078> CALIB STANDHYD | Area (ha) = 18.10  
03079> | 04:HIP04 DT= 2.50 | Total Imp (%) = 71.00 Dir. Conn. (%) = 50.00

IMPERVIOUS PERVIOUS (i)  
03084> Surface Area (ha) = 12.85 5.25  
03085> Dep. Storage (mm) = 1.57 4.67  
03086> Average Slope (%) = .60 1.50  
03087> Length (m) = 600.00 100.00  
03088> Mannings n = .030 .250

Max. eff. Inten. (mm/hr) = 138.95 96.02  
03091> over (min) 12.50 27.50  
03092> Storage Coeff. (min) = 13.34 (ii) 26.90 (ii)  
03093> Unit Hyd. Tpeak (min) = 12.50 27.50  
03094> Unit Hyd. peak (cms) = .09 .04

PEAK FLOW (cms) = 2.16 .83 \*TOTALS\*  
03096> TIME TO PEAK (hrs) = 1.13 1.42 2.596 (iii)  
03097> RUNOFF VOLUME (mm) = 63.24 39.90 1.167  
03098> TOTAL RAINFALL (mm) = 64.81 64.81 64.806  
03099> RUNOFF COEFFICIENT = .98 .62 .796

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03102> CN\* = 81.0 Ia = Dep. Storage (Above)  
03104> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03105> THAN THE STORAGE COEFFICIENT.

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

03106> 001:0018  
03107> ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03108> (ha) (cms) (hrs) (mm) (cms)  
03112> ID1 03:HIP03 17.00 2.819 1.13 51.57 .000  
03113> +ID2 04:HIP04 18.10 2.596 1.17 51.57 .000  
03114> SUM 05:HIP05 35.10 5.372 1.13 51.57 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03119> 001:0019  
03120> \* SUB-AREA No. 4  
03121> DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN) = 85.00  
03122> | 06:Pond-B DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00  
03123> U.H. Tp (hrs) = .170

Unit Hyd Opeak (cms) = .899  
03129> PEAK FLOW (cms) = .551 (i)  
03130> TIME TO PEAK (hrs) = 1.125  
03131> RUNOFF VOLUME (mm) = 34.455  
03132> TOTAL RAINFALL (mm) = 64.806  
03133> RUNOFF COEFFICIENT = .532

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

03139> 001:0020  
03140> DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN) = 85.00  
03141> | 06:Pond-B DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00  
03142> U.H. Tp (hrs) = .170

Unit Hyd Opeak (cms) = .899  
03143> PEAK FLOW (cms) = .551 (i)  
03144> TIME TO PEAK (hrs) = 1.125  
03145> RUNOFF VOLUME (mm) = 34.455  
03146> TOTAL RAINFALL (mm) = 64.806  
03147> RUNOFF COEFFICIENT = .532

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

03139> 001:0021  
03140> ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
03141> IN>07: (HIPO6 ) |  
03142> OUT>08: (HIP-PO) |

===== OUTFLOW STORAGE TABLE =====  
03143> OUTFLOW STORAGE | OUTFLOW STORAGE |  
03144> (cms) (ha.m.) | (cms) (ha.m.) |  
03145> .000 .0000E+00 | .724 .2210E+01 |  
03146> .048 .5740E-01 | .937 .2501E+01 |  
03147> .054 .2434E+00 | 1.262 .2798E+01 |  
03148> .059 .5834E+00 | 1.404 .3101E+01 |  
03149> .062 .8400E+00 | 1.532 .3410E+01 |  
03150> .064 .1102E+01 | 1.650 .3724E+01 |  
03151> .147 .1370E+01 | 2.409 .4044E+01 |  
03152> .280 .1644E+01 | 3.689 .4370E+01 |  
03153> .472 .1924E+01 | .000 .0000E+00 |

ROUTING RESULTS AREA QPEAK TPEAK R.V.  
03158> (ha) (cms) (hrs) (mm)  
03159> INFLOW >07: (HIP06 ) 67.56 8.958 1.125 51.735  
03160> OUTFLOW>08: (HIP-PO) 67.56 .973 3.097 51.735

PEAK FLOW REDUCTION [Qout/Qin] (%) = 10.864  
03176> TIME SHIFT OF PEAK FLOW (min) = 118.33  
03177> MAXIMUM STORAGE USED (ha.m.) = 2534E+01

03179> 001:0022  
03180> \* SUB-AREA No. 5  
03181> DESIGN NASHYD | Area (ha) = 6.80 Curve Number (CN) = 76.00  
03182> | 07:A2 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00  
03183> U.H. Tp (hrs) = .370

Unit Hyd Opeak (cms) = .702  
03189> PEAK FLOW (cms) = .417 (i)  
03190> TIME TO PEAK (hrs) = 1.417  
03191> RUNOFF VOLUME (mm) = 25.767  
03192> TOTAL RAINFALL (mm) = 64.806  
03193> RUNOFF COEFFICIENT = .398

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

03199> 001:0023  
03200> \* SUB-AREA No. 6  
03201> DESIGN NASHYD | Area (ha) = 5.30 Curve Number (CN) = 76.00  
03202> | 10:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00  
03203> U.H. Tp (hrs) = .804

Unit Hyd Opeak (cms) = .252  
03210> PEAK FLOW (cms) = .188 (i)  
03211> TIME TO PEAK (hrs) = 2.000  
03212> RUNOFF VOLUME (mm) = 25.767  
03213> TOTAL RAINFALL (mm) = 64.806  
03214> RUNOFF COEFFICIENT = .398

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

03219> 001:0024  
03220> ADD HYD (Interi) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03221> (ha) (cms) (hrs) (mm) (cms)  
03224> ID1 08:HIP-PO 67.56 .973 3.10 51.73 .000  
03225> +ID2 09:A2 6.80 .417 1.42 25.77 .000  
03226> +ID3 10:A3 5.30 .188 2.00 25.77 .000  
03227> SUM 01:Interi 79.66 1.191 2.31 47.79 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03230> 001:0025  
03231> \* SUB-AREA No. 7  
03232> DESIGN NASHYD | Area (ha) = 5.30 Curve Number (CN) = 76.00  
03233> | 10:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00  
03234> U.H. Tp (hrs) = .804

Unit Hyd Opeak (cms) = .252  
03240> PEAK FLOW (cms) = .188 (i)  
03241> TIME TO PEAK (hrs) = 2.000  
03242> RUNOFF VOLUME (mm) = 25.767  
03243> TOTAL RAINFALL (mm) = 64.806  
03244> RUNOFF COEFFICIENT = .398

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

03235> \* CALCULATION OF 3HR - 1:100 YEAR STORM EVENT \*  
03236> START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWMMHYM-1\1  
03237> Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWMMHYM-1\1  
03238> TZERO = .00 hrs on 0

```

03241> METOUT= 2 (output = METRIC)
03242> NRUN = 001
03243> NSTORM= 0
03244> -----
03245> 001:0002-----
03246> -----
03247> | CHICAGO STORM | IDF curve parameters: A=1735.688
03248> | Ptotal= 71.66 mm | B= 6.014
03249> C= .820
03250> used in: INTENSITY = A / (t + B)^C
03251> -----
03252> Duration of storm = 3.00 hrs
03253> Storm time step = 10.00 min
03254> Time to peak ratio = .33
03255> -----
03256> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
03257> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
03258> .17 6.046 | 1.00 178.559 | 1.83 11.059 | 2.67 5.760
03259> .37 7.542 | 1.17 54.049 | 2.00 9.285 | 2.83 5.280
03260> .50 10.159 | 1.33 27.319 | 2.17 8.024 | 3.00 4.879
03261> .67 15.969 | 1.50 18.240 | 2.33 7.080 |
03262> .83 40.655 | 1.67 13.737 | 2.50 6.347 |
03263> -----
03264> -----
03265> 001:0003-----
03266> -----
03267> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\ORGA.VAL
03268> | ICASBdv = 1 (read and print data)
03269> Filetitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
03270> ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----
03271> Horton's infiltration equation parameters:
03272> [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
03273> Parameters for PERVIOUS surfaces in STANDHYD:
03274> [Iapez= 4.67 mm] [LGP=10.00 m] [DMP= .250]
03275> Parameters for IMPERVIOUS surfaces in STANDHYD:
03276> [IAimp= 1.57 mm] [CLI= 1.50] [MWI= .035]
03277> Parameters used in NASHYD:
03278> [Ia= 4.67 mm] [N= 3.00]
03279> -----
03280> 001:0004-----
03281> *****
03282> * ORGAWORLD FILE *
03283> *****
03284> * SUB-AREA No.1
03285> -----
03286> | CALIB STANDHYD | Area (ha)= 2.07
03287> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
03288> -----
03289> IMPERVIOUS PERVIOUS (i)
03290> Surface Area (ha)= 1.74 .33
03291> Dep. Storage (mm)= 1.57 4.67
03292> Average Slope (%)= .52 1.00
03293> Length (m)= 204.72 20.00
03294> Mannings n = .030 .250
03295> -----
03296> Max. eff. Inten. (mm/hr)= 178.56 74.05
03297> over (min) 7.50 12.50
03298> Storage Coeff. (min)= 6.25 (ii) 12.72 (ii)
03299> Unit Hyd. Tpeak (min)= 7.50 12.50
03300> Unit Hyd. peak (cms)= .17 .09
03301> -----
03302> *TOTALS*
03303> PEAK FLOW (cms)= .66 .04 .685 (iii)
03304> TIME TO PEAK (hrs)= 1.04 1.17 1.042
03305> RUNOFF VOLUME (mm)= 70.09 35.46 64.553
03306> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03307> RUNOFF COEFFICIENT = .98 .49 .901
03308> -----
03309> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03310> CN* = 81.0 Ia = Dep. Storage (Above)
03311> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03312> THAN THE STORAGE COEFFICIENT.
03313> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03314> -----
03315> -----
03316> 001:0005-----
03317> * SUB-AREA No.2
03318> -----
03319> | CALIB STANDHYD | Area (ha)= 1.54
03320> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
03321> -----
03322> IMPERVIOUS PERVIOUS (i)
03323> Surface Area (ha)= 1.42 .12
03324> Dep. Storage (mm)= 1.57 4.67
03325> Average Slope (%)= .50 1.00
03326> Length (m)= 244.34 5.00
03327> Mannings n = .030 .030
03328> -----
03329> Max. eff. Inten. (mm/hr)= 178.56 93.23
03330> over (min) 7.50 7.50
03331> Storage Coeff. (min)= 7.04 (ii) 7.76 (ii)
03332> Unit Hyd. Tpeak (min)= 7.50 7.50
03333> Unit Hyd. peak (cms)= .16 .15
03334> -----
03335> *TOTALS*
03336> PEAK FLOW (cms)= .51 .02 .534 (iii)
03337> TIME TO PEAK (hrs)= 1.04 1.08 1.042
03338> RUNOFF VOLUME (mm)= 70.09 35.46 67.324
03339> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03340> RUNOFF COEFFICIENT = .98 .49 .939
03341> -----
03342> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03343> CN* = 81.0 Ia = Dep. Storage (Above)
03344> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03345> THAN THE STORAGE COEFFICIENT.
03346> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03347> -----
03348> -----
03349> 001:0006-----
03350> * SUB-AREA No.3
03351> -----
03352> | CALIB STANDHYD | Area (ha)= 1.40
03353> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03354> -----
03355> IMPERVIOUS PERVIOUS (i)
03356> Surface Area (ha)= 1.36 .04
03357> Dep. Storage (mm)= 1.57 4.67
03358> Average Slope (%)= .51 1.00
03359> Length (m)= 225.63 5.00
03360> Mannings n = .030 .030
03361> -----
03362> Max. eff. Inten. (mm/hr)= 178.56 93.23
03363> over (min) 7.50 7.50
03364> Storage Coeff. (min)= 6.67 (ii) 7.50 (ii)
03365> Unit Hyd. Tpeak (min)= 7.50 7.50
03366> Unit Hyd. peak (cms)= .16 .15
03367> -----
03368> *TOTALS*
03369> PEAK FLOW (cms)= .50 .01 1.509 (iii)
03370> TIME TO PEAK (hrs)= 1.04 1.08 1.042
03371> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03372> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03373> RUNOFF COEFFICIENT = .98 .49 .964
03374> -----
03375> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```

```

03376> CN* = 81.0 Ia = Dep. Storage (Above)
03377> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03378> THAN THE STORAGE COEFFICIENT.
03379> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03380> -----
03381> -----
03382> 001:0007-----
03383> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03384> | | | (ha) (cms) (hrs) (mm) (cms)
03385> ID1 01:010 2.07 .685 1.04 64.55 .000
03386> +ID2 02:020 1.54 .534 1.04 67.32 .000
03387> -----
03388> SUM 04:040 3.61 1.220 1.04 65.74 .000
03389> -----
03390> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03391> -----
03392> -----
03393> 001:0008-----
03394> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03395> | | | (ha) (cms) (hrs) (mm) (cms)
03396> ID1 03:030 1.40 .509 1.04 69.06 .000
03397> +ID2 04:040 3.61 1.220 1.04 65.74 .000
03398> -----
03399> SUM 05:050 5.01 1.729 1.04 66.66 .000
03400> -----
03401> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03402> -----
03403> -----
03404> -----
03405> 001:0009-----
03406> * SUB-AREA No.4
03407> -----
03408> | CALIB STANDHYD | Area (ha)= .89
03409> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03410> -----
03411> IMPERVIOUS PERVIOUS (i)
03412> Surface Area (ha)= 1.56 .03
03413> Dep. Storage (mm)= 1.57 4.67
03414> Average Slope (%)= .52 1.00
03415> Length (m)= 164.82 40.00
03416> Mannings n = .030 .250
03417> -----
03418> Max. eff. Inten. (mm/hr)= 178.56 67.61
03419> over (min) 5.00 15.00
03420> Storage Coeff. (min)= 4.62 (ii) 15.92 (ii)
03421> Unit Hyd. Tpeak (min)= 5.00 15.00
03422> Unit Hyd. peak (cms)= .24 .07
03423> -----
03424> *TOTALS*
03425> PEAK FLOW (cms)= .37 .00 .374 (iii)
03426> TIME TO PEAK (hrs)= 1.00 1.21 1.000
03427> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03428> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03429> RUNOFF COEFFICIENT = .98 .49 .964
03430> -----
03431> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03432> CN* = 81.0 Ia = Dep. Storage (Above)
03433> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03434> THAN THE STORAGE COEFFICIENT.
03435> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03436> -----
03437> -----
03438> -----
03439> 001:0010-----
03440> * SUB-AREA No.5
03441> -----
03442> | CALIB STANDHYD | Area (ha)= 2.66
03443> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
03444> -----
03445> IMPERVIOUS PERVIOUS (i)
03446> Surface Area (ha)= 2.58 .08
03447> Dep. Storage (mm)= 1.57 4.67
03448> Average Slope (%)= .61 1.50
03449> Length (m)= 207.25 20.00
03450> Mannings n = .030 .250
03451> -----
03452> Max. eff. Inten. (mm/hr)= 178.56 74.05
03453> over (min) 5.00 12.50
03454> Storage Coeff. (min)= 6.01 (ii) 11.73 (ii)
03455> Unit Hyd. Tpeak (min)= 5.00 12.50
03456> Unit Hyd. peak (cms)= .20 .09
03457> -----
03458> *TOTALS*
03459> PEAK FLOW (cms)= 1.03 .01 1.034 (iii)
03460> TIME TO PEAK (hrs)= 1.00 1.17 1.000
03461> RUNOFF VOLUME (mm)= 70.09 35.46 69.056
03462> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03463> RUNOFF COEFFICIENT = .98 .49 .964
03464> -----
03465> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03466> CN* = 81.0 Ia = Dep. Storage (Above)
03467> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03468> THAN THE STORAGE COEFFICIENT.
03469> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03470> -----
03471> -----
03472> 001:0011-----
03473> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03474> | | | (ha) (cms) (hrs) (mm) (cms)
03475> ID1 06:060 .89 .374 1.00 69.06 .000
03476> +ID2 07:070 2.66 1.034 1.00 69.06 .000
03477> -----
03478> SUM 08:080 3.55 1.408 1.00 69.06 .000
03479> -----
03480> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03481> -----
03482> -----
03483> -----
03484> 001:0012-----
03485> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03486> | | | (ha) (cms) (hrs) (mm) (cms)
03487> ID1 05:050 5.01 1.729 1.04 66.66 .000
03488> +ID2 08:080 3.55 1.408 1.00 69.06 .000
03489> -----
03490> SUM 09:090 8.56 3.067 1.04 67.66 .000
03491> -----
03492> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03493> -----
03494> -----
03495> 001:0013-----
03496> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
03497> | IN>09 (090 ) |
03498> | OUT<10 (POND) |
03499> -----
03500> ===== OUTFLOW STORAGE TABLE =====
03501> OUTFLOW STORAGE | OUTFLOW STORAGE
03502> (cms) (ha.m.) | (cms) (ha.m.)
03503> .000 .0000E+00 | .593 .6251E+00
03504> .008 .6560E-01 | .654 .6631E+00
03505> .017 .1311E+00 | .797 .7391E+00
03506> .093 .2831E+00 | .950 .8274E+00
03507> .233 .3971E+00 | 1.304 .9157E+00
03508> .337 .4731E+00 | 1.880 .1004E+01
03509> .465 .5491E+00 | 2.577 .1092E+01
03510> .531 .5871E+00 | .000 .0000E+00

```

03511> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
03512> (ha) (cms) (hrs) (mm)  
03513> INFLOW >09: (090 ) 8.56 3.067 1.022 67.655  
03514> OUTFLOW <10: (POND ) 8.56 .283 1.861 67.653  
03515>  
03516>  
03517> PEAK FLOW REDUCTION [Qout/Qin] (%) = 9.214  
03518> TIME SHIFT OF PEAK FLOW (min) = 49.17  
03519> MAXIMUM STORAGE USED (ha.m.) = 4333E+00  
03520>  
03521>  
03522> 001:0014-----  
03523> \*\*\*\*\*  
03524> \* Remaining Hawthorne Industrial Park \*  
03525> \*\*\*\*\*  
03526> \*  
03527> \* SUB-AREA No.1  
03528>-----  
03529> | CALIB STANDHYD | Area (ha)= 19.90  
03530> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03531>-----  
03532> IMPERVIOUS PERVIOUS (i)  
03533> Surface Area (ha)= 14.13 5.77  
03534> Dep. Storage (mm)= 1.57 4.67  
03535> Average Slope (%)= .60 1.50  
03536> Length (m)= 580.00 100.00  
03537> Mannings n = .030 .250  
03538>  
03539> Max. eff. Inten. (mm/hr)= 153.66 117.89  
03540> over (min) 12.50 25.00  
03541> Storage Coeff. (min)= 11.89 (ii) 24.37 (ii)  
03542> Unit Hyd. Tpeak (min)= 12.50 25.00  
03543> Unit Hyd. peak (cms)= .09 .05  
03544>  
03545> PEAK FLOW (cms)= 2.77 1.13 3.419 (iii)  
03546> TIME TO PEAK (hrs)= 1.13 1.38 1.167  
03547> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03548> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03549> RUNOFF COEFFICIENT = .98 .64 .810  
03550>  
03551> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03552> CN\* = 81.0 Ia = Dep. Storage (Above)  
03553> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03554> THAN THE STORAGE COEFFICIENT.  
03555> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03556>  
03557>  
03558> 001:0015-----  
03559> \*\*\*\*\*  
03560> | ADD HYD (HIP02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03561> (ha) (cms) (hrs) (mm) (cms)  
03562> ID1 10:POND 8.56 .283 1.86 67.65 .000  
03563> +ID2 01:HIP01 19.90 3.419 1.17 58.02 .000  
03564>-----  
03565> SUM 02:HIP02 28.46 3.554 1.17 60.91 .000  
03566>  
03567> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03568>  
03569>  
03570> 001:0016-----  
03571> \*  
03572> \* SUB-AREA No.2  
03573>-----  
03574> | CALIB STANDHYD | Area (ha)= 17.00  
03575> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03576>-----  
03577> IMPERVIOUS PERVIOUS (i)  
03578> Surface Area (ha)= 12.07 4.93  
03579> Dep. Storage (mm)= 1.57 4.67  
03580> Average Slope (%)= .65 1.50  
03581> Length (m)= 450.00 100.00  
03582> Mannings n = .030 .250  
03583>  
03584> Max. eff. Inten. (mm/hr)= 178.56 126.60  
03585> over (min) 10.00 22.50  
03586> Storage Coeff. (min)= 9.39 (ii) 21.52 (ii)  
03587> Unit Hyd. Tpeak (min)= 10.00 22.50  
03588> Unit Hyd. peak (cms)= .12 .05  
03589>  
03590> PEAK FLOW (cms)= 2.68 1.05 3.203 (iii)  
03591> TIME TO PEAK (hrs)= 1.08 1.33 1.125  
03592> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03593> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03594> RUNOFF COEFFICIENT = .98 .64 .810  
03595>  
03596> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03597> CN\* = 81.0 Ia = Dep. Storage (Above)  
03598> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03599> THAN THE STORAGE COEFFICIENT.  
03600> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03601>  
03602>  
03603> 001:0017-----  
03604> \*  
03605> \* SUB-AREA No.3  
03606>-----  
03607> | CALIB STANDHYD | Area (ha)= 18.10  
03608> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03609>-----  
03610> IMPERVIOUS PERVIOUS (i)  
03611> Surface Area (ha)= 12.85 5.25  
03612> Dep. Storage (mm)= 1.57 4.67  
03613> Average Slope (%)= .50 1.50  
03614> Length (m)= 600.00 100.00  
03615> Mannings n = .030 .250  
03616>  
03617> Max. eff. Inten. (mm/hr)= 153.66 117.89  
03618> over (min) 12.50 25.00  
03619> Storage Coeff. (min)= 12.92 (ii) 25.30 (ii)  
03620> Unit Hyd. Tpeak (min)= 12.50 25.00  
03621> Unit Hyd. peak (cms)= .09 .04  
03622>  
03623> PEAK FLOW (cms)= 2.43 1.01 3.031 (iii)  
03624> TIME TO PEAK (hrs)= 1.13 1.38 1.167  
03625> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03626> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03627> RUNOFF COEFFICIENT = .98 .64 .810  
03628>  
03629> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03630> CN\* = 81.0 Ia = Dep. Storage (Above)  
03631> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03632> THAN THE STORAGE COEFFICIENT.  
03633> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03634>  
03635>  
03636> 001:0018-----  
03637> \*  
03638> | ADD HYD (HIP05 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03639> (ha) (cms) (hrs) (mm) (cms)  
03640> ID1 03:HIP03 17.00 3.203 1.13 58.02 .000  
03641> +ID2 04:HIP04 18.10 3.031 1.17 58.02 .000  
03642>-----  
03643> SUM 05:HIP05 35.10 6.178 1.13 58.02 .000  
03644>  
03645> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03646>  
03647>  
03648> 001:0019-----  
03649> \*  
03650> \*SUB-AREA No.4  
03651>-----  
03652> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
03653> | 06:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
03654> U.H. Tp(hrs)= 1.170  
03655>  
03656> Unit Hyd Qpeak (cms)= .899  
03657>  
03658> PEAK FLOW (cms)= .649 (i)  
03659> TIME TO PEAK (hrs)= 1.125  
03660> RUNOFF VOLUME (mm)= 40.139  
03661> TOTAL RAINFALL (mm)= 71.665  
03662> RUNOFF COEFFICIENT = .560  
03663>  
03664> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03665>  
03666>  
03667> 001:0020-----  
03668> \*  
03669> | ADD HYD (HIP06 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03670> (ha) (cms) (hrs) (mm) (cms)  
03671> ID1 02:HIP02 28.46 3.554 1.17 60.91 .000  
03672> +ID2 05:HIP05 35.10 6.178 1.13 58.02 .000  
03673> +ID3 06:Pond-B 4.00 .649 1.13 40.14 .000  
03674>-----  
03675> SUM 07:HIP06 67.56 10.299 1.13 58.18 .000  
03676>  
03677> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03678>  
03679>  
03680> 001:0021-----  
03681> \*  
03682> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
03683> | IN>07: (HIP06 ) |  
03684> | OUT<08: (HIP-PO) |  
03685>-----  
03686> OUTFLOW STORAGE TABLE  
03687> (cms) (ha.m.) (cms) (ha.m.)  
03688> .000 .000E+00 | .724 .2210E+01  
03689> .048 .5740E+01 | .937 .2501E+01  
03690> .054 .2434E+00 | 1.262 .2798E+01  
03691> .059 .5834E+00 | 1.404 .3101E+01  
03692> .062 .8400E+00 | 1.532 .3410E+01  
03693> .064 .1102E+01 | 1.650 .3724E+01  
03694> .147 .1370E+01 | 2.409 .4044E+01  
03695> .280 .1644E+01 | 3.689 .4370E+01  
03696> .472 .1924E+01 | .000 .0000E+00  
03697>  
03698> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
03699> (ha) (cms) (hrs) (mm) (cms)  
03700> INFLOW >07: (HIP06 ) 67.56 10.299 1.125 58.176  
03701> OUTFLOW<08: (HIP-PO) 67.56 1.246 2.958 58.176  
03702>  
03703> PEAK FLOW REDUCTION [Qout/Qin] (%) = 12.102  
03704> TIME SHIFT OF PEAK FLOW (min) = 110.00  
03705> MAXIMUM STORAGE USED (ha.m.) = 2784E+01  
03706>  
03707> 001:0022-----  
03708> \*  
03709> \*SUB-AREA No. 5  
03710>-----  
03711> | DESIGN NASHYD | Area (ha)= 6.80 Curve Number (CN)=76.00  
03712> | 09:A2 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
03713> U.H. Tp(hrs)= .370  
03714>  
03715> Unit Hyd Qpeak (cms)= .702  
03716>  
03717> PEAK FLOW (cms)= .497 (i)  
03718> TIME TO PEAK (hrs)= 1.417  
03719> RUNOFF VOLUME (mm)= 30.490  
03720> TOTAL RAINFALL (mm)= 71.665  
03721> RUNOFF COEFFICIENT = .425  
03722>  
03723> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03724>  
03725>  
03726> 001:0023-----  
03727> \*  
03728> \*SUB-AREA No. 6  
03729>-----  
03730> | DESIGN NASHYD | Area (ha)= 5.30 Curve Number (CN)=76.00  
03731> | 10:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
03732> U.H. Tp(hrs)= .804  
03733>  
03734> Unit Hyd Qpeak (cms)= .252  
03735>  
03736> PEAK FLOW (cms)= .223 (i)  
03737> TIME TO PEAK (hrs)= 1.958  
03738> RUNOFF VOLUME (mm)= 30.490  
03739> TOTAL RAINFALL (mm)= 71.665  
03740> RUNOFF COEFFICIENT = .425  
03741>  
03742> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03743>  
03744>  
03745> 001:0024-----  
03746> \*  
03747> | ADD HYD (Interi) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
03748> (ha) (cms) (hrs) (mm) (cms)  
03749> ID1 08:HIP-PO 67.56 1.246 2.96 58.18 .000  
03750> +ID2 09:A2 6.80 .497 1.42 30.49 .000  
03751> +ID3 10:A3 5.30 .223 1.96 30.49 .000  
03752>-----  
03753> SUM 01:Interi 79.66 1.531 2.39 53.97 .000  
03754>  
03755> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03756>  
03757>  
03758>  
03759>  
03760> 001:0025-----  
03761> \* FINISH  
03762>-----  
03763> \*\*\*\*\*  
03764> WARNINGS / ERRORS / NOTES  
03765>  
03766> Simulation ended on 2009-05-15 at 08:57:05  
03767>  
03768>  
03769>



**APPENDIX 'H'**

**SWMHYMO INPUT AND OUTPUT FILES  
(Post-Development Controlled Phase 2 Conditions)**

```

00001> 2 Metric units
00002> *****
00003> # Project Name : Hawthorne Industrial Park Project Number: [20983]
00004> # Date : January, 2009
00005> # Revised : WA
00006> # Developed by : Mark Buchanan, E.I.T.
00007> # Reviewed by : Guy Forget, P.Eng.
00008> # Company : J.L. Richards & Associates Limited
00009> # License # : 4418403
00010> *****
00011> *
00012> *
00013> #*****
00014> # FILENAME: V:\20983.DU\ENG\SWMHYMO\20983PST.DAT *
00015> # FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00016> # OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00017> #*****
00018> *
00019> *****
00020> # SNMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE
00021> # PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00022> #*****
00023> *
00024> *****
00025> # HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00026> # FOR DESIGN STORMS OF 1.2, 5, 10, 25, 50 AND 100 YR *
00027> #*****
00028> *
00029> *****
00030> # POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00031> *****
00032> *
00033> *****
00034> # CALCULATION OF 4 HR 25 MM STORM EVENT *
00035> *****
00037> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00038> # [ ] <- storm filename, one per line for NSTORM time
00039> READ STORM STORM_FILENAME=[4HR25-15.STM]
00040> *
00041> #-----
00042> # DEFAULT VALUES ICSDef=[1], read and print values
00043> # DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
00044> *
00045> *****
00046> # ORGAWORLD FILE *
00047> *****
00048> *
00049> # SUB-AREA No.1
00050> *****
00051> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00052> XIMP=[0.64], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00053> SCS curve number CN=[81],
00054> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00055> LGP=[20] (m), MNP=[0.25], SCP=[0.0] (mi)
00056> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00057> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00058> RAINFALL=[ , , , ] (mm/hr), END=-1
00059> *
00060> #-----
00061> # SUB-AREA No.2
00062> *****
00063> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00064> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00065> SCS curve number CN=[81],
00066> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00067> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (mi),
00068> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
00069> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00070> RAINFALL=[ , , , ] (mm/hr), END=-1
00071> *
00072> #-----
00073> # SUB-AREA No.3
00074> *****
00075> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00076> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00077> SCS curve number CN=[81],
00078> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00079> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (mi),
00080> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00081> LGI=[223.53] (m), MNI=[0.03], SCI=[0.0]
00082> RAINFALL=[ , , , ] (mm/hr), END=-1
00083> *
00084> #-----
00085> # ADD HYD IDsum=[4], NHYD="040", IDs to add=[1+2]
00086> #-----
00087> # ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00088> *
00089> #-----
00090> # SUB-AREA No.4
00091> *****
00092> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00093> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00094> SCS curve number CN=[81],
00095> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00096> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (mi)
00097> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
00098> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00099> RAINFALL=[ , , , ] (mm/hr), END=-1
00100> *
00101> #-----
00102> # SUB-AREA No.5
00103> *****
00104> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00105> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00106> SCS curve number CN=[81],
00107> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00108> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00109> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00110> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00111> RAINFALL=[ , , , ] (mm/hr), END=-1
00112> #-----
00113> # ADD HYD IDsum=[8], NHYD="080", IDs to add=[6+7]
00114> #-----
00115> # ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00116> *
00117> #-----
00118> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00119> RDT=[1.0] (min),
00120> *****
00121> # TABLE of ( OUTFLOW-STORAGE ) values
00122> # (cms) - (ha-m)
00123> [ 0.00, 0.0000 ]
00124> [ 0.008, 0.0656 ]
00125> [ 0.017, 0.1311 ]
00126> [ 0.093, 0.2831 ]
00127> [ 0.233, 0.3971 ]
00128> [ 0.337, 0.4731 ]
00129> [ 0.465, 0.5491 ]
00130> [ 0.531, 0.5871 ]
00131> [ 0.593, 0.6251 ]
00132> [ 0.654, 0.6631 ]
00133> [ 0.797, 0.7391 ]
00134> [ 0.950, 0.8271 ]
00135> [ 1.304, 0.9157 ]
00136> [ 1.880, 1.0040 ]
00137> [ 2.577, 1.0923 ]

```

```

00136> [ -1 , -1 ] (max twenty pts)
00137> *****
00138> *****
00139> # Remaining Hawthorne Industrial Park *
00140> *****
00141> *
00142> # SUB-AREA No.1
00143> *****
00144> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
00145> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00146> SCS curve number CN=[81],
00147> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00148> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00149> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00150> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00151> RAINFALL=[ , , , ] (mm/hr), END=-1
00152> *
00153> #-----
00154> # ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00155> *
00156> #-----
00157> # SUB-AREA No.2
00158> *****
00159> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
00160> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00161> SCS curve number CN=[81],
00162> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00163> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00164> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.65] (%),
00165> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00166> RAINFALL=[ , , , ] (mm/hr), END=-1
00167> *
00168> #-----
00169> # SUB-AREA No.3
00170> *****
00171> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
00172> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00173> SCS curve number CN=[81],
00174> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00175> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00176> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00177> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00178> RAINFALL=[ , , , ] (mm/hr), END=-1
00179> #-----
00180> # ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00181> #-----
00182> # ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00183> *
00184> #-----
00185> # SUB-AREA No.4
00186> *****
00187> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
00188> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00189> SCS curve number CN=[81],
00190> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00191> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
00192> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
00193> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00194> RAINFALL=[ , , , ] (mm/hr), END=-1
00195> *
00196> #-----
00197> # SUB-AREA No.5
00198> *****
00199> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] (min), AREA=[4.0] (ha),
00200> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00201> RAINFALL=[ , , , ] (mm/hr), END=-1
00202> *
00203> #-----
00204> # ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00205> *
00206> #-----
00207> # ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
00208> RDT=[1.0] (min),
00209> *****
00210> # TABLE of ( OUTFLOW-STORAGE ) values
00211> # (cms) - (ha-m)
00212> [ 0 , 0 ]
00213> [ 0.048 , 0.0574 ]
00214> [ 0.054 , 0.2434 ]
00215> [ 0.059 , 0.5834 ]
00216> [ 0.062 , 0.8400 ]
00217> [ 0.064 , 1.1024 ]
00218> [ 0.147 , 1.3705 ]
00219> [ 0.280 , 1.6444 ]
00220> [ 0.472 , 1.9242 ]
00221> [ 0.724 , 2.2097 ]
00222> [ 0.937 , 2.5010 ]
00223> [ 1.262 , 2.7981 ]
00224> [ 1.404 , 3.1009 ]
00225> [ 1.532 , 3.4096 ]
00226> [ 1.650 , 3.7240 ]
00227> [ 2.409 , 4.0442 ]
00228> [ 3.689 , 4.3702 ]
00229> [ -1 , -1 ] (max twenty pts)
00230> *
00231> #-----
00232> # SUB-AREA No.6
00233> *****
00234> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] (min), AREA=[2.7] (ha),
00235> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
00236> RAINFALL=[ , , , ] (mm/hr), END=-1
00237> *
00238> #-----
00239> # ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
00240> *
00241> #-----
00242> #-----
00243> *****
00244> # CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00245> *****
00246> #-----
00247> # START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00248> # [ ] <- storm filename, one per line for NSTORM time
00249> *
00250> # CHICAGO STORM IUNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00251> # ICASEcs=[1],
00252> # A=[732.951], B=[6.199], and C=[0.810],
00253> *
00254> # DEFAULT VALUES ICASEdef=[1], read and print values
00255> # DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
00256> *
00257> *****
00258> *****
00259> # ORGAWORLD FILE *
00260> *****
00261> *
00262> #-----
00263> # SUB-AREA No.1
00264> *****
00265> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00266> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00267> SCS curve number CN=[81],
00268> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00269> LGP=[20] (m), MNP=[0.25], SCP=[0.0] (mi)
00270> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00271> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]

```

00271> RAINFALL=[ , , , ](mm/hr) , END=-1
00272> \*%-----
00273> \*
00274> \* SUB-AREA No.2
00275> \*
00276> CALIB STANDHYD ID=[ 2 ], NYHD=["020"], DT=[2.5](min), AREA=[1.54](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%) ,
LGP=[20.0](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.50](%) ,
LGI=[244.34](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00284> \*%-----
00285> \*
00286> \* SUB-AREA No.3
00287> \*
00288> CALIB STANDHYD ID=[ 3 ], NYHD=["030"], DT=[2.5](min), AREA=[1.4](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%) ,
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.51](%) ,
LGI=[225.63](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00296> \*%-----
00297> ADD HYD IDsum=[4], NYHD=["040"], IDs to add=[1+2]
00298> \*%-----
00299> ADD HYD IDsum=[5], NYHD=["050"], IDs to add=[3+4]
00300> \*%-----
00301> \*
00302> \* SUB-AREA No.4
00303> \*
00304> CALIB STANDHYD ID=[6], NYHD=["060"], DT=[2.5](min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[0.7](%) ,
LGP=[40](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.93](%) ,
LGI=[154.82](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00312> \*%-----
00313> \*
00314> \* SUB-AREA No.5
00315> \*
00316> CALIB STANDHYD ID=[ 7 ], NYHD=["070"], DT=[2.5](min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.61](%) ,
LGI=[207.25](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00324> \*%-----
00325> ADD HYD IDsum=[8], NYHD=["080"], IDs to add=[6+7]
00326> \*%-----
00327> ADD HYD IDsum=[9], NYHD=["090"], IDs to add=[5+8]
00328> \*%-----
00329> \*
00330> ROUTE RESERVOIR IDout=[10], NYHD=["POND"], IDin=[9],
RDT=[1.0](min)
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
[ 0.000, 0.0000]
[ 0.008, 0.0556]
[ 0.017, 0.1311]
[ 0.093, 0.2831]
[ 0.233, 0.3971]
[ 0.337, 0.4731]
[ 0.455, 0.5491]
[ 0.531, 0.5871]
[ 0.593, 0.6251]
[ 0.654, 0.6631]
[ 0.797, 0.7391]
[ 0.950, 0.8274]
[ 1.304, 0.9157]
[ 1.880, 1.0040]
[ 2.577, 1.0923]
[ -1, -1 ] (max twenty pts)
00351> \*%-----
00352> \* Remaining Hawthorne Industrial Park \*
00353> \*%-----
00354> \*
00355> \* SUB-AREA No.1
00356> \*
00357> CALIB STANDHYD ID=[ 1 ], NYHD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.61](%) ,
LGI=[580](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00366> \*%-----
00367> ADD HYD IDsum=[ 2 ], NYHD=["HIP02"], IDs to add=[10+1]
00368> \*%-----
00369> \*
00370> \* SUB-AREA No.2
00371> CALIB STANDHYD ID=[ 3 ], NYHD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.61](%) ,
LGI=[450](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00379> \*%-----
00380> \*
00381> \* SUB-AREA No.3
00382> \*
00383> CALIB STANDHYD ID=[ 4 ], NYHD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.51](%) ,
LGI=[600](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00391> \*%-----
00392> ADD HYD IDsum=[ 5 ], NYHD=["HIP05"], IDs to add=[3+4]
00393> \*%-----
00394> ADD HYD IDsum=[ 6 ], NYHD=["HIP06"], IDs to add=[5+2]
00395> \*%-----
00396> \*
00397> \* SUB-AREA No.4
00398> \*
00399> CALIB STANDHYD ID=[ 7 ], NYHD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.7](%) ,
LGI=[210](m), MNI=[0.03], SCI=[0.0]
00405> \*

00406> RAINFALL=[ , , , ](mm/hr) , END=-1
00407> \*%-----
00408> \*
00409> \*
00410> \* SUB-AREA No.5
00411> \*
00412> DESIGN NASHYD ID=[ 8 ], NYHD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
DWF=[0](cms), CN/C=[ 85 ], TP=[0.17]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
00415> \*%-----
00417> ADD HYD IDsum=[ 9 ], NYHD=["HIP08"], IDs to add=[6+7+8]
00418> \*%-----
00419> \*
00420> ROUTE RESERVOIR IDout=[ 10 ], NYHD=["HIP-POND"], IDin=[ 9 ],
RDT=[1.0](min)
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
[ 0.0, 0.0 ]
[ 0.048, 0.0574 ]
[ 0.054, 0.2434 ]
[ 0.059, 0.5834 ]
[ 0.062, 0.8400 ]
[ 0.064, 1.1024 ]
[ 0.147, 1.3705 ]
[ 0.280, 1.6444 ]
[ 0.472, 1.9242 ]
[ 0.724, 2.2097 ]
[ 0.937, 2.5010 ]
[ 1.262, 2.7981 ]
[ 1.404, 3.1009 ]
[ 1.532, 3.4096 ]
[ 1.650, 3.7240 ]
[ 2.409, 4.0442 ]
[ 3.689, 4.3702 ]
[ -1, -1 ] (max twenty pts)
00443> \*%-----
00444> \*
00445> \* SUB-AREA No.6
00446> \*
00447> DESIGN NASHYD ID = [1], NYHD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
DWF=[0](cms), CN/C=[76], TP=[0.80]hrs,
RAINFALL=[ , , , ](mm/hr) , END=-1
00450> \*%-----
00451> \*
00452> ADD HYD IDsum=[2], NYHD=["Ultimate"], IDs to add=[10+1]
00453> \*%-----
00454> \*
00455> \*%-----
00456> \*%-----
00457> \*%-----
00458> \*%-----
00459> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00460> \*%-----
00461> \* [ ] <-storm filename, one per line for NSTORM time
00462> CHICAGO STORM IUNITS=[2], TD=[3.0](hrs), TPRAT=[0.333], CSDT=[10.0](min)
ICASECs=[1],
A=[998.071], B=[6.053], and C=[0.814]
00464> \*%-----
00465> \*
00466> DEFAULT VALUES ICSEDef=[1], read and print variables
DEFVAL\_FILENAME=[V:\22973.DU\ENG\SWHYG\ORGA.VAL"]
00468> \*%-----
00469> \*
00470> \*%-----
00471> \* ORGANWORD FILE \*
00472> \*%-----
00473> \*
00474> \* SUB-AREA No.1
00475> \*
00476> CALIB STANDHYD ID=[ 1 ], NYHD=["010"], DT=[2.5](min), AREA=[2.07](ha),
XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%) ,
LGP=[20](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.52](%) ,
LGI=[204.72](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00484> \*%-----
00485> \*
00486> \* SUB-AREA No.2
00487> \*
00488> CALIB STANDHYD ID=[ 2 ], NYHD=["020"], DT=[2.5](min), AREA=[1.54](ha),
XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%) ,
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.50](%) ,
LGI=[244.34](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00496> \*%-----
00497> \*
00498> \* SUB-AREA No.3
00499> \*
00500> CALIB STANDHYD ID=[ 3 ], NYHD=["030"], DT=[2.5](min), AREA=[1.4](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.0](%) ,
LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.51](%) ,
LGI=[225.63](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00508> \*%-----
00509> ADD HYD IDsum=[4], NYHD=["040"], IDs to add=[1+2]
00510> \*%-----
00511> ADD HYD IDsum=[5], NYHD=["050"], IDs to add=[3+4]
00512> \*%-----
00513> \*
00514> \* SUB-AREA No.4
00515> \*
00516> CALIB STANDHYD ID=[6], NYHD=["060"], DT=[2.5](min), AREA=[0.89](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[0.7](%) ,
LGP=[40](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.93](%) ,
LGI=[154.82](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00524> \*%-----
00525> \*
00526> \* SUB-AREA No.5
00527> \*
00528> CALIB STANDHYD ID=[ 7 ], NYHD=["070"], DT=[2.5](min), AREA=[2.66](ha),
XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
SCS curve number CN=[81],
Pervious surfaces: IAPER=[4.67](mm), SLPP=[1.5](%) ,
LGP=[20.0](m), MNP=[0.25], SCP=[0.0](min),
Impervious surfaces: IAIMP=[1.57](mm), SLPI=[0.61](%) ,
LGI=[207.25](m), MNI=[0.03], SCI=[0.0]
RAINFALL=[ , , , ](mm/hr) , END=-1
00536> \*%-----
00537> ADD HYD IDsum=[8], NYHD=["080"], IDs to add=[6+7]
00538> \*%-----
00539> ADD HYD IDsum=[9], NYHD=["090"], IDs to add=[5+8]
00540> \*

```

00541>
00542> ROUTE RESERVOIR IDout=10], NHYD=["POND"], IDin=9],
00543> RDT=1.0(min),
00544> TABLE of ( OUTFLOW-STORAGE ) values
00545> (cms) (ha-m)
00546> [ 0.000, 0.0000]
00547> [ 0.008, 0.0656]
00548> [ 0.017, 0.1311]
00549> [ 0.093, 0.2831]
00550> [ 0.233, 0.3971]
00551> [ 0.337, 0.4731]
00552> [ 0.465, 0.5491]
00553> [ 0.531, 0.5871]
00554> [ 0.593, 0.6251]
00555> [ 0.654, 0.6631]
00556> [ 0.797, 0.7391]
00557> [ 0.950, 0.8274]
00558> [ 1.304, 0.9157]
00559> [ 1.880, 1.0040]
00560> [ 2.577, 1.0923]
00561> [ -1, -1 ] (max twenty pts)
00562>
00563> *****
00564> * Remaining Hawthorne Industrial Park *
00565> *****
00566> *
00567> * SUB-AREA No.1
00568>
00569> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
00570> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00571> SCS curve number CN=[81],
00572> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00573> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00574> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.6](%),
00575> LGI=[580](m), MNI=[0.03], SCI=[0.0](min)
00576> RAINFALL=[ , , , ](mm/hr), END=-1
00577> *
00578> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00579> *
00580>
00581> * SUB-AREA No.2
00582>
00583> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
00584> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00585> SCS curve number CN=[81],
00586> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00587> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00588> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.65](%),
00589> LGI=[450](m), MNI=[0.03], SCI=[0.0](min)
00590> RAINFALL=[ , , , ](mm/hr), END=-1
00591> *
00592>
00593> * SUB-AREA No.3
00594>
00595> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
00596> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00597> SCS curve number CN=[81],
00598> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00599> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00600> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.5](%),
00601> LGI=[600](m), MNI=[0.03], SCI=[0.0](min)
00602> RAINFALL=[ , , , ](mm/hr), END=-1
00603> *
00604> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00605> *
00606> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00607> *
00608>
00609> * SUB-AREA No.4
00610>
00611> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
00612> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00613> SCS curve number CN=[81],
00614> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00615> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00616> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.7](%),
00617> LGI=[210](m), MNI=[0.03], SCI=[0.0](min)
00618> RAINFALL=[ , , , ](mm/hr), END=-1
00619>
00620> *
00621>
00622> * SUB-AREA No.5
00623>
00624> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
00625> DWF=[0](cms), CNC=[85], TP=[0.17]hrs,
00626> RAINFALL=[ , , , ](mm/hr), END=-1
00627> *
00628>
00629> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00630> *
00631>
00632> ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
00633> RDT=[1.0](min),
00634> TABLE of ( OUTFLOW-STORAGE ) values
00635> (cms) (ha-m)
00636> [ 0.0, 0.0 ]
00637> [ 0.048, 0.0574 ]
00638> [ 0.054, 0.2434 ]
00639> [ 0.059, 0.5834 ]
00640> [ 0.062, 0.8400 ]
00641> [ 0.064, 1.1024 ]
00642> [ 0.147, 1.3705 ]
00643> [ 0.280, 1.6444 ]
00644> [ 0.472, 1.9242 ]
00645> [ 0.724, 2.2097 ]
00646> [ 0.937, 2.5010 ]
00647> [ 1.262, 2.7981 ]
00648> [ 1.404, 3.1009 ]
00649> [ 1.532, 3.4096 ]
00650> [ 1.650, 3.7240 ]
00651> [ 2.409, 4.0442 ]
00652> [ 4.689, 4.3702 ]
00653> [ -1, -1 ] (max twenty pts)
00654>
00655> *
00656>
00657> * SUB-AREA No. 6
00658>
00659> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
00660> DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
00661> RAINFALL=[ , , , ](mm/hr), END=-1
00662> *
00663>
00664> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
00665> *
00666>
00667> *****
00668> * CALCULATION OF 3HR - 1:10 YEAR STORM EVENT *
00669> *****
00670>
00671> START TZERO=[0.0], MEFOUT=[2], NSTORM=[0], NRUN=[0]
00672> *
00673> *
00674> CHICAGO STORM IUNITS=[2], TD=[3.0](hrs), TPRAT=[0.333], CSDT=[10.0](min)
00675> ICASEcs=[1],

```

```

00676> A=[1174.184], B=[6.014], and C=[0.816],
00677> *
00678> DEFAULT VALUES ICASEdef=[1], read and print values
00679> DEFVAL_FILENAME=[V:\22973.DUVENG\SWMHYM\ORGA.VAL]
00680> *
00681>
00682> *****
00683> * ORGWORLD FILE *
00684> *****
00685> *
00686> * SUB-AREA No.1
00687>
00688> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
00689> XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
00690> SCS curve number CN=[81],
00691> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.0](%),
00692> LGP=[20](m), MNP=[0.25], SCP=[0.0](m)
00693> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.52](%),
00694> LGI=[204.72](m), MNI=[0.03], SCI=[0.0]
00695> RAINFALL=[ , , , ](mm/hr), END=-1
00696> *
00697>
00698> * SUB-AREA No.2
00699>
00700> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
00701> XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
00702> SCS curve number CN=[81],
00703> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.0](%),
00704> LGP=[5](m), MNP=[0.03], SCP=[0.0](min)
00705> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.50](%),
00706> LGI=[244.34](m), MNI=[0.03], SCI=[0.0]
00707> RAINFALL=[ , , , ](mm/hr), END=-1
00708> *
00709>
00710> * SUB-AREA No.3
00711>
00712> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
00713> XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00714> SCS curve number CN=[81],
00715> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.0](%),
00716> LGP=[5](m), MNP=[0.03], SCP=[0.0](min)
00717> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.25](%),
00718> LGI=[225.63](m), MNI=[0.03], SCI=[0.0]
00719> RAINFALL=[ , , , ](mm/hr), END=-1
00720> *
00721> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00722> *
00723> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00724> *
00725>
00726> * SUB-AREA No.4
00727>
00728> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
00729> XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00730> SCS curve number CN=[81],
00731> Pervious surfaces: IAPer=[4.67](mm), SLPP=[0.7](%),
00732> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](min)
00733> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.61](%),
00734> LGI=[164.82](m), MNI=[0.03], SCI=[0.0]
00735> RAINFALL=[ , , , ](mm/hr), END=-1
00736> *
00737>
00738> * SUB-AREA No.5
00739>
00740> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
00741> XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00742> SCS curve number CN=[81],
00743> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00744> LGP=[20.0](m), MNP=[0.25], SCP=[0.0](m)
00745> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.61](%),
00746> LGI=[207.25](m), MNI=[0.03], SCI=[0.0]
00747> RAINFALL=[ , , , ](mm/hr), END=-1
00748> *
00749> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00750> *
00751> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00752> *
00753>
00754> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00755> RDT=[1.0](min),
00756> TABLE of ( OUTFLOW-STORAGE ) values
00757> (cms) (ha-m)
00758> [ 0.000, 0.0000]
00759> [ 0.008, 0.0656]
00760> [ 0.017, 0.1311]
00761> [ 0.093, 0.2831]
00762> [ 0.233, 0.3971]
00763> [ 0.337, 0.4731]
00764> [ 0.465, 0.5491]
00765> [ 0.531, 0.5871]
00766> [ 0.593, 0.6251]
00767> [ 0.654, 0.6631]
00768> [ 0.797, 0.7391]
00769> [ 0.950, 0.8274]
00770> [ 1.304, 0.9157]
00771> [ 1.880, 1.0040]
00772> [ 2.577, 1.0923]
00773> [ -1, -1 ] (max twenty pts)
00774>
00775> *****
00776> * Remaining Hawthorne Industrial Park *
00777> *****
00778> *
00779> * SUB-AREA No.1
00780>
00781> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
00782> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00783> SCS curve number CN=[81],
00784> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00785> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00786> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.65](%),
00787> LGI=[580](m), MNI=[0.03], SCI=[0.0](min)
00788> RAINFALL=[ , , , ](mm/hr), END=-1
00789> *
00790> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00791> *
00792>
00793> * SUB-AREA No.2
00794>
00795> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
00796> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00797> SCS curve number CN=[81],
00798> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),
00799> LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m)
00800> Impervious surfaces: IAImp=[1.57](mm), SLPI=[0.65](%),
00801> LGI=[450](m), MNI=[0.03], SCI=[0.0](min)
00802> RAINFALL=[ , , , ](mm/hr), END=-1
00803> *
00804>
00805> * SUB-AREA No.3
00806>
00807> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
00808> XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00809> SCS curve number CN=[81],
00810> Pervious surfaces: IAPer=[4.67](mm), SLPP=[1.5](%),

```

```

00811> Impervious surfaces: LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00812> IAimp=[1.57] (mm), SLP=[0.5] (%)
00813> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00814> RAINFALL=[ , , , ] (mm/hr), END=-1
00815> *%-----
00816> ADD HYD IDsum=[ 5 ], NHYD=["HIPO5"], IDs to add=[3+4]
00817> *%-----
00818> ADD HYD IDsum=[ 6 ], NHYD=["HIPO6"], IDs to add=[5+2]
00819> *%-----
00820> *
00821> * SUB-AREA No. 4
00822>
00823> CALIB STANDHYD ID=[ 7 ], NHYD=["HIPO7"], DT=[2.5] (min), AREA=[12.2] (ha),
00824> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00825> SCS curve number CN=[81],
00826> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
00827> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00828> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.7] (%),
00829> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00830> RAINFALL=[ , , , ] (mm/hr), END=-1
00831>
00832> *%-----
00833> *
00834> * SUB-AREA No. 5
00835>
00836> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00837> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00838> RAINFALL=[ , , , ] (mm/hr), END=-1
00839>
00840> *%-----
00841> ADD HYD IDsum=[ 9 ], NHYD=["HIPO8"], IDs to add=[6+7+8]
00842> *%-----
00843>
00844> ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
00845> RDT=[1.0] (min),
00846> TABLE of ( OUTFLOW-STORAGE ) values
00847> ( cms ) - ( ha-m )
00848> [ 0.0 , 0.0 ]
00849> [ 0.048 , 0.0574 ]
00850> [ 0.054 , 0.2454 ]
00851> [ 0.059 , 0.5834 ]
00852> [ 0.062 , 0.8400 ]
00853> [ 0.064 , 1.1024 ]
00854> [ 0.147 , 1.3705 ]
00855> [ 0.280 , 1.6444 ]
00856> [ 0.472 , 1.9242 ]
00857> [ 0.724 , 2.2097 ]
00858> [ 0.937 , 2.5010 ]
00859> [ 1.262 , 2.7981 ]
00860> [ 1.404 , 3.1009 ]
00861> [ 1.532 , 3.4096 ]
00862> [ 1.650 , 3.7240 ]
00863> [ 2.409 , 4.0442 ]
00864> [ 3.689 , 4.3702 ]
00865> [ -1 , -1 ] (max twenty pts)
00866>
00867> *%-----
00868> *
00869> * SUB-AREA No. 6
00870>
00871> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[2.7] (ha),
00872> DWF=[0] (cms), CNC=[76], TP=[0.80] hrs,
00873> RAINFALL=[ , , , ] (mm/hr), END=-1
00874>
00875> *%-----
00876> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
00877> *%-----
00878>
00879>
00880>
00881> * CALCULATION OF 3HR - 1:25 YEAR STORM EVENT *
00882> *-----
00883>
00884> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00885> * [ ] <- storm filename, one per line for NSTORM time
00886> *
00887> CHICAGO STORM UNITS=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
00888> ICASecs=[1],
00889> A=[1402.884], B=[6.018], and C=[0.819],
00890>
00891> DEFAULT VALUES ICASedef=[1], read and print values
00892> DEFVAL_FILENAME=[V:\22975.DU\ENG\SWMHYMO\ORGA.VAL]
00893> *%-----
00894>
00895> * ORGAWORLD FILE *
00896> *-----
00897> *
00898> *
00899> * SUB-AREA No. 1
00900>
00901> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00902> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00903> SCS curve number CN=[81],
00904> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.0] (%),
00905> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00906> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.5] (%),
00907> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0] (min)
00908> RAINFALL=[ , , , ] (mm/hr), END=-1
00909>
00910> *%-----
00911> * SUB-AREA No. 2
00912>
00913> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00914> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00915> SCS curve number CN=[81],
00916> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.0] (%),
00917> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00918> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.50] (%),
00919> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0] (min)
00920> RAINFALL=[ , , , ] (mm/hr), END=-1
00921> *%-----
00922> *
00923> * SUB-AREA No. 3
00924>
00925> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00926> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00927> SCS curve number CN=[81],
00928> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.0] (%),
00929> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00930> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.51] (%),
00931> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0] (min)
00932> RAINFALL=[ , , , ] (mm/hr), END=-1
00933> *%-----
00934> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
00935> *%-----
00936> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
00937> *%-----
00938> *
00939> * SUB-AREA No. 4
00940>
00941> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00942> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00943> SCS curve number CN=[81],
00944> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[0.7] (%),
00945> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)

```

```

00946> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.93] (%),
00947> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0] (min)
00948> RAINFALL=[ , , , ] (mm/hr), END=-1
00949> *%-----
00950> *
00951> * SUB-AREA No. 5
00952>
00953> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00954> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00955> SCS curve number CN=[81],
00956> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
00957> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
00958> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.61] (%),
00959> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0] (min)
00960> RAINFALL=[ , , , ] (mm/hr), END=-1
00961> *%-----
00962> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
00963> *%-----
00964> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
00965> *%-----
00966>
00967> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00968> RDT=[1.0] (min),
00969> TABLE of ( OUTFLOW-STORAGE ) values
00970> ( cms ) - ( ha-m )
00971> [ 0.000 , 0.0000 ]
00972> [ 0.008 , 0.0566 ]
00973> [ 0.017 , 0.1311 ]
00974> [ 0.093 , 0.2831 ]
00975> [ 0.233 , 0.3971 ]
00976> [ 0.337 , 0.4731 ]
00977> [ 0.465 , 0.5491 ]
00978> [ 0.531 , 0.5871 ]
00979> [ 0.593 , 0.6251 ]
00980> [ 0.654 , 0.6631 ]
00981> [ 0.797 , 0.7391 ]
00982> [ 0.950 , 0.8274 ]
00983> [ 1.304 , 0.9157 ]
00984> [ 1.880 , 1.0040 ]
00985> [ 2.577 , 1.0923 ]
00986> [ -1 , -1 ] (max twenty pts)
00987>
00988> *-----
00989> * Remaining Hawthorne Industrial Park *
00990> *-----
00991> *
00992> * SUB-AREA No. 1
00993>
00994> CALIB STANDHYD ID=[ 1 ], NHYD=["HIPO1"], DT=[2.5] (min), AREA=[19.9] (ha),
00995> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00996> SCS curve number CN=[81],
00997> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
00998> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00999> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.6] (%),
01000> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
01001> RAINFALL=[ , , , ] (mm/hr), END=-1
01002> *%-----
01003> ADD HYD IDsum=[ 2 ], NHYD=["HIPO2"], IDs to add=[10+1]
01004> *%-----
01005> *
01006> * SUB-AREA No. 2
01007>
01008> CALIB STANDHYD ID=[ 3 ], NHYD=["HIPO3"], DT=[2.5] (min), AREA=[17] (ha),
01009> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01010> SCS curve number CN=[81],
01011> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
01012> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01013> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.65] (%),
01014> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01015> RAINFALL=[ , , , ] (mm/hr), END=-1
01016> *%-----
01017> *
01018> * SUB-AREA No. 3
01019>
01020> CALIB STANDHYD ID=[ 4 ], NHYD=["HIPO4"], DT=[2.5] (min), AREA=[15.6] (ha),
01021> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01022> SCS curve number CN=[81],
01023> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
01024> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01025> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.5] (%),
01026> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01027> RAINFALL=[ , , , ] (mm/hr), END=-1
01028> *%-----
01029> ADD HYD IDsum=[ 5 ], NHYD=["HIPO5"], IDs to add=[3+4]
01030> *%-----
01031> ADD HYD IDsum=[ 6 ], NHYD=["HIPO6"], IDs to add=[5+2]
01032> *%-----
01033> *
01034> * SUB-AREA No. 4
01035>
01036> CALIB STANDHYD ID=[ 7 ], NHYD=["HIPO7"], DT=[2.5] (min), AREA=[12.2] (ha),
01037> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01038> SCS curve number CN=[81],
01039> Pervious surfaces: IApex=[4.67] (mm), SLEPP=[1.5] (%),
01040> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
01041> Impervious surfaces: IAimp=[1.57] (mm), SLP=[0.7] (%),
01042> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
01043> RAINFALL=[ , , , ] (mm/hr), END=-1
01044>
01045> *%-----
01046> *
01047> * SUB-AREA No. 5
01048>
01049> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
01050> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
01051> RAINFALL=[ , , , ] (mm/hr), END=-1
01052> *%-----
01053>
01054> ADD HYD IDsum=[ 9 ], NHYD=["HIPO8"], IDs to add=[6+7+8]
01055> *%-----
01056>
01057> ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
01058> RDT=[1.0] (min),
01059> TABLE of ( OUTFLOW-STORAGE ) values
01060> ( cms ) - ( ha-m )
01061> [ 0.0 , 0.0 ]
01062> [ 0.048 , 0.0574 ]
01063> [ 0.054 , 0.2434 ]
01064> [ 0.059 , 0.5834 ]
01065> [ 0.062 , 0.8400 ]
01066> [ 0.064 , 1.1024 ]
01067> [ 0.147 , 1.3705 ]
01068> [ 0.280 , 1.6444 ]
01069> [ 0.472 , 1.9242 ]
01070> [ 0.724 , 2.2097 ]
01071> [ 0.937 , 2.5010 ]
01072> [ 1.262 , 2.7981 ]
01073> [ 1.404 , 3.1009 ]
01074> [ 1.532 , 3.4096 ]
01075> [ 1.650 , 3.7240 ]
01076> [ 2.409 , 4.0442 ]
01077> [ 3.689 , 4.3702 ]
01078> [ -1 , -1 ] (max twenty pts)
01079>
01080> *%-----

```

```

01081 *
01082 *SUB-AREA No. 6
01083
01084 DESIGN WASHYD ID = [ 1 ], NHYD=["A3"], DT=[2.5]min, AREA=[2.7] (ha),
01085 DWF=[0] (cms), CNC=[76], TP=[0.80]hrs,
01086 RAINFALL=[ , , , ](mm/hr), END=-1
01087 *
01088
01089 ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
01090 *
01091
01092 *****
01093 * CALCULATION OF 3HR - 1:50 YEAR STORM EVENT *
01094 *****
01095
01096 START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
01097 *
01098 * [ ] <- storm filename, one per line for NSTORM time
01099
01100 CHICAGO STORM IUNIT=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
01101 ICASE=[1],
01102 A=[1569.560], B=[6.014], and C=[0.820]
01103
01104 DEFAULT VALUES ICASEdef=[1], read and print values
01105 DEFPAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
01106 *
01107 *****
01108 * ORGAWORLD FILE *
01109 *****
01110 *
01111 * SUB-AREA No. 1
01112
01113 CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
01114 XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
01115 SCS curve number CN=[81],
01116 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01117 LGP=[20] (m), MNP=[0.25], SCP=[0.0] (mi)
01118 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
01119 LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
01120 RAINFALL=[ , , , ](mm/hr), END=-1
01121 *
01122 *
01123 * SUB-AREA No. 2
01124
01125 CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
01126 XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
01127 SCS curve number CN=[81],
01128 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01129 LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01130 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
01131 LGI=[204.34] (m), MNI=[0.03], SCI=[0.0]
01132 RAINFALL=[ , , , ](mm/hr), END=-1
01133 *
01134 *
01135 * SUB-AREA No. 3
01136
01137 CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
01138 XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01139 SCS curve number CN=[81],
01140 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01141 LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01142 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
01143 LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0]
01144 RAINFALL=[ , , , ](mm/hr), END=-1
01145 *
01146 ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
01147 *
01148 ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
01149 *
01150 *
01151 * SUB-AREA No. 4
01152
01153 CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
01154 XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01155 SCS curve number CN=[81],
01156 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
01157 LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
01158 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
01159 LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
01160 RAINFALL=[ , , , ](mm/hr), END=-1
01161 *
01162 *
01163 * SUB-AREA No. 5
01164
01165 CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
01166 XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01167 SCS curve number CN=[81],
01168 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01169 LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi)
01170 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
01171 LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
01172 RAINFALL=[ , , , ](mm/hr), END=-1
01173 *
01174 ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
01175 *
01176 ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
01177 *
01178
01179 ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
01180 RDT=[1.0] (min),
01181 TABLE of ( OUTFLOW-STORAGE ) values
01182 ( cms ) - ( ha-m )
01183 [ 0.000, 0.0000 ]
01184 [ 0.008, 0.0656 ]
01185 [ 0.017, 0.1311 ]
01186 [ 0.033, 0.2623 ]
01187 [ 0.233, 0.3971 ]
01188 [ 0.337, 0.4731 ]
01189 [ 0.465, 0.5491 ]
01190 [ 0.531, 0.5871 ]
01191 [ 0.593, 0.6251 ]
01192 [ 0.654, 0.6631 ]
01193 [ 0.797, 0.7391 ]
01194 [ 0.950, 0.8274 ]
01195 [ 1.304, 0.9157 ]
01196 [ 1.880, 1.0040 ]
01197 [ 2.577, 1.0923 ]
01198 [ -1, -1 ] (max twenty pts)
01199
01200 *****
01201 * Remaining Hawthorne Industrial Park *
01202 *****
01203 *
01204 * SUB-AREA No. 1
01205
01206 CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
01207 XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01208 SCS curve number CN=[81],
01209 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01210 LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
01211 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
01212 LGI=[590] (m), MNI=[0.03], SCI=[0.0] (min)
01213 RAINFALL=[ , , , ](mm/hr), END=-1
01214 *
01215 ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]

```

```

01216 *
01217 *
01218 * SUB-AREA No. 2
01219
01220 CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
01221 XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01222 SCS curve number CN=[81],
01223 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01224 LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
01225 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.65] (%),
01226 LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
01227 RAINFALL=[ , , , ](mm/hr), END=-1
01228 *
01229 *
01230 * SUB-AREA No. 3
01231
01232 CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
01233 XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01234 SCS curve number CN=[81],
01235 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01236 LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
01237 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
01238 LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
01239 RAINFALL=[ , , , ](mm/hr), END=-1
01240 *
01241 ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01242 *
01243 ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
01244 *
01245 *
01246 * SUB-AREA No. 4
01247
01248 CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
01249 XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01250 SCS curve number CN=[81],
01251 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
01252 LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (mi)
01253 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.7] (%),
01254 LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
01255 RAINFALL=[ , , , ](mm/hr), END=-1
01256 *
01257 *
01258 *
01259 * SUB-AREA No. 5
01260
01261 DESIGN WASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0] (ha),
01262 DWF=[ 0 ] (cms), CNC=[ 85 ], TP=[0.17]hrs,
01263 RAINFALL=[ , , , ](mm/hr), END=-1
01264 *
01265
01266 ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
01267 *
01268
01269 ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
01270 RDT=[1.0] (min),
01271 TABLE of ( OUTFLOW-STORAGE ) values
01272 ( cms ) - ( ha-m )
01273 [ 0.0, 0.0 ]
01274 [ 0.048, 0.0574 ]
01275 [ 0.054, 0.2434 ]
01276 [ 0.059, 0.5834 ]
01277 [ 0.062, 0.8400 ]
01278 [ 0.064, 1.1024 ]
01279 [ 0.147, 1.3705 ]
01280 [ 0.280, 1.6444 ]
01281 [ 0.472, 1.9242 ]
01282 [ 0.724, 2.2097 ]
01283 [ 0.937, 2.5010 ]
01284 [ 1.262, 2.7981 ]
01285 [ 1.404, 3.1009 ]
01286 [ 1.532, 3.4096 ]
01287 [ 1.650, 3.7240 ]
01288 [ 2.409, 4.0442 ]
01289 [ 3.689, 4.3702 ]
01290 [ -1, -1 ] (max twenty pts)
01291 *
01292 *
01293 *
01294 * SUB-AREA No. 6
01295
01296 DESIGN WASHYD ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7] (ha),
01297 DWF=[0] (cms), CNC=[76], TP=[0.80]hrs,
01298 RAINFALL=[ , , , ](mm/hr), END=-1
01299 *
01300
01301 ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
01302 *
01303
01304 *****
01305 * CALCULATION OF 3HR - 1:100 YEAR STORM EVENT *
01306 *****
01307
01308 START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
01309 *
01310 * [ ] <- storm filename, one per line for NSTORM time
01311
01312 CHICAGO STORM IUNIT=[2], TD=[3.0] (hrs), TPRAT=[0.333], CSDT=[10.0] (min)
01313 ICASE=[1],
01314 A=[1735.688], B=[6.014], and C=[0.820]
01315
01316 DEFAULT VALUES ICASEdef=[1], read and print values
01317 DEFPAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\ORGA.VAL]
01318 *
01319 *****
01320 * ORGAWORLD FILE *
01321 *****
01322 *
01323 * SUB-AREA No. 1
01324
01325 CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
01326 XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
01327 SCS curve number CN=[81],
01328 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01329 LGP=[20] (m), MNP=[0.25], SCP=[0.0] (mi)
01330 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
01331 LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
01332 RAINFALL=[ , , , ](mm/hr), END=-1
01333 *
01334 *
01335 * SUB-AREA No. 2
01336
01337 CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
01338 XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
01339 SCS curve number CN=[81],
01340 Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
01341 LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01342 Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
01343 LGI=[204.34] (m), MNI=[0.03], SCI=[0.0]
01344 RAINFALL=[ , , , ](mm/hr), END=-1
01345 *
01346 *
01347 * SUB-AREA No. 3
01348
01349 CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
01350 XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],

```

```

01351> SCS curve number CN=[81],
01352> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.0] (%),
01353> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
01354> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.51] (%),
01355> LGI=[225.63] (m), MNI=[0.03], SCI=[0.0]
01356> RAINFALL=[ , , , ] (mm/hr), END=-1
01357> *%-----|
01358> ADD HYD IDsum=[4], NHYD=["040"], IDs to add=[1+2]
01359> *%-----|
01360> ADD HYD IDsum=[5], NHYD=["050"], IDs to add=[3+4]
01361> *%-----|
01362> *
01363> * SUB-AREA No.4
01364>
01365> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
01366> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01367> SCS curve number CN=[81],
01368> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[0.7] (%),
01369> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
01370> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.93] (%),
01371> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
01372> RAINFALL=[ , , , ] (mm/hr), END=-1
01373> *%-----|
01374> *
01375> * SUB-AREA No.5
01376>
01377> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
01378> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
01379> SCS curve number CN=[81],
01380> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
01381> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (mi
01382> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.61] (%),
01383> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
01384> RAINFALL=[ , , , ] (mm/hr), END=-1
01385> *%-----|
01386> ADD HYD IDsum=[8], NHYD=["080"], IDs to add=[6+7]
01387> *%-----|
01388> ADD HYD IDsum=[9], NHYD=["090"], IDs to add=[5+8]
01389> *%-----|
01390>
01391> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
01392> RDT=[1.0] (min),
01393> TABLE of ( OUTFLOW-STORAGE ) values
01394> (cms) - (ha-m)
01395> [ 0.000, 0.0000]
01396> [ 0.008, 0.0663]
01397> [ 0.017, 0.1311]
01398> [ 0.093, 0.2831]
01399> [ 0.233, 0.3971]
01400> [ 0.337, 0.4731]
01401> [ 0.465, 0.5491]
01402> [ 0.531, 0.5871]
01403> [ 0.593, 0.6251]
01404> [ 0.654, 0.6631]
01405> [ 0.797, 0.7391]
01406> [ 0.850, 0.8274]
01407> [ 1.304, 0.9157]
01408> [ 1.880, 1.0040]
01409> [ 2.577, 1.0923]
01410> [ -1, -1 ] (max twenty pts)
01411>
01412> *****
01413> * Remaining Hawthorne Industrial Park *
01414> *****
01415> *
01416> * SUB-AREA No.1
01417>
01418> CALIB STANDHYD ID=[ 1 ], NHYD=["HIP01"], DT=[2.5] (min), AREA=[19.9] (ha),
01419> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01420> SCS curve number CN=[81],
01421> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
01422> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m
01423> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.6] (%),
01424> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min
01425> RAINFALL=[ , , , ] (mm/hr), END=-1
01426> *%-----|
01427> ADD HYD IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01428> *%-----|
01429> *
01430> * SUB-AREA No.2
01431>
01432> CALIB STANDHYD ID=[ 3 ], NHYD=["HIP03"], DT=[2.5] (min), AREA=[17] (ha),
01433> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01434> SCS curve number CN=[81],
01435> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
01436> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m
01437> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.65] (%),
01438> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min
01439> RAINFALL=[ , , , ] (mm/hr), END=-1
01440> *%-----|
01441> *
01442> * SUB-AREA No.3
01443>
01444> CALIB STANDHYD ID=[ 4 ], NHYD=["HIP04"], DT=[2.5] (min), AREA=[15.6] (ha),
01445> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01446> SCS curve number CN=[81],
01447> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
01448> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m
01449> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.5] (%),
01450> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min
01451> RAINFALL=[ , , , ] (mm/hr), END=-1
01452> *%-----|
01453> ADD HYD IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01454> *%-----|
01455> ADD HYD IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
01456> *%-----|
01457> *
01458> * SUB-AREA No.4
01459>
01460> CALIB STANDHYD ID=[ 7 ], NHYD=["HIP07"], DT=[2.5] (min), AREA=[12.2] (ha),
01461> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
01462> SCS curve number CN=[81],
01463> Pervious surfaces: IAPER=[4.67] (mm), SLEP=[1.5] (%),
01464> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m
01465> Impervious surfaces: IAimp=[1.57] (mm), SLPI=[0.7] (%),
01466> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min
01467> RAINFALL=[ , , , ] (mm/hr), END=-1
01468>
01469> *%-----|
01470> *
01471> * SUB-AREA No.5
01472>
01473> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
01474> DWF=[ 0 ] (cms), CN/C=[ 85 ], TP=[0-17] hrs,
01475> RAINFALL=[ , , , ] (mm/hr), END=-1
01476> *%-----|
01477> *
01478> ADD HYD IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
01479> *%-----|
01480>
01481> ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIP-POND"], IDin=[ 9 ],
01482> RDT=[1.0] (min),
01483> TABLE of ( OUTFLOW-STORAGE ) values
01484> (cms) - (ha-m)
01485> [ 0.0, 0.0 ]

```

```

01486> [ 0.048, 0.0574 ]
01487> [ 0.054, 0.2434 ]
01488> [ 0.059, 0.5834 ]
01489> [ 0.062, 0.8400 ]
01490> [ 0.064, 1.1024 ]
01491> [ 0.147, 1.3705 ]
01492> [ 0.280, 1.6444 ]
01493> [ 0.472, 1.9242 ]
01494> [ 0.724, 2.2097 ]
01495> [ 0.937, 2.5010 ]
01496> [ 1.262, 2.7981 ]
01497> [ 1.404, 3.1009 ]
01498> [ 1.532, 3.4096 ]
01499> [ 1.650, 3.7240 ]
01500> [ 2.409, 4.0442 ]
01501> [ 3.689, 4.3702 ]
01502> [ -1, -1 ] (max twenty pts)
01503>
01504> *%-----|
01505> *
01506> * SUB-AREA No. 6
01507>
01508> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[2.7] (ha),
01509> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
01510> RAINFALL=[ , , , ] (mm/hr), END=-1
01511> *%-----|
01512> *
01513> ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
01514> *%-----|
01515> *
01516>
01517>
01518>
01519> FINISH

```

```

00001>-----
00002>
00003> SSSSS W W M M H H Y Y M M O O 999 999 =====
00004> S W W W M M M H H Y Y M M O O 9 9 9 9
00005> SSSSS W W M M H H H H Y Y M M O O # 9 9 9 Ver. 4.02
00006> S W W M M H H Y Y M M O O 9999 9999 July 1999
00007> SSSSS W W M M H H Y Y M M O O 9 9
00008> StormWater Management Hydrologic Model 999 999 =====
00009>
00010>
00011> ***** SWMHYMO-99 Ver/4.02 *****
00012> ***** A single event and continuous hydrologic simulation model *****
00013> ***** based on the principles of HMMO and its successors *****
00014> ***** OTTHYMO-83 and OTTHYMO-89. *****
00015> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00016> ***** Ottawa, Ontario: (613) 727-5199 *****
00017> ***** Gatineau, Quebec: (819) 243-6858 *****
00018> ***** E-Mail: swmhymo@jfsa.com *****
00019>
00020>
00021>
00022>
00023>++++++ Licensed user: J. L. Richards & Associates Limited ++++++
00024>++++++ Ottawa SERIAL#:4418403 ++++++
00025>++++++
00026>++++++ PROGRAM ARRAY DIMENSIONS ++++++
00027>++++++
00028>++++++ Maximum value for ID numbers : 10 *****
00029>++++++ Max. number of rainfall points: 15000 *****
00030>++++++ Max. number of flow points : 15000 *****
00031>++++++
00032>*****
00033>*****
00034>*****
00035>*****
00036>*****
00037>*****
00038>*****
00039>*****
00040>*****
00041>*****
00042>*****
00043>*****
00044>*****
00045>*****
00046>*****
00047>*****
00048>*****
00049>*****
00050>
00051>
00052>
00053>
00054>
00055>
00056>
00057>
00058>
00059>
00060>
00061>
00062>
00063>
00064>
00065>
00066>
00067>
00068>
00069>
00070>
00071>
00072>
00073>
00074>
00075>
00076>
00077>
00078>
00079>
00080>
00081>
00082>
00083>
00084>
00085>
00086>
00087>
00088>
00089>
00090>
00091>
00092>
00093>
00094>
00095>
00096>
00097>
00098>
00099>
00100>
00101>
00102>
00103>
00104>
00105>
00106>
00107>
00108>
00109>
00110>
00111>
00112>
00113>
00114>
00115>
00116>
00117>
00118>
00119>
00120>
00121>
00122>
00123>
00124>
00125>
00126>
00127>
00128>
00129>
00130>
00131>
00132>
00133>
00134>
00135>

```

```

00136> over (min) 10.00 30.00
00137> Storage Coeff (min)= 10.00 (ii) 29.27 (ii)
00138> Unit Hyd. Tpeak (min)= 10.00 30.00
00139> Unit Hyd. peak (cms)= .11 .04
00140>
00141> PEAK FLOW (cms)= .16 .00 .158 (iii)
00142> TIME TO PEAK (hrs)= 1.29 1.75 1.292
00143> RUNOFF VOLUME (mm)= 23.43 5.17 20.508
00144> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00145> RUNOFF COEFFICIENT = .94 .21 .820
00146>
00147> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00148> CN* = 81.0 Ia = Dep. Storage (Above)
00149> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00150> THAN THE STORAGE COEFFICIENT.
00151> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00152>-----
00153>
00154> 001:0005
00155> *
00156> * SUB-AREA No.2
00157>
00158> | CALIB STANDHYD | Area (ha)= 1.54
00159> | 02:02 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00160>
00161>
00162> IMPERVIOUS PERVIOUS (i)
00163> Surface Area (ha)= 1.42 .12
00164> Dep. Storage (mm)= 1.57 4.67
00165> Average Slope (%)= .50 1.00
00166> Length (m)= 244.34 5.00
00167> Mannings n = .030 .030
00168>
00168> Max. eff. Inten. (mm/hr)= 45.63 7.24
00169> over (min) 12.50 15.00
00170> Storage Coeff. (min)= 12.15 (ii) 14.15 (ii)
00171> Unit Hyd. Tpeak (min)= 12.50 15.00
00172> Unit Hyd. peak (cms)= .09 .08
00173>
00174> PEAK FLOW (cms)= .12 .00 .121 (iii)
00175> TIME TO PEAK (hrs)= 1.33 1.46 1.333
00176> RUNOFF VOLUME (mm)= 23.43 5.17 21.969
00177> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00178> RUNOFF COEFFICIENT = .94 .21 .879
00179>
00180> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00181> CN* = 81.0 Ia = Dep. Storage (Above)
00182> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00183> THAN THE STORAGE COEFFICIENT.
00184> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00185>-----
00186>
00187>
00188> 001:0006
00189> *
00190> * SUB-AREA No.3
00191>
00192> | CALIB STANDHYD | Area (ha)= 1.40
00193> | 03:03 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00194>
00195> IMPERVIOUS PERVIOUS (i)
00196> Surface Area (ha)= 1.36 .04
00197> Dep. Storage (mm)= 1.57 4.67
00198> Average Slope (%)= .51 1.00
00199> Length (m)= 225.63 5.00
00200> Mannings n = .030 .030
00201>
00201> Max. eff. Inten. (mm/hr)= 45.63 7.97
00202> over (min) 12.50 15.50
00203> Storage Coeff. (min)= 11.52 (ii) 13.44 (ii)
00204> Unit Hyd. Tpeak (min)= 12.50 12.50
00205> Unit Hyd. peak (cms)= .10 .09
00206>
00206> PEAK FLOW (cms)= .12 .00 .118 (iii)
00207> TIME TO PEAK (hrs)= 1.33 1.42 1.333
00208> RUNOFF VOLUME (mm)= 23.43 5.17 22.861
00209> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00210> RUNOFF COEFFICIENT = .94 .21 .915
00211>
00212> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00213> CN* = 81.0 Ia = Dep. Storage (Above)
00214> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00215> THAN THE STORAGE COEFFICIENT.
00216> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00217>-----
00218>
00219>
00220> 001:0007
00221>
00222> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00223> | (ha) (cms) (hrs) (cms) (cms)
00224> | ID1 01:010 2.07 .158 1.29 20.51 .000
00225> | +ID2 02:020 1.54 .121 1.33 21.97 .000
00226>
00227> | SUM 04:040 3.61 .278 1.33 21.13 .000
00228>
00229> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00230>-----
00231>
00232>
00233> 001:0008
00234>
00235> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00236> | (ha) (cms) (hrs) (cms) (cms)
00237> | ID1 03:030 1.40 .118 1.33 22.88 .000
00238> | +ID2 04:040 3.61 .278 1.33 21.13 .000
00239>
00240> | SUM 05:050 5.01 .396 1.33 21.62 .000
00241>
00242> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00243>-----
00244>
00245> 001:0009
00246> *
00247> * SUB-AREA No.4
00248>
00249> | CALIB STANDHYD | Area (ha)= .89
00250> | 06:06 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00251>
00252> IMPERVIOUS PERVIOUS (i)
00253> Surface Area (ha)= .86 .03
00254> Dep. Storage (mm)= 1.57 4.67
00255> Average Slope (%)= .93 .70
00256> Length (m)= 164.82 40.00
00257> Mannings n = .030 .250
00258>
00258> Max. eff. Inten. (mm/hr)= 45.63 4.42
00259> over (min) 7.50 42.50
00260> Storage Coeff. (min)= 7.97 (ii) 41.62 (ii)
00261> Unit Hyd. Tpeak (min)= 7.50 42.50
00262> Unit Hyd. peak (cms)= .14 .03
00263>
00264> PEAK FLOW (cms)= .09 .00 .089 (iii)
00265> TIME TO PEAK (hrs)= 1.25 2.00 1.250
00266> RUNOFF VOLUME (mm)= 23.43 5.17 22.861
00267> TOTAL RAINFALL (mm)= 25.00 25.00 24.999
00268> RUNOFF COEFFICIENT = .94 .21 .915
00269>
00270> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```



00271> CN\* = 81.0 Ia = Dep. Storage (Above)  
00272> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00273> THAN THE STORAGE COEFFICIENT.  
00274> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00275>  
00276>

00277> 001:0010-----  
00278> \* SUB-AREA No.2  
00279>  
00280> CALIB STANDHYD | Area (ha)= 2.66  
00281> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
00282>  
00283> IMPERVIOUS PERVIOUS (i)  
00284> Surface Area (ha)= 2.58 .08  
00285> Dep. Storage (mm)= 1.57 4.67  
00286> Average Slope (%)= .61 1.50  
00287> Length (m)= 207.25 20.00  
00288> Mannings n = .030 .250  
00289>  
00290> Max.eff.Inten.(mm/hr)= 45.63 5.66  
00291> over (min) 10.00 27.50  
00292> Storage Coeff. (min)= 10.37 (ii) 26.38 (ii)  
00293> Unit Hyd. Tpeak (min)= 10.00 27.50  
00294> Unit Hyd. peak (cms)= .11 .04  
00295>  
00296> \*TOTALS\*  
00297> PEAK FLOW (cms)= .24 .00 2.38 (iii)  
00298> TIME TO PEAK (hrs)= 1.29 1.67 1.292  
00299> RUNOFF VOLUME (mm)= 23.43 5.17 22.82  
00300> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00301> RUNOFF COEFFICIENT = .94 .35 24.999  
00302>  
00303> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00304> CN\* = 81.0 Ia = Dep. Storage (Above)  
00305> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00306> THAN THE STORAGE COEFFICIENT.  
00307> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00308>  
00309>

00310> 001:0011-----  
00311> [ ADD HYD (090 ) ] ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00312> (ha) (cms) (hrs) (mm) (cms)  
00313> ID1 06:060 .89 .089 1.25 22.88 .000  
00314> +ID2 07:070 2.66 .238 1.29 22.88 .000  
00315>  
00316> SUM 08:080 3.55 .327 1.29 22.88 .000  
00317>  
00318> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00319>  
00320>

00321> 001:0012-----  
00322> [ ADD HYD (090 ) ] ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00323> (ha) (cms) (hrs) (mm) (cms)  
00324> ID1 05:050 5.01 .396 1.33 21.62 .000  
00325> +ID2 08:080 3.55 .327 1.29 22.88 .000  
00326>  
00327> SUM 09:090 8.56 .716 1.29 22.14 .000  
00328>  
00329> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00330>  
00331>

00332> 001:0013-----  
00333> ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
00334> | IN-09: (POND ) |  
00335> | OUT-10: (POND ) |

OUTFLOW STORAGE TABLE	
OUTFLOW (cms)	STORAGE (ha.m.)
.000	0000E+00
.008	.650E+01
.017	.1311E+02
.093	.2831E+02
.233	.3971E+02
.337	.4731E+02
.465	.5491E+02
.531	.5871E+02
.000	.000E+00

00336> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
00337> (ha) (cms) (hrs) (mm)  
00338> INFLOW<09: (POND ) 8.56 .716 1.292 22.143  
00339> OUTFLOW<10: (POND ) 8.56 .032 3.875 22.141  
00340>  
00341> PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.470  
00342> TIME SHIFT OF PEAK FLOW (min) = 155.00  
00343> MAXIMUM STORAGE USED (ha.m.) = 1611E+00  
00344>  
00345>

