CORPORATION OF THE
TOWNSHIP OF EDWARDSBURGH CARDINAL

BY-LAW NO. 2024-33

"BEING A BY-LAW TO AUTHORIZE THE EXECUTION OF A SITE PLAN CONTROL AGREEMENT WITH JOHNSTOWN SELF STORAGE INC."

WHEREAS the Council of the Corporation of the Township of Edwardsburgh Cardinal deems it advisable to enter into a Site Plan Control Agreement with HB Holdings Inc. respecting development of a property described as:

PLAN 6 LOTS 11 AND 12 S; FIRST ST LOT 12 N FIRST ST;
PT LOT 11 N FIRST ST; PT LOTS 11 AND 12 N WATER ST; PT KING ST
TOWNSHIP OF EDWARDSBURGH/CARDINAL
PIN: 68155-0884 AND 68155-0203

WHEREAS Authority is granted under Section 41 of the Planning Act, RSO 1990, c.P. 13, as amended to the Council of the Corporation of the Township of Edwardsburgh Cardinal to enter into and amend such agreements; and

NOW THEREFORE BE IT RESOLVED THAT the Council of the Corporation of the Township of Edwardsburgh Cardinal enacts as follows:

1. That the Mayor and Clerk are hereby authorized to execute an agreement with Johnstown Self Storage Inc. and that a signed copy of said agreement is attached hereto as Schedule "A".

2. That this by-law shall come into force and effect upon passing.

Read a first and second time in open Council this 24 day of June, 2024.

Read a third and final time, passed, signed and sealed in open Council this 24 day of June, 2024.

Mayor Tory Deschamps (Jun 25, 2024 23:49 EDT)

Mayor **Clerk**

Bylaw SPCA Johnstown Storage

Final Audit Report 2024-06-26

Created:	2024-06-25
By:	Clerk Rebecca Crich (rcrich@twpec.ca)
Status:	Signed
Transaction ID:	CBJCHBCAABAAmcBqnwxD58qEFVkLzgGpTYim3aLBLJVz

"Bylaw SPCA Johnstown Storage" History

Document created by Clerk Rebecca Crich (rcrich@twpec.ca)
2024-06-25 - 1:27:04 PM GMT

Document emailed to Mayor Tory Deschamps (mayor@twpec.ca) for signature
2024-06-25 - 1:27:07 PM GMT

Email viewed by Mayor Tory Deschamps (mayor@twpec.ca)
2024-06-26 - 3:49:29 AM GMT

Document e-signed by Mayor Tory Deschamps (mayor@twpec.ca)
Signature Date: 2024-06-26 - 3:49:49 AM GMT - Time Source: server

Document emailed to Clerk Rebecca Crich (rcrich@twpec.ca) for signature
2024-06-26 - 3:49:50 AM GMT

Email viewed by Clerk Rebecca Crich (rcrich@twpec.ca)
2024-06-26 - 4:40:19 PM GMT

Document e-signed by Clerk Rebecca Crich (rcrich@twpec.ca)
Signature Date: 2024-06-26 - 4:40:27 PM GMT - Time Source: server

Agreement completed.
2024-06-26 - 4:40:27 PM GMT

THE CORPORATION OF THE

TOWNSHIP OF EDWARDSBURGH/CARDINAL

SITE PLAN CONTROL AGREEMENT

THIS AGREEMENT made in triplicate this 28 day of June, 2024

BETWEEN: JOHNSTOWN SELF STORAGE INC.

Hereinafter called the "Owner" of the first part

AND: THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL

Hereinafter called the "Township" of the second part

WHEREAS the Owner has applied to the Township in accordance with the Site Plan Control provisions of Bylaw No. 2023-47, to permit the development of the lands described in Schedule "A" attached hereto;

AND WHEREAS the Owner has agreed with the Township to undertake, furnish and perform the works, material, matter and things required to be done, furnished and performed in the manner hereafter described in connection with the proposed use of the land and in conformity with the Zoning Bylaw;

NOW THEREFORE THIS AGREEMENT WITNESSETH THAT in consideration of other good and valuable consideration and the sum of two dollars ($2.00) of lawful money of Canada now paid by the Owner to the Municipality, the receipt of which is hereby acknowledged, the Parties hereby agree as follows:

1. **Land to Which this Agreement Applies**

   This is an agreement made pursuant to the provisions of Section 41 of the Planning Act, RSO 1990, as amended, and applies to the lands described in Schedule "A" to this agreement.

2. **Statutes, Bylaws, Licenses, Permits and Regulations**

   The Owner undertakes and agrees that prior to the commencement of any development, redevelopment, site alteration, construction or other works, the Owner shall obtain all necessary permits and approvals required by the

Government of Canada, the Province of Ontario or any agency thereof, the Township and any other affected agency. The Owner undertakes and agrees to comply with the requirements of all relevant municipal bylaws, provincial and federal statutes and regulations, permits, approvals or licenses in addition to the terms of this agreement.

3. Schedules

The Owner hereby agrees that prior written approval by the Township and/or an amendment to a Schedule shall be required for any departure, change or modification from the Schedules.

The following list of schedules attached hereto are deemed to be and form part of this Agreement:

3.1 Schedule "A" -Legal Description of the Land to which this Agreement applies.

3.2 Schedule "B" -Site Plan; Grading, Sediment and Erosion; Project Phasing

3.3 Schedule "C" -Stormwater Management Report, by Kollaard Associates

3.4 Schedule "D" -Geotechnical Investigation, by Kollaard Associates

3.5 Schedule "E" -Road Works

3.6 Schedule "F" -Special Conditions

4. Registration of Agreement and Commencement of Work

The Owner covenants that he/she/they shall not commence any development or site alteration whatsoever until this Agreement is registered on title against the land at the expense of the Owner.

The Owner further agrees that no development or site alteration on phase 2 of this project, as shown in Exhibit 3 of Schedule "B," shall commence until approval has been obtained by the Township for the use of the unopened road allowance, as per the Township's Unopened Road Allowance Policy (bylaw 2015-52).

5. Completion Date

The owner agrees to complete the work required under this Agreement within

three (3) years of the date of the commencement of works. Notwithstanding, if exceptional circumstances prevent the owner from complying with the requirements, the Township may extend the completion date.

6. Default

In the event the Owner defaults in the performance of an obligation under this agreement or for reasons of public safety as determined by the Chief Building Official under the Building Code Act of Ontario or the Fire Marshall under the Fire Protection & Prevention Act of Ontario, the Township or their agent may, at the expense of the Owner, enter upon the lands and do all such matters and things as may be required to remedy the default or comply with any Order of the Chief Building Official or Assistant to the Fire Marshall (local Fire Chief). Such actual costs incurred by the Township plus an overhead charge of 15%, shall be deemed to be recoverable from the Owner by invoice and may be recovered in like manner as municipal taxes pursuant to the Municipal Act.

7. Facilities and Work to be Provided and Maintained

The Owner covenants and agrees to provide and maintain, at his/her/their sole expense each and every facility, work or other matter illustrated on the Schedules to the satisfaction of the Township, acting in a commercially reasonable manner, and to engage qualified professionals, where required, to design and carry forth any of the work undertaken under this Agreement. This shall include the restoration of any faulty workmanship or materials.

8. Certificate of Compliance

Upon the satisfactory completion of all matters and things to be provided and maintained by the Owner pursuant to this Agreement, the Owner shall be entitled to obtain a Certificate of Compliance from the Township confirming that all provisions of this Agreement have been complied with in full to the date of such Certificate.

9. Notice to Parties

Any Notice by any party to this agreement to another shall be given in writing and mailed or delivered to the Party:

9.1 In the case of the Municipality:

To the Clerk of the Township of Edwardsburgh/Cardinal
18 Centre Street
P.O. Box 129
Spencerville, ON KOE 1XO

9.2 In the case of the Owner(s):

Johnstown Self Storage Inc.
c/o Robert Mitchell
15 Howden Cres.
Guelph ON N1L 1T2

10. Severability

The terms of this agreement are severable, and the unenforceability of any part hereof shall not render the whole unenforceable. No forbearance or failure by the Township to strictly enforce any term or covenant herein shall prevent the Township from insisting upon strict compliance by the Owner subsequent to such forbearance or failure to strictly enforce its terms. The terms of this agreement may not be altered except by a subsequent agreement in writing between the parties.

11. Successors and Assigns

This Agreement shall ensure to the benefit of and be binding upon the respective heirs, personal representatives, successors and assigns of each of the parties hereto.

12. Force and Effect

This Agreement comes into force after it has been executed by all parties hereto and registered against the title to the lands described in Schedule "A".

IN WITNESS WHEREOF the Parties have hereunto set their hands and seals, corporate parties over the hand(s) of their duly authorized signing officers in that regard.

OWNER/AUTHORIZED AGENT

Robert Mitchell

Robert Mitchell (Jun 27, 2024 15:11 EDT)

Owner

I have the authority to bind the corporation.

CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL

Mayor Tory Deschamps (Jun 27, 2024 16:38 EDT)

Mayor

Clerk

We have the authority to bind the corporation.

SCHEDULE "A"

Site Plan Control Agreement

DESCRIPTION OF THE PROPERTY

PLAN 6 LOTS 11 AND 12 S; FIRST ST LOT 12 N FIRST ST; PT LOT 11 N FIRST ST PT LOTS;11 AND 12 N WATER ST PT KING; ST

PIN: 68155 0884 and 68155 0203

SCHEDULE "B"

Site Plan Control Agreement

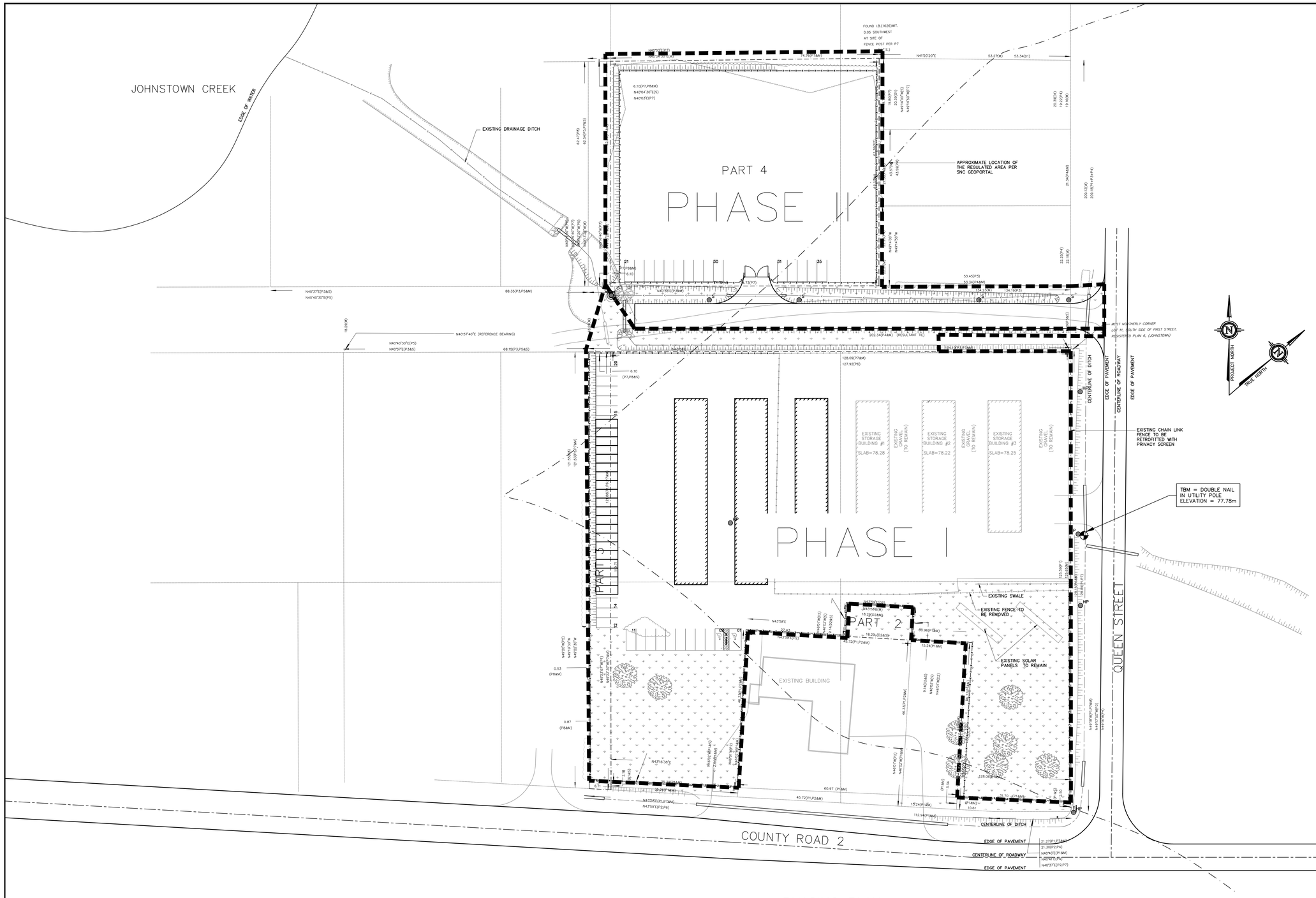
SITE PLAN

EXHIBITS: The following Exhibits attached hereto shall form part of this Schedule:

Exhibit 1- Grading and Sediment and Erosion Control

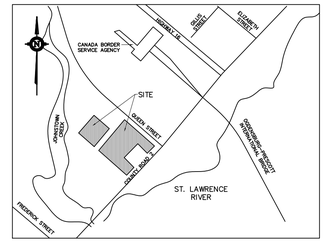
Exhibit 2- Site and Landscape Plan

Exhibit 3- Project Phasing



PHASING PLAN

SCALE = 1:500



KEY PLAN

NOT TO SCALE

SCALE 1:500 — 0 1 2 3 4 5 10 15 20 METRES

LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATIONS
- PROPOSED CURB ELEVATION
- PROPOSED MAINTENANCE HOLE TOP OF GRATE ELEVATION
- PROPOSED CATCH BASIN TOP OF GRATE ELEVATION
- PROPOSED DITCH/SWALE ELEVATION
- PROPOSED ELEVATION
- DRAINAGE SLOPE
- EXISTING DRAINAGE
- CENTRELINE OF ROAD
- EDGE OF ROAD
- TOP OF SLOPE
- PROPERTY LINE
- LIMIT OF DEVELOPMENT LINE
- UTILITY WIRES
- SILT FENCE
- OVERHEAD WIRE
- OVERLAND FLOW ROUTE
- EXISTING HYDRO POLE
- TEMPORARY BENCHMARK
- EXISTING HYDRO GUY WIRE ANCHOR
- FIRE ROUTE SIGNAGE

LANDSCAPING LEGEND

- GRASS AREAS
- GRAVEL

NOTES:

1. ALL DIMENSIONS ARE IN METRES, UNLESS OTHERWISE SPECIFIED; ALL ELEVATIONS ARE IN METRES AND ARE GEODETIC.
2. THIS IS NOT A LEGAL SURVEY.
3. BOUNDARY INFORMATION WAS DERIVED FROM H.A. KEN SHIPMAN SURVEYING LTD. FILE No. 23-13239
4. CLIENT IS RESPONSIBLE FOR ACQUIRING ALL NECESSARY PERMITS.
5. CONTRACTOR TO VERIFY THAT APPROPRIATE PERMITS HAVE BEEN ACQUIRED PRIOR TO ANY CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR LOCATION AND PROTECTION OF UTILITIES.
7. ALL DIMENSIONS TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION.
8. THIS DRAWING IS NOT FOR CONSTRUCTION UNTIL ALL APPROVALS HAVE BEEN GRANTED.
9. INSPECTION OF ROUGH GRADE BY KOLLAARD ASSOCIATES INC. AND TOWNSHIP OF EDWARDSBURGH/CARDINAL MUST BE CONDUCTED PRIOR TO PLACEMENT OF TOPSOIL OR SOD.
10. HYDRO SERVICE TO BE INSTALLED ACCORDING TO THE SPECIFICATIONS OF SERVICE PROVIDER AND THE MECHANICAL ENGINEER.
11. ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE TOWNSHIP OF EDWARDSBURGH/CARDINAL STANDARDS AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
12. ANY CHANGES MADE TO THIS PLAN MUST BE VERIFIED AND APPROVED BY KOLLAARD ASSOCIATES, INC.
13. THIS DRAWING IS PART OF KOLLAARD ASSOCIATES DESIGN REPORT # 221121.

No.	REVISION	DATE	BY
4.	UPDATED SEACAN LOCATION	23.APR.2024	NJR
3.	ISSUED IN RESPONSE TO SNCA 2ND REVIEW COMMENTS	FEB 28, 2024	NJR
2.	ISSUED IN RESPONSE TO SNCA REVIEW COMMENTS	JAN 30, 2024	NJR
1.	ISSUED IN RESPONSE TO FIRST REVIEW COMMENTS	OCT 30, 2023	NJR
0.	ISSUED FOR SPC AMENDMENT	MAY 31.2023	NJR

CONSULTANTS

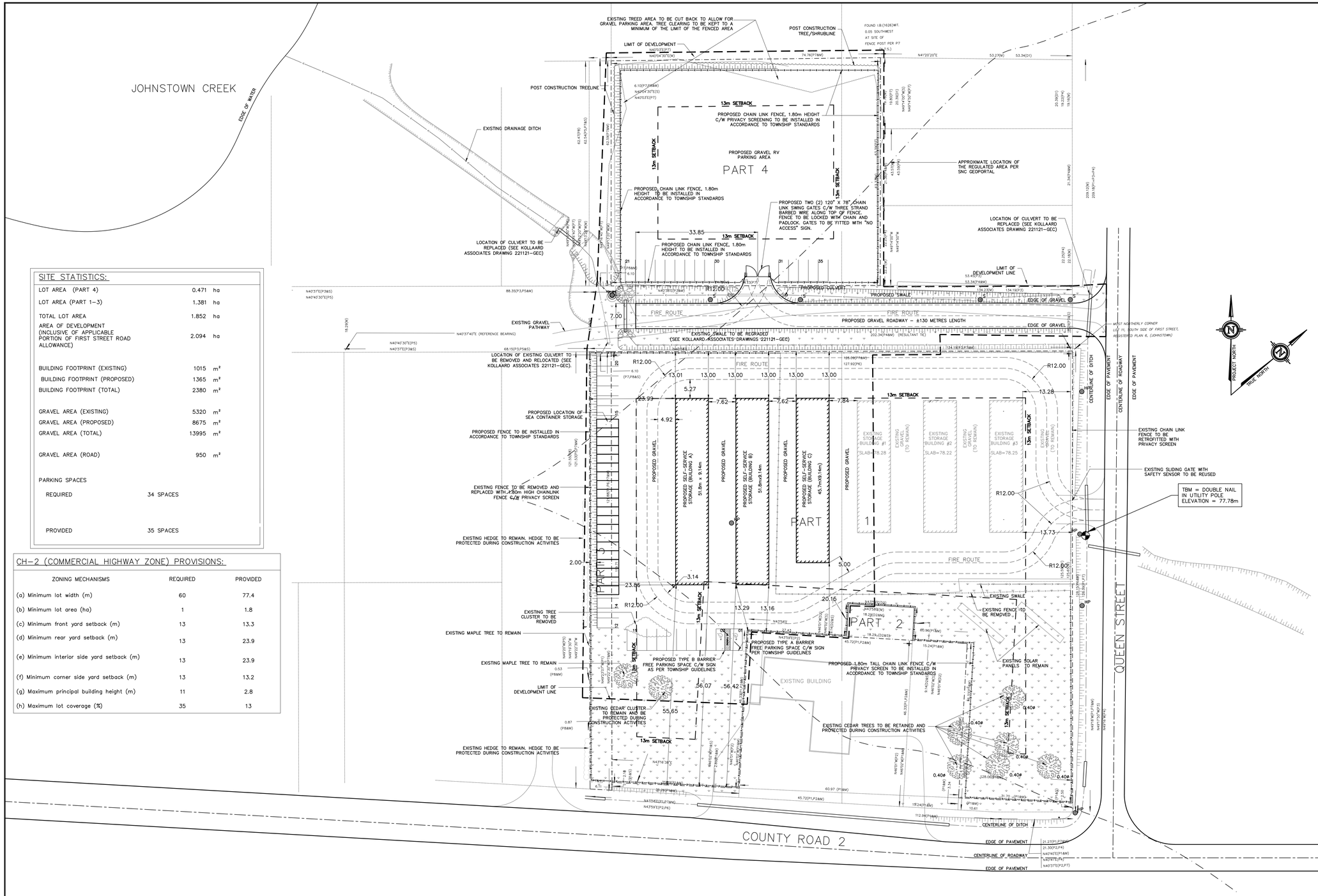
Kollaard Associates Engineers
BOX 189
210 PRESCOTT STREET
KEMPTVILLE, ONTARIO
K0G 1J0
FACSIMILE (613) 258-0475
(613) 860-0923

DESIGN: NJR
DRAWN: NJR
CHECKED: SD
APPROVED: SD

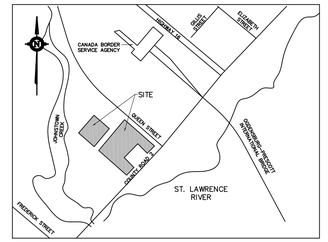
STAMP: LICENSED PROFESSIONAL ENGINEER — 23.APR.2024 — S. E. deWit — 100079612 — PROVINCE OF ONTARIO

CLIENT NAME: JOHNSTOWN MINI STORAGE
PROJECT NAME: PROPOSED STORAGE UNITS
PROJECT LOCATION: 2-8 QUEEN STREET, JOHNSTOWN, TOWNSHIP OF EDWARDSBURGH/ CARDINAL
DRAWING: PROJECT PHASING

PROJECT No.: 221121
DATE: 31.MAY.2023
SCALE: AS_NOTED
DRAWING No.: 221121-SP



SITE PLAN
SCALE = 1:500



KEY PLAN
NOT TO SCALE

SCALE 1:500 — 0 1 2 3 4 5 10 15 20 METRES

SITE STATISTICS:

LOT AREA (PART 4)	0.471	ha
LOT AREA (PART 1–3)	1.381	ha
TOTAL LOT AREA	1.852	ha
AREA OF DEVELOPMENT (INCLUSIVE OF APPLICABLE PORTION OF FIRST STREET ROAD ALLOWANCE)	2.094	ha
BUILDING FOOTPRINT (EXISTING)	1015	m^2
BUILDING FOOTPRINT (PROPOSED)	1365	m^2
BUILDING FOOTPRINT (TOTAL)	2380	m^2
GRAVEL AREA (EXISTING)	5320	m^2
GRAVEL AREA (PROPOSED)	8675	m^2
GRAVEL AREA (TOTAL)	13995	m^2
GRAVEL AREA (ROAD)	950	m^2
PARKING SPACES		
REQUIRED	34 SPACES	
PROVIDED	35 SPACES	

CH–2 (COMMERCIAL HIGHWAY ZONE) PROVISIONS:

ZONING MECHANISMS	REQUIRED	PROVIDED
(a) Minimum lot width (m)	60	77.4
(b) Minimum lot area (ha)	1	1.8
(c) Minimum front yard setback (m)	13	13.3
(d) Minimum rear yard setback (m)	13	23.9
(e) Minimum interior side yard setback (m)	13	23.9
(f) Minimum corner side yard setback (m)	13	13.2
(g) Maximum principal building height (m)	11	2.8
(h) Maximum lot coverage (%)	35	13

LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATIONS
- PROPOSED CURB ELEVATION
- PROPOSED MAINTENANCE HOLE TOP OF GRATE ELEVATION
- PROPOSED CATCH BASIN TOP OF GRATE ELEVATION
- PROPOSED DITCH/SWALE ELEVATION
- PROPOSED ELEVATION
- DRAINAGE SLOPE
- EXISTING DRAINAGE
- CENTRELINE OF ROAD
- EDGE OF ROAD
- TOP OF SLOPE
- PROPERTY LINE
- LIMIT OF DEVELOPMENT LINE
- UTILITY WIRES
- SILT FENCE
- OVERHEAD WIRE
- OVERLAND FLOW ROUTE
- EXISTING HYDRO POLE
- TEMPORARY BENCHMARK
- EXISTING HYDRO GUY WIRE ANCHOR
- FIRE ROUTE SIGNAGE

LANDSCAPING LEGEND

- GRASS AREAS
- GRAVEL

NOTES:
1. ALL DIMENSIONS ARE IN METRES, UNLESS OTHERWISE SPECIFIED; ALL ELEVATIONS ARE IN METRES AND ARE GEODETIC.
2. THIS IS NOT A LEGAL SURVEY.
3. BOUNDARY INFORMATION WAS DERIVED FROM H.A. KEN SHIPMAN SURVEYING LTD. FILE No. 23-13239
4. CLIENT IS RESPONSIBLE FOR ACQUIRING ALL NECESSARY PERMITS.
5. CONTRACTOR TO VERIFY THAT APPROPRIATE PERMITS HAVE BEEN ACQUIRED PRIOR TO ANY CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR LOCATION AND PROTECTION OF UTILITIES.
7. ALL DIMENSIONS TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION.
8. THIS DRAWING IS NOT FOR CONSTRUCTION UNTIL ALL APPROVALS HAVE BEEN GRANTED.
9. INSPECTION OF ROUGH GRADE BY KOLLAARD ASSOCIATES INC. AND TOWNSHIP OF EDWARDSBURGH/CARDINAL MUST BE CONDUCTED PRIOR TO PLACEMENT OF TOPSOIL OR SOD.
10. HYDRO SERVICE TO BE INSTALLED ACCORDING TO THE SPECIFICATIONS OF SERVICE PROVIDER AND THE MECHANICAL ENGINEER.
11. ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE TOWNSHIP OF EDWARDSBURGH/CARDINAL STANDARDS AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
12. ANY CHANGES MADE TO THIS PLAN MUST BE VERIFIED AND APPROVED BY KOLLAARD ASSOCIATES, INC.
13. THIS DRAWING IS PART OF KOLLAARD ASSOCIATES DESIGN REPORT # 221121.

No.	REVISION	DATE	BY
4.	UPDATED SEACAN LOCATION	23.APR.2024	NJR
3.	ISSUED IN RESPONSE TO SNCA 2ND REVIEW COMMENTS	FEB 28, 2024	NJR
2.	ISSUED IN RESPONSE TO SNCA REVIEW COMMENTS	JAN 30, 2024	NJR
1.	ISSUED IN RESPONSE TO FIRST REVIEW COMMENTS	OCT 30, 2023	NJR
0.	ISSUED FOR SPC AMENDMENT	MAY 31.2023	NJR

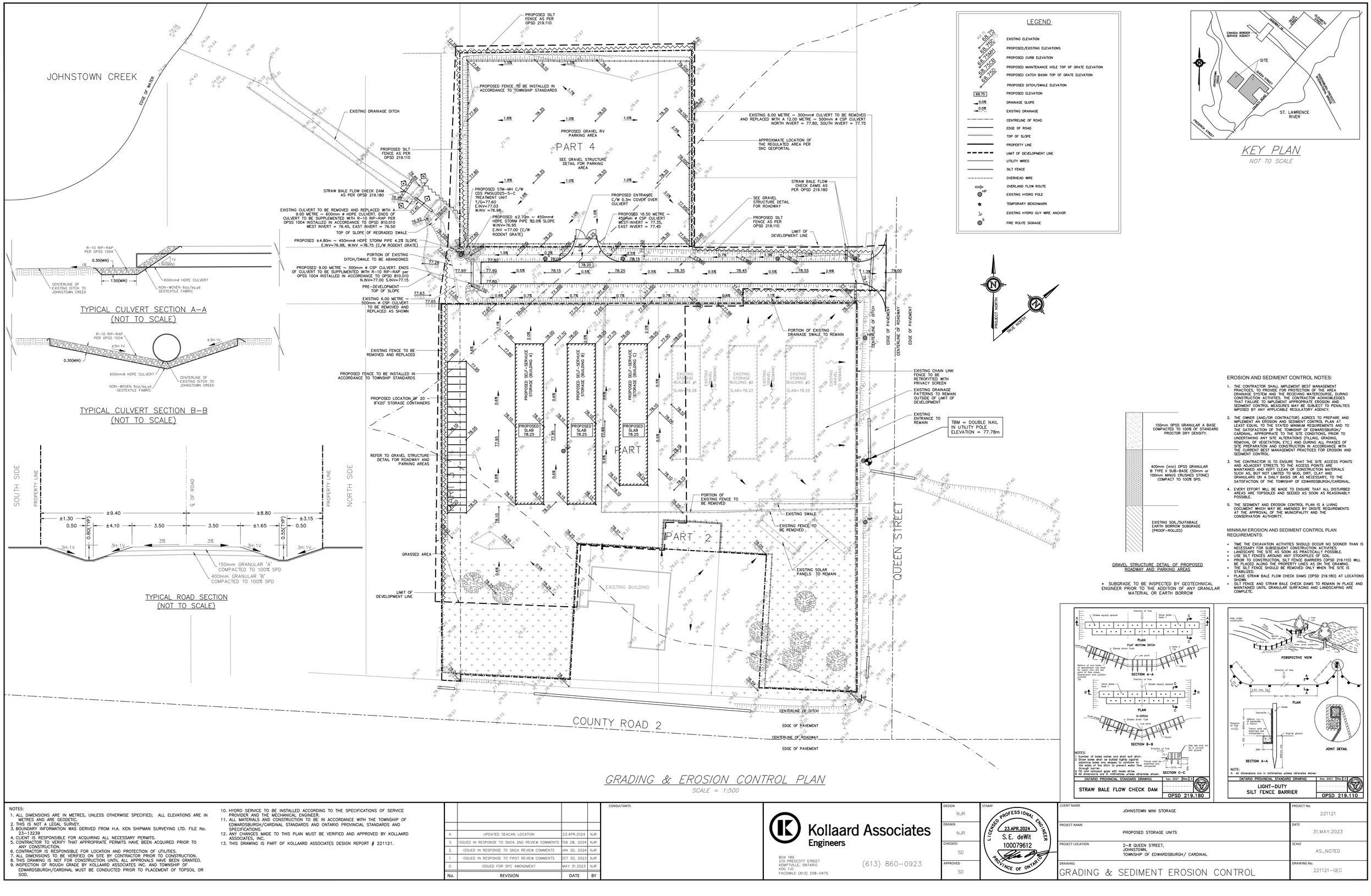
CONSULTANTS

Kollaard Associates Engineers
BOX 189
210 PRESCOTT STREET
KEMPTVILLE, ONTARIO
K0G 1J0
FACSIMILE (613) 258-0475
(613) 860-0923

DESIGN: NJR
DRAWN: NJR
CHECKED: SD
APPROVED: SD

STAMP: LICENSED PROFESSIONAL ENGINEER — 23.APR.2024 — S.E. deWit — 100079612 — PROVINCE OF ONTARIO

CLIENT NAME	JOHNSTOWN MINI STORAGE
PROJECT NAME	PROPOSED STORAGE UNITS
PROJECT LOCATION	2–8 QUEEN STREET, JOHNSTOWN, TOWNSHIP OF EDWARDSBURGH/ CARDINAL
DRAWING	SITE & LANDSCAPE PLAN
PROJECT No.	221121
DATE	31.MAY.2023
SCALE	AS_NOTED
DRAWING No.	221121-SP



LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATIONS
- PROPOSED CURB ELEVATION
- PROPOSED MAINTENANCE HOLE TOP OF GRATE ELEVATION
- PROPOSED CATCH BASIN TOP OF GRATE ELEVATION
- PROPOSED DITCH/SWALE ELEVATION
- PROPOSED ELEVATION
- DRAINAGE SLOPE
- EXISTING DRAINAGE
- CENTERLINE OF ROAD
- EDGE OF ROAD
- TOP OF SLOPE
- PROPERTY LINE
- LIMIT OF DEVELOPMENT LINE
- UTILITY WIRES
- SILT FENCE
- OVERHEAD WIRE
- OVERLAND FLOW ROUTE
- EXISTING HYDRO POLE
- TEMPORARY BENCHMARK
- EXISTING HYDRO GUY WIRE ANCHOR
- FIRE ROUTE SIGNAGE

KEY PLAN
NOT TO SCALE

TYPICAL CULVERT SECTION A-A
(NOT TO SCALE)

TYPICAL CULVERT SECTION B-B
(NOT TO SCALE)

TYPICAL ROAD SECTION
(NOT TO SCALE)

GRAVEL STRUCTURE DETAIL OF PROPOSED ROADWAY AND PARKING AREAS

- SUBGRADE TO BE INSPECTED BY GEOTECHNICAL ENGINEER PRIOR TO THE ADDITION OF ANY GRANULAR MATERIAL OR EARTH BORROW

EROSION AND SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. THE OWNER (AND/OR CONTRACTOR) AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN AT LEAST EQUAL TO THE STATED MINIMUM REQUIREMENTS AND TO THE SATISFACTION OF THE TOWNSHIP OF EDWARDSBURGH/ CARDINAL, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL.
3. THE CONTRACTOR IS TO ENSURE THAT THE SITE ACCESS POINTS AND ADJACENT STREETS TO THE ACCESS POINTS ARE MAINTAINED AND KEPT CLEAN OF CONSTRUCTION MATERIALS SUCH AS, BUT NOT LIMITED TO MUD, DIRT, CLAY AND GRANULARS ON A DAILY BASIS OR AS NECESSARY, TO THE SATISFACTION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL.
4. EVERY EFFORT WILL BE MADE TO ENSURE THAT ALL DISTURBED AREAS ARE TOPSOILED AND SEEDED AS SOON AS REASONABLY POSSIBLE.
5. THE SEDIMENT AND EROSION CONTROL PLAN IS A LIVING DOCUMENT WHICH MAY BE AMENDED BY ONSITE REQUIREMENTS AT THE APPROVAL OF THE MUNICIPALITY AND THE CONSERVATION AUTHORITY.