00346> 001:0014-----  
00347> \*\*\*\*\*  
00348> \* Remaining Hawthorne Industrial Park \*  
00349> \*\*\*\*\*  
00350> \* SUB-AREA No.1  
00351>  
00352> CALIB STANDHYD | Area (ha)= 19.90  
00353> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00354>  
00355> IMPERVIOUS PERVIOUS (i)  
00356> Surface Area (ha)= 14.13 5.77  
00357> Dep. Storage (mm)= 1.57 4.67  
00358> Average Slope (%)= .60 1.50  
00359> Length (m)= 580.00 100.00  
00360> Mannings n = .030 .250  
00361>  
00362> Max.eff.Inten.(mm/hr)= 34.39 11.90  
00363> over (min) 22.50 52.50  
00364> Storage Coeff. (min)= 21.64 (ii) 52.88 (ii)  
00365> Unit Hyd. Tpeak (min)= 22.50 52.50  
00366> Unit Hyd. peak (cms)= .05 .02  
00367>  
00368> \*TOTALS\*  
00369> PEAK FLOW (cms)= .60 .11 1.542 (iii)  
00370> TIME TO PEAK (hrs)= 1.50 2.13 1.542  
00371> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00372> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00373> RUNOFF COEFFICIENT = .94 .35 24.999  
00374>  
00375> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00376> CN\* = 81.0 Ia = Dep. Storage (Above)  
00377> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00378> THAN THE STORAGE COEFFICIENT.  
00379> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00380>  
00381>

00382> 001:0015-----  
00383> [ ADD HYD (H1P02 ) ] ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00384> (ha) (cms) (hrs) (mm) (cms)  
00385> ID1 10:POND 8.56 .032 3.88 22.14 .000  
00386> +ID2 01:H1P01 19.90 .642 1.54 16.08 .000  
00387>  
00388> SUM 02:H1P02 28.46 .655 1.54 17.91 .000  
00389>  
00390> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00391>

00406>  
00407>  
00408> 001:0016-----  
00409> \* SUB-AREA No.2  
00410>  
00411> CALIB STANDHYD | Area (ha)= 17.00  
00412> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00413>  
00414> IMPERVIOUS PERVIOUS (i)  
00415> Surface Area (ha)= 12.07 4.93  
00416> Dep. Storage (mm)= 1.57 4.67  
00417> Average Slope (%)= .65 1.50  
00418> Length (m)= 450.00 100.00  
00419> Mannings n = .030 .250  
00420>  
00421> Max.eff.Inten.(mm/hr)= 40.81 12.73  
00422> over (min) 17.50 47.50  
00423> Storage Coeff. (min)= 16.94 (ii) 47.35 (ii)  
00424> Unit Hyd. Tpeak (min)= 17.50 47.50  
00425> Unit Hyd. peak (cms)= .07 .02  
00426>  
00427> \*TOTALS\*  
00428> PEAK FLOW (cms)= .60 .10 1.625 (iii)  
00429> TIME TO PEAK (hrs)= 1.42 2.00 1.458  
00430> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00431> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00432> RUNOFF COEFFICIENT = .94 .35 24.999  
00433>  
00434> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00435> CN\* = 81.0 Ia = Dep. Storage (Above)  
00436> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00437> THAN THE STORAGE COEFFICIENT.  
00438> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00439>  
00440>

00441> 001:0017-----  
00442> \* SUB-AREA No.3  
00443>  
00444> CALIB STANDHYD | Area (ha)= 15.60  
00445> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00446>  
00447> IMPERVIOUS PERVIOUS (i)  
00448> Surface Area (ha)= 11.08 4.52  
00449> Dep. Storage (mm)= 1.57 4.67  
00450> Average Slope (%)= .50 1.50  
00451> Length (m)= 600.00 100.00  
00452> Mannings n = .030 .250  
00453>  
00454> Max.eff.Inten.(mm/hr)= 34.39 11.54  
00455> over (min) 22.50 55.00  
00456> Storage Coeff. (min)= 23.33 (ii) 54.95 (ii)  
00457> Unit Hyd. Tpeak (min)= 22.50 55.00  
00458> Unit Hyd. peak (cms)= .05 .02  
00459>  
00460> \*TOTALS\*  
00461> PEAK FLOW (cms)= .45 .08 1.484 (iii)  
00462> TIME TO PEAK (hrs)= 1.50 2.17 1.542  
00463> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00464> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00465> RUNOFF COEFFICIENT = .94 .35 24.999  
00466>  
00467> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00468> CN\* = 81.0 Ia = Dep. Storage (Above)  
00469> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00470> THAN THE STORAGE COEFFICIENT.  
00471> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00472>  
00473>

00474> 001:0018-----  
00475> [ ADD HYD (H1P05 ) ] ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00476> (ha) (cms) (hrs) (mm) (cms)  
00477> ID1 03:H1P03 17.00 .625 1.46 16.08 .000  
00478> +ID2 04:H1P04 15.60 .484 1.54 16.08 .000  
00479>  
00480> SUM 05:H1P05 32.60 1.091 1.46 16.08 .000  
00481>  
00482> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00483>  
00484>

00485> 001:0019-----  
00486> [ ADD HYD (H1P06 ) ] ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00487> (ha) (cms) (hrs) (mm) (cms)  
00488> ID1 05:H1P05 32.60 1.091 1.46 16.08 .000  
00489> +ID2 02:H1P02 28.46 .655 1.54 17.91 .000  
00490>  
00491> SUM 06:H1P06 61.06 1.740 1.50 16.93 .000  
00492>  
00493> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
00494>  
00495>

00496> 001:0020-----  
00497> \* SUB-AREA No.4  
00498>  
00499> CALIB STANDHYD | Area (ha)= 12.20  
00500> | 07:H1P07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00501>  
00502> IMPERVIOUS PERVIOUS (i)  
00503> Surface Area (ha)= 8.66 3.54  
00504> Dep. Storage (mm)= 1.57 4.67  
00505> Average Slope (%)= .70 1.50  
00506> Length (m)= 210.00 100.00  
00507> Mannings n = .030 .250  
00508>  
00509> Max.eff.Inten.(mm/hr)= 45.63 14.15  
00510> over (min) 10.00 40.00  
00511> Storage Coeff. (min)= 10.03 (ii) 39.18 (ii)  
00512> Unit Hyd. Tpeak (min)= 10.00 40.00  
00513> Unit Hyd. peak (cms)= .11 .03  
00514>  
00515> \*TOTALS\*  
00516> PEAK FLOW (cms)= .57 .08 1.585 (iii)  
00517> TIME TO PEAK (hrs)= 1.29 1.88 1.292  
00518> RUNOFF VOLUME (mm)= 23.43 8.74 16.085  
00519> TOTAL RAINFALL (mm)= 25.00 25.00 24.999  
00520> RUNOFF COEFFICIENT = .94 .35 24.999  
00521>  
00522> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00523> CN\* = 81.0 Ia = Dep. Storage (Above)  
00524> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00525> THAN THE STORAGE COEFFICIENT.  
00526> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
00527>  
00528>

00529> 001:0021-----  
00530> \* SUB-AREA No.5  
00531>  
00532> DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00  
00533> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00  
00534> U.H. Tp(hrs)= .170  
00535>  
00536> Unit Hyd Qpeak (cms)= .899  
00537>  
00538>  
00539>  
00540>

```

00541> PEAK FLOW (cms) = .077 (i)
00542> TIME TO PEAK (hrs) = 1.375
00543> RUNOFF VOLUME (mm) = 6.343
00544> TOTAL RAINFALL (mm) = 24.999
00545> RUNOFF COEFFICIENT = .254
00546>
00547> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00548>
00549>
00550> 001:0022-----
00551>
00552> | ADD HYD (HIP08) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00553> |-----|-----|-----|-----|-----|-----|
00554> | ID1 06:HIP06 61.06 1.740 1.50 16.93 .000
00555> | +ID2 07:HIP07 12.20 .585 1.29 16.08 .000
00556> | +ID3 08:POND-B 4.00 .077 1.38 6.34 .000
00557> |-----|-----|-----|-----|-----|-----|
00558> | SUM 09:HIP08 77.26 2.227 1.46 16.25 .000
00559>
00560> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00561>
00562>
00563> 001:0023-----
00564>
00565> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00566> | IN:09 (HIP08) |
00567> | OUT:10 (HIP-PO) |
00568>
00569> ===== OUTFLOW STORAGE TABLE =====
00570> OUTFLOW STORAGE OUTFLOW STORAGE
00571> (cms) (ha.m.) (cms) (ha.m.)
00572> .003 0000E+00 | .724 2210E+01
00573> .048 5740E-01 | .937 2501E+01
00574> .054 2434E+00 | 1.262 2798E+01
00575> .059 5834E+00 | 1.404 3101E+01
00576> .062 8400E+00 | 1.532 3410E+01
00577> .064 1102E+01 | 1.650 3724E+01
00578> .147 1370E+01 | 2.408 4044E+01
00579> .280 1644E+01 | 3.689 4370E+01
00580> .472 1924E+01 | .000 0000E+00
00581>
00582> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00583> (ha) (cms) (hrs) (mm)
00584> INFLOW >09: (HIP08) 77.26 2.227 1.458 16.251
00585> OUTFLOW <10: (HIP-PO) 77.26 .063 5.431 16.251
00586>
00587> PEAK FLOW REDUCTION [Qout/Qin] (%) = 2.839
00588> TIME SHIFT OF PEAK FLOW (min) = 238.33
00589> MAXIMUM STORAGE USED (ha.m.) = 1001E+01
00590>
00591> 001:0024-----
00592> *SUB-AREA No. 6
00593>
00594> | DESIGN NASHYD | Area (ha) = 2.70 Curve Number (CN) = 76.00
00595> | 01:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N) = 3.00
00596> | U.H. Tp (hrs) = .800
00597>
00598> Unit Hyd Qpeak (cms) = .129
00599>
00600> PEAK FLOW (cms) = .013 (i)
00601> TIME TO PEAK (hrs) = 2.292
00602> RUNOFF VOLUME (mm) = 4.110
00603> TOTAL RAINFALL (mm) = 24.999
00604> RUNOFF COEFFICIENT = .164
00605>
00606> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00607>
00608>
00609> 001:0025-----
00610>
00611> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00612> |-----|-----|-----|-----|-----|-----|
00613> | ID1 10:HIP-PO 77.26 .063 5.43 16.25 .000
00614> | +ID2 01:A3 2.70 .013 2.29 4.11 .000
00615> |-----|-----|-----|-----|-----|-----|
00616> | SUM 02:Ultima 79.96 .073 2.50 15.84 .000
00617>
00618> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00619>
00620>
00621> 001:0026-----
00622> *****
00623> * CALCULATION OF 3HR - 1:2 YEAR STORM EVENT *
00624> *****
00625>
00626> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
00627> | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
00628>
00629> TZERO = .00 hrs on 0
00630> METRIC = 2 (output = METRIC)
00631> NRUN = 001
00632> NSTORM = 0
00633>
00634> 001:0002-----
00635> | CHICAGO STORM | IDF curve parameters: A= 732.951
00636> | Ptotal= 31.86 mm | B= 6.189
00637> |-----|-----|-----|-----|-----|-----|
00638> | used in: INTENSITY = A / (t + B)^C
00639>
00640> Duration of storm = 3.00 hrs
00641> Storm time step = 10.00 min
00642> Time to peak ratio = .33
00643>
00644> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00645> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00646> .17 2.815 | 1.00 76.805 | 1.83 5.095 | 2.67 2.684
00647> .33 3.498 | 1.17 24.079 | 2.00 4.291 | 2.83 2.463
00648> .50 4.687 | 1.33 12.364 | 2.17 3.718 | 3.00 2.279
00649> .67 7.305 | 1.50 8.324 | 2.33 3.288 |
00650> .83 16.209 | 1.67 6.303 | 2.50 2.953 |
00651>
00652>
00653> 001:0003-----
00654>
00655> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\ORGA.VAL
00656>
00657> | FileTitle = ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
00658> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----
00659>
00660> Horton's infiltration equation parameters:
00661> [F0= 50.00 mm/hr] [F1= 7.50 mm/hr] [DCAY= 2.00 /hr] [F2= .00 mm]
00662> Parameters for PERVIOUS surfaces in STANDHYD:
00663> [Iaper= 4.67 mm] [LGP= 40.00 mm] [MNI= .250]
00664> Parameters for IMPERVIOUS surfaces in STANDHYD:
00665> [Iaimp= 1.57 mm] [CL= 1.50] [MNI= .035]
00666> Parameters used in NASHYD:
00667> [Ia= 4.67 mm] [N= 3.00]
00668>
00669> 001:0004-----
00670> *****
00671> ***** ORGAWORLD FILE *****
00672> *
00673> * SUB-AREA No.1
00674>
00675> | CALIB STANDHYD | Area (ha) = 2.07

```

```

00676> | 01:010 DT= 2.50 | Total Imp(%) = 84.00 Dir. Conn.(%) = 84.00
00677>
00678> | IMPERVIOUS PERVIOUS (i)
00679> Surface Area (ha) = 1.74 .33
00680> Dep. Storage (mm) = 1.57 4.67
00681> Average Slope (%) = 1.52 1.00
00682> Length (m) = 204.72 20.00
00683> Mannings n = .030 .250
00684>
00685> Max.eff.Inten.(mm/hr) = 76.81 11.88
00686> over (min) = 10.00 22.50
00687> Storage Coeff. (min) = 8.77 (ii) 22.21 (ii)
00688> Unit Hyd. Tpeak (min) = 10.00 22.50
00689> Unit Hyd. peak (cms) = .12 .05
00690>
00691> PEAK FLOW (cms) = .24 .01 *TOTALS*
00692> TIME TO PEAK (hrs) = 1.08 1.38 1.245 (iii)
00693> RUNOFF VOLUME (mm) = 30.29 8.52 26.807
00694> TOTAL RAINFALL (mm) = 31.86 31.86 31.860
00695> RUNOFF COEFFICIENT = .95 .27 .841
00696>
00697> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00698> CN* = 81.0 Ia = Dep. Storage (Above)
00699> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00700> THAN THE STORAGE COEFFICIENT.
00701> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00702>
00703>
00704> 001:0005-----
00705>
00706> * SUB-AREA No.2
00707>
00708> | CALIB STANDHYD | Area (ha) = 1.54
00709> | 02:020 DT= 2.50 | Total Imp(%) = 92.00 Dir. Conn.(%) = 92.00
00710>
00711> | IMPERVIOUS PERVIOUS (i)
00712> Surface Area (ha) = 1.42 .12
00713> Dep. Storage (mm) = 1.57 4.67
00714> Average Slope (%) = .50 1.00
00715> Length (m) = 244.34 5.00
00716> Mannings n = .030 .030
00717>
00718> Max.eff.Inten.(mm/hr) = 76.81 15.07
00719> over (min) = 10.00 12.50
00720> Storage Coeff. (min) = 9.87 (ii) 11.36 (ii)
00721> Unit Hyd. Tpeak (min) = 10.00 12.50
00722> Unit Hyd. peak (cms) = .11 .10
00723>
00724> PEAK FLOW (cms) = .19 .00 *TOTALS*
00725> TIME TO PEAK (hrs) = 1.08 1.17 1.083
00726> RUNOFF VOLUME (mm) = 30.29 8.52 28.548
00727> TOTAL RAINFALL (mm) = 31.86 31.86 31.860
00728> RUNOFF COEFFICIENT = .95 .27 .896
00729>
00730> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00731> CN* = 81.0 Ia = Dep. Storage (Above)
00732> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00733> THAN THE STORAGE COEFFICIENT.
00734> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00735>
00736>
00737> 001:0006-----
00738> *
00739> * SUB-AREA No.3
00740>
00741> | CALIB STANDHYD | Area (ha) = 1.40
00742> | 03:030 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00
00743>
00744> | IMPERVIOUS PERVIOUS (i)
00745> Surface Area (ha) = 1.36 .04
00746> Dep. Storage (mm) = 1.57 4.67
00747> Average Slope (%) = .51 1.00
00748> Length (m) = 225.63 5.00
00749> Mannings n = .030 .030
00750>
00751> Max.eff.Inten.(mm/hr) = 76.81 16.59
00752> over (min) = 10.00 10.00
00753> Storage Coeff. (min) = 9.35 (ii) 10.79 (ii)
00754> Unit Hyd. Tpeak (min) = 10.00 10.00
00755> Unit Hyd. peak (cms) = .12 .11
00756>
00757> PEAK FLOW (cms) = .18 .00 *TOTALS*
00758> TIME TO PEAK (hrs) = 1.08 1.13 1.083
00759> RUNOFF VOLUME (mm) = 30.29 8.52 29.637
00760> TOTAL RAINFALL (mm) = 31.86 31.86 31.860
00761> RUNOFF COEFFICIENT = .95 .27 .930
00762>
00763> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00764> CN* = 81.0 Ia = Dep. Storage (Above)
00765> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00766> THAN THE STORAGE COEFFICIENT.
00767> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00768>
00769>
00770> 001:0007-----
00771>
00772> | ADD HYD (040) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00773> |-----|-----|-----|-----|-----|-----|
00774> | ID1 01:010 2.07 .245 1.08 26.81 .000
00775> | +ID2 02:020 1.54 .192 1.08 28.55 .000
00776> |-----|-----|-----|-----|-----|-----|
00777> | SUM 04:040 3.61 .436 1.08 27.55 .000
00778>
00779> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00780>
00781>
00782> 001:0008-----
00783>
00784> | ADD HYD (050) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00785> |-----|-----|-----|-----|-----|-----|
00786> | ID1 03:030 1.40 .186 1.08 29.64 .000
00787> | +ID2 04:040 3.61 .436 1.08 27.55 .000
00788> |-----|-----|-----|-----|-----|-----|
00789> | SUM 05:050 5.01 .623 1.08 28.13 .000
00790>
00791> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00792>
00793>
00794> 001:0009-----
00795> *
00796> * SUB-AREA No.4
00797>
00798> | CALIB STANDHYD | Area (ha) = .89
00799> | 06:060 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00
00800>
00801> | IMPERVIOUS PERVIOUS (i)
00802> Surface Area (ha) = .86 .03
00803> Dep. Storage (mm) = 1.57 4.67
00804> Average Slope (%) = .93 .70
00805> Length (m) = 164.82 40.00
00806> Mannings n = .030 .250
00807>
00808> Max.eff.Inten.(mm/hr) = 76.81 10.24
00809> over (min) = 7.50 30.00
00810> Storage Coeff. (min) = 6.47 (ii) 30.53 (ii)

```

00911> Unit Hyd. Tpeak (min)= 7.50 30.00  
00912> Unit Hyd. peak (cms)= .16 .04 \*TOTALS\*  
00913> PEAK FLOW (cms)= .14 .00 1.39 (iii)  
00914> TIME TO PEAK (hrs)= 1.04 1.54 1.042  
00915> RUNOFF VOLUME (mm)= 30.29 8.52 29.637  
00916> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
00917> RUNOFF COEFFICIENT = .95 .27 .930  
00918>  
00919> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00920> CN\* = 81.0 Ia = Dep. Storage (Above)  
00921> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00922> THAN THE STORAGE COEFFICIENT.  
00923> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00924> \* SUB-AREA No.5  
00925>  
00926> 001:0010  
00927> CALIB STANDHYD | Area (ha)= 2.66  
00928> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
00929>  
00930> IMPERVIOUS PERVIOUS (i)  
00931> Surface Area (ha)= 2.58 .08  
00932> Dep. Storage (mm)= 1.57 4.67  
00933> Average Slope (%)= .61 1.50  
00934> Length (m)= 207.25 20.00  
00935> Mannings n = .030 .250  
00936> Max. eff. Inten. (mm/hr)= 76.81 12.71  
00937> over (min) 7.50 20.00  
00938> Storage Coeff. (min)= 8.42 (ii) 20.00 (ii)  
00939> Unit Hyd. Tpeak (min)= 7.50 20.00  
00940> Unit Hyd. peak (cms)= .14 .06  
00941>  
00942> \*TOTALS\*  
00943> PEAK FLOW (cms)= .38 .00 .379 (iii)  
00944> TIME TO PEAK (hrs)= 1.04 1.33 1.042  
00945> RUNOFF VOLUME (mm)= 30.29 8.52 29.637  
00946> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
00947> RUNOFF COEFFICIENT = .95 .27 .930  
00948>  
00949> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00950> CN\* = 81.0 Ia = Dep. Storage (Above)  
00951> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00952> THAN THE STORAGE COEFFICIENT.  
00953> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00954> \* SUB-AREA No.1  
00955>  
00956> 001:0014  
00957> CALIB STANDHYD | Area (ha)= 19.90  
00958> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00959>  
00960> IMPERVIOUS PERVIOUS (i)  
00961> Surface Area (ha)= 14.13 5.77  
00962> Dep. Storage (mm)= 1.57 4.67  
00963> Average Slope (%)= .60 1.50  
00964> Length (m)= 580.00 100.00  
00965> Mannings n = .030 .250  
00966> Max. eff. Inten. (mm/hr)= 54.21 23.06  
00967> over (min) 17.50 42.50  
00968> Storage Coeff. (min)= 18.04 (ii) 42.02 (ii)  
00969> Unit Hyd. Tpeak (min)= 17.50 42.50  
00970> Unit Hyd. peak (cms)= .06 .03  
00971>  
00972> \*TOTALS\*  
00973> PEAK FLOW (cms)= .95 .21 1.020 (iii)  
00974> TIME TO PEAK (hrs)= 1.21 1.71 1.250  
00975> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
00976> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
00977> RUNOFF COEFFICIENT = .95 .42 .685  
00978>  
00979> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00980> CN\* = 81.0 Ia = Dep. Storage (Above)  
00981> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00982> THAN THE STORAGE COEFFICIENT.  
00983> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00946> 001:0015  
00947>  
00948> | ADD HYD (HIP02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
00949> | (ha) (cms) (hrs) (mm) (cms)  
00950> ID1 10:POND 8.56 .056 3.00 28.75 .000  
00951> +ID2 01:HIP01 19.90 1.020 1.25 21.81 .000  
00952>  
00953> SUM 02:HIP02 28.46 1.039 1.25 23.90 .000  
00954>  
00955> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

00956> \* SUB-AREA No.2  
00957>  
00958> 001:0016  
00959> CALIB STANDHYD | Area (ha)= 17.00  
00960> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00961>  
00962> IMPERVIOUS PERVIOUS (i)  
00963> Surface Area (ha)= 12.07 4.93  
00964> Dep. Storage (mm)= 1.57 4.67  
00965> Average Slope (%)= .65 1.50  
00966> Length (m)= 450.00 100.00  
00967> Mannings n = .030 .250  
00968> Max. eff. Inten. (mm/hr)= 59.23 25.04  
00969> over (min) 15.00 37.50  
00970> Storage Coeff. (min)= 14.60 (ii) 37.80 (ii)  
00971> Unit Hyd. Tpeak (min)= 15.00 37.50  
00972> Unit Hyd. peak (cms)= .08 .03  
00973>  
00974> \*TOTALS\*  
00975> PEAK FLOW (cms)= .91 .19 .978 (iii)  
00976> TIME TO PEAK (hrs)= 1.17 1.63 1.167  
00977> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
00978> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
00979> RUNOFF COEFFICIENT = .95 .42 .685  
00980>  
00981> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
00982> CN\* = 81.0 Ia = Dep. Storage (Above)  
00983> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
00984> THAN THE STORAGE COEFFICIENT.  
00985> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00986> \* SUB-AREA No.3  
00987>  
00988> 001:0017  
00989> CALIB STANDHYD | Area (ha)= 15.60  
00990> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
00991>  
00992> IMPERVIOUS PERVIOUS (i)  
00993> Surface Area (ha)= 11.08 4.52  
00994> Dep. Storage (mm)= 1.57 4.67  
00995> Average Slope (%)= .50 1.50  
00996> Length (m)= 600.00 100.00  
00997> Mannings n = .030 .250  
00998> Max. eff. Inten. (mm/hr)= 50.44 22.17  
00999> over (min) 20.00 45.00  
01000> Storage Coeff. (min)= 20.01 (ii) 44.37 (ii)  
01001> Unit Hyd. Tpeak (min)= 20.00 45.00  
01002> Unit Hyd. peak (cms)= .06 .03  
01003>  
01004> \*TOTALS\*  
01005> PEAK FLOW (cms)= .69 .16 .753 (iii)  
01006> TIME TO PEAK (hrs)= 1.25 1.79 1.292  
01007> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
01008> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
01009> RUNOFF COEFFICIENT = .95 .42 .685  
01010>  
01011> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01012> CN\* = 81.0 Ia = Dep. Storage (Above)  
01013> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01014> THAN THE STORAGE COEFFICIENT.  
01015> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01016> \* SUB-AREA No.4  
01017>  
01018> 001:0018  
01019> CALIB STANDHYD | Area (ha)= 12.20  
01020> | 07:HIP07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01021>  
01022> IMPERVIOUS PERVIOUS (i)  
01023> Surface Area (ha)= 8.66 3.54  
01024> Dep. Storage (mm)= 1.57 4.67  
01025> Average Slope (%)= .70 1.50  
01026> Length (m)= 210.00 100.00  
01027> Mannings n = .030 .250  
01028> Max. eff. Inten. (mm/hr)= 76.81 29.02  
01029> over (min) 7.50 30.00  
01030> Storage Coeff. (min)= 8.15 (ii) 30.01 (ii)  
01031> Unit Hyd. Tpeak (min)= 7.50 30.00  
01032> Unit Hyd. peak (cms)= .14 .04  
01033>  
01034> \*TOTALS\*  
01035> PEAK FLOW (cms)= .91 .16 .941 (iii)  
01036> TIME TO PEAK (hrs)= 1.04 1.50 1.042  
01037> RUNOFF VOLUME (mm)= 30.29 13.34 21.814  
01038> TOTAL RAINFALL (mm)= 31.86 31.86 31.860  
01039> RUNOFF COEFFICIENT = .95 .42 .685  
01040>  
01041> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01042> CN\* = 81.0 Ia = Dep. Storage (Above)  
01043> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01044> THAN THE STORAGE COEFFICIENT.  
01045> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

01081> 001:0021-----
01082> *
01083> *SUB-AREA No.5
01084> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
01085> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
01087> | U.H. Tp(hrs)= .170
01088>
01089> Unit Hyd Opeak (cms)= .899
01090>
01091> PEAK FLOW (cms)= .145 (i)
01092> TIME TO PEAK (hrs)= 1.167
01093> RUNOFF VOLUME (mm)= 10.266
01094> TOTAL RAINFALL (mm)= 31.860
01095> RUNOFF COEFFICIENT = .322
01096>
01097> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01098>
01099>
01100> 001:0022-----
01101>
01102> | ADD HYD (HIP08 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01103> | (ha) (cms) (hrs) (mm) (cms)
01104> | ID1 06:HIP06 61.06 2.733 1.21 22.79 .000
01105> | +ID2 07:HIP07 12.20 .941 1.04 21.81 .000
01106> | +ID3 08:Pond-B 4.00 .145 1.17 10.27 .000
01107>
01108> | SUM 09:HIP08 77.26 3.542 1.21 21.98 .000
01109>
01110> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01111>
01112>
01113> 001:0023-----
01114>
01115> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01116> | IN:09: (HIP-PO) |
01117> | OUT:10: (HIP-PO) |
01118>
01119> ===== OUTFLOW STORAGE TABLE =====
01120> OUTFLOW STORAGE OUTFLOW STORAGE
01121> (cms) (ha.m.) (cms) (ha.m.)
01122> .000 .000E+00 .724 .2210E+01
01123> .048 .574E+01 .937 .2501E+01
01124> .054 .2434E+00 1.262 .2798E+01
01125> .059 .5834E+00 1.404 .3101E+01
01126> .062 .8400E+00 1.532 .3410E+01
01127> .064 .1102E+01 1.650 .3724E+01
01128> .147 .1370E+01 2.409 .4044E+01
01129> .280 .1644E+01 3.689 .4370E+01
01130> .472 .1924E+01 .000 .000E+00
01131>
01132> ROUTING RESULTS AREA OPEAK TPEAK R.V.
01133> (ha) (cms) (hrs) (mm)
01134> INFLOW >09: (HIP08 ) 77.26 3.542 1.208 21.985
01135> OUTFLOW <10: (HIP-PO) 77.26 .148 4.014 21.985
01136>
01137> PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.179
01138> TIME SHIFT OF PEAK FLOW (min) = 168.33
01139> MAXIMUM STORAGE USED (ha.m.) = 1373E+01
01140>
01141> 001:0024-----
01142> *SUB-AREA No. 6
01143>
01144> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
01145> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
01146> | U.H. Tp(hrs)= .800
01147>
01148> Unit Hyd Opeak (cms)= .129
01149>
01150> PEAK FLOW (cms)= .024 (i)
01151> TIME TO PEAK (hrs)= 2.085
01152> RUNOFF VOLUME (mm)= 6.883
01153> TOTAL RAINFALL (mm)= 31.860
01154> RUNOFF COEFFICIENT = .216
01155>
01156> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01157>
01158>
01159> 001:0025-----
01160>
01161> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01162> | (ha) (cms) (hrs) (mm) (cms)
01163> | ID1 10:HIP-PO 77.26 .148 4.01 21.98 .000
01164> | +ID2 01:A3 2.70 .024 2.08 6.88 .000
01165>
01166> | SUM 02:Ultima 79.96 .156 3.65 21.47 .000
01167>
01168> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01169>
01170>
01171> 001:0026-----
01172> *
01173> * CALCULATION OF 3HR - 1.5 YEAR STORM EVENT *
01174> *
01175>
01176> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWMHY-1\
01177> | TZERO = .00 hrs on 0 Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWMHY-1\
01178> | METOUT= 2 (output = METRIC)
01180> | NSTORM= 0
01181>
01182>
01183> 001:0002-----
01184>
01185> | CHICAGO STORM | IDF curve parameters: A= 998.071
01186> | Ptotal= 42.51 mm | B= 6.053
01187> | C= .814
01188> used in: INTENSITY = A / (t + B)^C
01189>
01190> Duration of storm = 3.00 hrs
01191> Storm time step = 10.00 min
01192> Time to peak ratio = .33
01193>
01194> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
01195> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
01196> .17 3.682 | 1.00 31.193 | 1.83 6.689 | 2.67 3.510
01197> .33 6.882 | 1.17 32.037 | 2.00 5.628 | 2.83 3.229
01198> .50 6.251 | 1.33 16.337 | 2.17 4.872 | 3.00 2.978
01199> .67 9.614 | 1.50 10.965 | 2.33 4.305 |
01200> .83 24.170 | 1.67 8.287 | 2.50 3.864 |
01201>
01202>
01203> 001:0003-----
01204>
01205> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWMHY-1\ORGA.VAL
01206> | ICASEd= (read and print data)
01207> | ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01208> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ---
01209>
01210> Horton's infiltration equation parameters:
01211> [F= 50.00 mm/hr] [P= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
01212> Parameters for IMPERVIOUS surfaces in STANDHYD:
01213> [Ia= 4.67 mm] [LIG= 0.00 mm] [MNI= .250]
01214> Parameters for IMPERVIOUS surfaces in STANDHYD:
01215> [Ia= 1.57 mm] [CLI= 1.50] [MNI= .035]
01216> Parameters used in NASHYD:

```

```

01216> [Ia= 4.67 mm] [N= 3.00]
01217>
01218> 001:0004-----
01219> *****
01220> ***** ORGAWORLD FILE *****
01221> *****
01222> *
01223> * SUB-AREA No.1
01224>
01225> | CALIB STANDHYD | Area (ha)= 2.07
01226> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
01227>
01228> IMPERVIOUS PERVIOUS (i)
01229> Surface Area (ha)= 1.74 .33
01230> Dep. Storage (mm)= 1.57 4.67
01231> Average Slope (%)= .52 1.00
01232> Length (m)= 204.72 20.00
01233> Mannings n = .030
01234>
01235> Max.eff.Inten.(mm/hr)= 104.19 24.26
01236> over (min)= 7.50 17.50
01237> Storage Coeff. (min)= 7.76 (ii) 17.86 (iii)
01238> Unit Hyd. Tpeak (min)= 7.50 17.50
01239> Unit Hyd. peak (cms)= .15 .06
01240>
01241> PEAK FLOW (cms)= .36 .01 *TOTALS*
01242> TIME TO PEAK (hrs)= 1.04 1.25 (iii)
01243> RUNOFF VOLUME (mm)= 40.94 14.70 36.745
01244> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01245> RUNOFF COEFFICIENT = .96 .35 .864
01246>
01247> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01248> CN* = 81.0 Ia = Dep. Storage (Above)
01249> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01250> THAN THE STORAGE COEFFICIENT.
01251> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01252>
01253>
01254> 001:0005-----
01255> *
01256> * SUB-AREA No.2
01257>
01258> | CALIB STANDHYD | Area (ha)= 1.54
01259> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
01260>
01261> IMPERVIOUS PERVIOUS (i)
01262> Surface Area (ha)= 1.42 .12
01263> Dep. Storage (mm)= 1.57 4.67
01264> Average Slope (%)= .50 1.00
01265> Length (m)= 244.34 5.00
01266> Mannings n = .030
01267>
01268> Max.eff.Inten.(mm/hr)= 104.19 31.02
01269> over (min)= 7.50 10.00
01270> Storage Coeff. (min)= 8.73 (ii) 9.85 (iii)
01271> Unit Hyd. Tpeak (min)= 7.50 10.00
01272> Unit Hyd. peak (cms)= .14 .11
01273>
01274> PEAK FLOW (cms)= .28 .01 *TOTALS*
01275> TIME TO PEAK (hrs)= 1.04 1.13 (iii)
01276> RUNOFF VOLUME (mm)= 40.94 14.70 38.845
01277> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01278> RUNOFF COEFFICIENT = .96 .35 .914
01279>
01280> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01281> CN* = 81.0 Ia = Dep. Storage (Above)
01282> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01283> THAN THE STORAGE COEFFICIENT.
01284> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01285>
01286>
01287> 001:0006-----
01288> *
01289> * SUB-AREA No.3
01290>
01291> | CALIB STANDHYD | Area (ha)= 1.40
01292> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01293>
01294> IMPERVIOUS PERVIOUS (i)
01295> Surface Area (ha)= 1.36 .04
01296> Dep. Storage (mm)= 1.57 4.67
01297> Average Slope (%)= .51 1.00
01298> Length (m)= 225.63 5.00
01299> Mannings n = .030
01300>
01301> Max.eff.Inten.(mm/hr)= 104.19 31.02
01302> over (min)= 7.50 10.00
01303> Storage Coeff. (min)= 8.28 (ii) 9.39 (iii)
01304> Unit Hyd. Tpeak (min)= 7.50 10.00
01305> Unit Hyd. peak (cms)= .14 .12
01306>
01307> PEAK FLOW (cms)= .27 .00 *TOTALS*
01308> TIME TO PEAK (hrs)= 1.04 1.13 (iii)
01309> RUNOFF VOLUME (mm)= 40.94 14.70 40.157
01310> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01311> RUNOFF COEFFICIENT = .96 .35 .945
01312>
01313> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01314> CN* = 81.0 Ia = Dep. Storage (Above)
01315> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01316> THAN THE STORAGE COEFFICIENT.
01317> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01318>
01319>
01320> 001:0007-----
01321>
01322> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01323> | (ha) (cms) (hrs) (mm) (cms)
01324> | ID1 01:010 2.07 .362 1.04 36.75 .000
01325> | +ID2 02:020 1.54 .283 1.04 38.94 .000
01326>
01327> | SUM 04:040 3.61 .645 1.04 37.64 .000
01328>
01329> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01330>
01331>
01332> 001:0008-----
01333>
01334> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01335> | (ha) (cms) (hrs) (mm) (cms)
01336> | ID1 03:030 1.40 .274 1.04 40.16 .000
01337> | +ID2 04:040 3.61 .645 1.04 37.64 .000
01338>
01339> | SUM 05:050 5.01 .918 1.04 38.34 .000
01340>
01341> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01342>
01343>
01344> 001:0009-----
01345> *
01346> * SUB-AREA No.4
01347>
01348> | CALIB STANDHYD | Area (ha)= .89
01349> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
01350>

```

01351> IMPERVIOUS PERVIOUS (i)  
01352> Surface Area (ha)= .86 .03  
01353> Dep. Storage (mm)= 1.57 4.67  
01354> Average Slope (%)= .93 .70  
01355> Length (m)= 164.82 40.00  
01356> Mannings n = .030 .250  
01357>  
01358> Max.eff.Inten.(mm/hr)= 104.19 20.32  
01359> over (min) 5.00 25.00  
01360> Storage Coeff. (min)= 5.72 (ii) 24.02 (ii)  
01361> Unit Hyd. Tpeak (min)= 5.00 25.00  
01362> Unit Hyd. peak (cms)= .20 .05  
01363>  
01364> PEAK FLOW (cms)= .20 .00 \*TOTALS\*  
01365> TIME TO PEAK (hrs)= 1.00 1.38 1.000 (iii)  
01366> RUNOFF VOLUME (mm)= 40.94 14.70 40.157  
01367> TOTAL RAINFALL (mm)= 42.51 42.51 42.514  
01368> RUNOFF COEFFICIENT = .96 .35 .945  
01369>  
01370> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01371> CN\* = 81.0 Ia = Dep. Storage (Above)  
01372> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01373> THAN THE STORAGE COEFFICIENT.  
01374> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01375>  
01376>  
01377> 001:0010-----  
01378> \* SUB-AREA No.5  
01379>  
01380> | CALIB STANDHYD | Area (ha)= 2.66  
01382> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00  
01383>  
01384> IMPERVIOUS PERVIOUS (i)  
01385> Surface Area (ha)= 2.58 .08  
01386> Dep. Storage (mm)= 1.57 4.67  
01387> Average Slope (%)= .61 1.50  
01388> Length (m)= 207.25 20.00  
01389> Mannings n = .030 .250  
01390>  
01391> Max.eff.Inten.(mm/hr)= 104.19 24.26  
01392> over (min) 7.50 17.50  
01393> Storage Coeff. (min)= 7.45 (ii) 16.40 (ii)  
01394> Unit Hyd. Tpeak (min)= 7.50 17.50  
01395> Unit Hyd. peak (cms)= .15 .07  
01396>  
01397> PEAK FLOW (cms)= .54 .00 \*TOTALS\*  
01398> TIME TO PEAK (hrs)= 1.04 1.25 1.042 (iii)  
01399> RUNOFF VOLUME (mm)= 40.94 14.70 40.157  
01400> TOTAL RAINFALL (mm)= 42.51 42.51 42.514  
01401> RUNOFF COEFFICIENT = .96 .35 .945  
01402>  
01403> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01404> CN\* = 81.0 Ia = Dep. Storage (Above)  
01405> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01406> THAN THE STORAGE COEFFICIENT.  
01407> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01408>  
01409>  
01410> 001:0011-----  
01411> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01412> (ha) (cms) (hrs) (mm) (cms)  
01413> ID1 06:060 .89 .205 1.00 40.16 .000  
01414> +ID2 07:070 2.66 .538 1.04 40.16 .000  
01415>  
01416> SUM 08:080 3.55 .733 1.04 40.16 .000  
01417>  
01418> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01419>  
01420>  
01421>  
01422> 001:0012-----  
01423> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01424> (ha) (cms) (hrs) (mm) (cms)  
01425> ID1 05:050 5.01 .918 1.04 39.34 .000  
01426> +ID2 08:080 3.55 .733 1.04 40.16 .000  
01427>  
01428> SUM 09:090 8.56 1.651 1.04 39.10 .000  
01429>  
01430> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01431>  
01432>  
01433>  
01434> 001:0013-----  
01435> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
01437> | IN>09:(090 ) |  
01438> | OUT<10:(POND ) |  
01439> ===== OUTFLOW STORAGE TABLE =====  
01440> OUTFLOW STORAGE OUTFLOW STORAGE  
01441> (cms) (ha.m.) (cms) (ha.m.)  
01442> .000 .000E+00 | .593 .625E+00  
01443> .008 .656E+01 | .654 .663E+00  
01444> .017 .131E+00 | .797 .739E+00  
01445> .093 .283E+00 | .950 .827E+00  
01446> .232 .397E+00 | 1.304 .915E+00  
01447> .337 .473E+00 | 1.880 .100E+01  
01448> .465 .549E+00 | 2.577 .109E+01  
01449> .531 .587E+00 | .000 .000E+00  
01450>  
01451> ROUTING RESULTS AREA OPEAK TPEAK R.V.  
01452> (ha) (cms) (hrs) (mm)  
01453> INFLOW>09:(POND ) 8.56 1.651 1.042 39.096  
01454> OUTFLOW<10:(POND ) 8.56 .089 2.625 39.093  
01455>  
01456> PEAK FLOW REDUCTION [Qout/Qin] (%) = 5.413  
01457> TIME SHIFT OF PEAK FLOW (min)= 95.00  
01458> MAXIMUM STORAGE USED (ha.m.) = .2758E+00  
01459>  
01460> 001:0014-----  
01461> \*\*\*\*\*  
01462> \* Remaining Hawthorne Industrial Park \*  
01463> \*\*\*\*\*  
01464>  
01465> \* SUB-AREA No.1  
01466>  
01467> | CALIB STANDHYD | Area (ha)= 19.90  
01468> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01469>  
01470> IMPERVIOUS PERVIOUS (i)  
01471> Surface Area (ha)= 14.12 5.77  
01472> Dep. Storage (mm)= 1.57 4.67  
01473> Average Slope (%)= .60 1.50  
01474> Length (m)= 580.00 100.00  
01475> Mannings n = .030 .250  
01476>  
01477> Max.eff.Inten.(mm/hr)= 80.14 42.65  
01478> over (min) 15.00 35.00  
01479> Storage Coeff. (min)= 15.43 (ii) 34.18 (ii)  
01480> Unit Hyd. Tpeak (min)= 15.00 35.00  
01481> Unit Hyd. peak (cms)= .07 .03  
01482>  
01483> PEAK FLOW (cms)= 1.41 .40 \*TOTALS\*  
01484> TIME TO PEAK (hrs)= 1.17 1.54 1.208 (iii)  
01485> RUNOFF VOLUME (mm)= 40.94 21.31 31.126

01486> TOTAL RAINFALL (mm)= 42.51 42.51 42.514  
01487> RUNOFF COEFFICIENT = .96 .50 .732  
01488>  
01489> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01490> CN\* = 81.0 Ia = Dep. Storage (Above)  
01491> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01492> THAN THE STORAGE COEFFICIENT.  
01493> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01494>  
01495>  
01496> 001:0015-----  
01497>  
01498> | ADD HYD (HIP02 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01499> (ha) (cms) (hrs) (mm) (cms)  
01500> ID1 10:POND 8.56 .089 2.63 39.09 .000  
01501> +ID2 01:HIP01 19.90 1.572 1.21 31.13 .000  
01502>  
01503> SUM 02:HIP02 28.46 1.615 1.21 33.52 .000  
01504>  
01505> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01506>  
01507>  
01508> 001:0016-----  
01509> \* SUB-AREA No.2  
01510>  
01511> | CALIB STANDHYD | Area (ha)= 17.00  
01513> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01514>  
01515> IMPERVIOUS PERVIOUS (i)  
01516> Surface Area (ha)= 12.07 4.93  
01517> Dep. Storage (mm)= 1.57 4.67  
01518> Average Slope (%)= .65 1.50  
01519> Length (m)= 450.00 100.00  
01520> Mannings n = .030 .250  
01521>  
01522> Max.eff.Inten.(mm/hr)= 89.76 47.48  
01523> over (min) 12.50 30.00  
01524> Storage Coeff. (min)= 12.36 (ii) 30.32 (ii)  
01525> Unit Hyd. Tpeak (min)= 12.50 30.00  
01526> Unit Hyd. peak (cms)= .09 .04  
01527>  
01528> PEAK FLOW (cms)= 1.36 .37 \*TOTALS\*  
01529> TIME TO PEAK (hrs)= 1.13 1.46 1.167 (iii)  
01530> RUNOFF VOLUME (mm)= 40.94 21.31 31.126  
01531> TOTAL RAINFALL (mm)= 42.51 42.51 42.514  
01532> RUNOFF COEFFICIENT = .96 .50 .732  
01533>  
01534> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01535> CN\* = 81.0 Ia = Dep. Storage (Above)  
01536> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01537> THAN THE STORAGE COEFFICIENT.  
01538> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01539>  
01540>  
01541>  
01542> 001:0017-----  
01543> \* SUB-AREA No.3  
01544>  
01545> | CALIB STANDHYD | Area (ha)= 15.60  
01547> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01548>  
01549> IMPERVIOUS PERVIOUS (i)  
01550> Surface Area (ha)= 11.08 4.52  
01551> Dep. Storage (mm)= 1.57 4.67  
01552> Average Slope (%)= .60 1.50  
01553> Length (m)= 600.00 100.00  
01554> Mannings n = .030 .250  
01555>  
01556> Max.eff.Inten.(mm/hr)= 73.27 42.65  
01557> over (min) 17.50 35.00  
01558> Storage Coeff. (min)= 17.24 (ii) 35.98 (ii)  
01559> Unit Hyd. Tpeak (min)= 17.50 35.00  
01560> Unit Hyd. peak (cms)= .07 .03  
01561>  
01562> PEAK FLOW (cms)= 1.03 .30 \*TOTALS\*  
01563> TIME TO PEAK (hrs)= 1.21 1.54 1.176 (iii)  
01564> RUNOFF VOLUME (mm)= 40.94 21.31 31.126  
01565> TOTAL RAINFALL (mm)= 42.51 42.51 42.514  
01566> RUNOFF COEFFICIENT = .96 .50 .732  
01567>  
01568> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
01569> CN\* = 81.0 Ia = Dep. Storage (Above)  
01570> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
01571> THAN THE STORAGE COEFFICIENT.  
01572> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
01573>  
01574>  
01575> 001:0018-----  
01576> | ADD HYD (HIP05 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01577> (ha) (cms) (hrs) (mm) (cms)  
01578> ID1 03:HIP03 17.00 1.504 1.17 31.13 .000  
01579> +ID2 04:HIP04 15.60 1.176 1.25 31.13 .000  
01580>  
01581> SUM 05:HIP05 32.60 2.621 1.17 31.13 .000  
01582>  
01583> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01584>  
01585>  
01586>  
01587>  
01588> 001:0019-----  
01589>  
01590> | ADD HYD (HIP06 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
01591> (ha) (cms) (hrs) (mm) (cms)  
01592> ID1 05:HIP05 32.60 2.621 1.17 31.13 .000  
01593> +ID2 02:HIP02 28.46 1.615 1.21 33.52 .000  
01594>  
01595> SUM 06:HIP06 61.06 4.222 1.17 32.24 .000  
01596>  
01597> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
01598>  
01599>  
01600> 001:0020-----  
01601> \* SUB-AREA No.4  
01602>  
01603> | CALIB STANDHYD | Area (ha)= 12.20  
01605> | 07:HIP07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
01606>  
01607> IMPERVIOUS PERVIOUS (i)  
01608> Surface Area (ha)= 8.66 3.54  
01609> Dep. Storage (mm)= 1.57 4.67  
01610> Average Slope (%)= .70 1.50  
01611> Length (m)= 210.00 100.00  
01612> Mannings n = .030 .250  
01613>  
01614> Max.eff.Inten.(mm/hr)= 104.19 52.96  
01615> over (min) 7.50 25.00  
01616> Storage Coeff. (min)= 7.21 (ii) 24.40 (ii)  
01617> Unit Hyd. Tpeak (min)= 7.50 25.00  
01618> Unit Hyd. peak (cms)= .15 .05  
01619>  
01620> PEAK FLOW (cms)= 1.28 .31 \*TOTALS\*  
01621> TIME TO PEAK (hrs)= 1.04 1.38 1.375 (iii)  
01622> RUNOFF VOLUME (mm)= 40.94 21.31 31.126

01621> TOTAL RAINFALL (mm)= 42.51 42.51 42.514
01622> RUNOFF COEFFICIENT = .96 .50 .732
01623>
01624> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01625> CN\* = 81.0 Ia = Dep. Storage (Above)
01626> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01627> THAN THE STORAGE COEFFICIENT.
01628> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01631> 001:0021-----
01632> \*
01633> \*SUB-AREA No.5
01634>
01635> | DESIGN WASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
01636> | 08:Pcond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
01637> | U.H. Tp(hrs)= .170

01638> Unit Hyd Opeak (cms)= .899
01639>
01640>
01641> PEAK FLOW (cms)= .260 (i)
01642> TIME TO PEAK (hrs)= 1.167
01643> RUNOFF VOLUME (mm)= 17.325
01644> TOTAL RAINFALL (mm)= 42.514
01645> RUNOFF COEFFICIENT = .408
01646>
01647> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01648>
01649>
01650> 001:0022-----
01651>
01652> | ADD HYD (HIP08 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01653> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01654> | IN-09: (HIP08 ) |
01655> | OUT<10: (HIP-PO) |
01656> ID1 06:HIP06 61.06 4.222 1.17 32.24 .000
01657> +ID2 07:HIP07 12.20 1.375 1.04 31.13 .000
01658> +ID3 08:Pcond-B 4.00 2.60 1.17 17.32 .000
01659> SUM 09:HIP08 77.26 5.545 1.17 31.29 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01663> 001:0023-----
01664>
01665> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01666> | IN-09: (HIP08 ) |
01667> | OUT<10: (HIP-PO) |

Table with columns: OUTFLOW STORAGE, STORAGE, OUTFLOW STORAGE, STORAGE. Rows include values for various flow parameters and storage levels.

ROUTING RESULTS AREA OPEAK TPEAK R.V.
01679> (ha) (cms) (hrs) (mm)
01680> INFLOW>09: (HIP-PO) 77.26 5.545 1.167 31.292
01681> OUTFLOW<10: (HIP-PO) 77.26 .435 3.389 31.292

PEAK FLOW REDUCTION (Qout/Qin) (%) = 7.850
01685> TIME SHIFT OF PEAK FLOW (min) = 133.33
01686> MAXIMUM STORAGE USED (ha.m.) = 1871E+01

01689> 001:0024-----
01690> \*
01691> \*SUB-AREA No. 6
01692>
01693> | DESIGN WASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
01694> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
01695> | U.H. Tp(hrs)= .800

01696> Unit Hyd Opeak (cms)= .129
01697>
01698>
01699> PEAK FLOW (cms)= .044 (i)
01700> TIME TO PEAK (hrs)= 2.042
01701> RUNOFF VOLUME (mm)= 12.131
01702> TOTAL RAINFALL (mm)= 42.514
01703> RUNOFF COEFFICIENT = .285
01704>
01705> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01709> 001:0025-----
01710>
01711> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01712> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01713> | IN-09: (HIP-PO) |
01714> | OUT<10: (HIP-PO) |
01715> ID1 10:HIP-PO 77.26 .435 3.39 31.29 .000
01716> +ID2 01:A3 2.70 .044 2.04 12.13 .000
01717> SUM 02:Ultima 79.96 .457 3.29 30.65 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01723> \* CALCULATION OF 3HR - 1:10 YEAR STORM EVENT \*
01724>
01725>
01726> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWHM-1\
01727> | TZERO = .00 hrs on 0 Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWHM-1\
01728> | METOUT= 2 (output = METRIC)
01729> | NSTORM= 0

01733> 001:0002-----
01734>
01735> | CHICAGO STORM | IDF curve parameters: A=1174.184
01736> | Ptotal= 49.50 mm | B= 6.814
01737> | C= .816
01738> used in: INTENSITY = A / (t + B)^C
01739>
01740> Duration of storm = 3.00 hrs
01741> Storm time step = 10.00 min
01742> Time to peak ratio = .33

Table with columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity and volume over time.

01753> 001:0003-----
01754>
01755> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWHM-1\ORGA.VAL

01756> ----- ICASdsv = 1 (read and print data)
01757> FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01758> ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 ----
01759> Horton's infiltration equation parameters:
01760> [Fw= 50.00 mm/hr] [Fw= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
01761> Parameters for PERVIOUS surfaces in STANDHYD:
01762> [IAPER= 4.67 mm] [LGP=40.00 m] [MNI= .250]
01763> Parameters for IMPERVIOUS surfaces in STANDHYD:
01764> [IAMP= 1.57 mm] [CLI= 1.50] [MNI= .035]
01765> Parameters used in WASHYD:
01766> [Ia= 4.67 mm] [N= 3.00]

01768> 001:0004-----
01769> \*
01770> \* ORGAWORLD FILE \*
01771> \*
01772> \*
01773> \* SUB-AREA No.1
01774>
01775> | CALIB STANDHYD | Area (ha)= 2.07
01776> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn. (%)= 84.00

01777> IMPERVIOUS PERVIOUS (i)
01778> Surface Area (ha)= 1.74 .33
01779> Dep. Storage (mm)= 1.57 4.67
01780> Average Slope (%)= 1.52 1.00
01781> Length (m)= 204.72 20.00
01782> Mannings n = .030 .250
01783>
01784> Max.eff.Inten.(mm/hr)= 122.14 34.69
01785> over (min) 7.50 15.00
01786> Storage Coeff. (min)= 7.28 (ii) 16.04 (iii)
01787> Unit Hyd. Tpeak (min)= 7.50 15.00
01788> Unit Hyd. peak (cms)= .15 .07
01789>
01790> PEAK FLOW (cms)= .43 .02 \*TOTALS\*
01791> TIME TO PEAK (hrs)= 1.04 1.21 .437 (iii)
01792> RUNOFF VOLUME (mm)= 47.93 19.25 43.345
01793> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01794> RUNOFF COEFFICIENT = .97 .39 .876

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01795> CN\* = 81.0 Ia = Dep. Storage (Above)
01796> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01797> THAN THE STORAGE COEFFICIENT.
01798> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01804> 001:0005-----
01805> \*
01806> \* SUB-AREA No.2
01807>
01808> | CALIB STANDHYD | Area (ha)= 1.54
01809> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn. (%)= 92.00

01810> IMPERVIOUS PERVIOUS (i)
01811> Surface Area (ha)= 1.42 .12
01812> Dep. Storage (mm)= 1.57 4.67
01813> Average Slope (%)= .50 1.00
01814> Length (m)= 244.34 5.00
01815> Mannings n = .030 .030
01816>
01817> Max.eff.Inten.(mm/hr)= 122.14 42.32
01818> over (min) 7.50 10.00
01819> Storage Coeff. (min)= 8.20 (ii) 9.18 (iii)
01820> Unit Hyd. Tpeak (min)= 7.50 10.00
01821> Unit Hyd. peak (cms)= .14 .12
01822>
01823> PEAK FLOW (cms)= .33 .01 \*TOTALS\*
01824> TIME TO PEAK (hrs)= 1.04 1.13 .341 (iii)
01825> RUNOFF VOLUME (mm)= 47.93 19.25 45.640
01826> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01827> RUNOFF COEFFICIENT = .97 .39 .922

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01828> CN\* = 81.0 Ia = Dep. Storage (Above)
01829> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01830> THAN THE STORAGE COEFFICIENT.
01831> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01837> 001:0006-----
01838> \*
01839> \* SUB-AREA No.3
01840>
01841> | CALIB STANDHYD | Area (ha)= 1.40
01842> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn. (%)= 97.00

01843> IMPERVIOUS PERVIOUS (i)
01844> Surface Area (ha)= 1.36 .04
01845> Dep. Storage (mm)= 1.57 4.67
01846> Average Slope (%)= .51 1.00
01847> Length (m)= 225.63 5.00
01848> Mannings n = .030 .030
01849>
01850> Max.eff.Inten.(mm/hr)= 122.14 48.18
01851> over (min) 7.50 7.50
01852> Storage Coeff. (min)= 7.77 (ii) 8.70 (iii)
01853> Unit Hyd. Tpeak (min)= 7.50 7.50
01854> Unit Hyd. peak (cms)= .15 .14
01855>
01856> PEAK FLOW (cms)= .33 .00 \*TOTALS\*
01857> TIME TO PEAK (hrs)= 1.04 1.08 .329 (iii)
01858> RUNOFF VOLUME (mm)= 47.93 19.25 47.074
01859> TOTAL RAINFALL (mm)= 49.50 49.50 49.505
01860> RUNOFF COEFFICIENT = .97 .39 .951

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01861> CN\* = 81.0 Ia = Dep. Storage (Above)
01862> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01863> THAN THE STORAGE COEFFICIENT.
01864> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

01870> 001:0007-----
01871>
01872> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01873> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01874> | IN-09: (HIP-PO) |
01875> | OUT<10: (HIP-PO) |
01876> ID1 01:010 2.07 .437 1.04 43.35 .000
01877> +ID2 02:020 1.54 .437 1.04 45.64 .000
01878> SUM 04:040 3.61 .778 1.04 44.32 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

01882> 001:0008-----
01883>
01884> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
01885> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
01886> | IN-09: (HIP-PO) |
01887> | OUT<10: (HIP-PO) |
01888> ID1 03:030 1.40 .329 1.04 47.07 .000
01889> +ID2 04:040 3.61 .778 1.04 44.32 .000
01890> SUM 05:050 5.01 1.107 1.04 45.09 .000

02161> Max. eff. inten. (mm/hr) = 122.14 72.53  
02162> over (min) = 7.50 22.50  
02163> Storage Coeff. (min) = 6.77 (ii) 21.93 (iii)  
02164> Unit Hyd. Tpeak (min) = 7.50 22.50  
02165> Unit Hyd. peak (cms) = .16 .05  
02166> \*TOTALS\*  
02167> PEAK FLOW (cms) = 1.54 .42 1.687 (iii)  
02168> TIME TO PEAK (hrs) = 1.04 1.33 1.042  
02170> RUNOFF VOLUME (mm) = 47.93 26.92 37.425  
02171> TOTAL RAINFALL (mm) = 49.50 49.50 49.505  
02172> RUNOFF COEFFICIENT = .97 .54 .756  
02173> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02175> CN\* = 81.0 Ia = Dep. Storage (Above)  
02176> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02177> THAN THE STORAGE COEFFICIENT.  
02178> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02181> 001:0021  
02182> \* SUB-AREA No.5  
02183> | DESIGN NASHYD | Area (ha) = 4.00 Curve Number (CN)=85.00  
02184> | 08:Pond-B DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
02187> U.H. Tp (hrs) = .170  
02188> Unit Hyd Qpeak (cms) = .899  
02189> PEAK FLOW (cms) = .345 (i)  
02190> TIME TO PEAK (hrs) = 1.167  
02191> RUNOFF VOLUME (mm) = 22.420  
02192> TOTAL RAINFALL (mm) = 49.505  
02193> RUNOFF COEFFICIENT = .453  
02194> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02200> 001:0022  
02201> | ADD HYD (HIP08 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02202> ID1 06:HIP06 61.06 5.358 1.17 38.61 .000  
02203> ID2 07:HIP07 12.20 1.687 1.04 37.43 .000  
02204> ID3 08:Pond-B 4.00 .345 1.17 22.42 .000  
02207> SUM 09:HIP08 77.26 7.016 1.17 37.59 .000  
02208> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02213> 001:0023  
02214> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
02215> | IN:09:(HIP08 ) |  
02216> | OUT:10:(HIP-PO) |

OUTFLOW STORAGE (cms)	OUTFLOW STORAGE (ha.m.)	OUTFLOW STORAGE (cms)	OUTFLOW STORAGE (ha.m.)
0.00	0.00E+00	.724	.2210E+01
.048	.5740E-01	.937	.2501E+01
.054	.2434E+00	1.262	.2798E+01
.059	.5834E+00	1.404	.3101E+01
.062	.8400E+00	1.532	.3410E+01
.064	.1102E+01	1.650	.3724E+01
.147	.1370E+01	2.409	.4044E+01
.280	.1644E+01	3.689	.4370E+01
.472	.1924E+01	.000	.0000E+00

02230> ROUTING RESULTS AREA QPEAK TPEAK R.V.  
02231> (ha) (cms) (hrs) (mm)  
02232> INFLOW >09: (HIP08 ) 77.26 7.016 1.167 37.588  
02233> OUTFLOW<10: (HIP-PO) 77.26 .696 3.208 37.588

02234> PEAK FLOW REDUCTION [Qout/Qin] (%) = 9.919  
02235> TIME SHIFT OF PEAK FLOW (min) = 122.50  
02236> MAXIMUM STORAGE USED (ha.m.) = .2178E+01

02240> 001:0024  
02241> \* SUB-AREA No. 6  
02242> | DESIGN NASHYD | Area (ha) = 2.70 Curve Number (CN)=76.00  
02243> | 01:A3 DT= 2.50 | Ia (mm) = 4.670 # of Linear Res. (N)= 3.00  
02246> U.H. Tp (hrs) = .800  
02247> Unit Hyd Qpeak (cms) = .129  
02248> PEAK FLOW (cms) = .059 (i)  
02249> TIME TO PEAK (hrs) = 2.000  
02250> RUNOFF VOLUME (mm) = 16.075  
02251> TOTAL RAINFALL (mm) = 49.505  
02252> RUNOFF COEFFICIENT = .325  
02253> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02258> 001:0025  
02259> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02260> ID1 10:HIP-PO 77.26 .696 3.21 37.59 .000  
02261> ID2 01:A3 2.70 .059 2.00 16.08 .000  
02264> SUM 02:Ultima 79.96 .729 3.15 36.86 .000  
02267> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02271> 001:0026  
02272> \*\*\*\*\* CALCULATION OF 3HR - 1:25 YEAR STORM EVENT \*\*\*\*\*  
02273> \*  
02274> \*\*\*\*\*  
02275> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWMHYM-1  
02276> | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWMHYM-1  
02277> TZERO = .00 hrs on 0  
02278> METFORM = 2 (output = METRIC)  
02279> NRUN = 001  
02280> NSTORM = 0  
02281> 001:0002  
02282> | CHICAGO STORM | IDF curve parameters: A=1402.884  
02283> | Ptotal= 58.23 mm | B= 6.018  
02284> C= .819  
02285> used in: INTENSITY = A / (t + B)^C  
02286> Duration of storm = 3.00 hrs  
02287> Storm time step = 10.00 min  
02288> Time to peak ratio = .33  
02289> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN  
02290> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr  
02291> 3.00 1.04 1.04 1.04  
02292> 10.00 1.04 1.04 1.04  
02293> 10.00 1.04 1.04 1.04  
02294> 10.00 1.04 1.04 1.04  
02295> 10.00 1.04 1.04 1.04

02296> .17 4.934 | 1.00 144.693 | 1.83 9.014 | 2.67 4.701  
02297> .33 6.152 | 1.17 43.904 | 2.00 7.571 | 2.83 4.310  
02298> .50 8.282 | 1.33 22.224 | 2.17 6.544 | 3.00 3.983  
02299> .67 13.006 | 1.50 14.852 | 2.33 5.776 |  
02300> .83 33.041 | 1.67 11.192 | 2.50 5.179 |  
02301>  
02302>  
02303> 001:0003-----  
02304> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWMHYM-1\ORGA.VAL  
02305> | ICASE\$V = 1 (read and print data)  
02306> | FileTitle = ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----  
02307> | PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----  
02308> Horton's infiltration equation parameters:  
02309> [F= 50.00 mm/hr] [F= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]  
02310> Parameters for PERVIOUS surfaces in STANDHYD:  
02311> [IAPER= 4.67 mm] [LGP=40.00 m] [MNP= .250]  
02312> Parameters for IMPERVIOUS surfaces in STANDHYD:  
02313> [IAlmp= 1.57 mm] [CL= 1.50] [MNI= .035]  
02314> Parameters used in NASHYD:  
02315> [Ia= 4.67 mm] [N= 3.00]  
02316>  
02317>  
02318> 001:0004-----  
02319> \*\*\*\*\* ORGAWORLD FILE \*\*\*\*\*  
02320> \* SUB-AREA No.1  
02321> | CALIB STANDHYD | Area (ha) = 2.07  
02322> | 01:010 DT= 2.50 | Total Imp(%) = 84.00 Dir. Conn.(%) = 84.00  
02323>  
02324> IMPERVIOUS PERVIOUS (i)  
02325> Surface Area (ha) = 1.74 .33  
02326> Dep. Storage (mm) = 1.57 4.67  
02327> Average Slope (%) = .52 1.00  
02328> Length (m) = 204.72 20.00  
02329> Mannings n = .030 .250  
02330> Max. eff. Inten. (mm/hr) = 144.69 47.07  
02331> over (min) = 7.50 15.00  
02332> Storage Coeff. (min) = 6.81 (ii) 14.56 (iii)  
02333> Unit Hyd. Tpeak (min) = 7.50 15.00  
02334> Unit Hyd. peak (cms) = .16 .08  
02335> \*TOTALS\*  
02336> PEAK FLOW (cms) = .52 .03 .532 (iii)  
02337> TIME TO PEAK (hrs) = 1.04 1.21 1.042  
02338> RUNOFF VOLUME (mm) = 56.66 25.35 51.647  
02339> TOTAL RAINFALL (mm) = 58.23 58.23 58.226  
02340> RUNOFF COEFFICIENT = .97 .44 .887  
02341> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02342> CN\* = 81.0 Ia = Dep. Storage (Above)  
02343> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02344> THAN THE STORAGE COEFFICIENT.  
02345> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02353> 001:0005  
02354> \* SUB-AREA No. 2  
02355> | CALIB STANDHYD | Area (ha) = 1.54  
02356> | 02:020 DT= 2.50 | Total Imp(%) = 92.00 Dir. Conn.(%) = 92.00  
02357>  
02358> IMPERVIOUS PERVIOUS (i)  
02359> Surface Area (ha) = 1.42 .12  
02360> Dep. Storage (mm) = 1.57 4.67  
02361> Average Slope (%) = .50 1.00  
02362> Length (m) = 244.34 5.00  
02363> Mannings n = .030 .030  
02364> Max. eff. Inten. (mm/hr) = 144.69 65.19  
02365> over (min) = 7.50 7.50  
02366> Storage Coeff. (min) = 7.66 (ii) 8.49 (iii)  
02367> Unit Hyd. Tpeak (min) = 7.50 7.50  
02368> Unit Hyd. peak (cms) = .15 .14  
02369> \*TOTALS\*  
02370> PEAK FLOW (cms) = .40 .01 .418 (iii)  
02371> TIME TO PEAK (hrs) = 1.04 1.08 1.042  
02372> RUNOFF VOLUME (mm) = 56.66 25.35 54.152  
02373> TOTAL RAINFALL (mm) = 58.23 58.23 58.226  
02374> RUNOFF COEFFICIENT = .97 .44 .930  
02375> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02376> CN\* = 81.0 Ia = Dep. Storage (Above)  
02377> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02378> THAN THE STORAGE COEFFICIENT.  
02379> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02387> 001:0006  
02388> \* SUB-AREA No.3  
02389> | CALIB STANDHYD | Area (ha) = 1.40  
02390> | 03:030 DT= 2.50 | Total Imp(%) = 97.00 Dir. Conn.(%) = 97.00  
02391>  
02392> IMPERVIOUS PERVIOUS (i)  
02393> Surface Area (ha) = 1.36 .04  
02394> Dep. Storage (mm) = 1.57 4.67  
02395> Average Slope (%) = .51 1.00  
02396> Length (m) = 225.63 5.00  
02397> Mannings n = .030 .030  
02398> Max. eff. Inten. (mm/hr) = 144.69 65.19  
02399> over (min) = 7.50 7.50  
02400> Storage Coeff. (min) = 7.26 (ii) 8.09 (iii)  
02401> Unit Hyd. Tpeak (min) = 7.50 7.50  
02402> Unit Hyd. peak (cms) = .15 .14  
02403> \*TOTALS\*  
02404> PEAK FLOW (cms) = .40 .00 .400 (iii)  
02405> TIME TO PEAK (hrs) = 1.04 1.08 1.042  
02406> RUNOFF VOLUME (mm) = 56.66 25.35 55.717  
02407> TOTAL RAINFALL (mm) = 58.23 58.23 58.226  
02408> RUNOFF COEFFICIENT = .97 .44 .957  
02409> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
02410> CN\* = 81.0 Ia = Dep. Storage (Above)  
02411> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
02412> THAN THE STORAGE COEFFICIENT.  
02413> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

02418> 001:0007  
02419> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF  
02420> ID1 01:010 2.07 .532 1.04 51.65 .000  
02421> ID2 02:020 1.54 .418 1.04 54.15 .000  
02422> SUM 04:040 3.61 .950 1.04 52.72 .000  
02423> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.





```

02701> | CALIB STANDHYD | Area (ha)= 12.20
02702> | 07:HIP07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
02703>
02704>
02705>
02706> Surface Area (ha)= IMPERVIOUS PERVIOUS (i)
02707> Dep. Storage (mm)= 1.57 4.67
02708> Average Slope (%)= .70 1.50
02709> Length (m)= 210.00 100.00
02710> Mannings n = .030 .250
02711>
02712> Max. eff. Inten. (mm/hr)= 144.69 101.36
02713> over (min)= 7.50 20.00
02714> Storage Coeff. (min)= 6.32 (ii) 19.58 (ii)
02715> Unit Hyd. Tpeak (min)= 7.50 20.00
02716> Unit Hyd. peak (cms)= .17 .06
02717>
02718> PEAK FLOW (cms)= 1.86 .59 *TOTALS*
02719> TIME TO PEAK (hrs)= 1.04 1.29 2.109 (iii)
02720> RUNOFF VOLUME (mm)= 56.66 34.22 45.437
02721> TOTAL RAINFALL (mm)= 58.23 58.23 58.226
02722> RUNOFF COEFFICIENT = .97 .59 .780
02723>
02724> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02725> CN* = 81.0 Ia = Dep. Storage (Above)
02726> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02727> THAN THE STORAGE COEFFICIENT.
02728> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02729>
02731> 001:0021-----
02732> *
02733> *SUB-AREA No.5
02734> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
02735> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
02736> | U.H. Tp (hrs)= .170
02737>
02738>
02739> Unit Hyd Qpeak (cms)= .899
02740>
02741> PEAK FLOW (cms)= .459 (i)
02742> TIME TO PEAK (hrs)= 1.167
02743> RUNOFF VOLUME (mm)= 29.155
02744> TOTAL RAINFALL (mm)= 58.226
02745> RUNOFF COEFFICIENT = .501
02746>
02747> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02748>
02749>
02750> 001:0022-----
02751>
02752> | ADD HYD (HIP08) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02753> (ha) (cms) (hrs) (mm) (cms)
02754> ID1 06:HIP06 61.06 6.741 1.17 46.70 .000
02755> +ID2 07:HIP07 12.20 2.109 1.04 45.44 .000
02756> +ID3 08:Pond-B 4.00 .459 1.17 29.15 .000
02757>
02758> SUM 09:HIP08 77.26 8.998 1.13 45.59 .000
02759>
02760> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02761>
02762>
02763> 001:0023-----
02764>
02765> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
02766> | IN:09: (HIP08) |
02767> | OUT:10: (HIP-PO) |
02768>
02769> ===== OUTFLOW STORAGE TABLE =====
02770> OUTFLOW STORAGE OUTFLOW STORAGE
02771> (cms) (ha.m.) (cms) (ha.m.)
02772> .000 .000E+00 | .724 .2210E+01
02773> .048 .5740E+01 | .937 .2501E+01
02774> .054 .2434E+00 | 1.262 .2798E+01
02775> .059 .5834E+00 | 1.404 .3101E+01
02776> .062 .8400E+00 | 1.532 .3410E+01
02777> .064 .1102E+01 | 1.650 .3724E+01
02778> .147 .1370E+01 | 2.409 .4042E+01
02779> .280 .1644E+01 | 3.689 .4370E+01
02780> .472 .1924E+01 | .000 .0000E+00
02781>
02782> ROUTING RESULTS AREA OPEAK TPEAK R.V.
02783> (ha) (cms) (hrs) (mm)
02784> INFLOW:09: (HIP08) 77.26 8.998 1.125 45.591
02785> OUTFLOW:10: (HIP-PO) 77.26 1.004 3.083 45.591
02786>
02787> PEAK FLOW REDUCTION [Qout/Qin] (%) = 11.160
02788> TIME SHIFT OF PEAK FLOW (min) = 117.50
02789> MAXIMUM STORAGE USED (ha.m.) = 2562E+01
02790>
02791> 001:0024-----
02792> *
02793> *SUB-AREA No. 6
02794> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
02795> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
02796> | U.H. Tp (hrs)= .800
02797>
02798> Unit Hyd Qpeak (cms)= .129
02799>
02800> PEAK FLOW (cms)= .079 (i)
02801> TIME TO PEAK (hrs)= 2.000
02802> RUNOFF VOLUME (mm)= 21.442
02803> TOTAL RAINFALL (mm)= 58.226
02804> RUNOFF COEFFICIENT = .368
02805>
02806> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02807>
02808>
02809> 001:0025-----
02810>
02811> | ADD HYD (Ultima) | ID: NHYD AREA OPEAK TPEAK R.V. DWF
02812> (ha) (cms) (hrs) (mm) (cms)
02813> ID1 10:HIP-PO 77.26 1.004 3.08 45.59 .000
02814> +ID2 01:A3 2.70 .079 2.00 21.44 .000
02815>
02816> SUM 02:Ultima 79.96 1.051 3.01 44.78 .000
02817>
02818> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02819>
02820>
02821> 001:0026-----
02822> *
02823> * CALCULATION OF 3HR - 1:50 YEAR STORM EVENT *
02824> *
02825>
02826> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
02827> | | Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
02828> TZERO = .00 hrs on 0
02829> METOUT= 2 (output = METRIC)
02830> NRUN = 001
02831> NSTORM= 0
02832>
02833> 001:0002-----
02834>
02835> | CHICAGO STORM | IDF curve parameters: A=1569.580

```