MINIMUM EROSION AND SEDIMENT CONTROL PLAN REQUIREMENTS:

- TIME THE EXCAVATION ACTIVITIES SHOULD OCCUR NO SOONER THAN IS NECESSARY FOR SUBSEQUENT CONSTRUCTION ACTIVITIES.
- LANDSCAPE THE SITE AS SOON AS PRACTICALLY POSSIBLE.
- USE SILT FENCES AROUND ANY STOCKPILES OF SOIL.
- PRIOR TO CONSTRUCTION, SILT FENCE BARRIERS (OPSD 219.110) WILL BE PLACED ALONG THE PROPERTY LINES AS ON THE DRAWING.
- THE SILT FENCE SHOULD BE REMOVED ONLY WHEN THE SITE IS STABILIZED.
- PLACE STRAW BALE FLOW CHECK DAMS (OPSD 219.180) AT LOCATIONS SHOWN.
- SILT FENCE AND STRAW BALE CHECK DAMS TO REMAIN IN PLACE AND MAINTAINED UNTIL GRANULAR SURFACING AND LANDSCAPING ARE COMPLETE.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev. 3
STRAW BALE FLOW CHECK DAM		OPSD 219.180

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev. 3
LIGHT-DUTY SILT FENCE BARRIER		OPSD 219.110

GRADING & EROSION CONTROL PLAN
SCALE = 1:500

NOTES:
1. ALL DIMENSIONS ARE IN METRES, UNLESS OTHERWISE SPECIFIED; ALL ELEVATIONS ARE IN METRES AND ARE GEODETIC.
2. THIS IS NOT A LEGAL SURVEY.
3. BOUNDARY INFORMATION WAS DERIVED FROM H.A. KEN SHIPMAN SURVEYING LTD. FILE No. 23-13239
4. CLIENT IS RESPONSIBLE FOR ACQUIRING ALL NECESSARY PERMITS.
5. CONTRACTOR TO VERIFY THAT APPROPRIATE PERMITS HAVE BEEN ACQUIRED PRIOR TO ANY CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR LOCATION AND PROTECTION OF UTILITIES.
7. ALL DIMENSIONS TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION.
8. THIS DRAWING IS NOT FOR CONSTRUCTION UNTIL ALL APPROVALS HAVE BEEN GRANTED.
9. INSPECTION OF ROUGH GRADE BY KOLLAARD ASSOCIATES INC. AND TOWNSHIP OF EDWARDSBURGH/CARDINAL MUST BE CONDUCTED PRIOR TO PLACEMENT OF TOPSOIL OR SOD.
10. HYDRO SERVICE TO BE INSTALLED ACCORDING TO THE SPECIFICATIONS OF SERVICE PROVIDER AND THE MECHANICAL ENGINEER.
11. ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE TOWNSHIP OF EDWARDSBURGH/CARDINAL STANDARDS AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
12. ANY CHANGES MADE TO THIS PLAN MUST BE VERIFIED AND APPROVED BY KOLLAARD ASSOCIATES, INC.
13. THIS DRAWING IS PART OF KOLLAARD ASSOCIATES DESIGN REPORT # 221121.

No.	REVISION	DATE	BY
4.	UPDATED SEACAN LOCATION	23.APR.2024	NJR
3.	ISSUED IN RESPONSE TO SNCA 2ND REVIEW COMMENTS	FEB 28, 2024	NJR
2.	ISSUED IN RESPONSE TO SNCA REVIEW COMMENTS	JAN 30, 2024	NJR
1.	ISSUED IN RESPONSE TO FIRST REVIEW COMMENTS	OCT 30, 2023	NJR
0.	ISSUED FOR SPC AMENDMENT	MAY 31,2023	NJR

CONSULTANTS

Kollaard Associates Engineers
BOX 189
210 PRESCOTT STREET
KEMPTVILLE, ONTARIO
K0G 1J0
FACSIMILE (613) 258-0475
(613) 860-0923

DESIGN: NJR
DRAWN: NJR
CHECKED: SD
APPROVED: SD

STAMP: LICENSED PROFESSIONAL ENGINEER — 23.APR.2024 — S. E. deWit — 100079612 — PROVINCE OF ONTARIO

CLIENT NAME	JOHNSTOWN MINI STORAGE
PROJECT NAME	PROPOSED STORAGE UNITS
PROJECT LOCATION	2-8 QUEEN STREET, JOHNSTOWN, TOWNSHIP OF EDWARDSBURGH/ CARDINAL
DRAWING	GRADING & SEDIMENT EROSION CONTROL
PROJECT No.	221121
DATE	31.MAY.2023
SCALE	AS_NOTED
DRAWING No.	221121-GEC

SCHEDULE “C”

Site Plan Control Agreement

STORMWATER MANAGEMENT

Prepared by Kollaard Associates, dated February 28, 2024

STORMWATER MANAGEMENT REPORT
Proposed Self-Service Storage Units
2-8 Queen Street
Johnstown, Ontario

Prepared For:
Johnstown Mini Storage

PROJECT #: 221121

DISTRIBUTION

1 Copy - Township of Edwardsburgh Cardinal
1 Copy - Johnstown Mini Storage
1 Copy - Kollaard Associates Inc

Rev 0 – Issued for Site Plan Control	May 31, 2023
Rev 1 – Issued in response to preliminary review comments	October 30, 2023
Rev 2 – Issued in response to second review comments	January 30, 2024
Rev 3 – Issued in response to third review comments	February 28, 2024

LIST OF APPENDICES

LIST OF DRAWINGS

1.0 INTRODUCTION

Johnstown Mini Storage has retained the services of Kollaard Associates Inc. (Kollaard) to complete a stormwater management design for proposed expansion of the existing storage facility. The Johnstown Mini Storage is located in an area legally described as *Parts of Lot 11 & 12, Registered Plan 6 in the Municipality Edwardsburgh Cardinal, County of Grenville.* An updated boundary survey has been completed by H.A. Ken Shipman Surveying Ltd., and has been used in the design drawings for the proposed storage units.

The Johnstown Mini Storage is located on a combined 1.76 hectare parcel (two lots shown on the boundary survey as Part 1 and Part 4, which are separated by an unmaintained road allowance) of land that is enclosed by County Road 2 to the Southeast, Queen Street to the northeast, and the unmaintained road allowance of First street to the northwest.

For the remainder of this report County Road 2 will be considered to be on an east west axis.

This report describes our recommendations for storm water management in support of the proposed storage facility expansion. Supporting sample calculations are provided. The report is to be read in conjunction with the stormwater management system design presented in the Kollaard Civil Drawings: 221121 –PRE, 221121 – POST, 221121 – GEC, 221121 – SP.

1.1 Background

The Johnstown Mini Storage currently consists of three storage unit buildings accessed from of Queen Street. The proposed units as part of the development are to be built to the west of the existing storage buildings. There is also a vacant parcel to the north of the First Street road allowance, referenced on the boundary survey as Part 4, which will be developed into a gravel parking area to be used for RV storage. It is noted that a small parcel to the west of Part 1, which is referenced on the boundary survey as Part 3 is to be acquired from the township as part of the proposed development. The existing site is a dry facility with no water or sanitary services.

A geotechnical investigation was completed for the proposed development. Geotechnical Investigation: Proposed Self-Storage Buildings, 8 Queen Street by Kollaard Associates Inc. dated November 8, 2022. From the report, the upper subsurface conditions consist of; in

the area of the proposed storage units topsoil overlying silty sand or topsoil overlying silty clay or fill materials overlying topsoil; in the area of the proposed gravel area, Fill materials overlying topsoil

1.2 Proposed Development

The proposed development will consist of the construction of three storage unit buildings, and a gravel parking area. The proposed portion of the development does not require any water or sanitary services. The portion of the parcel subject to the proposed storage units is currently undeveloped and is a maintained grassed area. The unmaintained road allowance known as First Street is to be developed as a gravel roadway for access to the above mentioned RV storage area. Part 3 has an area of 742 m^2, bringing the total area of the parcel to about 1.84 hectares.

The proposed development is to be divided into two phases; the first phase will consist of the development of the south portion of the site including the construction of the three self storage units, re-grading the existing swale within the first street road allowance, replacement/relocation of two culverts in the drainage network, and installation of a treatment unit, and the second phase of the development consisting of the development of the First Street Road allowance to allow access to a gravel parking area in the north parcel. The phasing of the development is illustrated on the drawing 221121-PH. The first phase of the development is to begin immediately, with anticipated construction pace of 1 building per year (3 years total). At this time it is anticipated that the second phase will be developed in 2027

1.3 Summary

The proposed stormwater management plan for the proposed storage units will ensure that the increased runoff as a result of the proposed development will be discharged from the site in such a manner to satisfy the criteria of the Township of Edwardsburgh Cardinal. The use of sheet flow in combination with roadside swales and existing drainage swale will allow for runoff to be channeled away from the municipal infrastructure into the Johnstown Creek. Lot grading in the area of the proposed development will runoff into a drainage swale that leads to the Johnstown creek. The drainage that runs into the roadway infrastructure will be slightly reduced as a result of the development. Capacity of the

receiving drainage system for the new development area has been assessed to ensure adequacy as a result of the increased runoff from the development.

2.0 STORMWATER MANAGEMENT DESIGN

The subject lands are within the Township of Edwardsburgh Cardinal. Stormwater management guidelines set out by the Ministry of the Environment, *Stormwater Planning and Design Manual* (2003) and Municipality established the parameters for the Stormwater Management Plan design at the development site.

2.1 Design Criteria

2.1.1 Quantity Control Criteria

The quantity control criteria for the site has been provided by the Township of Edwardsburgh/Cardinal and are as follows:

- Include a specific reference to impacts on the County/Township Road System
- Indicate that all surface drainage from the development will be discharged internally, thus not impacting the County/Township infrastructure or;
- include a statement which clearly indicates the quantity of water being discharged into the road allowance (during normal flows) and further notes that the infrastructure will not be negatively impacted based on acceptable design standards

Additional criteria was provided by the South Nation Conservation Authority as follows:

- The drainage area and imperviousness to Johnstown Creek will increase under developed conditions; however, no quantity control is proposed. Per SNC pre-consultation comments (not provided to Kollaard Associates prior to the review comment January 8, 2024), proposed flows to the PSW and Johnstown Creek must be controlled to pre-development rates for all storm events up to and including the 100-year event.
- Feedback from the Township of Edwardsburgh Cardinal states that "… the application at this time is only meant to apply to apply to phase 1 of the development (south parcel). Most of the south parcel is outside of SNC's

permitting area, but a permit will be needed for the culvert on the neighbour's property and that there is capacity in the channel to handle it so that it doesn't cause flooding for the neighbor. Prior to an application for phase 2, the SWM plan could be updated to address flow from the north parcel."

2.1.2 Quality Control Criteria

The quality control criteria for the site has been provided by the Township of Edwardsburgh/Cardinal following the preliminary review completed August 8, 2023 and are as follow:

- 80% TSS Removal. Engineer to provide an opinion on whether an oil/grit separator is required.

2.2 Guidelines, Manuals and Reports

The following guidelines and manuals were utilized in the creation of the stormwater management design and the preparation of this report.

Stormwater Management Planning and Design Manual
Ministry of the Environment (now known as MECP), March 2003
(SWMP Design Manual)

City of Ottawa Sewer Design Guidelines: Second Edition
City of Ottawa, October 2012

Visual OTTHYMO V2.0: Reference Manual
Greenland International Consulting Inc., July 2002

Part 650 Hydrology National Engineering Handbook – Chapter 15 Time of Concentration
United States Department of Agriculture (USDA Chapter 15)

Urban Hydrology for Small Watersheds Technical Release 55
United States Department of Agriculture (USDA TR55)

Technical Guide – River &Stream Systems: Erosion Hazard Limit

Ontario Ministry of Natural Resources – Water Resources Section, 2002

Ontario Watershed Information Tool (OWIT)
Ontario Ministry of Natural Resources and Forestry, 2023

3.0 PROPOSED HYDROLOGIC MODEL

3.1 Design Storms

Rainfall intensity data used for the model was derived from the intensity equation:

$$I = \frac{A}{(T_d + C)^B}$$

Where:

I = Intensity (mm/hr)
T_d = Time of duration (min)
A,B,C = regression constants for each return period

The information obtained from the IDF curve equations and summary data was used to generate 6 hour and 12 hour City of Ottawa Chicago Storms Distributions in 5 year, 10 year, and 100 year events. The IDF formulae obtained from the City of Ottawa Chicago storm distributions and utilized are as follows:

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$

The rainfall intensities for each event was then compared and confirmed with the Ministry of Ontario IDF Curve lookup tool. The IDF Curve and rainfall summary data obtained from the Ministry of Ontario website is included in Appendix A following the text report.

3.2 Methodology

The hydrologic modeling software, Visual OTTHYMO (V6.2) was used to assess pre- and post-development stormwater conditions at the site to verify the capacity of the existing drainage network into the Johnstown Creek.

The catchment area conditions were calculated using both NASHYD watershed and STANHYD watershed commands. The catchment areas having an impervious ratio of more than 20 percent were calculated the STANHYD watershed command.

The NASHYD hydrograph method uses the Nash instantaneous unit hydrograph which is made of a cascade of 'N' linear reservoirs and is used to model rural areas.

The STANDHYD hydrograph method is used to simulate runoff flows from urban watersheds. The program uses two parallel standard instantaneous unit hydrographs modeled at the same time to combine the effective rainfall intensity over the pervious and impervious surfaces.

The post-development conditions were modeled for quantity control purposes utilizing Chicago storm distributions of various duration and magnitude as mentioned above.

The resulting pre- and post-development models contain the storm events as follows:

Simulation 1 - 6 hour 5 year Chicago
Simulation 2 - 12 hour 5 year Chicago
Simulation 3 - 6 hour 10 year Chicago
Simulation 4 - 12 hour 10 year Chicago
Simulation 5 - 6 hour 100 year Chicago
Simulation 6 - 12 hour 100 year Chicago

Detailed output data from the above Visual OTTHYMO model is provided in Appendix B and is summarized in Section 5.0 of this report.