```

02836> | Total= 64.81 mm | B= 6.014
02837> C= .820
02838> used in: INTENSITY = A / (t + B)^C
02839>
02840> Duration of storm = 3.00 hrs
02841> Storm time step = 10.00 min
02842> Time to peak ratio = .33
02843>
02844> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
02845> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
02846> .17 5.467 | 1.00 161.471 | 1.83 10.000 | 2.67 5.209
02847> .33 6.820 | 1.17 48.876 | 2.00 8.387 | 2.83 4.774
02848> .50 9.187 | 1.33 24.704 | 2.17 7.256 | 3.00 4.412
02849> .67 14.441 | 1.50 16.495 | 2.33 6.403 |
02850> .83 36.764 | 1.67 12.422 | 2.50 5.740 |
02851>
02852>
02853> 001:0003-----
02854>
02855> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\ORGA.VAL
02856> | CASADV = 1 (read and print data)
02857> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02858> | ----- PARAMETER VALUES MUST BE ENTERED AFTER COLUMN 60 -----
02859> Horton's infiltration equation parameters:
02860> [P= 50.00 mm/hr] [Pc= 7.50 mm/hr] [DCAY= 2.00 /hr] [P= .00 mm]
02861> Parameters for PERVIOUS surfaces in STANDHYD:
02862> [IAPER= 4.67 mm] [LGP=40.00 mm] [MNI= 2.50]
02863> Parameters for IMPERVIOUS surfaces in STANDHYD:
02864> [LAImp= 1.57 mm] [CLI=1.50] [MNI=.035]
02865> Parameters used in NASHYD:
02866> [Ia= 4.67 mm] [N= 3.00]
02867>
02868> 001:0004-----
02869> *
02870> * ORGAWORLD FILE *
02871> *
02872> *
02873> * SUB-AREA No.1
02874>
02875> | CALIB STANDHYD | Area (ha)= 2.07 Dir. Conn.(%)= 84.00
02876> | 01:010 DT= 2.50 | Total Imp(%)= 84.00
02877>
02878> IMPERVIOUS PERVIOUS (i)
02879> Surface Area (ha)= 1.74 .33
02880> Dep. Storage (mm)= 1.57 4.67
02881> Average Slope (%)= .52 1.00
02882> Length (m)= 204.72 20.00
02883> Mannings n = .030 .250
02884>
02885> Max. eff. Inten. (mm/hr)= 161.47 62.27
02886> over (min)= 7.50 12.50
02887> Storage Coeff. (min)= 6.51 (ii) 13.44 (ii)
02888> Unit Hyd. Tpeak (min)= 7.50 12.50
02889> Unit Hyd. peak (cms)= .16 .09
02890>
02891> PEAK FLOW (cms)= .59 .03 *TOTALS*
02892> TIME TO PEAK (hrs)= 1.04 1.01 1.609 (iii)
02893> RUNOFF VOLUME (mm)= 63.24 30.21 57.952
02894> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02895> RUNOFF COEFFICIENT = .98 .47 .894
02896>
02897> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02898> CN* = 81.0 Ia = Dep. Storage (Above)
02899> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02900> THAN THE STORAGE COEFFICIENT.
02901> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02902>
02903>
02904> 001:0005-----
02905> *
02906> * SUB-AREA No.2
02907>
02908> | CALIB STANDHYD | Area (ha)= 1.54 Dir. Conn.(%)= 92.00
02909> | 02:020 DT= 2.50 | Total Imp(%)= 92.00
02910>
02911> IMPERVIOUS PERVIOUS (i)
02912> Surface Area (ha)= 1.42 .12
02913> Dep. Storage (mm)= 1.57 4.67
02914> Average Slope (%)= .50 1.00
02915> Length (m)= 244.34 5.00
02916> Mannings n = .030 .030
02917>
02918> Max. eff. Inten. (mm/hr)= 161.47 78.73
02919> over (min)= 7.50 7.50
02920> Storage Coeff. (min)= 7.33 (ii) 8.10 (ii)
02921> Unit Hyd. Tpeak (min)= 7.50 7.50
02922> Unit Hyd. peak (cms)= .15 .14
02923>
02924> PEAK FLOW (cms)= .46 .02 *TOTALS*
02925> TIME TO PEAK (hrs)= 1.04 1.08 1.042
02926> RUNOFF VOLUME (mm)= 63.24 30.21 60.594
02927> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02928> RUNOFF COEFFICIENT = .98 .47 .935
02929>
02930> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02931> CN* = 81.0 Ia = Dep. Storage (Above)
02932> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02933> THAN THE STORAGE COEFFICIENT.
02934> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02935>
02936>
02937> 001:0006-----
02938> *
02939> * SUB-AREA No.3
02940>
02941> | CALIB STANDHYD | Area (ha)= 1.40 Dir. Conn.(%)= 97.00
02942> | 03:030 DT= 2.50 | Total Imp(%)= 97.00
02943>
02944> IMPERVIOUS PERVIOUS (i)
02945> Surface Area (ha)= 1.36 .04
02946> Dep. Storage (mm)= 1.57 4.67
02947> Average Slope (%)= .51 1.00
02948> Length (m)= 225.63 5.00
02949> Mannings n = .030 .030
02950>
02951> Max. eff. Inten. (mm/hr)= 161.47 78.73
02952> over (min)= 7.50 7.50
02953> Storage Coeff. (min)= 6.95 (ii) 7.72 (ii)
02954> Unit Hyd. Tpeak (min)= 7.50 7.50
02955> Unit Hyd. peak (cms)= .16 .15
02956>
02957> PEAK FLOW (cms)= .45 .01 *TOTALS*
02958> TIME TO PEAK (hrs)= 1.04 1.08 1.042 (iii)
02959> RUNOFF VOLUME (mm)= 63.24 30.21 62.245
02960> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
02961> RUNOFF COEFFICIENT = .98 .47 .960
02962>
02963> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02964> CN* = 81.0 Ia = Dep. Storage (Above)
02965> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02966> THAN THE STORAGE COEFFICIENT.
02967> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02968>
02969>
02970> 001:0007-----

```

02971> ADD HYD (040) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02972> ID1 01:010 2.07 .609 1.04 57.95 .000
02974> +ID2 02:020 1.54 .475 1.04 60.59 .000
02976> SUM 04:040 3.61 1.084 1.04 59.08 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02982> 001:0008 ADD HYD (050) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
02983> ID1 03:030 1.40 .454 1.04 62.25 .000
02987> +ID2 04:040 3.61 1.084 1.04 59.08 .000
02989> SUM 05:050 5.01 1.538 1.04 59.96 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

02992> 001:0009 CALIB STANDHYD | Area (ha)= .89 Dir. Conn.(%)= 97.00
02993> 06:060 DT= 2.50 Total Imp(%)= 97.00

03001> IMPERVIOUS PERVIOUS (i)
03002> Surface Area (ha)= .86 .03
03003> Dep. Storage (mm)= 1.57 4.67
03004> Average Slope (%)= .93 .70
03005> Length (m)= 164.82 40.00
03006> Mannings n = .030 .250
03008> Max. eff. Inten. (mm/hr)= 161.47 53.28
03009> over (min)= 5.00 17.50
03010> Storage Coeff. (min)= 4.80 (ii) 17.24 (ii)
03011> Unit Hyd. Tpeak (min)= 5.00 17.50
03012> Unit Hyd. peak (cms)= .23 .07
03013> PEAK FLOW (cms)= .33 .00 \*TOTALS\*
03014> TIME TO PEAK (hrs)= 1.25 1.00 3.35 (iii)
03016> RUNOFF VOLUME (mm)= 63.24 30.21 62.245
03017> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
03018> RUNOFF COEFFICIENT = .98 .47 960

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

03022> 001:0010 CALIB STANDHYD | Area (ha)= 2.66 Dir. Conn.(%)= 97.00
03023> 07:070 DT= 2.50 Total Imp(%)= 97.00

03034> IMPERVIOUS PERVIOUS (i)
03035> Surface Area (ha)= 2.58 .08
03036> Dep. Storage (mm)= 1.57 4.67
03037> Average Slope (%)= .61 1.50
03038> Length (m)= 207.25 20.00
03039> Mannings n = .030 .250
03041> Max. eff. Inten. (mm/hr)= 161.47 62.27
03042> over (min)= 7.50 12.50
03043> Storage Coeff. (min)= 6.26 (ii) 12.39 (ii)
03044> Unit Hyd. Tpeak (min)= 7.50 12.50
03045> Unit Hyd. peak (cms)= .17 .09
03046> PEAK FLOW (cms)= .88 .01 \*TOTALS\*
03047> TIME TO PEAK (hrs)= 1.04 1.17 1.042
03048> RUNOFF VOLUME (mm)= 63.24 30.21 62.245
03049> TOTAL RAINFALL (mm)= 64.81 64.81 64.806
03051> RUNOFF COEFFICIENT = .98 .47 960

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 81.0 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.

03062> 001:0011 ADD HYD (080) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03063> ID1 06:060 .89 .335 1.00 62.25 .000
03065> +ID2 07:070 2.66 .886 1.04 62.25 .000
03067> SUM 08:080 3.55 1.197 1.04 62.25 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03072> 001:0012 ADD HYD (090) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03073> ID1 05:050 5.01 1.538 1.04 59.96 .000
03077> +ID2 08:080 3.55 1.197 1.04 62.25 .000
03079> SUM 09:090 8.56 2.735 1.04 60.91 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03086> ROUTE RESERVOIR | Requested routing time step = 1.0 min.
03087> IN>09:(090) |
03088> OUT<10:(POND) |

03089> OUTFLOW STORAGE TABLE
03090> OUTFLOW STORAGE | OUTFLOW STORAGE
03091> (cms) (ha.m.) | (cms) (ha.m.)
03092> .000 0.000E+00 | .593 6251E+00
03093> .008 6560E-01 | .654 6631E+00
03094> .017 1.311E+00 | .797 7391E+00
03095> .093 2.831E+00 | .950 8274E+00
03096> .233 3.971E+00 | 1.304 9157E+00
03097> .337 4.731E+00 | 1.860 1004E+01
03098> .465 5.491E+00 | 2.577 1092E+01
03099> .531 5.871E+00 | .000 0.000E+00

03100> ROUTING RESULTS AREA QPEAK TPEAK R.V.
03101> (ha) (cms) (hrs) (mm)
03102> INFLOW >09: (090) 8.56 2.735 1.042 60.910
03103> OUTFLOW <10: (POND) 8.56 .233 1.944 60.908
03104> PEAK FLOW REDUCTION [Qout/Qin] (%) = 8.503

03106> TIME SHIFT OF PEAK FLOW (min)= 54.17
03107> MAXIMUM STORAGE USED (ha.m.)= 3967E+00
03108>

03109> 001:0014
03110> \*\*\*\*\*
03111> Remaining Hawthorne Industrial Park
03112> \*
03113> \*\*\*\*\*

03114> \* SUB-AREA No.1
03115>
03116> CALIB STANDHYD | Area (ha)= 19.90
03118> 01:HIP01 DT= 2.50 Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

03119> IMPERVIOUS PERVIOUS (i)
03120> Surface Area (ha)= 14.13 5.77
03122> Dep. Storage (mm)= 1.57 4.67
03123> Average Slope (%)= .60 1.50
03124> Length (m)= 580.00 100.00
03125> Mannings n = .030 .250
03126> Max. eff. Inten. (mm/hr)= 138.95 102.13
03128> over (min)= 12.50 25.00
03129> Storage Coeff. (min)= 12.38 (ii) 25.60 (ii)
03130> Unit Hyd. Tpeak (min)= 12.50 25.00
03131> Unit Hyd. peak (cms)= .09 .04
03132> PEAK FLOW (cms)= 2.46 .95 \*TOTALS\*
03133> TIME TO PEAK (hrs)= 1.13 1.38 3.001 (iii)
03134> RUNOFF VOLUME (mm)= 63.24 39.90 1.167
03135> TOTAL RAINFALL (mm)= 64.81 64.81 51.566
03136> RUNOFF COEFFICIENT = .98 .62 64.806
03137> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03138> CN\* = 81.0 Ia = Dep. Storage (Above)
03139> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
03140> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03141> 001:0015

03148> ADD HYD (HIP02) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03149> ID1 10:POND 8.56 .233 1.94 60.91 .000
03151> +ID2 01:HIP01 19.90 3.001 1.17 51.57 .000
03152> SUM 02:HIP02 28.46 3.092 1.17 54.37 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03158> 001:0016 CALIB STANDHYD | Area (ha)= 17.00
03159> 03:HIP03 DT= 2.50 Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

03160> IMPERVIOUS PERVIOUS (i)
03161> Surface Area (ha)= 12.07 4.93
03162> Dep. Storage (mm)= 1.57 4.67
03163> Average Slope (%)= .65 1.50
03164> Length (m)= 450.00 100.00
03165> Mannings n = .030 .250
03167> Max. eff. Inten. (mm/hr)= 161.47 109.61
03170> over (min)= 10.00 22.50
03171> Storage Coeff. (min)= 9.77 (ii) 22.63 (ii)
03172> Unit Hyd. Tpeak (min)= 10.00 22.50
03173> Unit Hyd. peak (cms)= .11 .05
03174> PEAK FLOW (cms)= 2.38 .88 \*TOTALS\*
03175> TIME TO PEAK (hrs)= 1.08 1.33 2.819 (iii)
03176> RUNOFF VOLUME (mm)= 63.24 39.90 1.125
03177> TOTAL RAINFALL (mm)= 64.81 64.81 51.566
03178> RUNOFF COEFFICIENT = .98 .62 64.806
03179> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03180> CN\* = 81.0 Ia = Dep. Storage (Above)
03181> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
03182> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03183> 001:0017

03192> \* SUB-AREA No.3
03193> CALIB STANDHYD | Area (ha)= 15.60
03194> 04:HIP04 DT= 2.50 Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00

03195> IMPERVIOUS PERVIOUS (i)
03196> Surface Area (ha)= 11.08 4.52
03197> Dep. Storage (mm)= 1.57 4.67
03198> Average Slope (%)= .50 1.50
03199> Length (m)= 600.00 100.00
03200> Mannings n = .030 .250
03201> Max. eff. Inten. (mm/hr)= 138.95 96.02
03202> over (min)= 12.50 27.50
03203> Storage Coeff. (min)= 13.34 (ii) 26.90 (ii)
03204> Unit Hyd. Tpeak (min)= 12.50 27.50
03205> Unit Hyd. peak (cms)= .09 .04
03206> PEAK FLOW (cms)= 1.86 .72 \*TOTALS\*
03207> TIME TO PEAK (hrs)= 1.13 1.42 2.237 (iii)
03208> RUNOFF VOLUME (mm)= 63.24 39.90 1.167
03209> TOTAL RAINFALL (mm)= 64.81 64.81 51.566
03210> RUNOFF COEFFICIENT = .98 .62 64.806
03211> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03212> CN\* = 81.0 Ia = Dep. Storage (Above)
03213> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
03214> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03215> 001:0018

03224> 001:0018 ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03225> ID1 03:HIP03 17.00 2.819 1.13 51.57 .000
03226> +ID2 04:HIP04 15.60 2.237 1.17 51.57 .000
03227> SUM 05:HIP05 32.60 5.019 1.13 51.57 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03232> 001:0019 ADD HYD (HIP06) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03233> ID1 05:HIP05 32.60 5.019 1.13 51.57 .000



03511> RUNOFF COEFFICIENT = .98 .49 .964  
03512>  
03513> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03514> CN\* = 81.0 Ia = Dep. Storage (Above)  
03515> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03516> THAN THE STORAGE COEFFICIENT.  
03517> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03518>  
03519>  
03520> 001:0007-----  
03521>  
03522> | ADD HYD (040 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03523> | (ha) (cms) (hrs) (mm) (cms)  
03524> ID1 01:010 2.07 .695 1.04 64.55 .000  
03525> +ID2 02:020 1.54 .534 1.04 67.32 .000  
03526> -----  
03527> SUM 04:040 3.61 1.220 1.04 65.74 .000  
03528>  
03529> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03530>  
03531>  
03532> 001:0008-----  
03533> | ADD HYD (050 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03534> | (ha) (cms) (hrs) (mm) (cms)  
03535> ID1 03:030 1.40 .509 1.04 69.06 .000  
03536> +ID2 04:040 3.61 1.220 1.04 65.74 .000  
03537> -----  
03538> SUM 05:050 5.01 1.729 1.04 66.66 .000  
03539>  
03540> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03541>  
03542>  
03543> 001:0009-----  
03544> \* SUB-AREA No.4  
03545>  
03546> | CALIB STANDHYD | Area (ha)= .89 Dir. Conn.(%)= 97.00  
03547> | 06:050 DT= 2.50 | Total Imp(%)= 97.00  
03548>  
03549> IMPERVIOUS PERVIOUS (i)  
03550> Surface Area (ha)= .86 .03  
03551> Dep. Storage (mm)= 1.57 4.67  
03552> Average Slope (%)= .93 1.50  
03553> Length (m)= 164.82 40.00  
03554> Mannings n = .030 .250  
03555>  
03556> Max.eff.Inten.(mm/hr)= 178.56 67.61  
03557> over (min) = 5.00 15.00  
03558> Storage Coeff. (min)= 4.62 (ii) 15.92 (ii)  
03559> Unit Hyd. Tpeak (min)= 5.00 15.00  
03560> Unit Hyd. peak (cms)= .24 .07  
03561>  
03562> PEAK FLOW (cms)= .37 .00 \*TOTALS\*  
03563> TIME TO PEAK (hrs)= 1.00 1.21 1.000 (iii)  
03564> RUNOFF VOLUME (mm)= 70.09 35.46 69.056  
03565> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03566> RUNOFF COEFFICIENT = .98 .49 .964  
03567>  
03568> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03569> CN\* = 81.0 Ia = Dep. Storage (Above)  
03570> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03571> THAN THE STORAGE COEFFICIENT.  
03572> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03573>  
03574>  
03575>  
03576>  
03577> 001:0010-----  
03578> \* SUB-AREA No.5  
03579>  
03580> | CALIB STANDHYD | Area (ha)= 2.66 Dir. Conn.(%)= 97.00  
03581> | 07:070 DT= 2.50 | Total Imp(%)= 97.00  
03582>  
03583> IMPERVIOUS PERVIOUS (i)  
03584> Surface Area (ha)= 2.58 .08  
03585> Dep. Storage (mm)= 1.57 4.67  
03586> Average Slope (%)= .61 1.50  
03587> Length (m)= 207.25 20.00  
03588> Mannings n = .030 .250  
03589>  
03590> Max.eff.Inten.(mm/hr)= 178.56 74.05  
03591> over (min) = 5.00 12.50  
03592> Storage Coeff. (min)= 6.01 (ii) 11.73 (ii)  
03593> Unit Hyd. Tpeak (min)= 5.00 12.50  
03594> Unit Hyd. peak (cms)= .20 .09  
03595>  
03596> PEAK FLOW (cms)= 1.03 .01 \*TOTALS\*  
03597> TIME TO PEAK (hrs)= 1.00 1.17 1.000 (iii)  
03598> RUNOFF VOLUME (mm)= 70.09 35.46 69.056  
03599> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03600> RUNOFF COEFFICIENT = .98 .49 .964  
03601>  
03602> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03603> CN\* = 81.0 Ia = Dep. Storage (Above)  
03604> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03605> THAN THE STORAGE COEFFICIENT.  
03606> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03607>  
03608>  
03609>  
03610> 001:0011-----  
03611> | ADD HYD (080 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03612> | (ha) (cms) (hrs) (mm) (cms)  
03613> ID1 06:060 2.89 .374 1.00 69.06 .000  
03614> +ID2 07:070 2.66 1.034 1.00 69.06 .000  
03615> -----  
03616> SUM 08:080 3.55 1.408 1.00 69.06 .000  
03617>  
03618> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03619>  
03620>  
03621> 001:0012-----  
03622> | ADD HYD (090 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03623> | (ha) (cms) (hrs) (mm) (cms)  
03624> ID1 05:050 5.01 1.729 1.04 66.66 .000  
03625> +ID2 08:080 3.55 1.408 1.00 69.06 .000  
03626> -----  
03627> SUM 09:090 8.56 3.067 1.04 67.66 .000  
03628>  
03629> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03630>  
03631>  
03632> 001:0013-----  
03633> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.  
03634> | IN>09: (090 ) |  
03635> | OUT<10: (POND ) |  
03636>  
03637> ===== OUTFLOW STORAGE TABLE =====  
03638> OUTFLOW STORAGE OUTFLOW STORAGE  
03639> (cms) (ha.m.) (cms) (ha.m.)  
03640> .000 .0000E+00 | .583 .6251E+00  
03641> .008 .6560E-01 | .654 .6631E+00  
03642> .017 .1311E+00 | .797 .7391E+00  
03643> .093 .2831E+00 | .950 .8274E+00  
03644> .233 .3971E+00 | 1.304 .9157E+00  
03645>

03646> .337 .4731E+00 | 1.880 .1004E+01  
03647> .465 .5491E+00 | 2.577 .1092E+01  
03648> .531 .5871E+00 | .000 .0000E+00  
03649>  
03650> ROUTING RESULTS AREA OPEAK TPEAK R.V.  
03651> (ha) (cms) (hrs) (mm)  
03652> INFLOW>09: (090 ) 8.56 3.067 1.042 67.655  
03653> OUTFLOW<10: (POND ) 8.56 .283 1.861 67.653  
03654>  
03655> PEAK FLOW REDUCTION [Qout/Qin] (%) = 9.214  
03656> TIME SHIFT OF PEAK FLOW (min) = 49.17  
03657> MAXIMUM STORAGE USED (ha.m.) = .4333E+00  
03658>  
03659>  
03660> 001:0014-----  
03661> \*\*\*\*\*  
03662> \* Remaining Hawthorne Industrial Park \*  
03663> \*\*\*\*\*  
03664> \* SUB-AREA No.1  
03665>  
03666> | CALIB STANDHYD | Area (ha)= 19.90  
03667> | 01:HIP01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03668>  
03669> IMPERVIOUS PERVIOUS (i)  
03670> Surface Area (ha)= 14.13 5.77  
03671> Dep. Storage (mm)= 1.57 4.67  
03672> Average Slope (%)= .60 1.50  
03673> Length (m)= 580.00 100.00  
03674> Mannings n = .030 .250  
03675>  
03676> Max.eff.Inten.(mm/hr)= 153.66 117.89  
03677> over (min) = 12.50 25.00  
03678> Storage Coeff. (min)= 11.89 (ii) 24.37 (ii)  
03679> Unit Hyd. Tpeak (min)= 12.60 25.00  
03680> Unit Hyd. peak (cms)= .09 .05  
03681>  
03682> PEAK FLOW (cms)= 2.77 1.13 \*TOTALS\*  
03683> TIME TO PEAK (hrs)= 1.13 1.38 3.419 (iii)  
03684> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03685> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03686> RUNOFF COEFFICIENT = .98 .64 .810  
03687>  
03688> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03689> CN\* = 81.0 Ia = Dep. Storage (Above)  
03690> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03691> THAN THE STORAGE COEFFICIENT.  
03692> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03693>  
03694>  
03695> 001:0015-----  
03696> | ADD HYD (HIPO2 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03697> | (ha) (cms) (hrs) (mm) (cms)  
03698> ID1 10:POND 8.56 .283 1.86 67.65 .000  
03699> +ID2 01:HIP01 19.90 3.419 1.17 58.02 .000  
03700> -----  
03701> SUM 02:HIPO2 28.46 3.554 1.17 60.91 .000  
03702>  
03703> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03704>  
03705>  
03706> 001:0016-----  
03707> \* SUB-AREA No.2  
03708>  
03709> | CALIB STANDHYD | Area (ha)= 17.00  
03710> | 03:HIP03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03711>  
03712> IMPERVIOUS PERVIOUS (i)  
03713> Surface Area (ha)= 12.07 4.93  
03714> Dep. Storage (mm)= 1.57 4.67  
03715> Average Slope (%)= .65 1.50  
03716> Length (m)= 450.00 100.00  
03717> Mannings n = .030 .250  
03718>  
03719> Max.eff.Inten.(mm/hr)= 178.56 126.60  
03720> over (min) = 10.00 22.50  
03721> Storage Coeff. (min)= 9.39 (ii) 21.52 (ii)  
03722> Unit Hyd. Tpeak (min)= 10.00 22.50  
03723> Unit Hyd. peak (cms)= .12 .05  
03724>  
03725> PEAK FLOW (cms)= 2.68 1.05 \*TOTALS\*  
03726> TIME TO PEAK (hrs)= 1.08 1.33 3.203 (iii)  
03727> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03728> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03729> RUNOFF COEFFICIENT = .98 .64 .810  
03730>  
03731> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03732> CN\* = 81.0 Ia = Dep. Storage (Above)  
03733> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03734> THAN THE STORAGE COEFFICIENT.  
03735> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03736>  
03737>  
03738> 001:0017-----  
03739> \* SUB-AREA No.3  
03740>  
03741> | CALIB STANDHYD | Area (ha)= 15.60  
03742> | 04:HIP04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00  
03743>  
03744> IMPERVIOUS PERVIOUS (i)  
03745> Surface Area (ha)= 11.08 4.52  
03746> Dep. Storage (mm)= 1.57 4.67  
03747> Average Slope (%)= .50 1.50  
03748> Length (m)= 600.00 100.00  
03749> Mannings n = .030 .250  
03750>  
03751> Max.eff.Inten.(mm/hr)= 153.66 117.89  
03752> over (min) = 12.50 25.00  
03753> Storage Coeff. (min)= 12.82 (ii) 25.30 (ii)  
03754> Unit Hyd. Tpeak (min)= 12.50 25.00  
03755> Unit Hyd. peak (cms)= .09 .04  
03756>  
03757> PEAK FLOW (cms)= 2.10 .87 \*TOTALS\*  
03758> TIME TO PEAK (hrs)= 1.13 1.38 2.612 (iii)  
03759> RUNOFF VOLUME (mm)= 70.09 45.94 58.015  
03760> TOTAL RAINFALL (mm)= 71.66 71.66 71.665  
03761> RUNOFF COEFFICIENT = .98 .64 .810  
03762>  
03763> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
03764> CN\* = 81.0 Ia = Dep. Storage (Above)  
03765> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
03766> THAN THE STORAGE COEFFICIENT.  
03767> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.  
03768>  
03769>  
03770> 001:0018-----  
03771> | ADD HYD (HIPO5 ) | ID: NHYD AREA OPEAK TPEAK R.V. DWF  
03772> | (ha) (cms) (hrs) (mm) (cms)  
03773> ID1 03:HIP03 17.00 3.203 1.13 58.02 .000  
03774> +ID2 04:HIP04 15.60 2.612 1.17 58.02 .000  
03775> -----  
03776> SUM 04:HIPO5 32.60 5.815 1.15 58.02 .000  
03777>  
03778> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.  
03779>  
03780>

03781> SUM 05:HIP05 32.60 5.767 1.13 58.02 .000

03782> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03783> 03784> 03785> 03786> 001:0019-----
03787> | ADD HYD (HIP05) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03788> (ha) (cms) (hrs) (mm) (cms)
03789> ID1 05:HIP05 32.60 5.767 1.13 58.02 .000
03790> +ID2 02:HIP02 28.46 3.554 1.17 60.91 .000
03791>
03792> SUM 06:HIP06 61.06 9.239 1.13 59.36 .000
03793>
03794> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03795> 03796> 03797> 001:0020-----

03798> \* SUB-AREA No.4

03801> | CALIB STANDHYD | Area (ha)= 12.20
03802> | DT:HIP07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
03803>
03804>

03805> IMPERVIOUS PERVIOUS (i)
03806> Surface Area (ha)= 8.66 3.54
03807> Dep. Storage (mm)= 1.57 4.67
03808> Average Slope (%)= .70 1.50
03809> Length (m)= 210.00 100.00
03810> Mannings n = .030 .250
03811>
03812> Max. eff. Inten. (mm/hr)= 178.56 146.17
03813> over (min)= 5.00 17.50
03814> Storage Coeff. (min)= 5.81 (ii) 17.27 (ii)
03815> Unit Hyd. Tpeak (min)= 5.00 17.50
03816> Unit Hyd. peak (cms)= .20 .07
03817>
03818> \*TOTALS\*
03819> PEAK FLOW (cms)= 2.46 .87 1.042 (iii)
03820> TIME TO PEAK (hrs)= 1.00 1.25
03821> RUNOFF VOLUME (mm)= 70.09 45.94 58.015
03822> TOTAL RAINFALL (mm)= 71.66 71.66 71.665
03823> RUNOFF COEFFICIENT = .98 .64 .810

03824> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03825> CN\* = 81.0 Ia = Dep. Storage (Above)
03826> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03827> THAN THE STORAGE COEFFICIENT.
03828> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03829> 03830> 03831> 001:0021-----

03832> \*SUB-AREA No.5

03833> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
03834> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
03835> | U.H. Tp(hrs)= .170
03836>
03837>

03838> Unit Hyd Qpeak (cms)= .899
03839>
03840> PEAK FLOW (cms)= .649 (i)
03841> TIME TO PEAK (hrs)= 1.125
03842> RUNOFF VOLUME (mm)= 40.139
03843> TOTAL RAINFALL (mm)= 71.665
03844> RUNOFF COEFFICIENT = .560
03845>
03846> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03847> 03848> 03849> 001:0022-----

03850> | ADD HYD (HIP08) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03851> (ha) (cms) (hrs) (mm) (cms)
03852> ID1 06:HIP06 61.06 9.239 1.13 59.36 .000
03853> +ID2 07:HIP07 12.20 2.793 1.04 58.02 .000
03854> +ID3 08:Pond-B 4.00 .649 1.13 40.14 .000
03855>
03856> SUM 09:HIP08 77.26 12.109 1.13 58.16 .000
03857>
03858> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03859> 03860> 03861> 001:0023-----

03862> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
03863> | IN>09: (HIP08) |
03864> | OUT<10: (HIP-PO) |

03865> ===== OUTFLOW STORAGE TABLE =====
03866> OUTFLOW STORAGE | OUTFLOW STORAGE
03867> (cms) (ha.m.) | (cms) (ha.m.)
03868> .000 .0000E+00 | .724 .2210E+01
03869> .048 .5740E-01 | .937 .2501E+01
03870> .054 .2434E+00 | 1.262 .2798E+01
03871> .059 .5834E+00 | 1.404 .3101E+01
03872> .062 .8400E+00 | 1.532 .3410E+01
03873> .064 .1102E+01 | 1.650 .3724E+01
03874> .147 .1370E+01 | 2.409 .4044E+01
03875> .280 .1644E+01 | 3.689 .4370E+01
03876> .472 .1924E+01 | .000 .0000E+00
03877>
03878>

03879> ROUTING RESULTS AREA QPEAK TPEAK R.V.
03880> (ha) (cms) (hrs) (mm)
03881> INFLOW >09: (HIP08) 77.26 12.109 1.125 58.156
03882> OUTFLOW <10: (HIP-PO) 77.26 1.432 2.889 58.156
03883>
03884> PEAK FLOW REDUCTION [Out/In] (%)= 11.826
03885> TIME SHIFT OF PEAK FLOW (min)= 105.83
03886> MAXIMUM STORAGE USED (ha.m.)=.3168E+01
03887>
03888>

03889> 03890> 001:0024-----

03891> \*SUB-AREA No. 6

03892> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
03893> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
03894> | U.H. Tp(hrs)= .800
03895>
03896>

03897> Unit Hyd Qpeak (cms)= .129
03898>
03899> PEAK FLOW (cms)= .114 (i)
03900> TIME TO PEAK (hrs)= 1.958
03901> RUNOFF VOLUME (mm)= 30.490
03902> TOTAL RAINFALL (mm)= 71.665
03903> RUNOFF COEFFICIENT = .425
03904>
03905> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

03906> 03907> 001:0025-----

03908> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
03909> (ha) (cms) (hrs) (mm) (cms)
03910> ID1 10:HIP-PO 77.26 1.432 2.89 58.16 .000
03911> +ID2 01:A3 2.70 .114 1.96 30.49 .000
03912>
03913>
03914>
03915>

03916> SUM 02:Ultima 79.96 1.515 2.57 57.22 .000

03917> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

03918> 03919> 03920> 001:0026-----
03921> FINISH
03922>
03923> \*\*\*\*\*
03924> WARNINGS / ERRORS / NOTES
03925>
03926> Simulation ended on 2009-05-15 at 08:45:24
03927>
03928>
03929>
03930>

**A P P E N D I X ' I '**

**MINISTRY OF THE ENVIRONMENT  
CERTIFICATE OF APPROVAL  
EXISTING SETTLING PONDS**

NK



Ministry of the Environment  
Ministère de l'Environnement



CERTIFICATE OF APPROVAL  
INDUSTRIAL SEWAGE WORKS  
NUMBER 6924-5YWQ3U

R. W. Tomlinson Limited  
5597 Power Road, R.R. No. 6  
Gloucester, Ontario  
K1G 3N4

Site Location: Tomlinson Property, east side of Hawthorne Road  
Lot 26 & 27, Concession VI  
Ottawa City

*You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:*

the establishment of sewage works for the collection, transmission, treatment and disposal of excess wash plant wash water, consisting of the following:

- 410 millimeter pipeline extending from the wash plant, located on the Rideau Road Quarry #1 site, to the settling ponds;
- three (3) settling ponds, in series, Cell #1 having an effective volume of 3,275 cubic metres (and an operating freeboard of 0.6 metres), Cell #2 having an effective volume of 2,347 cubic metres (and an operating freeboard of 0.6 metres) and Cell #3 having an effective volume of 1,154 cubic metres (and an operating freeboard of 0.6 metres), including temporary floating pumping station in Cell #1, floating recycle pumping station in Cell #2, baffle in Cell #2 and mixing manhole between Cell #2 and Cell #3 (if required), with an overflow discharge from Cell #3 to the roadside ditch along Hawthorne Road;
- all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Industrial Sewage Works submitted by Ronald Tomlinson of R. W. Tomlinson Limited dated March 8, 2004;
2. Report on Application for Industrial Sewage Works Approval under Section 53 of the Ontario Water Resources Act, R.W. Tomlinson Limited, Aggregate Wash Water Management Associated with Rideau Road Quarry No. 1, Geographic City of Gloucester, City of Ottawa, Ontario prepared by Golder Associates, dated March 2004; and

3. Letter and attachments dated May 11, 2004 from Nural Kuyucak and K. Marentette of Golder Associates to Randy Chin of the Ministry of the Environment.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

"Certificate" means this entire certificate of approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;

"Director" means any Ministry employee appointed by the Minister pursuant to section 5 of the *Ontario Water Resources Act*;

"District Manager" means the District Manager of the Ottawa District Office of the Ministry;

"Ministry" means the Ontario Ministry of the Environment;

"Owner" means R. W. Tomlinson Limited and includes its successors and assignees; and

"works" means the sewage works described in the Owner's application, this certificate and in the supporting documentation referred to herein, to the extent approved by this certificate.

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*

## **TERMS AND CONDITIONS**

### **1. GENERAL CONDITION**

(1) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the works in accordance with the description given in this Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

(2) Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

### **2. CHANGE OF OWNER**

(1) The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within 30 days of the change occurring:

(a) change of Owner or operating authority, or both;

(b) change of address of Owner or operating authority or address of new owner or operating



authority;

(c) change of partners where the Owner or operating authority is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Partnerships Registration Act*; and

(d) change of name of the corporation where the Owner or operator is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1, 2 or 3 of O. Reg. 189, R.R.O. 1980, as amended from time to time), filed under the *Corporations Informations Act* shall be included in the notification to the District Manager.

(2) In the event of any change in ownership of the works, the Owner shall notify in writing the succeeding owner of the existence of this certificate, and a copy of such notice shall be forwarded to the District Manager.

(3) The Owner shall ensure that all communications made pursuant to this condition will refer to this certificate's number.

### 3. OPERATIONS MANUAL

(1) The Owner shall prepare an operations manual prior to the commencement of operation of the sewage works, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the works;

(b) inspection programs, including frequency of inspection, for the works and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the works;

(d) contingency plans and procedures for dealing with potential spill, bypasses and any other abnormal situations and for notifying the District Manager; and

(e) complaint procedures for receiving and responding to public complaints.

(2) The Owner shall maintain the operations manual up to date through revisions undertaken from time to time and retain a copy at the location of the sewage works. Upon request, the Owner shall make the manual available for inspection and copying by Ministry personnel.

### 4. CLOSED LOOP OPERATION

(1) The Owner shall ensure that the works are normally operated as a closed loop system with treated water being recycled back to the wash plant.

(2) In the event that excess accumulation of water occurs and a discharge is necessary, the Owner shall undertake the monitoring outlined in Condition 6 and shall adhere to the effluent limits in Condition 5.

5. EFFLUENT LIMITS

(1) The Owner shall design, construct and operate the works such that the concentration of Total Suspended Solids does not exceed 25 milligrams per litre in the effluent from the works.

(2) For the purposes of determining compliance with and enforcing subsection (1), non-compliance with respect to the Total Suspended Solids concentration limit is deemed to have occurred when any single sample (along with a follow-up confirmation sample collected within 7 days of the receipt of the original sample result that indicated that an exceedance had occurred) analyzed for Total Suspended Solids is greater than the corresponding maximum concentration set out in subsection (1).

6. EFFLUENT MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the sewage works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this certificate are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) Samples shall be collected of the discharge from Cell #3 to the Hawthorne Road ditch and analyzed, at the sampling frequencies and using the sample type specified for each parameter listed:

<b>Frequency</b>	Once each Month During Periods of Effluent Discharge
<b>Sample Type</b>	Grab
<b>Parameters</b>	Total Suspended Solids

(3) The methods and protocols for sampling, analysis, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (August 1994), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and

(b) the publication "Standard Methods for the Examination of Water and Wastewater" (17th edition) as amended from time to time by more recently published editions.

(4) The Owner shall measure, record and calculate the flowrate from Cell #3 to the Hawthorne Road ditch daily (during periods of discharge), within an accuracy of plus or minus 15 per cent of the actual flowrate.

(5) The Owner shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this certificate.

7. **REPORTING**

(1) The Owner shall report to the District Manager or designate, of any exceedence of any parameter specified in Conditions 5 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition 1 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.
3. Condition 3 is included to ensure that a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the Ministry. Such a manual is an integral part of the operation of the works. Its compilation and use should assist the owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the owner's operation of the work.
4. Condition 4 is included to ensure that the works are operated as designed.
5. Condition 5 is imposed to ensure that the effluent discharged from the works meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver.
6. Conditions 6 and 7 are included to require the owner to demonstrate on a continual basis that the quality of the effluent from the approved works is consistent with the effluent limits specified in the certificate and that the approved works does not cause any impairment to the receiving watercourse.

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*

The Secretary\*  
Environmental Review Tribunal  
2300 Yonge St., 12th Floor  
P.O. Box 2382  
Toronto, Ontario  
M4P 1E4

AND

The Environmental Commissioner  
1075 Bay Street, 6th Floor  
Suite 605  
Toronto, Ontario  
M5S 2B1

AND

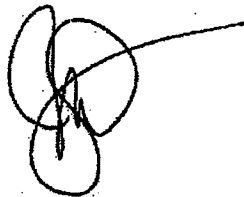
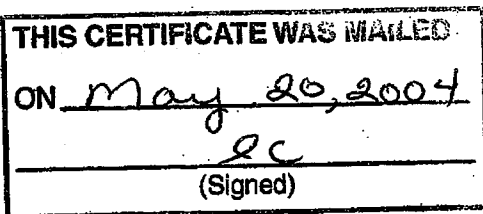
The Director  
Section 53, Ontario Water Resources Act  
Ministry of the Environment  
2 St. Clair Avenue West, Floor 12A  
Toronto, Ontario  
M4V 1L5

\* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or [www.ert.gov.on.ca](http://www.ert.gov.on.ca)

*This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at [www.ene.gov.on.ca](http://www.ene.gov.on.ca), you can determine when the leave to appeal period ends.*

*The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.*

DATED AT TORONTO this 19th day of May, 2004



Mohamed Dhalla, P.Eng.  
Director  
Section 53, Ontario Water Resources Act

RC/

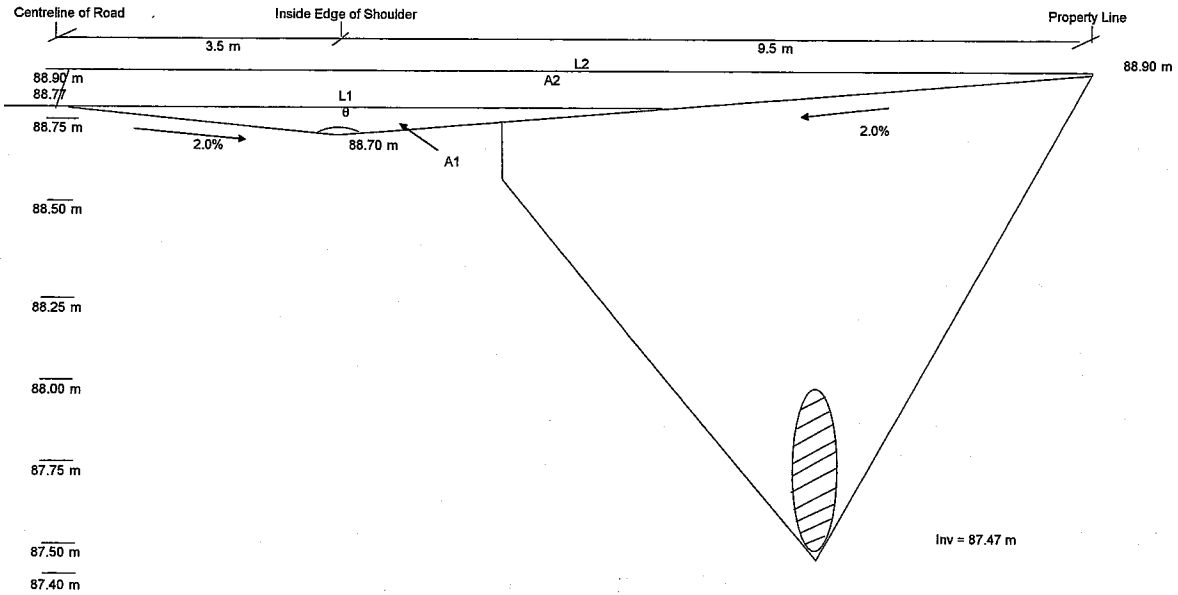
c: District Manager, MOE Ottawa  
Nural Kuyucak, Golder Associates Ltd. ✓

**APPENDIX 'J'**

**ASSESSMENT OF CULVERT CROSSING  
DURING AN EXTREME STORM EVENT**

## ENTRANCE TO POND ACCESS ROAD - OPEN DITCH/CULVERT CONFIGURATION

Typical open ditch/culvert configuration: 1390x970mm CSPA culvert, invert approx. 1.43 m below elevation at property line.  
Proposed Terrace Elevation is approx. 0.13 m above road centreline.



A1: 0.24 m<sup>2</sup>                      L1: 7.000 m  
A2: 1.30 m<sup>2</sup>                      L2: 13.000 m  
θ: 178 Degrees

FLOW ABOVE CULVERT THRU A1:	FLOW ABOVE CULVERT THRU A2:
Since θ is equal to approx. 180 degrees Use the Rectangular Weir Equation to Estimate the Flow Thru A1:  $Q = C \times L \times H^{1.5}$ $C = 1.84$ $L' = L1 - (0.1 \times n \times h)$ , where n= no. of end contractions  use $h = 88.77 - 88.7 = 0.07$ m $h = 0.07$ m  $L' = 6.99$ m  $Q_{A1} = 0.24$ m <sup>3</sup> /s	Using the Rectangular Weir Equation to Estimate the Flow Thru A2:  $Q = C \times L \times H^{1.5}$ $C = 1.84$ $L' = L3 - (0.1 \times n \times h)$ , where n= no. of end contractions  use $h = 88.9 - 88.77 = 0.13$ m $h = 0.13$ m $L3 = (L1 + L2) / 2 = 10$ m (Avg. Length) $L' = 9.97$ m  $Q_{A2} = 0.86$ m <sup>3</sup> /s

1:100 year Peak Flow Rate of 3.0 m<sup>3</sup>/s (From Storm Design Sheet : 100 Year Flow 27B-27C)

Flow through the 1390 x 970 mm CSPA Culvert under Inlet Control Conditions = 1.9 m<sup>3</sup>/s (From Culvert Sizing Nomograph 27B-27C)

Total flow above culvert =  $Q_{A1} + Q_{A2} = 0.24$  m<sup>3</sup>/s +  $0.86$  m<sup>3</sup>/s =  $1.10$  m<sup>3</sup>/s

Therefore, Total Flow =  $1.9$  m<sup>3</sup>/s +  $1.1$  m<sup>3</sup>/s

=  $3.0$  m<sup>3</sup>/s

= 1:100 year Peak Flow Rate

**APPENDIX 'K'**

**SWMHYMO INPUT AND OUTPUT FILES  
(July 1, 1979 Historical Storm Event)**

```

00001> 2 Metric units
00002> *****
00003> # Project Name : Hawthorne Industrial Park Project Number: [20983] *
00004> # Date : January, 2005 *
00005> # Revised : N/A *
00006> # Developed by : Mark Buchanan, E.I.T. *
00007> # Reviewed by : Guy Forget, P.Eng. *
00008> # Company : J.L. Richards & Associates Limited *
00009> # License # : 4618403 *
00010> *****
00011> *
00012> *
00013> *****
00014> # FILENAME: V:\20983.DUEN\SWMHYMO\20983PST.DAT
00015> # FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00016> # OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00017> *****
00018> *
00019> *****
00020> # SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE
00021> # PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00022> *****
00023> *
00024> *****
00025> # HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00026> # FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00027> *****
00028> *****
00029> # CALCULATION OF JULY 1st 1979 STORM EVENT *****
00030> *****
00031> *****
00032> START TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
00033> # [ ] <- storm filename, one per line for NSTORM time
00034> STORM_FILENAME="JUL_1_79.STM"
00035> *****
00036> # DEFAULT VALUES ICASDEF=[1], read and print values
00037> DEVAL_FILENAME="V:\22973.DUEN\G\SWMHYMO\ORGA.VAL"
00038> *****
00039> *
00040> *****
00041> # ORGAWORLD FILE *
00042> *****
00043> *
00044> # SUB-AREA No.1 *
00045> *****
00046> CALIB STANDHYD ID=[ 1 ], NHYD=["010"], DT=[2.5] (min), AREA=[ 2.07 ] (ha),
00047> XIMP=[0.84], TIMP=[0.84], DWF=[0.0] (cms), LOSS=[2],
00048> SCS curve number CN=[81],
00049> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00050> LGP=[20] (m), MNP=[ 0.25 ], SCP=[0.0] (m)
00051> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.52] (%),
00052> LGI=[204.72] (m), MNI=[0.03], SCI=[0.0]
00053> RAINFALL=[ , , , ] (mm/hr), END=-1
00054> *****
00055> *
00056> # SUB-AREA No.2 *
00057> *****
00058> CALIB STANDHYD ID=[ 2 ], NHYD=["020"], DT=[2.5] (min), AREA=[ 1.54 ] (ha),
00059> XIMP=[0.92], TIMP=[0.92], DWF=[0.0] (cms), LOSS=[2],
00060> SCS curve number CN=[81],
00061> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00062> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00063> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.50] (%),
00064> LGI=[244.34] (m), MNI=[0.03], SCI=[0.0]
00065> RAINFALL=[ , , , ] (mm/hr), END=-1
00066> *****
00067> *
00068> # SUB-AREA No.3 *
00069> *****
00070> CALIB STANDHYD ID=[ 3 ], NHYD=["030"], DT=[2.5] (min), AREA=[1.4] (ha),
00071> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00072> SCS curve number CN=[81],
00073> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.0] (%),
00074> LGP=[5] (m), MNP=[0.03], SCP=[0.0] (min),
00075> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.51] (%),
00076> LGI=[ 225.63 ] (m), MNI=[0.03], SCI=[0.0]
00077> RAINFALL=[ , , , ] (mm/hr), END=-1
00078> *****
00079> # ADD HYD IDsum=[4], NHYD=[ "040" ], IDs to add=[1+2]
00080> *****
00081> # ADD HYD IDsum=[5], NHYD=[ "050" ], IDs to add=[3+4]
00082> *****
00083> *
00084> # SUB-AREA No.4 *
00085> *****
00086> CALIB STANDHYD ID=[6], NHYD=["060"], DT=[2.5] (min), AREA=[0.89] (ha),
00087> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00088> SCS curve number CN=[81],
00089> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[0.7] (%),
00090> LGP=[40] (m), MNP=[0.25], SCP=[0.0] (min)
00091> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.93] (%),
00092> LGI=[164.82] (m), MNI=[0.03], SCI=[0.0]
00093> RAINFALL=[ , , , ] (mm/hr), END=-1
00094> *****
00095> *
00096> # SUB-AREA No.5 *
00097> *****
00098> CALIB STANDHYD ID=[ 7 ], NHYD=["070"], DT=[2.5] (min), AREA=[2.66] (ha),
00099> XIMP=[0.97], TIMP=[0.97], DWF=[0.0] (cms), LOSS=[2],
00100> SCS curve number CN=[81],
00101> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00102> LGP=[20.0] (m), MNP=[0.25], SCP=[0.0] (m)
00103> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.61] (%),
00104> LGI=[207.25] (m), MNI=[0.03], SCI=[0.0]
00105> RAINFALL=[ , , , ] (mm/hr), END=-1
00106> *****
00107> # ADD HYD IDsum=[8], NHYD=[ "080" ], IDs to add=[6+7]
00108> *****
00109> # ADD HYD IDsum=[9], NHYD=[ "090" ], IDs to add=[5+8]
00110> *****
00111> *
00112> ROUTE RESERVOIR IDout=[10], NHYD=["POND"], IDin=[9],
00113> RDT=[1.0] (min),
00114> *****
00115> # TABLE of ( OUTFLOW-STORAGE ) values
00116> *****
00117> [ 0.000, 0.0000 ]
00118> [ 0.008, 0.0656 ]
00119> [ 0.017, 0.1311 ]
00120> [ 0.093, 0.2831 ]
00121> [ 0.223, 0.3971 ]
00122> [ 0.337, 0.4731 ]
00123> [ 0.465, 0.5491 ]
00124> [ 0.531, 0.5871 ]
00125> [ 0.593, 0.6251 ]
00126> [ 0.654, 0.6631 ]
00127> [ 0.797, 0.7391 ]
00128> [ 0.950, 0.8274 ]
00129> [ 1.304, 0.9157 ]
00130> [ 1.880, 1.0040 ]
00131> [ 2.577, 1.0923 ]
00132> [ -1, -1 ] (max twenty pts)
00133> *****
00134> # Remaining Hawthorne Industrial Park *
00135> *****

```

```

00136> *
00137> # SUB-AREA No.1
00138> *****
00139> CALIB STANDHYD ID=[ 1 ], NHYD=["HIPO1"], DT=[2.5] (min), AREA=[19.9] (ha),
00140> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00141> SCS curve number CN=[81],
00142> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00143> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00144> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.6] (%),
00145> LGI=[580] (m), MNI=[0.03], SCI=[0.0] (min)
00146> RAINFALL=[ , , , ] (mm/hr), END=-1
00147> *****
00148> # ADD HYD IDsum=[ 2 ], NHYD=["HIPO2"], IDs to add=[10+1]
00149> *****
00150> *
00151> # SUB-AREA No.2
00152> *****
00153> CALIB STANDHYD ID=[ 3 ], NHYD=["HIPO3"], DT=[2.5] (min), AREA=[17] (ha),
00154> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00155> SCS curve number CN=[81],
00156> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00157> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00158> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.65] (%),
00159> LGI=[450] (m), MNI=[0.03], SCI=[0.0] (min)
00160> RAINFALL=[ , , , ] (mm/hr), END=-1
00161> *****
00162> *
00163> # SUB-AREA No.3
00164> *****
00165> CALIB STANDHYD ID=[ 4 ], NHYD=["HIPO4"], DT=[2.5] (min), AREA=[15.6] (ha),
00166> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00167> SCS curve number CN=[81],
00168> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00169> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00170> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00171> LGI=[600] (m), MNI=[0.03], SCI=[0.0] (min)
00172> RAINFALL=[ , , , ] (mm/hr), END=-1
00173> *****
00174> # ADD HYD IDsum=[ 5 ], NHYD=["HIPO5"], IDs to add=[3+4]
00175> *****
00176> # ADD HYD IDsum=[ 6 ], NHYD=["HIPO6"], IDs to add=[5+2]
00177> *****
00178> *
00179> # SUB-AREA No.4
00180> *****
00181> CALIB STANDHYD ID=[ 7 ], NHYD=["HIPO7"], DT=[2.5] (min), AREA=[12.2] (ha),
00182> XIMP=[0.50], TIMP=[0.71], DWF=[0.0] (cms), LOSS=[2],
00183> SCS curve number CN=[81],
00184> Pervious surfaces: IAPER=[4.67] (mm), SLPP=[1.5] (%),
00185> LGP=[100.0] (m), MNP=[0.25], SCP=[0.0] (m)
00186> Impervious surfaces: IAIMP=[1.57] (mm), SLPI=[0.5] (%),
00187> LGI=[210] (m), MNI=[0.03], SCI=[0.0] (min)
00188> RAINFALL=[ , , , ] (mm/hr), END=-1
00189> *****
00190> *
00191> *
00192> # SUB-AREA No.5
00193> *****
00194> DESIGN NASHYD ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5] min, AREA=[4.0] (ha),
00195> DWF=[0.0] (cms), CN/C=[ 85 ], TP=[0.17] hrs,
00196> RAINFALL=[ , , , ] (mm/hr), END=-1
00197> *****
00198> *
00199> # ADD HYD IDsum=[ 9 ], NHYD=["HIPO8"], IDs to add=[6+7+8]
00200> *****
00201> *
00202> ROUTE RESERVOIR IDout=[ 10 ], NHYD=["HIPO-POND"], IDin=[ 9 ],
00203> RDT=[1.0] (min),
00204> *****
00205> # TABLE of ( OUTFLOW-STORAGE ) values
00206> *****
00207> [ 0.0, 0.0 ]
00208> [ 0.048, 0.0574 ]
00209> [ 0.054, 0.2434 ]
00210> [ 0.059, 0.5824 ]
00211> [ 0.062, 0.8400 ]
00212> [ 0.064, 1.1024 ]
00213> [ 0.147, 1.3705 ]
00214> [ 0.280, 1.6444 ]
00215> [ 0.472, 1.9242 ]
00216> [ 0.724, 2.2097 ]
00217> [ 0.937, 2.5010 ]
00218> [ 1.262, 2.7981 ]
00219> [ 1.404, 3.1009 ]
00220> [ 1.532, 3.4096 ]
00221> [ 1.650, 3.7240 ]
00222> [ 2.409, 4.0442 ]
00223> [ 3.689, 4.3702 ]
00224> [ -1, -1 ] (max twenty pts)
00225> *****
00226> *
00227> # SUB-AREA No.6
00228> *****
00229> DESIGN NASHYD ID = [1], NHYD=["A3"], DT=[2.5] min, AREA=[2.7] (ha),
00230> DWF=[0] (cms), CN/C=[76], TP=[0.80] hrs,
00231> RAINFALL=[ , , , ] (mm/hr), END=-1
00232> *****
00233> *
00234> # ADD HYD IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
00235> *****
00236> *
00237> FINISH
00238> *****
00239> *
00240> *
00241> *
00242> *

```



```

00001> -----
00002>
00003> SSSSS W W M M H H Y Y M M O O 999 999 -----
00004> S W W M M H H Y Y M M O O ## 9 9 9 Ver. 4.02
00005> SSSSS W W M M H H H H Y Y M M O O 9999 9999 July 1999
00006> S W W M M H H Y Y M M O O 9999 9999 July 1999
00007> SSSSS W W M M H H Y Y M M O O 9 9 9
00008> 9 9 9 # 418403
00009> StormWater Management Hydrologic Model 999 999 -----
00010>
00011> *****
00012> ***** SWHYMO-99 Ver/4.02 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> ***** OTHYMO-83 and OTHYMO-89 *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: swmhy@jffa.com *****
00021> *****
00022>
00023> *****
00024> ***** Licensed user: J. L. Richards & Associates Limited *****
00025> ***** Ottawa SERIAL#:418403 *****
00026> *****
00027> *****
00028> *****
00029> ***** ***** PROGRAM ARRAY DIMENSIONS *****
00030> ***** Maximum value for ID number: 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034> *****
00035> *****
00036> ***** DETAILED OUTPUT *****
00037> *****
00038> ***** DATE: 2009-05-15 TIME: 09:03:53 RUN COUNTER: 000200 *****
00039> *****
00040> ***** * input filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\July1979.dat *****
00041> ***** * Output filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\July1979.out *****
00042> ***** * Summary filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\July1979.sum *****
00043> ***** * User comments: *****
00044> ***** * 1: *****
00045> ***** * 2: *****
00046> ***** * 3: *****
00047> *****
00048>
00049>
00050> 001:0001-----
00051> *****
00052> ***** * Project Name : Hawthorne Industrial Park Project Number: [20983] *
00053> ***** * Date : January, 2009 *
00054> ***** * Revised : N/A *
00055> ***** * Developed by : Mark Buchanan, E.I.T. *
00056> ***** * Reviewed by : Guy Forget, P.Eng. *
00057> ***** * Company : J.L. Richards & Associates Limited *
00058> ***** * License # : 4418403 *
00059> *****
00060> *****
00061> *****
00062> *****
00063> ***** * FILENAME: V:\20983.DU\ENG\SWHYMO\20983PST.DAT *
00064> ***** * FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00065> ***** * OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00066> *****
00067> *****
00068> *****
00069> *****
00070> ***** * PROPOSED COMPOSTING SITE UNDER INVESTIGATION FLOOD FLOWS OF THE *
00071> ***** * PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
00072> *****
00073> ***** * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND *
00074> ***** * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00075> ***** * OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE *
00076> *****
00077> ***** * CALCULATION OF JULY 1st 1979 STORM EVENT *
00078> *****
00079> -----
00080> | START | Project dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
00081> |-----| Rainfall dir.: V:\20983.DU\ENG\FINALS-1\SWHYM-1\
00082> | TZERO = .00 hrs on 0
00083> | MROUT = 2 (output = METRIC)
00084> | NWUN = 001
00085> | NSTORM = 0
00086>
00087> 001:0002-----
00088> |-----|
00089> | READ STORM | Filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\JUL_1
00090> | Ptotal= 88.86 mm | Comments: HISTORICAL STORM - JULY 1, 1979
00091>
00092>
00093>
00094>
00095>
00096>
00097>
00098>
00099>
00100>
00101>
00102>
00103>
00104>
00105> 001:0003-----
00106> |-----|
00107> | DEFAULT VALUES | Filename: V:\20983.DU\ENG\FINALS-1\SWHYM-1\ORGA.VAL
00108> | ICASEdv = 1 (read and print data)
00109> |-----|
00110> | FileTitle= ----- ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE -----
00111> | Horton's infiltration equation parameters:
00112> | [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F= .00 mm]
00113> | Parameters for PERVIOUS surfaces in STANDHYD:
00114> | [Iaper= 4.67 mm] [LGF=40.00 mm] [MNP= .250]
00115> | Parameters for IMPERVIOUS surfaces in STANDHYD:
00116> | [Irimp= 1.57 mm] [CII= 1.50] [MNI= .035]
00117> | Parameters used in NASHDY:
00118> | [Ia= 4.67 mm] [N= 3.00]
00119>
00120> 001:0004-----
00121> *****
00122> ***** ORGAWORLD FILE *****
00123> *****
00124> *****
00125> ***** SUB-AREA No. 1 *****
00126>
00127> | CALIB STANDHYD | Area (ha)= 2.07
00128> | 01:010 DT= 2.50 | Total Imp(%)= 84.00 Dir. Conn.(%)= 84.00
00129>
00130>
00131>
00132>
00133>
00134>
00135>

```

```

00136>
00137> Max.eff.Inten.(mm/hr)= 106.70 67.70
00138> over (min) 7.50 15.00
00139> Storage Coeff. (min)= 7.69 (ii) 14.39 (iii)
00140> Unit Hyd. Tpeak (min)= 7.50 15.00
00141> Unit Hyd. peak (cms)= .15 .08
00142>
00143> ***** *TOTALS* *****
00144> PEAK FLOW (cms)= .474 .05
00145> TIME TO PEAK (hrs)= 1.54 1.71 1.542
00146> RUNOFF VOLUME (mm)= 87.29 49.30 81.209
00147> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00148> RUNOFF COEFFICIENT = .98 .55 .914
00149>
00150> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00151> CN* = 81.0 Ia = Dep. Storage (Above)
00152> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00153> THAN THE STORAGE COEFFICIENT.
00154> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00155>
00156> 001:0005-----
00157> *
00158> * SUB-AREA No. 2
00159>
00160> | CALIB STANDHYD | Area (ha)= 1.54
00161> | 02:020 DT= 2.50 | Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00
00162>
00163>
00164>
00165>
00166>
00167>
00168>
00169>
00170>
00171>
00172>
00173>
00174>
00175>
00176>
00177>
00178>
00179>
00180>
00181>
00182>
00183>
00184>
00185>
00186>
00187>
00188>
00189> 001:0006-----
00190> *
00191> * SUB-AREA No. 3
00192>
00193> | CALIB STANDHYD | Area (ha)= 1.40
00194> | 03:030 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00195>
00196>
00197>
00198>
00199>
00200>
00201>
00202>
00203>
00204>
00205>
00206>
00207>
00208>
00209>
00210>
00211>
00212>
00213>
00214>
00215>
00216>
00217>
00218>
00219>
00220>
00221>
00222> 001:0007-----
00223>
00224> | ADD HYD (040 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00225> |-----| (ha) (cms) (hrs) (mm) (cms)
00226> ID1 01:010 2.07 476 1.54 81.21 .000
00227> +ID2 02:020 1.54 .367 1.54 84.25 .000
00228> -----
00229> SUM 04:040 3.61 .844 1.54 82.50 .000
00230>
00231> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00232>
00233>
00234> 001:0008-----
00235> | ADD HYD (050 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00236> |-----| (ha) (cms) (hrs) (mm) (cms)
00237> ID1 03:030 1.40 .344 1.54 86.15 .000
00238> +ID2 04:040 3.61 .844 1.54 82.50 .000
00239> -----
00240> SUM 05:050 5.01 1.188 1.54 83.52 .000
00241>
00242> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00243>
00244>
00245>
00246> 001:0009-----
00247> *
00248> * SUB-AREA No. 4
00249>
00250> | CALIB STANDHYD | Area (ha)= .89
00251> | 06:060 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00252>
00253>
00254>
00255>
00256>
00257>
00258>
00259>
00260>
00261>
00262>
00263>
00264>
00265>
00266>
00267>
00268>
00269>
00270>

```

```

00271> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00272> CN* = 81.0 Ia = Dep. Storage (Above)
00273> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00274> THAN THE STORAGE COEFFICIENT.
00275> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00276>
00277>
00278>
00279> 001:0010-----
00280> *
00281> * SUB-AREA No.5
00282>
00283> | CALIB STANDHYD | Area (ha)= 2.66
00284> | 07:070 DT= 2.50 | Total Imp(%)= 97.00 Dir. Conn.(%)= 97.00
00285>
00286> IMPERVIOUS PERVIOUS (i)
00287> Surface Area (ha)= 2.58 .08
00288> Dep. Storage (mm)= 1.57 4.67
00289> Average Slope (%)= .61 1.50
00290> Length (m)= 207.25 20.00
00291> Mannings n = .030 .250
00292>
00293> Max.eff.Inten.(mm/hr)= 106.70 70.39
00294> over (min)= 7.50 12.50
00295> Storage Coeff. (min)= 7.38 (ii) 13.23 (ii)
00296> Unit Hyd. Tpeak (min)= 7.50 12.50
00297> Unit Hyd. peak (cms)= .15 .09
00298>
00299> PEAK FLOW (cms)= .45 .01 *TOTALS*
00300> TIME TO PEAK (hrs)= 1.54 1.67 .655 (iii)
00301> RUNOFF VOLUME (mm)= 87.29 49.30 86.147
00302> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00303> RUNOFF COEFFICIENT = .98 .55 .970
00304>
00305> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00306> CN* = 81.0 Ia = Dep. Storage (Above)
00307> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00308> THAN THE STORAGE COEFFICIENT.
00309> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00310>
00311>
00312> 001:0011-----
00313> | ADD HYD (080 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00314> | (ha) (cms) (hrs) (mm) (cms)
00315> ID1 06:060 .89 .235 1.50 86.15 .000
00316> +ID2 07:070 2.66 .665 1.54 86.15 .000
00317>
00318> SUM 08:080 3.55 .896 1.54 86.15 .000
00319>
00320>
00321> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00322>
00323>
00324> 001:0012-----
00325> | ADD HYD (090 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00326> | (ha) (cms) (hrs) (mm) (cms)
00327> ID1 05:050 5.01 1.188 1.54 83.52 .000
00328> +ID2 08:000 3.55 .896 1.54 86.15 .000
00329>
00330> SUM 09:090 8.56 2.084 1.54 84.61 .000
00331>
00332> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00333>
00334>
00335>
00336> 001:0013-----
00337> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00338> | ID:09: (090 ) |
00339> | OUT<10: (POND ) |
00340>
00341> ===== OUTFLOW STORAGE TABLE =====
00342> OUTFLOW STORAGE OUTFLOW STORAGE
00343> (cms) (ha.m.) (cms) (ha.m.)
00344> .000 .0000E+00 | .593 .6251E+00
00345> .008 .6560E-01 | .654 .6631E+00
00346> .017 .1311E+00 | .797 .7391E+00
00347> .093 .2831E+00 | .950 .8274E+00
00348> .233 .3971E+00 | 1.304 .9157E+00
00349> .337 .4731E+00 | 1.880 .1004E+01
00350> .465 .5491E+00 | 2.577 .1092E+01
00351> .531 .5871E+00 | .000 .0000E+00
00352>
00353> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00354> INFLOW<09: (090 ) (ha) (cms) (hrs) (mm)
00355> OUTFLOW<10: (POND ) 8.56 2.084 1.542 84.611
00356>
00357> PEAK FLOW REDUCTION [Qout/Qin] (%) = 23.815
00358> TIME SHIFT OF PEAK FLOW (min) = 35.00
00359> MAXIMUM STORAGE USED (ha.m.) = .5671E+00
00360>
00361>
00362> 001:0014-----
00363> *****
00364> * Remaining Hawthorne Industrial Park *
00365> *****
00366> *
00367> * SUB-AREA No.1
00368>
00369> | CALIB STANDHYD | Area (ha)= 19.90
00370> | 01:H1P01 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00371>
00372> IMPERVIOUS PERVIOUS (i)
00373> Surface Area (ha)= 14.13 5.77
00374> Dep. Storage (mm)= 1.57 4.67
00375> Average Slope (%)= .60 1.50
00376> Length (m)= 580.00 100.00
00377> Mannings n = .030 .250
00378>
00379> Max.eff.Inten.(mm/hr)= 96.53 119.96
00380> over (min)= 15.00 27.50
00381> Storage Coeff. (min)= 14.32 (ii) 26.72 (ii)
00382> Unit Hyd. Tpeak (min)= 15.00 27.50
00383> Unit Hyd. peak (cms)= .08 .04
00384>
00385> PEAK FLOW (cms)= 2.14 1.33 *TOTALS*
00386> TIME TO PEAK (hrs)= 1.67 1.92 1.708 (iii)
00387> RUNOFF VOLUME (mm)= 87.29 61.48 74.386
00388> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00389> RUNOFF COEFFICIENT = .98 .69 .837
00390>
00391> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00392> CN* = 81.0 Ia = Dep. Storage (Above)
00393> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00394> THAN THE STORAGE COEFFICIENT.
00395> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00396>
00397>
00398> 001:0015-----
00399> | ADD HYD (H1P02 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00400> | (ha) (cms) (hrs) (mm) (cms)
00401> ID1 10:POND 8.56 .496 2.13 84.61 .000
00402> +ID2 01:H1P01 19.90 3.264 1.71 74.39 .000
00403>
00404> SUM 02:H1P02 28.46 3.642 1.75 77.46 .000
00405>

```

```

00406>
00407> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00408>
00409>
00410> 001:0016-----
00411> *
00412> * SUB-AREA No.2
00413>
00414> | CALIB STANDHYD | Area (ha)= 17.00
00415> | 03:H1P03 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00416>
00417> IMPERVIOUS PERVIOUS (i)
00418> Surface Area (ha)= 12.07 4.93
00419> Dep. Storage (mm)= 1.57 4.67
00420> Average Slope (%)= .65 1.50
00421> Length (m)= 450.00 100.00
00422> Mannings n = .030 .250
00423>
00424> Max.eff.Inten.(mm/hr)= 100.60 125.35
00425> over (min)= 12.50 25.00
00426> Storage Coeff. (min)= 11.81 (ii) 23.99 (ii)
00427> Unit Hyd. Tpeak (min)= 12.50 25.00
00428> Unit Hyd. peak (cms)= .09 .05
00429>
00430> PEAK FLOW (cms)= 1.92 1.20 *TOTALS*
00431> TIME TO PEAK (hrs)= 1.63 1.88 1.667 (iii)
00432> RUNOFF VOLUME (mm)= 87.29 61.48 74.386
00433> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00434> RUNOFF COEFFICIENT = .98 .69 .837
00435>
00436> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00437> CN* = 81.0 Ia = Dep. Storage (Above)
00438> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00439> THAN THE STORAGE COEFFICIENT.
00440> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00441>
00442>
00443> 001:0017-----
00444> *
00445> * SUB-AREA No.3
00446>
00447> | CALIB STANDHYD | Area (ha)= 15.60
00448> | 04:H1P04 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00449>
00450> IMPERVIOUS PERVIOUS (i)
00451> Surface Area (ha)= 11.08 4.52
00452> Dep. Storage (mm)= 1.57 4.67
00453> Average Slope (%)= .50 1.50
00454> Length (m)= 600.00 100.00
00455> Mannings n = .030 .250
00456>
00457> Max.eff.Inten.(mm/hr)= 96.53 119.96
00458> over (min)= 15.00 27.50
00459> Storage Coeff. (min)= 15.44 (ii) 27.83 (ii)
00460> Unit Hyd. Tpeak (min)= 15.00 27.50
00461> Unit Hyd. peak (cms)= .07 .04
00462>
00463> PEAK FLOW (cms)= 1.64 1.03 *TOTALS*
00464> TIME TO PEAK (hrs)= 1.67 1.92 2.519 (iii)
00465> RUNOFF VOLUME (mm)= 87.29 61.48 74.386
00466> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00467> RUNOFF COEFFICIENT = .98 .69 .837
00468>
00469> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00470> CN* = 81.0 Ia = Dep. Storage (Above)
00471> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00472> THAN THE STORAGE COEFFICIENT.
00473> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00474>
00475>
00476> 001:0018-----
00477> | ADD HYD (H1P05 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00478> | (ha) (cms) (hrs) (mm) (cms)
00479> ID1 03:H1P03 17.00 2.923 1.67 74.39 .000
00480> +ID2 04:H1P04 15.60 2.519 1.75 74.39 .000
00481>
00482> SUM 05:H1P05 32.60 5.435 1.71 74.39 .000
00483>
00484>
00485> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00486>
00487>
00488> 001:0019-----
00489> | ADD HYD (H1P06 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00490> | (ha) (cms) (hrs) (mm) (cms)
00491> ID1 05:H1P05 32.60 5.435 1.71 74.39 .000
00492> +ID2 02:H1P02 28.46 3.642 1.75 77.46 .000
00493>
00494> SUM 06:H1P06 61.06 9.050 1.74 75.82 .000
00495>
00496>
00497> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00498>
00499>
00500> 001:0020-----
00501> *
00502> * SUB-AREA No.4
00503>
00504> | CALIB STANDHYD | Area (ha)= 12.20
00505> | 07:H1P07 DT= 2.50 | Total Imp(%)= 71.00 Dir. Conn.(%)= 50.00
00506>
00507> IMPERVIOUS PERVIOUS (i)
00508> Surface Area (ha)= 8.66 3.54
00509> Dep. Storage (mm)= 1.57 4.67
00510> Average Slope (%)= .70 1.50
00511> Length (m)= 210.00 100.00
00512> Mannings n = .030 .250
00513>
00514> Max.eff.Inten.(mm/hr)= 106.70 131.04
00515> over (min)= 7.50 20.00
00516> Storage Coeff. (min)= 7.14 (ii) 19.11 (ii)
00517> Unit Hyd. Tpeak (min)= 7.50 20.00
00518> Unit Hyd. peak (cms)= .15 .06
00519>
00520> PEAK FLOW (cms)= 1.56 .95 *TOTALS*
00521> TIME TO PEAK (hrs)= 1.54 1.79 2.287 (iii)
00522> RUNOFF VOLUME (mm)= 87.29 61.48 74.386
00523> TOTAL RAINFALL (mm)= 88.86 88.86 88.857
00524> RUNOFF COEFFICIENT = .98 .69 .837
00525>
00526> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00527> CN* = 81.0 Ia = Dep. Storage (Above)
00528> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00529> THAN THE STORAGE COEFFICIENT.
00530> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00531>
00532>
00533> 001:0021-----
00534> *
00535> * SUB-AREA No.5
00536>
00537> | DESIGN NASHYD | Area (ha)= 4.00 Curve Number (CN)=85.00
00538> | 08:Pond-B DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
00539> | U.H. Tp (hrs)= .170
00540>

```