3.3 OTTHYMO Storm Analysis Variables

The **NASHYD** command uses the following inputs:

DT – Simulation time step increment (min) – must be shorter than TP
Area – Watershed or catchment area (hectares)
DWF – A constant Dry Weather Flow or Baseflow (m^3/s) assumed to be 0 (doesn't change from pre to post development)
CN – SCS Modified Curve Number
IA – Initial Abstraction (mm)
N – Number of Linear reservoir used for derivation of the Nash Unit Hydrograph
TP – Unit hydrograph time to peak (hr)

The **STANDHYD** command uses the following inputs:

DT – Simulation time step increment (min) – must be shorter than TP
Area – Watershed or catchment area (hectares)
DWF – A constant Dry Weather Flow or Baseflow (m^3/s) assumed to be 0 (doesn't change from pre to post development)
XIMP – Directly connected imperviousness (ratio of area which is impervious and directly connected to the storm sewer or discharge point
TIMP – Total impervious area (ratio of total impervious area to total catchment area)
LOSS – Loss method (Modified SCS Curve number)
SLPP – Pervious area ground slope
LGP – Length of flow over pervious area
MNP – manning's roughness coefficient for sheet flow over pervious area
SCP – Pervious area storage coefficient (set to allow program to calculate)
DPSI – Available impervious area depression storage
SLPI – Impervious area ground slope
LGI – Flow length of impervious area
MNI – Manning's Roughness coefficient for impervious area (channel flow)
SCI – Impervious area storage coefficient (set to allow program to calculate)

3.3.1 Curve Numbers

The NasHyd hydrograph method which uses the SCS loss method for pervious areas was used to model post development conditions of the proposed storage units. Runoff Curve Numbers (CN) are utilized in the SCS hydrology method. The Curve Number is a function of

soil type, ground cover, and antecedent moisture conditions. The soil type was chosen to be Group , considering the fine to medium grained sand and silty clay underlying the topsoil and the fill materials at the site. Group C represents a conservative estimate as sandy soils would typically facilitate a Group B condition, in the absence of the fill and silty clay material encountered. For the purpose of analysis presented in this report the surface cover for undeveloped areas was considered as Pasture Grassland in good condition with a CN value equal to 74. The CN value was taken from the the United States Department of Agriculture Urban Hydrology for Small Watersheds Technical Release 55 (USDA TR55).

3.3.2 Initial Abstraction and Potential Storage

The initial abstraction includes all losses before runoff begins, and includes water retained in surface depressions, water taken up by vegetation, evaporation, and infiltration. This value is related to characteristics of the soil and the soil cover. Initial abstraction is a function of the potential storage and is generally assumed to be equal to 0.2 S where S is the potential storage.

It is considered that for lower CN values, the relationship IA = 0.2S tends to overestimate the initial abstraction resulting in underestimated peak runoff. As such, suggested guidelines are as follows:

CN ≤ 70 IA = 0.075S
CN > 70 ≤ 80 IA = 0.10S
CN > 80 ≤ 90 IA = 0.15S
CN > 90 IA = 0.2S

The potential storage S is related to the runoff coefficient as follows:

S = (25400/CN) - 254

3.3.3 Time of Concentration and Time to Peak

The time to peak is typically considered to be two thirds of the time of concentration of a catchment area. The time of concentration of each catchment was determined using the Velocity method. The velocity method assumes that the time of concentration is the sum of travel times for segments along the hydraulically most distant flow path. The segments used in the velocity method may be of three types: sheet flow T_s, shallow concentrated flow T_{sc}, and open channel flow T_c. Example calculation of time of Concentration for the pre-development catchment OS-1:

Travel time for Sheet Flow:

$$T_s = \frac{0.007(nl)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

Where
T_s = travel time, h
n = Manning's roughness coefficient sheet flow = 0.13
l = sheet flow length, 54.39 ft
P_2 = 2-year 24-hour rainfall, = 2.08 inches
S = Slope of land surface ft/ft = 0.005
T_s = 0.19 hours

Rainfall quantities and intensities were obtained using the Ontario Ministry of Transport IDF lookup tool. The IDF curve is included in Appendix A.

Travel time for shallow concentrated flow:

The flow velocity used to calculate the time of travel for shallow concentrated flow was determined using Figure 15-4 of Chapter 15 of the USDA handbook. This chart can be used to estimate the velocity when the slope and ground cover are known. The ground cover used in reading Figure 15-4 catchment CA-1, subject to shallow concentrated flow, was considered to be short-grass pasture. The slope was calculated to be on average 0.6% based on the existing topography. Figure 15-4 indicates a velocity of V= 0.55 ft/s or 0.17 m/s. The distance of shallow concentrated flow is the distance between the point at which sheet flow ended and open channel flow begins or the end of the catchment. Travel time is given by:

$$T_{sc} = \frac{l}{3600\,V}$$

Where
T_{sc} = travel time, h
l = distance of shallow concentrated flow = 77 m
V = average velocity = 0.17 m/s
T_{sc} = 0.13 hrs

There was no open channel flow considered during pre-development conditions. The open channel flow during post-development conditions was modelled using the Route Channel and the Route Pipe Command in OTTHYMO.

The total time of concentration for the pre-development catchment PRECA-1 is therefore equal to

Tt = 0.19 + 0.13 = 0.32 hrs.

The time to peak is therefore equal to 0.32 x 2/3 = 0.21 hrs = 12.8 mins.

3.3.4 Manning Coefficients

The Manning Roughness (n) Coefficients for overland flow selected for impervious site areas (MNI) was assumed to be 0.013 based on the CofO Guidelines: Appendix 6-C Manning Coefficient values for street and gutter flow assuming asphalt. This represents a conservative approach as the area of the proposed development is gravel, which would have a higher roughness coefficient. However, a lower roughness coefficient was used to ensure that in the event that the owner was to pave the parking area, the additional runoff was accounted for.

The Manning's roughness coefficient for pervious surfaces (MNP) was selected to be 0.25 based on sheet flow through good quality grass in the pervious areas.

4.0 PRE-DEVELOPMENT STORMWATER ANALYSIS

The existing runoff on the site in pre-development conditions is divided between two catchment areas. The first catchment area outlets into a drainage system, which discharges into Johnstown Creek, to the west of the site (to be referred to as the Johnstown Creek catchment area. The second outlet for the site is into the municipal roadside infrastructure east of the site (referred to as the Queen Street catchment). The Johnstown Creek catchment is comprised of four sub-catchment area; PRECA-1, PRECA-2, PRECA-3, PREOS-1. The Queen Street catchment is comprised of two sub-catchements; PRECA-4, PREOS-2. The sub-catchments have been illustrated on the drawing 221121-PRE.

4.1 Off Site Runoff Conditions and Contributing Areas

The western border of the site receives offsite runoff from the property currently occupied by a hotel. The runoff from this offsite drainage is conveyed to the north towards the existing culvert, which crosses the right of way referred to as First Street. For the purpose of this analysis the area contributing offsite runoff was labeled as sub-catchment PREOS-1.

The property which borders the southern property line is currently occupied by a gas station and marine mechanic shop. The drainage from this lot is primarily directed towards the north and east onto the site. This area has been labeled as sub catchment OS-2. The portion of the lot in front of the building drains towards County Road 2 into the municipal infrastructure. The roof drainage and remaining surface drainage is directed towards the north onto the lot. Drainage is ultimately directed into a swale to the south of the existing storage buildings and drains into the roadside municipal infrastructure and does not have an effect on the portion of the site subject to development.

For an illustration of offsite catchments see Kollaard drawing #221121-PRE.

4.2 Site Runoff Conditions

As previously mentioned above, the site currently consists of three self-storage buildings surrounded by a gravel drive/parking area. The remainder of the lot consists of a combination of young to mature tree and maintained grassed area. The drainage along the west portion of the lot is directed towards the north to an existing drainage swale on the northern property line bordering the right of way known as First Street. The swale directing runoff towards the west currently discharges through a 500mm diameter CSP culvert which

runs underneath the existing pathway constructed within the road allowance of First Street and ultimately discharges into Johnstown Creek. This portion of the site was assigned the pre-development sub-catchment label, PRECA-1.

The surface runoff along the east portion of the lot drains via sheet flow towards the north and east into the municipal infrastructure. The high point of the lot is along the existing storage building #1. For the purpose of the storm analysis, the roof of the storage building was assumed to divide the runoff equally towards the east and west catchments. This site was assigned the pre-development sub-catchment label, PRECA-4

As previously mentioned, a portion of the development consists of a parcel to the north of the First Street road allowance shown on the boundary survey as Part 4. Part 4 currently consists of short maintained grass and drains via sheet flow towards the south and west. The portion of Part 4 that drained to the south drained over the First Street and into the above mentioned drainage swale that outlets into Johnstown Creek. This site was assigned the pre-development sub-catchment label, PRE-CA2. The remaining portion drains via sheet flow towards the portion of the drainage system immediately upstream of Johnstown Creek. This catchment was assigned the pre-development sub-catchment label PRE-CA3

For an illustration of pre-development sub-catchments see Kollaard drawing #221121-PRE.

4.3 Pre-development Runoff Coefficient

Pre-development site conditions are summarized in the following Table 4-1.

Table 4-1 – Summary of Pre-Development Site Conditions

Sub-Catchment	Runoff Coefficient		Area (ha)
	5, 10-year	100-year	
PRECA-1	0.31	0.38	0.951
PRECA-2	0.20	0.25	0.254
PRECA-3	0.20	0.25	0.216
PRECA-4	0.48	0.59	0.690
PREOS-1	0.20	0.25	0.227
PREOS-2	0.40	0.47	0.185

4.4 Pre-Development OTTHYMO Parameters

Based on the ground surface cover, the OTTHYMO input parameters for the pre-development on-site and off-site conditions can be summarized on Table 4-2 below. It is noted that the Runoff Curve Numbers for off-site conditions are not affected by the proposed development and are the same in post-development conditions as in pre-development. Refer to 221121-PRE in Appendix A as well as the OTTHYMO Schematic shown in Appendix B for an illustration of the specified catchment areas.

Table 4-2 OTTHYMO Input Parameters for Pre-Development Conditions

OTTHYMO NASHYD PARAMETERS											
NHYD #	NAME	OUTLET #	DT [min]	AREA [ha]	DWF [m^3/s]	CN	IA [mm]	N	TP [hr]	STORM INDEX	RAIN [mm/hr]
1	PRE CA-1	10	5	0.941	0	74	8.92	3	0.35	1	0
2	PRE CA-2	10	5	0.253	0	74	8.92	3	0.17	1	0
4	PRE CA-3	9	5	0.216	0	74	8.92	3	0.17	1	0
5	OS-1	8	5	0.220	0	74	8.92	3	0.27	1	0
6	OS-2	7	5	0.185	0	74	8.92	3	0.17	1	0

OTTHYMO STANHYD PARAMETERS											
NHYD #	NAME	OUTLET	DT [min]	AREA [ha]	TIMP	XIMP	DWF [m^3/s]	Loss	SLPP [%]	LGP [m]	MNP
4	PRE CA-4	7	5	0.690	0.516	0.516	0	Horton's Equation	0.8	59.9	0.25

OTTYMO STANHYD PARAMETERS (Cont.)									
NHYD #	SCP [hr]	DPSI [mm]	SLPI [%]	LGI TYPE	LGI [m]	MNI	SCI [hr]	STORM INDEX	RAIN [mm/hr]
4	0	1.57	0.24	Auto	64.0	0.013	0	1	0

4.5 Pre-development Runoff Flows

In order to assess the impact of the proposed development on the receiving catchment areas, the pre-development conditions were modeled to determine the runoff rates for each storm event.

Appendix B contains the OTTHYMO detailed output file for the last link in the model. The detailed output file for the last link summarizes the post-development flows exiting the proposed development. Table 4-3 and Table 4-4 below summarizes the peak runoff rate and runoff volume from the model during each respective storm event contributing to the runoff into the Johnstown Creek and County infrastructure respectively.

Table 4-3: Pre Development Peak Runoff Rates and Runoff Volumes to Johnstown Creek

Design Storm Event	**Pre-Development Runoff Rates**		
	Pre-Development Runoff Rate (m^3/s)	**Runoff Volume (mm)**	**Time to Peak (hrs)**
1. 6 HR 5yr Chicago	0.041	12.42	2.25
2. 12 HR 5 YR CHICAGO	0.047	16.33	4.25
3. 6 HR 10 YR CHICAGO	0.058	16.82	2.25
4. 12 HR 10 YR CHICAGO	0.066	21.75	4.25
5. 6 HR 100 YR CHICAGO	0.123	33.08	2.25
6. 12 HR 100 YR CHICAGO	0.137	41.40	4.25

Table 4-4: Pre Development Peak Runoff Rates and Runoff Volumes to County Infrastructure.

Design Storm Event	Pre-Development Runoff Rates		
	Pre-Development Runoff Rate (m^3/s)	Runoff Volume (mm)	Time to Peak (hrs)
1. 6 HR 5yr Chicago	0.106	25.07	2.00
2. 12 HR 5 YR CHICAGO	0.108	29.27	4.00
3. 6 HR 10 YR CHICAGO	0.129	31.11	2.00
4. 12 HR 10 YR CHICAGO	0.133	36.07	4.00
5. 6 HR 100 YR CHICAGO	0.215	51.48	2.00
6. 12 HR 100 YR CHICAGO	0.222	58.91	4.00

5.0 POST-DEVELOPMENT STORMWATER ANALYSIS

In general, the existing drainage patterns of the site will remain relatively unchanged as a result of the proposed development, with one minor change to the catchment areas. The division line between the Queen Street catchment area and Johnstown Creek catchment area, which was previously along the centre of existing storage building #1 has been shifted to the centre of existing storage building #2. The runoff in the Queen Street catchment area is reduced as a result of the proposed grading, which will direct more water to the Johnstown Creek catchment area than in pre-development conditions. Since the proposed grading directs more water to the Johnstown Creek Catchment area, the sub-catchment area CA-1 increases in size from the pre-development to post-development conditions, and sub-catchment area CA-4 decreases in size from pre-development to post-development conditions. The area of the site subject to the proposed development will drain to the north and west and discharge into Johnstown Creek. A limit of development has been defined on the drawing set, which shows the portion of the site subject to development. Runoff from this area is directed towards Johnstown Creek, away from the municipal infrastructure. The runoff generated from the rooftops of the storage buildings, gravel drive areas and grassed area will be directed by means of sheet flow and shallow swales towards the right of way along First Street.

The offsite runoff from the property to the west, labeled as sub-catchment OS-1 is outside of the limit of development, but was still used for the OTTHYMO model because it was contributing runoff to the drainage outlet. The area of the proposed storage buildings and

relocated storage containers conveys drainage from the south towards the northern property line. The catchment area was assigned the label CA-1.

The proposed gravel RV Storage area on Part 4 was split into two catchment areas. One of the sub-catchment areas, labeled as CA-2 conveys drainage into the roadside swale that will be discussed later in this report. The remaining sub-catchment area, labeled as CA-3, directs runoff to the west into a treed area, which will intersect the drainage swale that ultimately outlets into Johnstown Creek. The catchment areas CA-4 and OS-2 while outside of the limit of development were also modeled in post-development conditions to assess the impact on the County Infrastructure.

For a detailed illustration of post-development catchments and flow paths see Kollaard drawing #221121-POST in conjunction with the OTTHYMO Post-Development model schematic in Appendix C for phase 1 and Appendix D for phase 1 and 2 combined.

5.1 Post-development Runoff Coefficient

Post-development site conditions are summarized in the following Tables 5-1 and Table 5-2. In phase 1 of the project, the gravel parking area and roadway are not to be developed. As such, the catchments CA-2 and CA-3 will remain as grassed area. As a conservative approach, the gravel area for the roadway for the proposed First Street road development was included in the calculations. This was done so that following the completion of phase 1 of the project, the catchment would not need to be reassessed during phase 2.