```

00541> Unit Hyd Qpeak (cms)= .899
00542>
00543> PEAK FLOW (cms)= .721 (i)
00544> TIME TO PEAK (hrs)= 1.667
00545> RUNOFF VOLUME (mm)= 54.937
00546> TOTAL RAINFALL (mm)= 88.857
00547> RUNOFF COEFFICIENT = .618
00548>
00549> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00550>
-----
00551>
00552> 001:0022-----
00553>
00554> | ADD HYD (HIP08 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00555> |-----|-----|-----|-----|-----|-----|
00556> | | (ha) (cms) (hrs) (mm) (cms)
00557> | ID1 06:HIP06 61.06 9.050 1.74 75.82 .000
00558> | +ID2 07:HIP07 12.20 2.287 1.58 74.39 .000
00559> | +ID3 08:Pond-B 4.00 .721 1.67 54.94 .000
00560> |-----|-----|-----|-----|-----|
00561> | SUM 09:HIP08 77.26 11.944 1.71 74.51 .000
00562>
00563> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00564>
-----
00565> 001:0023-----
00566>
00567> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00568> | IN>09: (HIP08 ) |
00569> | OUT<10: (HIP-PO) |
00570> |-----|-----|-----|-----|-----|
00571> | OUTFLOW STORAGE OUTFLOW STORAGE
00572> | (cms) (ha.m.) | (cms) (ha.m.)
00573> | .000 .0000E+00 | .724 .2210E+01
00574> | .048 .5740E-01 | .937 .2501E+01
00575> | .054 .2454E+00 | 1.262 .3798E+01
00576> | .059 .5834E+00 | 1.404 .3101E+01
00577> | .062 .8400E+00 | 1.532 .3410E+01
00578> | .064 .1102E+01 | 1.650 .3724E+01
00579> | .147 .1370E+01 | 2.409 .4044E+01
00580> | .280 .1644E+01 | 3.689 .4370E+01
00581> | .472 .1924E+01 | .000 .0000E+00
00582>
00583> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00584> |-----|-----|-----|-----|
00585> | INFLOW >09: (HIP08 ) 77.26 11.944 1.708 74.508
00586> | OUTFLOW <10: (HIP-PO) 77.26 2.666 2.625 74.508
00587>
00588> PEAK FLOW REDUCTION [Qout/Qin] (%)= 22.321
00589> TIME SHIFT OF PEAK FLOW (min)= 55.00
00590> MAXIMUM STORAGE USED (ha.m.)=.4310E+01
00591>
-----
00592> 001:0024-----
00593> *
00594> *SUB-AREA No. 6
00595>
00596> | DESIGN NASHYD | Area (ha)= 2.70 Curve Number (CN)=76.00
00597> | 01:A3 DT= 2.50 | Ia (mm)= 4.670 # of Linear Res. (N)= 3.00
00598> | | U.H. Tp (hrs)= .800
00599>
00600> Unit Hyd Qpeak (cms)= .129
00601>
00602> PEAK FLOW (cms)= .180 (i)
00603> TIME TO PEAK (hrs)= 2.333
00604> RUNOFF VOLUME (mm)= 43.111
00605> TOTAL RAINFALL (mm)= 88.857
00606> RUNOFF COEFFICIENT = .485
00607>
00608> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00609>
-----
00610>
00611> 001:0025-----
00612>
00613> | ADD HYD (Ultima) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00614> |-----|-----|-----|-----|-----|
00615> | | (ha) (cms) (hrs) (mm) (cms)
00616> | ID1 10:HIP-PO 77.26 2.666 2.63 74.51 .000
00617> | +ID2 01:A3 2.70 .180 2.33 43.11 .000
00618> |-----|-----|-----|-----|-----|
00619> | SUM 02:Ultima 79.96 2.830 2.61 73.45 .000
00620>
00621> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00622>
-----
00623> 001:0026-----
00624> FINISH
00625>
00626> *****
00627> WARNINGS / ERRORS / NOTES
00628>
00629> Simulation ended on 2009-05-15 at 09:03:53
00630>
00631>
00632>

```

# A

Appendix A-2  
MOE Certificate of Approval Hawthorne Industrial Park

**CERTIFICATE OF APPROVAL**  
**MUNICIPAL AND PRIVATE SEWAGE WORKS**  
NUMBER 4660-7UNPRJ  
Issue Date: November 9, 2009

Tomlinson Development Corporation  
5597 Power Rd  
Ottawa, Ontario K1G 3N4

Site Location: Hawthorne Industrial Park (HIP) - Phase 1  
Lot 26 and 27, Concession 6 (R.F.)  
City of Ottawa, Ontario

*You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:*

the establishment of sewage works for the collection, transmission, treatment and disposal of stormwater runoff from a catchment area of approximately 70 hectares, servicing the Hawthorne Industrial Park, located immediately southeast of the Hawthorne Road/Rideau Road intersection in the City of Ottawa, to provide partial water quality protection (Normal Protection Level) and to attenuate post-development peak flows to pre-development levels, discharging to Findlay Creek, which is a tributary to the North Castor River, for all storm events up to and including the 100 year return storm, consisting of the following stormwater works:

**Stormwater Management System**

Outlet No. 1, HIP to a dry pond facility (Service area of 69.81 ha):

- A dry pond facility to provide quantity control by attenuating post development peak flows to pre-development levels for all storm events up to and including the 100 year return storm, having a design minimum liquid retention volume of approximately 37,240 m<sup>3</sup> at elevation 86.15 m (0.23 m above 100-year surface pond elevation), with side slopes of 4:1, and servicing approximately 69.81 hectares, which includes Orgaworld Canada Ltd's stormwater treated effluent (10.14 ha). The SWM pond is designed to provide a controlled maximum discharge flow rate of 1,531 L/s for the 100-year storm event, discharging to Findlay Creek; and equipped with:
  - An outlet structure consisting of a 150 mm diameter orifice within a 200 mm diameter polyvinyl chloride (PVC) pipe at an invert elevation of 82.90 m, which serves as outlet to the facility;
  - Two (2) 600 mm diameter corrugated steel pipe (CSP) culvert placed at an invert elevation of 84.80 m, which also serves as an outlet to the facility; and
  - An emergency spillway of 0.35 m deep with a 6.0 m wide base to convey surface flow toward the

receiving channel during extreme storm events.

- The simulated modelling estimate and drainage pattern draining to Outlet No.1 is as follows:

Storm Events (catchment for Outlet #1 – 70 ha)	2-year	5-year	25-year	100-year
Existing flows, pre-development (m <sup>3</sup> /s.)	0.467	0.826	1.468	2.093
Post-development flows (m <sup>3</sup> /s)	3.077	4.812	7.772	10.662
Post-development attenuated flows (m <sup>3</sup> /s)	0.194	0.359	0.939	1.531

- A new roadside ditch system draining to the dry pond facility, equipped with CSP culverts and approximately 1,755 m of 200 mm diameter HDPE perforated pipe sub-drains and clear stone bedding wrapped in geotextile located at the base of the ditches to meet a Normal water quality Protection Level (70% Total Suspended Solids removal) for the contributing catchment area of 1.58 ha which includes the paved portion of the industrial park road network located within the subdivision right-of-way as per the SWM Report (J.L.Richards, 2009).
- The requirement for quality protection for the remaining 68.23 ha is provided by the individual industrial lots within HIP as per the following Certificates of Approval (this list will be amended as future CofAs for other lots within HIP are developed, as per Condition 7 of this Certificate):
  - CofA # 9465-7NVRWT, issued on September 16, 2009, providing Normal water quality Protection Level for 10.14 ha.

Outlet No.2, to Findlay Creek (Service area of 39.16 ha):

- A new roadside ditch system draining to Findlay Creek via an existing roadside ditch located adjacent to Rideau Road, servicing a catchment area along the Hawthorne Road extension and includes the Tomlinson Quarry, as per the SWM Report (J.L.Richards, 2009). This service area is not part of the HIP site.

All including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works* ;

all in accordance with the following supporting documents:

1. Application for Approval of Industrial Sewage Works submitted by Domenic Idone, P.Eng., Planning Engineer of Tomlinson Development Corporation, dated March 12, 2009, and received on June 8 , 2009;
2. Stormwater Management Report - Hawthorne Industrial Park, dated February 2009 (revised May 2009), and prepared by J.L Richards & Associates Limited.
3. Geotechnical Study Subdivision Plan - Hawthorne Industrial Park, Lots 26 and 27, Concession 6, Southeast of Hawthorne and Rideau Roads, Ottawa, dated May 4, 2009, and prepared by

Inspec-Sol Inc.

4. Certificate of Approval 6924-5YWQ3U, issued on May 19, 2004, for R.W. Tomlinson Limited for a lagoon system to treat sewage from the Tomlinson Quarry.
5. s.53 OWRA Certificate of Approval, Orgaworld Canada Ltd. (9465-7NVRWT, issued on September 16, 2009).
6. Revised Fish Habitat Enhancement Strategy - Hawthorne Industrial Park Stormwater Management Pond, prepared by Stantec (Jacques Whitford Stantec Limited), dated May 13, 2009.
7. Clearance Letter from the South Nation Conservation dated May 26, 2009, issued to the City of Ottawa for the Tomlinson / Hawthorne Industrial Park Subdivision.
8. Emails from Derrick P. Upton, P.Eng., of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated August 7 & 11, 2009, with additional information requested.
9. Letter from Derrick P. Upton, P.Eng., of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated August 31, 2009, with additional information requested.
10. Email from Tim Chadder of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated October 9, 2009, with final comments to the CofA.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

"*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

"*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

"*District Manager* " means the District Manager of the Ottawa District Office of the *Ministry* ;

"*Ministry* " means the Ontario Ministry of the Environment;

"*Owner* " means Tomlinson Development Corporation and includes its successors and assignees; and

"*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*

## TERMS AND CONDITIONS

### 1. GENERAL PROVISIONS

(1) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

(2) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(3) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

### 2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

### 3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner* ;

(b) change of address of the *Owner* ;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager* ; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* .

### 4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times.

(2) The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the



*Works* to prevent the excessive build-up of sediments and/or vegetation.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's office for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works* ;

(b) the date and results of each inspection, maintenance, monitoring reports and cleaning, including an estimate of the quantity of any materials removed; and

(c) the date of each spill within the catchment area, including follow-up actions / remedial measures undertaken.

(4) The *Owner* shall operate the *Works* with an objective of achieving Normal water quality Protection Level (70% long-term Total Suspended Solids removal) for the portion of the land being treated with the proposed *Works*.

5. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works*, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this *Certificate* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, Semi-annually means once twice per year;

(3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

<b>Table 1 - Surface Water Monitoring</b>	
Sample location: at the inlet of the dry pond facility	
<b>Frequency</b>	Semi-annually; at least once being for the snowmelt freshets and another being 72 hours after the fall of precipitation of more than 25 mm.
<b>Sample Type</b>	Grab
<b>Parameters</b>	<i>CBOD5</i> , Total Suspended Solids, Total Phosphorus, <i>E. Coli</i> , pH, Temperature, Acute Lethality.

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from

time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(d) the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (July 1990) and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna" (July 1990), as amended from time to time by more recently published editions; and,

(6) The measurement frequencies and the overall monitoring program specified in subsection (3) are minimum requirements which may, after three (3) years of monitoring in accordance with this Condition or after a minimum 75% build-up of the site, whichever occurs first, be modified by the *District Manager* in writing from time to time.

(7) The *Owner* shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Certificate* .

(8) The *Owner* shall enter into an agreement with the owner of the composting facility located within HIP, located at Part of Lot 27, Concession 6, 5123 Hawthorne Road, for the long-term access to private wells for its operation, maintenance and testing to ensure that the provisions of a groundwater monitoring program can be administered. A copy of such Agreement shall be provided to the *District Manager* prior to the commencement of operation of the *Works* .

## 6. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance and activities required by this *Certificate* .

## 7. SPECIAL CONDITION

(1) The *Owner* shall ensure through the Site Plan Approval process that individual lots developed within the industrial park will obtain a approval, in accordance with section 53 of the OWRA, before discharging into the roadside ditches and ultimately to the dry pond facility.

(2) The *Owner* shall not approve any additional flow from storm sewers, catchbasin leads, and storm service drains to the individual industrial plots to connect with the dry pond unless this Certificate of Approval is amended with adequate quality treatment proposed via provision of additional sewage treatment works, best management practices and hydraulic capacity servicing them has been designed and reviewed by the Ministry concluding that the additional quality of stormwater will not overload the

downstream collection system, pond and/or alter the stormwater quality of effluent discharged to the receiver of this *Certificate*.

*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that the *Works* are constructed in a timely manner so that standards applicable at the time of Approval of the *Works* are still applicable at the time of construction, to ensure the ongoing protection of the environment
3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.
4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .
5. Conditions 5 and 7 are included to enable the *Owner* to evaluate and demonstrate the performance of the *Works* , on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives specified in the *Certificate* and that the *Works* does not cause any impairment to the receiving watercourse.
6. Condition 6 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*

The Secretary\*  
Environmental Review Tribunal  
655 Bay Street, 15th Floor  
Toronto, Ontario  
M5G 1E5

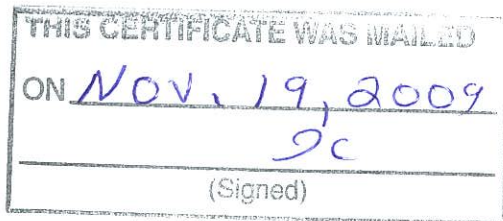
AND

The Director  
Section 53, *Ontario Water Resources Act*  
Ministry of the Environment  
2 St. Clair Avenue West, Floor 12A  
Toronto, Ontario  
M4V 1L5

\* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or [www.ert.gov.on.ca](http://www.ert.gov.on.ca)

*The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.*

DATED AT TORONTO this 9th day of November, 2009



---

Mansoor Mahmood, P.Eng.  
Director  
Section 53, *Ontario Water Resources Act*

ET/

c: District Manager, MOE Ottawa District Office  
Derrick Upton, P.Eng., J.L. Richards & Associates Limited ✓

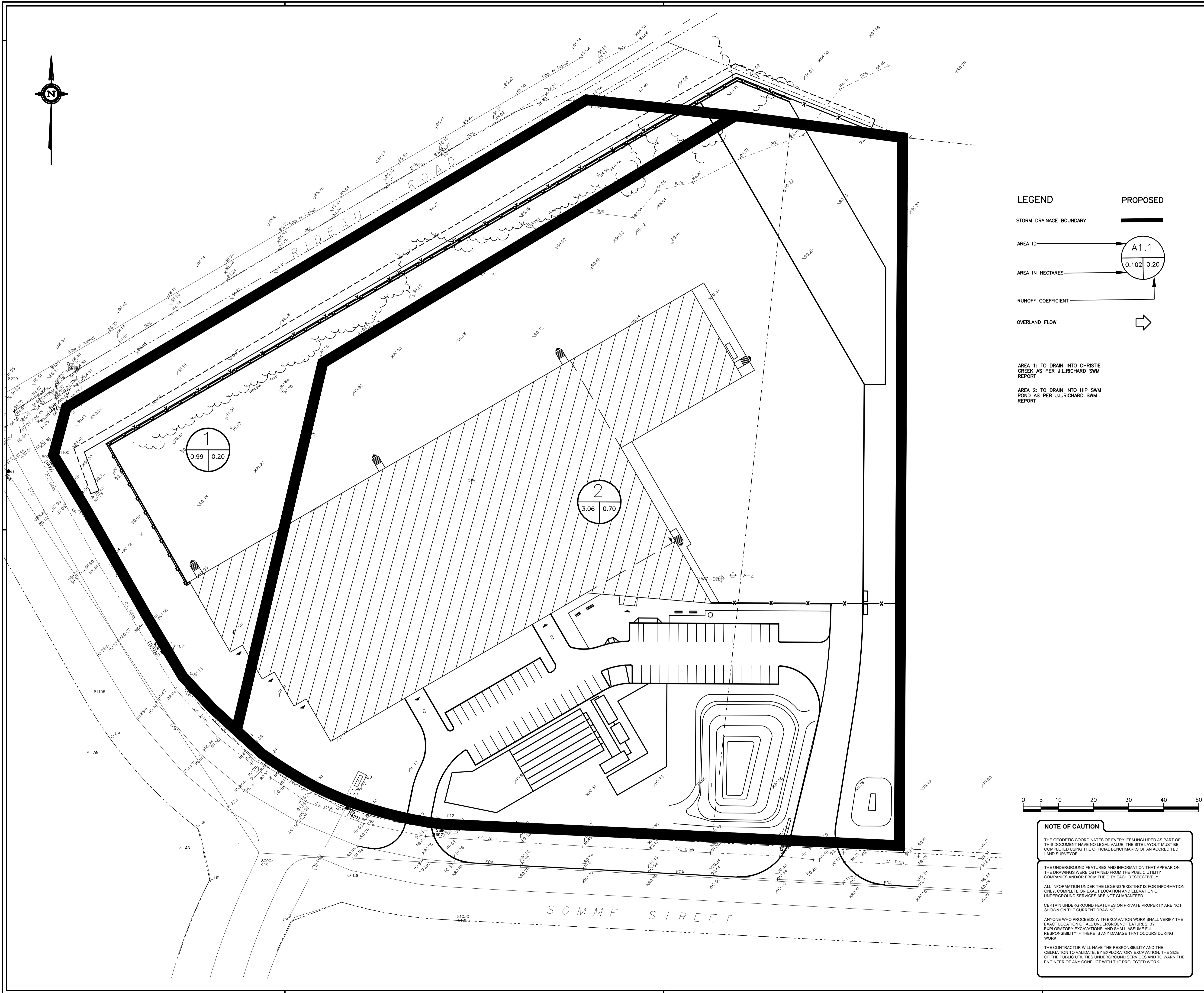
RECEIVED  
NOV 23 2009

J.L. Richards & Associates Limited  
OTTAWA OFFICE

# B

## Appendix B-1 SWM DRAWING PRE-DEVELOPMENT

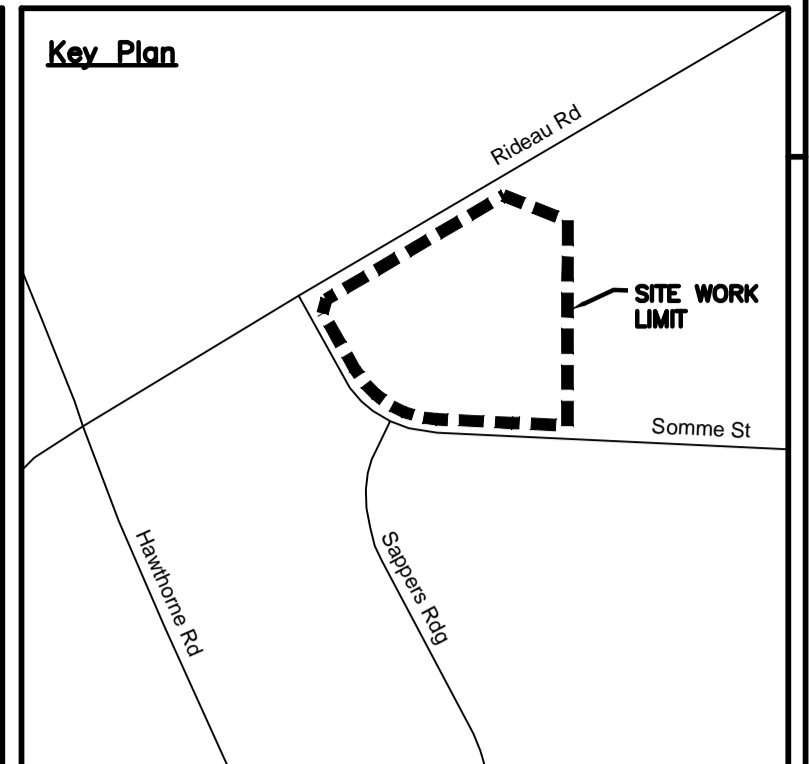




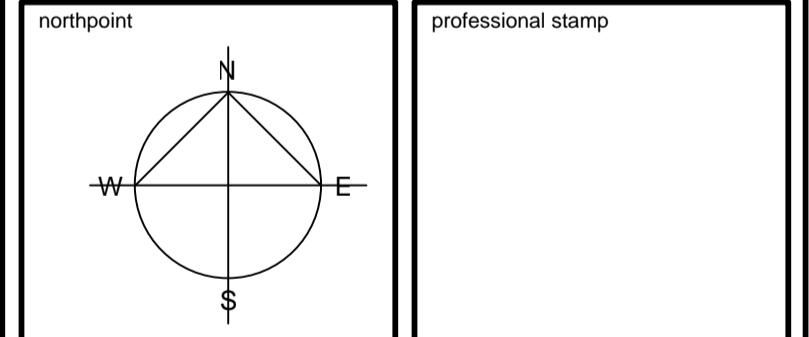
**LEGEND**

- STORM DRAINAGE BOUNDARY
- AREA ID
- AREA IN HECTARES
- RUNOFF COEFFICIENT
- OVERLAND FLOW

AREA 1: TO DRAIN INTO CHRISTIE CREEK AS PER J.L.RICHARD SWM REPORT  
 AREA 2: TO DRAIN INTO HIP SWM POND AS PER J.L.RICHARD SWM REPORT



no.	date	ISSUED FOR SITE PLAN CONTROL	J.S.
1	JUNE 3, 2022	REVISION/ISSUE	BY



project title  
**SOMME STREET, OTTAWA, ONTARIO FASTFRATE FACILITY**

drawing title  
**STORMWATER MANAGEMENT PLAN (PRE-DEVELOPMENT)**

date	MARCH 08, 2021	job no.	<b>A001083</b>
scale	1 : 500	drawing no.	<b>SWM</b>
drawn	D.CANN		
approved	J.SAUVÉ		
plot date	1/13/2021 3:31:05 PM		



**NOTE OF CAUTION**

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

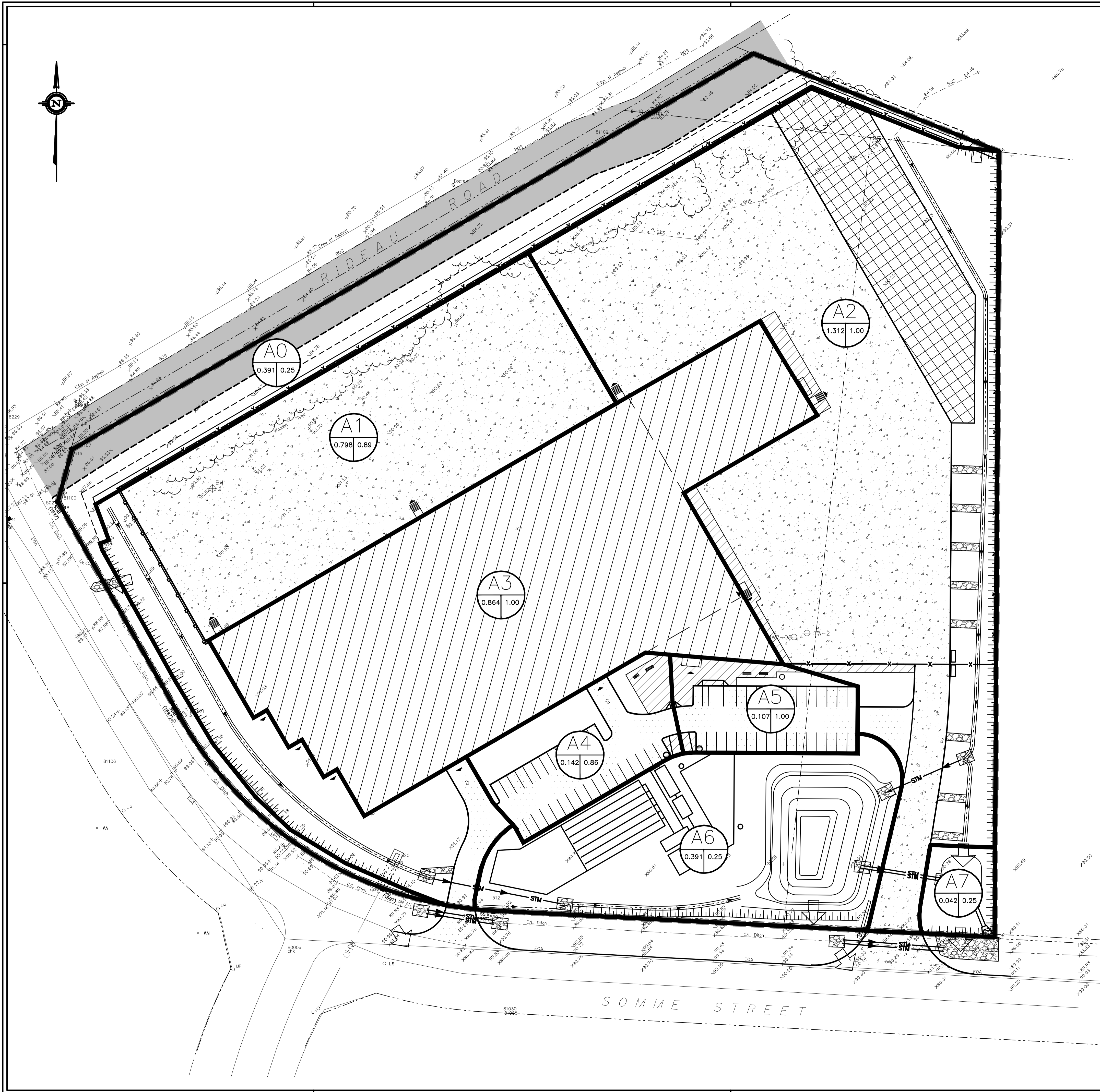
THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

1. DO NOT SCALE FROM THIS DRAWING  
 2. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES  
 3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE FOLLOWING DRAWINGS: STRUCTURAL, MECHANICAL, ELECTRICAL

# B

## Appendix B-2 SWM DRAWING POST-DEVELOPMENT





**LEGEND**

STORM DRAINAGE BOUNDARY

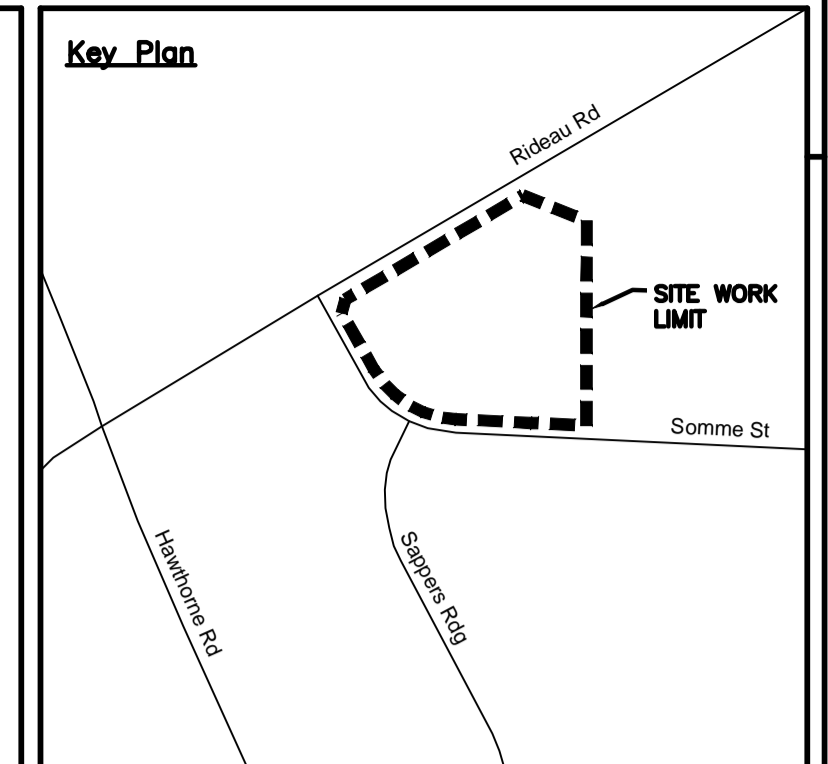
AREA ID

AREA IN HECTARES

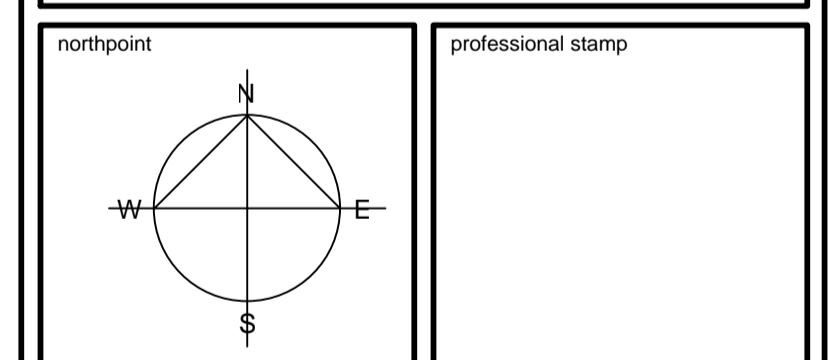
RUNOFF COEFFICIENT

OVERLAND FLOW

**PROPOSED**



2	JUNE 07, 2022	ISSUED FOR SITE PLAN CONTROL REV 2	J.S.
1	JULY 26, 2021	ISSUED FOR REVIEW	
no.	date	revision/issue	by



project title

**SOMME STREET,  
OTTAWA, ONTARIO  
FASTFRATE FACILITY**

drawing title

**STORMWATER MANAGEMENT  
PLAN (POST-DEVELOPMENT)**

date	MARCH 08, 2021	job no.	<b>A001083</b>
scale	1 : 500	drawing no.	<b>SWM</b>
drawn	D.CANN		
approved	J.SAUVÉ		
plot date	1/13/2021 3:31:05 PM		



**NOTE OF CAUTION**

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

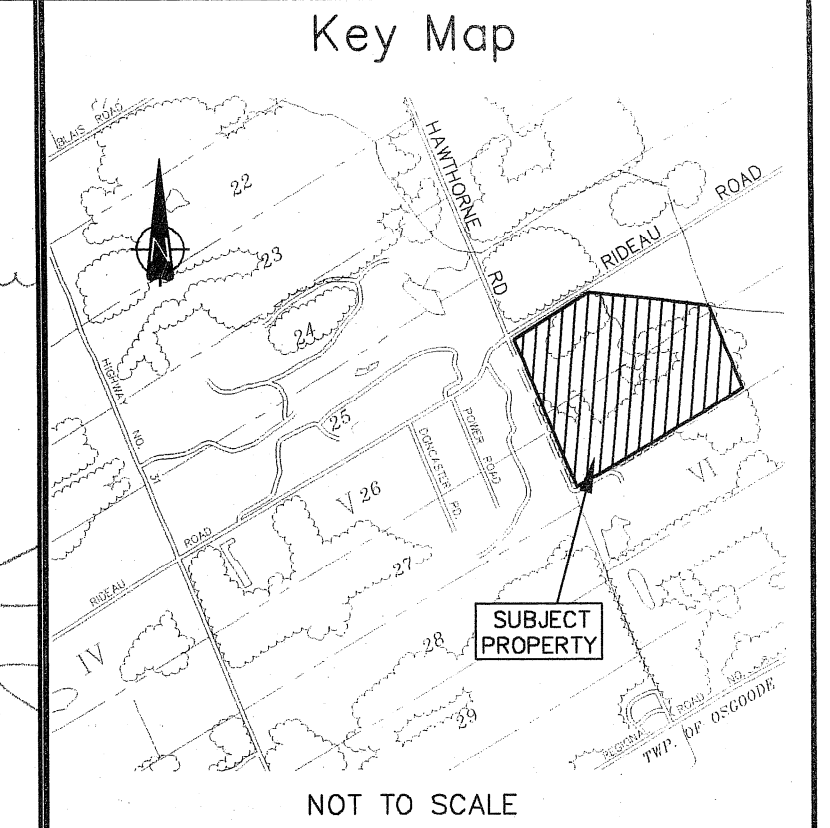
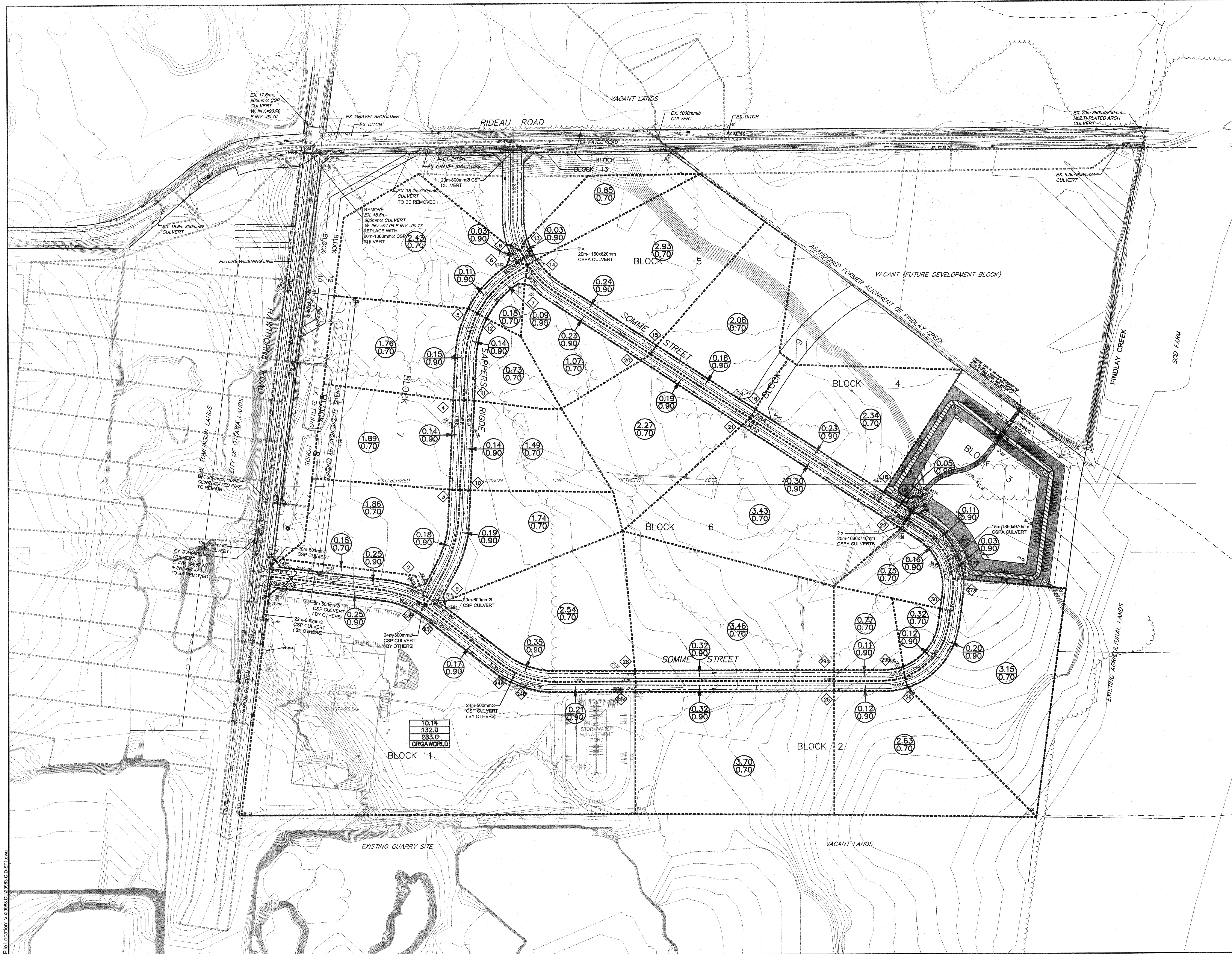
1. DO NOT SCALE FROM THIS DRAWING  
2. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES  
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE FOLLOWING DRAWINGS: STRUCTURAL, MECHANICAL, ELECTRICAL



# B

Appendix B-3  
STORM AREA DRAINAGE PLAN FOR HIP FROM J.L.  
RICHARDS





**LEGEND**

- DRAINAGE BOUNDARY
- (2.91 / 0.70) AREA IN HECTARES  
\* RUNOFF COEFFICIENT (C)
- 10.14 DRAINAGE AREA (ha)
- 132.0 10 YEAR PEAK FLOW (l/s)
- 283.0 100 YEAR PEAK FLOW (l/s)
- ORGA WORLD ORGA WORLD SITE
- 28 NODE LOCATION NUMBER
- PROPOSED DITCH AND FLOW DIRECTION

NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: 1:2000

0 25 50 100 150

**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

PROFESSIONAL STAMP  
 LICENSED PROFESSIONAL ENGINEER  
 D. P. UPTON  
 PROVINCE OF ONTARIO

PROJECT NORTH

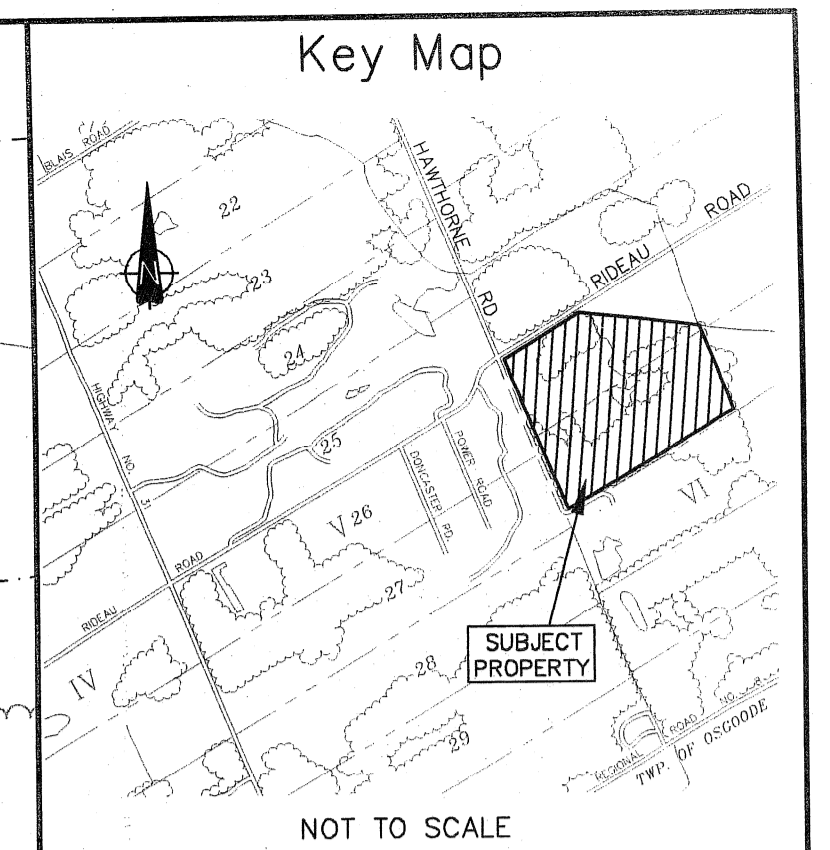
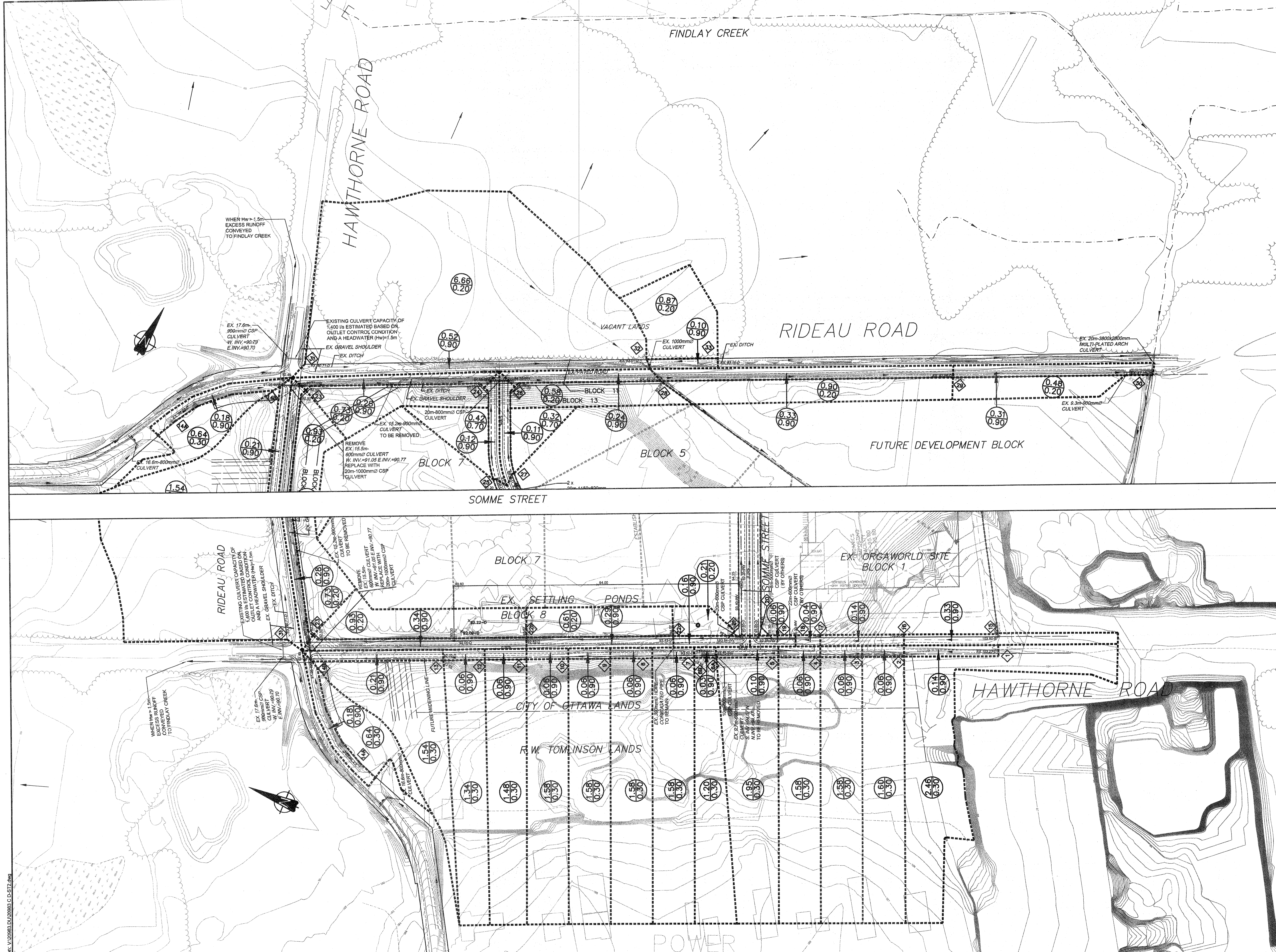
PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

DRAWING:  
**STORM DRAINAGE AREA PLAN**

DESIGN: M.B.  
 DRAWN: T.S.  
 CHECKED: D.U.  
 PLOTTED: May 28, 2009

DRAWING NO.:  
**D-ST1**  
 JLR NO:  
 20983

File Location: V:\2009\05\200905\_C.D-ST1.dwg



**LEGEND**

- DRAINAGE BOUNDARY
- AREA IN HECTARES  
\* RUNOFF COEFFICIENT (C)
- NODE LOCATION NUMBER
- PROPOSED DITCH AND FLOW DIRECTION
- EXISTING SURFACE FLOW DIRECTION

\* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.

SCALE: 1:2000

**J.L. Richards & Associates Limited**  
 203-863 Princess Street  
 Kingston, ON Canada  
 K7L 5N4  
 Tel: 613 544 1424  
 Fax: 613 544 5679

**J.L. Richards**  
 ENGINEERS ARCHITECTS-PLANNERS

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:  
**HAWTHORNE INDUSTRIAL PARK**

DRAWING:  
**STORM DRAINAGE AREA PLAN**

DESIGN: M.B.	DRAWING NO.: <b>D-ST2</b>
DRAWN: T.S.	JLR NO:
CHECKED: D.U.	20983
PLOTTED: May 28, 2009	

# B

Appendix B-4  
IDENTIFICATION OF SOURCE DATA FROM HIP SWM  
REPORT BY J.L. RICHARDS

**IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT**  
 Project: Fastrate Warehouse Development - CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Industrial Park**

**Legend:**

**OPEN DITCH/CULVERT DESIGN SHEET**

City of Ottawa

Source Data Identification

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

Checked by: G. Forget, P.Eng.

1:10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA				PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)						
	FROM	TO	Area at C of		SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL				OUTLET CONTROL	HW 1:10 (m)				
			0.70 (ha)	0.90 (ha)																														
NORTHERN CATCHMENT AREA																																		
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.46	1.46	4.07	4.07	15.00	97.85	398.2	0.00	0.42	1.20	3.00	0.50	424.2	6973.0	0.80	136.80										2.84	92.50	91.82	
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.45	2.92	4.04	8.11	17.84	88.22	715.4	0.00	0.51	1.20	3.00	0.80	904.2	8856.1	1.16	111.00										1.60	91.82	90.93	
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.36	4.28	3.79	11.90	19.44	83.68	995.9	0.00	0.58	1.20	3.00	0.51	1011.3	7029.1	1.00	112.85										1.88	90.93	90.36	
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	1.80	6.08	5.00	16.90	21.32	78.96	1334.4	0.00	0.65	1.20	3.00	0.62	1513.4	7762.6	1.19	82.79										1.16	90.36	89.85	
NORTH ENTRANCE TO SOMME STREET	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	97.85	7.3	0.00	0.20	1.20	3.00	1.30	94.9	11276.7	0.79	10.00										0.21	89.98	89.85	
CULVERT CROSSING	6	14		0.00	0.00	0.00	6.11	0.00	16.97	22.47	76.34	1295.8										2	----	1.15 x 0.82	NO	YES	0.75	0.38	89.85	89.75				
NORTH PORTION SOMME STREET	13	14	0.85	0.03	0.88	0.62	0.62	1.73	1.73	15.00	97.85	169.2	0.00	0.30	1.20	3.00	2.30	372.0	14999.4	1.38	10.00										0.12	89.98	89.75	
NORTH PORTION SOMME STREET	14	15	2.93	0.24	3.17	2.27	8.99	6.30	25.00	22.85	75.52	1888.2	0.00	0.74	1.20	3.00	0.50	1926.6	6992.8	1.17	184.04										2.62	89.75	88.83	
NORTH PORTION SOMME STREET	15	16	2.08	0.18	2.26	1.62	10.61	4.50	29.50	25.47	70.36	2075.4	0.00	0.77	1.20	3.00	0.57	2291.4	7480.8	1.29	145.08										1.88	88.83	88.00	
NORTH PORTION SOMME STREET	16	18	2.34	0.23	2.57	1.85	12.46	5.13	34.63	27.35	67.11	2323.9	0.00	0.80	1.20	3.00	0.51	2399.6	7074.8	1.25	185.66										2.48	88.00	87.05	
NORTH PORTION SOMME STREET	18	19	0.00	0.05	0.05	0.05	12.50	0.13	34.75	29.82	63.30	2199.9	0.00	0.76	1.20	3.00	0.72	2476.8	8372.8	1.43	41.86										0.49	87.05	86.75	
EAST SIDE SAPPERS RIDGE	9	10	1.74	0.19	1.93	1.39	1.39	3.86	3.86	15.00	97.85	378.0	0.00	0.41	1.20	3.00	0.50	399.2	6996.6	0.79	147.87										3.11	92.40	91.66	
EAST SIDE SAPPERS RIDGE	10	11	1.49	0.14	1.63	1.17	2.56	3.25	7.11	18.11	87.42	622.0	0.00	0.49	1.20	3.00	0.66	735.9	8019.2	1.02	111.04										1.81	91.66	90.93	
EAST SIDE SAPPERS RIDGE	11	12	0.73	0.14	0.87	0.64	3.20	1.77	8.88	19.92	82.40	732.0	0.00	0.52	1.20	3.00	0.55	785.5	7304.8	0.97	104.49										1.80	90.93	90.36	
EAST SIDE SAPPERS RIDGE	12	7	0.18	0.09	0.27	0.21	3.40	0.58	9.46	21.72	78.02	738.2	0.00	0.49	1.20	3.00	0.81	818.5	8919.0	1.14	72.55										1.06	90.36	89.77	
NORTH PORTION SOMME STREET	7	20	1.07	0.23	1.30	0.96	4.36	2.66	12.12	22.79	75.66	916.9	0.00	0.57	1.20	3.00	0.50	956.8	6966.1	0.98	177.39										3.01	89.77	88.89	
NORTH PORTION SOMME STREET	20	21	2.27	0.19	2.46	1.76	6.12	4.89	17.01	25.80	69.76	1186.8	0.00	0.62	1.20	3.00	0.50	1200.1	6981.9	1.04	147.49										2.36	88.89	88.16	
NORTH PORTION SOMME STREET	21	22	3.43	0.30	3.73	2.67	8.79	7.43	24.44	28.16	65.80	1608.1	0.00	0.70	1.20	3.00	0.56	1759.0	7404.4	1.20	232.84										3.24	88.16	86.85	
SOUTHERN CATCHMENT AREA																																		
SOUTH PORTION SOMME STREET	23A	23B	0.00	0.25	0.25	0.23	0.23	0.63	0.63	15.00	97.85	61.2	0.00	0.20	1.20	3.00	0.64	66.3	7883.5	0.55	181.00											5.46	93.65	92.50
CULVERT CROSSING	23B	23C		0.00	0.00	0.00	0.23	0.00	0.63	20.46	81.05	50.7										1	500	----	NO	YES	0.33	1.55	92.50	92.40				
SOUTH PORTION SOMME STREET	23C	24A	0.00	0.17	0.17	0.15	0.38	0.43	1.05	22.00	77.38	81.3	0.00	0.22	1.20	3.00	0.82	97.0	8946.1	0.67	110.00											2.74	92.40	91.50
CULVERT CROSSING	24A	24B		0.00	0.00	0.00	0.38	0.00	1.05	24.75	71.70	75.3										1	500	----	NO	YES	0.34	1.04	91.50	91.40				
SOUTH PORTION SOMME STREET	24B	24C	0.00	0.21	0.21	0.19	0.57	0.53	1.58	25.79	69.78	110.0	0.00	0.25	1.20	3.00	0.70	126.0	8258.2	0.67	142.00										3.52	91.40	90.41	
ORGAWORLD - SITE	US	24C	1:10 year peak flow = 132 L/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008																															
SOUTH PORTION SOMME STREET	24C	25	3.70	0.32	4.02	2.88	3.44	8.00	9.58	29.31	64.05	745.3	0.00	0.52	1.20	3.00	0.54	783.8	7289.5	0.97	244.84										4.22	90.41	89.08	
SOUTH PORTION SOMME STREET	25	26	2.63	0.12	2.75	1.95	5.39	5.42	14.99	33.53	58.41	1007.7	0.00	0.58	1.20	3.00	0.51	1013.1	7041.5	1.00	90.75										1.51	89.08	88.62	
SOUTH PORTION SOMME STREET	26	27A	3.15	0.20	3.35	2.39	7.78	6.63	21.63	35.04	56.65	1357.2	0.00	0.62	1.20	3.00	0.65	1370.0	7970.4	1.19	157.06										2.20	88.62	87.60	
SOUTH PORTION SOMME STREET	27A	27B	0.00	0.03	0.03	0.03	7.81	0.08	21.70	37.24	54.29	1310.1	0.00	0.61	1.20	3.00	0.65	1312.4	7973.8	1.18	20.00										0.28	87.60	87.47	
CULVERT CROSSING	27B	27C		0.00	0.00	0.00	7.81	0.00	21.70	37.53	54.00	1303.8										1	----	1.39 X 0.97	YES	NO	0.87	0.20	87.47	87.36				
CORNER OF POND	27C	19	0.00	0.11	0.11	0.10	7.88	0.28	21.98	37.73	53.79	1314.2	0.00	0.65	1.20	3.00	0.71	1622.9	8324.0	1.28	72.00										0.94	87.36	86.85	


**IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT**  
 Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Industrial Park**

City of Ottawa

JLR 20983  
 February 2009 (Revised April 2009)

Legend:

 Source Data Identification

**OPEN DITCH/CULVERT DESIGN SHEET**

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:10 year Ottawa International Airport IDF Curve


Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA						CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW	U/S	D/S						
	FROM	TO	Area at C of		SUM(A)	SUM(A°C)	TOTAL A°C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)	TIME (min)	Inv (m)	Inv (m)		
			0.70 (ha)	0.90 (ha)																												
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.35	0.35	0.97	0.97	15.00	97.85	94.6	0.00	0.32	1.20	3.00	0.61	226.9	7702.7	0.74	189.60									4.28	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.35	0.00	0.97	19.28	84.12	81.3					0.50				20.00	1	600	----	NO	YES	0.52	1.16	92.50	92.40		
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.10	2.44	5.83	6.80	20.44	81.10	551.2	0.00	0.47	1.20	3.00	0.73	694.0	8450.7	1.05	272.58									4.34	92.40	90.41
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	2.71	5.15	7.53	14.33	24.77	71.65	1026.7	0.00	0.61	1.20	3.00	0.54	1198.8	7283.5	1.07	245.24									3.81	90.41	89.08
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.64	5.79	1.78	16.11	28.58	65.15	1049.5	0.00	0.62	1.20	3.00	0.53	1239.6	7212.0	1.07	86.51									1.34	89.08	88.62
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.33	6.13	0.92	17.03	29.92	63.16	1075.8	0.00	0.58	1.20	3.00	0.70	1191.6	8282.1	1.18	94.12									1.33	88.62	87.96
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.67	6.80	1.86	18.89	31.25	61.31	1158.5	0.00	0.58	1.20	3.00	0.97	1402.6	9748.4	1.39	124.55									1.49	87.96	86.75
										32.74																						
CULVERT CROSSING	22	19		0.00	0.00	0.00	15.59	0.00	43.33	32.74	59.38	2573.1					0.50				20.00	2	----	1.03 X 0.74	YES	NO	1.30	0.08	86.85	86.75		
										32.82																						
POND INLET	19	POND		0.00	0.00	0.00	35.97	0.00	100.06	38.67	52.87	5422.6	3.09	0.38	1.20	3.00	5.68	5629.1	13135.2	3.50	22.00									0.10	86.75	85.50
POND OUTLET DITCH	POND	DITCH	1:10 year controlled post development peak flow = 696 l/s, see SWMHYMO output of this Report										1.00	0.27	0.38	3.00	2.08	750.9	1506.6	1.54	24.00								0.26	82.50	82.00	

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT  
Project: Fastrate Warehouse Development – CIMA+ Ref: A001083  
Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
Date : 2022-06-01

Hawthorne Industrial Park

Legend:  
 Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve


February 2009 (Revised April 2009)

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)		
	FROM	TO	Area at C of		SUM(A)	SUM(A*1.25°C) 25% increase in C factor	TOTAL A°C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL					
			0.70 (ha)	0.90 (ha)																									
<b>NORTHERN CATCHMENT AREA</b>																													
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.81	1.81	5.02	5.02	15.00	142.89	718.0	0.00	1.20	3.00	0.50	6973.0	1.61	136.80							1.41	92.50	91.82	
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.80	3.61	5.00	10.02	16.41	135.47	1357.9	0.00	1.20	3.00	0.80	8856.1	2.05	111.00							0.90	91.82	90.93	
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.69	5.29	4.69	14.71	17.31	131.16	1929.7	0.00	1.20	3.00	0.51	7029.1	1.63	112.85							1.16	90.93	90.36	
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	2.23	7.53	6.21	20.92	18.47	126.06	2637.5	0.00	1.20	3.00	0.62	7762.6	1.80	82.79							0.77	90.36	89.85	
<b>NORTH ENTRANCE TO SOMME STREET</b>																													
	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	142.89	11.9	0.00	1.20	3.00	1.30	11276.7	2.61	10.00							0.06	89.98	89.85	
<b>CULVERT CROSSING</b>																													
	6	14		0.00	0.00	0.00	7.56	0.00	21.01	19.24	122.91	2581.8				0.50			20.00	2	----	1.15 x 0.82	NO	YES	0.19	89.85	89.75		
<b>NORTH PORTION SOMME STREET</b>																													
	13	14	0.85	0.03	0.88	0.77	0.77	2.15	2.15	15.00	142.89	307.4	0.00	1.20	3.00	2.30	14999.4	3.47	10.00							0.05	89.98	89.75	
<b>NORTH PORTION SOMME STREET</b>																													
	14	15	2.93	0.24	3.17	2.80	11.13	7.79	30.95	19.43	122.15	3780.5	0.00	1.20	3.00	0.50	6992.8	1.62	184.04							1.89	89.75	88.83	
<b>NORTH PORTION SOMME STREET</b>																													
	15	16	2.08	0.18	2.26	2.00	13.13	5.56	36.51	21.32	115.16	4204.4	0.00	1.20	3.00	0.57	7480.8	1.73	145.08							1.40	88.83	88.00	
<b>NORTH PORTION SOMME STREET</b>																													
	16	18	2.34	0.23	2.57	2.28	15.41	6.33	42.84	22.72	110.55	4736.0	0.00	1.20	3.00	0.51	7074.8	1.64	185.66							1.89	88.00	87.05	
<b>NORTH PORTION SOMME STREET</b>																													
	18	19	0.00	0.05	0.05	0.05	15.46	0.14	42.98	24.61	104.93	4509.7	0.00	1.20	3.00	0.72	8372.8	1.94	41.86							0.36	87.05	86.75	
<b>EAST SIDE SAPPERS RIDGE</b>																													
	9	10	1.74	0.19	1.93	1.71	1.71	4.76	4.76	15.00	142.89	680.4	0.00	1.20	3.00	0.50	6996.6	1.62	147.87							1.52	92.40	91.66	
<b>EAST SIDE SAPPERS RIDGE</b>																													
	10	11	1.49	0.14	1.63	1.44	3.16	4.02	8.78	16.52	134.93	1184.3	0.00	1.20	3.00	0.66	8019.2	1.86	111.04							1.00	91.66	90.93	
<b>EAST SIDE SAPPERS RIDGE</b>																													
	11	12	0.73	0.14	0.87	0.78	3.94	2.16	10.94	17.52	130.23	1424.7	0.00	1.20	3.00	0.55	7304.8	1.69	104.49							1.03	90.93	90.36	
<b>EAST SIDE SAPPERS RIDGE</b>																													
	12	7	0.18	0.09	0.27	0.25	4.18	0.69	11.63	18.55	125.73	1462.2	0.00	1.20	3.00	0.81	8919.0	2.06	72.55							0.59	90.36	89.77	
<b>NORTH PORTION SOMME STREET</b>																													
	7	20	1.07	0.23	1.30	1.17	5.35	3.24	14.87	19.13	123.33	1834.1	0.00	1.20	3.00	0.50	6966.1	1.61	177.39							1.83	89.77	88.89	
<b>NORTH PORTION SOMME STREET</b>																													
	20	21	2.27	0.19	2.46	2.18	7.53	6.05	20.92	20.97	116.41	2435.6	0.00	1.20	3.00	0.50	6981.9	1.62	147.49							1.52	88.89	88.16	
<b>NORTH PORTION SOMME STREET</b>																													
	21	22	3.43	0.30	3.73	3.30	10.83	9.18	30.10	22.49	111.29	3350.0	0.00	1.20	3.00	0.56	7404.4	1.71	232.84							2.26	88.16	86.85	
<b>SOUTHERN CATCHMENT AREA</b>																													
<b>SOUTH PORTION SOMME STREET</b>																													
	23A	23B	0.00	0.25	0.25	0.25	0.25	0.70	0.70	15.00	142.89	99.3	0.00	1.20	3.00	0.64	7883.5	1.82	181.00							1.65	93.65	92.50	
<b>CULVERT CROSSING</b>																													
	23B	23C		0.00	0.00	0.00	0.25	0.00	0.70	16.65	134.29	93.3				0.42			24.00	1	500	----	NO	YES	0.84	92.50	92.40		
<b>SOUTH PORTION SOMME STREET</b>																													
	23C	24A	0.00	0.17	0.17	0.17	0.42	0.47	1.17	17.49	130.34	152.2	0.00	1.20	3.00	0.82	8946.1	2.07	110.00							0.89	92.40	91.50	
<b>CULVERT CROSSING</b>																													
	24A	24B		0.00	0.00	0.00	0.42	0.00	1.17	18.38	126.45	147.6				0.42			24.00	1	500	----	NO	YES	0.53	91.50	91.40		
<b>SOUTH PORTION SOMME STREET</b>																													
	24B	24C	0.00	0.21	0.21	0.21	0.63	0.58	1.75	18.91	124.24	217.6	0.00	1.20	3.00	0.70	8258.2	1.91	142.00							1.24	91.40	90.41	
<b>ORGAWORLD - SITE</b>																													
	U/S	24C	1:100 year peak flow = 283 l/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008									283.0																	
<b>SOUTH PORTION SOMME STREET</b>																													
	24C	25	3.70	0.32	4.02	3.56	4.19	9.89	11.64	20.15	119.40	1672.8	0.00	1.20	3.00	0.54	7289.5	1.69	244.84							2.42	90.41	89.08	
<b>SOUTH PORTION SOMME STREET</b>																													
	25	26	2.63	0.12	2.75	2.42	6.61	6.73	18.37	22.57	111.05	2323.0	0.00	1.20	3.00	0.51	7041.5	1.63	90.75							0.93	89.08	88.62	
<b>SOUTH PORTION SOMME STREET</b>																													
	26	27A	3.15	0.20	3.35	2.96	9.57	8.22	26.59	23.49	108.17	3159.5	0.00	1.20	3.00	0.65	7970.4	1.84	157.06							1.42	88.62	87.60	
<b>SOUTH PORTION SOMME STREET</b>																													
	27A	27B	0.00	0.03	0.03	0.03	9.60	0.08	26.67	24.91	104.09	3059.5	0.00	1.20	3.00	0.65	7973.8	1.85	20.00							0.18	87.60	87.47	
<b>CULVERT CROSSING</b>																													
	27B	27C		0.00	0.00	0.00	9.60	0.00	26.67	25.09	103.59	3046.2				0.73			15.00	1	----	1.39 X 0.97	YES	NO	0.09	87.47	87.36		
<b>CORNER OF POND</b>																													
	27C	19	0.00	0.11	0.11	0.11	9.71	0.31	26.98	25.18	103.36	3071.7	0.00	1.20	3.00	0.71	8324.0	1.93	72.00							0.62	87.36	86.85	

**IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT**  
 Project: Fastrate Warehouse Development – CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Industrial Park**

**Legend:**  
 Source Data Identification

**OPEN DITCH/CULVERT DESIGN SHEET**

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

February 2009 (Revised April 2009)

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA						CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT				FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)					
	FROM	TO	Area at C of		SUM(A)	SUM(A*1.25°C) 25% increase in C factor	TOTAL A°C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)				INLET CONTROL	OUTLET CONTROL			
			0.70 (ha)	0.90 (ha)																										
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.40	0.40	1.12	1.12	15.00	142.89	160.5	0.00	1.20	3.00	0.61	7702.7	1.78	189.60									1.77	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.40	0.00	1.12	16.77	133.71	150.2				0.50			20.00	1	600	----	NO	YES			0.63	92.50	92.40	
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.58	2.98	7.16	8.29	17.40	130.77	1083.6				0.73	8450.7	1.96	272.58								2.32	92.40	90.41	
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	3.35	6.33	9.31	17.59	19.72	121.01	2128.9				0.54	7283.5	1.69	245.24								2.42	90.41	89.08	
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.79	7.11	2.19	19.78	22.15	112.40	2223.0				0.53	7212.0	1.67	86.51								0.86	89.08	88.62	
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.40	7.51	1.11	20.89	23.01	109.65	2290.7				0.70	8282.1	1.92	94.12								0.82	88.62	87.96	
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.82	8.33	2.27	23.16	23.83	107.18	2482.3				0.97	9748.4	2.26	124.55								0.92	87.96	86.75	
										24.75																				
CULVERT CROSSING	22	19		0.00	0.00	0.00	19.16	0.00	53.26	24.75	104.53	5567.5				0.50			20.00	2	----	1.03 X 0.74	YES	NO			0.04	86.85	86.75	
										24.79																				
POND INLET	19	POND		0.00	0.00	0.00	44.32	0.00	123.22	25.80	101.69	12813.8				5.68	13135.2	4.09	22.00									0.09	86.75	85.50
POND OUTLET DITCH	POND	DITCH	1:100 year controlled post development peak flow = 1,432 l/s, see SWMHYMO output of this Report									1432.0																0.22	82.50	82.00

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030



IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT  
 Project: Fastfrate Warehouse Development - CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Road & Rideau Road**

Legend:

Source Data Identification

**OPEN DITCH/CULVERT DESIGN SHEET**

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983  
 February 2009

Checked by: G. Forget, P.Eng.

10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA						PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA						CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)							
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels				DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)		
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																												
<b>WEST CATCHMENT AREA</b>																																		
WEST SIDE HAWTHORNE ROAD	1	2		2.46		0.14	2.60	0.86	0.86	2.40	2.40	15.00	97.85	235.0	0.00	0.41	0.50	3.00	0.20	250.1	424.5	0.50	112.00								3.76	103.22	103.00	
WEST SIDE HAWTHORNE ROAD	2	3		1.60		0.06	1.66	0.53	1.40	1.48	3.89	18.76	85.54	332.5	0.00	0.25	0.50	3.00	5.00	337.3	2141.9	1.80	50.00								0.46	103.00	100.50	
WEST SIDE HAWTHORNE ROAD	3	4		1.58		0.06	1.64	0.53	1.93	1.47	5.35	19.23	84.26	451.1	0.00	0.27	0.50	3.00	7.00	490.1	2534.3	2.24	50.00								0.37	100.50	97.00	
WEST SIDE HAWTHORNE ROAD	4	5		1.58		0.06	1.64	0.53	2.45	1.47	6.82	19.60	83.26	568.0	0.00	0.34	0.50	3.00	5.00	765.9	2141.9	2.21	50.00								0.38	97.00	94.50	
WEST SIDE HAWTHORNE ROAD	5	6a		1.95		0.10	2.05	0.68	3.13	1.88	8.70	19.98	82.27	715.6	0.00	0.45	0.65	3.00	1.07	747.0	1991.5	1.23	75.00								1.02	94.50	93.70	
CULVERT CROSSING	6a	6b				0.00	0.00	0.00	3.13	0.00	8.70	20.99	79.73	693.6								1.00	10.00	1	800	----	YES	NO	0.84	0.12	93.70	93.60		
WEST SIDE HAWTHORNE ROAD	6b	7		1.20		0.03	1.23	0.39	3.52	1.08	9.77	21.11	79.45	776.5	0.00	0.53	1.15	3.00	0.53	817.1	6447.9	0.97	15.00								0.26	93.60	93.52	
WEST SIDE HAWTHORNE ROAD	7	8		1.58		0.06	1.64	0.53	4.04	1.47	11.24	21.37	78.83	886.3	0.00	0.56	1.15	3.00	0.50	916.3	6243.2	0.97	50.00								0.86	93.52	93.27	
WEST SIDE HAWTHORNE ROAD	8	9		1.58		0.06	1.64	0.53	4.57	1.47	12.71	22.23	76.88	977.2	0.00	0.58	1.15	3.00	0.50	1006.2	6243.2	1.00	50.00								0.84	93.27	93.02	
WEST SIDE HAWTHORNE ROAD	9	10		1.58		0.06	1.64	0.53	5.10	1.47	14.18	23.06	75.07	1064.4	0.00	0.60	1.15	3.00	0.50	1101.4	6243.2	1.02	50.00								0.82	93.02	92.77	
WEST SIDE HAWTHORNE ROAD	10	11		1.58		0.06	1.64	0.53	5.63	1.47	15.65	23.88	73.39	1148.3	0.00	0.62	1.15	3.00	0.50	1202.1	6243.2	1.04	50.00								0.80	92.77	92.52	
WEST SIDE HAWTHORNE ROAD	11	12		1.48		0.06	1.54	0.50	6.13	1.38	17.03	24.68	71.83	1223.3	0.00	0.63	1.15	3.00	0.50	1254.5	6243.2	1.05	50.00								0.79	92.52	92.27	
WEST SIDE HAWTHORNE ROAD	12	13		1.34		0.06	1.40	0.46	6.58	1.27	18.30	25.47	70.35	1287.3	0.00	0.64	1.15	3.00	0.50	1308.3	6243.2	1.06	50.00								0.78	92.27	92.02	
WEST SIDE HAWTHORNE ROAD	13	14b		1.54		0.21	1.75	0.65	7.23	1.81	20.11	26.25	68.96	1386.6	0.00	0.64	1.15	3.00	0.61	1449.7	6918.0	1.18	158.00								2.23	92.02	91.05	
												28.49																						
SW RIDEAU & HAWTHORNE	14a	14b		0.64		0.18	0.82	0.35	0.35	0.98	0.98	15.00	97.85	96.3	0.00	0.20	1.30	3.00	4.06	167.6	24661.5	1.40	140.00									1.67	96.73	91.05
												16.67																						
CULVERT CROSSING	14b	23				0.00	0.00	0.00	7.59	0.00	21.09	28.49	65.29	1377.2								1.40	20.00	1	1000	----	YES	NO	1.14	0.19	91.05	90.77		
												28.68																						
<b>EAST CATCHMENT AREA</b>																																		
EAST SIDE HAWTHORNE ROAD	15	16				0.33	0.33	0.30	0.30	0.83	0.83	15.00	97.85	80.8	0.00	0.25	0.30	3.00	0.45	101.7	165.4	0.54	110.00									3.38	103.80	103.30
EAST SIDE HAWTHORNE ROAD	16	17				0.14	0.14	0.13	0.42	0.35	1.18	18.38	86.64	101.9	0.00	0.16	0.30	3.00	6.20	114.3	610.8	1.49	100.00									1.12	103.30	97.10
EAST SIDE HAWTHORNE ROAD	17	18				0.04	0.04	0.04	0.46	0.10	1.28	19.50	83.52	106.6	0.00	0.16	1.20	3.00	6.36	115.8	24949.6	1.51	33.00									0.36	97.10	95.00
CULVERT CROSSING	18	19				0.00	0.00	0.00	0.46	0.00	1.28	19.86	82.56	105.3								1.77	22.00	1	600	----	YES	NO	0.30	0.98	95.00	94.61		
EAST SIDE HAWTHORNE ROAD	19	20				0.06	0.06	0.05	0.51	0.15	1.43	20.85	80.08	114.2	0.00	0.21	0.70	3.00	2.79	158.3	3925.7	1.20	24.00								0.33	94.61	93.94	
CULVERT CROSSING	20	21				0.00	0.00	0.00	0.51	0.00	1.43	21.18	79.28	113.1								0.50	20.00	1	600	----	NO	YES	0.37	0.83	93.94	93.84		
EAST SIDE HAWTHORNE ROAD	21	22a	0.21			0.16	0.37	0.19	0.70	0.52	1.94	22.02	77.35	150.3	0.00	0.29	0.80	3.00	0.50	158.5	2372.0	0.63	82.00								2.18	93.84	93.43	
EAST SIDE HAWTHORNE ROAD	22a	22b	0.61			0.29	0.90	0.38	1.08	1.06	3.01	24.19	72.77	218.9	0.00	0.33	1.17	3.00	0.52	228.1	6666.4	0.70	175.00								4.18	93.43	92.52	
EAST SIDE HAWTHORNE ROAD	22b	23	0.93			0.34	1.27	0.49	1.57	1.37	4.38	28.37	65.47	286.5	0.00	0.35	1.17	3.00	0.70	309.6	7734.6	0.84	260.00								5.14	92.59	90.77	
												33.51																						
<b>SOUTH CATCHMENT AREA</b>																																		
SOUTH SIDE RIDEAU ROAD	23	24	0.73			0.28	1.01	0.40	9.56	1.11	26.57	33.51	58.43	1552.8	0.00	0.51	1.74	3.00	2.65	1642.9	43339.8	2.11	235.00									1.86	90.77	84.55
												35.37																						
WEST SIDE SOMME STREET	25	24				0.42	0.12	0.54	0.40	0.40	1.12	15.00	97.85	109.4	0.00	0.18	1.20	3.00	2.80	105.1	16548.0	1.08	125.74									1.94	89.98	86.46
												16.94																						
CULVERT CROSSING	24	26				0.00	0.00	0.00	9.96	0.00	27.69	35.37	56.28	1558.5								1.00	20.00	1	800	----	NO	YES	2.31	0.11	84.55	84.35		
												35.48																						
EAST SIDE SOMME STREET	27	26				0.32	0.11	0.43	0.32	0.32	0.90	15.00	97.85	87.9	0.00	0.17	1.20	3.00	2.80	90.3	16548.0	1.04	125.74									2.01	89.98	86.46
												17.01																						
SOUTH SIDE RIDEAU ROAD	26	28	0.58			0.24	0.82	0.33	10.62	0.92	29.51	35.48	56.16	1657.5	0.00	0.66	2.20	3.00	0.71	1695.7	42043.4	1.30	183.76									2.36	84.35	83.04
												37.84																						

**IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT**  
 Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Road & Rideau Road**

**Legend:**

Source Data Identification

**OPEN DITCH/CULVERT DESIGN SHEET**

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983  
 February 2009

Checked by: G. Forget, P.Eng.

10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA						PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)							
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D <sub>10yr</sub> m	D <sub>max</sub> m	SS X:1	SLOPE %	Q <sub>10yr</sub> l/s	Q <sub>100yr</sub> l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)				B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																													
<b>NORTH CATCHMENT AREA</b>																																			
Existing 900 mm dia. culvert capacity before ditch flows to Findlay Creek																																			
1400.0																																			
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	1.80	1.80	5.00	5.00	20.00	97.26		0.00	0.58	1.50	3.00	1.93	1974.3	24880.1	1.96	400.00								3.41	90.71	83.01		
												23.41																							
EXISTING CULVERT CROSSING	32	28																																	
<b>SOUTH CATCHMENT AREA</b>																																			
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.48	13.16	1.33	36.58	37.84	53.68	3363.5	0.00	1.17	2.20	3.00	0.14	3437.1	18513.7	0.84	347.24										6.91	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.38	13.53	1.04	37.62	44.76	47.64	3192.1	0.00	0.90	2.20	3.00	0.51	3287.0	35640.2	1.35	236.20										2.91	82.56	81.35

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development - CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Road & Rideau Road

Legend:
[Red Box] Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

JLR 20983
February 2009

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.


1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0% up C = 1.0

Main data table with columns: DETAILS, NODES (FROM, TO), DRAINAGE AREA (AREA (A) at C of, SUM(A), etc.), PEAK FLOW GENERATION (2.78AR, TIME, INTENS., etc.), OPEN DITCH/SWALE DATA (BW, D, SS, SLOPE, etc.), CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT (No. of Barrels, DIA, etc.), and FLOW TIME, U/S Inv, D/S Inv.

**IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT**  
 Project: Fastrate Warehouse Development – CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**Hawthorne Road & Rideau Road**

Legend:  
 Source Data Identification

**OPEN DITCH/CULVERT DESIGN SHEET**

City of Ottawa

JLR 20983  
 February 2009

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT				FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)			
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*1.25 <sup>C</sup> ) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL				OUTLET CONTROL		
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																									
<b>NORTH CATCHMENT AREA</b>																															
Existing 900 mm dia. Culvert Capacity before ditch flows to Findlay Creek																															
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	2.19	2.19	6.07	6.07	20.00	119.95	2128.6	0.00	1.50	3.00	1.93	24880.1	3.69	400.00								1.81	90.71	83.01
NORTH SIDE RIDEAU ROAD	33	32	0.87			0.10	0.97	0.32	0.32	0.88	0.88	15.00	142.89	126.1	0.00	1.50	3.00	0.16	7240.8	1.07	92.00							1.43	83.16	83.01	
EXISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.50	0.00	6.96	21.81	113.52	2189.7				-0.15			20.00	1	1000				0.12	83.01	83.04		
<b>SOUTH CATCHMENT AREA</b>																															
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.56	15.91	1.54	44.24	27.18	98.22	5745.1	0.00	2.20	3.00	0.14	18513.7	1.28	347.24						4.54	83.04	82.56		
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.43	16.34	1.20	45.44	31.72	88.42	5417.3	0.00	2.20	3.00	0.51	35640.2	2.45	236.20						1.60	82.56	81.35		

Note: Conveyance Capacities for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT  
 Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083  
 Prepared by : Guillaume LeBlond, M.A.Sc., EIT  
 Date : 2022-06-01

**HAWTHORNE INDUSTRIAL PARK**  
 CONVENTIONAL CULVERT DESIGN

Legend:



Source Data Identification

Prepared by: Mark Buchanan, E.I.T.  
 Reviewed by: Guy Forget, P.Eng.  
 Date: February 2009

1:10 YEAR ROADSIDE CULVERT DESIGN

Station	DESIGN DATA							CULVERT DATA					INLET CONTROL			OUTLET CONTROL					GOVERNING HW (m)	VEL V <sub>o</sub> (m/s)				
	Q (m³/s)	d (m)	d <sub>c</sub> (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	B (m)	D or H (m)	N	Q/N (m³/s)	A (each) (m²)	Q/NB (m³/s/m)	HW/D	HW (m)	K <sub>e</sub>	H (m)	d <sub>c</sub> (m)	(d <sub>c</sub> + D)/2 (m)			TW (m)	h <sub>o</sub> (m)	LS (m)	HW (m)
1	2	3	4	5	6	7	8	9	10a	10b	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6 to 14	1.296	0.67	0.05	1.1	0	20.0	0.005	CSPA 6	1.15	0.82	2	0.648	0.74	---	0.73	0.60	0.9	0.13	0.33	0.58	0.72	0.72	0.10	0.75	0.75	
23B to 23C	0.051	0.22	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.051	0.20	---	0.50	0.25	0.9	0.1	0.15	0.33	0.27	0.33	0.10	0.33	0.33	
24A to 24B	0.075	0.25	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.075	0.20	---	0.54	0.27	0.9	0.1	0.18	0.34	0.30	0.34	0.10	0.34	0.34	
2 to 9	0.081	0.47	0.05	1.15	0	20.0	0.005	CSP 600	N/A	0.6	1	0.081	0.28	---	0.50	0.30	0.9	0.1	0.19	0.40	0.52	0.52	0.10	0.52	0.52	
27B to 27C	1.304	0.61	0.05	1.23	0	15.0	0.007	CSPA 7	1.39	0.97	1	1.304	1.06	---	0.90	0.87	0.9	0.22	0.45	0.71	0.66	0.71	0.11	0.82	0.87	
22 to 19	2.573	0.38	0.05	1.35	0	20.0	0.005	CSPA 5	1.03	0.74	2	1.287	0.61	---	1.75	1.30	0.9	0.74	0.51	0.63	0.43	0.63	0.10	1.27	1.30	
<p>2 From Form PH-D-533, col. 12                      3 Flood Depth                      4 Embedment below channel invert                      5 Col. 3 + col. 4 + allowable backwater                      7 Allowance for skew if applicable</p> <p>8 Culvert Slope                      10a/b D (circular) or B x H (arch)                      11 Number of Barrels                      13 Area per barrel                      14 For box only</p> <p>15 Charts D5-1A to C and E to J                      16 HW = col. 15 x D (col. 10)                      17 Chart D5-8                      18 Charts D5-2A to G                      19 Charts D5-3A to F: (d<sub>c</sub> &gt; D)</p> <p>21 Col. 3 + col. 4                      22 H<sub>o</sub> = larger of cols. 20 and 21                      23 Col. 7 x col. 8                      24 HW = col. 18 + col. 22 - col. 23                      25 Larger of cols 16 and 24</p> <p>26 Outlet velocity if required (Subsection 3.2.3)</p>																										

# B

## Appendix B-5 STORM RUNOFF COEFFICIENT



**EVALUATION OF RUNOFF COEFFICIENTS**

**Client:** Fastfrate (Ottawa) Holdings Inc.  
**Project:** Fastfrate Warehouse Development  
**Location:** Ottawa, Ontario  
**Project #:** A001083  
**Project Status:** Revision - 3 for S.P.A.



Area	Total Area (m <sup>2</sup> )	Grassed Area (m <sup>2</sup> )	Runoff Coefficient	Gravel Area (m <sup>2</sup> )	Runoff Coefficient	Hard Surface Area (m <sup>2</sup> )	Runoff Coefficient	Runoff Coefficient (10-year event)	Runoff Coefficient (100-year)
A0	3907	3907	0.20	0	0.50	0	0.90	0.20	0.25
<b>TOTAL - Christie Creek</b>	<b>3907</b>	<b>3907</b>		<b>0</b>		<b>0</b>		<b>0.20</b>	<b>0.25</b>
A1	7979	2165	0.20	0	0.50	5814	0.90	0.71	0.89
A2	13124	682	0.20	1798	0.50	10644	0.90	0.81	1.00
A3	8636	0	0.20	0	0.50	8636	0.90	0.90	1.00
A4	1425	429	0.20	0	0.50	996	0.90	0.69	0.86
A5	1067	79	0.20	0	0.50	988	0.90	0.85	1.00
A6	3906	3906	0.20	0	0.50	0	0.90	0.20	0.25
A7	426	426	0.20	0	0.50	0	0.90	0.20	0.25
<b>TOTAL - Somme Street SWMF</b>	<b>36563</b>	<b>7687</b>		<b>1798</b>		<b>27078</b>		<b>0.73</b>	<b>0.92</b>

Impervious Area Calculation - Quality Control		
Impervious Area	27057	m <sup>2</sup>
<b>TOTAL - Somme Street SWMF</b>	<b>36563</b>	<b>m<sup>2</sup></b>
% Impervious	0.74001039	-

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: 2022-05-30

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: 2022-05-30

# B

## Appendix B-6 STORM POST-DEV 10 & 100-YEAR UNCONTROLLED







**PROJECT NAME:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**CIMA+ PROJECT NUMBER:** A001083  
**CLIENT:** Fastfrate  
**PROJECT STATUS:** Detailed Design

**STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)**  
**Proposed Stormwater Management**

**DESCRIPTION**

This calculation reflects the proposed stormwater management for the subject site areas discharging to the HIP SWMF. This calculation serves to determine the uncontrolled release rate as proposed.

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012

**PRE-DEVELOPMENT FLOW DETERMINATION:**

**DESIGN CRITERIA:**

<b>Design Storm (year):</b>	<b>10</b>	
<b>IDF Regression Constants: (a)</b>	1174.184	
<b>(b)</b>	6.014	
<b>(c)</b>	0.816	
<b>IDF Curve Equation (mm/hr):</b>	$I = a / (\text{Time in min} + b)^c$	
<b>Rational Formula (L/s):</b>	$Q = 2.78C \cdot I \cdot A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

**ALLOWABLE RELEASE RATE - SUMMARY:**

Catchment ID	Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.80	0.71	22.85	75.52	<b>118.86</b>	<b>148.96</b>
A2	1.31	0.81	22.85	75.52	<b>222.69</b>	<b>169.68</b>
A3	0.86	0.90	22.85	75.52	<b>163.06</b>	<b>188.81</b>
A4	0.14	0.69	22.85	75.52	<b>20.61</b>	<b>144.60</b>
A5	0.11	0.85	22.85	75.52	<b>18.99</b>	<b>177.94</b>
A6	0.39	0.20	22.85	75.52	<b>16.39</b>	<b>41.96</b>
A7	0.04	0.20	22.85	75.52	<b>1.79</b>	<b>41.96</b>
<b>Total</b>	<b>3.66</b>				<b>562.373</b>	<b>153.81</b>

**NOTES:**

1. Time of concentration taken from SWM report (JL Richards, 2009). It is assumed that the resulting time of concentration is identical to JL Richards SWM report.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Guillaume LeBlond, M.A.Sc., EI  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

\\cma.plus\cma\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\02\_Storm Post-Dev Flow - Uncontrolled\220527\_Storm Post-Development Uncontrolled Flow.xlsx\100y



**PROJECT NAME:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**CIMA+ PROJECT NUMBER:** A001083  
**CLIENT:** Fastfrate  
**PROJECT STATUS:** Detailed Design

**STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)**  
**Per Master Stormwater Management Report (J.L. Richards, 2009)**

**DESCRIPTION**

This calculation reflects the stormwater management for the subject site areas discharging to the HIP SWMF - per the HIP SWM report. This calculation demonstrates the allowable release rate for the proposed SWM to match the HIP SWM report.

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012

**PRE-DEVELOPMENT FLOW DETERMINATION:**

**DESIGN CRITERIA:**

<b>Design Storm (year):</b>	<b>10</b>	
<b>IDF Regression Constants: (a)</b>	1174.184	
<b>(b)</b>	6.014	
<b>(c)</b>	0.816	
<b>IDF Curve Equation (mm/hr):</b>	$I = a / (\text{Time in min} + b)^c$	
<b>Rational Formula (L/s):</b>	$Q = 2.78C \cdot I \cdot A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

**ALLOWABLE RELEASE RATE - SUMMARY:**

Catchment ID	Total Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Allowable Release Flow Per Unit Area (Q/ha) L/s/ha
Total Site Area Draining to SWMF per JLR 2009 SWM	3.05	0.70	22.85	75.52	<b>448.57</b>	<b>146.85</b>
<b>Total - JLR 2009 SWM</b>	<b>3.05</b>				<b>448.567</b>	<b>146.85</b>
<b>Proposed SWM</b>	<b>3.66</b>				<b>448.567</b>	<b>122.68</b>

**NOTES:**

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

\\cma.plus\cma\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\02\_Storm Post-Dev Flow - Uncontrolled\220527\_Storm Post-Development Uncontrolled Flow.xlsx\100y controlled JLR



**PROJECT NAME:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**CIMA+ PROJECT NUMBER:** A001083  
**CLIENT:** Fastfrate  
**PROJECT STATUS:** Detailed Design

**STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)**  
**Proposed Stormwater Management**

**DESCRIPTION**

This calculation reflects the proposed stormwater management for the subject site areas discharging to the HIP SWMF. This calculation serves to determine the uncontrolled release rate as proposed.

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012

**PRE-DEVELOPMENT FLOW DETERMINATION:**

**DESIGN CRITERIA:**

Design Storm (year):	<b>100</b>	
IDF Regression Constants: (a)	1735.688	
(b)	6.014	
(c)	0.820	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	$Q = 2.78C \cdot I \cdot A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

**ALLOWABLE RELEASE RATE - SUMMARY:**

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.80	0.89	19.43	122.15	240.295	<b>301.16</b>
A2	1.31	1.00	19.43	122.15	445.303	<b>339.30</b>
A3	0.86	1.00	19.43	122.15	293.023	<b>339.30</b>
A4	0.14	0.86	19.43	122.15	41.658	<b>292.34</b>
A5	0.11	1.00	19.43	122.15	36.204	<b>339.30</b>
A6	0.39	0.25	19.43	122.15	33.133	<b>84.83</b>
A7	0.04	0.25	19.43	122.15	3.614	<b>84.83</b>
<b>Total</b>	<b>3.66</b>				<b>1093.229</b>	<b>299.00</b>

**NOTES:**

1. Time of concentration taken from SWM report (JL Richards, 2009). It is assumed that the resulting time of concentration is identical to JL Richards SWM report.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
3. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EI  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

\\cma.plus\cma\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\02\_Storm Post-Dev Flow - Uncontrolled\220527\_Storm Post-Development Uncontrolled Flow.xlsx\100y



**PROJECT NAME:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**CIMA+ PROJECT NUMBER:** A001083  
**CLIENT:** Fastfrate  
**PROJECT STATUS:** Detailed Design

**STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)**  
**Per Master Stormwater Management Report (J.L. Richards, 2009)**

**DESCRIPTION**

This calculation reflects the stormwater management for the subject site areas discharging to the HIP SWMF - per the HIP SWM report. This calculation demonstrates the allowable release rate for the proposed SWM to match HIP SWM report.

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012

**PRE-DEVELOPMENT FLOW DETERMINATION:**

**DESIGN CRITERIA:**

<b>Design Storm (year):</b>	<b>100</b>	
<b>IDF Regression Constants: (a)</b>	1735.688	
<b>(b)</b>	6.014	
<b>(c)</b>	0.820	
<b>IDF Curve Equation (mm/hr):</b>	$I = a / (\text{Time in min} + b)^c$	
<b>Rational Formula (L/s):</b>	$Q = 2.78C \cdot I \cdot A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

**ALLOWABLE RELEASE RATE - SUMMARY:**

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Allowable Release Flow Per Unit Area (Q/ha) L/s/ha
Total Site Area Draining to SWMF per JLR 2009 SWM	3.05	0.70	19.43	122.15	<b>906.87</b>	<b>296.89</b>
<b>Total - JLR 2009 SWM</b>	<b>3.05</b>				<b>906.867</b>	<b>296.89</b>
<b>Proposed SWM</b>	<b>3.66</b>				<b>906.867</b>	<b>248.03</b>

**NOTES:**

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
4. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

\\cma.plus\cma\Cima-C10\Ott\_Projects\AIA001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\02\_Storm Post-Dev Flow - Uncontrolled\220527\_Storm Post-Development Uncontrolled Flow.xlsx\100y