Table 5-1 – Summary of Post-Development Site Conditions – Phase 1

Sub-Catchment	Runoff Coefficient		Area (ha)
	5, 10-year	100-year	
CA-1	0.59	0.72	1.038
CA-2	0.20	0.25	0.368
CA-3	0.20	0.25	0.216
CA-4	0.46	0.56	0.495
OS-1	0.20	0.25	0.227
OS-2	0.40	0.47	0.184

Table 5-2 – Summary of Post-Development Site Conditions – Phase 1 and 2 combined

Sub-Catchment	Runoff Coefficient		Area (ha)
	5, 10-year	100-year	
CA-1	0.59	0.72	1.038
CA-2	0.62	0.78	0.407
CA-3	0.70	0.88	0.177
CA-4	0.46	0.56	0.495
OS-1	0.20	0.25	0.227
OS-2	0.40	0.47	0.184

5.2 Post-Development OTTHYMO Parameters

Based on the ground surface cover, the OTTHYMO input parameters for the post-development on-site and off-site conditions can be summarized on Table 5-3 and Table 5-4 below. It is noted that the Runoff Curve Numbers for off-site conditions are not affected by the proposed development and are the same in post-development conditions as in pre-development. Refer to 221121-POST in Appendix A as well as the OTTHYMO Schematic shown in Appendix C and Appendix D for an illustration of the specified catchment areas. The input parameters of catchments CA-4 and OS-2 have been separated and included on Table 5-5 below as those catchment areas discharge to the county infrastructure and do not contribute to Johnstown Creek.

Table 5-3 OTTHYMO Input Parameters Phase 1

OTTHYMO NASHYD PARAMETERS											
NHYD #	NAME	OUTLET #	DT [min]	AREA [ha]	DWF [m^3/s]	CN	IA [mm]	N	TP [hr]	STORM INDEX	RAIN [mm/hr]
4	OS-1	8	5	0.227	0	74	8.92	3	0.29	1	0
15	CA-2	17	5	0.368	0	74	8.92	3	0.17	1	0
16	CA-3	11	5	0.216	0	74	8.92	3	0.17	1	0

OTTHYMO STANHYD PARAMETERS											
NHYD #	NAME	OUTLET	DT [min]	AREA [ha]	TIMP	XIMP	DWF [m^3/s]	Loss	SLPP [%]	LGP [m]	MNP
1	CA-1	17	5	1.04	0.597	0.298	0	Horton's Equation	0.5	123	0.25

OTTYMO STANHYD PARAMETERS (Cont.)									
NHYD #	SCP [hr]	DPSI [mm]	SLPI [%]	LGI TYPE	LGI [m]	MNI	SCI [hr]	STORM INDEX	RAIN [mm/hr]
1	0	1.57	0.6	Auto	83.37	0.013	0	1	0

Table 5-4 OTTHYMO Input Parameters Phase 1 and 2 combined

OTTHYMO NASHYD PARAMETERS											
NHYD #	NAME	OUTLET #	DT [min]	AREA [ha]	DWF [m^3/s]	CN	IA [mm]	N	TP [hr]	STORM INDEX	RAIN [mm/hr]
4	OS-1	8	5	0.227	0	74	12.99	3	0.29	1	0

OTTHYMO STANHYD PARAMETERS											
NHYD #	NAME	OUTLET	DT [min]	AREA [ha]	TIMP	XIMP	DWF [m^3/s]	Loss	SLPP [%]	LGP [m]	MNP
1	CA-1	9	5	1.04	0.598	0.298	0	Horton's Equation	0.6	135	0.25
2	CA-2	10	5	0.41	0.61	0.305	0		1.0	55	0.25
3	CA-3	11	5	0.18	0.71	0.355	0		1.6	45	0.25

OTTYMO STANHYD PARAMETERS (Cont.)									
NHYD #	SCP [hr]	DPSI [mm]	SLPI [%]	LGI TYPE	LGI [m]	MNI	SCI [hr]	STORM INDEX	RAIN [mm/hr]
1	0	1.57	0.6	Auto	122.9	0.013	0	1	0
2	0	1.57	0.6	Auto	87.35	0.013	0	1	0
3	0	1.57	0.6	Auto	44.67	0.013	0	1	0

Table 5-5 OTTHYMO Input Parameters for catchments discharging to County infrastructure (P1 and P2)

OTTHYMO NASHYD PARAMETERS											
NHYD #	NAME	OUTLET #	DT [min]	AREA [ha]	DWF [m^3/s]	CN	IA [mm]	N	TP [hr]	STORM INDEX	RAIN [mm/hr]
13	OS-2	14	5	0.185	0	74	8.92	3	0.17	1	0
OTTHYMO STANHYD PARAMETERS											
NHYD #	NAME	OUTLET	DT [min]	AREA [ha]	TIMP	XIMP	DWF [m^3/s]	Loss	SLPP [%]	LGP [m]	MNP
12	CA-4	14	5	0.479	0.489	0.489	0	Horton's Equation	0.8	59.9	0.25
OTTYMO STANHYD PARAMETERS (Cont.)											
NHYD #	SCP [hr]	DPSI [mm]	SLPI [%]	LGI TYPE	LGI [m]	MNI	SCI [hr]	STORM INDEX		RAIN [mm/hr]	
12	0	1.57	0.25	Auto	56.52	0.013	0	1		0	

5.3 Quantity Control – Queen Street Catchment Area

Peak flow for runoff quantities for the Pre-development and Post development stages of the project within the Queen Street catchment area were modeled in post-development conditions and compared to pre-development conditions. Table 5-6 below summarizes the peak runoff rate and volume from the model during each respective storm event and difference in peak runoff rate between pre-development and post-development conditions

Table 5-6: Post-Development Peak Runoff Rates and Runoff Volumes to County Infrastructure.

Design Storm Event	Post-Development Runoff Rates			Reduction in Runoff Rate From Pre- to Post-Development Conditions (m^3/s)
	Post-Development Runoff Rate (m^3/s)	Runoff Volume (mm)	Time to Peak (hrs)	
1. 6 HR 5yr Chicago	0.072	23.22	2.00	0.034
2. 12 HR 5 YR CHICAGO	0.074	27.27	4.00	0.034
3. 6 HR 10 YR CHICAGO	0.089	29.06	2.00	0.040
4. 12 HR 10 YR CHICAGO	0.091	33.88	4.00	0.042
5. 6 HR 100 YR CHICAGO	0.149	48.91	2.00	0.066
6. 12 HR 100 YR CHICAGO	0.155	56.23	4.00	0.067

Based on the above, the runoff rate directed towards County infrastructure following the completion of phase 1 of the storage facility expansion will be reduced by between 0.034 and 0.067 m^3/s from current existing conditions. This is directly correlated to the reduction in area of CA-4 between pre-and post-development conditions. The runoff is redirected towards the Johnstown Creek Catchment area and the impacts are discussed later in this report.

5.4 Stormwater Conveyance

Under post-development conditions storm water runoff within the Johnstown Creek catchment area is conveyed by the following mechanisms.

5.4.1 Swale

The existing pathway along the unmaintained road allowance known as First Street between the two parcels is proposed to be upgraded to a gravel roadway with a drainage swale on either side. The first drainage swale will convey runoff from the storage building area along the north property line. There is currently a drainage swale in this area, which has split drainage towards the west and east, with a high point in line with the midpoint of existing building #1. As a result of the proposed road construction, the high point of the existing portion of the swale will be shifted further towards the east, to the north of existing storage building #2, and direct more runoff away from municipal infrastructure and towards the Johnstown Creek catchment area. The portion of swale that outlets to the west will be regraded as proposed on 221121-GEC, and will outlet through the existing CSP culvert as was in pre-development conditions. The 500mm diameter CSP culvert is to be relocated as shown on 221121-GEC. While the proposed road is not to be constructed until phase 2 of the project, the proposed regarding of the existing drainage swale along the north end of the southern parcel is to be completed in phase 1.

A roadside drainage swale has been proposed along the northern boundary of the road allowance of First Street, which will convey runoff westward from the west edge of the Queen Street road allowance. The roadside swale proposed does not intersect with the roadside ditch of Queen Street. The proposed swale combines with the roadside swale along the southern portion of First Street on the downstream side of the relocated 500mm CSP Culvert forming a larger drainage swale, which discharges into the Johnstown Creek, about 380 metres upstream of the St. Lawrence River. A swale has been proposed along the eastern property line of Part 4, which discharges into the proposed roadside swale mentioned above. Both of the above mentioned swales are to be constructed during phase 2 of the project.

The proposed roadside swales will be constructed to have trapezoidal cross sections with 0.50 meter wide bottoms and 3H:1V side slopes.

5.5 Quantity Control – Johnstown Creek Catchment Area

As previously indicated, the post-development flow rate resulting from the proposed development will discharge directly into Johnstown Creek, thus not impacting County/Township infrastructure.

Due to the increased impervious area and decreased time of concentration resulting from the proposed development, the post-development unrestricted runoff rates from the site will be greater than the pre-development runoff rates. As mentioned above, the proposed grading directs more runoff from the Queen Street catchment area towards the Johnstown Creek catchment area, which also increases the runoff. Since the runoff generated by the proposed development will be draining into the Johnstown Creek, the County/Township infrastructure will not be affected, and will be reduced in each storm event as discussed in Table 5-6. The drainage system that discharges into the Johnstown Creek was modeled and analyzed for capacity.

5.5.1 Outlet Structures

The proposed drainage swale along the southern side of the proposed gravel roadway will discharge through a 500mm CSP culvert. The culvert was analyzed for adequate capacity as a result of the increased runoff from the development. Flow from the drainage swale along the northern side of First Street intersects with the flow in the swale at the downstream side of the above mentioned CSP culvert prior to discharging through a 600mm CSP culvert.

The remainder of the flow from catchment CA-3 is collected on the downstream side of the 600mm culvert by the drainage swale prior to discharging to the Johnstown Creek. The 600mm culvert was also analyzed to ensure there was adequate capacity.

5.6 Post-Development Runoff

The proposed development within the Johnstown Creek catchment area has been divided into sub-catchments. As mentioned above, the runoff from the catchment areas with exception of catchment CA-3 generally drain without restriction into swales along the proposed roadway within the First Street allowance, into a large drainage swale, which discharges into Johnstown Creek. Catchment CA-3 drains via sheet flow without restriction towards the west and intersects the existing drainage swale downstream of the 600mm diameter culvert prior to discharging into Johnstown Creek.

Appendix C and contains the OTTHYMO detailed output file for the last link in the model during phase 1 . Appendix D contains the OTTHYMO detailed output file for the last link in the model during phase 2 inclusive of phase 1. The detailed output file for the last link summarizes the post-development flows exiting the proposed development. Table 5-7 and Table 5-8 below summarizes the peak runoff rate and runoff volume from the model during each respective storm event contributing to the runoff into the Johnstown Creek in phase 1 and phase 2 (inclusive of phase 1) respectively.

Table 5-7: Post-Development Peak Runoff Rates and Runoff Volumes to Johnstown Creek (Phase 1)

Design Storm Event	Post-Development Runoff Rates			Increase in Runoff Rate From Pre- to Post-Development Conditions (m^3/s)
	Post-Development Runoff Rate (m^3/s)	Runoff Volume (mm)	Time to Peak (hrs)	
1. 6 HR 5yr Chicago	0.104	20.74	2.00	0.063
2. 12 HR 5 YR CHICAGO	0.109	24.24	4.00	0.062
3. 6 HR 10 YR CHICAGO	0.138	26.42	2.00	0.080
4. 12 HR 10 YR CHICAGO	0.146	30.56	4.00	0.080
5. 6 HR 100 YR CHICAGO	0.262	45.64	2.00	0.139
6. 12 HR 100 YR CHICAGO	0.278	51.96	4.00	0.141

Table 5-8: Post-Development Peak Runoff Rates and Runoff Volumes to Johnstown Creek (Phase 1 and 2 combined)

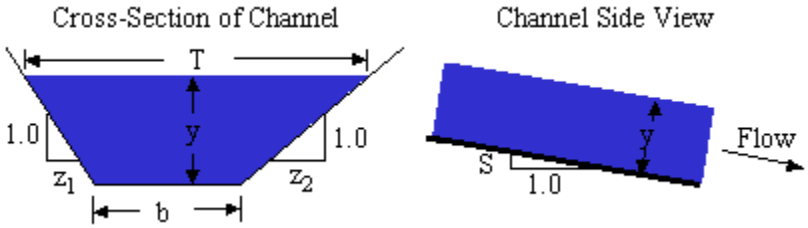
Design Storm Event	Post-Development Runoff Rates			Increase in Runoff Rate From Pre- to Post-Development Conditions (m^3/s)
	Post-Development Runoff Rate (m^3/s)	Runoff Volume (mm)	Time to Peak (hrs)	
1. 6 HR 5yr Chicago	0.168	25.94	2.00	0.127
2. 12 HR 5 YR CHICAGO	0.172	29.24	4.00	0.125
3. 6 HR 10 YR CHICAGO	0.223	32.37	2.00	0.165
4. 12 HR 10 YR CHICAGO	0.229	36.11	4.00	0.163
5. 6 HR 100 YR CHICAGO	0.398	53.58	2.00	0.276
6. 12 HR 100 YR CHICAGO	0.411	58.63	4.00	0.274

5.6.1 Velocity of flow downstream of Culverts and Drainage Swale

Table 5-9 summarizes the post-development peak runoff rates for the various storm events. The table provides the maximum channel depth of the runoff expected through the culverts for each storm event. The existing 600mm CSP culvert was determined to be inadequate for the increased runoff rate as a result of the proposed development. As such, the 600mm diameter CSP culvert was replaced in the model with an 600mm HDPE double wall smooth interior culvert with a slope as proposed on the grading plan 221121-GEC.

As mentioned above, once the runoff from a storm event discharges through the 600mm culvert, the runoff travels through an existing drainage swale prior to discharging into the Johnstown Creek, approximately 380 metres upstream of the St. Lawrence River. The capacity and capacity and flow depth have been determined using the equations for open channel flow as shown below. A Manning's roughness coefficient for open channel flow of n = 0.070 was obtained from the Ottawa Sewer Design Guidelines Appendix 6-C assuming unmaintained channel with uncut vegetation with dense weeds. The swale has a bottom width of about 1.5m about 20 metres downstream of the culvert, which expands to about 15m width immediately upstream of the discharge point into the Johnstown Creek. The swale has side slopes of between 5H to 1V and 3H to 1V. The swale has a longitudinal slope of between 1% and 3.5%. The section of the swale analyzed is immediately downstream of the 600mm diameter culvert. The bottom width was assumed to be 1.5m (the narrowest section of the channel) and side slopes of 3H to 1V on the north bank and 5H:1V on the south bank of the drainage swale. The first 20 metre section of the swale has a longitudinal slope of 1% and was used for the analysis.

When considering the 500mm diameter CSP culvert, the upstream and downstream roadside swales as a part of the proposed development as shown on 221121-GEC. The trapezoidal shaped swale has a bottom width of 0.5m, longitudinal slope of 0.7% and sides slopes of 3H to 1V to typical channel depths of 0.55m and 0.80m. A Manning's roughness coefficient for open channel flow of n = 0.025 was obtained from the Ottawa Sewer Design Guidelines Appendix 6-C assuming that the roadside swales will be maintained with grass and some weeds, as is the case with the roadside ditches around the perimeter of the east and south portions of the site.



$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{y}{2}(b+T)$$

$$P=b+y\left(\sqrt{1+z_1^2}+\sqrt{1+z_2^2}\right) \qquad T=b+y(z_1+z_2)$$

$$F=V\sqrt{\frac{T}{gA\cos\theta}} \qquad \theta=Tan^{-1}(S)$$

Table 5-9: Post Development Peak Runoff Rates Through Culverts (Phase 1 and 2 Combined)

Design Storm Event	Post-Development Runoff Rates					
	Peak Flow Culvert 1 (500mm) (m^3/s)	Max Depth Culvert 1 (500mm) (m)	Velocity on Downstream Side of Culvert (m/s)	Peak Flow Culvert 2 (600mm) (m^3/s)	Max Depth Culvert 2 (600mm) (m)	Velocity on Downstream Side of Culvert (m/s)
6 HR 5yr Chicago	0.09	0.20	1.22	0.13	0.21	1.48
12 HR 5 YR CHICAGO	0.09	0.20	1.23	0.13	0.21	1.49
6 HR 10 YR CHICAGO	0.12	0.23	1.31	0.18	0.25	1.61
12 HR 10 YR CHICAGO	0.12	0.25	1.31	0.18	0.25	1.63
6 HR 100 YR CHICAGO	0.21	0.34	1.50	0.33	0.36	1.87
12 HR 100 YR CHICAGO	0.22	0.35	1.50	0.34	0.37	1.89

A model was run approximately 40 metres downstream of the outlet side of the proposed 600mm diameter HDPE Culvert. To consider the impacts of CA-3 in conjunction with the entire development, the cross section of the swale in this location was about 1.5m in width with side slopes of 3H to 1V on the north bank and 5H to 1V on the south bank and longitudinal slope of between 3.0% and 3.5%. For the purpose of the model, a longitudinal slope of 3.5% was assumed as a "worst case scenario." The following table 5-10 provides a

summary of the capacity and flow level of the swale in the "Last Link" in the drainage swale between the downstream side of the 600mm diameter culvert and the east bank of the Johnstown Creek. A Manning's roughness coefficient for open channel flow of n = 0.070 was obtained from the Ottawa Sewer Design Guidelines Appendix 6-C assuming unmaintained channel with uncut vegetation with dense weeds.

Table 5-10 Capacity and Flow Level in Drainage Swale

Storm Event	Flow Rate (m^3/sec)	Flow Depth (m)	Flow Velocity (m/s)
6 HR 5yr Chicago	0.168	0.14	0.60
12 HR 5 YR CHICAGO	0.172	0.14	0.60
6 HR 10 YR CHICAGO	0.223	0.16	0.65
12 HR 10 YR CHICAGO	0.229	0.16	0.66
6 HR 100 YR CHICAGO	0.398	0.22	0.77
12 HR 100 YR CHICAGO	0.411	0.22	0.78

The Technical Guide – River & Stream Systems: Erosion Hazard Limit defines permissible flow velocities for different soil mediums. For a silty clay soil, as was the soil conditions encountered on the site, Table 2.1 – Allowable Flow Velocity for aged channels and Table 2.3 – Permissible flow velocities , New Channels allow a permissible velocity of 4-5 feet per second (1.2m/s to 1.5 m/s) for fair to good vegetation. Since the maximum flow velocity, which was encountered during the 100 year 12 hour Chicago Storm was 0.78 m/s, there is no additional erosion control measures required for the drainage swale.

To protect the channel at the inlet and outlet points of the culverts, rip-rap is to be installed at either end of the culvert as per OPSD 810.010 Type-B modified for in-line ditch applications. This rip-rap will disperse and slow the flow through the culverts. The additional rip-rap proposed at each end of the culvert will aid to disperse and reduce the velocity of stormwater flows. The rip-rap should meet the specifications for R-10 in accordance to OPSS 1004.

5.6.2 Impact of Development on Johnstown Creek & Quantity Control Requirements

At the request of the Conservation Authority, additional modeling was conducted to discuss the impacts of the proposed development on the receiving watershed and Johnstown Creek. With aid from the Ontario Watershed Information Tool (OWIT), it was determined that the watershed in which the site discharges into has a drainage area of around 35.6 km^2 as shown in Figure 1 below.

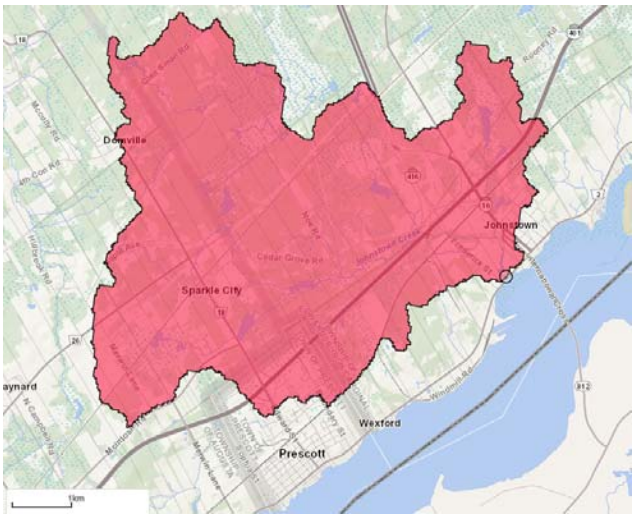


Figure 1: Map of receiving watershed

Within the watershed, the majority of the land cover consisted of about 31% swamp and marsh area, about 39% forested/treed area, 8% Community/infrastructure, and about 22% agricultural use. This land usage gives an average weighted CN value of about 77.3.

Upon review of watersheds of similar size and characteristics, the anticipated peak flows were expected to be in the area of 30-35 m^3/s during a 100-year storm event. By adjusting the CN value to 65 to be conservative, the time of concentration could be back calculated before achieving a reasonable estimated peak flow of 33.2 m^3/s during a 12 hour 100-year storm event. The assumed values used to determine the peak flow were modeled in OTTHYMO using a NASHYD command with the following parameters:

Table 5-11 OTTHYMO Input Parameters Receiving Watershed

OTTHYMO NASHYD PARAMETERS								
DT [min]	AREA [ha]	DWF [m^3/s]	CN	IA [mm]	N	TP [hr]	STORM INDEX	RAIN [mm/hr]
5	3557.2	0	65	10.9	3	4.00	1	0

The time to peak was determined to be around 9 hours, which is 5 hours after the time to peak determined for the discharge from the site during phase 1 and 2 combined. By comparing the last link hydrograph from the model of the site for phase 1 and phase 2 combined with the overall Johnstown Creek watershed model, it can be seen in Figure 2 below that the peak discharge from the site would occur with negligible effects on the flow in Johnstown Creek.

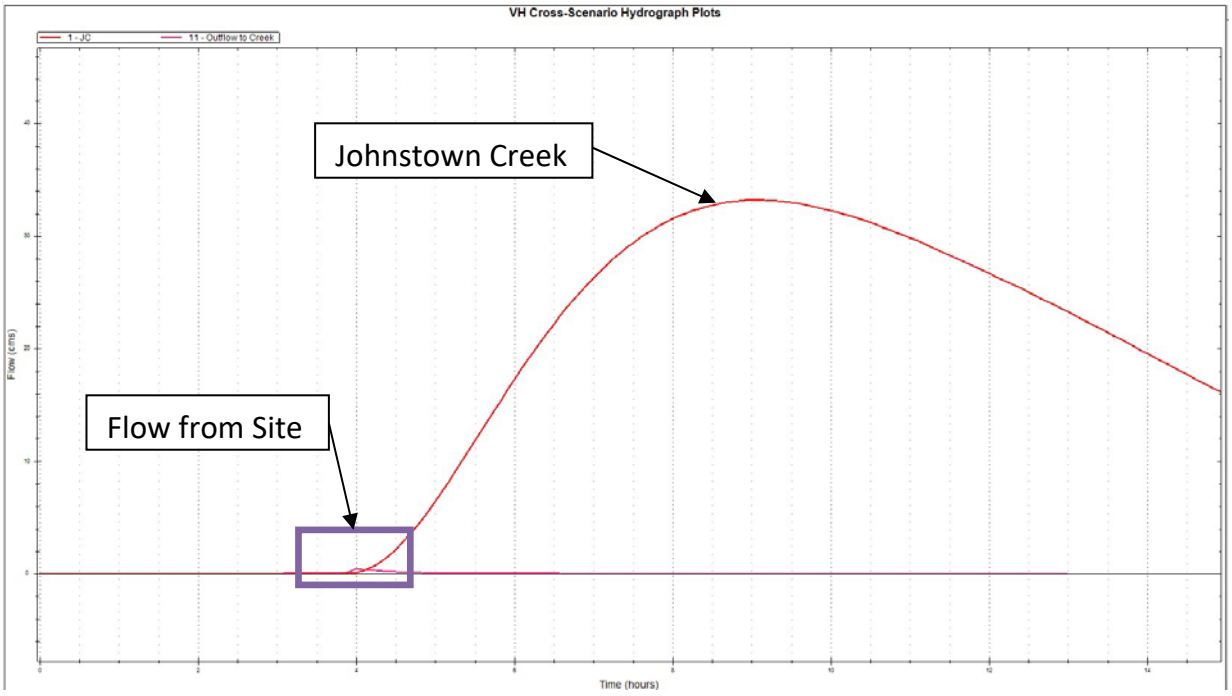


Figure2: Cross-scenario hydrograph plots

It is noted that the location of the site discharge to Johnstown Creek is approximately 380m upstream of the St. Lawrence River. Given the sites close proximity to the St. Lawrence River, it would prove beneficial to have the site be released into the creek uncontrolled. With the figure above, it shows that following the 12-hour 100-year storm event that the flows from the site would be dissipated downstream prior to the peak flows from upstream. Restricting the flows and controlling post-development runoff rates to pre-development, would not prove beneficial for the PSW. If flows were restricted for more than 5 hours, they will become coincident of upstream flows shown in the figure above, which may have negative implications on the ecosystem. It is also noted that the flood elevation of the Johnstown Creek are more likely to be controlled by the St. Lawrence river given its close proximity and flows that are of several magnitude larger than those discharged by the site.

As such, it is the opinion of Kollaard Associates that the quantity control measures requested by the South Nation Conservation Authority be omitted for this particular site.

5.7 Post-Development Quality Control

Stormwater treatment of 80% TSS removal will be provided by a treatment train approach. Pre-treatment will be provided by best management practices and by vegetative filtration and sedimentation within the roadside swales.

As indicated in the Stormwater Management Planning and Design Manual published by the Ontario Ministry of the Environment (The Manual), the recommended strategy for stormwater management is to provided an integrated treatment train approach to water management. In general, the best practices for stormwater management quality control are divided into three categories: source control, conveyance control and end of pipe control. As indicated in the manual, the priority in applying these BMP's should follow the sequence presented with end of pipe measures applied as the last resort.

5.7.1 Runoff Pollutant Source Control

The primary source of total suspended solids (TSS) and associated runoff pollution under post-development conditions of a development of this nature is considered to be the areas of a site subject to vehicle traffic. A second significant source of TSS during winter months is sidewalks subject to sanding and de-icing operations. At the proposed development, this

consists of the access roadways and parking areas. The vegetated landscaped surfaces and building roof are typically not considered to be significant sources of suspended solids following the completion of the development and establishment of the vegetation in landscaped areas.

Other common roadway pollutants include the non-particulate pollutants sodium, calcium sulphates and chloride (from de-icing salts) and petroleum products. These pollutants are generally more difficult to remove from the runoff. The removal of de-icing salts is more feasibly achieved with source controls such as application reduction or alternative de-icing materials more compatible with the environment.

The application of de-icing chemicals including salts and sand can be reduced with a best management plan for the application of these products. BMPs with respect to de-icing chemicals include such measures as timing of application, targeted application, and clearing of snow cover before application.

The access roadway, parking areas and walkways in the north portion of the site will be frequently used. It is considered that the nature of the occupancy of the proposed buildings makes maintaining the walking surfaces clear of ice and snow. As such, proper timing of snow clearing and application of de-icing chemicals in the north catchment area of the site will be critical in limiting their use.

5.7.2 Conveyance Control

The primary mode of treatment, following reduction of potential pollutants by source control, is by means of vegetative filtration through the landscaped surfaces and by sedimentation within the proposed roadside swales within the conveyed road allowance.

Research has shown that vegetative filters can partially remove sediments and pollutants attached to sediment particles in runoff. Field experiments on vegetative filter strips showed average sediment removal varying from 50 to 98% as flow path length increases from 2.5 to 10 metres. The research indicates that almost all particles larger than 40 microns in diameter are captured within the first five meters of a filter strip provided the flow velocity is limited to less than 0.5 m/s during the quality control storm event. About 50% of the sediments are removed within the first 2.5 metre of travel over the vegetative filter flow path. An additional 25% to 45% of sediments are removed within the next 2.5 m

of the flow path depending on the flow rate and velocity. The removal efficiency of the vegetative filtration does not significantly increase with a flow path length beyond 10 m.

5.7.3 End of Pipe Control

The immediate receiving water body for the runoff from the proposed development is a drainage swale, which discharges into the Johnstown Creek, immediately upstream of the St. Lawrence River. Treatment for the runoff being discharged into the swale will be provided by a CDS hydrodynamic separator in STM-MH1, with a minimum of 80% TSS removal. The CDS unit will be installed on the north side of the unmaintained road, at the southwest corner of Part 4. Details for the CDS unit are included in Appendix C. The CDS unit is to be installed according to manufacturer's specifications and guidelines

6.0 STORMWATER MANAGEMENT SUMMARY

In general, the stormwater management plan consists of collecting the stormwater runoff from the development area and directing the runoff towards the drainage swale discharging into the Johnstown Creek. None of the runoff originating on the portion of the site subject to the proposed development will discharge into Township/County infrastructure. The drainage system was modeled and analyzed for the 5 year, 10 year, and 100 year return periods for 6 hour and 12 hour Chicago storms. The plan has taken into account any offsite runoff that enters into the site.

The stormwater runoff will be directed towards the proposed swales by means of sheet drainage and will be conveyed into a larger swale that discharges into the Johnstown Creek.

It is noted that an existing 600mm CSP culvert will be removed and replaced with a 600mm HDPE culvert as proposed on the grading plan 221121-GEC.

The size of the drainage area directing runoff towards Queen Street and the existing Township/County infrastructure will be reduced as a result of the development. As such, the runoff rate and volume directed towards the Township/County infrastructure will be reduced.

Since the runoff rate and volume discharging to the Township/County infrastructure is reduced, there will be no negative impact to the Township/County road system.

The runoff rate discharging to Johnstown Creek has been modeled to assess the impacts on the receiving watershed. It was determined that by allowing the discharge from the site to flow uncontrolled towards the creek, that the runoff will outlet to the St. Lawrence River prior to becoming coincident with upstream flows within the watershed and will be of more benefit to the creek and PSW than restricting the flows.

7.0 STORMWATER SYSTEM OPERATION AND MAINTENANCE

The responsibility for the operation and maintenance of the stormwater system is that of the owner. The swales and culverts should be inspected on a weekly basis and after any rainfall event after construction until vegetation is well established. Any areas of distress should be repaired immediately.

Once vegetation is well established, the swales and culverts should be inspected on a bi-annual basis and following significant storm events. The culverts should be inspected for any blockages and freed as necessary. Any debris should be removed from the swales if present.

7.1 Hydrodynamic Separator

The Hydrodynamic Separator (CDS unit) is to be maintained in accordance with manufactures recommendations and guidelines as provided in the owner's manual. In addition the followings maintenance practice should be followed:

- Inspect every 6 months for the first year to determine the oil and sediment accumulation rate. In subsequent years, inspections are based on first-year observations or local requirements
- Inspect immediately after an oil, fuel or chemical spill. A licensed waste management company should remove oil and sediment and dispose responsibly.
- Sediment removal to be completed with a vacuum truck.

8.0 SPILL CONTINGENCY AND EROSION AND SEDIMENT CONTROL

8.1 Spill Contingency

All activities, including equipment maintenance and refueling, shall be controlled to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material into a watercourse. Refueling and maintenance of vehicles on-site shall be completed distanced away from any channels such that spillage cannot enter the storm water system or the accepting Johnstown Creek watercourse. Any material which is inadvertently spilt shall be cleaned up and removed by the contractor at the contractor's expense in a manner satisfactory to the Contract Administrator.

The Contractor shall have on site at all times an emergency spill kit that will include as a minimum the following items:

- 10 – 18 in x 18 in absorbent pads,
- 5 lbs Zorbal absorbing material
- 1 pair goggles, 1 pair PVC gloves.

Contractor to have a supply of 20 – 40 lb. bags of Zorbal, and 1 box of 18 in. x 18 in. absorbent pads (100 pcs.) on site.

All spills will be reported to the local office of the Ministry of Environment as well as the Contract Administrator as soon as they happen. The spills action centre phone hotline is # 1–800-268-6060.

8.2 Sediment and Erosion Control

The owner (and/or contractor) agrees to prepare and implement an erosion and sediment control plan at least equal to the stated minimum requirements and to the satisfaction of The Township of Edwardsburgh Cardinal, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and during all phases of site preparation and construction in accordance with the current best management practices for erosion and sediment control. It is considered to be the owners and/or contractors responsibility to ensure that the erosion control measures are implemented and maintained.