**PROJECT NAME:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**CIMA+ PROJECT NUMBER:** A001083  
**CLIENT:** Fastfrate  
**PROJECT STATUS:** Detailed Design

**STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)**  
**SWM Comparison of Areas Draining to Christie Creek**

**DESCRIPTION**

This calculation compares the HIP SWM and Proposed SWM for the subject site areas discharging to Christie Creek. This calculation demonstrates the allowable release rate for the proposed SWM for it to match the HIP SWM report.

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012

**PRE-DEVELOPMENT FLOW DETERMINATION:**

**DESIGN CRITERIA:**

<b>Design Storm (year):</b>	<b>100</b>	
<b>IDF Regression Constants: (a)</b>	1735.688	
<b>(b)</b>	6.014	
<b>(c)</b>	0.820	
<b>IDF Curve Equation (mm/hr):</b>	$I = a / (\text{Time in min} + b)^c$	
<b>Rational Formula (L/s):</b>	$Q = 2.78C \cdot I \cdot A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

**ALLOWABLE RELEASE RATE - SUMMARY:**

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
East Side Somme Street	0.32	0.88	15.00	142.89	111.140	<b>347.31</b>
South Side Rideau Road	0.58	0.25	26.12	100.87	40.628	<b>70.05</b>
East Side Somme Street (Revised)	0.00	0.88	15.00	142.89	0.000	-
South Side Rideau Road (Revised)	0.26	0.25	26.12	100.87	18.072	<b>70.05</b>
<b>Total - JLR 2009 SWM</b>	<b>0.90</b>				<b>151.768</b>	<b>168.63</b>
<b>Proposed SWM</b>	<b>0.26</b>				<b>Actual Release Rate: Residual Release Rate: 18.072 133.695</b>	<b>70.05</b>

**NOTES:**

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
4. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EI  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

\\cma.plus\cma\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\02\_Storm Post-Dev Flow - Uncontrolled\220527\_Storm Post-Development Uncontrolled Flow.xlsx\100y

# B

## Appendix B-7 STORM WATER MANAGEMENT – STORAGE AND DRAWDOWN FULL RELEASE RATE



Date: 2022-05-30

**Fastrate Warehouse Development  
Industrial/Commercial Development  
A001083 (360)**

**STORM WATER MANAGEMENT - SUMMARY - FULL RELEASE RATE**

Rainfall event 100 years

Sub-Area	Total Area	Capacity Area	Y <sub>max</sub>	V <sub>max</sub>	V <sub>rain</sub>	Difference	V <sub>acc</sub>	Y <sub>rain</sub>	A <sub>rain</sub>	Q <sub>ave</sub>	Drawdown Time	Comments
	(m <sup>2</sup> )	(m <sup>2</sup> )	(m)	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m)	(m <sup>2</sup> )	(L/s)	(min)	
A1	7979	2394	0.00	0.00	95.85	-95.85	0.00	0.00	0	191.429	0	NC
A2	13124	3937	0.00	0.00	201.60	-201.60	0.00	0.00	0	314.866	0	NC
A3 - Building	8636	8636	0.05	143.93	115.00	28.93	115.00	0.04	7719	234.988	8	
A4	1425	428	0.00	0.00	16.06	-16.06	0.00	0.00	0	34.188	0	NC
A5	1067	320	0.00	0.00	16.39	-16.39	0.00	0.00	0	25.599	0	NC
A6	3906	1172	0.00	0.00	0.00	0.00	0.00	0.00	0	93.711	0	NC
A7	426	128	0.00	0.00	0.00	0.00	0.00	0.00	0	10.220	0	NC
<b>Total</b>	<b>36563</b>	<b>17014</b>		<b>143.93</b>	<b>444.90</b>	<b>-300.97</b>	<b>115.00</b>					

\\cima.plus\cima\Cima-C10\Ott\_Projects\AA001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates\220525\_Storm Water Management - Storage and Drawdown\_full RR.xlsx\Sommaire

**Legend:**

- NC = Non-controlled areas (no storage available)
- Capacity Area = Area of water accumulated in sub-area at Max. Elev.
- Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).
- Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.
- Y<sub>max</sub> = Maximum depth of water that may be accumulated within the sub-area.
- V<sub>max</sub> = Maximum volume of water (capacity) that may be accumulated within the sub-area.
- V<sub>rain</sub> = Volume of water generated by rainfall.
- Difference = Difference between V<sub>max</sub> and V<sub>rain</sub> (remaining capacity of sub-area)
- V<sub>acc</sub> = Total volume of water accumulated within the sub-area in the event of a specific rainfall.
- Y<sub>rain</sub> = Depth of water generated by rainfall.
- Elev<sub>rain</sub> = Elevation of water generated by rainfall.
- A<sub>rain</sub> = Area of water generated by rainfall.
- Q<sub>ave</sub> = Average flow (for drawdown time calculation).
- Drawdown Time = Time required for the total volume of water accumulated within sub-area to evacuate (following rainfall event).

**Design Criteria:**

- 1) Maximum Allowable Total Release Rate = 248.03 L/s/ha
- 2) Pipe size for 10 years
- 3) Rainfall event of 100 years
- 4) Pre-development flow (5-year) = \_\_\_\_ L/s (or \_\_\_\_ L/s/ha)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.

Date: May 27, 2022

PEO No.: 100067842

**STORM WATER MANAGEMENT - AVERAGE FLOW CALCULATION FOR RELEASE RATES**

Date: 2022-05-30

Catchment ID	Release Rate	Specified Flow rate	Calculated area
	L/s/ha	L/s	(mm <sup>2</sup> )
A1	239.98	191.48	52255
A2	239.98	314.95	85950
A3 - Building	274.06	236.68	63773
A4	239.98	34.20	9332
A5	239.98	25.61	6988
A6	239.98	93.74	25581
A7	239.98	10.22	2790
Total		906.87	
Allowable		906.87	
Difference		0.00	

\\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates\220525\_Storm Water Management - Storage and Drawdown\_full RR.xlsx]Temps de vidange

Préparé par: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Vérifié par: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022





**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A1 0.7979 ha  
**Runoff Coefficient C (unfactored):** 0.71  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.8875  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.191479545 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 95.85 m<sup>3</sup>

Rainfall IDF Curve	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall IDF Curve	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

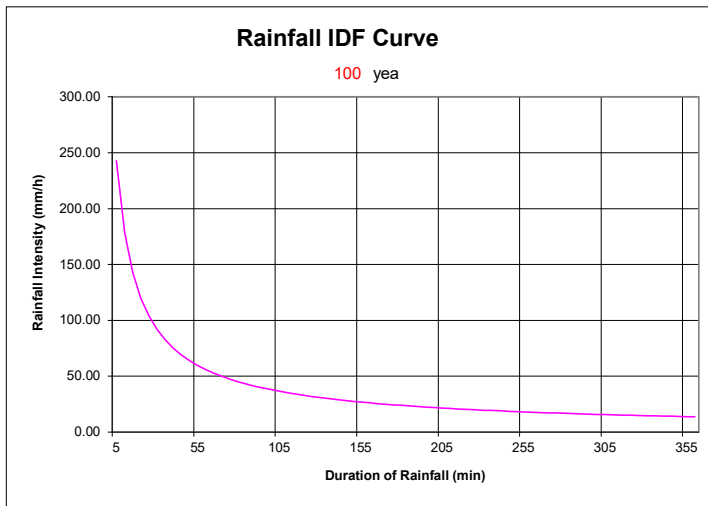
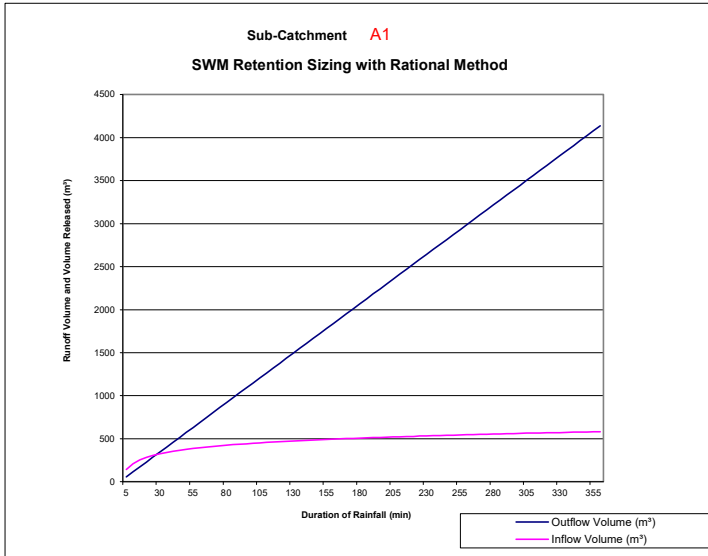
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) CIAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	143.22	57.4438635	85.78
10.0	178.56	210.74	114.887727	95.85
15.0	142.89	252.97	172.33159	80.64
20.0	119.95	283.14	229.775454	53.36
25.0	103.85	306.41	287.219317	19.19
30.0	91.87	325.28	344.663181	-19.39
35.0	82.58	341.12	402.107044	-60.99
40.0	75.15	354.75	459.550908	-104.80
45.0	69.05	366.73	516.994771	-150.27
50.0	63.95	377.40	574.438635	-197.04
55.0	59.62	387.03	631.882498	-244.85
60.0	55.89	395.81	689.326362	-293.52
65.0	52.65	403.88	746.770225	-342.89
70.0	49.79	411.34	804.214089	-392.87
75.0	47.26	418.29	861.657952	-443.37
80.0	44.99	424.80	919.101816	-494.31
85.0	42.95	430.91	976.545679	-545.63
90.0	41.11	436.68	1033.98954	-597.31
95.0	39.43	442.15	1091.43341	-649.29
100.0	37.90	447.34	1148.87727	-701.54
105.0	36.50	452.29	1206.32113	-754.03
110.0	35.20	457.02	1263.765	-806.75
115.0	34.01	461.54	1321.20886	-859.67
120.0	32.89	465.88	1378.65272	-912.77
125.0	31.86	470.05	1436.09659	-966.04
130.0	30.90	474.07	1493.54045	-1019.47
135.0	30.00	477.94	1550.98431	-1073.04
140.0	29.15	481.68	1608.42818	-1126.74
145.0	28.36	485.30	1665.87204	-1180.57
150.0	27.61	488.80	1723.3159	-1234.51
155.0	26.91	492.20	1780.75977	-1288.56
160.0	26.24	495.49	1838.20363	-1342.71
165.0	25.61	498.70	1895.6475	-1396.95
170.0	25.01	501.81	1953.09136	-1451.28
175.0	24.44	504.84	2010.53522	-1505.70
180.0	23.90	507.79	2067.97909	-1560.19
185.0	23.39	510.66	2125.42295	-1614.76
190.0	22.90	513.47	2182.86681	-1669.40
195.0	22.43	516.21	2240.31068	-1724.10
200.0	21.98	518.89	2297.75454	-1778.87
205.0	21.55	521.50	2355.1984	-1833.70
210.0	21.14	524.06	2412.64227	-1888.58
215.0	20.75	526.56	2470.08613	-1943.52
220.0	20.37	529.02	2527.52999	-1998.51
225.0	20.01	531.42	2584.97386	-2053.56
230.0	19.66	533.77	2642.41772	-2108.65
235.0	19.33	536.08	2699.86158	-2163.78
240.0	19.01	538.35	2757.30545	-2218.96
245.0	18.69	540.57	2814.74931	-2274.18
250.0	18.39	542.75	2872.19317	-2329.44
255.0	18.11	544.90	2929.63704	-2384.74
260.0	17.83	547.00	2987.0809	-2440.08
265.0	17.56	549.07	3044.52476	-2495.45
270.0	17.29	551.11	3101.96863	-2550.86
275.0	17.04	553.11	3159.41249	-2606.30
280.0	16.80	555.08	3216.85636	-2661.77
285.0	16.56	557.02	3274.30022	-2717.28
290.0	16.33	558.93	3331.74408	-2772.81
295.0	16.11	560.81	3389.18795	-2828.37
300.0	15.89	562.67	3446.63181	-2883.97
305.0	15.68	564.49	3504.07567	-2939.58
310.0	15.48	566.29	3561.51954	-2995.23
315.0	15.28	568.07	3618.9634	-3050.90
320.0	15.09	569.81	3676.40726	-3106.59
325.0	14.90	571.54	3733.85113	-3162.31
330.0	14.72	573.24	3791.29499	-3218.05
335.0	14.54	574.92	3848.73885	-3273.82
340.0	14.37	576.58	3906.18272	-3329.60
345.0	14.20	578.22	3963.62658	-3385.41
350.0	14.04	579.83	4021.07044	-3441.24
355.0	13.88	581.43	4078.51431	-3497.09
360.0	13.72	583.00	4135.95817	-3552.95
<b>Max Volume (V max):</b>				<b>95.85</b>
<b>Design Volume (V design) :</b>				<b>95.85</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IA\A001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM\_redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A2 1.3124 ha  
**Runoff Coefficient C (unfactored):** 0.81  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.314948934 m³/s  
**Discharge Factor K :** 1

**Design Volume:** 201.60 m³

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

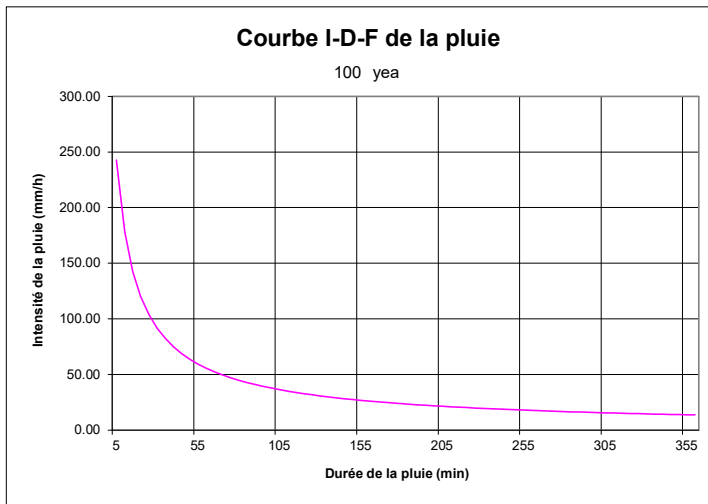
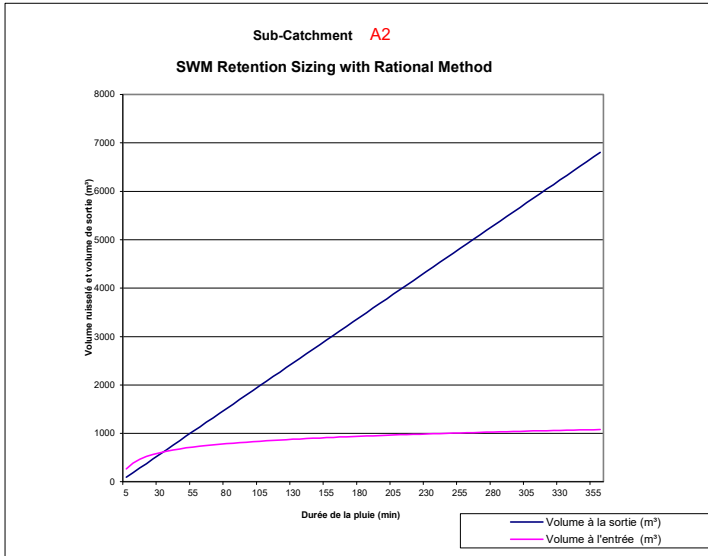
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/AT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	265.44	94.4846803	170.95
10.0	178.56	390.57	188.969361	201.60
15.0	142.89	468.84	283.454041	185.38
20.0	119.95	524.74	377.938721	146.80
25.0	103.85	567.87	472.423402	95.45
30.0	91.87	602.84	566.908082	35.93
35.0	82.58	632.19	661.392762	-29.20
40.0	75.15	657.47	755.877443	-98.41
45.0	69.05	679.66	850.362123	-170.70
50.0	63.95	699.44	944.846803	-245.40
55.0	59.62	717.29	1039.33148	-322.04
60.0	55.89	733.56	1133.81616	-400.26
65.0	52.65	748.51	1228.30084	-479.79
70.0	49.79	762.35	1322.78552	-560.44
75.0	47.26	775.23	1417.27021	-642.04
80.0	44.99	787.28	1511.75489	-724.47
85.0	42.95	798.61	1606.23957	-807.63
90.0	41.11	809.31	1700.72425	-891.41
95.0	39.43	819.44	1795.20893	-975.77
100.0	37.90	829.07	1889.69361	-1060.63
105.0	36.50	838.24	1984.17829	-1145.94
110.0	35.20	846.99	2078.66297	-1231.67
115.0	34.01	855.38	2173.14765	-1317.77
120.0	32.89	863.42	2267.63233	-1404.21
125.0	31.86	871.16	2362.11701	-1490.96
130.0	30.90	878.60	2456.60169	-1578.00
135.0	30.00	885.78	2551.08637	-1665.31
140.0	29.15	892.71	2645.57105	-1752.86
145.0	28.36	899.42	2740.05573	-1840.64
150.0	27.61	905.91	2834.54041	-1928.63
155.0	26.91	912.20	2929.02509	-2016.82
160.0	26.24	918.31	3023.50977	-2105.20
165.0	25.61	924.24	3117.99445	-2193.75
170.0	25.01	930.01	3212.47913	-2282.47
175.0	24.44	935.62	3306.96381	-2371.34
180.0	23.90	941.09	3401.44849	-2460.36
185.0	23.39	946.42	3495.93317	-2549.51
190.0	22.90	951.62	3590.41785	-2638.80
195.0	22.43	956.70	3684.90253	-2728.20
200.0	21.98	961.66	3779.38721	-2817.73
205.0	21.55	966.51	3873.87189	-2907.36
210.0	21.14	971.25	3968.35657	-2997.11
215.0	20.75	975.89	4062.84125	-3086.95
220.0	20.37	980.43	4157.32593	-3176.89
225.0	20.01	984.89	4251.81062	-3266.93
230.0	19.66	989.25	4346.2953	-3357.05
235.0	19.33	993.53	4440.77998	-3447.25
240.0	19.01	997.72	4535.26466	-3537.54
245.0	18.69	1001.84	4629.74934	-3627.90
250.0	18.39	1005.89	4724.23402	-3718.34
255.0	18.11	1009.86	4818.7187	-3808.86
260.0	17.83	1013.77	4913.20338	-3899.44
265.0	17.56	1017.61	5007.68806	-3990.08
270.0	17.29	1021.38	5102.17274	-4080.79
275.0	17.04	1025.09	5196.65742	-4171.57
280.0	16.80	1028.74	5291.1421	-4262.40
285.0	16.56	1032.34	5385.62678	-4353.29
290.0	16.33	1035.88	5480.11146	-4444.23
295.0	16.11	1039.36	5574.59614	-4535.23
300.0	15.89	1042.80	5669.08082	-4626.28
305.0	15.68	1046.18	5763.5655	-4717.38
310.0	15.48	1049.52	5858.05018	-4808.53
315.0	15.28	1052.80	5952.53486	-4899.73
320.0	15.09	1056.05	6047.01954	-4990.97
325.0	14.90	1059.24	6141.50422	-5082.26
330.0	14.72	1062.40	6235.9889	-5173.59
335.0	14.54	1065.51	6330.47358	-5264.96
340.0	14.37	1068.58	6424.95826	-5356.37
345.0	14.20	1071.62	6519.44294	-5447.83
350.0	14.04	1074.61	6613.92762	-5539.32
355.0	13.88	1077.57	6708.4123	-5630.84
360.0	13.72	1080.49	6802.89698	-5722.41
<b>Max Volume (V max):</b>				201.60
<b>Design Volume (V design) :</b>				<b>201.60</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 274.0581214 L/s/ha

**Area :** A3 - Building 0.8636 ha  
**Runoff Coefficient C (unfactored):** 0.9  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.236676594 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 115.00 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

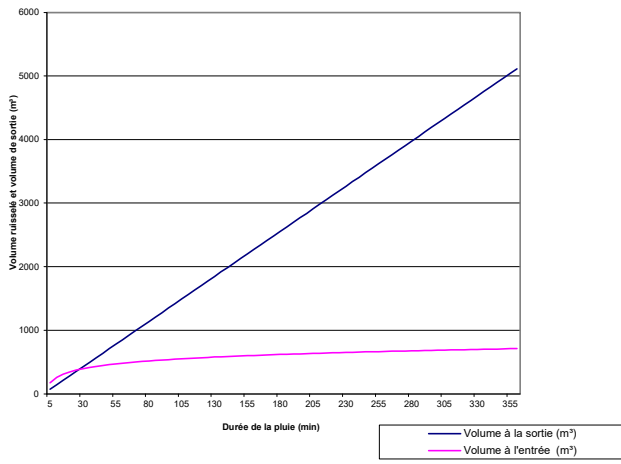
Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastfrate Warehouse Development  
 Industrial/Commercial Development

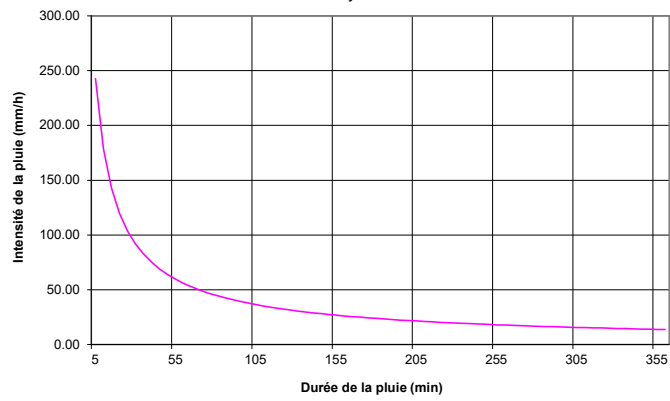
Sub-Catchment **A3**

**SWM Retention Sizing with Rational Method**



**Courbe I-D-F de la pluie**

100 yea





Rainfall Duration (min) <i>T</i> (1)	Rainfall Intensity (mm/h) <i>I</i> (2)	Runoff Volume (m <sup>3</sup> ) <i>CIAT</i> (4)	Output Volume (m <sup>3</sup> ) <i>kQT</i> (5)	Retention Volume (m <sup>3</sup> ) <i>(4)-(5)</i> (6)
5.0	242.70	174.67	71.0029781	103.66
10.0	178.56	257.01	142.005956	115.00
15.0	142.89	308.51	213.008934	95.50
20.0	119.95	345.30	284.011912	61.29
25.0	103.85	373.68	355.01489	18.66
30.0	91.87	396.69	426.017869	-29.33
35.0	82.58	416.00	497.020847	-81.02
40.0	75.15	432.64	568.023825	-135.39
45.0	69.05	447.24	639.026803	-191.79
50.0	63.95	460.26	710.029781	-249.77
55.0	59.62	472.00	781.032759	-309.03
60.0	55.89	482.71	852.035737	-369.33
65.0	52.65	492.54	923.038715	-430.50
70.0	49.79	501.65	994.041693	-492.39
75.0	47.26	510.12	1065.04467	-554.92
80.0	44.99	518.06	1136.04765	-617.99
85.0	42.95	525.51	1207.05063	-681.54
90.0	41.11	532.55	1278.05361	-745.50
95.0	39.43	539.22	1349.05658	-809.84
100.0	37.90	545.55	1420.05956	-874.51
105.0	36.50	551.59	1491.06254	-939.48
110.0	35.20	557.35	1562.06552	-1004.72
115.0	34.01	562.87	1633.0685	-1070.20
120.0	32.89	568.16	1704.07147	-1135.91
125.0	31.86	573.25	1775.07445	-1201.83
130.0	30.90	578.15	1846.07743	-1267.93
135.0	30.00	582.87	1917.08041	-1334.21
140.0	29.15	587.43	1988.08339	-1400.65
145.0	28.36	591.84	2059.08636	-1467.24
150.0	27.61	596.12	2130.08934	-1533.97
155.0	26.91	600.26	2201.09232	-1600.84
160.0	26.24	604.27	2272.0953	-1667.82
165.0	25.61	608.18	2343.09828	-1734.92
170.0	25.01	611.97	2414.10126	-1802.13
175.0	24.44	615.67	2485.10423	-1869.44
180.0	23.90	619.27	2556.10721	-1936.84
185.0	23.39	622.78	2627.11019	-2004.33
190.0	22.90	626.20	2698.11317	-2071.92
195.0	22.43	629.54	2769.11615	-2139.58
200.0	21.98	632.80	2840.11912	-2207.32
205.0	21.55	635.99	2911.1221	-2275.13
210.0	21.14	639.11	2982.12508	-2343.01
215.0	20.75	642.17	3053.12806	-2410.96
220.0	20.37	645.16	3124.13104	-2478.98
225.0	20.01	648.09	3195.13401	-2547.05
230.0	19.66	650.96	3266.13699	-2615.18
235.0	19.33	653.77	3337.13997	-2683.37
240.0	19.01	656.53	3408.14295	-2751.61
245.0	18.69	659.24	3479.14593	-2819.90
250.0	18.39	661.91	3550.1489	-2888.24
255.0	18.11	664.52	3621.15188	-2956.63
260.0	17.83	667.09	3692.15486	-3025.06
265.0	17.56	669.62	3763.15784	-3093.54
270.0	17.29	672.10	3834.16082	-3162.06
275.0	17.04	674.54	3905.1638	-3230.62
280.0	16.80	676.95	3976.16677	-3299.22
285.0	16.56	679.31	4047.16975	-3367.86
290.0	16.33	681.64	4118.17273	-3436.53
295.0	16.11	683.93	4189.17571	-3505.24
300.0	15.89	686.19	4260.17869	-3573.99
305.0	15.68	688.42	4331.18166	-3642.76
310.0	15.48	690.61	4402.18464	-3711.57
315.0	15.28	692.78	4473.18762	-3780.41
320.0	15.09	694.91	4544.1906	-3849.28
325.0	14.90	697.02	4615.19358	-3918.18
330.0	14.72	699.09	4686.19655	-3987.11
335.0	14.54	701.14	4757.19953	-4056.06
340.0	14.37	703.16	4828.20251	-4125.04
345.0	14.20	705.16	4899.20549	-4194.05
350.0	14.04	707.13	4970.20847	-4263.08
355.0	13.88	709.07	5041.21144	-4332.14
360.0	13.72	711.00	5112.21442	-4401.22
<b>Max Volume (V max):</b>				<b>115.00</b>
<b>Design Volume (V design):</b>				<b>115.00</b>



## STORAGE VOLUME CALCULATIONS

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM\_redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A4 0.1425 ha  
**Runoff Coefficient C (unfactored):** 0.69  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.8625  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.034197061 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 16.06 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

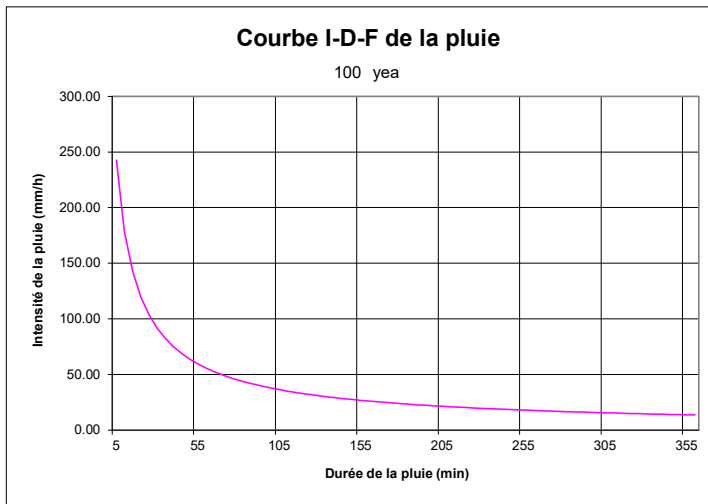
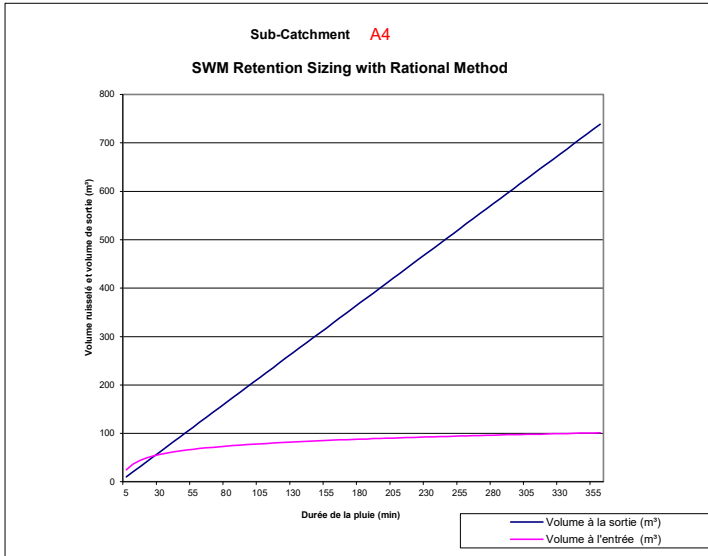
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/IAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	24.86	10.2591184	14.60
10.0	178.56	36.58	20.5182367	16.06
15.0	142.89	43.91	30.7773551	13.13
20.0	119.95	49.14	41.0364735	8.11
25.0	103.85	53.18	51.2955918	1.89
30.0	91.87	56.46	61.5547102	-5.10
35.0	82.58	59.20	71.8138286	-12.61
40.0	75.15	61.57	82.072947	-20.50
45.0	69.05	63.65	92.3320653	-28.68
50.0	63.95	65.50	102.591184	-37.09
55.0	59.62	67.17	112.850302	-45.68
60.0	55.89	68.70	123.10942	-54.41
65.0	52.65	70.10	133.368539	-63.27
70.0	49.79	71.39	143.627657	-72.23
75.0	47.26	72.60	153.886776	-81.29
80.0	44.99	73.73	164.145894	-90.42
85.0	42.95	74.79	174.405012	-99.61
90.0	41.11	75.79	184.664131	-108.87
95.0	39.43	76.74	194.923249	-118.18
100.0	37.90	77.64	205.182367	-127.54
105.0	36.50	78.50	215.441486	-136.94
110.0	35.20	79.32	225.700604	-146.38
115.0	34.01	80.11	235.959723	-155.85
120.0	32.89	80.86	246.218841	-165.36
125.0	31.86	81.58	256.477959	-174.89
130.0	30.90	82.28	266.737078	-184.46
135.0	30.00	82.95	276.996196	-194.04
140.0	29.15	83.60	287.255314	-203.65
145.0	28.36	84.23	297.514433	-213.28
150.0	27.61	84.84	307.773551	-222.94
155.0	26.91	85.43	318.032669	-232.61
160.0	26.24	86.00	328.291788	-242.29
165.0	25.61	86.56	338.550906	-252.00
170.0	25.01	87.10	348.810025	-261.71
175.0	24.44	87.62	359.069143	-271.45
180.0	23.90	88.13	369.328261	-281.20
185.0	23.39	88.63	379.58738	-290.95
190.0	22.90	89.12	389.846498	-300.73
195.0	22.43	89.59	400.105616	-310.51
200.0	21.98	90.06	410.364735	-320.31
205.0	21.55	90.51	420.623853	-330.11
210.0	21.14	90.96	430.882972	-339.93
215.0	20.75	91.39	441.14209	-349.75
220.0	20.37	91.82	451.401208	-359.58
225.0	20.01	92.23	461.660327	-369.43
230.0	19.66	92.64	471.919445	-379.28
235.0	19.33	93.04	482.178563	-389.13
240.0	19.01	93.44	492.437682	-399.00
245.0	18.69	93.82	502.6968	-408.87
250.0	18.39	94.20	512.955918	-418.75
255.0	18.11	94.57	523.215037	-428.64
260.0	17.83	94.94	533.474155	-438.53
265.0	17.56	95.30	543.733274	-448.43
270.0	17.29	95.65	553.992392	-458.34
275.0	17.04	96.00	564.25151	-468.25
280.0	16.80	96.34	574.510629	-478.17
285.0	16.56	96.68	584.769747	-488.09
290.0	16.33	97.01	595.028865	-498.02
295.0	16.11	97.34	605.287984	-507.95
300.0	15.89	97.66	615.547102	-517.89
305.0	15.68	97.97	625.806221	-527.83
310.0	15.48	98.29	636.065339	-537.78
315.0	15.28	98.60	646.324457	-547.73
320.0	15.09	98.90	656.583576	-557.68
325.0	14.90	99.20	666.842694	-567.64
330.0	14.72	99.49	677.101812	-577.61
335.0	14.54	99.79	687.360931	-587.58
340.0	14.37	100.07	697.620049	-597.55
345.0	14.20	100.36	707.879168	-607.52
350.0	14.04	100.64	718.138286	-617.50
355.0	13.88	100.91	728.397404	-627.48
360.0	13.72	101.19	738.656523	-637.47
<b>Max Volume (V max):</b>				16.06
<b>Design Volume (V design) :</b>				<b>16.06</b>



## STORAGE VOLUME CALCULATIONS

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM\_redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A5 0.1067 ha  
**Runoff Coefficient C (unfactored):** 0.85  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.0256058 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 16.39 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

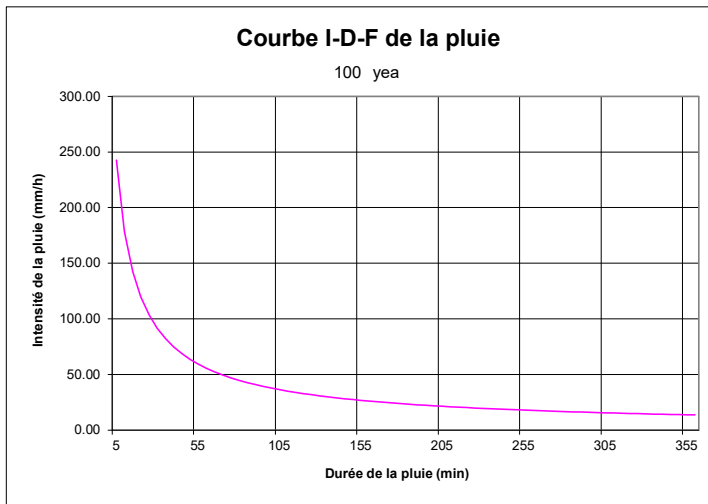
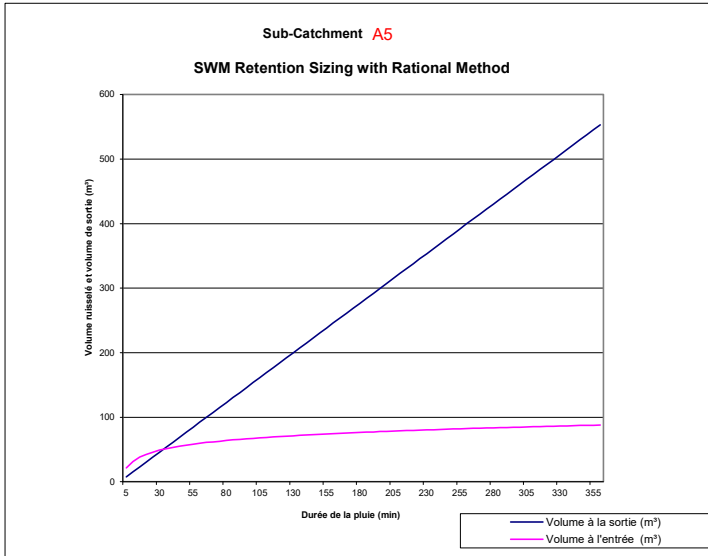
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) CIAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	21.58	7.68173986	13.90
10.0	178.56	31.75	15.3634797	16.39
15.0	142.89	38.12	23.0452196	15.07
20.0	119.95	42.66	30.7269594	11.94
25.0	103.85	46.17	38.4086993	7.76
30.0	91.87	49.01	46.0904392	2.92
35.0	82.58	51.40	53.772179	-2.37
40.0	75.15	53.45	61.4539189	-8.00
45.0	69.05	55.26	69.1356587	-13.88
50.0	63.95	56.87	76.8173986	-19.95
55.0	59.62	58.32	84.4991385	-26.18
60.0	55.89	59.64	92.1808783	-32.54
65.0	52.65	60.85	99.8626182	-39.01
70.0	49.79	61.98	107.544358	-45.56
75.0	47.26	63.03	115.226098	-52.20
80.0	44.99	64.01	122.907838	-58.90
85.0	42.95	64.93	130.589578	-65.66
90.0	41.11	65.80	138.271317	-72.47
95.0	39.43	66.62	145.953057	-79.33
100.0	37.90	67.40	153.634797	-86.23
105.0	36.50	68.15	161.316537	-93.17
110.0	35.20	68.86	168.998277	-100.14
115.0	34.01	69.54	176.680017	-107.14
120.0	32.89	70.20	184.361757	-114.16
125.0	31.86	70.83	192.043497	-121.22
130.0	30.90	71.43	199.725236	-128.29
135.0	30.00	72.02	207.406976	-135.39
140.0	29.15	72.58	215.088716	-142.51
145.0	28.36	73.12	222.770456	-149.65
150.0	27.61	73.65	230.452196	-156.80
155.0	26.91	74.16	238.133936	-163.97
160.0	26.24	74.66	245.815676	-171.16
165.0	25.61	75.14	253.497415	-178.36
170.0	25.01	75.61	261.179155	-185.57
175.0	24.44	76.07	268.860895	-192.79
180.0	23.90	76.51	276.542635	-200.03
185.0	23.39	76.95	284.224375	-207.28
190.0	22.90	77.37	291.906115	-214.54
195.0	22.43	77.78	299.587855	-221.81
200.0	21.98	78.18	307.269594	-229.09
205.0	21.55	78.58	314.951334	-236.37
210.0	21.14	78.96	322.633074	-243.67
215.0	20.75	79.34	330.314814	-250.97
220.0	20.37	79.71	337.996554	-258.29
225.0	20.01	80.07	345.678294	-265.61
230.0	19.66	80.43	353.360034	-272.93
235.0	19.33	80.78	361.041773	-280.27
240.0	19.01	81.12	368.723513	-287.61
245.0	18.69	81.45	376.405253	-294.95
250.0	18.39	81.78	384.086993	-302.31
255.0	18.11	82.10	391.768733	-309.67
260.0	17.83	82.42	399.450473	-317.03
265.0	17.56	82.73	407.132213	-324.40
270.0	17.29	83.04	414.813952	-331.77
275.0	17.04	83.34	422.495692	-339.15
280.0	16.80	83.64	430.177432	-346.54
285.0	16.56	83.93	437.859172	-353.93
290.0	16.33	84.22	445.540912	-361.32
295.0	16.11	84.50	453.222652	-368.72
300.0	15.89	84.78	460.904392	-376.12
305.0	15.68	85.06	468.586131	-383.53
310.0	15.48	85.33	476.267871	-390.94
315.0	15.28	85.59	483.949611	-398.36
320.0	15.09	85.86	491.631351	-405.77
325.0	14.90	86.12	499.313091	-413.20
330.0	14.72	86.37	506.994831	-420.62
335.0	14.54	86.63	514.676571	-428.05
340.0	14.37	86.88	522.35831	-435.48
345.0	14.20	87.12	530.04005	-442.92
350.0	14.04	87.37	537.72179	-450.35
355.0	13.88	87.61	545.40353	-457.80
360.0	13.72	87.85	553.08527	-465.24
<b>Max Volume (V max):</b>				16.39
<b>Design Volume (V design) :</b>				<b>16.39</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM\_redesign\03\_Storm Release Rates\220525\_Storm Water

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A6 0.3906 ha  
**Runoff Coefficient C (unfactored):** 0.2  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.25  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.093735945 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 0.00 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

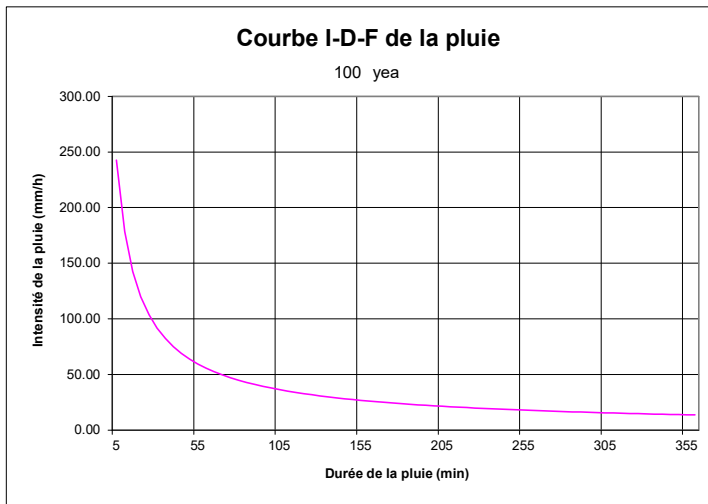
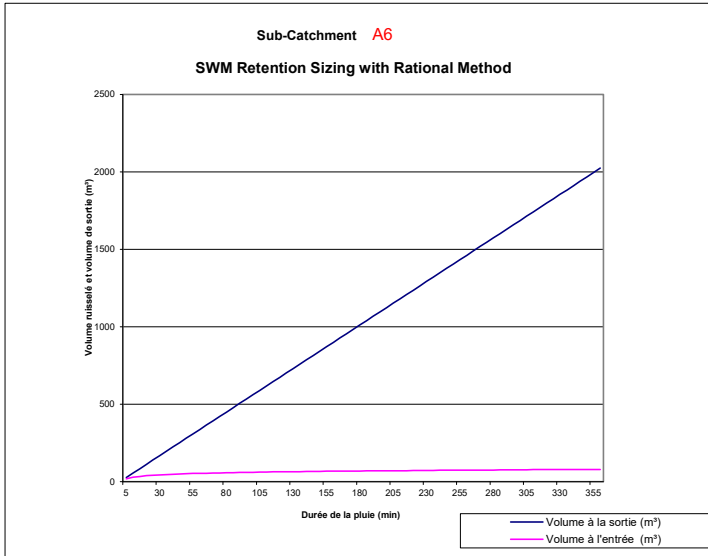
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022



Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/IAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	19.75	28.1207834	-8.37
10.0	178.56	29.06	56.2415668	-27.18
15.0	142.89	34.88	84.3623502	-49.48
20.0	119.95	39.04	112.483134	-73.44
25.0	103.85	42.25	140.603917	-98.35
30.0	91.87	44.85	168.7247	-123.87
35.0	82.58	47.04	196.845484	-149.81
40.0	75.15	48.92	224.966267	-176.05
45.0	69.05	50.57	253.087051	-202.52
50.0	63.95	52.04	281.207834	-229.17
55.0	59.62	53.37	309.328617	-255.96
60.0	55.89	54.58	337.449401	-282.87
65.0	52.65	55.69	365.570184	-309.88
70.0	49.79	56.72	393.690968	-336.97
75.0	47.26	57.68	421.811751	-364.13
80.0	44.99	58.58	449.932534	-391.35
85.0	42.95	59.42	478.053318	-418.63
90.0	41.11	60.22	506.174101	-445.96
95.0	39.43	60.97	534.294885	-473.32
100.0	37.90	61.69	562.415668	-500.73
105.0	36.50	62.37	590.536452	-528.17
110.0	35.20	63.02	618.657235	-555.64
115.0	34.01	63.65	646.778018	-583.13
120.0	32.89	64.24	674.898802	-610.66
125.0	31.86	64.82	703.019585	-638.20
130.0	30.90	65.37	731.140369	-665.77
135.0	30.00	65.91	759.261152	-693.35
140.0	29.15	66.42	787.381935	-720.96
145.0	28.36	66.92	815.502719	-748.58
150.0	27.61	67.40	843.623502	-776.22
155.0	26.91	67.87	871.744286	-803.87
160.0	26.24	68.33	899.865069	-831.54
165.0	25.61	68.77	927.985852	-859.22
170.0	25.01	69.20	956.106636	-886.91
175.0	24.44	69.62	984.227419	-914.61
180.0	23.90	70.02	1012.3482	-942.33
185.0	23.39	70.42	1040.46899	-970.05
190.0	22.90	70.81	1068.58977	-997.78
195.0	22.43	71.18	1096.71055	-1025.53
200.0	21.98	71.55	1124.83134	-1053.28
205.0	21.55	71.91	1152.95212	-1081.04
210.0	21.14	72.27	1181.0729	-1108.81
215.0	20.75	72.61	1209.19369	-1136.58
220.0	20.37	72.95	1237.31447	-1164.36
225.0	20.01	73.28	1265.43525	-1192.15
230.0	19.66	73.61	1293.55604	-1219.95
235.0	19.33	73.92	1321.67682	-1247.75
240.0	19.01	74.24	1349.7976	-1275.56
245.0	18.69	74.54	1377.91839	-1303.38
250.0	18.39	74.84	1406.03917	-1331.20
255.0	18.11	75.14	1434.15995	-1359.02
260.0	17.83	75.43	1462.28074	-1386.85
265.0	17.56	75.72	1490.40152	-1414.69
270.0	17.29	76.00	1518.5223	-1442.53
275.0	17.04	76.27	1546.64309	-1470.37
280.0	16.80	76.54	1574.76387	-1498.22
285.0	16.56	76.81	1602.88465	-1526.07
290.0	16.33	77.08	1631.00544	-1553.93
295.0	16.11	77.33	1659.12622	-1581.79
300.0	15.89	77.59	1687.247	-1609.66
305.0	15.68	77.84	1715.36779	-1637.53
310.0	15.48	78.09	1743.48857	-1665.40
315.0	15.28	78.33	1771.60935	-1693.27
320.0	15.09	78.58	1799.73014	-1721.15
325.0	14.90	78.81	1827.85092	-1749.04
330.0	14.72	79.05	1855.9717	-1776.92
335.0	14.54	79.28	1884.09249	-1804.81
340.0	14.37	79.51	1912.21327	-1832.70
345.0	14.20	79.73	1940.33405	-1860.60
350.0	14.04	79.96	1968.45484	-1888.50
355.0	13.88	80.18	1996.57562	-1916.40
360.0	13.72	80.39	2024.69641	-1944.30
<b>Max Volume (V max):</b>				<b>-8.37</b>
<b>Design Volume (V design) :</b>				<b>-8.37</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:00

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates\220525\_Storm Water Management - Storage and Drawdown\_full RR.xlsx\A7

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 239.9793771 L/s/ha

**Area :** A7 0.0426 ha  
**Runoff Coefficient C (unfactored):** 0.2  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.25  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.010223121 m³/s  
**Discharge Factor K :** 1

**Design Volume:** 0.00 m³

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

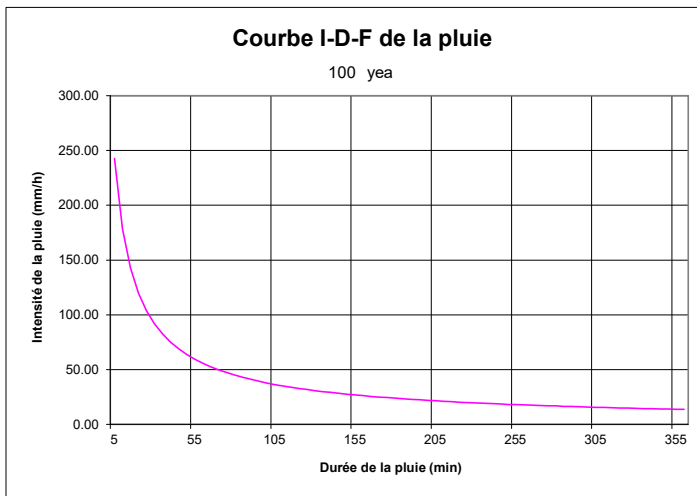
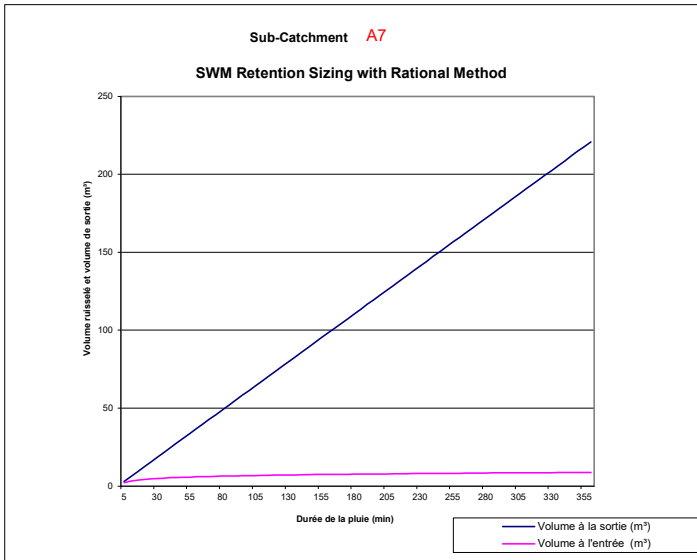
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 27, 2022

Fastfrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min)	Rainfall Intensity (mm/h)	Runoff Volume (m <sup>3</sup> )	Output Volume (m <sup>3</sup> )	Retention Volume (m <sup>3</sup> )
T	I	CIAT	kQT	(4)-(-5)
(1)	(2)	(4)	(5)	(6)
5.0	242.70	2.15	3.06693644	-0.91
10.0	178.56	3.17	6.13387288	-2.96
15.0	142.89	3.80	9.20080932	-5.40
20.0	119.95	4.26	12.2677458	-8.01
25.0	103.85	4.61	15.3346822	-10.73
30.0	91.87	4.89	18.4016186	-13.51
35.0	82.58	5.13	21.4685551	-16.34
40.0	75.15	5.34	24.5354915	-19.20
45.0	69.05	5.52	27.602428	-22.09
50.0	63.95	5.68	30.6693644	-24.99
55.0	59.62	5.82	33.7363008	-27.92
60.0	55.89	5.95	36.8032373	-30.85
65.0	52.65	6.07	39.8701737	-33.80
70.0	49.79	6.19	42.9371101	-36.75
75.0	47.26	6.29	46.0040466	-39.71
80.0	44.99	6.39	49.070983	-42.68
85.0	42.95	6.48	52.1379195	-45.66
90.0	41.11	6.57	55.2048559	-48.64
95.0	39.43	6.65	58.2717923	-51.62
100.0	37.90	6.73	61.3387288	-54.61
105.0	36.50	6.80	64.4056652	-57.60
110.0	35.20	6.87	67.4726017	-60.60
115.0	34.01	6.94	70.5395381	-63.60
120.0	32.89	7.01	73.6064745	-66.60
125.0	31.86	7.07	76.673411	-69.60
130.0	30.90	7.13	79.7403474	-72.61
135.0	30.00	7.19	82.8072839	-75.62
140.0	29.15	7.24	85.8742203	-78.63
145.0	28.36	7.30	88.9411567	-81.64
150.0	27.61	7.35	92.0080932	-84.66
155.0	26.91	7.40	95.0750296	-87.67
160.0	26.24	7.45	98.141966	-90.69
165.0	25.61	7.50	101.208902	-93.71
170.0	25.01	7.55	104.275839	-96.73
175.0	24.44	7.59	107.342775	-99.75
180.0	23.90	7.64	110.409712	-102.77
185.0	23.39	7.68	113.476648	-105.80
190.0	22.90	7.72	116.543585	-108.82
195.0	22.43	7.76	119.610521	-111.85
200.0	21.98	7.80	122.677458	-114.87
205.0	21.55	7.84	125.744394	-117.90
210.0	21.14	7.88	128.81133	-120.93
215.0	20.75	7.92	131.878267	-123.96
220.0	20.37	7.96	134.945203	-126.99
225.0	20.01	7.99	138.01214	-130.02
230.0	19.66	8.03	141.079076	-133.05
235.0	19.33	8.06	144.146013	-136.08
240.0	19.01	8.10	147.212949	-139.12
245.0	18.69	8.13	150.279886	-142.15
250.0	18.39	8.16	153.346822	-145.18
255.0	18.11	8.19	156.413758	-148.22
260.0	17.83	8.23	159.480695	-151.25
265.0	17.56	8.26	162.547631	-154.29
270.0	17.29	8.29	165.614568	-157.33
275.0	17.04	8.32	168.681504	-160.36
280.0	16.80	8.35	171.748441	-163.40
285.0	16.56	8.38	174.815377	-166.44
290.0	16.33	8.41	177.882313	-169.48
295.0	16.11	8.43	180.94925	-172.51
300.0	15.89	8.46	184.016186	-175.55
305.0	15.68	8.49	187.083123	-178.59
310.0	15.48	8.52	190.150059	-181.63
315.0	15.28	8.54	193.216996	-184.67
320.0	15.09	8.57	196.283932	-187.71
325.0	14.90	8.60	199.350869	-190.76
330.0	14.72	8.62	202.417805	-193.80
335.0	14.54	8.65	205.484741	-196.84
340.0	14.37	8.67	208.551678	-199.88
345.0	14.20	8.70	211.618614	-202.92
350.0	14.04	8.72	214.685551	-205.97
355.0	13.88	8.74	217.752487	-209.01
360.0	13.72	8.77	220.819424	-212.05
<b>Max Volume (V max):</b>				<b>-0.91</b>
<b>Design Volume (V design) :</b>				<b>-0.91</b>

# B

## Appendix B-8 STORM WATER MANAGEMENT – STORAGE AND DRAWDOWN HALF RELEASE RATE



Date: 2022-05-30

**Fastrate Warehouse Development  
Industrial/Commercial Development  
A001083 (360)**

**STORM WATER MANAGEMENT - SUMMARY - HALF RELEASE RATE**

Rainfall event 100 years

Sub-Area	Total Area	Capacity Area	$Y_{max}$	$V_{max}$	$V_{rain}$	Difference	$V_{acc}$	$Y_{rain}$	$A_{rain}$	$Q_{ave}$	Drawdown Time	Comments
	(m <sup>2</sup> )	(m <sup>2</sup> )	(m)	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m <sup>3</sup> )	(m)	(m <sup>2</sup> )	(L/s)	(min)	
A1	7979	2394	0.00	0.00	213.80	-213.80	0.00	0.00	0	61.913	0	NC
A2	13124	3937	0.00	0.00	419.49	-419.49	0.00	0.00	0	101.836	0	NC
A3 - Building	8636	8636	0.05	143.93	115.00	28.93	115.00	0.04	7719	234.988	8	
A4	1425	428	0.00	0.00	36.59	-36.59	0.00	0.00	0	11.057	0	NC
A5	1067	320	0.00	0.00	34.10	-34.10	0.00	0.00	0	8.279	0	NC
A6	3906	1172	0.00	0.00	10.87	-10.87	0.00	0.00	0	30.309	0	NC
A7	426	128	0.00	0.00	1.19	-1.19	0.00	0.00	0	3.306	0	NC
<b>Total</b>	<b>36563</b>	<b>17014</b>		<b>143.93</b>	<b>831.04</b>	<b>-687.11</b>	<b>115.00</b>					

\\cima.plus\cima\Cima-C10\Ott\_Projects\AA001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half RR\220530\_Storm Water Management - Storage and Drawdown\_Half RR.xlsx\Sommaire

<p><b>Legend:</b></p> <p>NC = Non-controlled areas (no storage available)</p> <p>Capacity Area = Area of water accumulated in sub-area at Max. Elev.</p> <p>Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).</p> <p>Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.</p> <p><math>Y_{max}</math> = Maximum depth of water that may be accumulated within the sub-area.</p> <p><math>V_{max}</math> = Maximum volume of water (capacity) that may be accumulated within the sub-area.</p> <p><math>V_{rain}</math> = Volume of water generated by rainfall.</p> <p>Difference = Difference between <math>V_{max}</math> and <math>V_{rain}</math> (remaining capacity of sub-area)</p> <p><math>V_{acc}</math> = Total volume of water accumulated within the sub-area in the event of a specific rainfall.</p> <p><math>Y_{rain}</math> = Depth of water generated by rainfall.</p> <p>Elev<sub>rain</sub> = Elevation of water generated by rainfall.</p> <p><math>A_{rain}</math> = Area of water generated by rainfall.</p> <p><math>Q_{ave}</math> = Average flow (for drawdown time calculation).</p> <p>Drawdown Time = Time required for the total volume of water accumulated within sub-area to evacuate (following rainfall event).</p>	<p><b>Design Criteria:</b></p> <p>1) Maximum Allowable Total Release Rate = 248.03 L/s/ha</p> <p>2) Pipe size for 10 years</p> <p>3) Rainfall event of 100 years</p> <p>4) Pre-development flow (5-year) = ____ L/s (or ____ L/s/ha)</p>
<p>Prepared by: <u>Guillaume LeBlond, M.A.Sc., EIT</u></p> <p>PEO No.: <u>100530467</u></p>	<p>Date: <u>May 30, 2022</u></p>
<p>Verified by: <u>Christian Lavoie-Lebel, P.Eng.</u></p> <p>PEO No.: <u>100067842</u></p>	<p>Date: <u>May 30, 2022</u></p>

**STORM WATER MANAGEMENT - AVERAGE FLOW CALCULATION FOR RELEASE RATES - HALF RELEASE RATE**

Catchment ID	Release Rate	Specified Flow rate	Calculated area
	L/s/ha	L/s	(mm <sup>2</sup> )
A1	77.62	61.93	16901
A2	77.62	101.86	27799
A3 - Building	274.06	236.68	63773
A4	77.62	11.06	3018
A5	77.62	8.28	2260
A6	77.62	30.32	8273
A7	77.62	3.31	902
Total		453.43	
Allowable		453.43	
Difference		0.00	

\\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half RR\220530\_Storm Water Management - Storage and Drawdown\_Half RR.xlsx|Temps de vidange

Préparé par: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Vérfifié par: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022





**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A1 0.7979 ha  
**Runoff Coefficient C (unfactored):** 0.71  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.8875  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.061929436 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 213.80 m<sup>3</sup>

Rainfall IDF Curve Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall IDF Curve Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

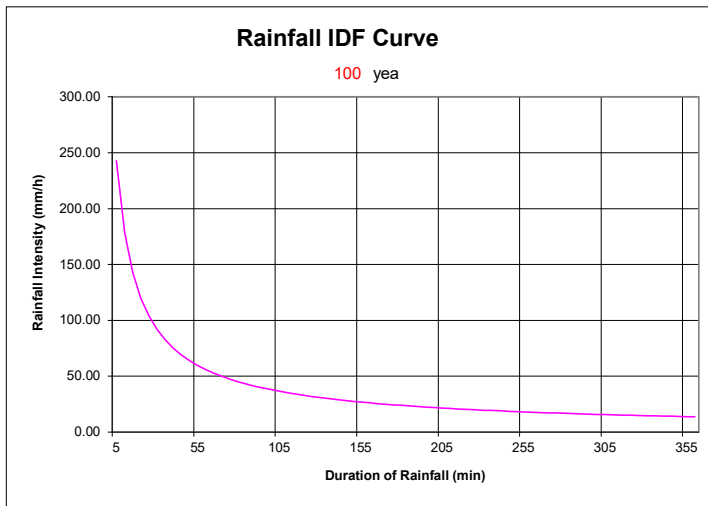
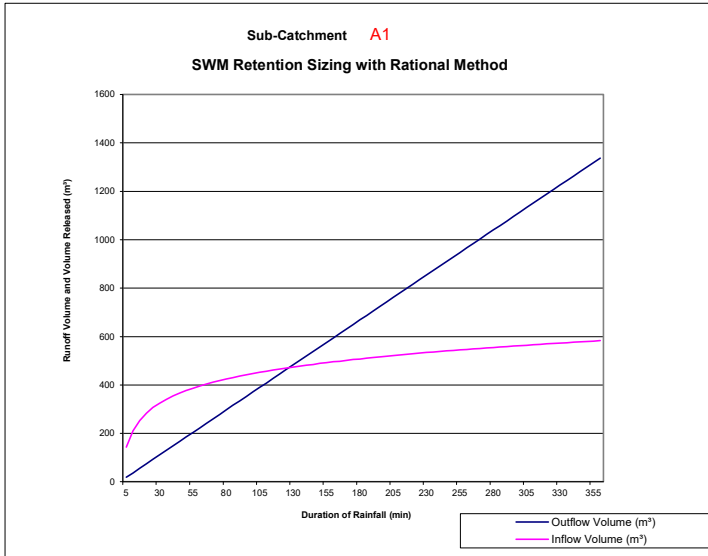
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) CIAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	143.22	18.5788308	124.64
10.0	178.56	210.74	37.1576615	173.58
15.0	142.89	252.97	55.7364923	197.23
20.0	119.95	283.14	74.3153231	208.82
25.0	103.85	306.41	92.8941538	213.51
30.0	91.87	325.28	111.472985	213.80
35.0	82.58	341.12	130.051815	211.06
40.0	75.15	354.75	148.630646	206.12
45.0	69.05	366.73	167.209477	199.52
50.0	63.95	377.40	185.788308	191.61
55.0	59.62	387.03	204.367138	182.67
60.0	55.89	395.81	222.945969	172.86
65.0	52.65	403.88	241.5248	162.35
70.0	49.79	411.34	260.103631	151.24
75.0	47.26	418.29	278.682461	139.61
80.0	44.99	424.80	297.261292	127.53
85.0	42.95	430.91	315.840123	115.07
90.0	41.11	436.68	334.418954	102.26
95.0	39.43	442.15	352.997784	89.15
100.0	37.90	447.34	371.576615	75.77
105.0	36.50	452.29	390.155446	62.13
110.0	35.20	457.02	408.734277	48.28
115.0	34.01	461.54	427.313108	34.23
120.0	32.89	465.88	445.891938	19.99
125.0	31.86	470.05	464.470769	5.58
130.0	30.90	474.07	483.0496	-8.98
135.0	30.00	477.94	501.628431	-23.69
140.0	29.15	481.68	520.207261	-38.52
145.0	28.36	485.30	538.786092	-53.49
150.0	27.61	488.80	557.364923	-68.56
155.0	26.91	492.20	575.943754	-83.74
160.0	26.24	495.49	594.522584	-99.03
165.0	25.61	498.70	613.101415	-114.41
170.0	25.01	501.81	631.680246	-129.87
175.0	24.44	504.84	650.259077	-145.42
180.0	23.90	507.79	668.837907	-161.05
185.0	23.39	510.66	687.416738	-176.75
190.0	22.90	513.47	705.995569	-192.53
195.0	22.43	516.21	724.5744	-208.36
200.0	21.98	518.89	743.153231	-224.27
205.0	21.55	521.50	761.732061	-240.23
210.0	21.14	524.06	780.310892	-256.25
215.0	20.75	526.56	798.889723	-272.33
220.0	20.37	529.02	817.468554	-288.45
225.0	20.01	531.42	836.047384	-304.63
230.0	19.66	533.77	854.626215	-320.85
235.0	19.33	536.08	873.205046	-337.12
240.0	19.01	538.35	891.783877	-353.44
245.0	18.69	540.57	910.362707	-369.79
250.0	18.39	542.75	928.941538	-386.19
255.0	18.11	544.90	947.520369	-402.63
260.0	17.83	547.00	966.0992	-419.10
265.0	17.56	549.07	984.67803	-435.61
270.0	17.29	551.11	1003.25686	-452.15
275.0	17.04	553.11	1021.83569	-468.72
280.0	16.80	555.08	1040.41452	-485.33
285.0	16.56	557.02	1058.99335	-501.97
290.0	16.33	558.93	1077.57218	-518.64
295.0	16.11	560.81	1096.15102	-535.34
300.0	15.89	562.67	1114.72985	-552.06
305.0	15.68	564.49	1133.30868	-568.82
310.0	15.48	566.29	1151.88751	-585.60
315.0	15.28	568.07	1170.46634	-602.40
320.0	15.09	569.81	1189.04517	-619.23
325.0	14.90	571.54	1207.624	-636.08
330.0	14.72	573.24	1226.20283	-652.96
335.0	14.54	574.92	1244.78166	-669.86
340.0	14.37	576.58	1263.36049	-686.78
345.0	14.20	578.22	1281.93932	-703.72
350.0	14.04	579.83	1300.51815	-720.69
355.0	13.88	581.43	1319.09698	-737.67
360.0	13.72	583.00	1337.67581	-754.67
<b>Max Volume (V max):</b>				<b>213.80</b>
<b>Design Volume (V design) :</b>				<b>213.80</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastfrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A2 1.3124 ha  
**Runoff Coefficient C (unfactored):** 0.81  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.101862629 m³/s  
**Discharge Factor K :** 1

**Design Volume:** 419.49 m³

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

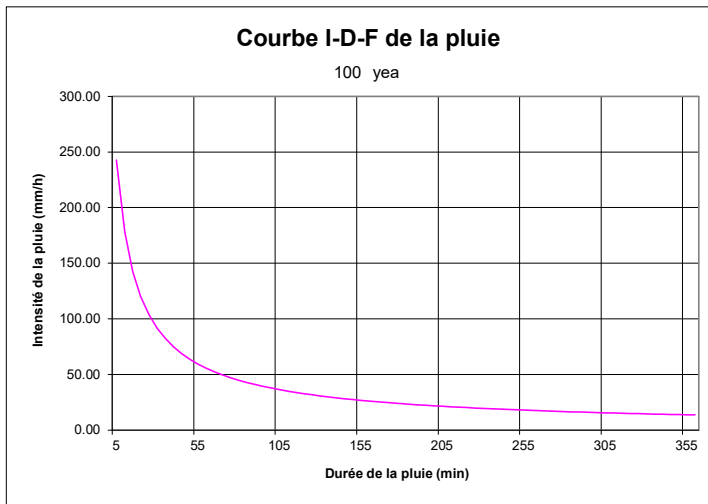
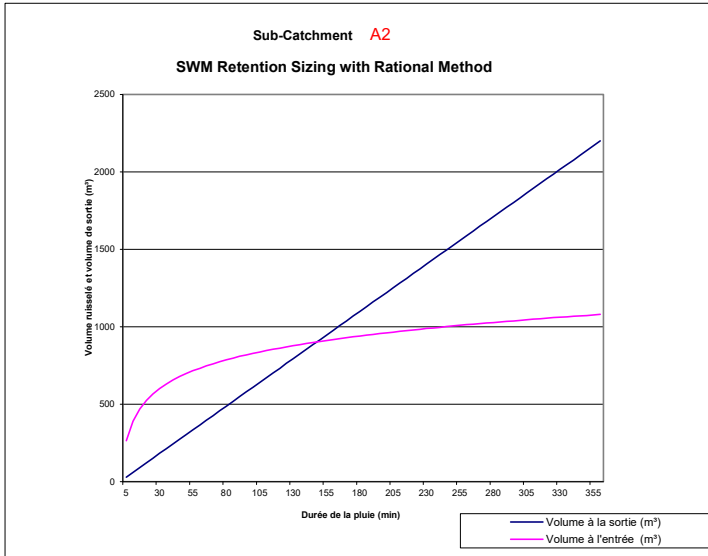
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/AT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	265.44	30.5587887	234.88
10.0	178.56	390.57	61.1175774	329.45
15.0	142.89	468.84	91.6763661	377.16
20.0	119.95	524.74	122.235155	402.51
25.0	103.85	567.87	152.793943	415.08
30.0	91.87	602.84	183.352732	419.49
35.0	82.58	632.19	213.911521	418.28
40.0	75.15	657.47	244.470309	413.00
45.0	69.05	679.66	275.029098	404.63
50.0	63.95	699.44	305.587887	393.86
55.0	59.62	717.29	336.146676	381.15
60.0	55.89	733.56	366.705464	366.86
65.0	52.65	748.51	397.264253	351.25
70.0	49.79	762.35	427.823042	334.52
75.0	47.26	775.23	458.38183	316.84
80.0	44.99	787.28	488.940619	298.34
85.0	42.95	798.61	519.499408	279.11
90.0	41.11	809.31	550.058196	259.25
95.0	39.43	819.44	580.616985	238.82
100.0	37.90	829.07	611.175774	217.89
105.0	36.50	838.24	641.734562	196.50
110.0	35.20	846.99	672.293351	174.70
115.0	34.01	855.38	702.85214	152.53
120.0	32.89	863.42	733.410928	130.01
125.0	31.86	871.16	763.969717	107.19
130.0	30.90	878.60	794.528506	84.07
135.0	30.00	885.78	825.087295	60.69
140.0	29.15	892.71	855.646083	37.07
145.0	28.36	899.42	886.204872	13.21
150.0	27.61	905.91	916.763661	-10.86
155.0	26.91	912.20	947.322449	-35.12
160.0	26.24	918.31	977.881238	-59.57
165.0	25.61	924.24	1008.44003	-84.20
170.0	25.01	930.01	1038.99882	-108.99
175.0	24.44	935.62	1069.5576	-133.94
180.0	23.90	941.09	1100.11639	-159.03
185.0	23.39	946.42	1130.67518	-184.25
190.0	22.90	951.62	1161.23397	-209.61
195.0	22.43	956.70	1191.79276	-235.09
200.0	21.98	961.66	1222.35155	-260.69
205.0	21.55	966.51	1252.91034	-286.40
210.0	21.14	971.25	1283.46912	-312.22
215.0	20.75	975.89	1314.02791	-338.14
220.0	20.37	980.43	1344.5867	-364.15
225.0	20.01	984.89	1375.14549	-390.26
230.0	19.66	989.25	1405.70428	-416.46
235.0	19.33	993.53	1436.26307	-442.74
240.0	19.01	997.72	1466.82186	-469.10
245.0	18.69	1001.84	1497.38065	-495.54
250.0	18.39	1005.89	1527.93943	-522.05
255.0	18.11	1009.86	1558.49822	-548.64
260.0	17.83	1013.77	1589.05701	-575.29
265.0	17.56	1017.61	1619.6158	-602.01
270.0	17.29	1021.38	1650.17459	-628.80
275.0	17.04	1025.09	1680.73338	-655.64
280.0	16.80	1028.74	1711.29217	-682.55
285.0	16.56	1032.34	1741.85096	-709.51
290.0	16.33	1035.88	1772.40974	-736.53
295.0	16.11	1039.36	1802.96853	-763.60
300.0	15.89	1042.80	1833.52732	-790.73
305.0	15.68	1046.18	1864.08611	-817.90
310.0	15.48	1049.52	1894.6449	-845.13
315.0	15.28	1052.80	1925.20369	-872.40
320.0	15.09	1056.05	1955.76248	-899.72
325.0	14.90	1059.24	1986.32126	-927.08
330.0	14.72	1062.40	2016.88005	-954.48
335.0	14.54	1065.51	2047.43884	-981.93
340.0	14.37	1068.58	2077.99763	-1009.41
345.0	14.20	1071.62	2108.55642	-1036.94
350.0	14.04	1074.61	2139.11521	-1064.50
355.0	13.88	1077.57	2169.674	-1092.10
360.0	13.72	1080.49	2200.23279	-1119.74
<b>Max Volume (V max):</b>				<b>419.49</b>
<b>Design Volume (V design) :</b>				<b>419.49</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 274.0581214 L/s/ha

**Area :** A3 - Building 0.8636 ha  
**Runoff Coefficient C (unfactored):** 0.9  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.236676594 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 115.00 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

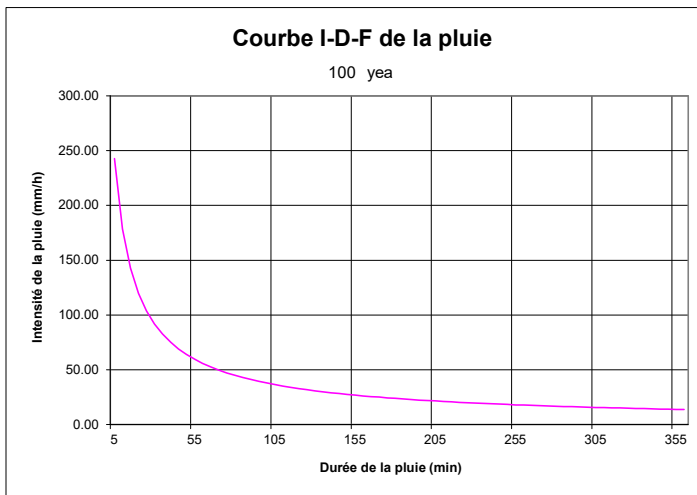
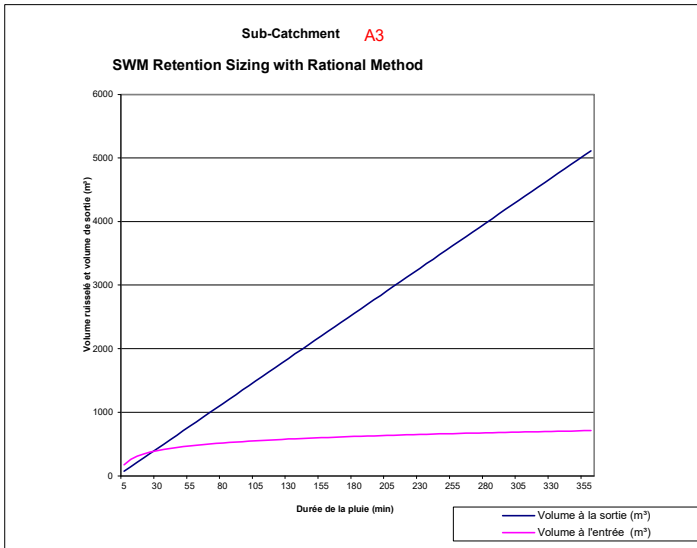
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastfrate Warehouse Development  
Industrial/Commercial Development





Rainfall Duration (min) <i>T</i> (1)	Rainfall Intensity (mm/h) <i>I</i> (2)	Runoff Volume (m <sup>3</sup> ) <i>CIAT</i> (4)	Output Volume (m <sup>3</sup> ) <i>kQT</i> (5)	Retention Volume (m <sup>3</sup> ) <i>(4)-(5)</i> (6)
5.0	242.70	174.67	71.0029781	103.66
10.0	178.56	257.01	142.005956	115.00
15.0	142.89	308.51	213.008934	95.50
20.0	119.95	345.30	284.011912	61.29
25.0	103.85	373.68	355.01489	18.66
30.0	91.87	396.69	426.017869	-29.33
35.0	82.58	416.00	497.020847	-81.02
40.0	75.15	432.64	568.023825	-135.39
45.0	69.05	447.24	639.026803	-191.79
50.0	63.95	460.26	710.029781	-249.77
55.0	59.62	472.00	781.032759	-309.03
60.0	55.89	482.71	852.035737	-369.33
65.0	52.65	492.54	923.038715	-430.50
70.0	49.79	501.65	994.041693	-492.39
75.0	47.26	510.12	1065.04467	-554.92
80.0	44.99	518.06	1136.04765	-617.99
85.0	42.95	525.51	1207.05063	-681.54
90.0	41.11	532.55	1278.05361	-745.50
95.0	39.43	539.22	1349.05658	-809.84
100.0	37.90	545.55	1420.05956	-874.51
105.0	36.50	551.59	1491.06254	-939.48
110.0	35.20	557.35	1562.06552	-1004.72
115.0	34.01	562.87	1633.0685	-1070.20
120.0	32.89	568.16	1704.07147	-1135.91
125.0	31.86	573.25	1775.07445	-1201.83
130.0	30.90	578.15	1846.07743	-1267.93
135.0	30.00	582.87	1917.08041	-1334.21
140.0	29.15	587.43	1988.08339	-1400.65
145.0	28.36	591.84	2059.08636	-1467.24
150.0	27.61	596.12	2130.08934	-1533.97
155.0	26.91	600.26	2201.09232	-1600.84
160.0	26.24	604.27	2272.0953	-1667.82
165.0	25.61	608.18	2343.09828	-1734.92
170.0	25.01	611.97	2414.10126	-1802.13
175.0	24.44	615.67	2485.10423	-1869.44
180.0	23.90	619.27	2556.10721	-1936.84
185.0	23.39	622.78	2627.11019	-2004.33
190.0	22.90	626.20	2698.11317	-2071.92
195.0	22.43	629.54	2769.11615	-2139.58
200.0	21.98	632.80	2840.11912	-2207.32
205.0	21.55	635.99	2911.1221	-2275.13
210.0	21.14	639.11	2982.12508	-2343.01
215.0	20.75	642.17	3053.12806	-2410.96
220.0	20.37	645.16	3124.13104	-2478.98
225.0	20.01	648.09	3195.13401	-2547.05
230.0	19.66	650.96	3266.13699	-2615.18
235.0	19.33	653.77	3337.13997	-2683.37
240.0	19.01	656.53	3408.14295	-2751.61
245.0	18.69	659.24	3479.14593	-2819.90
250.0	18.39	661.91	3550.1489	-2888.24
255.0	18.11	664.52	3621.15188	-2956.63
260.0	17.83	667.09	3692.15486	-3025.06
265.0	17.56	669.62	3763.15784	-3093.54
270.0	17.29	672.10	3834.16082	-3162.06
275.0	17.04	674.54	3905.1638	-3230.62
280.0	16.80	676.95	3976.16677	-3299.22
285.0	16.56	679.31	4047.16975	-3367.86
290.0	16.33	681.64	4118.17273	-3436.53
295.0	16.11	683.93	4189.17571	-3505.24
300.0	15.89	686.19	4260.17869	-3573.99
305.0	15.68	688.42	4331.18166	-3642.76
310.0	15.48	690.61	4402.18464	-3711.57
315.0	15.28	692.78	4473.18762	-3780.41
320.0	15.09	694.91	4544.1906	-3849.28
325.0	14.90	697.02	4615.19358	-3918.18
330.0	14.72	699.09	4686.19655	-3987.11
335.0	14.54	701.14	4757.19953	-4056.06
340.0	14.37	703.16	4828.20251	-4125.04
345.0	14.20	705.16	4899.20549	-4194.05
350.0	14.04	707.13	4970.20847	-4263.08
355.0	13.88	709.07	5041.21144	-4332.14
360.0	13.72	711.00	5112.21442	-4401.22
<b>Max Volume (V max):</b>				<b>115.00</b>
<b>Design Volume (V design):</b>				<b>115.00</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A4 0.1425 ha  
**Runoff Coefficient C (unfactored):** 0.69  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.8625  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.011060214 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 36.59 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

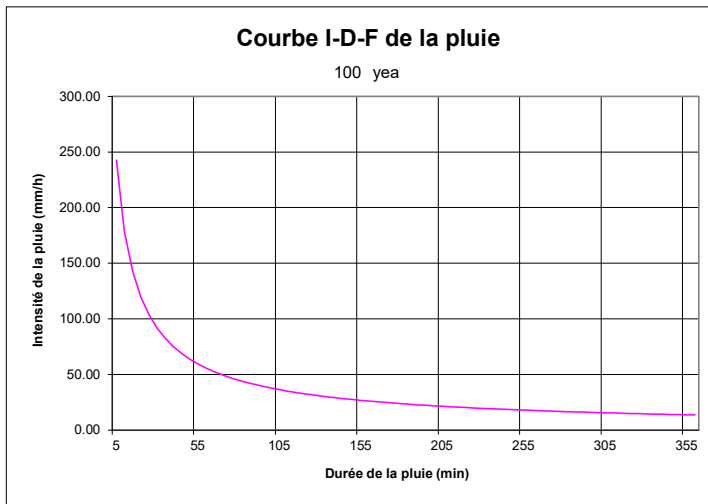
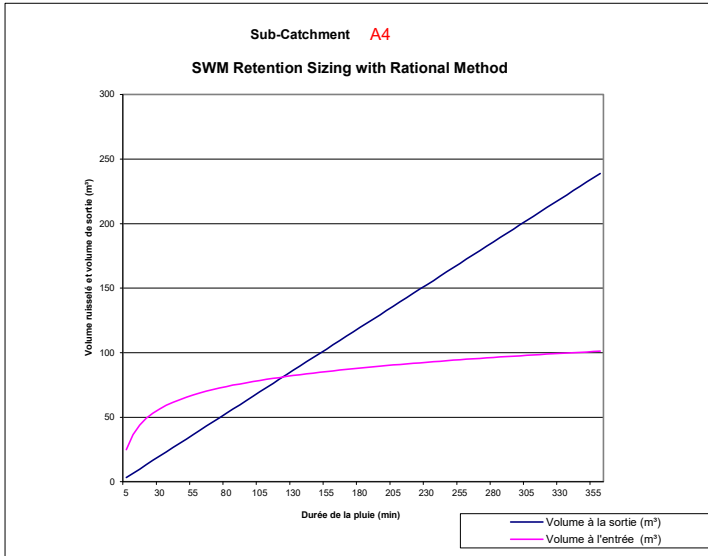
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/IAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	24.86	3.31806415	21.54
10.0	178.56	36.58	6.6361283	29.94
15.0	142.89	43.91	9.95419244	33.95
20.0	119.95	49.14	13.2722566	35.87
25.0	103.85	53.18	16.5903207	36.59
30.0	91.87	56.46	19.9083849	36.55
35.0	82.58	59.20	23.226449	35.98
40.0	75.15	61.57	26.5445132	35.03
45.0	69.05	63.65	29.8625773	33.79
50.0	63.95	65.50	33.1806415	32.32
55.0	59.62	67.17	36.4987056	30.68
60.0	55.89	68.70	39.8167698	28.88
65.0	52.65	70.10	43.1348339	26.96
70.0	49.79	71.39	46.4528981	24.94
75.0	47.26	72.60	49.7709622	22.83
80.0	44.99	73.73	53.0890264	20.64
85.0	42.95	74.79	56.4070905	18.38
90.0	41.11	75.79	59.7251547	16.07
95.0	39.43	76.74	63.0432188	13.70
100.0	37.90	77.64	66.361283	11.28
105.0	36.50	78.50	69.6793471	8.82
110.0	35.20	79.32	72.9974113	6.32
115.0	34.01	80.11	76.3154754	3.79
120.0	32.89	80.86	79.6335396	1.23
125.0	31.86	81.58	82.9516037	-1.37
130.0	30.90	82.28	86.2696678	-3.99
135.0	30.00	82.95	89.587732	-6.63
140.0	29.15	83.60	92.9057961	-9.30
145.0	28.36	84.23	96.2238603	-11.99
150.0	27.61	84.84	99.5419244	-14.70
155.0	26.91	85.43	102.859989	-17.43
160.0	26.24	86.00	106.178053	-20.18
165.0	25.61	86.56	109.496117	-22.94
170.0	25.01	87.10	112.814181	-25.72
175.0	24.44	87.62	116.132245	-28.51
180.0	23.90	88.13	119.450309	-31.32
185.0	23.39	88.63	122.768373	-34.14
190.0	22.90	89.12	126.086438	-36.97
195.0	22.43	89.59	129.404502	-39.81
200.0	21.98	90.06	132.722566	-42.66
205.0	21.55	90.51	136.04063	-45.53
210.0	21.14	90.96	139.358694	-48.40
215.0	20.75	91.39	142.676758	-51.28
220.0	20.37	91.82	145.994823	-54.18
225.0	20.01	92.23	149.312887	-57.08
230.0	19.66	92.64	152.630951	-59.99
235.0	19.33	93.04	155.949015	-62.91
240.0	19.01	93.44	159.267079	-65.83
245.0	18.69	93.82	162.585143	-68.76
250.0	18.39	94.20	165.903207	-71.70
255.0	18.11	94.57	169.221272	-74.65
260.0	17.83	94.94	172.539336	-77.60
265.0	17.56	95.30	175.8574	-80.56
270.0	17.29	95.65	179.175464	-83.52
275.0	17.04	96.00	182.493528	-86.49
280.0	16.80	96.34	185.811592	-89.47
285.0	16.56	96.68	189.129656	-92.45
290.0	16.33	97.01	192.447721	-95.44
295.0	16.11	97.34	195.765785	-98.43
300.0	15.89	97.66	199.083849	-101.43
305.0	15.68	97.97	202.401913	-104.43
310.0	15.48	98.29	205.719977	-107.43
315.0	15.28	98.60	209.038041	-110.44
320.0	15.09	98.90	212.356105	-113.46
325.0	14.90	99.20	215.67417	-116.48
330.0	14.72	99.49	218.992234	-119.50
335.0	14.54	99.79	222.310298	-122.53
340.0	14.37	100.07	225.628362	-125.56
345.0	14.20	100.36	228.946426	-128.59
350.0	14.04	100.64	232.26449	-131.63
355.0	13.88	100.91	235.582555	-134.67
360.0	13.72	101.19	238.900619	-137.71
<b>Max Volume (V max):</b>				<b>36.59</b>
<b>Design Volume (V design) :</b>				<b>36.59</b>



## STORAGE VOLUME CALCULATIONS

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastrate Warehouse  
**Location:** Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A5 0.1067 ha  
**Runoff Coefficient C (unfactored):** 0.85  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 1  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.008281578 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 34.10 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

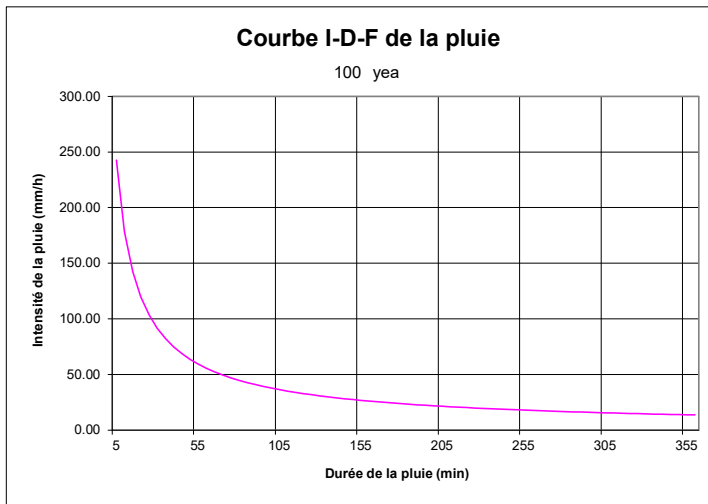
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) CIAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	21.58	2.4844733	19.10
10.0	178.56	31.75	4.96894659	26.78
15.0	142.89	38.12	7.45341989	30.66
20.0	119.95	42.66	9.93789318	32.72
25.0	103.85	46.17	12.4223665	33.75
30.0	91.87	49.01	14.9068398	34.10
35.0	82.58	51.40	17.3913131	34.01
40.0	75.15	53.45	19.8757864	33.58
45.0	69.05	55.26	22.3602597	32.90
50.0	63.95	56.87	24.844733	32.02
55.0	59.62	58.32	27.3292062	30.99
60.0	55.89	59.64	29.8136795	29.83
65.0	52.65	60.85	32.2981528	28.56
70.0	49.79	61.98	34.7826261	27.20
75.0	47.26	63.03	37.2670994	25.76
80.0	44.99	64.01	39.7515727	24.26
85.0	42.95	64.93	42.236046	22.69
90.0	41.11	65.80	44.7205193	21.08
95.0	39.43	66.62	47.2049926	19.42
100.0	37.90	67.40	49.6894659	17.71
105.0	36.50	68.15	52.1739392	15.98
110.0	35.20	68.86	54.6584125	14.20
115.0	34.01	69.54	57.1428858	12.40
120.0	32.89	70.20	59.6273591	10.57
125.0	31.86	70.83	62.1118324	8.71
130.0	30.90	71.43	64.5963057	6.84
135.0	30.00	72.02	67.080779	4.93
140.0	29.15	72.58	69.5652523	3.01
145.0	28.36	73.12	72.0497256	1.07
150.0	27.61	73.65	74.5341989	-0.88
155.0	26.91	74.16	77.0186722	-2.86
160.0	26.24	74.66	79.5031455	-4.84
165.0	25.61	75.14	81.9876187	-6.85
170.0	25.01	75.61	84.472092	-8.86
175.0	24.44	76.07	86.9565653	-10.89
180.0	23.90	76.51	89.4410386	-12.93
185.0	23.39	76.95	91.9255119	-14.98
190.0	22.90	77.37	94.4099852	-17.04
195.0	22.43	77.78	96.8944585	-19.11
200.0	21.98	78.18	99.3789318	-21.19
205.0	21.55	78.58	101.863405	-23.28
210.0	21.14	78.96	104.347878	-25.38
215.0	20.75	79.34	106.832352	-27.49
220.0	20.37	79.71	109.316825	-29.61
225.0	20.01	80.07	111.801298	-31.73
230.0	19.66	80.43	114.285772	-33.86
235.0	19.33	80.78	116.770245	-36.00
240.0	19.01	81.12	119.254718	-38.14
245.0	18.69	81.45	121.739191	-40.29
250.0	18.39	81.78	124.223665	-42.44
255.0	18.11	82.10	126.708138	-44.60
260.0	17.83	82.42	129.192611	-46.77
265.0	17.56	82.73	131.677085	-48.94
270.0	17.29	83.04	134.161558	-51.12
275.0	17.04	83.34	136.646031	-53.30
280.0	16.80	83.64	139.130505	-55.49
285.0	16.56	83.93	141.614978	-57.68
290.0	16.33	84.22	144.099451	-59.88
295.0	16.11	84.50	146.583924	-62.08
300.0	15.89	84.78	149.068398	-64.29
305.0	15.68	85.06	151.552871	-66.50
310.0	15.48	85.33	154.037344	-68.71
315.0	15.28	85.59	156.521818	-70.93
320.0	15.09	85.86	159.006291	-73.15
325.0	14.90	86.12	161.490764	-75.37
330.0	14.72	86.37	163.975237	-77.60
335.0	14.54	86.63	166.459711	-79.83
340.0	14.37	86.88	168.944184	-82.07
345.0	14.20	87.12	171.428657	-84.30
350.0	14.04	87.37	173.913131	-86.55
355.0	13.88	87.61	176.397604	-88.79
360.0	13.72	87.85	178.882077	-91.04
<b>Max Volume (V max):</b>				<b>34.10</b>
<b>Design Volume (V design) :</b>				<b>34.10</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastfrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\IAA001000-A001499\A001083\_Fastfrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A6 0.3906 ha  
**Runoff Coefficient C (unfactored):** 0.2  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.25  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.030316628 m<sup>3</sup>/s  
**Discharge Factor K :** 1

**Design Volume:** 10.87 m<sup>3</sup>

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

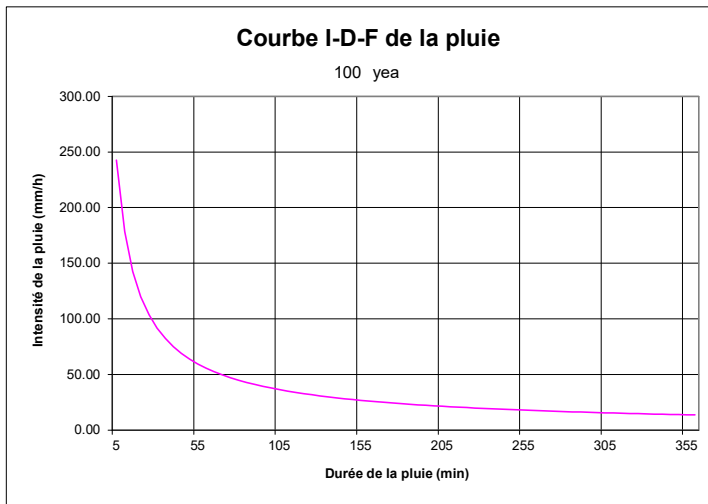
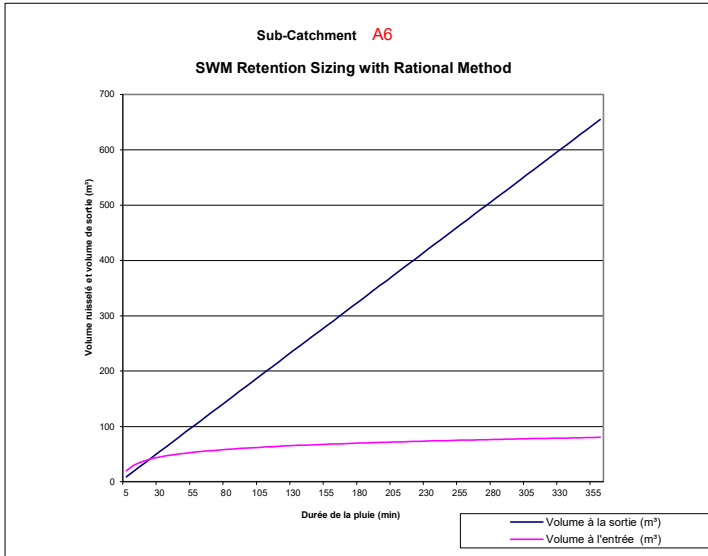
Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022



Fastrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) C/IAT (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(5) (6)
5.0	242.70	19.75	9.09498846	10.66
10.0	178.56	29.06	18.1899769	10.87
15.0	142.89	34.88	27.2849654	7.60
20.0	119.95	39.04	36.3799539	2.66
25.0	103.85	42.25	45.4749423	-3.22
30.0	91.87	44.85	54.5699308	-9.72
35.0	82.58	47.04	63.6649193	-16.63
40.0	75.15	48.92	72.7599077	-23.84
45.0	69.05	50.57	81.8548962	-31.28
50.0	63.95	52.04	90.9498846	-38.91
55.0	59.62	53.37	100.044873	-46.67
60.0	55.89	54.58	109.139862	-54.56
65.0	52.65	55.69	118.23485	-62.54
70.0	49.79	56.72	127.329839	-70.61
75.0	47.26	57.68	136.424827	-78.74
80.0	44.99	58.58	145.519815	-86.94
85.0	42.95	59.42	154.614804	-95.19
90.0	41.11	60.22	163.709792	-103.49
95.0	39.43	60.97	172.804781	-111.83
100.0	37.90	61.69	181.899769	-120.21
105.0	36.50	62.37	190.994758	-128.63
110.0	35.20	63.02	200.089746	-137.07
115.0	34.01	63.65	209.184735	-145.54
120.0	32.89	64.24	218.279723	-154.04
125.0	31.86	64.82	227.374712	-162.56
130.0	30.90	65.37	236.4697	-171.10
135.0	30.00	65.91	245.564689	-179.66
140.0	29.15	66.42	254.659677	-188.24
145.0	28.36	66.92	263.754665	-196.83
150.0	27.61	67.40	272.849654	-205.45
155.0	26.91	67.87	281.944642	-214.07
160.0	26.24	68.33	291.039631	-222.71
165.0	25.61	68.77	300.134619	-231.37
170.0	25.01	69.20	309.229608	-240.03
175.0	24.44	69.62	318.324596	-248.71
180.0	23.90	70.02	327.419585	-257.40
185.0	23.39	70.42	336.514573	-266.10
190.0	22.90	70.81	345.609562	-274.80
195.0	22.43	71.18	354.70455	-283.52
200.0	21.98	71.55	363.799539	-292.25
205.0	21.55	71.91	372.894527	-300.98
210.0	21.14	72.27	381.989516	-309.72
215.0	20.75	72.61	391.084504	-318.47
220.0	20.37	72.95	400.179492	-327.23
225.0	20.01	73.28	409.274481	-335.99
230.0	19.66	73.61	418.369469	-344.76
235.0	19.33	73.92	427.464458	-353.54
240.0	19.01	74.24	436.559446	-362.32
245.0	18.69	74.54	445.654435	-371.11
250.0	18.39	74.84	454.749423	-379.91
255.0	18.11	75.14	463.844412	-388.70
260.0	17.83	75.43	472.9394	-397.51
265.0	17.56	75.72	482.034389	-406.32
270.0	17.29	76.00	491.129377	-415.13
275.0	17.04	76.27	500.224366	-423.95
280.0	16.80	76.54	509.319354	-432.78
285.0	16.56	76.81	518.414342	-441.60
290.0	16.33	77.08	527.509331	-450.43
295.0	16.11	77.33	536.604319	-459.27
300.0	15.89	77.59	545.699308	-468.11
305.0	15.68	77.84	554.794296	-476.95
310.0	15.48	78.09	563.889285	-485.80
315.0	15.28	78.33	572.984273	-494.65
320.0	15.09	78.58	582.079262	-503.50
325.0	14.90	78.81	591.17425	-512.36
330.0	14.72	79.05	600.269239	-521.22
335.0	14.54	79.28	609.364227	-530.08
340.0	14.37	79.51	618.459216	-538.95
345.0	14.20	79.73	627.554204	-547.82
350.0	14.04	79.96	636.649193	-556.69
355.0	13.88	80.18	645.744181	-565.57
360.0	13.72	80.39	654.839169	-574.44
<b>Max Volume (V max):</b>				<b>10.87</b>
<b>Design Volume (V design) :</b>				<b>10.87</b>



**STORAGE VOLUME CALCULATIONS**

**Project:** Fastrate Warehouse Development  
 Industrial/Commercial Development  
**Project #:** A001083 (360)  
**Station:** OTTAWA SEWER DESIGN GUIDELINES  
**Date:** 2022-05-30 14:06

**File:** \\cima.plus\cima\Cima-C10\Ott\_Projects\A\A001000-A001499\A001083\_Fastrate Warehouse Development\300\360\_Civil\01-SWM\220527\_SWM redesign\03\_Storm Release Rates & Storage - Half RR\220530\_Storm Water Management - Storage and Drawdown\_Half RR.xlsx\A7

**Description:** Storage volume calculations with the rational method

**Specified Release Rate:** 77.61553563 L/s/ha

**Area :** A7 0.0426 ha  
**Runoff Coefficient C (unfactored):** 0.2  
**C\_runoff factor:** 1.25  
**Runoff Coefficient C :** 0.25  
**Rainfall Event :** 100 year  
**Discharge Flow Q :** 0.003306422 m³/s  
**Discharge Factor K :** 1

**Design Volume:** 1.19 m³

Rainfall Pluviometry Coefficients	2 year		5 year		10 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816

Rainfall Pluviometry Coefficients	25 year		50 year		100 year	
	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

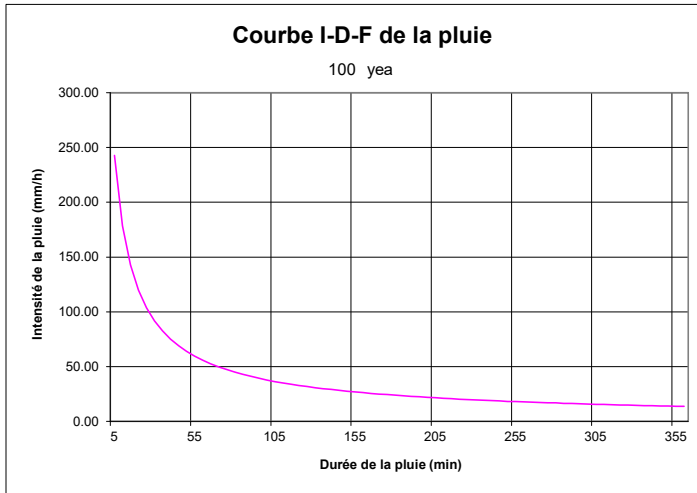
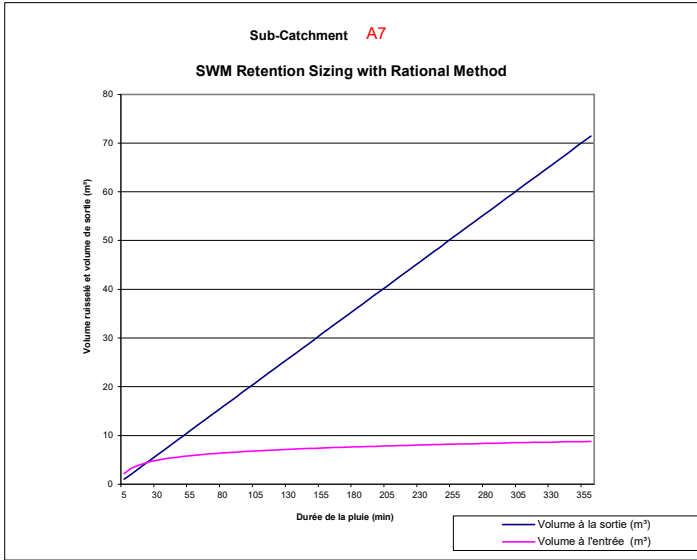
Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 30, 2022

Fastfrate Warehouse Development  
Industrial/Commercial Development



Rainfall Duration (min) T (1)	Rainfall Intensity (mm/h) I (2)	Runoff Volume (m³) CIA/T (4)	Output Volume (m³) kQT (5)	Retention Volume (m³) (4)-(-5) (6)
5.0	242.70	2.15	0.99192655	1.16
10.0	178.56	3.17	1.98385309	1.19
15.0	142.89	3.80	2.97577964	0.83
20.0	119.95	4.26	3.96770618	0.29
25.0	103.85	4.61	4.95963273	-0.35
30.0	91.87	4.89	5.95155927	-1.06
35.0	82.58	5.13	6.94348582	-1.81
40.0	75.15	5.34	7.93541236	-2.60
45.0	69.05	5.52	8.92733891	-3.41
50.0	63.95	5.68	9.91926545	-4.24
55.0	59.62	5.82	10.911192	-5.09
60.0	55.89	5.95	11.9031185	-5.95
65.0	52.65	6.07	12.8950451	-6.82
70.0	49.79	6.19	13.8869716	-7.70
75.0	47.26	6.29	14.8788982	-8.59
80.0	44.99	6.39	15.8708247	-9.48
85.0	42.95	6.48	16.8627513	-10.38
90.0	41.11	6.57	17.8546778	-11.29
95.0	39.43	6.65	18.8466044	-12.20
100.0	37.90	6.73	19.8385309	-13.11
105.0	36.50	6.80	20.8304575	-14.03
110.0	35.20	6.87	21.822384	-14.95
115.0	34.01	6.94	22.8143105	-15.87
120.0	32.89	7.01	23.8062371	-16.80
125.0	31.86	7.07	24.7981636	-17.73
130.0	30.90	7.13	25.7900902	-18.66
135.0	30.00	7.19	26.7820167	-19.59
140.0	29.15	7.24	27.7739433	-20.53
145.0	28.36	7.30	28.7658698	-21.47
150.0	27.61	7.35	29.7577964	-22.41
155.0	26.91	7.40	30.7497229	-23.35
160.0	26.24	7.45	31.7416494	-24.29
165.0	25.61	7.50	32.733576	-25.23
170.0	25.01	7.55	33.7255025	-26.18
175.0	24.44	7.59	34.7174291	-27.12
180.0	23.90	7.64	35.7093556	-28.07
185.0	23.39	7.68	36.7012822	-29.02
190.0	22.90	7.72	37.6932087	-29.97
195.0	22.43	7.76	38.6851353	-30.92
200.0	21.98	7.80	39.6770618	-31.87
205.0	21.55	7.84	40.6689884	-32.83
210.0	21.14	7.88	41.6609149	-33.78
215.0	20.75	7.92	42.6528414	-34.73
220.0	20.37	7.96	43.644768	-35.69
225.0	20.01	7.99	44.6366945	-36.64
230.0	19.66	8.03	45.6286211	-37.60
235.0	19.33	8.06	46.6205476	-38.56
240.0	19.01	8.10	47.6124742	-39.52
245.0	18.69	8.13	48.6044007	-40.47
250.0	18.39	8.16	49.5963273	-41.43
255.0	18.11	8.19	50.5882538	-42.39
260.0	17.83	8.23	51.5801804	-43.35
265.0	17.56	8.26	52.5721069	-44.31
270.0	17.29	8.29	53.5640334	-45.28
275.0	17.04	8.32	54.55596	-46.24
280.0	16.80	8.35	55.5478865	-47.20
285.0	16.56	8.38	56.5398131	-48.16
290.0	16.33	8.41	57.5317396	-49.13
295.0	16.11	8.43	58.5236662	-50.09
300.0	15.89	8.46	59.5155927	-51.05
305.0	15.68	8.49	60.5075193	-52.02
310.0	15.48	8.52	61.4994458	-52.98
315.0	15.28	8.54	62.4913724	-53.95
320.0	15.09	8.57	63.4832989	-54.91
325.0	14.90	8.60	64.4752254	-55.88
330.0	14.72	8.62	65.467152	-56.85
335.0	14.54	8.65	66.4590785	-57.81
340.0	14.37	8.67	67.4510051	-58.78
345.0	14.20	8.70	68.4429316	-59.75
350.0	14.04	8.72	69.4348582	-60.71
355.0	13.88	8.74	70.4267847	-61.68
360.0	13.72	8.77	71.4187113	-62.65
<b>Max Volume (V max):</b>				<b>1.19</b>
<b>Design Volume (V design) :</b>				<b>1.19</b>

# B

## Appendix B-9 SOMME STREET DITCH ELEVATION (100-YEAR)

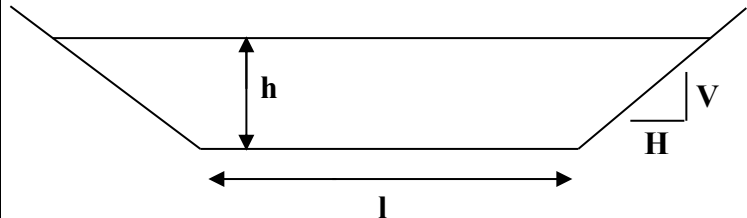


**FASTFRATE**

**A001083 (360)**

**CHANNEL CHECK AT DITCH ON SOMME STREET (100-YEAR)**

<b>Bed Length (l)</b>	m	0.000		
<b>Side Slopes (H:V)</b>	H/V	3.0000	1.0000	
<b>Slope (S)</b>	m/m	0.0050	%	0.50
<b>Roughness Coefficient</b>	n	0.0300		
<b>Flow (Q)</b>	m <sup>3</sup> /s	3.857	l/s	3,857
<b>Velocity (V)</b>	m/s	1.395	cm/s	140
<b>Hydraulic Radius (R<sub>h</sub>)</b>	m	0.455		
<b>Wetted Area</b>	m <sup>2</sup>	2.765		
<b>Wetted Perimeter</b>	m	6.072		
<b>Height of water (h)</b>	m	0.960		



**Notes:**

The ditch on Somme street at which our site is connecting will have a headwater height of 0.96m during the 100-year storm event. The bottom of the ditch at that location is 89.110 which means the hydraulic grade line within the ditch will be at 90.07.

Prepared by: Julien Sauvé, P.Eng  
100200100

Date: July 20, 2021

Verified by: Julien Sauvé, P.Eng  
 PEO No.: 100200100

Date: July 20, 2021

# B

## Appendix B-10 STORM HYDRAULIC GRADE LINE









# B

## Appendix B-11 SWM POND CONTROL SIZING





PROJECT NAME: Fastfrate (Ottawa) Warehouse Development  
 CIMA+ PROJECT NUMBER: A001083  
 CLIENT: Fastfrate (Ottawa) Holdings Inc.  
 PROJECT STATUS: 90 % Design (Site plan Approval)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

**Numerical Analysis; Orifice sizing**

**Extended Detention Control**

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

**Extended Detention Orifice**

Control Type: Circular Orifice plate  
 Elevation Range (m): 89.3 to 89.5  
 Base elevation (m):  
 Initial head over Orifice:  
 Orifice Diameter (mm):

Weir Equation Comparison		Values	Notes
89.3	Weir Elevation (m)	89.3	
0	Head over weir, H_w (m)	0.20	
80	Weir Discharge Coeff., C_w	0.61	
1	Weir Length, L_w (m):	0.1	
9.81	Gravitational Acceleration, g (m/s <sup>2</sup> )		
0.63	Discharge Coefficient, C_d		

No. of orifices:  
 Gravitational Acceleration, g (m/s<sup>2</sup>):  
 Discharge Coefficient, C\_d:

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice		Weir		Flow all conditions	
				Orifice Area "a" (m2)	Q=a*C*sqrt(2*g*hf) (m3/s)	Q=2/3*C_w*L_w*sqrt(2*g)	Q (m3/s)	Q (m3/s)	Time differential, dt (s)
89.30	0.00	0.00	0	846.29	5.03E-03	1.00E-06	0.00E+00	0.00E+00	0.00E+00
89.31	0.01	0.01	0.01	849.30	5.03E-03	1.40E-03	1.80E-04	1.80E-04	4.71E+04
89.32	0.02	0.02	0.01	852.32	5.03E-03	1.98E-03	5.09E-04	5.09E-04	1.67E+04
89.33	0.03	0.03	0.01	855.34	5.03E-03	2.43E-03	9.36E-04	9.36E-04	9.14E+03
89.34	0.04	0.04	0.01	858.37	5.03E-03	2.81E-03	1.44E-03	1.44E-03	5.96E+03
89.35	0.05	0.05	0.01	861.40	5.03E-03	3.14E-03	2.01E-03	2.01E-03	4.28E+03
89.36	0.06	0.06	0.01	864.44	5.03E-03	3.44E-03	2.65E-03	2.65E-03	3.27E+03
89.37	0.07	0.07	0.01	867.48	5.03E-03	3.71E-03	3.34E-03	3.34E-03	2.60E+03
89.38	0.08	0.08	0.01	870.53	5.03E-03	3.97E-03	4.08E-03	3.97E-03	2.19E+03
89.39	0.09	0.09	0.01	873.59	5.03E-03	4.21E-03	4.86E-03	4.21E-03	2.08E+03
89.40	0.10	0.10	0.01	876.65	5.03E-03	4.44E-03	5.70E-03	4.44E-03	1.98E+03
89.41	0.11	0.11	0.01	879.71	5.03E-03	4.65E-03	6.57E-03	4.65E-03	1.89E+03
89.42	0.12	0.12	0.01	882.78	5.03E-03	4.86E-03	7.49E-03	4.86E-03	1.82E+03
89.43	0.13	0.13	0.01	885.86	5.03E-03	5.06E-03	8.44E-03	5.06E-03	1.75E+03
89.44	0.14	0.14	0.01	888.94	5.03E-03	5.25E-03	9.44E-03	5.25E-03	1.69E+03
89.45	0.15	0.15	0.01	892.03	5.03E-03	5.43E-03	1.05E-02	5.43E-03	1.64E+03
89.46	0.16	0.16	0.01	895.12	5.03E-03	5.61E-03	1.15E-02	5.61E-03	1.60E+03
89.47	0.17	0.17	0.01	898.22	5.03E-03	5.78E-03	1.26E-02	5.78E-03	1.55E+03
89.48	0.18	0.18	0.01	901.32	5.03E-03	5.95E-03	1.38E-02	5.95E-03	1.51E+03
89.49	0.19	0.19	0.01	904.43	5.03E-03	6.11E-03	1.49E-02	6.11E-03	1.48E+03
89.50	0.20	0.20	0.01	907.55	5.03E-03	6.27E-03	1.61E-02	6.27E-03	1.45E+03

**Numerical Results:**

Parameter	Value	Units
Peak Flowrate (L/s)	6.27	L/s
Average Flowrate (L/s)	4.12	L/s
Water Quality Volume (m <sup>3</sup> )	175.65	m <sup>3</sup>
Drawdown Time (h)	31.0	h
90% Drawdown Time (h)	17.9	h

**MOE Equation 4.10 Results:**

Parameter	Value	Units
Area of Pond	876.75	m2
Orifice Discharge Coeff. C	0.63	unls.
Orifice Area, A <sub>o</sub>	5.03E-03	m2
g	9.81	m/s <sup>2</sup>
h1	0.2	m
h2	0.0	m
Drawdown Time, t	5.6E+04	s
<b>Drawdown Time, t</b>	<b>15.5</b>	<b>h</b>

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

**Retention Control - Freeflow condition**

Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

**Retention Control Orifice**

Control Type	Rectangular Orifice	Weir Equation	Values	Notes
Elevation Range (m)	89.5- 89.85	Weir Elevation (m)	89.5	
Base elevation (m)		Weir Discharge Coeff., C_w	0.61	
Initial head over Orifice		Weir Length, L_w (m):	0.83	
Orifice Depth (mm)	450			
Orifice Width (mm)	830			
No. of orifices	1			
Gravitational Acceleration, g (m/s <sup>2</sup> )	9.81			
Orifice Discharge Coeff., C_d	0.63			

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Orifice		Weir	Flow all conditions		Time differential, dt (s)
			Pond Area "A" (m <sup>2</sup> )	Orifice Area "a" (m <sup>2</sup> )	Q=a*C_d*sqrt(2*g*hf) (m <sup>3</sup> /s)	Q=2/3*C_w*L_w*sqrt(2*g)*h <sup>1.5</sup> Q (m <sup>3</sup> /s)		
89.50	0.00	0	907.55	3.74E-01	0.00	0.00	0.00	0.00
89.51	0.01	0.01	910.67	3.74E-01	0.10	0.00	0.00	6091.08
89.52	0.02	0.01	913.79	3.74E-01	0.15	0.00	0.00	4321.83
89.53	0.03	0.01	916.93	3.74E-01	0.18	0.01	0.01	3540.85
89.54	0.04	0.01	920.06	3.74E-01	0.21	0.01	0.01	3076.96
89.55	0.05	0.01	923.21	3.74E-01	0.23	0.02	0.02	2761.51
89.56	0.06	0.01	926.35	3.74E-01	0.26	0.02	0.02	2529.50
89.57	0.07	0.01	929.51	3.74E-01	0.28	0.03	0.03	2349.83
89.58	0.08	0.01	932.67	3.74E-01	0.29	0.03	0.03	2205.54
89.59	0.09	0.01	935.83	3.74E-01	0.31	0.04	0.04	2086.46
89.60	0.10	0.01	939.00	3.74E-01	0.33	0.05	0.05	1986.09
89.61	0.11	0.01	942.18	3.74E-01	0.35	0.05	0.05	1900.07
89.62	0.12	0.01	945.36	3.74E-01	0.36	0.06	0.06	1825.32
89.63	0.13	0.01	948.54	3.74E-01	0.38	0.07	0.07	1759.62
89.64	0.14	0.01	951.73	3.74E-01	0.39	0.08	0.08	1701.32
89.65	0.15	0.01	954.93	3.74E-01	0.40	0.09	0.09	1649.15
89.66	0.16	0.01	958.13	3.74E-01	0.42	0.10	0.10	1602.14
89.67	0.17	0.01	961.34	3.74E-01	0.43	0.10	0.10	1559.51
89.68	0.18	0.01	964.56	3.74E-01	0.44	0.11	0.11	1520.64
89.69	0.19	0.01	967.78	3.74E-01	0.45	0.12	0.12	1485.02
89.70	0.20	0.01	971.00	3.74E-01	0.47	0.13	0.13	1452.24
89.71	0.21	0.01	974.23	3.74E-01	0.48	0.14	0.14	1421.96
89.72	0.22	0.01	977.47	3.74E-01	0.49	0.15	0.15	1393.88
89.73	0.23	0.01	980.71	3.74E-01	0.50	0.16	0.16	1367.76
89.74	0.24	0.01	983.95	3.74E-01	0.51	0.18	0.18	1343.39
89.75	0.25	0.01	987.21	3.74E-01	0.52	0.19	0.19	1320.60
89.76	0.26	0.01	990.46	3.74E-01	0.53	0.20	0.20	1299.23
89.77	0.27	0.01	993.73	3.74E-01	0.54	0.21	0.21	1279.14
89.78	0.28	0.01	997.00	3.74E-01	0.55	0.22	0.22	1260.23
89.79	0.29	0.01	1000.27	3.74E-01	0.56	0.23	0.23	1242.37
89.80	0.30	0.01	1003.55	3.74E-01	0.57	0.25	0.25	1225.50
89.81	0.31	0.01	1006.84	3.74E-01	0.58	0.26	0.26	1209.52
89.82	0.32	0.01	1010.13	3.74E-01	0.59	0.27	0.27	1194.36
89.83	0.33	0.01	1013.42	3.74E-01	0.60	0.28	0.28	1179.96
89.84	0.34	0.01	1016.72	3.74E-01	0.61	0.30	0.30	1166.27
89.85	0.35	0.01	1020.03	3.74E-01	0.62	0.31	0.31	1153.22
89.86	0.36	0.01	1023.34	3.74E-01	0.63	0.32	0.32	1140.79
89.87	0.37	0.01	1026.66	3.74E-01	0.63	0.34	0.34	1128.91
89.88	0.38	0.01	1029.99	3.74E-01	0.64	0.35	0.35	1117.57
89.89	0.39	0.01	1033.32	3.74E-01	0.65	0.36	0.36	1106.71
89.90	0.40	0.01	1036.65	3.74E-01	0.66	0.38	0.38	1096.32
89.91	0.41	0.01	1039.99	3.74E-01	0.67	0.39	0.39	1086.35
89.92	0.42	0.01	1043.34	3.74E-01	0.68	0.41	0.41	1076.80
89.93	0.43	0.01	1046.69	3.74E-01	0.68	0.42	0.42	1067.62
89.94	0.44	0.01	1050.04	3.74E-01	0.69	0.44	0.44	1058.80
89.95	0.45	0.01	1053.41	3.74E-01	0.70	0.45	0.45	1050.27
89.96	0.46	0.01	1056.77	3.74E-01	0.71	0.47	0.47	1042.00
89.97	0.47	0.01	1060.15	3.74E-01	0.71	0.48	0.48	1034.00
89.98	0.48	0.01	1063.53	3.74E-01	0.72	0.50	0.50	1026.25
89.99	0.49	0.01	1066.91	3.74E-01	0.73	0.51	0.51	1018.75
90.00	0.50	0.01	1070.30	3.74E-01	0.74	0.53	0.53	1011.50
90.01	0.51	0.01	1073.70	3.74E-01	0.74	0.54	0.54	1004.50
90.02	0.52	0.01	1077.10	3.74E-01	0.75	0.56	0.56	997.75
90.03	0.53	0.01	1080.50	3.74E-01	0.76	0.58	0.58	991.25
90.04	0.54	0.01	1083.91	3.74E-01	0.77	0.59	0.59	984.99
90.05	0.55	0.01	1087.33	3.74E-01	0.77	0.61	0.61	978.96
90.06	0.56	0.01	1090.75	3.74E-01	0.78	0.63	0.63	973.14
90.07	0.57	0.01	1094.18	3.74E-01	0.79	0.64	0.64	967.52
90.08	0.58	0.01	1097.62	3.74E-01	0.79	0.66	0.66	962.09
90.09	0.59	0.01	1101.05	3.74E-01	0.80	0.68	0.68	956.84

**Numerical Results:**

Maximum Flowrate - Quantity Control Orifice 1	800.6 L/s
Maximum Flowrate - Quantity Control Orifice 2	93.6 L/s
Maximum Flowrate - Extended Detention Orifice	12.5 L/s
Total Maximum Flowrate	906.6 L/s
Allowable Flowrate	906.9 L/s

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

Retention Control - Freeflow condition

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

Retention Control Orifice 2

Control Type	Rectangular Orifice
Elevation Range (m)	90.07-90.15
Base elevation (m)	89.5
Initial net head over Orifice	0
Orifice Depth (mm)	200
Orifice Width (mm)	775
No. of orifices	1
Gravitational Acceleration, g (m/s <sup>2</sup> )	9.81
Discharge Coefficient, C <sub>d</sub>	0.63

Weir Equation	Values	Notes
Weir Elevation (m)	89.925	
Weir Discharge Coeff., C <sub>w</sub>	0.61	
Weir Length, L <sub>w</sub> (m)	0.775	

Water Elevation (m)	Rectangular Orifice			Orifice		Weir		Flow all conditions	
	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m <sup>2</sup> )	Orifice Area "a" (m <sup>2</sup> )	Q=a*C <sub>d</sub> *sqrt(2*g*hf) (m <sup>3</sup> /s)	Q=2/3*C <sub>w</sub> *L <sub>w</sub> *sqrt(2*g)	Q (m <sup>3</sup> /s)	Time differential, dt (s)	
89.50	-0.42	0	907.55	0.155	0.00	0.00	0.00	0.00	
89.51	-0.41	0.01	910.67	0.155	0.00	0.00	0.00	0.00	
89.52	-0.40	0.01	913.79	0.155	0.00	0.00	0.00	0.00	
89.53	-0.39	0.01	916.93	0.155	0.00	0.00	0.00	0.00	
89.54	-0.38	0.01	920.06	0.155	0.00	0.00	0.00	0.00	
89.55	-0.37	0.01	923.21	0.155	0.00	0.00	0.00	0.00	
89.56	-0.36	0.01	926.35	0.155	0.00	0.00	0.00	0.00	
89.57	-0.35	0.01	929.51	0.155	0.00	0.00	0.00	0.00	
89.58	-0.34	0.01	932.67	0.155	0.00	0.00	0.00	0.00	
89.59	-0.33	0.01	935.83	0.155	0.00	0.00	0.00	0.00	
89.60	-0.32	0.01	939.00	0.155	0.00	0.00	0.00	0.00	
89.61	-0.31	0.01	942.18	0.155	0.00	0.00	0.00	0.00	
89.62	-0.30	0.01	945.36	0.155	0.00	0.00	0.00	0.00	
89.63	-0.29	0.01	948.54	0.155	0.00	0.00	0.00	0.00	
89.64	-0.28	0.01	951.73	0.155	0.00	0.00	0.00	0.00	
89.65	-0.27	0.01	954.93	0.155	0.00	0.00	0.00	0.00	
89.66	-0.26	0.01	958.13	0.155	0.00	0.00	0.00	0.00	
89.67	-0.25	0.01	961.34	0.155	0.00	0.00	0.00	0.00	
89.68	-0.24	0.01	964.56	0.155	0.00	0.00	0.00	0.00	
89.69	-0.23	0.01	967.78	0.155	0.00	0.00	0.00	0.00	
89.70	-0.22	0.01	971.00	0.155	0.00	0.00	0.00	0.00	
89.71	-0.21	0.01	974.23	0.155	0.00	0.00	0.00	0.00	
89.72	-0.20	0.01	977.47	0.155	0.00	0.00	0.00	0.00	
89.73	-0.19	0.01	980.71	0.155	0.00	0.00	0.00	0.00	
89.74	-0.18	0.01	983.95	0.155	0.00	0.00	0.00	0.00	
89.75	-0.17	0.01	987.21	0.155	0.00	0.00	0.00	0.00	
89.76	-0.16	0.01	990.46	0.155	0.00	0.00	0.00	0.00	
89.77	-0.15	0.01	993.73	0.155	0.00	0.00	0.00	0.00	
89.78	-0.14	0.01	997.00	0.155	0.00	0.00	0.00	0.00	
89.79	-0.13	0.01	1000.27	0.155	0.00	0.00	0.00	0.00	
89.80	-0.12	0.01	1003.55	0.155	0.00	0.00	0.00	0.00	
89.81	-0.11	0.01	1006.84	0.155	0.00	0.00	0.00	0.00	
89.82	-0.10	0.01	1010.13	0.155	0.00	0.00	0.00	0.00	
89.83	-0.09	0.01	1013.42	0.155	0.00	0.00	0.00	0.00	
89.84	-0.08	0.01	1016.72	0.155	0.00	0.00	0.00	0.00	
89.85	-0.07	0.01	1020.03	0.155	0.00	0.00	0.00	0.00	
89.86	-0.06	0.01	1023.34	0.155	0.00	0.00	0.00	0.00	
89.87	-0.05	0.01	1026.66	0.155	0.00	0.00	0.00	0.00	
89.88	-0.04	0.01	1029.99	0.155	0.00	0.00	0.00	0.00	
89.89	-0.03	0.01	1033.32	0.155	0.00	0.00	0.00	0.00	
89.90	-0.02	0.01	1036.65	0.155	0.00	0.00	0.00	0.00	
89.91	-0.01	0.01	1039.99	0.155	0.00	0.00	0.00	0.00	
89.92	0.00	0.01	1043.34	0.155	0.00	0.00	0.00	0.00	
89.93	0.01	0.01	1046.69	0.155	0.03	0.00	0.00	21206.67	
89.94	0.02	0.01	1050.04	0.155	0.05	0.00	0.00	4094.31	
89.95	0.03	0.01	1053.41	0.155	0.07	0.01	0.01	1908.96	
89.96	0.04	0.01	1056.77	0.155	0.08	0.01	0.01	1156.09	
89.97	0.05	0.01	1060.15	0.155	0.09	0.01	0.01	795.53	
89.98	0.06	0.01	1063.53	0.155	0.10	0.02	0.02	590.63	
89.99	0.07	0.01	1066.91	0.155	0.11	0.02	0.02	461.18	
90.00	0.08	0.01	1070.30	0.155	0.12	0.03	0.03	373.27	
90.01	0.09	0.01	1073.70	0.155	0.13	0.03	0.03	310.36	
90.02	0.10	0.01	1077.10	0.155	0.13	0.04	0.04	263.50	
90.03	0.11	0.01	1080.50	0.155	0.14	0.05	0.05	227.48	
90.04	0.12	0.01	1083.91	0.155	0.15	0.05	0.05	199.09	
90.05	0.13	0.01	1087.33	0.155	0.15	0.06	0.06	176.24	
90.06	0.14	0.01	1090.75	0.155	0.16	0.07	0.07	157.52	
90.07	0.15	0.01	1094.18	0.155	0.16	0.08	0.08	141.95	
90.08	0.16	0.01	1097.62	0.155	0.17	0.09	0.09	128.84	
90.09	0.17	0.01	1101.05	0.155	0.18	0.09	0.09	117.68	

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

**Retention Control - Freeflow condition**

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

**Extended Detention Orifice**

Control Type: Circular Orifice plate  
 Elevation Range (m): 89.5- 89.85  
 Base elevation (m): 89.5  
 Initial head over Orifice: 0.2  
 Orifice Diameter (mm): 80

No. of orifices: 1  
 Gravitational Acceleration, g ( ): 9.81  
 Discharge Coefficient, C<sub>d</sub>: 0.63

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m <sup>2</sup> )	Orifice Area "a" (m <sup>2</sup> )	Q=a*C*sqrt(2*g*hf) (m <sup>3</sup> /s)	Time differential, dt (s)
89.50	0.20	0	907.55	5.03E-03	1.00E-06	0.00
89.51	0.21	0.01	910.67	5.03E-03	6.43E-03	1416.74
89.52	0.22	0.01	913.79	5.03E-03	6.58E-03	1388.92
89.53	0.23	0.01	916.93	5.03E-03	6.73E-03	1363.05
89.54	0.24	0.01	920.06	5.03E-03	6.87E-03	1338.91
89.55	0.25	0.01	923.21	5.03E-03	7.01E-03	1316.34
89.56	0.26	0.01	926.35	5.03E-03	7.15E-03	1295.18
89.57	0.27	0.01	929.51	5.03E-03	7.29E-03	1275.30
89.58	0.28	0.01	932.67	5.03E-03	7.42E-03	1256.57
89.59	0.29	0.01	935.83	5.03E-03	7.55E-03	1238.90
89.60	0.30	0.01	939.00	5.03E-03	7.68E-03	1222.21
89.61	0.31	0.01	942.18	5.03E-03	7.81E-03	1206.40
89.62	0.32	0.01	945.36	5.03E-03	7.93E-03	1191.41
89.63	0.33	0.01	948.54	5.03E-03	8.06E-03	1177.17
89.64	0.34	0.01	951.73	5.03E-03	8.18E-03	1163.63
89.65	0.35	0.01	954.93	5.03E-03	8.30E-03	1150.74
89.66	0.36	0.01	958.13	5.03E-03	8.42E-03	1138.45
89.67	0.37	0.01	961.34	5.03E-03	8.53E-03	1126.72
89.68	0.38	0.01	964.56	5.03E-03	8.65E-03	1115.52
89.69	0.39	0.01	967.78	5.03E-03	8.76E-03	1104.80
89.70	0.40	0.01	971.00	5.03E-03	8.87E-03	1094.53
89.71	0.41	0.01	974.23	5.03E-03	8.98E-03	1084.70
89.72	0.42	0.01	977.47	5.03E-03	9.09E-03	1075.27
89.73	0.43	0.01	980.71	5.03E-03	9.20E-03	1066.22
89.74	0.44	0.01	983.95	5.03E-03	9.30E-03	1057.52
89.75	0.45	0.01	987.21	5.03E-03	9.41E-03	1049.16
89.76	0.46	0.01	990.46	5.03E-03	9.51E-03	1041.12
89.77	0.47	0.01	993.73	5.03E-03	9.62E-03	1033.38
89.78	0.48	0.01	997.00	5.03E-03	9.72E-03	1025.92
89.79	0.49	0.01	1000.27	5.03E-03	9.82E-03	1018.73
89.80	0.50	0.01	1003.55	5.03E-03	9.92E-03	1011.80
89.81	0.51	0.01	1006.84	5.03E-03	1.00E-02	1005.11
89.82	0.52	0.01	1010.13	5.03E-03	1.01E-02	998.65
89.83	0.53	0.01	1013.42	5.03E-03	1.02E-02	992.41
89.84	0.54	0.01	1016.72	5.03E-03	1.03E-02	986.39
89.85	0.55	0.01	1020.03	5.03E-03	1.04E-02	980.56
89.86	0.56	0.01	1023.34	5.03E-03	1.05E-02	974.92
89.87	0.57	0.01	1026.66	5.03E-03	1.06E-02	969.46
89.88	0.58	0.01	1029.99	5.03E-03	1.07E-02	964.18
89.89	0.59	0.01	1033.32	5.03E-03	1.08E-02	959.06
89.90	0.60	0.01	1036.65	5.03E-03	1.09E-02	954.11
89.91	0.61	0.01	1039.99	5.03E-03	1.10E-02	949.30
89.92	0.62	0.01	1043.34	5.03E-03	1.10E-02	944.65
89.93	0.63	0.01	1046.69	5.03E-03	1.11E-02	940.13
89.94	0.64	0.01	1050.04	5.03E-03	1.12E-02	935.75
89.95	0.65	0.01	1053.41	5.03E-03	1.13E-02	931.49
89.96	0.66	0.01	1056.77	5.03E-03	1.14E-02	927.36
89.97	0.67	0.01	1060.15	5.03E-03	1.15E-02	923.36
89.98	0.68	0.01	1063.53	5.03E-03	1.16E-02	919.46
89.99	0.69	0.01	1066.91	5.03E-03	1.17E-02	915.68
90.00	0.70	0.01	1070.30	5.03E-03	1.17E-02	912.00
90.01	0.71	0.01	1073.70	5.03E-03	1.18E-02	908.43
90.02	0.72	0.01	1077.10	5.03E-03	1.19E-02	904.96
90.03	0.73	0.01	1080.50	5.03E-03	1.20E-02	901.58
90.04	0.74	0.01	1083.91	5.03E-03	1.21E-02	898.29
90.05	0.75	0.01	1087.33	5.03E-03	1.21E-02	895.10
90.06	0.76	0.01	1090.75	5.03E-03	1.22E-02	891.99
90.07	0.77	0.01	1094.18	5.03E-03	1.23E-02	888.96
90.08	0.78	0.01	1097.62	5.03E-03	1.24E-02	886.02
90.09	0.79	0.01	1101.05	5.03E-03	1.25E-02	883.15

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

**Retention Control - Surcharged condition**

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

**Retention Control Orifice**

Control Type	Rectangular Orifice	Weir Equation	Values	Notes
Elevation Range (m)	90.07-90.15	Weir Elevation (m)	89.5	
Base elevation (m)	90.07	Weir Discharge Coeff., C <sub>w</sub>	0.61	
Initial net head over Orifice	0	Weir Length, L <sub>w</sub> (m):	0.83	
Orifice Depth (mm)	450			
Orifice Width (mm)	830			
No. of orifices	1			
Gravitational Acceleration, g (m/s <sup>2</sup> )	9.81			
Discharge Coefficient, C <sub>d</sub>	0.63			

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m <sup>2</sup> )	Orifice Area "a" (m <sup>2</sup> )	Orifice	Weir	Flow all conditions	Time differential, dt (s)	
					Q=a*C*sqrt(2*g*hf) (m <sup>3</sup> /s)	Q=2/3*C <sub>w</sub> *L <sub>w</sub> *sqrt(2*g)*h <sup>1.5</sup> Q (m <sup>3</sup> /s)	Q (m <sup>3</sup> /s)		
90.07	0.00	0	1094.18	0.374	0.00	0.00	0.00	0.00	0.00
90.08	0.01	0.01	1097.62	0.374	0.10	0.00	0.10	0.10	105.31
90.09	0.02	0.01	1101.05	0.374	0.15	0.00	0.15	0.15	74.70
90.10	0.03	0.01	1104.50	0.374	0.18	0.01	0.18	0.18	61.18
90.11	0.04	0.01	1107.95	0.374	0.21	0.01	0.21	0.21	53.15
90.12	0.05	0.01	1111.40	0.374	0.23	0.02	0.23	0.23	47.69
90.13	0.06	0.01	1114.87	0.374	0.26	0.02	0.26	0.26	43.67
90.14	0.07	0.01	1118.33	0.374	0.28	0.03	0.28	0.28	40.55
90.15	0.08	0.01	1121.80	0.374	0.29	0.03	0.29	0.29	38.05
90.16	0.09	0.01	1125.28	0.374	0.31	0.04	0.31	0.31	35.99
90.17	0.10	0.01	1128.76	0.374	0.33	0.05	0.33	0.33	34.25

**Numerical Results:**

Maximum Flowrate - Quantity Control Orifice 1	329.60 L/s
Maximum Flowrate - Quantity Control Orifice 2	136.78 L/s
Maximum Flowrate - Extended Detention Orifice	4.44 L/s
Total Flowrate	470.8 L/s
Half of Allowable Flowrate	453.43 L/s



Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: May 31, 2022

**Retention Control - Surcharged condition**

Verified by: Christian Lavoie-Label, P.Eng.  
 PEO No.: 100067842

Date: May 31, 2022

**Retention Control Orifice**

Control Type	Rectangular Orifice	Weir Equation	Values	Notes
Elevation Range (m)	90.07-90.15	Weir Elevation (m)	89.925	
Base elevation (m)		Weir Discharge Coeff., C <sub>w</sub>	0.61	
Initial net head over Orifice		Weir Length, L <sub>w</sub> (m):	0.775	
Orifice Depth (mm)	200			
Orifice Width (mm)	775			
No. of orifices	1			
Gravitational Acceleration, g (m/s <sup>2</sup> )	9.81			
Discharge Coefficient, C <sub>d</sub>	0.63			

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m <sup>2</sup> )	Orifice Area "a" (m <sup>2</sup> )	Orifice	Weir	Flow all conditions		Time differential, dt (s)
					Q=a*C*sqrt(2*g*hf) (m <sup>3</sup> /s)	Q=2/3*C_w*L_w*sqrt(2*g)	Q (m <sup>3</sup> /s)	Q (m <sup>3</sup> /s)	
90.07	0.00	0	1094.18	0.155	0.00	0.00	0.00	0.00	0.00
90.08	0.01	0.01	1097.62	0.155	0.04	0.00	0.00	0.00	7862.49
90.09	0.02	0.01	1101.05	0.155	0.06	0.00	0.00	0.00	2788.52
90.10	0.03	0.01	1104.50	0.155	0.07	0.01	0.01	0.01	1522.63
90.11	0.04	0.01	1107.95	0.155	0.09	0.01	0.01	0.01	992.06
90.12	0.05	0.01	1111.40	0.155	0.10	0.02	0.02	0.02	712.08
90.13	0.06	0.01	1114.87	0.155	0.11	0.02	0.11	0.11	105.23
90.14	0.07	0.01	1118.33	0.155	0.11	0.03	0.11	0.11	97.72
90.15	0.08	0.01	1121.80	0.155	0.12	0.03	0.12	0.12	91.70
90.16	0.09	0.01	1125.28	0.155	0.13	0.04	0.13	0.13	86.72
90.17	0.10	0.01	1128.76	0.155	0.14	0.04	0.14	0.14	82.52

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
PEO No.: 1E+08

Date: May 31, 2022

Retention Control - ~~SV~~ Verified by: Christian Lavoie-Lebel, P.Eng.  
PEO No.: 1E+08

Date: May 31, 2022

**Extended Detention Orifice**

Control Type: Circular Orifice plate

Elevation R 90.07-90.15

Base elevation 90.07

Initial net h 0

Orifice Diameter 80

No. of orifices 1

Gravitational acceleration 9.81

Discharge coefficient 0.63

Water Elev	Head over	Head differ	Pond Area	Orifice Area "a" (m <sup>2</sup> )	$Q=a*C*\sqrt{2*g*h}$ (m <sup>3</sup> /s)	Time differential, dt (s)
90.07	0.00	0	1094.18	5.03E-03	1.00E-06	0
90.08	0.01	0.01	1097.62	5.03E-03	1.40E-03	7825
90.09	0.02	0.01	1101.05	5.03E-03	1.98E-03	5551
90.10	0.03	0.01	1104.50	5.03E-03	2.43E-03	4546
90.11	0.04	0.01	1107.95	5.03E-03	2.81E-03	3949
90.12	0.05	0.01	1111.40	5.03E-03	3.14E-03	3543
90.13	0.06	0.01	1114.87	5.03E-03	3.44E-03	3245
90.14	0.07	0.01	1118.33	5.03E-03	3.71E-03	3013
90.15	0.08	0.01	1121.80	5.03E-03	3.97E-03	2828
90.16	0.09	0.01	1125.28	5.03E-03	4.21E-03	2674
90.17	0.10	0.01	1128.76	5.03E-03	4.44E-03	2545

# B

## Appendix B-12 STORM SERVICE CONNECTION SIZING





PROJECT NAME: Warehouse Development  
 CIMA+ PROJECT NUMBER: A001083  
 CLIENT: Fastfrate (Ottawa) Holdings Inc.  
 PROJECT STATUS: Issued for Site Plan Approval

October 6, 2021

HYDRAULIC CALCULATIONS FOR STORM SEWERS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012
2. City of Ottawa Technical Bulletins up to and including ISTB-2018-01

DESIGN BASIS:

Manning Coefficient : 0.013  
 Maximum permitted velocity : 3.00 m/s  
 Minimum permitted velocity : 0.80 m/s

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m³/s	Velocity (full) m/s	Flow m³/s	Velocity (actual) m/s	% Full
Building Service Connection --> STM #1	600	22.4	1.00%	89.750	89.525	0.614	2.17	0.213	1.96	35%
STM #1 --> STM #2	600	27.9	0.50%	89.515	89.375	0.435	1.54	0.283	1.64	65%
STM #2 --> Outlet (Wet Pond)	600	9.0	0.50%	89.345	89.300	0.435	1.54	0.283	1.64	65%

**Remarks**

The data in green has been calculated or modified by the designer  
 The data in blue has been calculated using formulas inserted by the designer

**Notes :**

1. Storm Sewer Peak Flow Determined per Roof Restricted flow of 213 L/s; and uncontrolled flow from Catchments A4 of 35.792 L/s and from Catchment A5 of 34.458 L/s.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: 2021-07-25

Updated by: Joseph Lolli, P.Eng.  
 PEO No.: 100505343

Date: 2021-10-06

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: 2021-10-06

# B

## Appendix B-13-1 ROAD CULVERT CALCULATION REPORTS

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: East Entrance Road Culvert**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.99	0.000	0.710	0-NF	0.000	0.000	0.740	0.740	0.000	0.000
0.13	0.13	89.99	0.118	0.712	6-FFt	0.199	0.070	0.740	0.740	0.084	0.000
0.26	0.26	90.00	0.185	0.719	6-FFt	0.308	0.110	0.740	0.740	0.169	0.000
0.39	0.39	90.01	0.240	0.730	6-FFt	0.406	0.143	0.740	0.740	0.253	0.000
0.52	0.52	90.02	0.289	0.743	6-FFt	0.507	0.173	0.740	0.740	0.337	0.000
0.65	0.65	90.04	0.334	0.760	6-FFt	0.636	0.200	0.740	0.740	0.422	0.000
0.78	0.78	90.07	0.376	0.795	6-FFt	0.758	0.224	0.740	0.740	0.506	0.000
0.91	0.91	90.10	0.419	0.824	6-FFt	0.758	0.247	0.740	0.740	0.590	0.000
1.04	1.04	90.14	0.463	0.858	6-FFt	0.758	0.269	0.740	0.740	0.674	0.000
1.17	1.17	90.17	0.507	0.895	6-FFt	0.758	0.290	0.740	0.740	0.759	0.000
1.29	1.29	90.22	0.550	0.936	6-FFt	0.758	0.310	0.740	0.740	0.843	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.28 m, Outlet Elevation (invert): 89.25 m

Culvert Length: 27.30 m, Culvert Slope: 0.0011

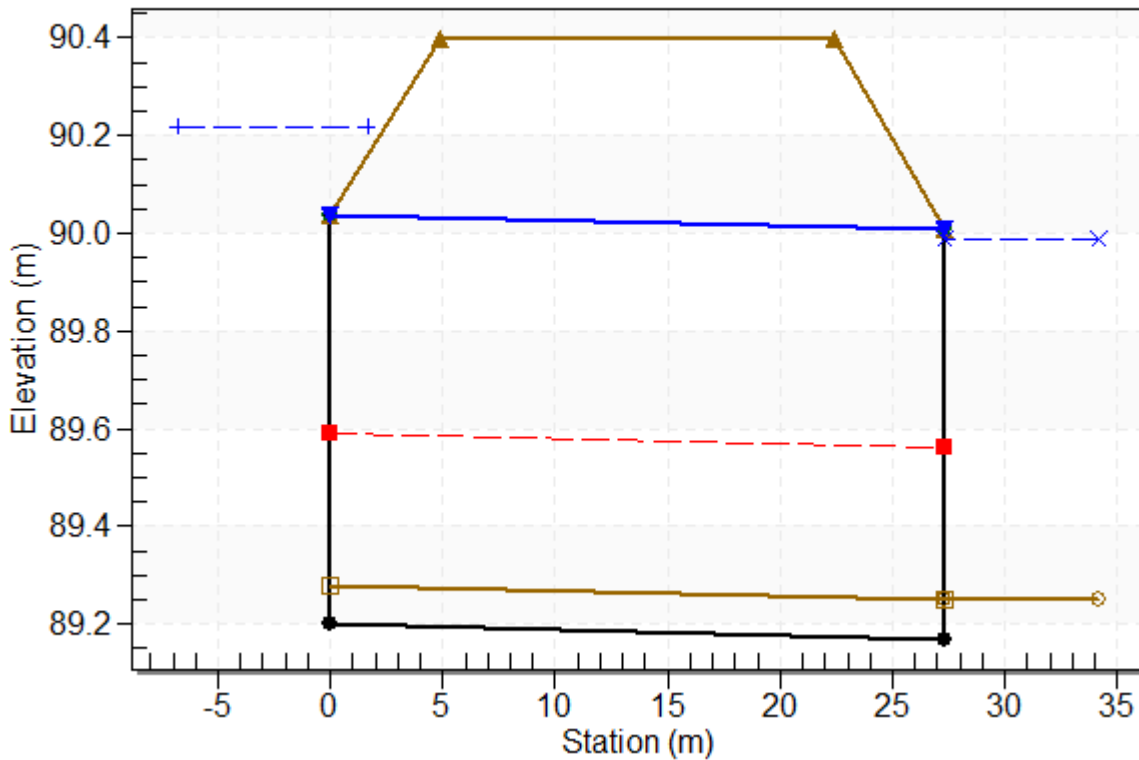
\*\*\*\*\*



## Water Surface Profile Plot for Culvert: East Entrance Road Culvert

Crossing - East Entrance, Design Discharge - 1.29 cms

Culvert - East Entrance Road Culvert, Culvert Discharge - 1.29 cms



### Culvert Data Summary - East Entrance Road Culvert

Barrel Shape: Pipe Arch

Barrel Span: 1244.60 mm

Barrel Rise: 838.20 mm

Barrel Material: Steel or Aluminum

Embedment: 80.00 mm

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Projecting

Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: West Entrance Road Culvert**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.37	0.000	0.730	0-NF	0.000	0.000	0.740	0.740	0.000	0.000
0.13	0.13	90.37	0.118	0.732	6-FFt	0.250	0.070	0.740	0.740	0.084	0.000
0.26	0.26	90.38	0.185	0.737	6-FFt	0.395	0.110	0.740	0.740	0.169	0.000
0.39	0.39	90.38	0.240	0.745	6-FFt	0.544	0.144	0.740	0.740	0.253	0.000
0.52	0.52	90.40	0.289	0.760	6-FFt	0.758	0.173	0.740	0.740	0.338	0.000
0.65	0.65	90.42	0.334	0.776	6-FFt	0.758	0.200	0.740	0.740	0.422	0.000
0.78	0.78	90.44	0.376	0.796	6-FFt	0.758	0.224	0.740	0.740	0.506	0.000
0.91	0.91	90.46	0.420	0.819	6-FFt	0.758	0.247	0.740	0.740	0.591	0.000
1.04	1.04	90.49	0.463	0.846	6-FFt	0.758	0.269	0.740	0.740	0.675	0.000
1.17	1.17	90.52	0.507	0.875	6-FFt	0.758	0.290	0.740	0.740	0.759	0.000
1.30	1.30	90.55	0.551	0.908	6-FFt	0.758	0.310	0.740	0.740	0.844	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.64 m, Outlet Elevation (invert): 89.63 m

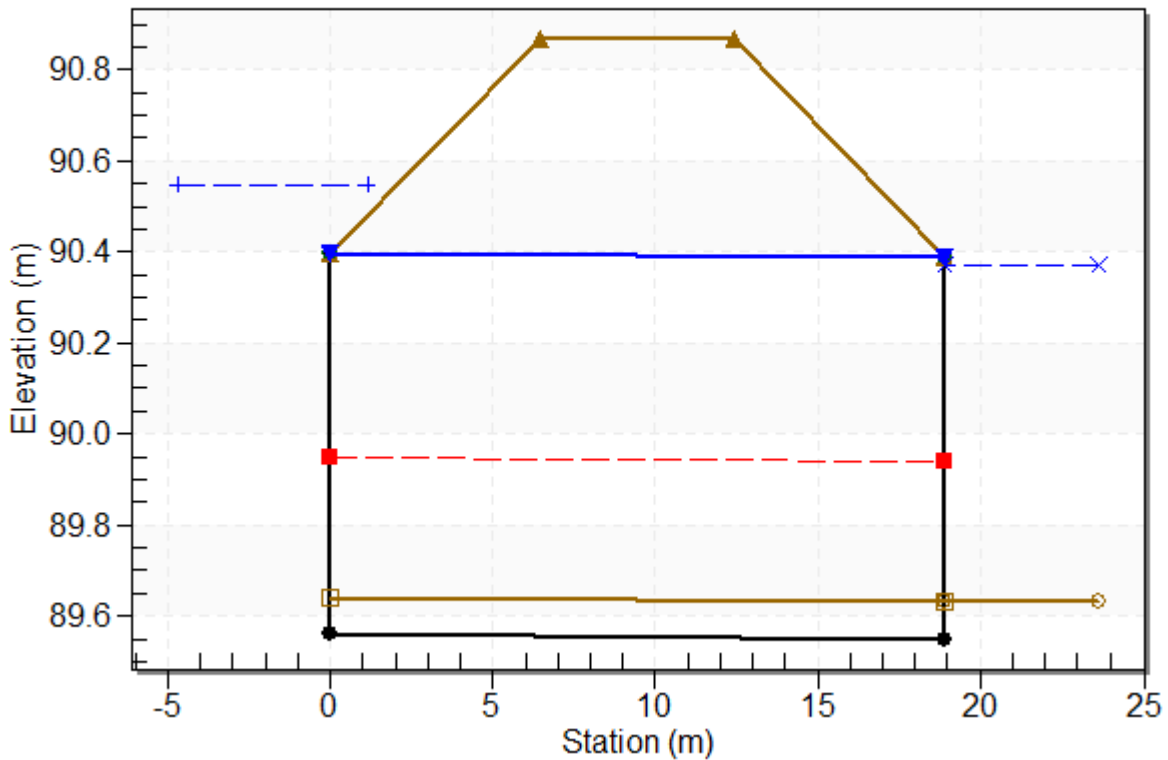
Culvert Length: 18.90 m, Culvert Slope: 0.0005

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: West Entrance Road Culvert

Crossing - West Entrance, Design Discharge - 1.30 cms

Culvert - West Entrance Road Culvert, Culvert Discharge - 1.30 cms



## Culvert Data Summary - West Entrance Road Culvert

Barrel Shape: Pipe Arch

Barrel Span: 1244.60 mm

Barrel Rise: 838.20 mm

Barrel Material: Steel or Aluminum

Embedment: 80.00 mm

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Projecting

Inlet Depression: None

# B

Appendix B-13-2  
SITE CULVERT CALCULATION REPORTS  
FREEFLOW OUTLET CONDITION

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: West Ditch Site Culvert 10y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.78	0.000	0.195	0-NF	0.000	0.000	0.236	0.240	0.000	0.000
0.02	0.02	89.79	0.075	0.204	3-M1t	0.129	0.044	0.236	0.240	0.114	0.000
0.05	0.05	89.81	0.119	0.227	3-M1t	0.199	0.069	0.236	0.240	0.228	0.000
0.07	0.07	89.84	0.154	0.256	3-M2t	0.261	0.090	0.236	0.240	0.341	0.000
0.09	0.09	89.87	0.186	0.287	3-M2t	0.321	0.109	0.236	0.240	0.455	0.000
0.11	0.11	89.90	0.213	0.317	3-M2t	0.382	0.125	0.236	0.240	0.561	0.000
0.14	0.14	89.94	0.242	0.351	3-M2t	0.480	0.141	0.236	0.240	0.683	0.000
0.16	0.16	89.97	0.267	0.382	3-M2t	0.545	0.156	0.236	0.240	0.796	0.000
0.18	0.18	90.00	0.290	0.414	3-M2t	0.545	0.170	0.236	0.240	0.910	0.000
0.21	0.21	90.03	0.311	0.445	3-M2t	0.545	0.183	0.236	0.240	1.024	0.000
0.23	0.23	90.06	0.333	0.477	3-M2t	0.545	0.196	0.236	0.240	1.138	0.000



\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.58 m, Outlet Elevation (invert): 89.54 m

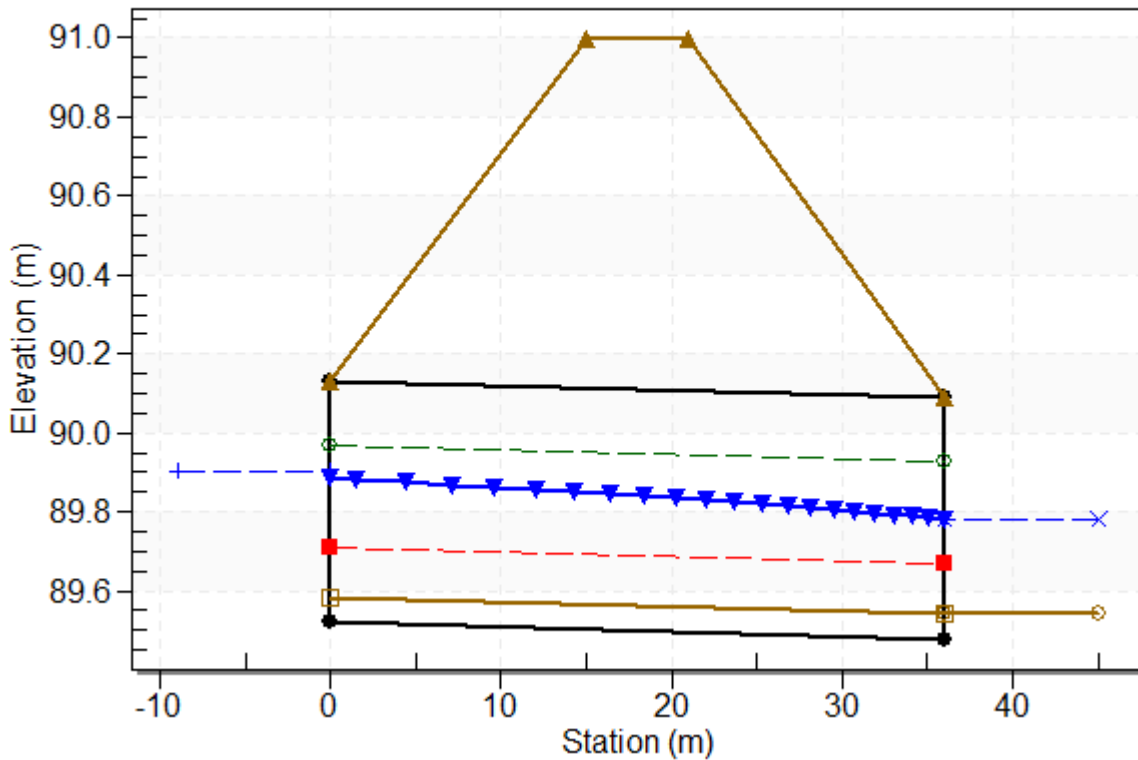
Culvert Length: 36.00 m, Culvert Slope: 0.0011

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: West Ditch Site Culvert 10y

Crossing - West Ditch Site Culvert 10y, Design Discharge - 0.11 cms

Culvert - West Ditch Site Culvert 10y, Culvert Discharge - 0.11 cms



## Culvert Data Summary - West Ditch Site Culvert 10y

Barrel Shape: Pipe Arch

Barrel Span: 889.00 mm

Barrel Rise: 609.60 mm

Barrel Material: Steel or Aluminum

Embedment: 65.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: West Ditch Site Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.82	0.000	0.227	0-NF	0.000	0.000	0.268	0.280	0.000	0.000
0.02	0.02	89.83	0.078	0.234	3-M1t	0.132	0.045	0.268	0.280	0.105	0.000
0.05	0.05	89.84	0.122	0.252	3-M1t	0.204	0.071	0.268	0.280	0.209	0.000
0.07	0.07	89.87	0.159	0.277	3-M2t	0.268	0.093	0.268	0.280	0.314	0.000
0.10	0.10	89.90	0.191	0.305	3-M2t	0.333	0.112	0.268	0.280	0.419	0.000
0.12	0.12	89.93	0.221	0.336	3-M2t	0.406	0.129	0.268	0.280	0.523	0.000
0.14	0.14	89.96	0.248	0.367	3-M2t	0.537	0.145	0.268	0.280	0.628	0.000
0.17	0.17	89.99	0.274	0.398	3-M2t	0.537	0.160	0.268	0.280	0.733	0.000
0.19	0.19	90.02	0.297	0.430	3-M2t	0.537	0.174	0.268	0.280	0.837	0.000
0.22	0.22	90.06	0.320	0.462	3-M2t	0.537	0.187	0.268	0.280	0.942	0.000
0.24	0.24	90.09	0.343	0.496	3-M2t	0.537	0.200	0.268	0.280	1.047	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.59 m, Outlet Elevation (invert): 89.55 m

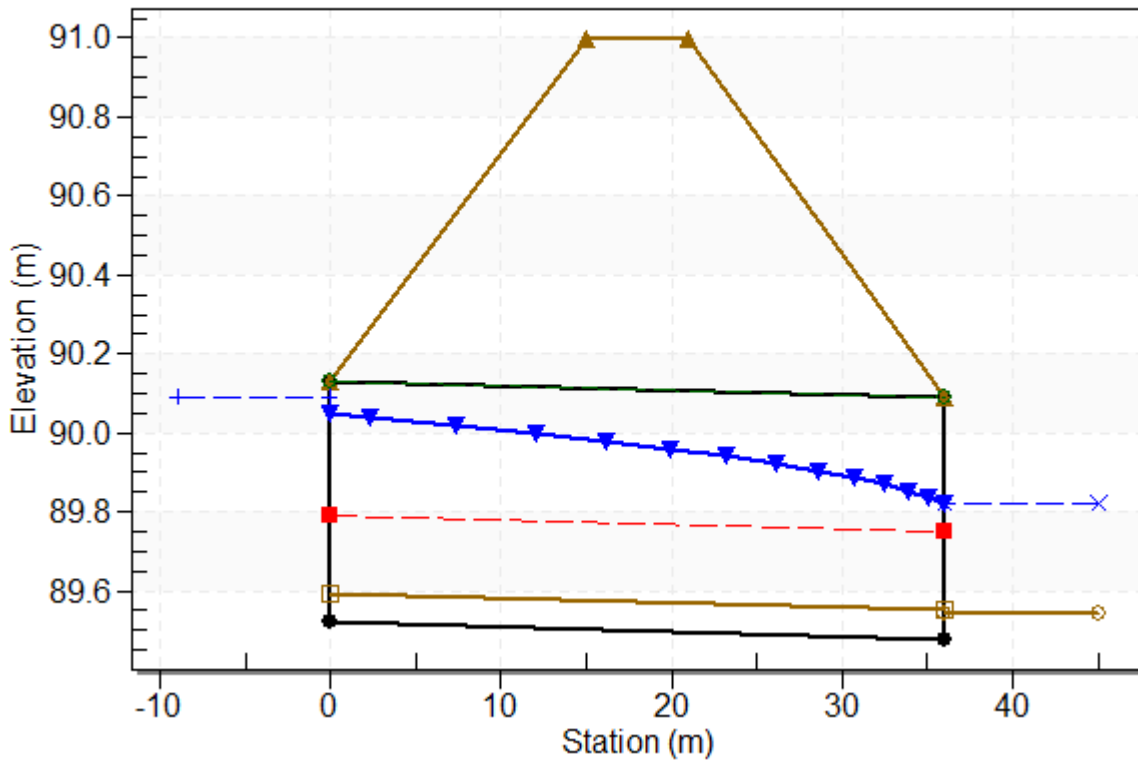
Culvert Length: 36.00 m, Culvert Slope: 0.0011

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: West Ditch Site Culvert 100y

Crossing - West Ditch Site Culvert 100y, Design Discharge - 0.24 cms

Culvert - West Ditch Site Culvert 100y, Culvert Discharge - 0.24 cms



## Culvert Data Summary - West Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 889.00 mm

Barrel Rise: 609.60 mm

Barrel Material: Steel or Aluminum

Embedment: 73.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: East Ditch Site Culvert 10y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.53	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.04	0.04	89.66	0.096	0.132	2-M2c	0.137	0.056	0.056	0.000	0.732	0.000
0.08	0.08	89.73	0.151	0.196	2-M2c	0.213	0.089	0.089	0.000	0.914	0.000
0.12	0.12	89.78	0.196	0.247	2-M2c	0.278	0.115	0.115	0.000	1.040	0.000
0.16	0.16	89.82	0.237	0.293	2-M2c	0.340	0.139	0.139	0.000	1.140	0.000
0.20	0.20	89.87	0.274	0.336	2-M2c	0.405	0.161	0.161	0.000	1.228	0.000
0.24	0.24	89.90	0.308	0.373	2-M2c	0.474	0.180	0.180	0.000	1.303	0.000
0.28	0.28	89.94	0.339	0.410	2-M2c	0.575	0.199	0.199	0.000	1.373	0.000
0.32	0.32	89.98	0.368	0.446	2-M2c	0.662	0.216	0.216	0.000	1.437	0.000
0.36	0.36	90.01	0.396	0.481	2-M2c	0.662	0.233	0.233	0.000	1.498	0.000
0.40	0.40	90.04	0.425	0.515	2-M2c	0.662	0.249	0.249	0.000	1.554	0.000



\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.53 m, Outlet Elevation (invert): 89.50 m

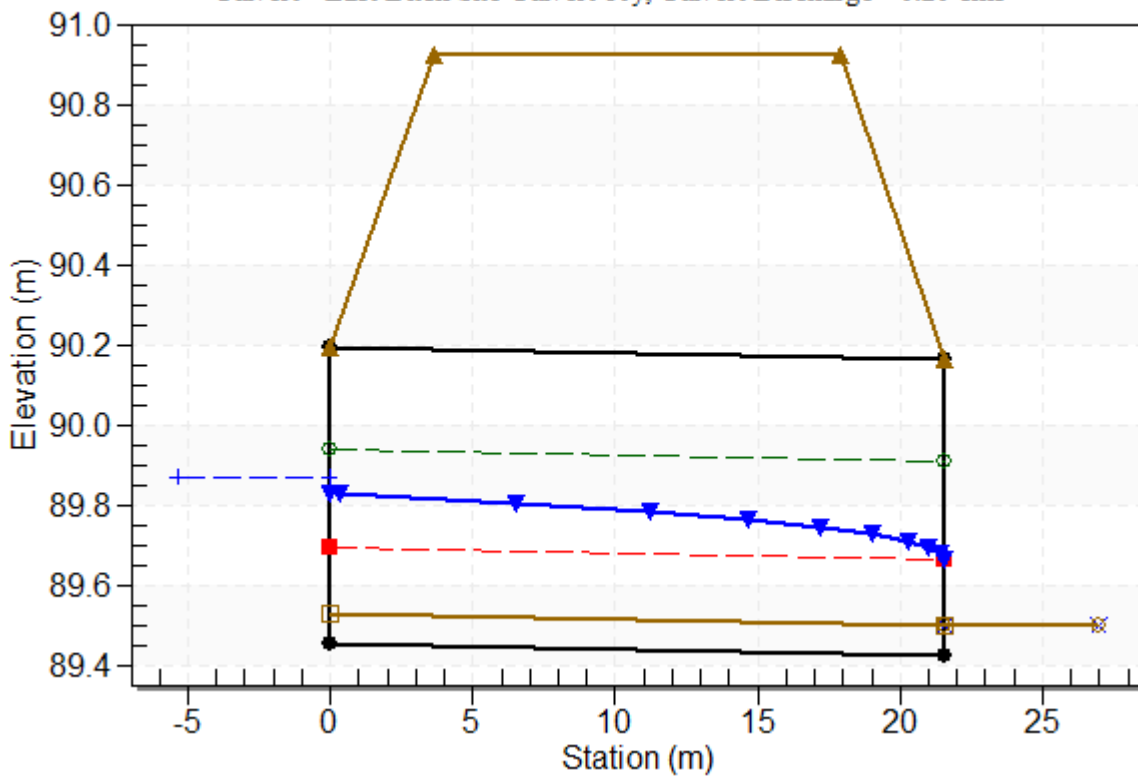
Culvert Length: 21.55 m, Culvert Slope: 0.0014

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: East Ditch Site Culvert 10y

Crossing - East Ditch Site Culvert 10y, Design Discharge - 0.20 cms

Culvert - East Ditch Site Culvert 10y, Culvert Discharge - 0.20 cms



## Culvert Data Summary - East Ditch Site Culvert 10y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: East Ditch Site Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.82	0.000	0.290	0-NF	0.000	0.000	0.320	0.320	0.000	0.000
0.04	0.04	89.82	0.103	0.295	3-M1t	0.147	0.060	0.320	0.320	0.135	0.000
0.09	0.09	89.84	0.162	0.309	3-M1t	0.228	0.095	0.320	0.320	0.270	0.000
0.13	0.13	89.86	0.211	0.330	3-M1t	0.299	0.124	0.320	0.320	0.405	0.000
0.18	0.18	89.89	0.254	0.356	3-M2t	0.369	0.149	0.320	0.320	0.540	0.000
0.22	0.22	89.92	0.293	0.386	3-M2t	0.443	0.172	0.320	0.320	0.675	0.000
0.27	0.27	89.95	0.330	0.418	3-M2t	0.536	0.193	0.320	0.320	0.811	0.000
0.31	0.31	89.98	0.362	0.452	3-M2t	0.662	0.213	0.320	0.320	0.946	0.000
0.36	0.36	90.02	0.394	0.486	3-M2t	0.662	0.232	0.320	0.320	1.081	0.000
0.40	0.40	90.05	0.426	0.521	3-M2t	0.662	0.250	0.320	0.320	1.216	0.000
0.45	0.45	90.09	0.457	0.556	3-M2t	0.662	0.267	0.320	0.320	1.351	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.53 m, Outlet Elevation (invert): 89.50 m

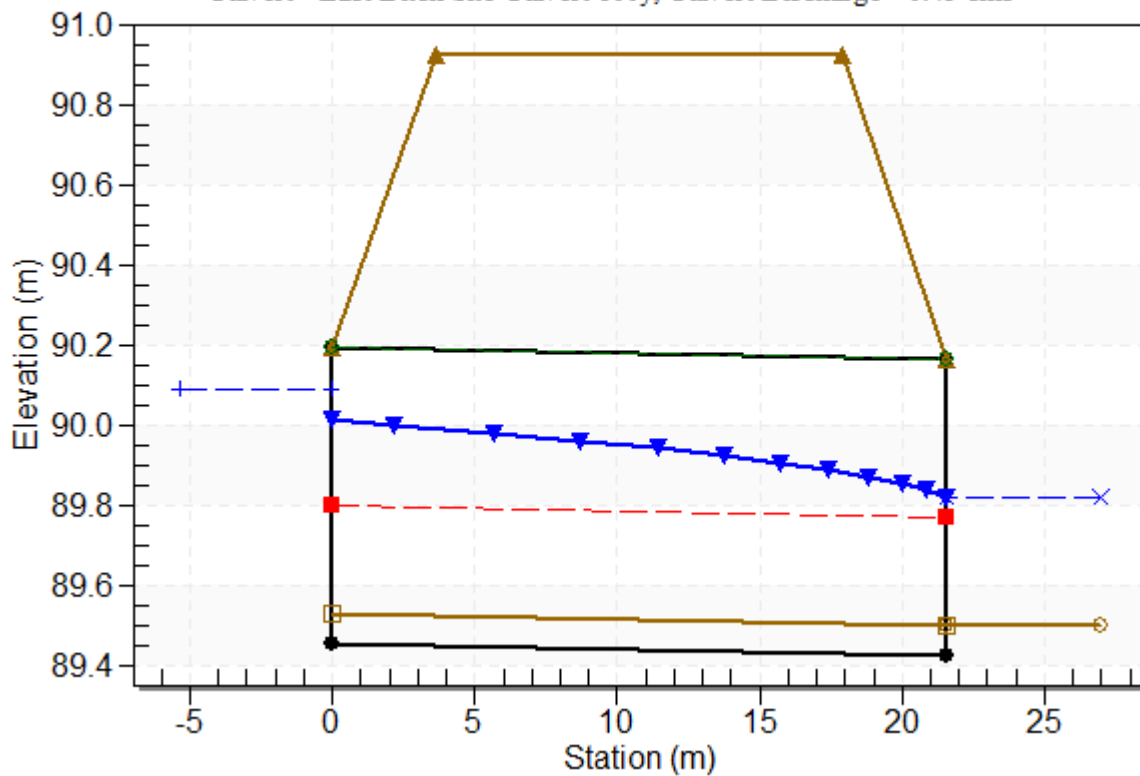
Culvert Length: 21.55 m, Culvert Slope: 0.0014

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: East Ditch Site Culvert 100y

Crossing - East Ditch Site Culvert 100y, Design Discharge - 0.45 cms

Culvert - East Ditch Site Culvert 100y, Culvert Discharge - 0.45 cms



## Culvert Data Summary - East Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: Transfer Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.50	0.000	0.200	0-NF	0.000	0.000	0.325	0.325	0.000	0.000
0.09	0.09	89.51	0.105	0.208	3-M1t	0.096	0.061	0.325	0.325	0.135	0.000
0.18	0.18	89.53	0.165	0.231	3-M1t	0.148	0.096	0.325	0.325	0.271	0.000
0.27	0.27	89.56	0.214	0.262	3-M1t	0.191	0.125	0.325	0.325	0.406	0.000
0.36	0.36	89.60	0.258	0.297	3-M1t	0.229	0.151	0.325	0.325	0.541	0.000
0.45	0.45	89.63	0.298	0.334	3-M1t	0.266	0.174	0.325	0.325	0.676	0.000
0.54	0.54	89.67	0.336	0.371	3-M1t	0.301	0.195	0.325	0.325	0.812	0.000
0.63	0.63	89.71	0.368	0.407	3-M2t	0.336	0.215	0.325	0.325	0.947	0.000
0.73	0.73	89.74	0.400	0.444	3-M2t	0.371	0.234	0.325	0.325	1.082	0.000
0.82	0.82	89.78	0.432	0.479	3-M2t	0.407	0.253	0.325	0.325	1.218	0.000
0.91	0.91	89.82	0.465	0.515	3-M2t	0.446	0.270	0.325	0.325	1.353	0.000



\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.30 m, Outlet Elevation (invert): 89.18 m

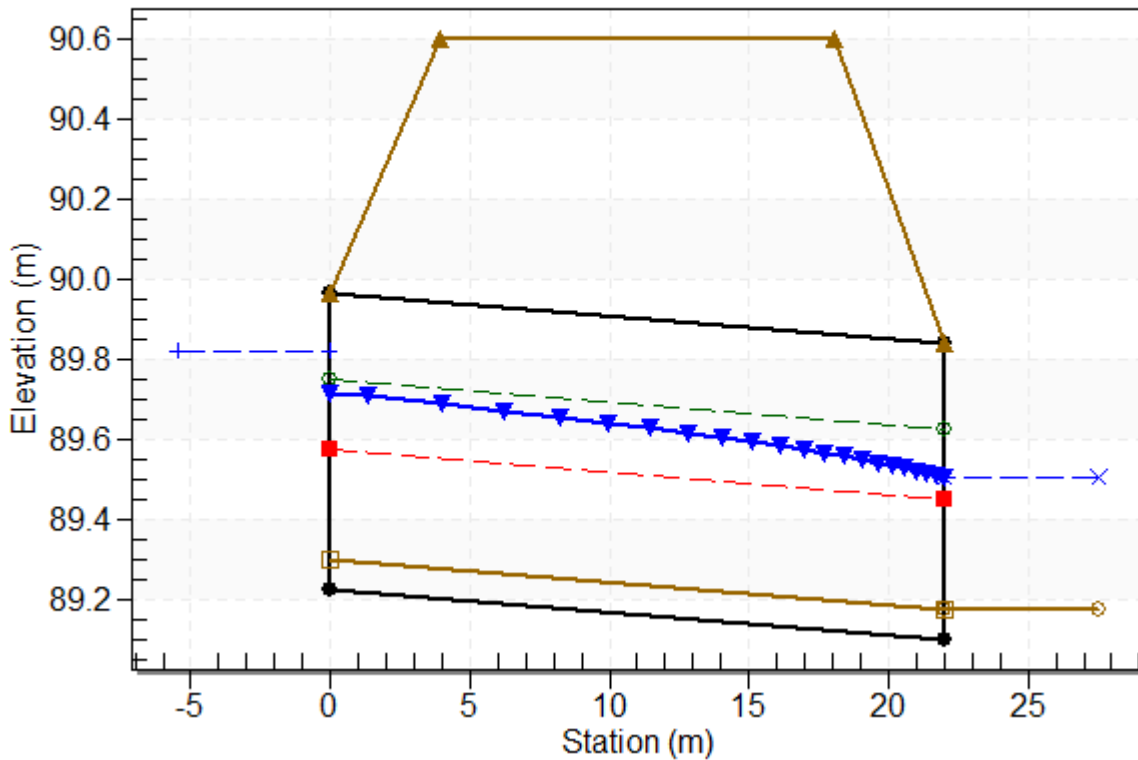
Culvert Length: 22.00 m, Culvert Slope: 0.0057

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: Transfer Culvert 100y

Crossing - Transfer Culvert 100y, Design Discharge - 0.91 cms

Culvert - Transfer Culvert 100y, Culvert Discharge - 0.91 cms



### Culvert Data Summary - Transfer Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# B

Appendix B-13-3  
SITE CULVERT CALCULATION REPORTS  
SUBMERGED OUTLET CONDITION

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: West Ditch Site Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.30	0.000	0.707	0-NF	0.000	0.000	0.537	0.760	0.000	0.000
0.02	0.02	90.30	0.078	0.709	4-FFf	0.132	0.045	0.537	0.760	0.062	0.000
0.05	0.05	90.31	0.122	0.716	4-FFf	0.204	0.071	0.537	0.760	0.124	0.000
0.07	0.07	90.32	0.159	0.725	4-FFf	0.268	0.093	0.537	0.760	0.186	0.000
0.10	0.10	90.33	0.191	0.738	4-FFf	0.333	0.112	0.537	0.760	0.248	0.000
0.12	0.12	90.35	0.221	0.754	4-FFf	0.406	0.129	0.537	0.760	0.310	0.000
0.14	0.14	90.38	0.248	0.787	4-FFf	0.537	0.145	0.537	0.760	0.371	0.000
0.17	0.17	90.41	0.274	0.815	4-FFf	0.537	0.160	0.537	0.760	0.433	0.000
0.19	0.19	90.44	0.297	0.846	4-FFf	0.537	0.174	0.537	0.760	0.495	0.000
0.22	0.22	90.47	0.320	0.881	4-FFf	0.537	0.187	0.537	0.760	0.557	0.000
0.24	0.24	90.51	0.343	0.920	4-FFf	0.537	0.200	0.537	0.760	0.619	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.59 m, Outlet Elevation (invert): 89.55 m

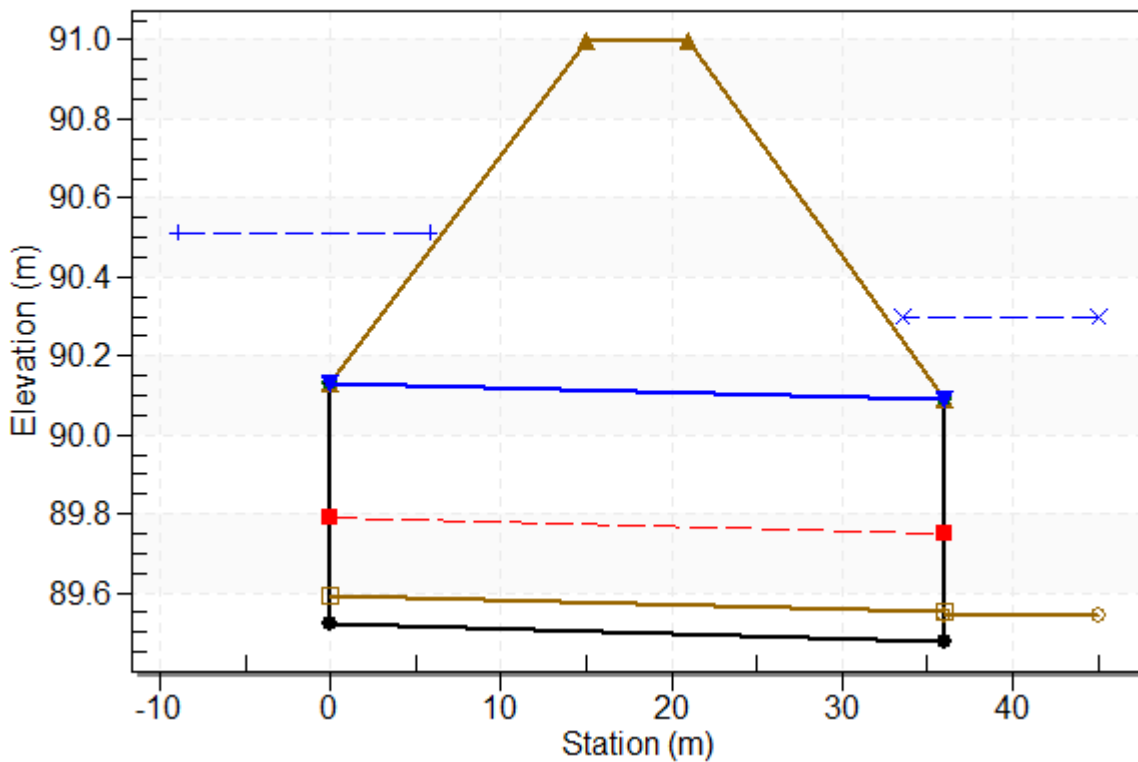
Culvert Length: 36.00 m, Culvert Slope: 0.0011

\*\*\*\*\*

### Water Surface Profile Plot for Culvert: West Ditch Site Culvert 100y

Crossing - West Ditch Site Culvert 100y, Design Discharge - 0.24 cms

Culvert - West Ditch Site Culvert 100y, Culvert Discharge - 0.24 cms



### Culvert Data Summary - West Ditch Site Culvert 100y

- Barrel Shape: Pipe Arch
- Barrel Span: 889.00 mm
- Barrel Rise: 609.60 mm
- Barrel Material: Steel or Aluminum
- Embedment: 73.00 mm
- Barrel Manning's n: 0.0250 (top and sides)
- Manning's n: 0.0350 (bottom)
- Culvert Type: Straight
- Inlet Configuration: Mitered
- Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:



**Table 1 - Culvert Summary Table: East Ditch Site Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.30	0.000	0.770	0-NF	0.000	0.000	0.662	0.800	0.000	0.000
0.04	0.04	90.30	0.103	0.772	4-FFf	0.147	0.060	0.662	0.800	0.077	0.000
0.09	0.09	90.31	0.162	0.776	4-FFf	0.228	0.095	0.662	0.800	0.154	0.000
0.13	0.13	90.31	0.211	0.783	4-FFf	0.299	0.124	0.662	0.800	0.231	0.000
0.18	0.18	90.32	0.254	0.793	4-FFf	0.369	0.149	0.662	0.800	0.308	0.000
0.22	0.22	90.34	0.293	0.805	4-FFf	0.443	0.172	0.662	0.800	0.385	0.000
0.27	0.27	90.35	0.330	0.820	4-FFf	0.536	0.193	0.662	0.800	0.462	0.000
0.31	0.31	90.37	0.362	0.843	4-FFf	0.662	0.213	0.662	0.800	0.539	0.000
0.36	0.36	90.39	0.394	0.865	4-FFf	0.662	0.232	0.662	0.800	0.616	0.000
0.40	0.40	90.42	0.426	0.889	4-FFf	0.662	0.250	0.662	0.800	0.694	0.000
0.45	0.45	90.45	0.457	0.917	4-FFf	0.662	0.267	0.662	0.800	0.771	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.53 m, Outlet Elevation (invert): 89.50 m

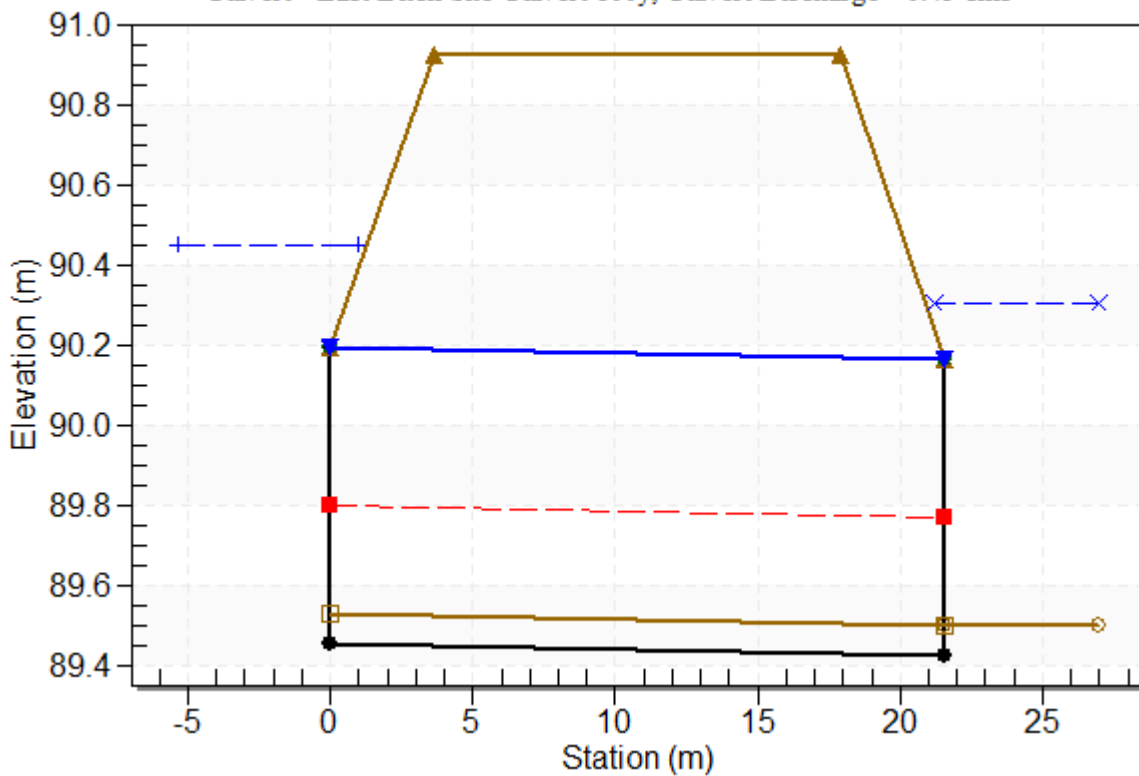
Culvert Length: 21.55 m, Culvert Slope: 0.0014

\*\*\*\*\*

### Water Surface Profile Plot for Culvert: East Ditch Site Culvert 100y

Crossing - East Ditch Site Culvert 100y, Design Discharge - 0.45 cms

Culvert - East Ditch Site Culvert 100y, Culvert Discharge - 0.45 cms



### Culvert Data Summary - East Ditch Site Culvert 100y

- Barrel Shape: Pipe Arch
- Barrel Span: 1066.80 mm
- Barrel Rise: 736.60 mm
- Barrel Material: Steel or Aluminum
- Embedment: 75.00 mm
- Barrel Manning's n: 0.0250 (top and sides)
- Manning's n: 0.0300 (bottom)
- Culvert Type: Straight
- Inlet Configuration: Mitered
- Inlet Depression: None

# HY-8 Culvert Analysis Report

## Project Notes

Project Title:

Designer:

Project Date: Wednesday, July 7, 2021

Notes:

**Table 1 - Culvert Summary Table: Transfer Culvert 100y**

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.15	0.000	0.850	0-NF	0.000	0.000	0.662	0.975	0.000	0.000
0.09	0.09	90.15	0.105	0.852	4-FFf	0.096	0.061	0.662	0.975	0.078	0.000
0.18	0.18	90.16	0.165	0.856	4-FFf	0.148	0.096	0.662	0.975	0.157	0.000
0.27	0.27	90.16	0.214	0.864	4-FFf	0.191	0.125	0.662	0.975	0.235	0.000
0.36	0.36	90.17	0.258	0.875	4-FFf	0.229	0.151	0.662	0.975	0.313	0.000
0.45	0.45	90.19	0.298	0.888	4-FFf	0.266	0.174	0.662	0.975	0.392	0.000
0.54	0.54	90.20	0.336	0.905	4-FFf	0.301	0.195	0.662	0.975	0.470	0.000
0.63	0.63	90.22	0.368	0.924	4-FFf	0.336	0.215	0.662	0.975	0.548	0.000
0.73	0.73	90.25	0.400	0.946	4-FFf	0.371	0.234	0.662	0.975	0.627	0.000
0.82	0.82	90.27	0.432	0.971	4-FFf	0.407	0.253	0.662	0.975	0.705	0.000
0.91	0.91	90.30	0.465	0.997	4-FFf	0.446	0.270	0.662	0.975	0.784	0.000

\*\*\*\*\*

Straight Culvert

Inlet Elevation (invert): 89.30 m, Outlet Elevation (invert): 89.18 m

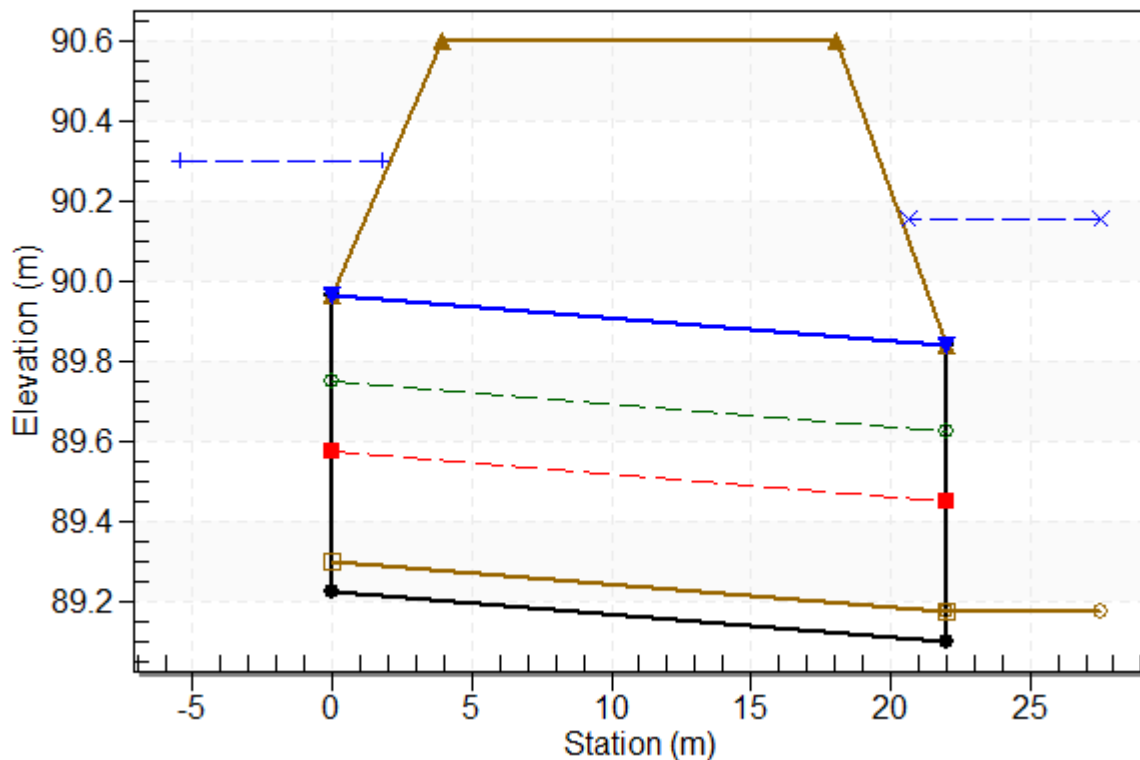
Culvert Length: 22.00 m, Culvert Slope: 0.0057

\*\*\*\*\*

## Water Surface Profile Plot for Culvert: Transfer Culvert 100y

Crossing - Transfer Culvert 100y, Design Discharge - 0.91 cms

Culvert - Transfer Culvert 100y, Culvert Discharge - 0.91 cms



## Culvert Data Summary - Transfer Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

# B

## Appendix B-13-4 CULVERT FLOW PROFILE TYPES





Fastfrate Site Servicing Report  
 Appendix B-13-4 - Summary of flow types.

### USGS Flow Types

Flow Control	Length Full	Flow Type		Flow Profiles	Outlet		Outlet Depth
		HW>D	HW<D		TW>D	TW<D	
Inlet	none	5	1	JS1		t	Jump, S1, TW
Inlet	none	5	1	M3, S3, H3, A3		t	Tailwater
Inlet	none	5	1	H3J, A3J		t	H3, Jump, TW
Inlet	part	5	1	S1	f		Full
Inlet	part	5	1	S1	f		Full
Inlet	part	5	1	JS1	f		Jump, S1, Full
Inlet	part	5	1	H3J, A3J	f		H3, Jump, Full
Outlet	none		2	M2, H2, A2		c	Critical
Outlet	none		3	M2, H2, A2		t	Tailwater
Outlet	none		3	M1		t	Tailwater
Outlet	part		3	M1	f		Full
Outlet	all	4		FF	f		Full
Outlet	most	6		FF		t	Tailwater
Outlet	most	6		FF		c	Critical
Outlet	part	7		M1		t	Tailwater
Outlet	part	7		M2, H2, A2		t	Tailwater
Outlet	part	7		M2, H2, A2		c	Critical

Close

# B

## Appendix B-14 DITCH CALCULATION REPORTS

# Hydraulic Analysis Report

---

## Project Data

Project Title: A001183 - Fastfrate Swales

Designer:

Project Date: Wednesday, June 6, 2022

Project Units: SI Units (Metric)

Notes:

## Channel Analysis: Channel West\_100y

Notes:

## Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.5000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.2310 cms

## Result Parameters

Depth 0.3050 m

Area of Flow 0.6539 m<sup>2</sup>

Wetted Perimeter 3.3707 m

Hydraulic Radius 0.1940 m

Average Velocity 0.3533 m/s

Top Width 3.2877 m

Froude Number: 0.2528

Critical Depth 0.1455 m

Critical Velocity 1.0273 m/s

Critical Slope: 0.0190 m/m

Critical Top Width 2.09 m

Calculated Max Shear Stress 2.9899 N/m<sup>2</sup>

Calculated Avg Shear Stress 1.9017 N/m<sup>2</sup>

## **Channel Analysis: Channel West\_10y**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.5000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.1140 cms

### **Result Parameters**

Depth 0.2158 m

Area of Flow 0.3903 m<sup>2</sup>

Wetted Perimeter 2.6769 m

Hydraulic Radius 0.1458 m

Average Velocity 0.2921 m/s

Top Width 2.6182 m

Froude Number: 0.2415

Critical Depth 0.0967 m

Critical Velocity 0.8656 m/s

Critical Slope: 0.0212 m/m

Critical Top Width 1.72 m

Calculated Max Shear Stress 2.1149 N/m<sup>2</sup>

Calculated Avg Shear Stress 1.4293 N/m<sup>2</sup>

## **Channel Analysis: Channel East\_100y**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.4453 cms

### **Result Parameters**

Depth 0.4381 m

Area of Flow 1.0139 m<sup>2</sup>

Wetted Perimeter 3.7708 m

Hydraulic Radius 0.2689 m

Average Velocity 0.4392 m/s

Top Width 3.6286 m

Froude Number: 0.2652

Critical Depth 0.2177 m

Critical Velocity 1.2374 m/s

Critical Slope: 0.0171 m/m

Critical Top Width 2.31 m

Calculated Max Shear Stress 4.2944 N/m<sup>2</sup>

Calculated Avg Shear Stress 2.6357 N/m<sup>2</sup>

## **Channel Analysis: Channel East\_10y**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.2226 cms

### **Result Parameters**

Depth 0.3138 m

Area of Flow 0.6092 m<sup>2</sup>

Wetted Perimeter 2.9846 m

Hydraulic Radius 0.2041 m

Average Velocity 0.3654 m/s

Top Width 2.8827 m

Froude Number: 0.2537

Critical Depth 0.1470 m

Critical Velocity 1.0509 m/s

Critical Slope: 0.0189 m/m

Critical Top Width 1.88 m

Calculated Max Shear Stress 3.0758 N/m<sup>2</sup>

Calculated Avg Shear Stress 2.0007 N/m<sup>2</sup>

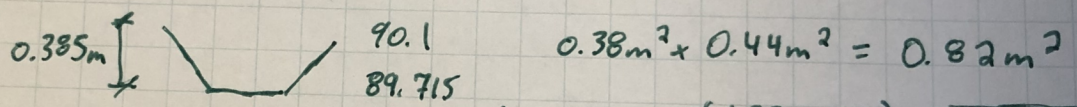
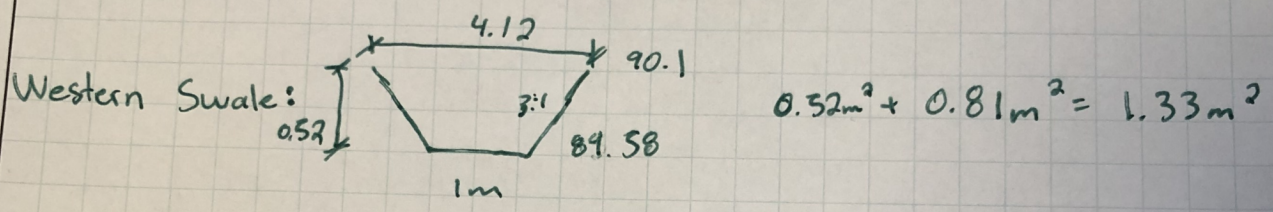
# B

## Appendix B-15 SITE STORAGE VOLUME CALCULATIONS

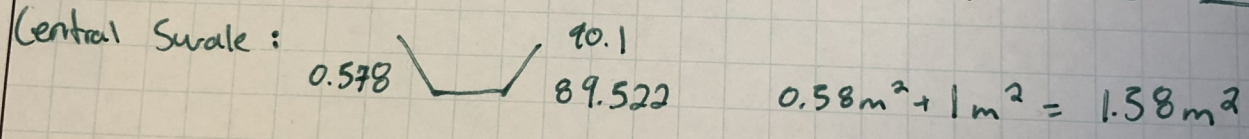


Main Pond: Area @ 89.5 =  $946\text{m}^2$   
 Area @ 90.1 =  $1155\text{m}^2$   
 0.6m }  $1050.5\text{m}^2 \times 0.6\text{m} = \boxed{630\text{m}^3}$

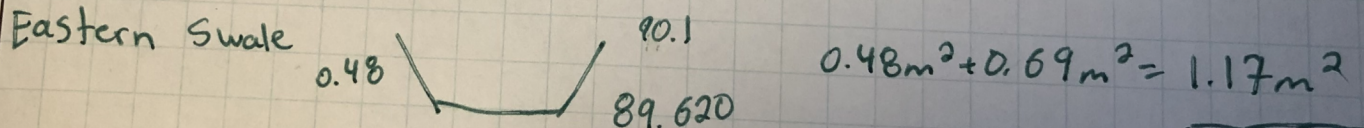
Small Pond: Area @ 89.5 =  $181\text{m}^2$   
 @ 90.1 =  $280\text{m}^2$  }  $230.5\text{m}^2 \times 0.6\text{m} = \boxed{138\text{m}^3}$



$L = 131\text{m} \times \left(\frac{1.33 + 0.82}{2}\right) = \boxed{141\text{m}^3}$



$L = 47\text{m} \times 1.58\text{m}^2 = \boxed{74\text{m}^3}$



$L = 189\text{m} \times 1.17\text{m}^2 = \boxed{221\text{m}^3}$

Detention Volume:

Main Pond  
 89.5 =  $946\text{m}^2$   
 89.3 =  $871\text{m}^2$  }  $\boxed{182\text{m}^3}$

Small Pond  
 89.5 =  $181\text{m}^2$   
 89.3 =  $152\text{m}^2$  }  $\boxed{33.3\text{m}^3}$

Total Volume  
 = 1419-m<sup>3</sup>



# B

## Appendix B-16 CULVERT ENDS (ROADSIDE SAFETY ASSESSMENT)



**Input - Printable**

Project Name: **Fastrate Warehouse Development - East Entrance**  
 Name of Analyst: **Jaymeson Adams, P.Eng.**

Unadjusted Obstacle's Offset from the Travelled Lane	4.95 m
Design Speed of the Road	60 km/h
Encroachment Rate	0.00045 enc/km/yr/vpd
Initial Year	2022
Project Life	50 yr
Discount Rate	5.0 %
Choose one of:	
Initial Year AADT	400 vpd
Design Year AADT	0 vpd
Which Costing System is to be used?	MTO 2011
Traffic Growth Rate	3.0 %
One-Way Highway or Two-Way Highway	Two-Way Highway
Divided or Undivided	Undivided
Number of Lanes	2
Lane Width	3.6 m
Directional Split (Adjacent)	50 %
Severity Index of Upstream Side of Obstacle	2.5
Severity Index of Upstream Corner of Obstacle	2.6
Severity Index of Face of Obstacle	2.5
Severity Index of Downstream Side of Obstacle	0
Severity Index of Downstream Corner of Obstacle	0

Location of Obstacle	Shoulder
Width of Obstacle	3.03 m
Length of Obstacle	2.92 m
Swath Width of Vehicle	3.6 m
Grade	0.4 %
Radius of Curvature	0 m
Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	-0.02
for a horizontal distance of	2.48 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0.4
for a horizontal distance of	2.47 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
for a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Average Damage Repair Cost of Feature after collision for:	
upstream side	\$ 30,000.00 /collision
upstream corner	\$ 30,000.00 /collision
face	\$ 30,000.00 /collision
downstream side	\$ 30,000.00 /collision
downstream corner	\$ 30,000.00 /collision

**OPTION 1**

Method of Improvement	Install SBGR
*Obstacle's Offset from the Travelled Lane	2.48 m
*Width of Obstacle	0.2 m
*Length of Obstacle	5.9 m
Grade	0.4 %
Radius of Curvature	0 m
*Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	0
For a horizontal distance of	0 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0
For a horizontal distance of	0 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
For a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Severity Index of Upstream Side of Obstacle	2.3
*Severity Index of Upstream Corner	2.3
*Severity Index of Face of Obstacle	2.3
*Severity Index of Downstream Side of Obstacle	2.3
*Severity Index of Downstream Corner of Obstacle	2.3
*Installation Cost	\$ 800.00
*Average Damage Repair Cost of improvement option after collision for:	
upstream side	\$ 400.00 /collision
upstream corner	\$ 400.00 /collision
face	\$ 800.00 /collision
downstream side	\$ 400.00 /collision
downstream corner	\$ 400.00 /collision
Annual Maintenance Cost	\$ 80.00 /yr
Salvage Value of Studied Feature	\$ -

**OPTION**

Method of Improvement	0
*Obstacle's Offset from the Travelled Lane	0 m
*Width of Obstacle	0 m
*Length of Obstacle	0 m
Grade	0.0 %
Radius of Curvature	0 m
Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	0
For a horizontal distance of	0 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0
For a horizontal distance of	0 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
For a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Severity Index of Upstream Side of Obstacle	0
*Severity Index of Upstream Corner	0
*Severity Index of Face of Obstacle	0
*Severity Index of Downstream Side of Obstacle	0
*Severity Index of Downstream Corner of Obstacle	0
*Installation Cost	\$ -
*Average Damage Repair Cost of improvement option after collision for:	
upstream side	\$ - /collision
upstream corner	\$ - /collision
face	\$ - /collision
downstream side	\$ - /collision
downstream corner	\$ - /collision
Annual Maintenance Cost	\$ - /yr
Salvage Value of Studied Feature	\$ -

**Output (Separated) - Printable**

Project Name: Fastrate Warehouse Development - East Entrance  
 Name of Analyst: Jaymeson Adams, P.Eng.

**BASE CASE** Do Nothing

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00002	impacts/yr
The number of impacts with the upstream corner is:	0.00007	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00002	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00002	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00001	impacts/yr
<b>CFTA</b>	0.00012	
<b>CFTO</b>	0.00003	
<b>Initial Collision Frequency:</b>	0.00015	
<b>Expected Impacts over Project Life:</b>	0.01685	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	\$	25,047.48
upstream corner :	\$	27,603.08
face:	\$	25,047.48
downstream side:	-\$	1,697.90
downstream corner:	-\$	1,697.90

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	\$ 124.49	\$ 6.82
<b>Accident Costs :</b>	\$ 101.27	\$ 5.55
<b>Installation Cost :</b>	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ 23.22	\$ 1.27
<b>Annual Maintenance Cost :</b>	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -

**Option 1** Install SBGR

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00001	impacts/yr
The number of impacts with the upstream corner is:	0.00032	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00019	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00011	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00006	impacts/yr
<b>CFTA</b>	0.00052	
<b>CFTO</b>	0.00017	
<b>Initial Collision Frequency:</b>	0.00069	
<b>Expected Impacts over Project Life:</b>	0.07760	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	\$	20,555.13
upstream corner :	\$	20,555.13
face:	\$	20,555.13
downstream side:	\$	20,555.13
downstream corner:	\$	20,555.13

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	\$ 2,708.17	\$ 148.34
<b>Accident Costs :</b>	\$ 447.18	\$ 24.49
<b>Installation Cost :</b>	\$ 800.00	\$ 43.82
<b>Accident Repair Costs :</b>	\$ 0.52	\$ 0.03
<b>Annual Maintenance Cost :</b>	\$ 1,460.47	\$ 80.00
<b>Salvage Value :</b>	\$ -	\$ -

**Option 0**

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00018	impacts/yr
The number of impacts with the upstream corner is:	0.00073	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00000	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00022	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00000	impacts/yr
<b>CFTA</b>	0.00090	
<b>CFTO</b>	0.00022	
<b>Initial Collision Frequency:</b>	0.00113	
<b>Expected Impacts over Project Life:</b>	0.12714	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	-\$	1,697.90
upstream corner :	-\$	1,697.90
face:	-\$	1,697.90
downstream side:	-\$	1,697.90
downstream corner:	-\$	1,697.90

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	-\$ 60.52	-\$ 3.32
<b>Accident Costs :</b>	-\$ 60.52	-\$ 3.32
<b>Installation Cost :</b>	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ -	\$ -
<b>Annual Maintenance Cost :</b>	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -

**Summary of Benefits and Costs**

Option 1	Install SBGR
Net Costs	\$ 800.00
Total Benefits	-\$ 1,783.68
Net Present Value	-\$ 2,583.68
Benefit/Cost Ratio	-2.23
Change in Total Impacts	0.06

Option 0	
Net Costs	\$ -
Total Benefits	\$ 185.01
Net Present Value	\$ 185.01
Benefit/Cost Ratio	#DIV/0!
Change in Total Impacts	0.11

**Output (Comparison) - Printable**

Project Name: Fastrate Warehouse Development - East Entrance  
 Name of Analyst: Jaymeson Adams, P.Eng.

	Do Nothing		OPTION 1 Install SBGR		OPTION 0	
The Number of impacts with						
the upstream side is:	0.00002	impacts/yr	0.00001	impacts/yr	0.00018	impacts/yr
the upstream corner is:	0.00007	impacts/yr	0.00032	impacts/yr	0.00073	impacts/yr
the face from adjacent traffic is:	0.00002	impacts/yr	0.00019	impacts/yr	0.00000	impacts/yr
the downstream side is:	0.00000	impacts/yr	0.00000	impacts/yr	0.00000	impacts/yr
the downstream corner is:	0.00002	impacts/yr	0.00011	impacts/yr	0.00022	impacts/yr
the face due to opposing traffic is:	0.00001	impacts/yr	0.00006	impacts/yr	0.00000	impacts/yr
<b>Cost Analysis</b>						
	<b>Total</b>	<b>Annual</b>	<b>Total</b>	<b>Annual</b>	<b>Total</b>	<b>Annual</b>
<b>Total Present Worth :</b>	\$ 124.49	\$ 6.82	\$ 2,708.17	\$ 148.34	-\$ 60.52	-\$ 3.32
<b>Accident Costs :</b>	\$ 101.27	\$ 5.55	\$ 447.18	\$ 24.49	-\$ 60.52	-\$ 3.32
<b>Installation Cost :</b>	\$ -	\$ -	\$ 800.00	\$ 43.82	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ 23.22	\$ 1.27	\$ 0.52	\$ 0.03	\$ -	\$ -
<b>Annual Maintenance Cost :</b>	\$ -	\$ -	\$ 1,460.47	\$ 80.00	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>CFTA</b>	0.00012		0.00052		0.00090	
<b>CFTO</b>	0.00003		0.00017		0.00022	
<b>Initial Collision Frequency:</b>	0.00015		0.00069		0.00113	
<b>Expected Impacts over Project Life:</b>	0.01685		0.07760		0.12714	
<b>Project Life:</b>	50		50		50	
<b>For the Direction Being Considered</b>						
Initial AADT is (vpd):	200		200		200	
Initial Encroachment Rate is (enc/yr/km):	0.09		0.09		0.09	
<b>Average Cost per Impact</b>						
upstream side:	\$ 25,047.48		\$ 20,555.13		-\$ 1,697.90	
upstream corner :	\$ 27,603.08		\$ 20,555.13		-\$ 1,697.90	
face:	\$ 25,047.48		\$ 20,555.13		-\$ 1,697.90	
downstream side:	-\$ 1,697.90		\$ 20,555.13		-\$ 1,697.90	
downstream corner:	-\$ 1,697.90		\$ 20,555.13		-\$ 1,697.90	
<b>Summary of Benefits and Costs</b>						
<b>Net Costs</b>	\$ -		\$ 800.00		\$ -	
<b>Total Benefits</b>	\$ -		-\$ 1,783.68		\$ 185.01	
<b>Net Present Value</b>	0.00		-2583.68		\$ 185.01	
<b>Benefit/Cost Ratio</b>	0.00		-2.23		#DIV/0!	
<b>Change in Total Impacts</b>	0.00		0.06		0.11	

Prepared by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

Reviewed by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

**STEEL BEAM GUIDERAIL – LENGTH AND COST**

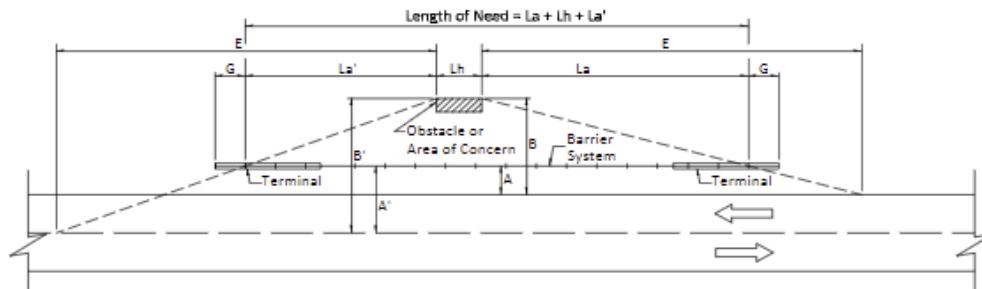
**APPLICABLE DESIGN GUIDELINES:**

- 1. MTO Roadside Design Manual, December 2017
- 2. MTO Roadside Evaluation Manual, July 2018

**STEEL BEAM GUIDERAIL – LENGTH OF NEED CALCULATION:**

**ROADWAY INFORMATION:**

Road Name:	Fastrate East Entrance (Somme St)		
Direction Considered:	East	side	
Design Speed:	60	km/h	
Construction year AADT (est'd):	400	vpd	*Initial Year AADT as described on Roadside.xlsx
Linear Growth Rate:	3.00	%	



**LENGTH OF NEED – APPROACHING TRAFFIC:**

A value (from CAD):	2.7	m
B value (from CAD):	7.1	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m

$La = E (1 - A/B)$  where:  $La$  = Approach Length of Barrier for Approaching Traffic  
 A = Distance from Edge of Travel Way to Face of Barrier.  
 B = Distance from Edge of Travel Way to Back of Obstacle or Area of Concern. B should not exceed Desirable Clear Zone according to Table 2-2  
 G = Gating length of terminal  
 E = Runout Length according to Table 2-15

**Approach Length ( $La$ ):** 3.0 m

**Length of Hazard ( $Lh$ ):** 2.9 m

\*Outside span to outside span of proposed culvert

**LENGTH OF NEED – OPPOSING TRAFFIC:**

A' value (from CAD):	0.0	m
B' value (from CAD):	0.0	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m

$La' = E (1 - A'/B')$  where:  $La$ ,  $Lh$  and  $G$  according to above example  
 $La'$  = Approach Length of Barrier for Opposing Traffic  
 A' = Distance from Centreline to Face of Barrier  
 B' = Distance from Centreline to Back of Obstacle or Area of Concern. B' should not exceed Desirable Clear Zone according to Table 2-2  
 E = Runout Length according to Table 2-15

**Approach Length for Opposing Traffic ( $La'$ ):** 0.0 m

**LENGTH OF NEED:** 5.9 m

**STEEL BEAM GUIDERAIL – COST CALCULATION:**

Cost of new Steel Beam Guiderail:	120.00	\$/m
Length of Need:	5.9	m

**COST FOR NEW SBGR:** 800.00 \$ (Rounded to nearest \$100)



**PROJECT NAME:** Fastrate Warehouse Development

**CIMA+ PROJECT NUMBER:** A001083

**CLIENT:** Fastrate

**PROJECT STATUS:** TENDER

## STEEL BEAM GUIDERAIL – LENGTH AND COST

### APPLICABLE DESIGN GUIDELINES:

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

### NOTES:

1. Culvert ends are the only roadside hazards considered in these calculations.
2. Somme St - undivided highway, 1 lane per direction of travel.

Prepared by: Jaymeson Adams, P.Eng.  
PEO # 100519478

Date: 2022-06-09

Verified by: Jaymeson Adams, P.Eng.  
PEO # 100519478

Date: 2022-06-09

**Input - Printable**

Project Name: **Fastrate Warehouse Development - West Entrance**  
 Name of Analyst: **Jaymeson Adams, P.Eng.**

Unadjusted Obstacle's Offset from the Travelled Lane	5.46 m
Design Speed of the Road	60 km/h
Encroachment Rate	0.00045 enc/km/yr/vpd
Initial Year	2022
Project Life	50 yr
Discount Rate	5.0 %
Choose one of:	
Initial Year AADT	400 vpd
Design Year AADT	0 vpd
Which Costing System is to be used?	MTO 2011
Traffic Growth Rate	3.0 %
One-Way Highway or Two-Way Highway	Two-Way Highway
Divided or Undivided	Undivided
Number of Lanes	2
Lane Width	3.6 m
Directional Split (Adjacent)	50 %
Severity Index of Upstream Side of Obstacle	2.5
Severity Index of Upstream Corner of Obstacle	2.6
Severity Index of Face of Obstacle	2.5
Severity Index of Downstream Side of Obstacle	0
Severity Index of Downstream Corner of Obstacle	0

Location of Obstacle	Shoulder
Width of Obstacle	3.03 m
Length of Obstacle	3.49 m
Swath Width of Vehicle	3.6 m
Grade	0.4 %
Radius of Curvature	197.97 m
Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	-0.03
for a horizontal distance of	2.36 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0.41
for a horizontal distance of	3.11 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
for a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Average Damage Repair Cost of Feature after collision for:	
upstream side	\$ 30,000.00 /collision
upstream corner	\$ 30,000.00 /collision
face	\$ 30,000.00 /collision
downstream side	\$ 30,000.00 /collision
downstream corner	\$ 30,000.00 /collision

**OPTION 1**

Method of Improvement	Install SBGR
*Obstacle's Offset from the Travelled Lane	0 m
*Width of Obstacle	0.2 m
*Length of Obstacle	10.2 m
Grade	0.4 %
Radius of Curvature	197.97 m
*Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	0
For a horizontal distance of	0 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0
For a horizontal distance of	0 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