In order to limit the amount of sediment carried in stormwater runoff from the site during construction, it is recommended to install a silt fence along the property line, as shown in Kollaard Associates Inc. drawing #221121-GEC. The silt fence may be polypropylene, nylon, and polyester or ethylene yarn.

If a standard filter fabric is used, it must be backed by a wire fence supported on posts not over 2.0 m apart. Extra strength filter fabric may be used without a wire fence backing if posts are not over 1.0 m apart. Fabric joints should be lapped at least 150 mm (6") and stapled. The bottom edge of the filter fabric should be anchored in a 300 mm (1 ft) deep trench, to prevent flow under the fence. Sections of fence should be cleaned, if blocked with sediment and replaced if torn.

The proposed landscaping works should be completed as soon as possible. The proposed granular and asphaltic concrete surfaced areas should be surfaced as soon as possible.

The silt fences should only be removed once the site is stabilized and landscaping is completed.

These measures will reduce the amount of sediment carried from the site during storm events that may occur during construction.

The attached drawing #221121-GEC for the proposed storage units and parking area includes the above noted measures. These measures are intended to ensure no sediment laden runoff leaves the site or impacts the water way either during construction or after development has been completed.

8.2.1 Construction Considerations for Structures Within the Drainage Swales

As a part of the proposed development, work will be completed within the drainage swale system upstream of Johnstown Creek. As mentioned above, the 600mm CSP culvert will be removed and replaced with a 600mm diameter HDPE culvert. In addition to the culvert replacement, the existing 500mm diameter CSP culvert will be relocated to facilitate the installation of the proposed CDS treatment unit.

- It is recommend that all of the erosion control measures mentioned above been installed prior to the commencement of any work.

- Construction work should take place during a dry weather period where there are at least 5 to 7 constant dry weather days in the forecast.
- Once the erosion control measures are implemented, the removal of the existing structures can commence. Soil disturbances should be kept to the area immediately surrounding the structure.
- The culverts and CDS treatment units should then be installed as quickly as possible according to all applicable standards.
- The disturbed areas adjacent to the structures should be seeded immediately following the completion of construction, while leaving all erosion control measures in place
- Only once vegetation is well established should the erosion control measures be removed from around the structures.

9.0 CONCLUSIONS

- The proposed self-storage unit facility addition consists of a area of approximately 1.84 hectares which currently houses 3 self-storage buildings, and has 3 proposed buildings for a total of 6 storage buildings. The portion of the property to be developed was considered to be grassland in predevelopment conditions.
- The stormwater runoff from the portion of the site subject to development will be directed towards proposed swales in the unmaintained road allowance known as First Street. The runoff will be directed to a larger drainage swale discharging into the Johnstown Creek.
- No runoff from the portion of the site within the limit of development will be directed towards the County/Township infrastructure.
- The quantity of runoff being discharged into the Queen Street road allowance will be reduced as a result of the proposed development and the municipal infrastructure will not be negatively impacted by the proposed development based on acceptable design standards.
- Erosion measures will be placed prior to construction and during development and will remain in place until construction is complete.

- Rip-rap meeting the specifications for R-10 per OPSS 1004 is to be installed at the up and downstream ends of the culverts to slow and disperse flows through the channel.
- Disturbed areas will be top soiled and seeded as soon as reasonably possible.
- The drainage swale discharging to Johnstown Creek has been assessed to ensure that the flow through the channel does not create erosion to ensure that sediment is not migrated towards Johnstown Creek.
- A treatment unit has been proposed at the outlet point of the north and south parcel in the First Street Road Allowance. The treatment unit has been designed for 80% TSS removal as required by the Township of Edwardsburgh Cardinal.
- The controlled discharge from the proposed development will have negligible impact to Johnstown Creek because of the location of the site discharge relative to the St. Lawrence River. Controlling and restricting runoff rate from the site will increase the impact to the Johnstown Creek.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we can be of any further assistance to you on this project, please do not hesitate to contact our office.

Sincerely,
Kollaard Associates Inc.

Prepared by – Nick Recoskie P.Eng.

Approved by - Steven deWit, P.Eng.

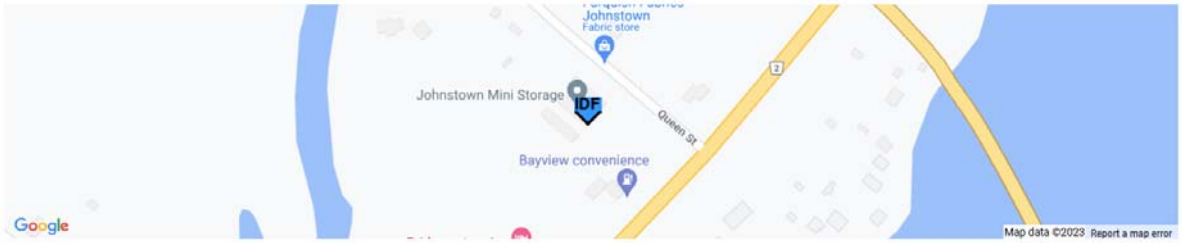
APPENDIX A: SITE PARAMETERS

IDF parameters for Johnstown, Ontario

Active coordinate

44° 44' 45" N, 75° 28' 14" W (44.745833,-75.470833)

Retrieved: Tue, 03 Jan 2023 20:20:18 GMT



Coefficient summary

IDF Curve: 44° 44' 45" N, 75° 28' 14" W (44.745833,-75.470833)

Retrieved: Tue, 03 Jan 2023 20:20:18 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.3	27.0	31.3	36.9	41.0	45.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	115.3	71.0	53.5	33.0	20.3	12.5	5.8	3.6	2.2
5-yr	153.4	94.5	71.2	43.8	27.0	16.6	7.7	4.8	2.9
10-yr	177.8	109.5	82.5	50.8	31.3	19.3	8.9	5.5	3.4
25-yr	209.6	129.1	97.2	59.9	36.9	22.7	10.5	6.5	4.0
50-yr	232.9	143.5	108.0	66.6	41.0	25.3	11.7	7.2	4.4
100-yr	255.6	157.4	118.6	73.1	45.0	27.7	12.9	7.9	4.9

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.6	11.8	13.4	16.5	20.3	25.0	34.8	42.9	52.8
5-yr	12.8	15.7	17.8	21.9	27.0	33.3	46.3	57.0	70.3
10-yr	14.8	18.3	20.6	25.4	31.3	38.6	53.7	66.1	81.5
25-yr	17.5	21.5	24.3	30.0	36.9	45.5	63.3	78.0	96.0
50-yr	19.4	23.9	27.0	33.3	41.0	50.5	70.3	86.6	106.7
100-yr	21.3	26.2	29.6	36.5	45.0	55.4	77.2	95.1	117.1

APPENDIX A: SITE PARAMETERS

Refer to Drawing # 221121-PRE and Drawing # 221121-POST for an illustration of the specified catchment areas.

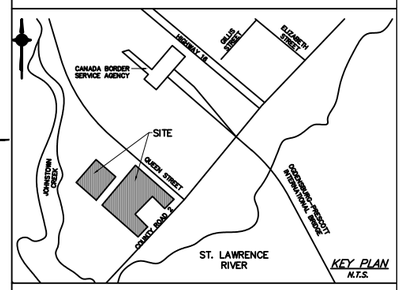
See next page…

PRE-DEVELOPMENT CONDITIONS

SCALE = 1:1000

LICENSED PROFESSIONAL ENGINEER
28.FEB.2024
S. E. deWit
100079612
PROVINCE OF ONTARIO

DRAWING NUMBER:
221121-PRE



LEGEND (STORM WATER MANAGEMENT)

- CONTROLLED — CATCHMENT LABEL
- 0.39 / 0.34 — CATCHMENT AREA (HECTARES) / 5-YR RUNOFF COEFFICIENT
- CATCHMENT AREA BOUNDARY
- DIRECTION OF FLOW
- PROPERTY LINE
- TOP OF SLOPE
- PRE-DEVELOPMENT DRAINAGE PATTERN
- POST-DEVELOPMENT OVERLAND FLOW PATH

REV	BY	DATE	DESCRIPTION
3	NJR	2024/02/28	RESPONSE TO SNCA SECOND REVIEW COMMENTS
2	NJR	2024/01/30	RESPONSE TO SNCA REVIEW COMMENTS
1	NJR	2023/10/30	RESPONSE TO FIRST REVIEW COMMENTS
0	NJR	2023/05/31	ISSUED FOR AMENDMENT

Kollaard Associates Engineers
P.O. BOX 189, 210 PRESCOTT ST
KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

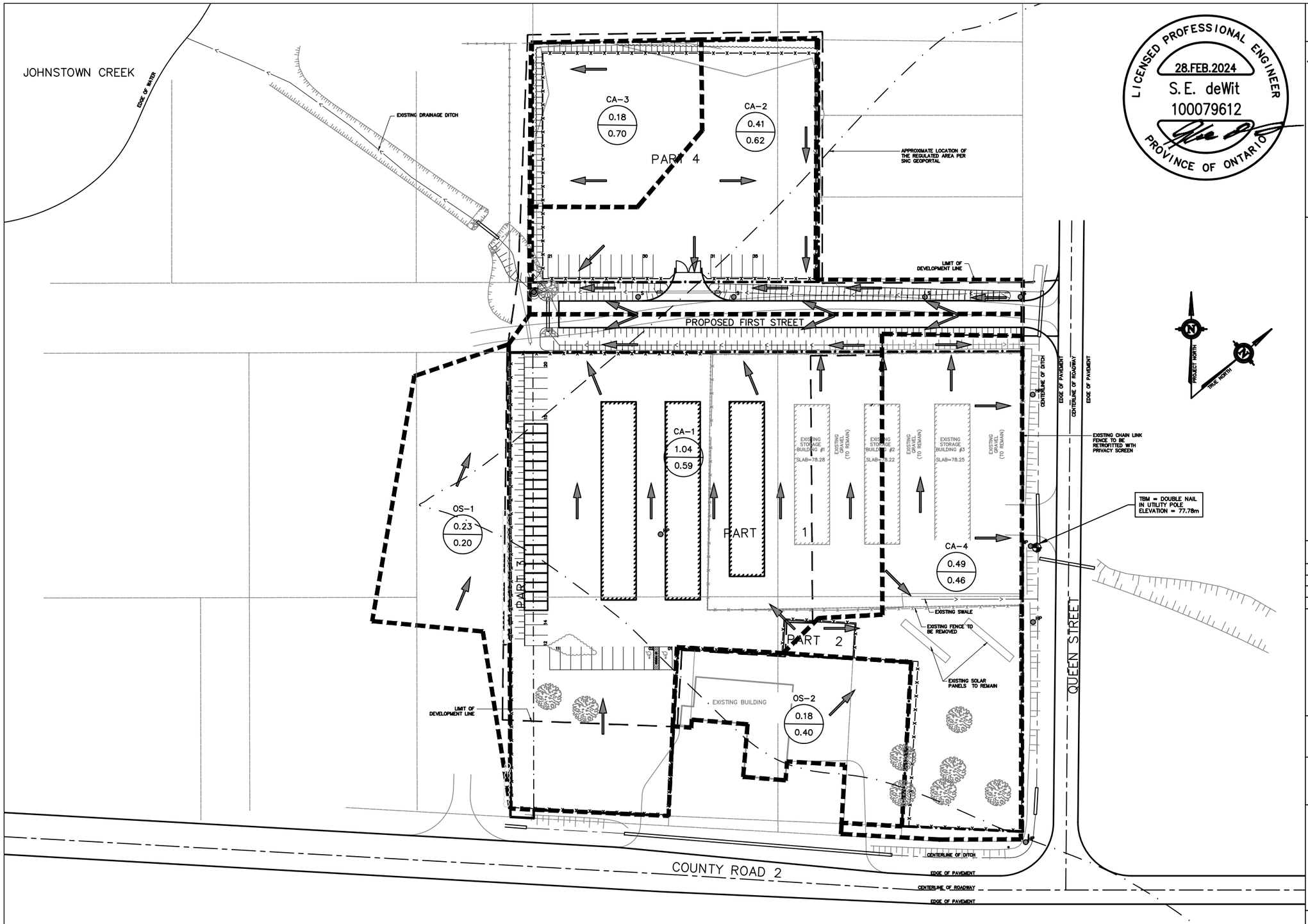
CLIENT:
JOHNSTOWN MINI-STORAGE

PROJECT:
PROPOSED STORAGE UNITS

LOCATION:
2-8 QUEEN STREET
JOHNSTOWN
TOWNSHIP OF EDWARDSBURGH/
CARDINAL, ONTARIO

DESIGNED BY:	*DATE:*
NJR	MAY 31, 2023
DRAWN BY:	*SCALE:*
NJR	1:1000

KOLLAARD FILE NUMBER:
221121

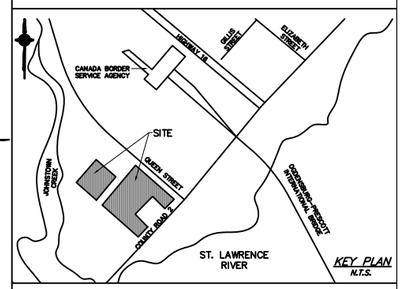


POST-DEVELOPMENT CONDITIONS

SCALE = 1:1000

LICENSED PROFESSIONAL ENGINEER
28.FEB.2024
S. E. deWit
100079612
PROVINCE OF ONTARIO

DRAWING NUMBER:
221121 – POST



LEGEND (STORM WATER MANAGEMENT)

CONTROLLED	CATCHMENT LABEL
0.39 / 0.34	CATCHMENT AREA (HECTARES) / 5-YR RUNOFF COEFFICIENT
	CATCHMENT AREA BOUNDARY
	DIRECTION OF FLOW
	PROPERTY LINE
	TOP OF SLOPE
	PRE-DEVELOPMENT DRAINAGE PATTERN
	POST-DEVELOPMENT OVERLAND FLOW PATH

REV	BY	DATE	DESCRIPTION
3	NJR	2024/02/28	RESPONSE TO SNCA SECOND REVIEW COMMENTS
2	NJR	2024/01/30	RESPONSE TO SNCA REVIEW COMMENTS
1	NJR	2023/30/23	RESPONSE TO FIRST REVIEW COMMENTS
0	NJR	2023/05/31	ISSUED FOR SPC AMENDMENT

Kollaard Associates Engineers
P.O. BOX 189, 210 PRESCOTT ST
KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

CLIENT:
JOHNSTOWN MINI-STORAGE

PROJECT:
PROPOSED STORAGE UNITS

LOCATION:
2-8 QUEEN STREET
JOHNSTOWN
TOWNSHIP OF EDWARDSBURGH/
CARDINAL, ONTARIO

DESIGNED BY:	*DATE:*
NJR	MAY 31, 2023
DRAWN BY:	*SCALE:*
NJR	1:1000

KOLLAARD FILE NUMBER:
221121

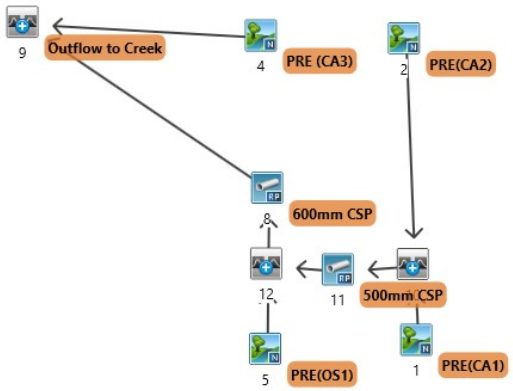
APPENDIX B: PRE-DEVELOPMENT DATA

Pre-Development OTTHYMO Model Schematic

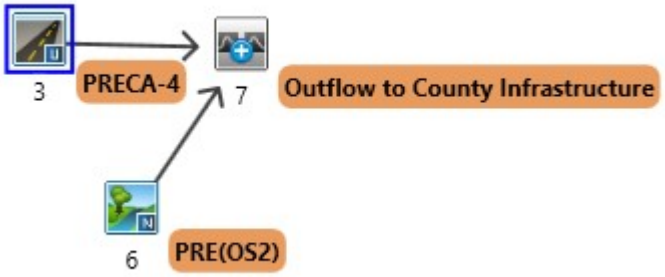
Pre-Development Schematic Summary Table

Pre-Development Detailed Output File

OTTHYMO Pre-Development Model Schematic (Johnstown Creek Catchment)