For a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Severity Index of Upstream Side of Obstacle	2.3
*Severity Index of Upstream Corner	2.3
*Severity Index of Face of Obstacle	2.3
*Severity Index of Downstream Side of Obstacle	2.3
*Severity Index of Downstream Corner of Obstacle	2.3
*Installation Cost	\$ 1,300.00
*Average Damage Repair Cost of improvement option after collision for:	
upstream side	\$ 650.00 /collision
upstream corner	\$ 650.00 /collision
face	\$ 1,300.00 /collision
downstream side	\$ 650.00 /collision
downstream corner	\$ 650.00 /collision
Annual Maintenance Cost	\$ 130.00 /yr
Salvage Value of Studied Feature	\$ -

**OPTION**

Method of Improvement	0
*Obstacle's Offset from the Travelled Lane	0 m
*Width of Obstacle	0 m
*Length of Obstacle	0 m
Grade	0.0 %
Radius of Curvature	0 m
Shoulder Width	0 m
Distance Between Edge of Shoulder and Beginning of Slope	0 m
Slope 1	0
For a horizontal distance of	0 m
Distance Between Base Slope 1 and Edge Slope 2	0 m
Slope 2	0
For a horizontal distance of	0 m
Distance Between Base Slope 2 and Edge Slope 3	0 m
Slope 3	0
For a horizontal distance of	0 m
Distance Between End of Slope and Obstacle	0 m
*Severity Index of Upstream Side of Obstacle	0
*Severity Index of Upstream Corner	0
*Severity Index of Face of Obstacle	0
*Severity Index of Downstream Side of Obstacle	0
*Severity Index of Downstream Corner of Obstacle	0
*Installation Cost	\$ -
*Average Damage Repair Cost of improvement option after collision for:	
upstream side	\$ - /collision
upstream corner	\$ - /collision
face	\$ - /collision
downstream side	\$ - /collision
downstream corner	\$ - /collision
Annual Maintenance Cost	\$ - /yr
Salvage Value of Studied Feature	\$ -

**Output (Separated) - Printable**

Project Name: Fastfrate Warehouse Development - West Entrance  
 Name of Analyst: Jaymeson Adams, P.Eng.

**BASE CASE** Do Nothing

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00003	impacts/yr
The number of impacts with the upstream corner is:	0.00010	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00004	impacts/yr
The number of impacts with the downstream side is:	0.00001	impacts/yr
The number of impacts with the downstream corner is:	0.00006	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00002	impacts/yr
<b>CFTA</b>	0.00016	
<b>CFTO</b>	0.00009	
<b>Initial Collision Frequency:</b>	0.00025	
<b>Expected Impacts over Project Life:</b>	0.02852	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	\$	25,047.48
upstream corner :	\$	27,603.08
face:	\$	25,047.48
downstream side:	-\$	1,697.90
downstream corner:	-\$	1,697.90

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	\$ 182.35	\$ 9.99
<b>Accident Costs :</b>	\$ 150.55	\$ 8.25
<b>Installation Cost :</b>	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ 31.80	\$ 1.74
<b>Annual Maintenance Cost :</b>	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -

**Option 1** Install SBGR

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00005	impacts/yr
The number of impacts with the upstream corner is:	0.00145	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00184	impacts/yr
The number of impacts with the downstream side is:	0.00003	impacts/yr
The number of impacts with the downstream corner is:	0.00089	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00091	impacts/yr
<b>CFTA</b>	0.00334	
<b>CFTO</b>	0.00183	
<b>Initial Collision Frequency:</b>	0.00517	
<b>Expected Impacts over Project Life:</b>	0.58262	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	\$	20,555.13
upstream corner :	\$	20,555.13
face:	\$	20,555.13
downstream side:	\$	20,555.13
downstream corner:	\$	20,555.13

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	\$ 7,036.88	\$ 385.46
<b>Accident Costs :</b>	\$ 3,357.50	\$ 183.91
<b>Installation Cost :</b>	\$ 1,300.00	\$ 71.21
<b>Accident Repair Costs :</b>	\$ 6.11	\$ 0.33
<b>Annual Maintenance Cost :</b>	\$ 2,373.27	\$ 130.00
<b>Salvage Value :</b>	\$ -	\$ -

**Option 0**

**For the Direction Being Considered**

Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00001	impacts/yr
The number of impacts with the upstream corner is:	0.00073	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00000	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00022	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00000	impacts/yr
<b>CFTA</b>	0.00073	
<b>CFTO</b>	0.00022	
<b>Initial Collision Frequency:</b>	0.00096	
<b>Expected Impacts over Project Life:</b>	0.10780	
<b>Project Life:</b>	50	

**Average Cost per Impact**

upstream side:	-\$	1,697.90
upstream corner :	-\$	1,697.90
face:	-\$	1,697.90
downstream side:	-\$	1,697.90
downstream corner:	-\$	1,697.90

**Cost Analysis**

	Total	Annual
<b>Total Present Worth :</b>	-\$ 51.31	-\$ 2.81
<b>Accident Costs :</b>	-\$ 51.31	-\$ 2.81
<b>Installation Cost :</b>	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ -	\$ -
<b>Annual Maintenance Cost :</b>	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -

**Summary of Benefits and Costs**

Option 1	Install SBGR
Net Costs	\$ 1,300.00
Total Benefits	-\$ 5,554.53
Net Present Value	-\$ 6,854.53
Benefit/Cost Ratio	-4.27
Change in Total Impacts	0.55

Option 0	
Net Costs	\$ -
Total Benefits	\$ 233.66
Net Present Value	\$ 233.66
Benefit/Cost Ratio	#DIV/0!
Change in Total Impacts	0.08



**Output (Comparison) - Printable**

Project Name: Fastfrate Warehouse Development - West Entrance

Name of Analyst: Jaymeson Adams, P.Eng.

	Do Nothing		OPTION 1 Install SBGR		OPTION 0	
The Number of impacts with						
the upstream side is:	0.00003	impacts/yr	0.00005	impacts/yr	0.00001	impacts/yr
the upstream corner is:	0.00010	impacts/yr	0.00145	impacts/yr	0.00073	impacts/yr
the face from adjacent traffic is:	0.00004	impacts/yr	0.00184	impacts/yr	0.00000	impacts/yr
the downstream side is:	0.00001	impacts/yr	0.00003	impacts/yr	0.00000	impacts/yr
the downstream corner is:	0.00006	impacts/yr	0.00089	impacts/yr	0.00022	impacts/yr
the face due to opposing traffic is:	0.00002	impacts/yr	0.00091	impacts/yr	0.00000	impacts/yr
<b>Cost Analysis</b>						
	<b>Total</b>	<b>Annual</b>	<b>Total</b>	<b>Annual</b>	<b>Total</b>	<b>Annual</b>
<b>Total Present Worth :</b>	\$ 182.35	\$ 9.99	\$ 7,036.88	\$ 385.46	-\$ 51.31	-\$ 2.81
<b>Accident Costs :</b>	\$ 150.55	\$ 8.25	\$ 3,357.50	\$ 183.91	-\$ 51.31	-\$ 2.81
<b>Installation Cost :</b>	\$ -	\$ -	\$ 1,300.00	\$ 71.21	\$ -	\$ -
<b>Accident Repair Costs :</b>	\$ 31.80	\$ 1.74	\$ 6.11	\$ 0.33	\$ -	\$ -
<b>Annual Maintenance Cost :</b>	\$ -	\$ -	\$ 2,373.27	\$ 130.00	\$ -	\$ -
<b>Salvage Value :</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>CFTA</b>	0.00016		0.00334		0.00073	
<b>CFTO</b>	0.00009		0.00183		0.00022	
<b>Initial Collision Frequency:</b>	0.00025		0.00517		0.00096	
<b>Expected Impacts over Project Life:</b>	0.02852		0.58262		0.10780	
<b>Project Life:</b>	50		50		50	
<b>For the Direction Being Considered</b>						
Initial AADT is (vpd):	200		200		200	
Initial Encroachment Rate is (enc/yr/km):	0.18		0.18		0.18	
<b>Average Cost per Impact</b>						
upstream side:	\$ 25,047.48		\$ 20,555.13		-\$ 1,697.90	
upstream corner :	\$ 27,603.08		\$ 20,555.13		-\$ 1,697.90	
face:	\$ 25,047.48		\$ 20,555.13		-\$ 1,697.90	
downstream side:	-\$ 1,697.90		\$ 20,555.13		-\$ 1,697.90	
downstream corner:	-\$ 1,697.90		\$ 20,555.13		-\$ 1,697.90	
<b>Summary of Benefits and Costs</b>						
Net Costs	\$ -		\$ 1,300.00		\$ -	
Total Benefits	\$ -		-\$ 5,554.53		\$ 233.66	
Net Present Value	0.00		-6854.53		\$ 233.66	
Benefit/Cost Ratio	0.00		-4.27		#DIV/0!	
Change in Total Impacts	0.00		0.55		0.08	

Prepared by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

Reviewed by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

**STEEL BEAM GUIDERAIL – LENGTH AND COST**

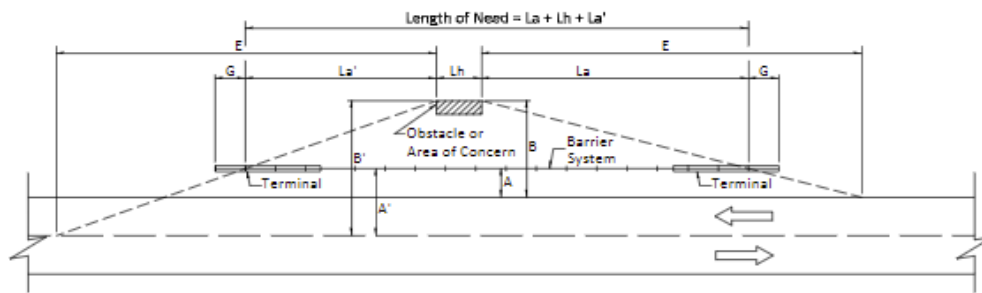
**APPLICABLE DESIGN GUIDELINES:**

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

**STEEL BEAM GUIDERAIL – LENGTH OF NEED CALCULATION:**

**ROADWAY INFORMATION:**

Road Name:	Fastrate West Entrance (Somme St)		
Direction Considered:	East	side	
Design Speed:	60	km/h	
Construction year AADT (est'd):	400	vpd	*Initial Year AADT as described on Roadside.xlsx
Linear Growth Rate:	3.00	%	



**LENGTH OF NEED – APPROACHING TRAFFIC:**

A value (from CAD):	2.4	m
B value (from CAD):	7.7	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m

$La = E (1 - A/B)$  where:  $La$  = Approach Length of Barrier for Approaching Traffic  
 A = Distance from Edge of Travel Way to Face of Barrier.  
 B = Distance from Edge of Travel Way to Back of Obstacle or Area of Concern. B should not exceed Desirable Clear Zone according to Table 2-2  
 G = Gating length of terminal  
 E = Runout Length according to Table 2-15

**Approach Length ( $La$ ):** 6.0 m

**Length of Hazard ( $Lh$ ):** 4.2 m

\*Outside span to outside span of proposed culvert

**LENGTH OF NEED – OPPOSING TRAFFIC:**

A' value (from CAD):	0.0	m
B' value (from CAD):	0.0	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m

$La' = E (1 - A'/B')$  where:  $La$ ,  $Lh$  and  $G$  according to above example  
 $La'$  = Approach Length of Barrier for Opposing Traffic  
 A' = Distance from Centreline to Face of Barrier  
 B' = Distance from Centreline to Back of Obstacle or Area of Concern. B' should not exceed Desirable Clear Zone according to Table 2-2  
 E = Runout Length according to Table 2-15

**Approach Length for Opposing Traffic ( $La'$ ):** 0.0 m

**LENGTH OF NEED:** 10.2 m

**STEEL BEAM GUIDERAIL – COST CALCULATION:**

Cost of new Steel Beam Guiderail:	120.00	\$/m
Length of Need:	10.2	m

**COST FOR NEW SBGR:** 1,300.00 \$ (Rounded to nearest \$100)



**PROJECT NAME:** Fastrate Warehouse Development

**CIMA+ PROJECT NUMBER:** A001083

**CLIENT:** Fastrate

**PROJECT STATUS:** TENDER

## STEEL BEAM GUIDERAIL – LENGTH AND COST

### APPLICABLE DESIGN GUIDELINES:

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

### NOTES:

1. Culvert ends are the only roadside hazards considered in these calculations.
2. Somme St - undivided highway, 1 lane per direction of travel.

Prepared by: Jaymeson Adams, P.Eng.  
PEO # 100519478

Date: 2022-06-09

Verified by: Jaymeson Adams, P.Eng.  
PEO # 100519478

Date: 2022-06-09

# C

## Appendix C-1 WATER SUPPLY





**PROJECT NAME:** Fastfrate Warehouse Development

**CIMA+ PROJECT NUMBER:** A001083

**CLIENT:** Fastfrate (Ottawa) Holdings Inc.

**PROJECT STATUS:** 90 % Design (Site Plan Approval)

## WATER CONSUMPTION CALCULATIONS

### APPLICABLE DESIGN GUIDELINES:

1. Ottawa Design Guidelines - Water Distribution (2010)
2. City of Ottawa Technical Bulletin ISTB-2021-03, ISTB-2018-02, ISDTB-2014-02 and ISD-2010-02
3. MOE Design Guidelines for Drinking-Water Systems

### COMMERCIAL WATER DEMANDS:

#### COMMERCIAL DESIGN CRITERIA:

Contributing Commercial Area:	0.860	gross ha (Building Area)
Commercial Average Day Demand:	28,000	L/gross ha/d
Maximum Day Peaking Factor:	1.5	x Average Daily Demand
Maximum (Peak Hour) Peaking Factor:	1.8	x Maximum Daily Demand

### WATER DEMANDS:

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Commercial	0.28	0.42	0.75
<b>Total</b>	<b>0.28</b>	<b>0.42</b>	<b>0.75</b>

### NOTES:

1. Maximum Day and Maximum Hour residential peaking factors determined from City of Ottawa Water Design Guidelines 2010 - as ammended by all technical bulletins.

Prepared by: Guillaume LeBlond, M.A.Sc., E  
PEO# 100530467

Date: 2022/06/01

Verified by: Christian Lavoie-Lebel, P.Eng.  
PEO# 100173201

Date: 2022/06/01

# C

## Appendix C-2 FIRE FLOW





## CIVELEC CONSULTANTS INC.

3900 COTE VERTU SUITE 200  
ST-LAURENT (QUÉBEC) H4R 1V4

TEL. : (514) 337-2600  
FAX : (514) 337-2610

August 18, 2022

### **Civitas Group**

203-6 Hamilton Avenue North  
Ottawa, Ontario  
K1Y 4R1

Attention: Douglas Rancier, Architect

Subject: **CBRE – Fastfrate Warehouse – Required Fire Flow Proposal**  
**Ottawa, Ontario**  
O/Ref.: 2206-09A

---

Dear Sir,

To determine the water demand for fire protection based on the Fire Underwriters Survey, a document has been prepared by the Opta Information Intelligence Corp (formerly Insurance Advisory Organization). Part 2 of the document, contains a guide (“Guide for Determination of Required Fire Flows for Public Fire Protection in Canada), from here on referred to as the “Guide”.

The subsection entitled “Risk Quantification with Required Fire Flows” states the following:

*“The Guide to calculate required fire flows is made available to municipal officials, consulting engineers and other interested stakeholders as an aid in estimating water supply requirements for public fire protection. This document is a guide and requires specialized knowledge and experience in public fire protection engineering for its effective application.”*

The guide provides the following formula for estimating the fire flow required for a given area:

$$RFF=220 CA^{0.5}$$

where RFF = Required Fire Flow

C = coefficient related to the type of construction

A is the total floor area of the building in m<sup>2</sup>

This formula only takes into consideration the building construction and the building area. The use of this formula provides a reasonable estimation for a building that does not have an adequate sprinkler system or that has a control mode density-area sprinkler system. The firefighting is based on a fire involving a majority of the building and the main objective is to limit the fire from spreading to other buildings and if possible extinguish the fire.



The modern-day sprinkler systems are designed to limit the fire to a relatively small area (by using Quick response sprinklers) and some are actually designed to extinguish the fire by using “Early Suppression Fast Response” sprinkler technology, as is the case in our situation. Since the proposed sprinkler design is based on the specific combustible loading of the building’s occupancy content, the actual storage configuration, the actual height of the building and the clearances of the sprinklers with respect to the combustibles, it would be almost impossible to create a simple equation to estimate the fire flow. As a number of sprinkler systems for speculative buildings are not designed for the actual combustible contents nor do they necessarily use ESFR sprinkler technology, the Guide uses a very conservative credit for sprinklered buildings.

The following examples will demonstrate the typical exceptions where the Guide would provide unreasonable flows (at times under-estimated and at times over-estimated) and where fire protection knowledge is required to determine the reasonable fire flows.

### **Example 1**

We have a 1000 m<sup>2</sup> building of non-combustible construction. The building is used for storage of Class 1B flammable liquids in relieving-type metal drums 25 ft high on racks. The building is fully sprinklered. There is no required exposure protection.

In this example, the estimated fire flow would be:

$$220 \times 0.8 \times 10000.5 = 5,565 \text{ L/min}$$

If we increase the flow by 25% for rapid burning fire, we get 6,957 L/min.

Assuming that we have a fully supervised sprinkler system, we can reduce the flow up to 50% yielding thus a RFF of 3,478 L/min or 920 usgpm.

The sprinkler system design for such an occupancy would require a density of 0.60 gpm/sq ft over an area of 3000 sq ft (flow of 1,800 gpm) plus in-rack sprinklers flowing 18 sprinklers at 30 gpm (flow of 540 gpm) and 500 gpm for hose streams yielding a total demand flow of 2840 usgpm or 10,750 L/min.

As we can see in this example, the real fire flow required to control the fire is approximately 3 times the flow calculated as per the Guide.

### **Example 2**

We have a 150,000 m<sup>2</sup> building of non-combustible construction. The building is used for storage of car parts. The building is fully sprinklered. There is no required exposure protection.





Fastfrate, Ottawa, Ontario

In this case the required flow is:

$$220 \times 0.8 \times 150,0000.5 = 68,164 \text{ L/min}$$

We did not increase the flow for medium hazard.

Assuming that we have a fully supervised sprinkler system, we can reduce the flow up to 50% and we obtain 34,082 L/min or 9,005 usgpm.

Giving a 50% credit for sprinklers is not reasonable. The sprinkler system is typically designed to control the fire within an area of 140 m<sup>2</sup>. If the fire is not extinguished or controlled within the sprinkler design area, the fire will probably spread to the entire building and the credit for 50% would not work as the fire would behave as if the sprinkler system would not be present.

To protect this warehouse, there is almost no municipal water system that can provide these flows based on the Guide's estimation equation. These large warehouses are installed in industrial parks and the typical fire flows required to extinguish the fire are in the range of 5,000 L/min to 10,000 L/min (1320 usgpm – 2640 usgpm).

In this case, the calculations based on the guide require over 4 times more the water flow that is actually required to extinguish the fire.

These examples show why the experience in fire protection engineering is required to correctly determine the actual fire flows required to extinguish a fire.

### **Fastfrate Fire Flow Calculations**

As the sprinkler system at Fastfrate warehouse will be designed to extinguish the fire within a very limited area by using ESFR sprinkler technology, the use of the Guide's empirical formula to estimate the fire flow yields unrealistic results since it does not give sufficient credit for using ESFR sprinklers.

The Fastfrate warehouse's sprinkler design criteria is based on site specific conditions that go far beyond the parameters of the Guide and include features such as building height, height of storage, type of combustibles, type of sprinkler system, etc. Calculations to determine the required fire flow are based on a single fire incident at a time. This is also the case for the Guide.

The design of the sprinkler protection for the warehouse high piled storage section is based on using K16.8 ESFR sprinklers with a very large orifice size at a minimum end head pressure of 52 psi. In most cases, only 4 such sprinklers are expected to flow in a fire scenario. NFPA requires an additional safety margin whereby the design criteria is based on 12 sprinklers flowing at a minimum end head pressure of 52 psi. Although the sprinkler flow would only be expected to be in the range of 500 gpm (1893 L/min), the actual required NFPA design criteria is based on a sprinkler flow rate of 1500 usgpm (5677 L/min). In addition, it is expected that the fire department will require to use



fire hoses to fully extinguish the fire. NFPA requires 250 gpm (946 L/min) to be reserved for outside hoses when using an ESFR sprinkler design approach. The calculated total water flow is 1750 usgpm (6,624 L/min).

Calculations based on the FUS Guide yield a required fire flow of 10,000 L/min (2642 usgpm) (see attached calculations). We recommend to apply an additional reduction due to the ESFR sprinkler system which is actually designed to extinguish the fire. With this additional reduction the required fire flow would be 1982 usgpm (7500 L/min).

We have also compared the recommended flow with the required sprinkler flow based on the NFPA requirements. The NFPA water flow, including hose streams for the fire department, is 1750 usgpm (6624 L/min) as discussed above. For sprinkler designs that are based on a control mode density-area approach (ie. conventional sprinklers), the required hose stream allowance would be 500 usgpm (1892 L/min). By considering 500 usgpm (1892 L/min) for outside hose streams rather than the 250 usgpm required for an ESFR design approach, the resulting total fire flow would be approximately 2000 usgpm (7570 L/min). This is consistent with our assessment above.

### **Fire Duration**

With ESFR sprinklers, the required fire duration is expected to be 60 minutes. We recommend adding a 50% safety factor yielding thus a duration of 90 minutes. The overall volume of water required would therefore be  $1982 \text{ GPM} \times 90 \text{ MINUTES} = 178,380 \text{ US GALLONS}$  or 675 cu. m.

### **Discussion on High One Storey Buildings**

Although FUS has special considerations for tall one storey buildings, for which the guide recommends to treat as a 3 storey building and to consider the potential of fire spreading to all three floors, our alternative objective based design already takes into consideration the higher combustibile loading within an uncompartimentalized building as described below.

The water demand calculations in this report have been based on an uncompartimentalized building that contains a relatively high combustibile loading in a single fire area for the full height of the building (37.5 ft). When comparing this scenario to a building that is vertically compartimentalized (ie multi-storey building), the fire demand and fire hazard for the latter are significantly decreased. To demonstrate this point, we will compare the NFPA 13 sprinkler demand requirement for a 3-storey building of the same total height versus the sprinkler demand requirement for the subject building.

If the building were deemed to be equivalent to a 3-storey building with a height of 12.5 ft per floor, the sprinkler demand as per NFPA 13 would be 600 us gpm based on the same commodity classification that the subject building will contain. The subject building has a proposed sprinkler demand of 1482 gpm (based on an ESFR sprinkler design). In the case of a 3 storey building, the vertically compartimentalized areas would significantly reduce the fire severity as demonstrated by



Fastfrate, Ottawa, Ontario

the much lower sprinkler demand. Furthermore, a 3-storey building of this size would be required to have fire separations between floors (as per OBC) which would limit fire spread.

Consequently, the alternative solution (using an ESFR suppression-based design) presented in this report would still be valid and provide an equivalent level of protection to the FUS recommended practice.

The attached Fire Flow Calculation Sheet represents the probable flows based on experience and fire protection engineering knowledge.

If you require any additional information, please do not hesitate to contact us.

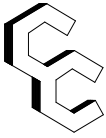
Sincerely Yours,

Civelec Consultants Inc.

A handwritten signature in black ink, appearing to read 'Paul Lhotsky'.

Paul Lhotsky, PhD, P. Eng., P. E.





**FIRE FLOW ASSESSMENT**

**Applicable design guidelines:**

1. Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 2020
2. Ottawa Design Guidelines - Water Distribution (2010) ISTB-2018-02
3. Technical Bulletin ISTB-2021-03

**STEP A - Determine the type of construction**

Type of construction	Coefficient (C)	Value selected (C)
Fire-resistive construction (> 3 hours)	0.6	<b>1.0</b>
Non-combustible construction	0.8	
Ordinary construction	1.0	
Wood frame construction	1.5	

**STEP B - Determine the floor area**

Floor / Level	Floor area per level (sq. ft.)	Floor area per level (m <sup>2</sup> )
Gross floor area (GFA) ground level	92,376	8582
<b>Total floor area (A)</b>	<b>92,376</b>	<b>8582</b>

**STEP C - Determine the height in storeys**

Floor / Level	Number of storeys	Percent of floor area considered
Ground level	1	100%
<b>Height in storeys</b>	<b>1</b>	

**STEP D - Determine base fire flow (round to nearest 1,000 L/min)**

$$F = 220C\sqrt{A}$$

Where:

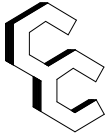
F is the required fire flow in L/min

C is the coefficient related to the type of construction, and;

A is the total floor area of the building in m<sup>2</sup>

Coefficient related to type of construction (C) =  $\frac{1.0}{8582 \text{ m}^2}$

**REQUIRED (BASE) FIRE FLOW (F) = 20,000 L/min (rounded to nearest 1,000 L/min)**



Civelec Consultant Inc.

Project: Fastfrate Warehouse

O/Ref.: 2206-09A

Client: Fastfrate (Ottawa) Holdings Inc.

**FIRE FLOW ASSESSMENT**

**STEP E = Determine the increase or decrease for occupancy and apply to Step D (Step D x Step E, do not round)**

Occupancy Class	Occupancy factor	Value selected (C)
Non-combustible	0.75	1.0
Limited combustible	0.85	
Combustible	1.00	
Free burning	1.15	
Rapid burning	1.25	

**REQUIRED (BASE) FIRE FLOW (F) =** 20,000 L/min (not rounded)

**STEP F - Determine the decrease, if any, for automatic sprinkler protection and apply to value in Step D above (do not round)**

Sprinkler system design	Sprinkler design charge	Value selected (C)	Total charge
Automatic sprinkler system conforming to NFPA standards	-30%	Yes	-30%
Standard water supply	-10%	Yes	-10%
Fully supervised system	-10%	Yes	-10%
<b>Total charge for sprinkler system</b>			<b>-50%</b>

**DECREASE FOR SPRINKLER PROTECTION =** 10,000 L/min (not rounded)

**STEP G - Determine the total increase for exposures and apply to value in Step D above (do not round)**

Façade	Separation distance (m)	Length-height factor of exposed wall (m-storeys)	Assumed construction of exposed wall of adjacent	Total charge
North façade	> 45	N/A	N/A	0%
East façade (fire/party wall)	> 45	N/A	N/A	0%
South façade	> 45	N/A	N/A	0%
West façade	> 45	N/A	N/A	0%
<b>Total charge for exposures</b>				<b>0%</b>

**INCREASE FOR EXPOSURES =** 0 L/min (not rounded)

**STEP H - Determine fire flow including all increases and reductions (Step E + Step F + Step G, round to nearest 1,000 L/min)**

**TOTAL REQUIRED FIRE FLOW (RFF) =** 10,000 L/min (rounded to nearest 1,000 L/min)  
166.6 L/s  
2642 USGPM



Civelec Consultant Inc.

Project: Fastfrate Warehouse

O/Ref.: 2206-09A

Client: Fastfrate (Ottawa) Holdings Inc.

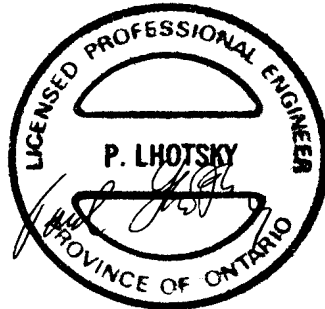
## FIRE FLOW ASSESSMENT

STEP I - Additional adjustment for engineering judgement. Justification: Reduction for ESFR sprinkler: 25%

TOTAL REQUIRED FIRE FLOW (RFF) =	<u>7,500</u>	L/min ( <i>rounded to nearest 1,000 L/min</i> )
	<u>125</u>	L/s
	<u>1982</u>	USGPM

Prepared by: Paul Lhotsky

Date: July 14, 2022



# C

## Appendix C-3 GRAVITY WATERMAIN FOR FIRE PROTECTION



PROJECT NAME: Warehouse Development  
 CIMA+ PROJECT NUMBER: A001083  
 CLIENT: Fastfrate (Ottawa) Holdings Inc.  
 PROJECT STATUS: Site Plan Control

#####

HYDRAULIC CALCULATIONS FOR GRAVITY FIRE PROTECTION WATERMAIN

APPLICABLE DESIGN GUIDELINES:

NFPA 13

DESIGN BASIS:

Manning Coefficient : 0.013  
 Maximum permitted velocity : 3.00 m/s  
 Minimum permitted velocity : 0.60 m/s

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m <sup>3</sup> /s	Velocity (full) m/s	Required Flow m <sup>3</sup> /s	Velocity (actual) m/s	% Full	F.S.
Fire Protection WM	450	60.1	0.20%	87.100	86.985	0.127	0.80	0.110000	0.90	87%	1.15

**Remarks**

The data in green has been calculated or modified by the designer  
 The data in blue has been calculated using formulas inserted by the designer

**Notes :**

- Slope of 3.00% has been assumed for all building connections.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: 10/3/2021

Verified by: Julien Sauvé, P.Eng.  
 PEO No.: 100200100

Date: 10/3/2021



# C

## Appendix C-4 ICE THICKNESS CALCULATION





**PROJECT NAME:** Fastfrate (Ottawa) Warehouse Development  
**NUMBER:** A001083  
**CLIENT:** Fastfrate (Ottawa) Holdings Inc.  
**PROJECT STATUS:** 90 % Design (Site Plan Approval)

$$AFDD = \sum_{day=1}^n FDD_{day}$$

AFDD 785 °C.day

$$Thickness (cm) = \alpha \sqrt{AFDD}$$

$\alpha$	2.4
T (cm)	67.24 cm
T (ft)	2.21 ft
T (ft, in)	2'3"

$\alpha$	1.7
T (cm)	47.63 cm
T (ft)	1.56 ft
T (ft, in)	1'7"

$\alpha$	2.7
T (cm)	75.65 cm
T (ft)	2.48 ft
T (ft, in)	2'6"

Only temperatures from winter (Dec 21 – March 21) are used for calculation.

Freezing Degree Days (FDD) are computed with this simple formula:

$$FDD = 0^{\circ}\text{C} - T_{(daily\ mean)}$$

AFDD is the sum of daily FDD over the season

– used to estimate river ice thickness

$$Thickness (cm) = \alpha \sqrt{AFDD}$$

Ice Cover Condition	$\alpha$
Windy lake, no snow	2.7
Average lake with snow	1.7-2.4
Average river with snow	0.4-0.5
Sheltered small river	0.7-1.4

Prepared by Jaymeson Adams, EIT Date: 2020-11-25

Verified by: Christian Lavoie-Lebel, P.Eng. Date: 2020-11-25

# D

## Appendix D-1 SANITARY SEWER FLOW





**PROJECT NAME:** Fastfrate (Ottawa)  
**CIMA+ PROJECT:** A001083  
**CLIENT:** Fastfrate (Ottawa) Holdings Inc.  
**PROJECT STATUS:** 90 % Design (Site plan Approval)

**WASTEWATER PEAK FLOW DETERMINATION - COMMERCIAL & INSTITUTIONAL**

**APPLICABLE DESIGN GUIDELINES:**

1. City of Ottawa Sewer Design Guidelines, 2012
2. City of Ottawa Technical Bulletin ISTB-2018-01

**DOMESTIC CONTRIBUTIONS:**

**COMMERCIAL & INSTITUTIONAL DESIGN CRITERIA:**

Base Flow: 2.8 L/m<sup>2</sup>/d  
 Peaking factor: 1.5 unitless  
 Extraneous Flows + Infiltration: 0.33 L/s/ha  
 OBC Baseflow: 12800 L/d  
 0.148 L/s

Commercial and Institutional Average Design Flow  
= 28,000 L/gross ha/day

**Commercial Peak factor:** 1.5 if commercial contribution >20%<sup>1</sup>, otherwise use 1.0  
**Institutional Peak factor:** 1.5 if institutional contribution >20%<sup>1</sup>, otherwise use 1.0  
**Industrial Peak Factor:** Per Figure in Appendix 4-B

**AVERAGE FLOW - DOMESTIC:**

Buildings	Building Area ft <sup>2</sup>	Building Area m <sup>2</sup>	Proportional Area ha	Average Base Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Extraneous Flow (L/s)	Maximum Flow (L/s)
Warehouse - Ottawa Sewer Design Guidelines	76503	7107	0.250	0.23	1.50	0.35	0.08	0.43
Note: -The value obtained from the City of Ottawa Sewer Design Guidelines for maximum flow was used since it is more conservative. -The Area used for the Extraneous flow is the entire front parking lot								
<b>Total</b>	76503	7107						Qmax - Total (L/s) = <b>0.43</b>

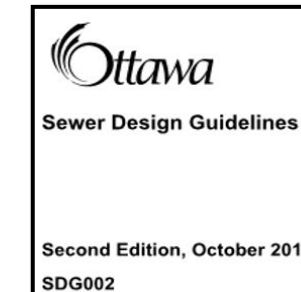
<sup>1</sup> If the commercial or institutional area is less than 20% of the total area, then a factor of 1.0 can be used.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT.  
 PEO No.: 100530467

Date: June 06 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: June 06 2022



# D

## Appendix D-2 SANITARY SEWER SIZING





PROJECT NAME: Warehouse Development  
 CIMA+ PROJECT NUMBER: A001083  
 CLIENT: Fastfrate (Ottawa) Holdings Inc.  
 PROJECT STATUS: 90 % Design (Site Plan Approval)

#####

HYDRAULIC CALCULATIONS FOR SANITARY SEWERS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012
2. City of Ottawa Technical Bulletin ISTB-2018-01

DESIGN BASIS:

Manning Coefficient : 0.013  
 Maximum permitted velocity : 3.00 m/s  
 Minimum permitted velocity : 0.60 m/s

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m³/s	Velocity (full) m/s	Flow m³/s	Velocity (actual) m/s	% Full
Building to SAN #1	200	12.2	2.00%	89.850	89.605	0.046	1.48	0.000430	0.46	1%
SAN #1 to Septic tank	200	14.7	2.00%	89.595	89.300	0.046	1.48	0.000430	0.46	1%
Outlet				89.300						

**Remarks**

The data in green has been calculated or modified by the designer  
 The data in blue has been calculated using formulas inserted by the designer

**Notes :**

1. Slope of 2.00% has been assumed for all building connections.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT  
 PEO No.: 100530467

Date: June 06 2022

Verified by: Christian Lavoie-Lebel, P.Eng.  
 PEO No.: 100067842

Date: June 06 2022

# E

## Appendix E - Septic System Detailed Calculations

Project:	Fastfrate Warehouse
Task:	Saniatry Sewage Flows per OBC
Project Number:	A001083
Created By:	Kayla Schmidt, P.Eng.
PEO No.	100524348
Date:	19-Jul-21
Reviewed By:	Kayla Schmidt, P.Eng.
PEO No.	100524348
Date:	19-Jul-21

Hazen Williams was used to calculate the TDH. There are 6 pumps total (2 for the Pumping Chamber, 2 for the Level IV treatment, and

Notes: 1 for the recycle line).

Table 1: Dosing Criteria		
Parameter	Value	Unit
Daily Design Flow Rate	12,800	L/d
Required Dosing per day	24	times
Time for each dosing	15	minutes
Hourly Design Flow Rate	533.3333333	L/hr
Design Flow Rate	8.888888889	L/min
Design Flow Rate	0.148148148	L/s
Assumed Pump Chamber Volume	17578	L

Where a pump or siphon is required, the pump or siphon shall be designed to discharge a dose of at least 75% of the internal volume of the *distribution pipe* within a time period not exceeding fifteen minutes.



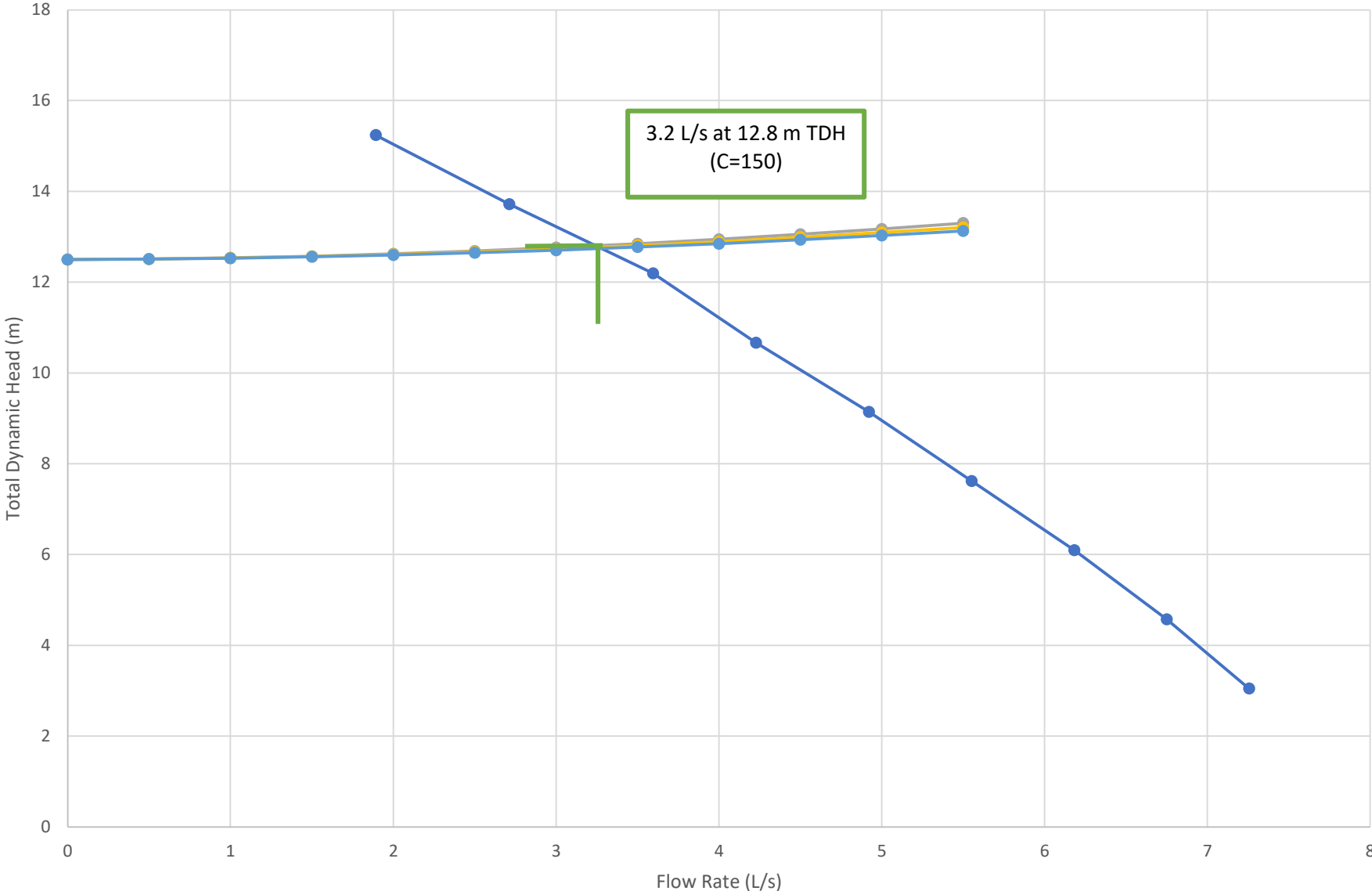
<b>Table 2: Dosing Requirements</b>			
<b>Parameter</b>	<b>Value</b>	<b>Unit</b>	<b>Notes</b>
Length of Each Distribution Pipe	25	m	
Number of Distribution Pipes	7		
Total Length	175	m	
Diameter	0.025	m	
Cross Sectional Area	0.000491	m <sup>2</sup>	
Total Volume of Distribution Pipe	0.086	m <sup>3</sup>	
Total Volume of Distribution Pipe	85.90	L	
75% of Volume of Distribution Pipe	64.43	L	
Max time	15.0	minutes	
Flow Rate Required	4.30	L/min	
Flow Rate Required	0.071586	L/s	
Daily Volume for Flow Rate	2061.67	L/d	below the daily flow rate
Minimum Required Flow Rate per hour	533.33	L/hr	
Flow Rate require for 15 minute time frame	35.56	L/min (per 15 minutes)	
Flow Rate require for 15 minute time frame	0.59	L/s (per 15 minutes)	
<b>Check</b>	<b>12800</b>	<b>L/d</b>	
<b>Pump Design Flow Rate</b>	<b>1</b>	<b>L/s</b>	
<b>Daily Flow Rate</b>	<b>21600</b>	<b>L/d</b>	



**Recycle Line Pump (from Level IV Treatment to Upstream of the Septic System)**

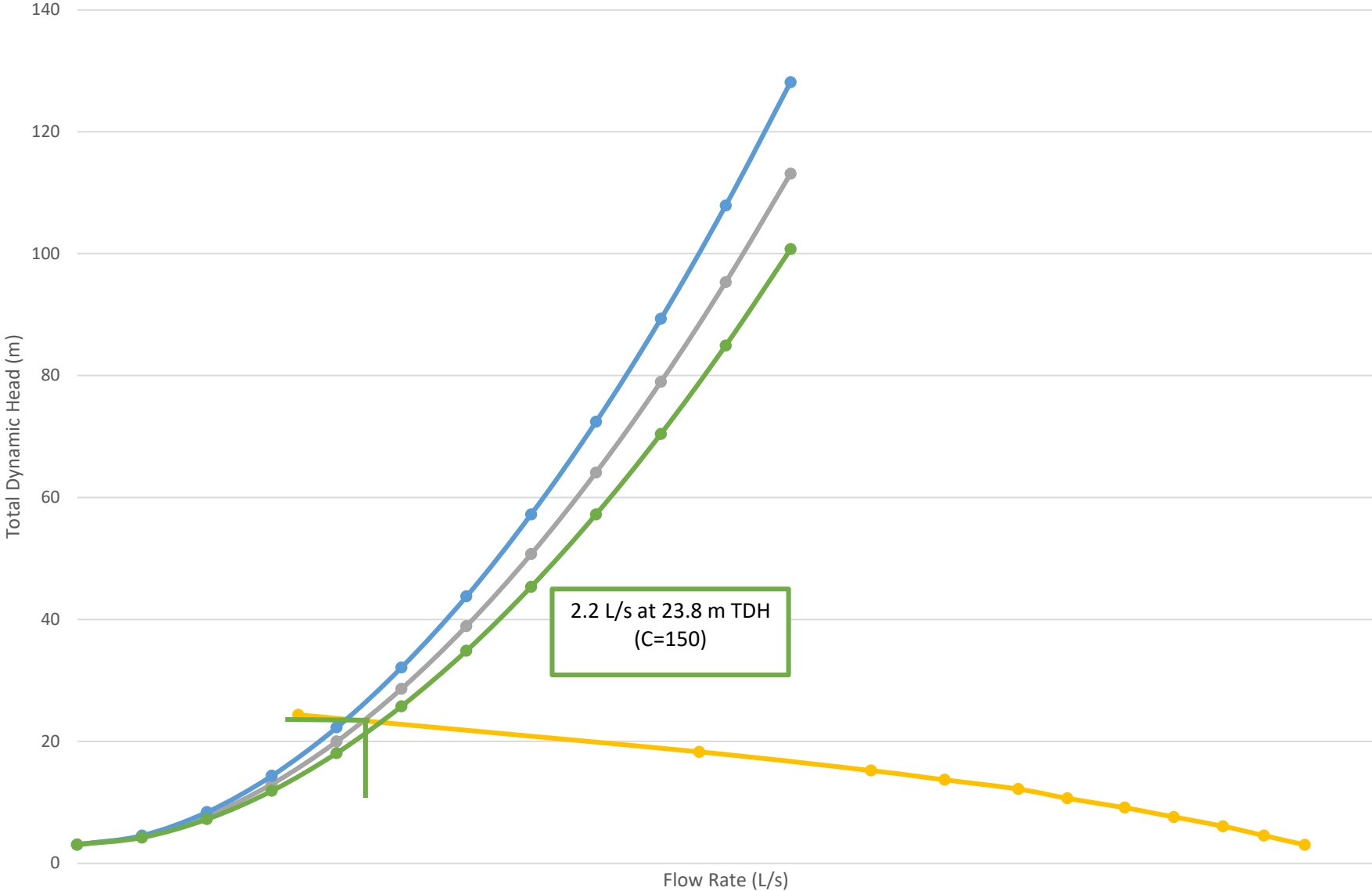
Parameter	Value	Unit	Notes	Flow		Velocity m/s	Fitting Loss (K*V <sup>2</sup> /2* g) m	Pipe Friction Losses Friction Coefficient (C) in m			Static Head m	Pressure to be dosed m	Total Dynamic Head Loss (m)		
				L/s	m <sup>3</sup> /s			140	150	160			140	150	160
Low Water Level				0	0	0	0	0	0	0	2.5	0.6	3.1	3.1	3.1
Top of Pipe				#####	0.0005	9.8E-07	7.128E-13	0.03	0.00	0.00	2.5	0.6	3.13	3.10	3.10
Static Head	2.5	m		#####	0.0010	2E-06	2.851E-12	0.12	0.00	0.00	2.5	0.6	3.22	3.10	3.10
Pipe Diameter	0.05	m		#####	0.0015	2.9E-06	6.415E-12	0.26	0.00	0.00	2.5	0.6	3.36	3.10	3.10
Pipe Area	0.00196	m <sup>2</sup>		#####	0.0020	3.9E-06	1.14E-11	0.44	0.00	0.00	2.5	0.6	3.54	3.10	3.10
Pipe Length	18	m		#####	0.0025	4.9E-06	1.782E-11	0.67	0.00	0.00	2.5	0.6	3.77	3.10	3.10
Pressure at end	0.6	m		#####	0.0030	5.9E-06	2.566E-11	0.94	0.00	0.00	2.5	0.6	4.04	3.10	3.10
<b>Fittings</b>	<b>K Value</b>	<b>Qty</b>	<b>Total</b>	#####	0.0035	6.9E-06	3.493E-11	1.25	0.00	0.00	2.5	0.6	4.35	3.10	3.10
90 degree elbows	0.81	3	2.43	#####	0.0040	7.9E-06	4.562E-11	1.60	0.00	0.00	2.5	0.6	4.70	3.10	3.10
Check Valve	10.8	1	10.8	#####	0.0045	8.8E-06	5.774E-11	1.99	0.00	0.00	2.5	0.6	5.09	3.10	3.10
Ball Valve	0.08	1	0.08	#####	0.0050	9.8E-06	7.128E-11	2.42	0.00	0.00	2.5	0.6	5.52	3.10	3.10
		Subtotal	13.31	#####	0.0055	1.1E-05	8.625E-11	2.89	0.00	0.00	2.5	0.6	5.99	3.10	3.10
		Safety Factor	1.2	#####	0.0060	1.2E-05	1.026E-10	3.40	0.00	0.00	2.5	0.6	6.50	3.10	3.10
		<b>Total</b>	<b>14.51</b>	#####	0.0065	1.3E-05	1.205E-10	3.94	0.00	0.00	2.5	0.6	7.04	3.10	3.10
				#####	0.0070	1.4E-05	1.397E-10	4.52	0.00	0.00	2.5	0.6	7.62	3.10	3.10
				#####	0.0075	1.5E-05	1.604E-10	5.14	0.00	0.00	2.5	0.6	8.24	3.10	3.10
				#####	0.0080	1.6E-05	1.825E-10	5.79	0.00	0.00	2.5	0.6	8.89	3.10	3.10
				#####	0.0085	1.7E-05	2.06E-10	6.48	0.00	0.00	2.5	0.6	9.58	3.10	3.10

Pumping Chamber Submersible Pump Discharge Curve



● WS50HAM-12-20    ● Pump Chamber Discharge (C=140)    ● Pump Chamber Discharge (C=150)    ● Pump Chamber Discharge (C=160)

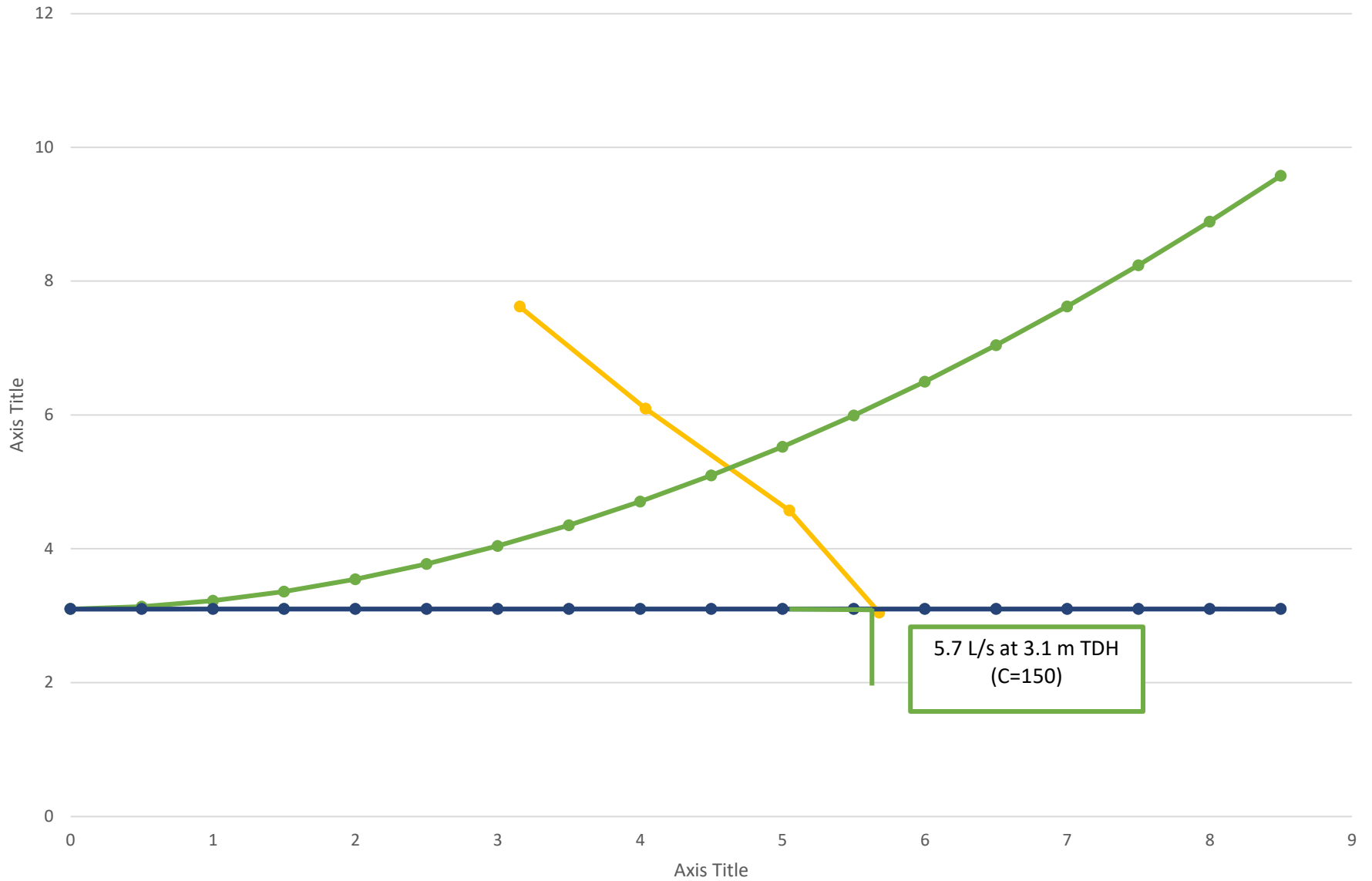
Level IV Treatment Submersible Pump Discharge Curve



2.2 L/s at 23.8 m TDH  
(C=150)

Level IV Treatment Pumps (C=150)    WS100HM-12-20    Level IV Treatment Pumps (C=140)    Level IV Treatment Pumps (C=160)

### Level IV Treatment Recycle Pump Discharge Curve



● Recycle Line Pump (C=150)    ● WS50M-12-20    ● Recycle Line Pump (C=140)    ● Recycle Line Pump (C=160)

# F

## Appendix F - Correspondence



## Julien Sauvé

---

**From:** James Holland <jholland@nation.on.ca>  
**Sent:** Tuesday, May 4, 2021 11:35 AM  
**To:** Julien Sauvé  
**Subject:** FW: Fastfrate Site Water Quality Requirements  
**Attachments:** FW\_ South Nation Conservation Property Inquiry Letters \_ (Roll\_ 061460008029995.msg; 200608 2009 05 Hawthorne Industrial Park-SWM REPORT FEB09.pdf

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

### **EXTERNAL EMAIL**

Hi Julien,

Thanks for confirming with the Conservation Authority; this question has come up for every property in the subdivision. The current standard is 80% TSS removal.

The pre-constitution for the site plan focussed on the adjacent watercourse and encroachment into the 30m setback. Our review will look to confirm that the stormwater management design implements the recommendations of an environmental impact statement that addresses this issue. We have not received a study so I cannot provide any additional information.

Feel free to contact me if there are any other questions about the site plan application.

Regards,  
James

---

**From:** Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>  
**Sent:** May 3, 2021 3:33 PM  
**To:** Laura Crites <[lcrites@nation.on.ca](mailto:lcrites@nation.on.ca)>  
**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; Douglas Rancier <[drancier@civitasgroup.ca](mailto:drancier@civitasgroup.ca)>  
**Subject:** Fastfrate Site Water Quality Requirements

**External email** - if you don't know or can't confirm the identity of the sender, please exercise caution and do not open links or attachments.

Hi Laura,

My name is Julien and I am working with Fastfrate to help design their new facility at the intersection of Rideau road and Somme Street. Refer to attached email for previous correspondence about the subject site.





The reason we are contacting you is to get confirmation on the water quality requirements. The attached SWM report 2009 for the Hawthorne Industrial site (see attached) states that individual site will need to fulfil the normal level of protection (TSS 70% removal). Can you confirm if this requirement is still valid? Refer to section 5 p. 14 of 30.

Please advise us on the water quality requirement and let us know if you have any questions.

Regards,

---

**JULIEN SAUVÉ, P.Eng.**  
Engineer / Infrastructure  
Ingénieur / Infrastructure

T 613-860-2462 ext. 6623 M 613-668-1298 F 613-860-1870  
110-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA



---

Do you really need to print this email? Let's protect the environment!  
Devez-vous vraiment imprimer ce courriel? Pensons à l'environnement!

CONFIDENTIALITY WARNING This e-mail is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.

AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

---

**From:** Uzochina Ukeje <uukeje@gwal.com>  
**Sent:** July 8, 2021 1:23 PM  
**To:** Guillaume LeBlond  
**Cc:** Christian Lavoie-Lebel; Peter Chan; Tim Kennedy; Julien Sauvé  
**Subject:** RE: [EXTERNAL]RE: A001083 - CBRE Fastfrate - Building Stormwater Management

**EXTERNAL EMAIL**

Hi Guillaume,

The architectural drawings we have on hand do not show any roof drain positions.

However, if we are to assume a horizontal roof with no adjacent walls, the **total** release rate will be **173.45L/s**.

- 1) With a 6in capacity Rain Water Leader, a total of 13 Roof drains will be required (each having a release rate of 14L/s)
- 2) With an 8in capacity Rain Water Leader, a total of 6 Roof drains will be required (each having a release rate of 30L/s)

Let me know if you have further questions.

Thank you

---

**From:** Guillaume LeBlond <[Guillaume.LeBlond@cima.ca](mailto:Guillaume.LeBlond@cima.ca)>  
**Sent:** July-08-21 11:53 AM  
**To:** Uzochina Ukeje <[uukeje@gwal.com](mailto:uukeje@gwal.com)>  
**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; Peter Chan <[pchan@gwal.com](mailto:pchan@gwal.com)>; Tim Kennedy <[Tim.Kennedy@cima.ca](mailto:Tim.Kennedy@cima.ca)>; Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>  
**Subject:** [EXTERNAL]RE: A001083 - CBRE Fastfrate - Building Stormwater Management

Hi Uzo,

Just to clarify what I need from my last email:

I need the number of roof drains as well as the flowrate per drain .

Hope this clears up any confusion.

Thanks,

---

**GUILLAUME LEBLOND**, M.A.Sc., EIT  
EIT / Infrastructures  
EIT / Infrastructure



T 613-860-2462 ext. 6667 C 613 868-5747 F 613-860-1870  
110-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

[Avis pour nos clients sur la COVID-19](#)



L'humain au centre  
de l'ingénierie



KINCENTRIC  
Employeur  
CANADA 2019

---

**From:** Guillaume LeBlond

**Sent:** July 8, 2021 10:44 AM

**To:** Uzochina Ukeje <[uukeje@gwal.com](mailto:uukeje@gwal.com)>

**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; [pchan@gwal.com](mailto:pchan@gwal.com); Tim Kennedy <[Tim.Kennedy@cima.ca](mailto:Tim.Kennedy@cima.ca)>; Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>

**Subject:** A001083 - CBRE Fastfrate - Building Stormwater Management

Good morning Uzo,

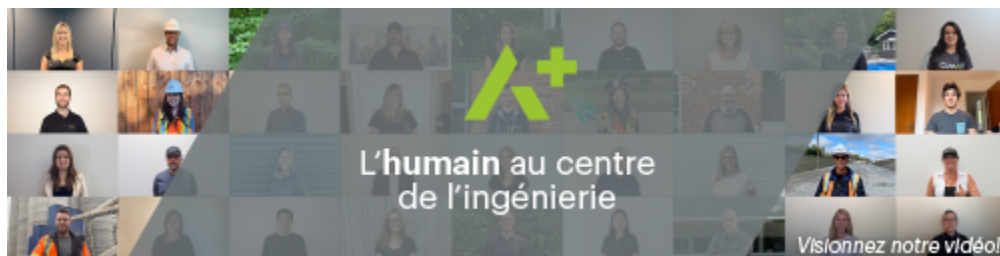
I work with Julien Sauvé and Christian Lavoie-Lebel on the Fastfrate project and we are currently finalizing the stormwater management design for the site.

Could you please provide us with the release rates of the building roof drains? We are looking for both the 10 year and 100 year rainfall.

Thank you,

---

**GUILLAUME LEBLOND**, M.A.Sc., EIT  
EIT / Infrastructures  
EIT / Infrastructure



T 613-860-2462 ext. 6667 C 613 868-5747 F 613-860-1870  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

[Avis pour nos clients sur la COVID-19](#)



L'humain au centre  
de l'ingénierie



KINCENTRIC  
Employeur  
CANADA 2019

---

This message and the documents attached thereto, is intended only for the addressee, and may contain privileged, confidential information and/or be exempt for disclosure under applicable law. If you are not the intended recipient, or responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify the sender immediately by e-mail and delete the original message and its attachments. The sender does not accept liability for any errors, omissions, corruption or viruses in the contents of this message or any attachments that arise as a result of e-mail transmission. Thank you. By submitting your or another individual's information to Goodkey Weedmark and Associates Limited, you agree, and confirm your authority from such other individual, to our collection, use and disclosure of such information for such purposes as are reasonably connected with this communication.

EXTERNAL EMAIL

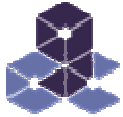
Jaymeson

Answers below in red font for ease of reference.

Arthur Gordon

Castleglenn Consultants Inc.  
2460 Lancaster Road  
Ottawa, Ontario  
K1B 4S5  
(T) (613) 731-4052 / (F) (613) 731-0253

[agordon@castleglenn.ca](mailto:agordon@castleglenn.ca)



**Castleglenn  
Consultants**

Engineers, Project Managers & Planners

---

**From:** Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>

**Sent:** June 7, 2022 4:13 PM

**To:** [agordoncastleglenn@gmail.com](mailto:agordoncastleglenn@gmail.com); Douglas Rancier <[drancier@civitasgroup.ca](mailto:drancier@civitasgroup.ca)>; Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>; 'Courteau, Pierre @ CBRE GCS Canada' <[Pierre.Courteau@cbre.com](mailto:Pierre.Courteau@cbre.com)>

**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; 'Primett, Keefe @ Ottawa' <[keefe.primett@cbre.com](mailto:keefe.primett@cbre.com)>; 'Nadia Toulaimat' <[ntoulaimat@civitasgroup.ca](mailto:ntoulaimat@civitasgroup.ca)>

**Subject:** RE: A001083 Fastfrate: Culvert Safety analysis

A001083

Hi Arthur,

I am responsible for the culvert safety analysis calculations on the CIMA+ team.

I was wondering if you could provide the following information:

- + The AADT (or projected AADT) of Somme Street **at the site entrance**: To the best of my knowledge, our TIA estimated a build-out year for this development to be 2022. Exhibit 6-1 estimated the 2-way traffic on Somme in front of the development to be about 40 vph at the entrance in 2022. Translating this to AADT would imply 400 vpd 2-way AADT, once again in 2022. However, the culvert safety review should really examine buildout of the entire sub-division along Somme to determine the required flows. This was not done for our TIA as you can see that several exemptions (See Section 3.0) were granted given the size and the estimated traffic generation of the individual development.
- + Confirm that a traffic growth rate of 3% is reasonable, as mentioned in the traffic study for the area. This we leave to you. The 3% figure was agreed to with the City of Ottawa in preparation of the TIA and was adopted. There is no rationale that the figure was based upon other than agreement with City staff.

I would also like to confirm whether the 3% traffic growth is linear or compounded. Unlike population growth, I have yet to ever see anyone apply compound growth to motor-vehicle travel, especially for long term horizons. I suggest using **lowing formula**.

$$TV_{future} = TV_{existing} \left[ 1 + \left( n \times \frac{\%}{100} \right) \right]$$

*TV = traffic volume*  
*n = number of years*


If you'd like to discuss, feel free to give me a call when you get a chance (343-204-5387).

Thanks,

---

**JAYMESON ADAMS, P.Eng.**  
Engineer / Infrastructure  
Ingénieur / Infrastructures



M 343 204-5387  [Contact me on Teams / Contactez-moi sur Teams](#)  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

[Notice to our customers on the COVID-19](#)



Engineering  
for people



**KINCENTRIC**  
**Best Employer**  
CANADA 2021

---

Do you really need to print this email? Let's protect the environment!  
Devez-vous vraiment imprimer ce courriel? Pensons à l'environnement!

CONFIDENTIALITY WARNING This email is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.  
AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

---

**From:** [agordoncastleglenn@gmail.com](mailto:agordoncastleglenn@gmail.com) <[agordoncastleglenn@gmail.com](mailto:agordoncastleglenn@gmail.com)>  
**Sent:** June 7, 2022 2:32 PM  
**To:** Douglas Rancier <[drancier@civitasgroup.ca](mailto:drancier@civitasgroup.ca)>; Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>; 'Courteau, Pierre @ CBRE GCS Canada' <[Pierre.Courteau@cbre.com](mailto:Pierre.Courteau@cbre.com)>  
**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>; 'Primett, Keefe @ Ottawa' <[keefe.primett@cbre.com](mailto:keefe.primett@cbre.com)>; 'Nadia Toulaimat' <[ntoulaimat@civitasgroup.ca](mailto:ntoulaimat@civitasgroup.ca)>  
**Subject:** RE: A001083 Fastfrate: Culvert Safety analysis

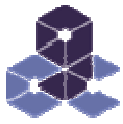
EXTERNAL EMAIL

Hi Douglas

We left a message for Julien Sauvé over at CIMA to give us a call.  
We'll be happy to provide what ever information he requires.

Arthur Gordon

Castleglenn Consultants Inc.  
2460 Lancaster Road  
Ottawa, Ontario  
K1B 4S5  
(T) (613) 731-4052 / (F) (613) 731-0253  
[agordon@castleglenn.ca](mailto:agordon@castleglenn.ca)



**Castleglenn  
Consultants**

Engineers, Project Managers & Planners

---

**From:** Douglas Rancier <[DRancier@civitasgroup.ca](mailto:DRancier@civitasgroup.ca)>

**Sent:** June 7, 2022 9:33 AM

**To:** Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>; Courteau, Pierre @ CBRE GCS Canada <[Pierre.Courteau@cbre.com](mailto:Pierre.Courteau@cbre.com)>;  
[agordoncastleglenn@gmail.com](mailto:agordoncastleglenn@gmail.com)

**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>; Primett,  
Keefe @ Ottawa <[keefe.primett@cbre.com](mailto:keefe.primett@cbre.com)>; Nadia Toulaimat <[ntoulaimat@civitasgroup.ca](mailto:ntoulaimat@civitasgroup.ca)>

**Subject:** RE: A001083 Fastfrate: Culvert Safety analysis

**Importance:** High

Good Morning Julien,

By way of this email we forwarding your question to Castleglenn for their verification as soon as possible.

Regards,



**DOUGLAS RANCIER**  
PRINCIPAL, DESIGN ARCHITECT  
B.ARCH., DIPL.ARCH.TECH.  
OAA, MRAIC, LEED® AP

Office: 613.742.7482 Ext. 101  
Mobile: 613.447.2550  
203-6 Hamilton Avenue N  
Ottawa, Ontario K1Y 4R1

---

**From:** Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>

**Sent:** June 7, 2022 9:29 AM

**To:** Douglas Rancier <[DRancier@civitasgroup.ca](mailto:DRancier@civitasgroup.ca)>; Courteau, Pierre @ CBRE GCS Canada <[Pierre.Courteau@cbre.com](mailto:Pierre.Courteau@cbre.com)>

**Cc:** Christian Lavoie-Lebel <[Christian.Lavoie-Lebel@cima.ca](mailto:Christian.Lavoie-Lebel@cima.ca)>; Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>

**Subject:** FW: A001083 Fastfrate: Culvert Safety analysis

Hi Doug / Pierre,

We are in the process of completing the Culvert Safety Analysis as per requirement from the City of Ottawa comments. In order to perform this task, we need to have the AADT (Average Annual Daily Traffic) value. The traffic study done by Castleglenn Consultants Inc does not provide this value. Could you reach out to them to obtain this value? Since the current site does not have any traffic at the current moment, they will most likely need to assume a certain value for future traffic.

Would it also be possible to confirm with the traffic team that a traffic growth rate of 3% is accurate at this location, and whether the 3% would be linear or compounded growth rate?

Regards,,

---

**JULIEN SAUVÉ**, P.Eng.  
Engineer / Infrastructure  
Ingénieur / Infrastructure

**T** 613-860-2462 ext. 6623 **M** 613-668-1298 **F** 613-860-1870  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA



---

Do you really need to print this email? Let's protect the environment!  
Devez-vous vraiment imprimer ce courriel? Pensons à l'environnement!

CONFIDENTIALITY WARNING This e-mail is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.

AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

---

**From:** Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>

**Sent:** Tuesday, June 7, 2022 9:15 AM

**To:** Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>

**Subject:** RE: A001083 Fastfrate: Culvert Security

A001083

Good morning Julien,

After reviewing the Traffic Study, there is no mention of an AADT (Average Annual Daily Traffic) to use or assume for Somme Street. I will require this number to do the culvert safety analysis as required per City comments.

Could you please check if there is an AADT available for Somme at the Fastfrate location?

Also, could you please confirm with the Traffic group that a traffic growth rate of 3% is accurate at this location, and whether the 3% would be linear or compounded growth rate?


Thanks,



---

**JAYMESON ADAMS, P.Eng.**  
Engineer / Infrastructure  
Ingénieur / Infrastructures



M 343 204-5387  [Contact me on Teams / Contactez-moi sur Teams](#)  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

[Notice to our customers on the COVID-19](#)



Engineering  
for people



---

Do you really need to print this email? Let's protect the environment!  
Devez-vous vraiment imprimer ce courriel? Pensons à l'environnement!

CONFIDENTIALITY WARNING This email is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.  
AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

---

**From:** Julien Sauvé <[Julien.Sauve@cima.ca](mailto:Julien.Sauve@cima.ca)>  
**Sent:** June 7, 2022 8:00 AM  
**To:** Jaymeson Adams <[Jaymeson.Adams@cima.ca](mailto:Jaymeson.Adams@cima.ca)>  
**Subject:** A001083 Fastfrate: Culvert Security

Hi Jaymeson,

For the Culvert transportation review safety please put all your documents in the link below:

[Z:\Cima-C10\Ott Projects\A\A001000-A001499\A001083\\_Fastfrate Warehouse Development\300\360\\_Civil\10-Culvert Safety](Z:\Cima-C10\Ott Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\10-Culvert Safety)

The CAD drawing are located in the 400 file. Grading is C006 and Servicing C007. Please make yourself a copy because I Simon needs to work in those drawings this morning.

Let me know if you need anything else.

Regards,

---

**JULIEN SAUVÉ, P.Eng.**  
Engineer / Infrastructure  
Ingénieur / Infrastructure

**T** 613-860-2462 ext. 6623 **M** 613-668-1298 **F** 613-860-1870  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA



---

Do you really need to print this email? Let's protect the environment!  
Devez-vous vraiment imprimer ce courriel? Pensons à l'environnement!

CONFIDENTIALITY WARNING This e-mail is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.

AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

---

T 613-860-2462 ext. 6667 C 613 868-5747 F 613-860-1870  
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

[Avis pour nos clients sur la COVID-19](#)



L'humain au centre  
de l'ingénierie



KINCENTRIC  
Employeur  
CANADA 2019

---

This message and the documents attached thereto, is intended only for the addressee, and may contain privileged, confidential information and/or be exempt for disclosure under applicable law. If you are not the intended recipient, or responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify the sender immediately by e-mail and delete the original message and its attachments. The sender does not accept liability for any errors, omissions, corruption or viruses in the contents of this message or any attachments that arise as a result of e-mail transmission. Thank you. By submitting your or another individual's information to Goodkey Weedmark and Associates Limited, you agree, and confirm your authority from such other individual, to our collection, use and disclosure of such information for such purposes as are reasonably connected with this communication.

# F

## Appendix F-2 DEVELOPMENT SERVICING STUDY CHECKLIST



## Servicing Study Guidelines for Development Applications

### 4. Development Servicing Study Checklist

#### 4.1 General Content

Required Content	Reference Location
<input type="checkbox"/> Executive Summary (for larger reports only).	N/A
<input checked="" type="checkbox"/> Date and revision number of the report.	Cover Sheet
<input checked="" type="checkbox"/> Location map and plan showing municipal address, boundary, and layout of proposed development.	Report Figures, Appendix
<input checked="" type="checkbox"/> Plan showing the site and location of all existing services.	Project Drawings - Under separate cover
<input checked="" type="checkbox"/> Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.1
<input checked="" type="checkbox"/> Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.4, Appendix L
<input checked="" type="checkbox"/> Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.	Section 1.3 & 4.3.2
<input checked="" type="checkbox"/> Statement of objectives and servicing criteria.	Section 1 , 2.2.1, 3.2 & 4.2
<input checked="" type="checkbox"/> Identification of existing and proposed infrastructure available in the immediate area.	Section 1.2 & Appendix B
<input type="checkbox"/> Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 1.1
<input type="checkbox"/> Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Project Drawings - Under separate cover
<input type="checkbox"/> Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	Geotechnical, Hydrogeological, and septic assessment - Under separate cover
<input type="checkbox"/> Proposed phasing of the development, if applicable.	N/A
<input type="checkbox"/> Reference to geotechnical studies and recommendations concerning servicing.	Section 7. References
<input type="checkbox"/> All preliminary and formal site plan submissions should have the following information: <ul style="list-style-type: none"> <li>- Metric scale;</li> <li>- North Arrow (including construction North);</li> <li>- Key Plan;</li> <li>- Name and contact information of applicant and property owner;</li> <li>- Property limits including bearings and dimensions;</li> <li>- Existing and proposed structures and parking areas;</li> <li>- Easements, road widening and rights-of-way;</li> <li>- Adjacent street names.</li> </ul>	Project Drawings - Under separate cover

#### 4.2 Development Servicing Report: Water

Required Content	Reference Location
<input type="checkbox"/> Confirm consistency with Master Servicing Study, if available	N/A
<input checked="" type="checkbox"/> Availability of public infrastructure to service proposed development	Section 1.2 & 3.1
<input checked="" type="checkbox"/> Identification of system constraints	
<input checked="" type="checkbox"/> Identify boundary conditions	Geotechnical, Hydrogeological, and septic assessment - Under separate cover
<input checked="" type="checkbox"/> Confirmation of adequate domestic supply and pressure	Section 3.2 & 3.3
<input checked="" type="checkbox"/> Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2.2
<input type="checkbox"/> Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
<input type="checkbox"/> Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
<input checked="" type="checkbox"/> Address reliability requirements such as appropriate location of shut-off valves	Project Drawings - Under separate cover

## Servicing Study Guidelines for Development Applications

<input type="checkbox"/>	Check on the necessity of a pressure zone boundary modification.	N/A
<input checked="" type="checkbox"/>	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.3 & Geotechnical, Hydrogeological, and septic assessment - Under separate cover
<input type="checkbox"/>	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
<input type="checkbox"/>	Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
<input checked="" type="checkbox"/>	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2, Appendix D
<input type="checkbox"/>	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

### 4.3 Development Servicing Report: Wastewater

Required Content	Reference Location
<input checked="" type="checkbox"/> Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 2.2
<input type="checkbox"/> Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
<input type="checkbox"/> Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
<input checked="" type="checkbox"/> Description of existing sanitary sewer available for discharge of wastewater from proposed development	N/A
<input checked="" type="checkbox"/> Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
<input checked="" type="checkbox"/> Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 2.2 & Appendix F
<input checked="" type="checkbox"/> Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 2.2
<input type="checkbox"/> Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
<input type="checkbox"/> Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
<input type="checkbox"/> Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
<input type="checkbox"/> Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
<input type="checkbox"/> Special considerations such as contamination, corrosive environment etc.	N/A

### 4.4 Development Servicing Report: Stormwater Checklist

Required Content	Reference Location
<input checked="" type="checkbox"/> Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 4.1
<input checked="" type="checkbox"/> Analysis of available capacity in existing public infrastructure.	Section 4.1, 4.3
<input checked="" type="checkbox"/> A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Appendix A, B
<input checked="" type="checkbox"/> Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 4.2
<input checked="" type="checkbox"/> Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 4.2
<input checked="" type="checkbox"/> Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 4.3, 4.4 & Appendix C
<input type="checkbox"/> Set-back from private sewage disposal systems.	Project Drawings - Under separate cover

## Servicing Study Guidelines for Development Applications

<input type="checkbox"/>	Watercourse and hazard lands setbacks.	Project Drawings - Under separate cover
<input checked="" type="checkbox"/>	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Section 1.4 & Appendix G
<input type="checkbox"/>	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 4
<input checked="" type="checkbox"/>	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 4.3 & Project Drawings - Under separate cover
<input type="checkbox"/>	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Section 4
<input checked="" type="checkbox"/>	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 4.1 & 4.3
<input type="checkbox"/>	Any proposed diversion of drainage catchment areas from one outlet to another.	Section 4.2, Appendix B
<input type="checkbox"/>	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Project Drawings - Under separate cover
<input type="checkbox"/>	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.	N/A
<input type="checkbox"/>	Identification of potential impacts to receiving watercourses	Section 1.3.4
<input type="checkbox"/>	Identification of municipal drains and related approval requirements.	N/A
<input checked="" type="checkbox"/>	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 4.3 and 4.4
<input type="checkbox"/>	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Project Drawings - Under separate cover
<input type="checkbox"/>	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Appendix C
<input type="checkbox"/>	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 5
<input type="checkbox"/>	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
<input type="checkbox"/>	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

### 4.5 Approval and Permit Requirements: Checklist

Required Content	Reference Location
<input type="checkbox"/> Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
<input type="checkbox"/> Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
<input type="checkbox"/> Changes to Municipal Drains.	N/A
<input type="checkbox"/> Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

### 4.6 Conclusion Checklist

Required Content	Reference Location
<input checked="" type="checkbox"/> Clearly stated conclusions and recommendations	Section 6
<input type="checkbox"/> Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
<input type="checkbox"/> All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

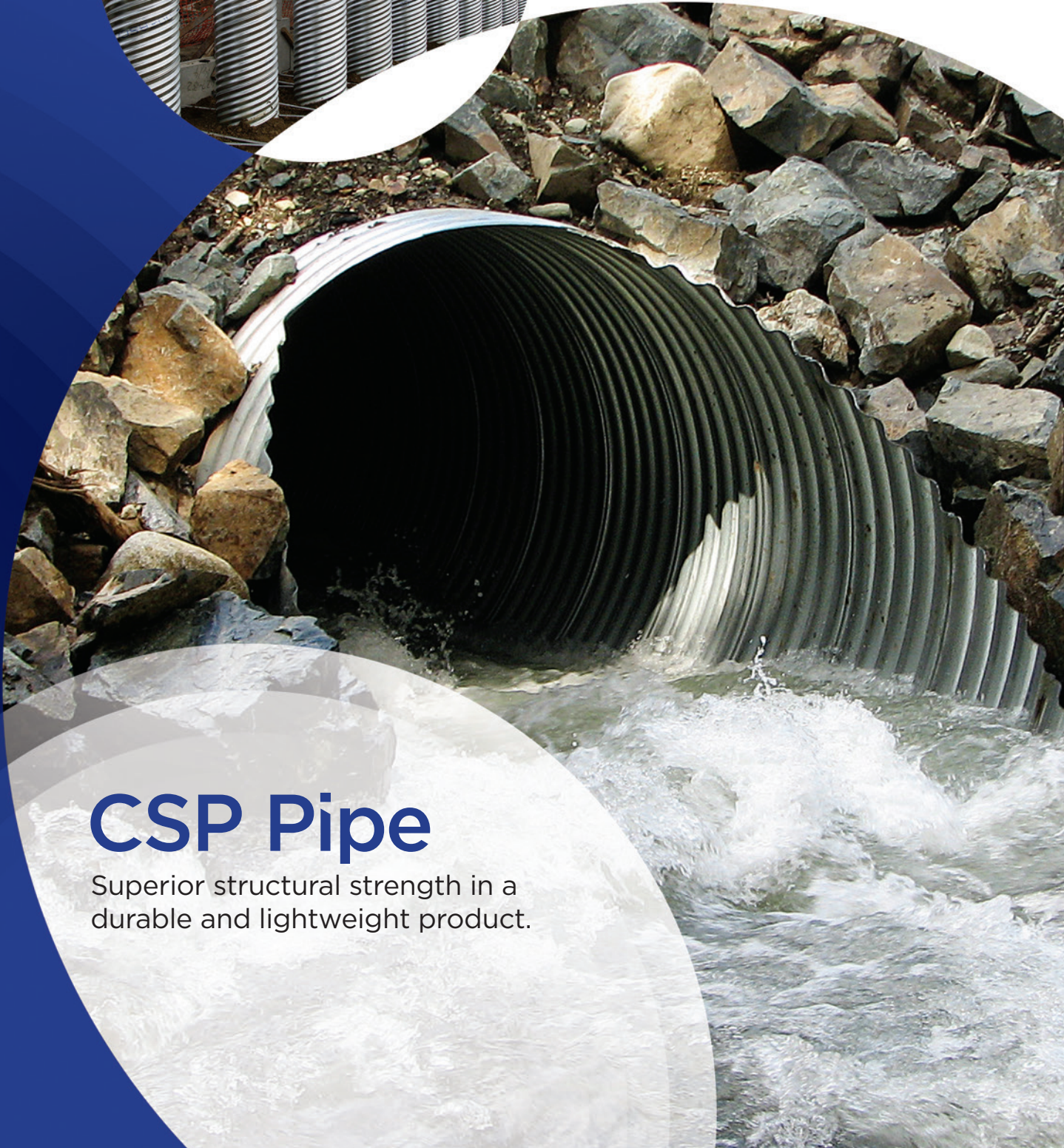
# G

## Appendix G-1 ARMTECH CORRUGATED STEEL PIPE





A division of  
**WGI** Westman Group Inc.



# CSP Pipe

Superior structural strength in a durable and lightweight product.

**APPLICATIONS INCLUDE:**

Culverts | Storm Sewers | Storm Water Detention Tanks | Utilidors | More!



From culverts to pole cribs, no other product works harder than **CSP**.

# CORRUGATED STEEL PIPE (CSP) AND RELATED PRODUCTS

Corrugated steel pipe has been successfully used in infrastructure across North America and around the world since the late 1890s. It is a trusted material that combines strength, light weight, flexibility and adaptability. The economy of CSP is second to none. No other material can beat its low up-front and total life cycle costs. Combine this with a service life of up to 100 years, and the choice is clear!

Armtec CSP is manufactured in Canada to the highest standard of quality and performance. With a variety of shapes, sizes, coating and material options, Armtec CSP products will meet the demands of your most challenging drainage projects.



## NESTABLE PIPE

Versatile half-round segments of corrugated steel in flange or notch type configuration for ease of transportation.



## STEELCOR

Galvanized CSP formed with helical corrugations and a continuous lock-seam combines flexibility with high compressive strength.



## ULTRA-FLO

Large diameter storm sewer pipe delivering superior hydraulic performance.



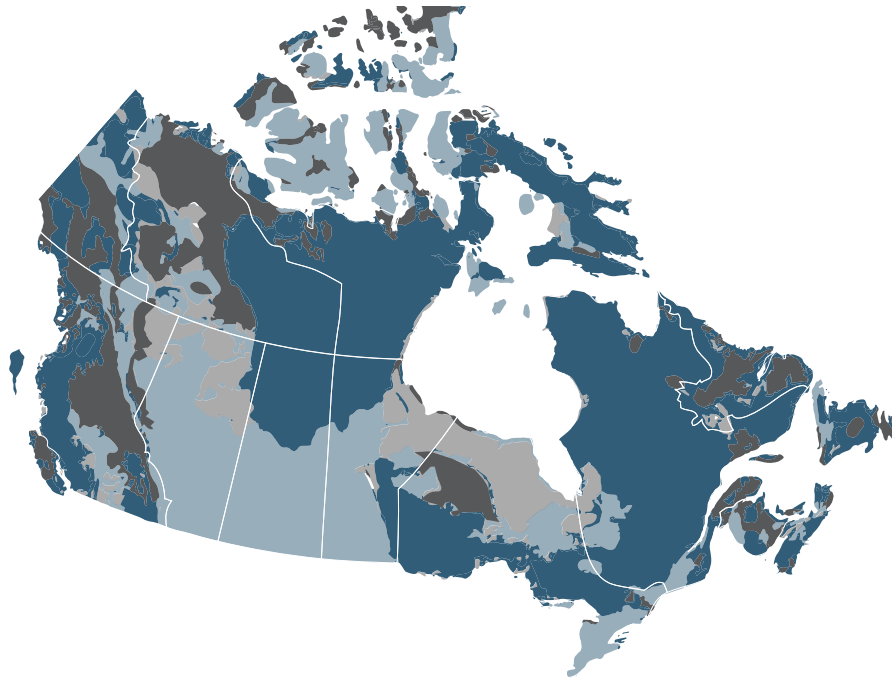
## CSP END SECTIONS

Lightweight end sections for improved hydraulic performance and erosion control.

**cspi** ARMTEC IS A MEMBER OF THE  
CORRUGATED STEEL PIPE INSTITUTE (CSPI)

# ARMTEC CSP can tackle any condition Canada can throw at it.

## Steel Pipe Coatings to Match the Environment



### Surface Water Sensitivity to Atmospheric Pollutants

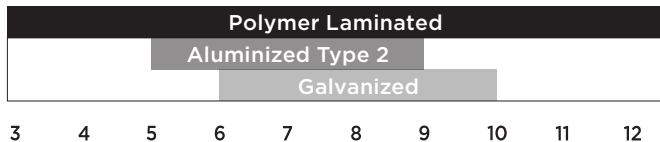
- Highly sensitive to acidification (i.e. low pH, elevated chloride and sulphate levels, low calcium carbonate levels [soft water]). Polymer laminated coating may be required.
- Moderately sensitive to acidification (i.e. moderate pH, medium to low calcium carbonate levels). Aluminized Type 2 coating may be required.
- Unlikely to be negatively influenced by atmospheric pollutants. Galvanized steel should be sufficient.
- Unrated



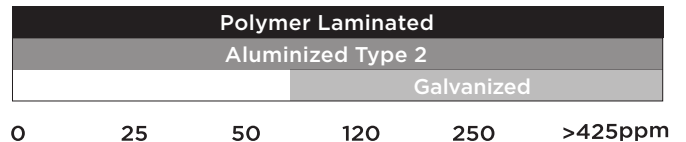
**BACKED BY SCIENCE** – Armtec can provide industry technical bulletins (for pH, chlorides, hardness and resistivity) to help you specify the right coating for your required service life.

## OPTIMUM OPERATING RANGE OF VARIOUS PIPE COATINGS

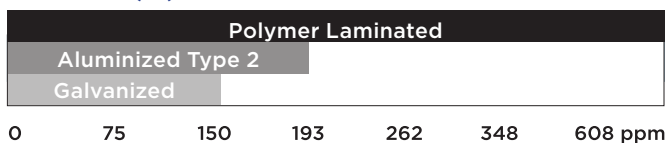
### pH



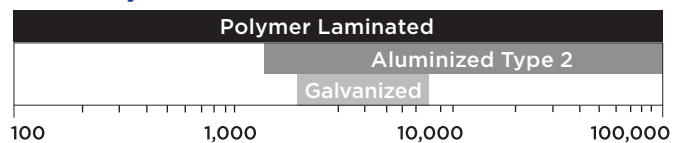
### Hardness CaCO<sub>3</sub>



### Chlorides (Cl)



### Resistivity Ohm - cm



**NOTE:** BASED ON CSPI TECHNICAL BULLETIN ISSUE 1

## CSP COATINGS AND DESIGN SERVICE LIFE



**50**  
YEARS

### **GALVANIZED STEEL**

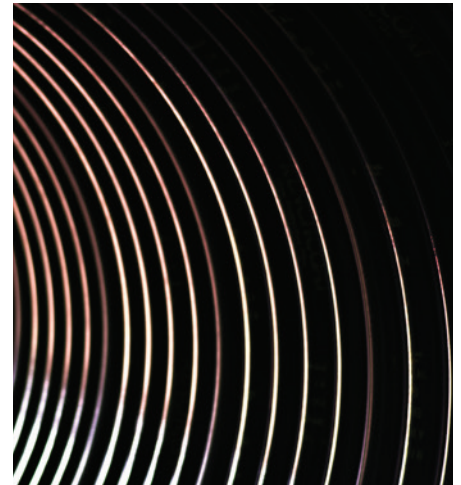
Galvanized steel is the standard finish for corrugated steel pipe. It performs well in low abrasion applications and in site conditions with a relatively neutral environment. Galvanized steel has a proven service life of 50 years minimum in non-aggressive (or ideal) site conditions. This is extended in hard water environments when the zinc coating reacts with the calcium carbonate ( $\text{CaCO}_3$ ) in the water to form an additional protective mineral scale.



**75**  
YEARS

### **ALUMINIZED STEEL TYPE 2**

Aluminized Steel Type 2 pipe combines the corrosion resistant properties of aluminum with the strength and durability of CSP. It is fabricated from steel coils, and hot-dip coated with a uniform thickness on both sides. It tolerates soft water and slightly more acidic and saline conditions than galvanized steel. With a 75 year service life in its optimal operating range, it is an economical alternative to concrete pipe.



**100**  
YEARS

### **POLYMER-LAMINATE**

Polymer-Laminate coating such as Trenchcoat can extend the service life of CSP to 100 years. The strong adhesion characteristics of the polyolefin laminate with the galvanized sheet makes it the most durable coating available today. This rugged laminate creates a protective barrier against corrosive and abrasive conditions, and maintains its service life across a broad pH spectrum.

Find out more about the durability of CSP at [www.cspi.ca](http://www.cspi.ca)

# STEELCOR CORRUGATED STEEL PIPE

Since 1934, SteelCor pipe has proven its effectiveness and durability in countless installations under diverse conditions. Its helical corrugations and continuous lock-seam provide high compressive strength in a lightweight, thin-walled structure. SteelCor is available in a wide variety of sizes and various coating options. For ground water drainage, perforated SteelCor offers exceptional performance in low-lying areas, especially where high strength and hydraulic capacity are required.

## TYPICAL APPLICATIONS

- Culverts
- Storm sewers
- Stormwater detention tanks
- Stream enclosures
- Underpasses
- Pipeline intakes
- Pipeline outfalls
- Storage relief tanks
- Caissons
- Cooling water lines
- Fish baffles

### FLEXIBILITY AND STRENGTH

Helical corrugation combines strength and flexibility in a thin walled structure

### HUGGER BAND

Hugger band couplers provide superior pull apart resistance, critical in soft soils

### VERSATILE

Variety of sizes, corrugation profiles and coating options

### QUICK INSTALLATION

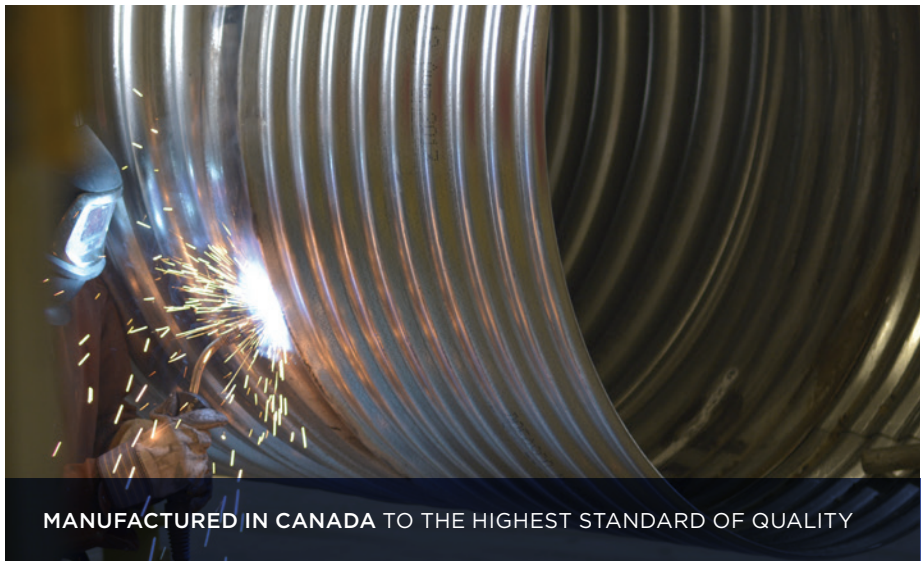
Lightweight and available in long lengths, minimizing installation time

### COST-EFFECTIVE

- Low installed cost
- Nestable pieces for economical shipping



STEELCOR IS AVAILABLE IN LONG LENGTHS, MINIMIZING INSTALLATION TIME



MANUFACTURED IN CANADA TO THE HIGHEST STANDARD OF QUALITY

## FLEXIBILITY AND HIGH COMPRESSIVE STRENGTH

CSP is categorized as a flexible pipe. The corrugated profile of the pipe wall provides a high degree of relative stiffness which, when combined with a properly-installed engineered backfill, provides for high circumferential strength in a thin-walled structure. The compacted fill acts together with the pipe wall to form a composite soil-steel structure.

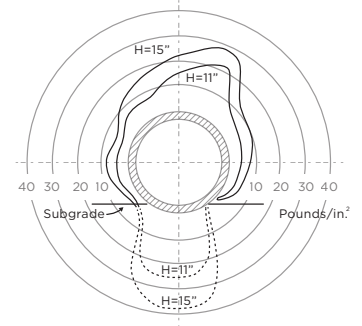
## RING COMPRESSION THEORY

The compressive thrust in the pipe wall is equal to the radial pressure acting on the wall multiplied by the wall radius. In other words, pressure distribution around a flexible pipe is more uniform and load is more evenly distributed in the flexible pipe vs. the rigid pipe (i.e. concrete). Pipe wall thickness can be reduced and less bedding material is required for flexible CSP to achieve the same buried strength as a rigid pipe system.

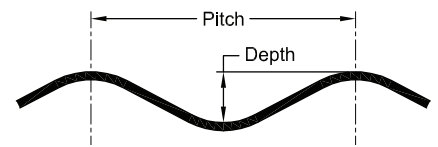
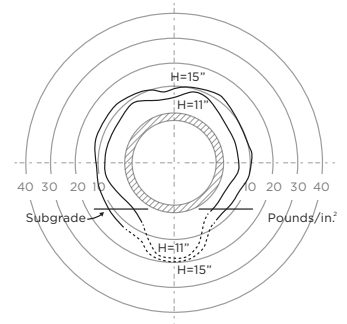
**Table 1: Available Corrugation Profiles & Diameters of CSP Pipe**

Corrugation (mm x mm)	Pitch (mm)	Depth (mm)	Inside Diameter (mm)
38 x 6.5	38	6.5	150, 200, 250
68 x 13	68	13	300 - 2,000
125 x 25	125	25	1,200 - 3,600

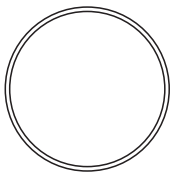
## Load Distribution - Rigid Pipe



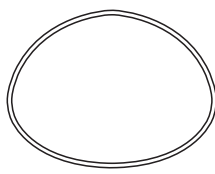
## Load Distribution - Flexible Pipe



### SteelCor Shapes



ROUND



PIPE ARCH



STEELCOR CSP IS AVAILABLE IN LARGE DIAMETERS UP TO 3,600MM



CSP PIPE ARCH

**PIPE ARCHING** is available for projects where headroom is limited.

# COUPLERS

SteelCor pipe features universal annular corrugated ends, so a variety of couplings may be used for the pipe and pipe-arch. Annular corrugated couplers are standard for municipal and highway drainage. Hugger Band couplers are standard for storm sewer applications and Dimpled couplers are often used in forestry.

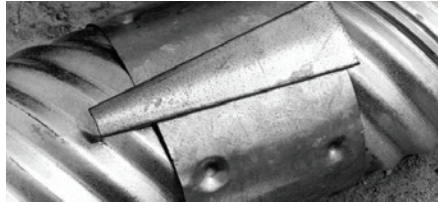
## Three types of couplers are available:

- Annular corrugated standard bolt and angle coupler
- Dimpled coupling band
- Hugger Band



### STANDARD ANNULAR CORRUGATED COUPLER

The standard annular corrugated coupler, fitted with bolt and angle attachments, seats snugly onto the pipe-end corrugations, and is suitable for most general-purpose applications. It comes in one, two or three piece configurations depending on the pipe diameter.



### DIMPLED COUPLING BAND

This coupler is used where helical and/or annular corrugated pipe ends are to be coupled. Dimpled couplers are available with steel angles or with wedge connectors as shown.



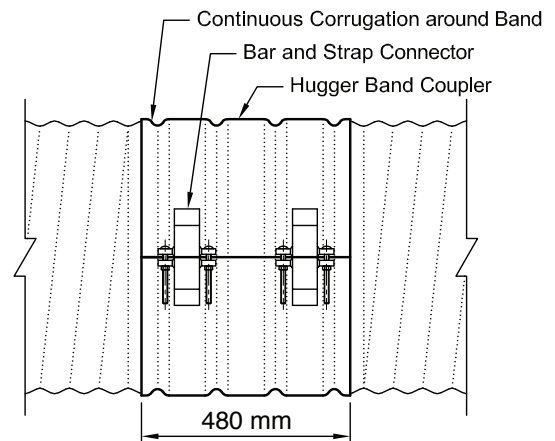
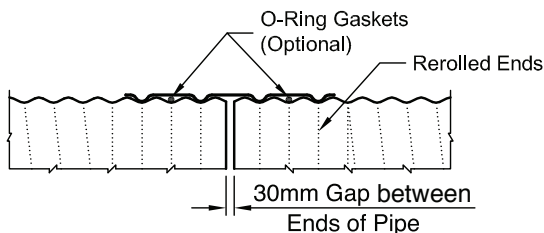
### HUGGER BAND

Armtec offers a highly effective Hugger Band joint. These 500mm wide bands are recommended for storm sewers and other installations where low leakage rates and resistance to longitudinal disjoints are prime requirements. When used with O-ring gaskets, the Hugger Band provides an extremely tight joint with low infiltration and exfiltration rates.

## Hugger Band Couplers for CSP joints are comprised of the following components:

- Semi-corrugated coupler sheet to accommodate placing elastomeric O-rings at both re-corrugated pipe ends
- Bolted bar and strap connector at coupler sheet lap(s) to maximize joint pull-apart strength
- O-rings in combination with neoprene gasket at coupler sheet lap(s) to minimize joint leakage and/or joint infiltration

## H-500 HUGGER BAND (DOUBLE BOLT, BAR AND STRAP)





## Fittings

Standard fittings such as tees, wyes and elbows are available. Special fittings such as saddle branches, manholes and catch-basins can be custom-fabricated to suit individual requirements.



CSP CAN BE FABRICATED TO SUIT A MULTITUDE OF CONFIGURATIONS

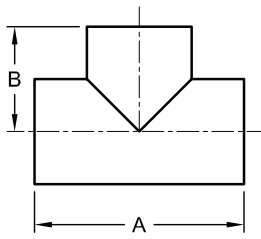


CUSTOM FITTINGS AVAILABLE

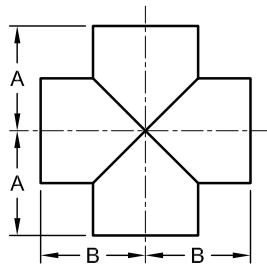


GALVANIZED CSP FIREWATER TANK SYSTEM

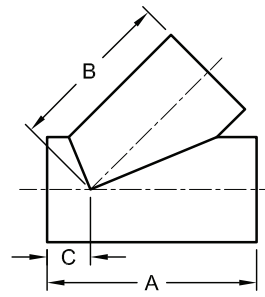
## Typical Fittings



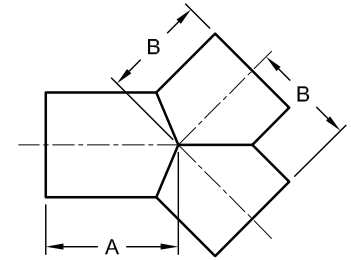
**Tee**



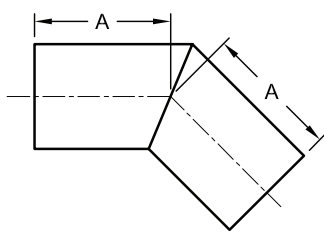
**Cross**



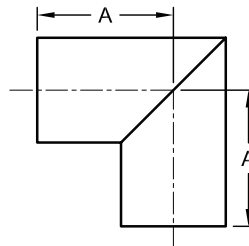
**45° Lateral**



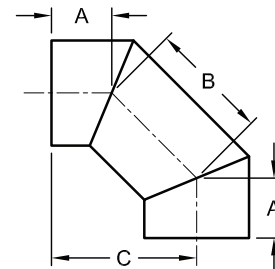
**45° Wye**



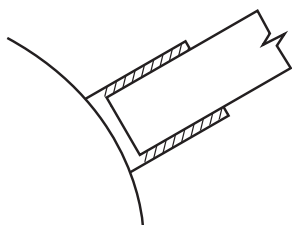
**2 Piece Elbow  
5° to 45°**



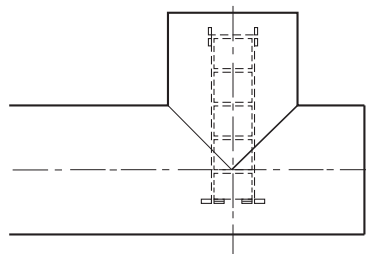
**2 Piece Elbow  
46° to 90°**



**3 Piece Elbow  
46° to 90°**



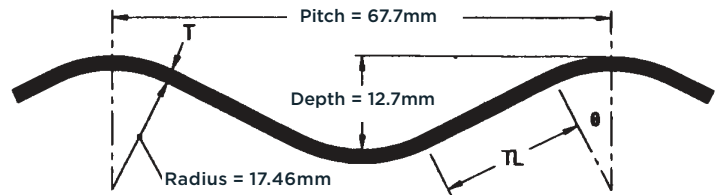
**Saddle Branch**



**Catch Basin with Manhole**

## STEELCOR PIPE AND PIPE-ARCH TECHNICAL SPECIFICATIONS

### 68mm x 13mm Corrugations



**Table 2: Section Properties of 68mm x 13mm Corrugated CSP**

Coated Thickness	Design Thickness	Area of Section	Moment of Inertia	Section Modulus	Radius of Gyration	Tangent Length	Tangent Angle	Developed Width Factor <sup>1</sup>
mm	mm	mm <sup>2</sup> /mm	mm <sup>4</sup> /mm	mm <sup>3</sup> /mm	mm	mm	△° degrees	
1.6	1.42	1.512	28.367	4.024	4.332	19.578	26.734	1.080
2.0	1.82	1.966	37.108	5.111	4.345	19.304	26.867	1.080
2.8	2.64	2.852	54.565	7.114	4.374	18.765	27.136	1.080
3.5	3.35	3.621	70.159	8.743	4.402	18.269	27.381	1.081
4.2	4.08	4.411	86.706	10.334	4.433	17.755	27.643	1.081

**NOTE:**

<sup>1</sup> DEVELOPED WIDTH FACTOR IS THE AMOUNT BY WHICH THE STEEL COIL OR SHEET IS REDUCED IN COVERING WIDTH DUE TO CORRUGATING

**Table 3: Handling Weight and End Area of 68mm x 13mm Corrugated CSP**

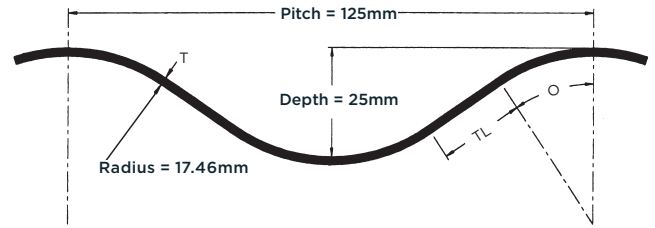
Pipe Diameter	End Area	Handling Weight - Galvanized (kg/m) for the Following Specified Wall Thickness (mm)					
		1.3mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
150 <sup>1</sup>	0.018	5.9	7.2	-	-	-	-
200 <sup>1</sup>	0.031	7.7	9.5	-	-	-	-
250 <sup>1</sup>	0.049	9.6	12	-	-	-	-
300	0.071	-	14	18	-	-	-
400	0.126	-	19	24	-	-	-
500	0.196	-	24	30	-	-	-
600	0.283	-	28	35	49	-	-
700	0.385	-	33	41	57	-	-
800	0.503	-	37	47	65	-	-
900	0.636	-	42	53	73	90	-
1,000	0.785	-	-	58	81	100	-
1,200	1.131	-	-	70	97	120	-
1,400	1.539	-	-	-	113	140	168
1,600	2.011	-	-	-	130	160	192
1,800	2.545	-	-	-	-	179	215
2,000	3.142	-	-	-	-	-	239

**NOTE:**

1. 150MM TO 250MM PIPE DIAMETER FABRICATED WITH 38 X 6.5 CORRUGATION PROFILE

## STEELCOR PIPE AND PIPE-ARCH TECHNICAL SPECIFICATIONS

### 125mm x 25mm Corrugations



**Table 4: Section Properties of 125mm x 25mm Corrugated CSP**

Coated Thickness	Design Thickness	Area of Section	Moment of Inertia	Section Modulus	Radius of Gyration	Tangent Length	Tangent Angle	Developed Width Factor <sup>1</sup>
mm	mm	mm <sup>2</sup> /mm	mm <sup>4</sup> /mm	mm <sup>3</sup> /mm	mm	mm	△° degrees	
1.6	1.40	1.549	133.300	9.730	9.277	18.568	35.564	1.106
2.0	1.82	2.014	173.720	12.489	9.287	17.970	35.811	1.107
2.8	2.64	2.923	253.237	17.684	9.308	16.742	36.330	1.107
3.5	3.35	3.711	322.743	21.993	9.326	15.600	36.826	1.108

**NOTE:**

1. DEVELOPED WIDTH FACTOR IS THE AMOUNT BY WHICH THE STEEL COIL OR SHEET IS REDUCED IN COVERING WIDTH DUE TO CORRUGATING

**Table 5: Handling Weight and End Area of 125mm x 25mm Corrugated CSP**

Pipe Diameter	End Area	Handling Weight - Galvanized (kg/m) for the Following Specified Wall Thickness (mm)			
		1.6mm	2.0mm	2.8mm	3.5mm
mm	m <sup>2</sup>				
1,200	1.131	57	71	100	124
1,400	1.539	-	83	116	144
1,600	2.011	-	95	132	165
1,800	2.545	-	106	148	185
2,000	3.142	-	118	165	205
2,200	3.801	-	129	181	225
2,400	4.524	-	141	197	245
2,700	5.726	-	159	222	276
3,000	7.069	-	-	246	306
3,300	8.553	-	-	270	336
3,600	10.179	-	-	-	367

## STEELCOR PIPE HEIGHT OF COVER LIMITS

### CL-625 and AREMA Cooper E-80 Live Loading

Table 6: 68mm x 13mm Corrugations

Minimum Cover (mm)			Maximum Height of Cover (m) for the Following Specified Wall Thickness (mm)				
Diameter	Highway	Railway	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
mm	CL-625	E-80					
300	300	300	70	91	-	-	-
400	300	300	53	68	-	-	-
500	300	300	42	54	-	-	-
600	300	300	35	45	66	-	-
700	300	300	30	39	57	-	-
800	300	300	26	34	50	-	-
900	300	300	23	30	44	56	70
1,000	300	300	21	27	40	50	63
1,200	300	300	-	23	33	42	52
1,400	300	500	-	-	27	35	43
1,600	300	500	-	-	22	28	35
1,800	500	500	-	-	-	22	27
2,000	500	500	-	-	-	-	22

Table 7: 125mm x 25mm Corrugations

Minimum Cover (mm)			Maximum Height of Cover (m) for the Following Specified Wall Thickness (mm)			
Diameter	Highway	Railway	1.6mm	2.0mm	2.8mm	3.5mm
mm	CL-625	E-80				
1,200	300	500	18	23	34	-
1,400	300	500	15	20	29	35
1,600	300	500	13	18	25	31
1,800	300	500	12	16	22	28
2,000	300	500	11	14	20	25
2,200	300	700	10	12	18	23
2,400	500	700	-	11	17	21
2,700	500	700	-	-	15	18
3,000	500	1,000	-	-	13	16
3,300	500	1,000	-	-	-	14
3,600*	700	1,000	-	-	-	12*

#### NOTES:

\* FLEXIBILITY LIMIT EXCEEDED - FOR SPECIFIED USE ONLY

1. DEAD LOAD IS BASED ON A UNIT WEIGHT OF BACKFILL OF 19 KN/M<sup>3</sup>

2. WHERE HEIGHT OF COVER EXCEEDS THE DIAMETER, A REDUCTION LOAD FACTOR OF 0.86 HAS BEEN USED

3. LIVE LOAD INCLUDES IMPACT

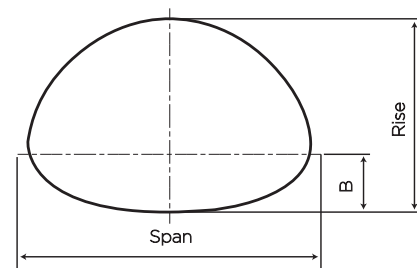
4. MINIMUM COVER IS TAKEN FROM TOP OF PIPE TO PROFILE GRADE OR TO THE TOP OF THE FINISHED GRANULAR BASE

5. SPECIAL CARE MUST BE TAKEN WITH TRUCK LOADS DURING CONSTRUCTION

6. FOUNDATION INVESTIGATION IS RECOMMENDED PRACTICE

7. THE ABOVE HEIGHT OF COVER TABLES ARE INDUSTRY STANDARDS. LOCAL, PROVINCIAL OR FEDERAL STANDARDS MAY DIFFER

## STEELCOR PIPE-ARCH DETAILS



**Table 8a: 68mm x 13mm Corrugations**

Diameter of Pipe of Equal Periphery	Span	Rise	B	Waterway Area
mm	mm	mm	mm	m <sup>2</sup>
400	450	340	130	0.11
500	560	420	165	0.19
600	680	500	190	0.27
700	800	580	220	0.37
800	910	660	255	0.48
900	1,030	740	265	0.61
1,000	1,150	820	310	0.74
1,200	1,390	970	375	1.06
1,400	1,630	1,120	430	1.44
1,600	1,880	1,260	500	1.87
1,800	2,130	1,400	560	2.36

**Table 8b: 125mm x 25mm Corrugations (where available)**

Diameter of Pipe of Equal Periphery	Span	Rise	B	Waterway Area
mm	mm	mm	mm	m <sup>2</sup>
1,600	1,780	1,360	635	1.93
1,800	2,010	1,530	650	2.44
2,000	2,230	1,700	660	2.97
2,200	2,500	1,830	750	3.44
2,400	2,800	1,950	805	4.27
2,700	3,300	2,080	905	5.39
3,000	3,650	2,280	1,005	6.60
3,300	3,890	2,690	1,090	8.29
3,600	4,370	2,890	1,195	9.76

**NOTES:**

FOR WEIGHTS OF PIPE-ARCHES WITH THE 68 X 13 CORRUGATION REFER TO THE WEIGHT OF THE CIRCULAR PIPE WITH THE EQUIVALENT PERIPHERY. NOT ALL SIZES ARE AVAILABLE IN ALL LOCATIONS. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS

**Table 9a: Height of Cover Limits for 68mm x 13mm Corrugated Steel Pipe-Arch CL-625 Live Load**

Span	Rise	Minimum Cover	Maximum Height of Cover (m) for Corner Bearing Pressure Limited to 200 kPa and the Following Specified Wall thickness				
			1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
mm	mm	mm					
560	420	300		4.1			
680	500	300		4.2			
800	580	300		4.1			
910	660	300		4.1			
1030	740	300		4.0			
1150	820	300			4.0		
1390	970	300			3.9		
1630	1120	300				3.9	
1880	1260	350					3.8
2130	1400	400					3.7

**Table 9b: Height of Cover Limits for 125mm x 25mm Corrugated Steel Pipe-Arch CL-625 Live Load**

Span	Rise	Minimum Cover	Maximum Height of Cover (m) for Corner Bearing Pressure Limited to 200 kPa and the Following Specified Wall thickness					
			1.6mm	2.0mm	2.8mm	3.5mm	4.2mm	
mm	mm	mm						
1780	1360	300					4.4	
2010	1530	350					4.3	
2230	1700	400					4.6	
2500	1830	450					4.5	
2800	1950	500					4.4	
3300	2080	550					4.3	
3650	2280	650					4.2	
3890	2690	650					3.5	
4370	2870	750					3.0 <sup>4</sup>	3.0

**NOTES:**

1. FILL HEIGHTS BASED ON AISI DESIGN METHOD
2. CL-625 LIVE LOAD
3. MAXIMUM APPLIED CORNER BEARING PRESSURE 200 KPA
4. EXCEEDS FLEXIBILITY, SPECIAL ATTENTION REQUIRED FOR BACKFILL MATERIAL AND CONSTRUCTION PROCESS

## PERFORATED STEELCOR PIPE FOR GROUND WATER CONTROL

Perforated SteelCor is widely accepted as a practical, durable and economical means of controlling unwanted ground water. It is an efficient solution and costs less than repeated surface repairs, virtually eliminating maintenance concerns. Perforated SteelCor pipe is available in plain galvanized and suitable for most applications, however it is strongly recommended that consideration be given to using either Aluminized Steel Type 2 or Polymer Coated in particularly aggressive environments.

### Pipe Size Selection

For normal subdrainage, the infiltration of ground water is very slow. Therefore, approximately 150 metres of 150mm diameter pipe may be used as an interceptor before any increase in pipe diameter is required. Where extremely pervious material is being drained or where springs are encountered, larger sizes may be required.

### Pipe Outlets

Perforated pipe's cantilever strength makes it ideal for use as a projecting pipe outlet.

Free outlets are important, and the failure of subdrains to properly function can often be attributed to plugged, damaged or improper outlets. Outlet pipes should be protected from damage by maintenance equipment. A suitable barrier such as a hinged rodent trap should be used to keep out wildlife whose nests could cause clogging.

### Spacing of Laterals

Draining large, comparatively flat areas usually requires a parallel or herringbone system of drainage pipe. The spacing used on highways and railways is controlled by the location of the water-bearing strata.

### Filter Sock and Geotextiles

Geotextile is widely used in perforated pipe applications, particularly where graded filter material is not available. More critical installations call for a high quality non-woven geotextile to separate the trenchfill from the native material. Armtec can also provide a low-cost knitted polyester sock to encase the pipe. This polyester sock is available custom sewn around the pipe.

### Recommended Backfill

The trench should be excavated with approximately 100mm of clearance at the sides of the pipe so that pervious backfill can surround the pipe. For the filter backfill, concrete sand or other commonly available coarse sand-gravel mixtures perform satisfactorily for perforated pipe in most soils.

### Placing of Perforations

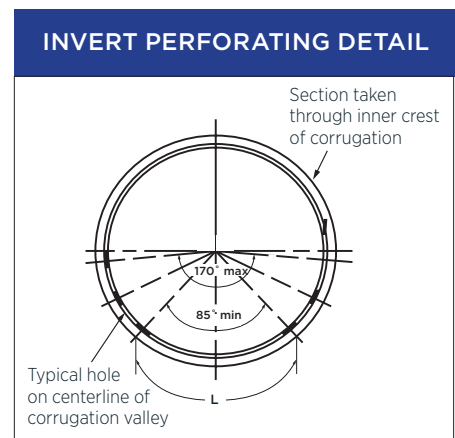
Armtec recommends that the pipe be placed with the perforations down. This hinders solids from entering the pipe and keeps the water table lower.

**Table 10: Dimensions, Thicknesses and Spacing of Perforations\***

Nominal Internal Diameter	Corrugation Profile	Normal Thickness Specified	Minimum No. of Rows of Perforations	Minimum Width Unperforated Segment	Distance Between Holes Along the Longitudinal Axis	Perforated Area
mm	mm	mm		mm	mm	cm <sup>2</sup> /m
150	38 x 6.5	1.6	4	125	38	74.61
200	38 x 6.5	1.6	4	160	38	74.61
250	38 x 6.5	1.6	4	195	38	74.61
300	68 x 13	1.6	6	235	136	31.27
400	68 x 13	1.6	6	310	136	31.27

**NOTE:**

\* ALL PERFORATIONS ARE A NOMINAL 9.5MM DIAMETER



**NOTE :**

\* RANDOM HOLE SPACING AROUND THE CIRCUMFERENCE IS AVAILABLE ON REQUEST

## STEELCOR CSP INSTALLATION

### Bedding and Backfilling

Well graded, free draining backfill is recommended for good compaction. The designer may wish to refer to the gradation and backfill specifications of the appropriate provincial highway standard. Stumps, rocks, frozen lumps and other debris should be removed from the bedding site.

Round pipe can be installed on a flat sand cushion with rodding and tamping of the backfill around the haunches. Alternatively, the pipe can be installed on a pre-shaped granular base.

The pipe-arch bottom arc must be erected on a pre-shaped sand cushion. The support under the bottom arc should be relatively yielding but under the corner haunches the supporting ground must be highly stable. Special attention should be given to compacting the backfill around the corner arcs where the highest soil pressures develop.

Backfill should be spread in 150mm to 200mm lifts alternating from one side of the pipe to the other, and should extend above the pipe to a minimum height of 300mm or one sixth the span, whichever is greater.

Compaction using suitable mechanical equipment should be carried out to achieve the specified backfill density. Care must be taken to ensure that the pipe or pipe-arch is not damaged by heavy equipment traffic during construction.



STEELCOR'S LIGHTWEIGHT SECTIONS ALLOW INSTALLATION WITHOUT THE NEED FOR HEAVY EQUIPMENT



HELICAL CORRUGATIONS AND CONTINUOUS LOCK-SEAM PROVIDE STRENGTH IN A LIGHTWEIGHT STRUCTURE

# ULTRA FLO CORRUGATED STEEL PIPE

Ultra Flo is a durable storm sewer pipe with a unique external rib corrugation and smooth pipe interior that provides superior hydraulic performance at an economical price. It is available in round or pipe arch shapes for restricted headroom applications. Materials include Galvanized Steel, Aluminized Steel Type 2 and Polymer-Laminate.

Ultra Flo pipe is produced by a continuous spiral seam method. Stiffness is provided by 19mm x 19mm x 190mm continuous external box-shaped rib corrugations. Ultra Flo performs as a flexible compression ring under load, redistributing pressure radially into the surrounding high-density soil. The unit pressure at the pipe invert can be as little as one-third of the unit pressure under a concrete pipe in identical loading conditions.

## TYPICAL APPLICATIONS

- Municipal storm sewers, in large diameter
- Highway median drainage
- Industrial storm sewers
- Large diameter culverts
- Slip-lines
- Stormwater detention tanks



ULTRA FLO'S EXTERIOR BOX RIBS AND SMOOTH INTERIOR COMBINES STRENGTH WITH SUPERIOR HYDRAULIC PERFORMANCE

### DURABLE

Available in a wide variety of coatings to suit environmental conditions

### EFFICIENT HYDRAULICS

Ultra Flo's low "n" factor is equivalent to or less than the standard 0.013 usually used in storm sewer design

### NESTABLE

Efficient shipping for remote locations

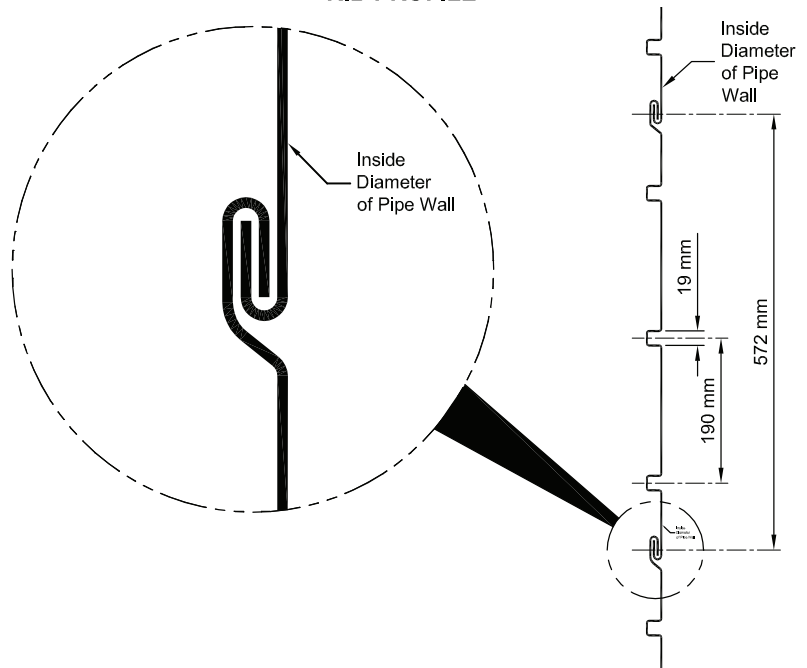
### QUICK INSTALLATION

Lightweight and available in long lengths with minimal joints

### ECONOMICAL

Lowest installed cost compared to large-diameter concrete storm sewers

## RIB PROFILE



## PIPE SIZES

Round (mm)	450, 525, 600, 750, 900, 1050, 1200, 1350, 1500, 1650, 1800, 2100, 2400
Arch, span x rise (mm)	500 x 410, 580 x 490, 680 x 540, 830 x 660, 1010 x 790, 1160 x 920, 1340 x 1050, 1520 x 1200, 1670 x 1300, 1850 x 1400

FOR DETAILED PRODUCT INFORMATION, SEE ULTRA FLO PRODUCT GUIDE



**Table 11: Height of Cover Table for Ultra Flo Round Pipe**

			Maximum Height of Fill (m) for Metal Thickness (mm)		
Diameter	Area	Minimum Height of Fill	1.6mm	2.0mm	2.8mm
mm	m <sup>2</sup>	mm			
450	0.16	300	22.7	22.7	
525	0.22	300	19.4	28.8	50.6
600	0.28	300	17.0	25.2	44.3
750	0.44	300	13.6	20.2	35.4
900	0.64	300	11.3	16.8	29.5
1,050	0.87	300	9.7	14.4	25.3
1,200	1.13	300	8.5*	12.6	22.1
1,350	1.43	340	7.5*	11.2	19.7
1,500	1.77	380	6.8*	10.1*	17.7
1,650	2.14	410		9.1*	16.1
1,800	2.54	450		8.4*	14.7
2,100	3.46	530			12.6*
2,400	4.52	600			11.0*
2,600	5.31	650			9.0*

**NOTES:**

1. ALLOWABLE MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE BOTTOM OF A FLEXIBLE PAVEMENT OR TOP OF A RIGID PAVEMENT. MINIMUM COVER IN UNPAVED AREAS MUST BE MAINTAINED. BACKFILL IS ASSUMED TO BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DRY DENSITY.
  2. ALL HEIGHTS OF COVER ARE BASED ON INSTALLATION IN A TRENCH. IF EMBANKMENT CONDITIONS EXIST, THERE MAY BE RESTRICTIONS ON GAUGES FOR LARGE DIAMETERS. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
  3. TABLES ARE FOR CL-625 LOADING ONLY. FOR HEAVY CONSTRUCTION LOADS, HIGHER MINIMUM COVERS MAY BE REQUIRED. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
- \* THESE SIZES AND GAUGES REQUIRE SPECIAL ATTENTION TO BACKFILL MATERIAL AND CONSTRUCTION METHODS.

**Table 12: Height of Cover Table for Ultra Flo Arch Pipe**

					Maximum Height of Fill (m) to Limit Corner Bearing Pressure to a Maximum of 200 kPa for Metal Thickness (mm)		
Span	Rise	Equivalent Diameter	Area	Minimum Height of Fill	1.6mm	2.0mm	2.8mm
mm	mm	mm	m <sup>2</sup>	mm			
500	410	450	0.15	300	4.0	4.0	
580	490	525	0.21	300	5.2	5.2	5.2
680	540	600	0.27	300	5.2	5.2	5.2
830	660	750	0.43	300	5.2	5.2	5.2
1,010	790	900	0.62	300	4.4	4.4	4.4
1,160	920	1,050	0.85	300	5.1	5.1	5.1
1,340	1,050	1,200	1.12	300		4.4	4.4
1,520	1,200	1,350	1.44	340		5.3*	5.3
1,670	1,300	1,500	1.79	380		5.1*	5.1
1,850	1,400	1,650	2.15	410		4.7*	4.7

**NOTES:**

1. ALLOWABLE MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE BOTTOM OF A FLEXIBLE PAVEMENT OR TOP OF A RIGID PAVEMENT. MINIMUM COVER IN UNPAVED AREAS MUST BE MAINTAINED. BACKFILL IS ASSUMED TO BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DRY DENSITY.
  2. ALL HEIGHTS OF COVER ARE BASED ON INSTALLATION IN A TRENCH. IF EMBANKMENT CONDITIONS EXIST, THERE MAY BE RESTRICTIONS ON GAUGES FOR LARGE DIAMETERS. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
  3. TABLES ARE FOR CL-625 LOADING ONLY. FOR HEAVY CONSTRUCTION LOADS, HIGHER MINIMUM COVERS MAY BE REQUIRED. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
- \* THESE SIZES AND GAUGES REQUIRE SPECIAL ATTENTION TO BACKFILL MATERIAL AND CONSTRUCTION METHODS.

# END TREATMENTS

## CSP END SECTIONS

Armtec supplies durable, lightweight end sections for improved hydraulic efficiency and erosion control. These sections help reduce scour at inlets, undermining at outlets, and provide an attractive and economical means of blending culvert ends with a sloping embankment.

The end sections clamp onto the culvert and are positioned with light equipment. In the case of the smaller available sections, no equipment is required to position the end sections. Earth is tamped around the sloping ends to complete the installation.

Standard end sections suit corrugated steel pipes up to 2,400mm diameter and pipe arches up to 2,130mm span x 1,400mm rise. They are available as twins, triplets and quads for multiple-pipe installations. Safety-slope end sections are also available with parallel cross bars and are built-in 4:1 or 6:1 slope.



CSP END SECTION WITH FUNCTIONAL GRATE



CSP END SECTION WITH OPTIONAL TOE PLATE EXTENSION



**SLOPE RETENTION**

Designed to support and retain slope grade and material



**ECONOMICAL**

Culvert repairs are reduced with the reduction of scour at the inlet and undermining at the outlet



**ATTRACTIVE SOLUTION**

End sections blend culvert ends with the slope embankment

## HEADWALLS

Headwalls can be constructed of concrete, stone, rip rap stone or steel sheeting.

Pro-Eco-Lite headwalls are engineered from a composite reinforced polymer concrete. They combine the lightweight characteristics of plastic with the strength of concrete. Flow control accessories such as pre-fabricated trash racks, security grids and handrails, bolt-on scour aprons, pre-fabricated weir boards and frames, and pre-installed flap gates and slide gates can be added to enhance performance without affecting appearance.

For large SteelCor pipe, headwalls constructed of Armtec sheeting combined with wing walls constructed from Armtec Bin-Wall provide an economic solution.

## CUT-OFFS

Armtec steel sheeting can be used as cut-offs under the SteelCor pipe inlet and outlet. Depth of cut-off is usually 1m to 1.5m below the invert. Steel sheeting can often be used as a partial headwall with clay or other materials used to further seal the embankment.



PRO ECO-LITE HEADWALL



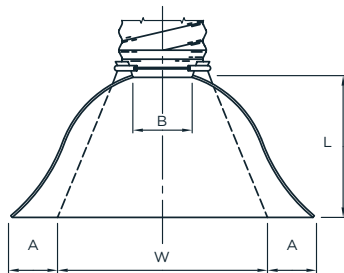
SHEETING HEADWALL

## SPECIFICATIONS

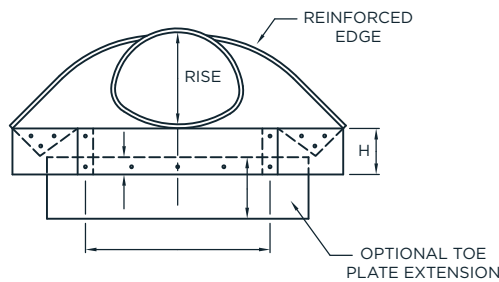
Table 13: End Sections for Pipe-Arch Shapes

Span x Rise	Equiv. Round	Thickness	A	B	H	L	W	Approx. Slope	Weight
mm	mm		mm	mm	mm	mm	mm		kg
560 x 420	450	1.6	180	255	150	585	915	2-1/2	19
680 x 500	600	1.6	230	355	150	810	1,220	2-1/2	24
910 x 660	800	2.0	255	405	200	990	1,525	2-1/2	42
1,030 x 740	900	2.0	305	455	230	1,170	1,905	2-1/2	73
1,150 x 820	1,000	2.8	330	535	230	1,345	2,160	2-1/2	105
1,390 x 970	1,200	2.8	455	660	305	1,600	2,285	2-1/2	143
1,630 x 1,120	1,400	2.8/3.5	455	840	305	1,955	2,895	1-1/2	217
1,880 x 1,260	1,600	2.8/3.5	455	915	305	1,955	3,200	1-1/2	284
2,130 x 1,400	1,800	2.8/3.5	455	990	305	1,955	3,505	1-1/2	304

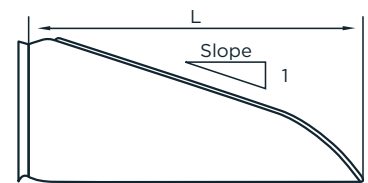
PLAN



ELEVATION



TYPICAL CROSS SECTION

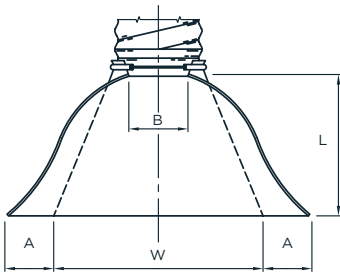


## SPECIFICATIONS

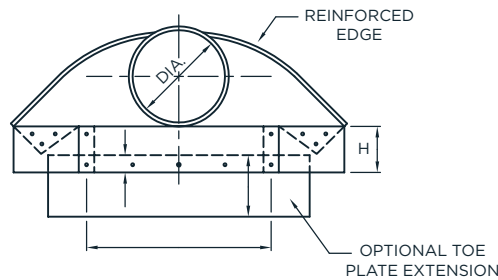
Table 14: End Sections for Round Pipe Shapes

Pipe Diameter	Thickness	A	B	H	L	W	Approx. Slope	Weight
mm		mm	mm	mm	mm	mm		kg
300	1.6	150	150	150	530	610	2-1/2	11
400	1.6	175	200	150	660	760	2-1/2	15
450	1.6	200	255	150	785	915	2-1/2	19
500	1.6	230	300	150	915	1,065	2-1/2	22
600	1.6	255	330	150	1,040	1,220	2-1/2	30
800	2.0	305	405	200	1,295	1,525	2-1/2	55
900	2.0	355	480	230	1,525	1,830	2-1/2	61
1,000	2.8	405	560	280	1,750	2,135	2-1/2	145
1,200	2.8	460	685	305	1,980	2,285	2-1/4	170
1,400	2.8	460	760	305	2,135	2,590	2-1/4	200
1,600	2.8/3.5	460	915	305	2,210	3,050	2	316
1,800	2.8/3.5	460	990	305	2,210	3,200	2	327
2,000	2.8/3.5	460	1,065	305	2,210	3,350	1-1/2	367
2,200	2.8/3.5	460	1,145	305	2,210	3,505	1-1/2	386
2,400	2.8/3.5	635	890	305	2,210	3,810	1-1/2	447

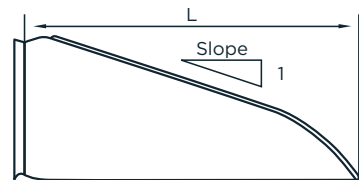
PLAN



ELEVATION



TYPICAL CROSS SECTION



# NESTABLE PIPE

Nestable corrugated steel pipe is available as flange-type and notch-type. Flange-type nestable CSP consists of half-round 610mm long sections with side flanges that can be easily bolted together to form a circular corrugated steel pipe. Notch-type nestable CSP consists of matching half-round segments of corrugated steel, assembled using stitch type or hook and eye bolts to become lengths of full-round corrugated steel pipe. Nestable pipe is typically galvanized and therefore highly durable under normal conditions. Aluminized Steel Type 2 is also available for added durability.

Nestable pipe sections are shipped nested and bundled together to save space during shipping. This is ideal for remote locations and overseas projects where shipping of factory-made pipe would be uneconomical. Both flange-type and notch-type products are useful where a casing is to be installed around an existing utility without disrupting its operation.

## TYPICAL APPLICATIONS

- Culverts
- Storm Sewers
- Drains
- Casings
- Utilidors



HOOK AND EYE BOLTS PROVIDE A SECURE SOIL-TIGHT CONNECTION



### ECONOMICAL

Sections are nested and bundled together for economical shipping



### DURABLE

Available in Aluminized Steel Type 2 for added protection and extended service life



### VERSATILE

Suitable for a wide range of applications

## FLANGE-TYPE NESTABLE PIPE

### Assembly

Flanged Nestable Pipe is easily assembled and no special instructions are necessary. Simple tools such as spud or socket wrenches are all that are required.

Five corrugation long pieces are used on the top at both ends to introduce a circumferential seam stagger. The 50mm wide flanges have slotted holes spaced at 68mm centre to centre on both sides and are bolted together using galvanized 10mm diameter bolts and nuts. All circumferential laps should be assembled in the direction of fluid flow.



FLANGE-TYPE NESTABLE PIPE REQUIRES ONLY SIMPLE TOOLS FOR ASSEMBLY

## NOTCH-TYPE NESTABLE PIPE

### Assembly

There are three standard methods used in attaching the half-round pipe segments together. The method used is dictated by the pipe diameter. The stitch type method (using #1 or #2 type stitches) is used up to 800mm in pipe diameter and the hook and eye bolt method is used for pipe diameters 900mm and over.

When assembling Armtec Nestable Pipe, the bottom ten corrugation sections are placed into position with each succeeding section overlapping the previous one by one

corrugation. The top ten corrugation sections are staggered by using five corrugation sections at the ends.

All laps should be assembled in the direction of fluid flow. The half sections will be drawn together at the notched seams with a bending bar and the appropriate fastener inserted through the matching holes. There are two fasteners every 600mm on each side.



NESTABLE PIPE IS IDEAL FOR MINING APPLICATIONS



NESTED SECTIONS ARE BUNDLED FOR ECONOMICAL TRANSPORTATION

**Table 15: Flange-Type Pipe Height of Cover Table - Live Load - AASHTO H-25 and CS-625**

Diameter mm	Area mm <sup>2</sup>	Minimum Cover mm	Maximum Height of Cover (m) for Following Specified Wall Thickness		
			1.6mm	2.0mm	2.8mm
300	0.17	300	9.0	-	-
400	0.13	300	9.0	-	-
450	0.16	300	6.0	9.0	-
500	0.20	300	6.0	9.0	-
600	0.28	300	4.5	9.0	-
700	0.38	300	-	7.5	9.0
800	0.50	300	-	6.0	9.0
900	0.64	300	-	6.0	9.0
1,000	0.79	300	-	4.5	9.0
1,200	1.13	300	-	-	7.5
1,400	1.51	500	-	-	6.0
1,600	2.01	500	-	-	4.5

**NOTES:**

STRUCTURES SHOULD BE BACKFILLED WITH WELL COMPACTED GRANULAR BACKFILL TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY. E-80 LOADING CAN ALSO BE MET. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS.

**Table 16: Flange-Type Pipe Approximate Weights (kg/m)**

Diameter mm	Approximate Weight (kg/m) for Following Specified Wall Thickness		
	1.6mm	2.0mm	2.8mm
300	18	22	-
400	22	28	-
450	24	31	43
500	27	34	48
600	31	39	54
700	36	45	62
800	41	51	70
900	45	56	77
1,000	48	61	83
1,200	59	74	102
1,400	68	85	118
1,600	78	97	134

**SPECIFICATIONS**

Half round sections are manufactured from 68mm x 13mm corrugated steel:

- Corrugations and steel thickness per ASTM A 760A, CSA G401, AASHTO M 36
- Galvanized and Aluminized Type 2 per ASTM A 929A, AASHTO M 218-87
- Zinc coating mass will not be less than 610 g/m<sup>2</sup> per AASHTO M 218
- Milling sampling and marking per ASTM A924 A 924M
- Minimum aluminum coating thickness of 47µm
- Installation per ASTM A798
- Hardware is zinc plated

**Table 17: Notch-Type Height of Cover Table - CS -625 Loading**

Diameter	Area	Minimum Cover	Maximum Height of Cover (m) for Following Specified Wall Thickness			
			1.6mm	2.0mm	2.8mm	3.5mm
300	0.07	300	9.2	13.17	-	-
400	0.13	300	6.1	12.2	13.7	-
450	0.16	300	6.1	12.2	13.7	-
500	0.20	300	6.1	10.7	13.7	-
600	0.28	300	4.6	9.2	13.7	-
700	0.38	300	-	7.6	13.7	-
800	0.50	300	-	7.6	13.7	-
900	0.64	300	-	6.1	10.7	-
1,000	0.79	300	-	4.6	9.2	-
1,200	1.13	300	-	-	7.6	9.0
1,400	1.54	500	-	-	6.1	9.0
1,600	2.01	500	-	-	-	9.0
1,800	2.54	500	-	-	-	-
2,000	3.14	500	-	-	-	-

**NOTES:**

STRUCTURES SHOULD BE BACKFILLED WITH WELL COMPACTED GRANULAR BACKFILL TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY. E-80 LOADING CAN ALSO BE MET. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS.

**Table 18: Notch-Type Pipe Approximate Weights (kg/m)**

Diameter	Approximate Weight (kg/m) for Following Specified Wall Thickness				
	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
300	15	19	26	-	-
400	20	25	34	-	-
450	23	29	38	47	-
500	25	32	43	53	-
600	29	37	51	63	-
700	34	43	59	73	-
800	39	49	68	84	-
900	44	56	77	95	113
1,000	49	61	85	105	126
1,200	59	74	102	126	151
1,400	69	85	119	147	176
1,600	78	98	137	168	202
1,800	88	110	153	188	226
2,000	98	122	170	210	252

**SPECIFICATIONS**

Half round sections are manufactured from 68mm x 13mm corrugated steel:

- Corrugations and steel thickness per ASTM A 760A, CSA G401, AASHTO M 36
- Galvanized and Aluminized Type 2 per ASTM A 929A, AASHTO M 218-87
- Zinc coating mass will not be less than 610 g/m<sup>2</sup> per AASHTO M 218
- Milling sampling and marking per ASTM A924 A 924M
- Minimum aluminum coating thickness of 47µm
- Installation per ASTM A798
- Hardware is zinc plated



Armtec is environmentally conscious by supporting limited paper usage.

#### **ATLANTIC**

Shediac, NB  
Sackville, NB  
Truro, NS  
Bishop's Falls, NL  
St. John's, NL

#### **CENTRAL**

Cambridge, ON  
Comber, ON  
Forest, ON  
Guelph, ON  
Orangeville, ON  
Peterborough, ON  
Sudbury, ON  
Thunder Bay, ON  
Walkerton, ON  
Woodstock, ON  
St-Augustin, QC  
St-Clet, QC

#### **PRAIRIES**

Calgary, AB  
Edmonton, AB  
Grande Prairie, AB  
Ponoka, AB  
Redwater, AB  
Winnipeg, MB  
Regina, SK  
Saskatoon, SK

#### **WEST COAST**

Dawson Creek, BC  
Genelle, BC  
Langley, BC  
Nanaimo, BC  
Prince George, BC



Platinum member

Find out how **CSP** pipe can be used on your next project.  
Call **1-800-565-1152** or visit **armtec.com**



# G

## Appendix G-2 FT SOLMAX – GEOMEMBRANE HDPE 1.0mm BLACK TECHNICAL DATA SHEET

PROPERTY <sup>(1)</sup>	TEST METHOD	FREQUENCY	UNIT Metric	1047812
<b>SPECIFICATIONS</b>				
Thickness (min. avg.)	ASTM D5199	Every roll	mm	1.00
Thickness (min.)	ASTM D5199	Every roll	mm	0.90
Resin Density	ASTM D1505	1/Batch	g/cc	> 0.932
Melt Index - 190/2.16 (max.)	ASTM D1238	1/Batch	g/10 min	1.0
Sheet Density	ASTM D792	Every 10 rolls	g/cc	≥ 0.940
Carbon Black Content	ASTM D4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	Every 10 rolls	Category	Cat. 1 / Cat. 2
OIT - standard (avg.)	ASTM D3895	1/Batch	min	100
Tensile Properties (min. avg) (2)	ASTM D6693	Every 2 rolls		
Strength at Yield			kN/m	15
Elongation at Yield			%	13
Strength at Break			kN/m	28
Elongation at Break			%	700
Tear Resistance (min. avg.)	ASTM D1004	Every 5 rolls	N	125
Puncture Resistance (min. avg.)	ASTM D4833	Every 5 rolls	N	356
Dimensional Stability	ASTM D1204	Certified	%	± 2
Stress Crack Resistance (SP-NCTL)	ASTM D5397	1/Batch	hr	500
Oven Aging - % retained after 90 days	ASTM D5721	Per formulation		
HP OIT (min. avg.)	ASTM D5885		%	80
UV Res. - % retained after 1600 hr	ASTM D7238	Per formulation		
HP-OIT (min. avg.)	ASTM D5885		%	50
Low Temperature Brittleness	ASTM D746	Certified	°C	- 77
<b>SUPPLY SPECIFICATIONS(Roll dimensions may vary ±1%)</b>				
Roll Dimension - Width	-		m	6.80
Roll Dimension - Length	-		m	237.7
Area (Surface/Roll)	-		m <sup>2</sup>	1616.36

## NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).

\* All values are nominal test results, except when specified as minimum or maximum.

\* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsibility of the user. SOLMAX assumes no liability in connection with the use of this information.

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.



Appendix G-3  
BACKFLOW PREVENTER – CHECKMATE  
BROCHURE





**Tideflex**<sup>®</sup>  
Technologies

**CheckMate**<sup>®</sup> Inline Check Valve



United States Patent # 5,769,125



Red Valve Company, Inc.<sup>®</sup>

# CheckMate®: Your Final Move to Eliminate Backflow!

## CHECKMATE® VALVE Designed for Inline Service

### Dependable Backflow Prevention

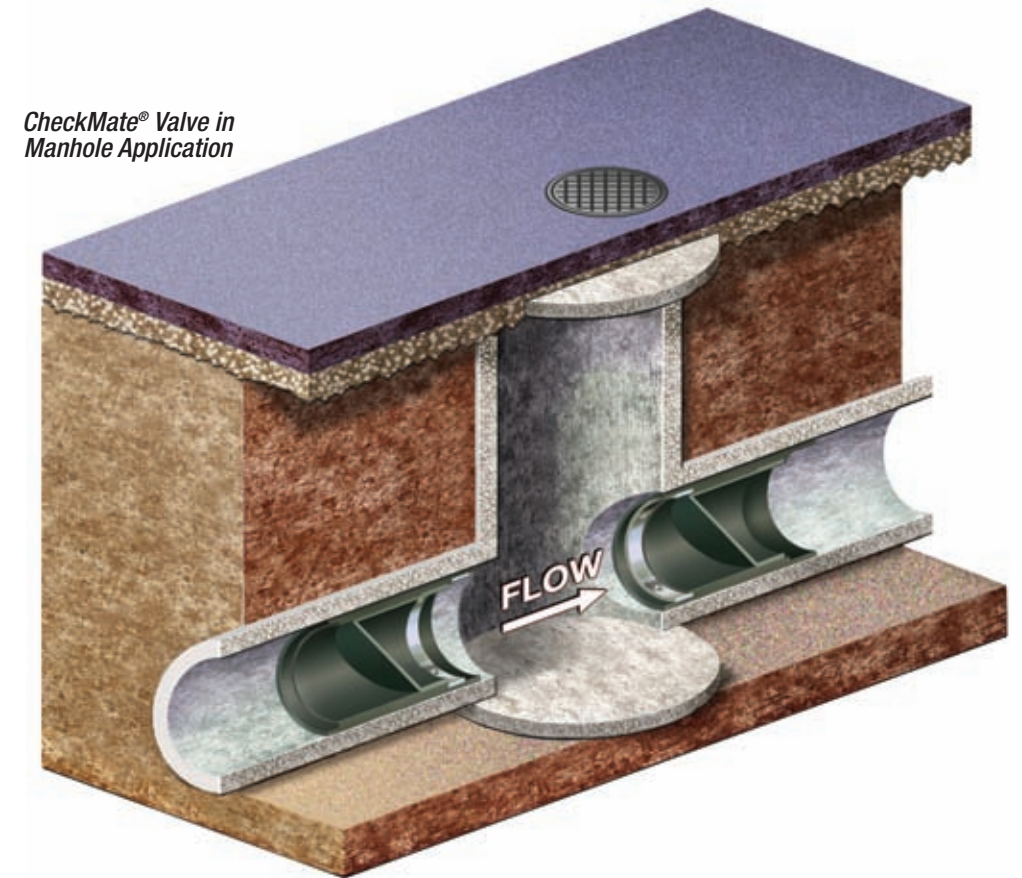
The CheckMate® Inline Check Valve is the valve of choice for both municipal and industrial applications - including stormwater, wastewater, highway run-off, CSO, SSO and flood control. CheckMate® Valves prevent unwanted backflow that can cause surcharging and flooding.

CheckMate® Inline Check Valves have become the specified solution for residential and commercial areas where complete, dependable backflow prevention is necessary. The CheckMate® is not simply a molded part. Rather it is hand-fabricated, utilizing various natural and synthetic elastomers and fabric ply reinforcement to create a unibody construction. There are no mechanical parts or fasteners to catch debris, corrode, or fail, making the CheckMate® maintenance-free. With seven elastomers to select from, the CheckMate® can be custom engineered to resist chemicals, grease and oils typically found in stormwater, wastewater and industrial applications.

The CheckMate® Valve boasts extremely low headloss, allowing for near 100% flow capacity. Its inherent design makes it the most user-friendly inline check valve on the market today. From the upstream or downstream end of the pipe, simply insert the valve into position and clamp it into place. Typically no modification to the pipe or structure is required to install the CheckMate®. Because the CheckMate® is recessed inside of the pipe, additional permitting is not required. The result is savings in both installation time and operational cost.



CheckMate® Valve in End of Pipe Application



CheckMate® Valve in Manhole Application

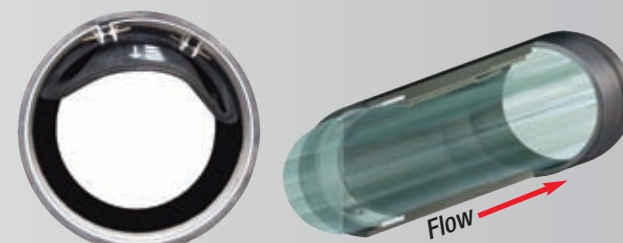
The valve can successfully withstand severe winter freezes, typhoons, hurricanes and flooding. The CheckMate® also minimizes damage to wetlands, beaches and residential areas, eliminates hydraulic surges to wastewater treatment plants and saves municipalities millions of dollars in maintenance and treatment costs.

### Benefits and Features of CheckMate®:

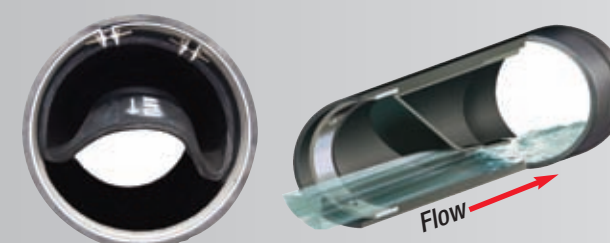
- Extremely Low Headloss
- No Moving Mechanical Parts to Corrode, Catch Debris or Fail
- Heavy Duty Elastomer Unibody Construction
- Quick and Easy Installation
- Seals Around Debris
- Operates on Differential Pressure, Totally Passive
- Virtually No Maintenance
- Self-draining, 1" of Cracking Pressure
- Silent, Non-slamming
- Available in Sizes 3" (75 mm) to 78" (1950 mm)
- Extensive Independent Hydraulic Testing



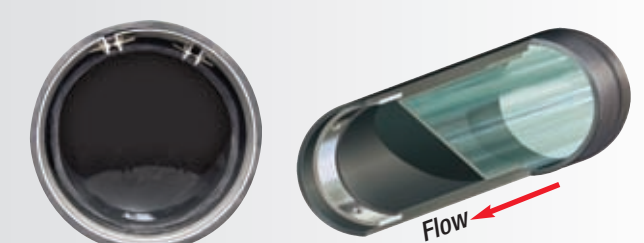
For an animated demonstration of the CheckMate® in operation, please visit:  
<http://www.tideflex.com/checkmate>.



FULLY OPEN



FLOWING



FULLY CLOSED



48" CheckMate® installed in a storm sewer drain to stop backflow from flooding a residential area.



24" CheckMate® is easily installed in a municipal sewer.



48" CheckMate® Valve replacing a faulty flapgate in a CSO application.



The CheckMate® is also easily installed by hand.

### Residential and Municipal Sewers

CheckMate® Inline Check Valves have become a frequently specified solution for residential and municipal areas where complete, dependable backflow prevention is necessary. The CheckMate® Valve's maintenance-free, passive operation provides years of trouble-free service.

### CSO, SSO and Outfalls

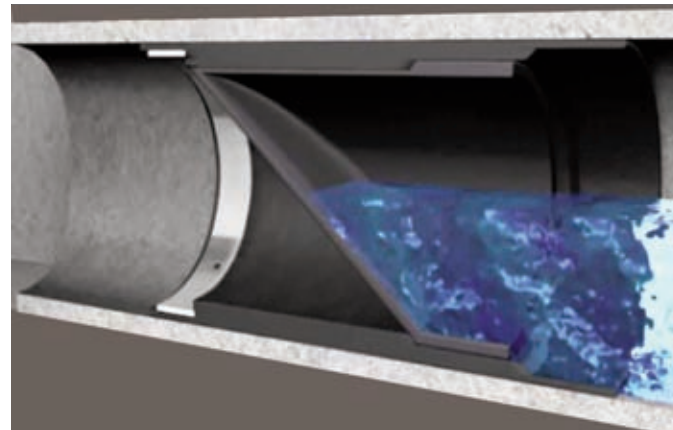
CheckMate® Valves are used for interceptor, manhole and outfall pipelines because they maximize pipeline storage and capacity while preventing water from backflowing into a sewage treatment plant. The CheckMate® Valve's innovative inline design allows it to be easily installed without modifications to structures.

### Stormwater, MS4, Highway Run-off and Site Drainage

CheckMate® Inline Check Valves are the valve of choice for both municipalities and commercial property owners to prevent costly flood damage and to maximize system storage. The CheckMate®'s low cracking pressure and headloss provide rapid drainage.

### Flow Equalization Basins, Pump Stations and Effluent Discharge

CheckMate® Valves provide backflow prevention in between basins and also protect pumps and capital equipment. The CheckMate®'s low headloss characteristics maximize flow efficiency.



The CheckMate's® rugged unibody construction prevents backflow.



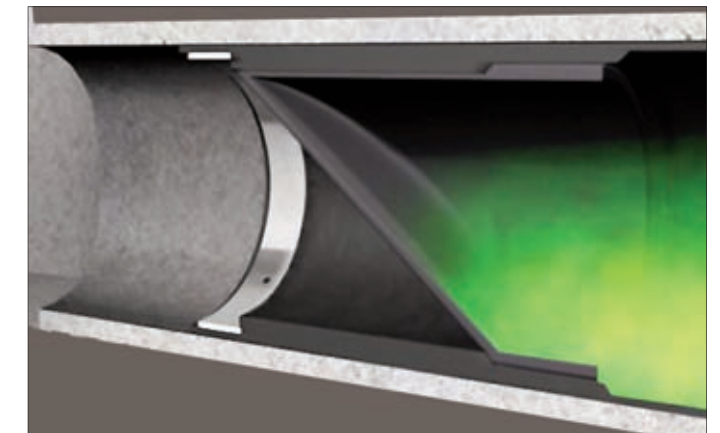
48" CheckMate® installed at the Freedom Tower for stormwater drainage.

### Odor Control

CheckMate® Inline Check Valves prevent sewer systems' offending odors from escaping, while still allowing water to discharge when needed. The CheckMate® Valve is designed to eliminate the backflow of unwanted methane and hydrogen sulfide gases that typically result in complaints about odor from the general public.

### Levees, Marinas and Wetlands

In low lying areas where headloss is at a premium, CheckMate® Valves efficiently drain with the added benefit of providing absolute backflow prevention.



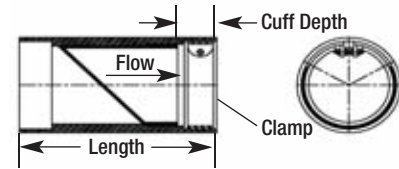
The CheckMate® provides odor control.

### Independent Hydraulic Testing

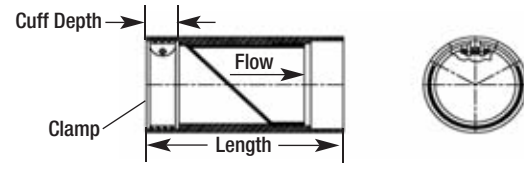
CheckMate® Inline Check Valves are independently tested to determine their hydraulic characteristics in both free and submerged discharge applications. Red Valve's published hydraulic data is validated through this independent testing.



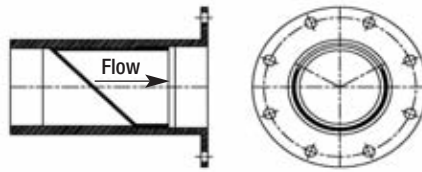
### Downstream Clamp



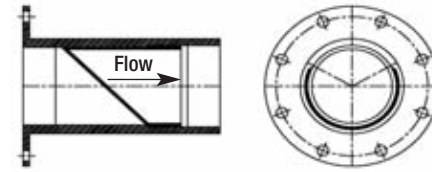
### Upstream Clamp



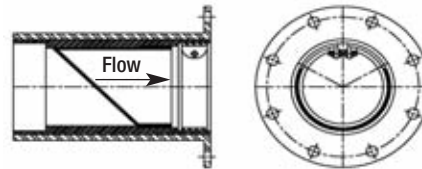
### Downstream Flanged



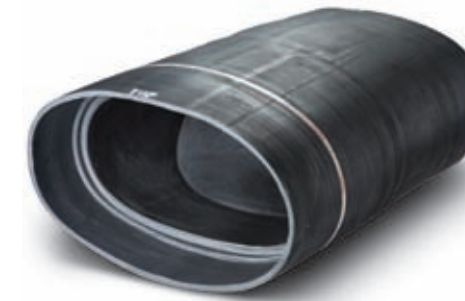
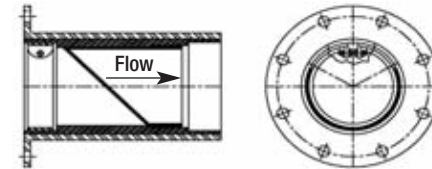
### Upstream Flanged



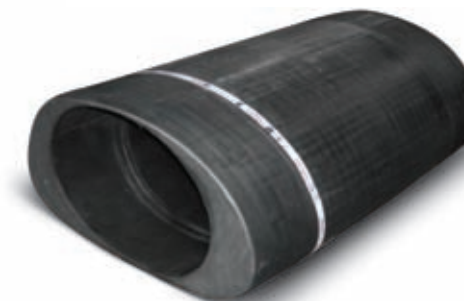
### Downstream Flanged Thimble Insert



### Upstream Flanged Thimble Insert



Elliptical Pipe CheckMate®



Arch Pipe CheckMate®



Rectangular Pipe CheckMate®

### Elliptical, Arch and Rectangular Pipes

Elliptical, arch and rectangular pipes for drainage and flood prevention projects have become popular, particularly in high water table areas with shallow surface gradients. CheckMate® Inline Check Valves are the perfect solution for backflow prevention in elliptical, arch and rectangular pipes.

### Rubber Flanged

Rubber Flanged CheckMate® Valves can be manufactured with an integral rubber upstream or downstream flange. The flanged CheckMate® gets inserted into the host pipe then can be bolted to a mating flange or anchored to a concrete headwall. The flange can be circular with standard drilling; or circular, square or rectangular with custom flange drilling. The valve is supplied with retaining rings for mounting.



Upstream Flanged CheckMate®

### Thimble Inserts

A CheckMate® Thimble Insert is a CheckMate® Valve that is factory-installed, clamped, and pinned into flanged or plain end pipe. The thimble insert assembly can either be inserted into the I.D. of the host pipe, or can be mounted to a mating flange or concrete headwall and extend beyond the pipe. Plain end thimble inserts are inserted into the host pipe and non-shrink grout is placed between the thimble insert O.D. and host pipe I.D. to form the seal.



CheckMate® Thimble Insert

CheckMates® can be made for any pipe I.D. Built to fit in sizes from 3" to 78".

Flange shape and bolt pattern can be customized. Flangeless thimble inserts are available.

CHECKMATE® VALVE											
	NOMINAL PIPE SIZE I.D.		OVERALL LENGTH*		NUMBER OF CLAMPS	CUFF DEPTH		BACK PRESSURE RATING**		WEIGHT	
	Inches	Millimeters	Inches	Millimeters		Inches	Millimeters	Feet	Meters	lbs	Kg
	Low Pressure	3	75	5.1		130	1	1.5	38	5	1.5
	4	100	7.9	201	1	1.5	38	5	1.5	1.5	0.7
Standard Pressure	3	75	5.1	130	1	1.5	38	85	26.0	3	1.4
	4	100	7.9	201	1	1.5	38	85	26.0	3	1.5
	5	125	9.5	241	1	1.5	38	83	25.3	4	2
	6	150	11.0	279	1	2.0	51	83	25.3	9	4
	7	175	12.8	325	1	2.0	51	79	24.1	11	5
	8	200	15.2	386	1	2.0	51	79	24.1	13	6
	9	225	15.4	391	1	2.0	51	75	22.9	17	8
	10	250	16.1	409	1	2.0	51	71	21.6	20	10
	12	300	19.8	503	1	2.0	51	68	20.1	37	17
	14	350	25.8	655	1	4.0	102	64	20.0	110	50
	16	400	28.6	726	1	4.0	102	60	18.3	133	52
	18	450	31.0	787	1	4.0	102	56	17.1	143	65
	20	500	42.1	1069	2	8.0	203	53	16.2	223	102
	24	600	47.5	1207	2	8.0	203	45	13.7	304	137
	30	750	54.9	1395	2	8.0	203	38	11.6	500	227
	36	900	62.3	1582	2	8.0	203	30	9.1	828	376
42	1050	70.6	1793	2	8.0	203	26	7.9	1423	646	
48	1200	79.0	2007	2	8.0	203	23	7.0	1801	817	
54	1350	86.4	2195	2	8.0	203	17	5.2	2700	1225	
60	1500	96.8	2459	2	9.0	229	15	4.6	3315	1504	
72	1800	119.0	3023	3	12.0	305	13	4.0	6100	2767	
78	1950	119.0	3023	3	12.0	305	13	4.0	7000	3176	

\*Shorter lengths available.

\*\*Back pressure measured from pipe invert. Higher back pressure ratings available. Consult factory.

The best choice for the toughest applications.

In addition to the Checkmate® Inline Check Valve, Tideflex® Technologies offers a complete line of check valves.

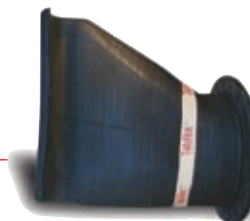
### TF-1 CHECK VALVES

The Tideflex® TF-1 Curved Bill Check Valve is designed with enhanced sealing to improve headloss. The improved TF-1 design allows the valve to handle long-term water weight while maintaining structural integrity. The spine is at a greater vertical angle, making it able to withstand the cantilever effect when water is flowing through the valve. The TF-1 is constructed of rubber, making it immune to rust, corrosion and weathering.



### SERIES 35-1 CHECK VALVES

The flat-bottom Series 35-1 features an integral rubber flange, allowing them to be mounted to flanged outfall pipes or directly to headwalls where the pipe is flush. The flange size drilling conforms to ANSI B16.10, Class 150#, or can be constructed with DIN, 2632 and other standards. The Series 35-1 Check Valve is furnished complete with steel or stainless steel backup rings for installation.



### SERIES 39 CHECK VALVES

The Tideflex® Series 39 Inline Check Valve features a fabric-reinforced elastomer check sleeve housed in a cast iron body with ANSI 125/150 flanges, allowing for easy installation into any piping system. The valve's operation is silent, non-slamming and maintenance free. Sliding, rotating, swinging and plunging parts are completely eliminated. The body is equipped with flush ports and a clean-out port and can be epoxy coated.



**Tideflex®**  
Technologies

600 N. Bell Ave.  
Carnegie, PA 15106

PHONE:  
412/279-0044

FAX:  
412/279-7878

[www.tideflex.com](http://www.tideflex.com)

The information presented in this catalog is provided in good faith. Red Valve Company, Inc. and Tideflex® Technologies reserves the right to modify or improve its design specifications without notice and does not imply any guarantee or warranty for any of its products from reliance upon the information contained herein. All orders are subject to Red Valve Company, Inc. and Tideflex® Technologies' standard terms and warranty and are subject to final acceptance by Red Valve Company, Inc. and Tideflex® Technologies.

Viton is a registered trademark of DuPont Dow Elastomers. Hypalon is a registered trademark of DuPont Performance Elastomers. Tideflex, Red Valve, and the Red Valve "rv" logo are registered trademarks of the Red Valve Company, Inc.

© 2009 Red Valve Company.  
All rights reserved.



CMCV 060515