OTTHYMO Pre-Development Model Schematic (Queen Street Catchment)



Schematic Summary Table

Hydrograph No.	Model Type	Catchment Represented	Comment
3	STANDHYD	CA-4	Typical: Catchment based on swale outlet location. Includes roof areas, gravel areas, and road surface which outlets to County Infrastructure
1, 2, 4	NASHHYD	CA-1, CA-2, CA-3	Typical: Catchments based on existing maintained grassed areas, which discharge into the drainage ditch which outlets into Johnstown Creek
5	NASHYD	OS-1	Offsite runoff from property to the west draining into the same route pipe as CA-1
6	NASHYD	OS-2	Offsite runoff from property to south draining into CA-4
11	ROUTEPIPE	n/a	Models storm pipe network of 500mm diameter CSP culvert crossing the unmaintained pathway of First Street
8	ROUTEPIPE	n/a	Models storm pipe network of existing 600mm diameter CSP culvert within the existing swale
10, 13	ADDHYD	n/a	Represents the merger of two hydrographs into a flowpipe
7, 9	ADDHYD	n/a	Last link in model. Represents total post-development flow.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\7c35380c-338a-40d3-80f1-c71264bad9ee\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\7c35380c-338a-40d3-80f1-c71264bad9ee\scenari

DATE: 02-27-2024                          TIME: 08:44:35

USER:


COMMENTS: _____
```

```
  ********************************************
  ** SIMULATION : Chicago Design Storm - 5 yr 6 **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 49.04 mm |                          B=   6.053
--------------------                          C=   0.814
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.00    1.78 |  1.50    9.61 |  3.00    4.87 |  4.50    2.31
             0.17    1.94 |  1.67   24.17 |  3.17    4.30 |  4.67    2.19
```

0.33	2.13	1.83	104.19	3.33	3.86	4.83	2.08
0.50	2.37	2.00	32.04	3.50	3.51	5.00	1.99
0.67	2.68	2.17	16.34	3.67	3.22	5.17	1.90
0.83	3.10	2.33	10.96	3.83	2.98	5.33	1.82
1.00	3.68	2.50	8.29	4.00	2.77	5.50	1.75
1.17	4.58	2.67	6.69	4.17	2.60	5.67	1.68
1.33	6.15	2.83	5.63	4.33	2.44	5.83	1.62

CALIB			
NASHYD (0006)	Area (ha)=	0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 12.394
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

```
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.69
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.60   Dir. Conn.(%)=  51.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.33
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.25         0.80
     Length            (m)=      67.83        59.90
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

```
     Max.Eff.Inten.(mm/hr)=     104.19        19.75
               over (min)         5.00        30.00
     Storage Coeff.  (min)=       3.02 (ii)   25.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.28         0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.01          0.102 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.42           2.00
     RUNOFF VOLUME    (mm)=      47.47         8.23          28.47
     TOTAL RAINFALL   (mm)=      49.04        49.04          49.04
     RUNOFF COEFFICIENT   =       0.97         0.17           0.58

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0007)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):		0.69	0.102	2.00	28.47
+ ID2= 2 (0006):		0.19	0.007	2.17	12.39
ID = 3 (0007):		0.88	0.106	2.00	25.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0001)	Area (ha)=	0.94	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.35	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.103

PEAK FLOW (cms)= 0.022 (i)
TIME TO PEAK (hrs)= 2.417

RUNOFF VOLUME (mm)= 12.438
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.254

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

CALIB			
NASHYD (0002)	Area (ha)=	0.25	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.057

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 12.396
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

```
--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.94   0.022     2.42    12.44
      + ID2= 2 (  0002):     0.25   0.009     2.17    12.40
        ================================================
        ID = 3 (  0010):     1.19   0.029     2.33    12.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0011)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.00
--------------------     Slope      (m/m)=  0.015
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .259E+00       0.0          0.75         0.13
       0.17     .720E+00       0.1          1.17         0.09
       0.26     .130E+01       0.3          1.51         0.07
       0.35     .197E+01       0.6          1.79         0.06
       0.43     .270E+01       0.9          2.04         0.05
       0.52     .348E+01       1.3          2.26         0.04
       0.61     .429E+01       1.8          2.45         0.04
       0.69     .513E+01       2.2          2.62         0.04
       0.78     .599E+01       2.8          2.76         0.04
       0.87     .684E+01       3.3          2.89         0.03
       0.96     .770E+01       3.8          3.00         0.03
       1.04     .854E+01       4.4          3.09         0.03
       1.13     .935E+01       4.9          3.15         0.03
       1.22     .101E+02       5.4          3.20         0.03
       1.30     .109E+02       5.8          3.22         0.03
       1.39     .115E+02       6.2          3.22         0.03
       1.48     .121E+02       6.4          3.19         0.03
       1.56     .126E+02       6.5          3.10         0.03
       1.65     .128E+02       6.1          2.83         0.04
                                    <---- hydrograph ---->   <-pipe /
channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0010)    1.19     0.03    2.33  12.43      0.08      0.75
OUTFLOW: ID= 1 (  0011)    1.19     0.03    2.33  12.43      0.08      0.75



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

```
      Unit Hyd Qpeak  (cms)=   0.031

   PEAK FLOW       (cms)=   0.006 (i)
   TIME TO PEAK    (hrs)=   2.333
   RUNOFF VOLUME    (mm)=  12.431
   TOTAL RAINFALL   (mm)=  49.038
   RUNOFF COEFFICIENT   =   0.253

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.028     2.33    12.43
      + ID2= 2 (  0005):     0.22   0.006     2.33    12.43
        ================================================
        ID = 3 (  0012):     1.41   0.035     2.33    12.43

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .280E+00       0.1          1.25         0.09
       0.17     .780E+00       0.2          1.95         0.06
       0.26     .141E+01       0.5          2.51         0.04
       0.35     .213E+01       1.0          2.98         0.04
       0.43     .292E+01       1.5          3.40         0.03
       0.52     .376E+01       2.2          3.76         0.03
       0.61     .465E+01       2.9          4.07         0.03
       0.69     .556E+01       3.7          4.35         0.02
       0.78     .648E+01       4.6          4.60         0.02
       0.87     .741E+01       5.5          4.81         0.02
       0.96     .834E+01       6.4          4.99         0.02
       1.04     .925E+01       7.3          5.13         0.02
       1.13     .101E+02       8.2          5.24         0.02
       1.22     .110E+02       9.0          5.32         0.02
       1.30     .118E+02       9.7          5.36         0.02
       1.39     .125E+02      10.3          5.36         0.02
       1.48     .131E+02      10.7          5.30         0.02
       1.56     .136E+02      10.8          5.16         0.02
       1.65     .139E+02      10.1          4.71         0.02
                                  <---- hydrograph ---->   <-pipe /
channel->
                          AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
INFLOW : ID= 2 (  0012)    1.41     0.03    2.33  12.43      0.06      1.25
OUTFLOW: ID= 1 (  0008)    1.41     0.03    2.33  12.43      0.06      1.25



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    1.78 | 1.583    9.61 | 3.083    4.87 |  4.58    2.31
         0.167    1.78 | 1.667    9.61 | 3.167    4.87 |  4.67    2.31
```

```
            0.250    1.94 | 1.750   24.17 | 3.250    4.30 |  4.75    2.19
            0.333    1.94 | 1.833   24.17 | 3.333    4.30 |  4.83    2.19
            0.417    2.13 | 1.917  104.19 | 3.417    3.86 |  4.92    2.08
            0.500    2.13 | 2.000  104.19 | 3.500    3.86 |  5.00    2.08
            0.583    2.37 | 2.083   32.04 | 3.583    3.51 |  5.08    1.99
            0.667    2.37 | 2.167   32.04 | 3.667    3.51 |  5.17    1.99
            0.750    2.68 | 2.250   16.34 | 3.750    3.22 |  5.25    1.90
            0.833    2.68 | 2.333   16.34 | 3.833    3.22 |  5.33    1.90
            0.917    3.10 | 2.417   10.96 | 3.917    2.98 |  5.42    1.82
            1.000    3.10 | 2.500   10.96 | 4.000    2.98 |  5.50    1.82
            1.083    3.68 | 2.583    8.29 | 4.083    2.77 |  5.58    1.75
            1.167    3.68 | 2.667    8.29 | 4.167    2.77 |  5.67    1.75
            1.250    4.58 | 2.750    6.69 | 4.250    2.60 |  5.75    1.68
            1.333    4.58 | 2.833    6.69 | 4.333    2.60 |  5.83    1.68
            1.417    6.15 | 2.917    5.63 | 4.417    2.44 |  5.92    1.62
            1.500    6.15 | 3.000    5.63 | 4.500    2.44 |  6.00    1.62
       Unit Hyd Qpeak  (cms)=   0.049

    PEAK FLOW       (cms)=   0.008 (i)
    TIME TO PEAK    (hrs)=   2.167
    RUNOFF VOLUME    (mm)=  12.396
    TOTAL RAINFALL   (mm)=  49.038
    RUNOFF COEFFICIENT   =   0.253

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

------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0009)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     0.22   0.008     2.17    12.40
     + ID2= 2 (  0008):     1.41   0.034     2.33    12.43
       ================================================
       ID = 3 (  0009):     1.63   0.041     2.25    12.42

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\deeaf04a-764a-40e1-9280-3fd1284c06d3\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\deeaf04a-764a-40e1-9280-3fd1284c06d3\scenari


DATE: 02-27-2024                          TIME: 08:44:36

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 5yr 12 **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 56.17 mm |                          B=   6.053
--------------------                          C=   0.814
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 12.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.94	3.00	3.68	6.00	2.77	9.00	1.30
0.17	0.98	3.17	4.58	6.17	2.60	9.17	1.27
0.33	1.02	3.33	6.15	6.33	2.44	9.33	1.24
0.50	1.06	3.50	9.61	6.50	2.31	9.50	1.20
0.67	1.11	3.67	24.17	6.67	2.19	9.67	1.17
0.83	1.16	3.83	104.19	6.83	2.08	9.83	1.15
1.00	1.22	4.00	32.04	7.00	1.99	10.00	1.12
1.17	1.28	4.17	16.34	7.17	1.90	10.17	1.10
1.33	1.36	4.33	10.96	7.33	1.82	10.33	1.07
1.50	1.44	4.50	8.29	7.50	1.75	10.50	1.05
1.67	1.54	4.67	6.69	7.67	1.68	10.67	1.03
1.83	1.65	4.83	5.63	7.83	1.62	10.83	1.01
2.00	1.78	5.00	4.87	8.00	1.57	11.00	0.99
2.17	1.94	5.17	4.30	8.17	1.51	11.17	0.97
2.33	2.13	5.33	3.86	8.33	1.47	11.33	0.95
2.50	2.37	5.50	3.51	8.50	1.42	11.50	0.93
2.67	2.68	5.67	3.22	8.67	1.38	11.67	0.92
2.83	3.10	5.83	2.98	8.83	1.34	11.83	0.90

CALIB			
NASHYD (0006)	Area (ha)= 0.19	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05

1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

CALIB			
STANDHYD (0003)	Area (ha)=	0.69	
ID= 1 DT= 5.0 min	Total Imp(%)=	51.60	Dir. Conn.(%)= 51.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.33
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	67.83	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24

0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Max.Eff.Inten.(mm/hr)=	104.19	28.36	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.02 (ii)	22.61 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.28	0.05	
			TOTALS
PEAK FLOW (cms)=	0.10	0.01	0.103 (iii)
TIME TO PEAK (hrs)=	4.00	4.33	4.00
RUNOFF VOLUME (mm)=	54.60	9.45	32.75
TOTAL RAINFALL (mm)=	56.17	56.17	56.17
RUNOFF COEFFICIENT =	0.97	0.17	0.58

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.69   0.103     4.00    32.75
      + ID2= 2 (  0006):     0.19   0.008     4.17    16.30
        ================================================
        ID = 3 (  0007):     0.88   0.108     4.00    29.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.94   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95

2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.103

PEAK FLOW (cms)= 0.025 (i)
TIME TO PEAK (hrs)= 4.417
RUNOFF VOLUME (mm)= 16.352
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.291

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

CALIB			
NASHYD (0002)	Area (ha)=	0.25	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01

```
             2.000    1.65 | 5.000    5.63 | 8.000    1.62 | 11.00    1.01
             2.083    1.78 | 5.083    4.87 | 8.083    1.57 | 11.08    0.99
             2.167    1.78 | 5.167    4.87 | 8.167    1.57 | 11.17    0.99
             2.250    1.94 | 5.250    4.30 | 8.250    1.51 | 11.25    0.97
             2.333    1.94 | 5.333    4.30 | 8.333    1.51 | 11.33    0.97
             2.417    2.13 | 5.417    3.86 | 8.417    1.47 | 11.42    0.95
             2.500    2.13 | 5.500    3.86 | 8.500    1.47 | 11.50    0.95
             2.583    2.37 | 5.583    3.51 | 8.583    1.42 | 11.58    0.93
             2.667    2.37 | 5.667    3.51 | 8.667    1.42 | 11.67    0.93
             2.750    2.68 | 5.750    3.22 | 8.750    1.38 | 11.75    0.92
             2.833    2.68 | 5.833    3.22 | 8.833    1.38 | 11.83    0.92
             2.917    3.10 | 5.917    2.98 | 8.917    1.34 | 11.92    0.90
             3.000    3.10 | 6.000    2.98 | 9.000    1.34 | 12.00    0.90
        Unit Hyd Qpeak  (cms)=   0.057

     PEAK FLOW       (cms)=   0.010 (i)
     TIME TO PEAK    (hrs)=   4.167
     RUNOFF VOLUME    (mm)=  16.296
     TOTAL RAINFALL   (mm)=  56.170
     RUNOFF COEFFICIENT   =   0.290

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.94   0.025     4.42    16.35
      + ID2= 2 (  0002):     0.25   0.010     4.17    16.30
        ================================================
        ID = 3 (  0010):     1.19   0.033     4.33    16.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0011)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.00
--------------------     Slope      (m/m)=  0.015
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .259E+00       0.0          0.75         0.13
       0.17     .720E+00       0.1          1.17         0.09
       0.26     .130E+01       0.3          1.51         0.07
       0.35     .197E+01       0.6          1.79         0.06
       0.43     .270E+01       0.9          2.04         0.05
       0.52     .348E+01       1.3          2.26         0.04
```

0.61	.429E+01	1.8	2.45	0.04
0.69	.513E+01	2.2	2.62	0.04
0.78	.599E+01	2.8	2.76	0.04
0.87	.684E+01	3.3	2.89	0.03
0.96	.770E+01	3.8	3.00	0.03
1.04	.854E+01	4.4	3.09	0.03
1.13	.935E+01	4.9	3.15	0.03
1.22	.101E+02	5.4	3.20	0.03
1.30	.109E+02	5.8	3.22	0.03
1.39	.115E+02	6.2	3.22	0.03
1.48	.121E+02	6.4	3.19	0.03
1.56	.126E+02	6.5	3.10	0.03
1.65	.128E+02	6.1	2.83	0.04

<---- hydrograph ----> <-pipe / channel->

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0010)	1.19	0.03	4.33	16.34	0.09	0.75
OUTFLOW: ID= 1 (0011)	1.19	0.03	4.33	16.34	0.09	0.75

| CALIB |		
| NASHYD (0005)|	Area (ha)= 0.22	Curve Number (CN)= 74.0
|ID= 1 DT= 5.0 min |	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07

1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

```
     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   4.250
     RUNOFF VOLUME    (mm)=  16.344
     TOTAL RAINFALL   (mm)=  56.170
     RUNOFF COEFFICIENT   =   0.291

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

-------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.033     4.33    16.34
      + ID2= 2 (  0005):     0.22   0.007     4.25    16.34
        ================================================
        ID = 3 (  0012):     1.41   0.040     4.33    16.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n       =  0.024
```

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.280E+00	0.1	1.25	0.09
0.17	.780E+00	0.2	1.95	0.06
0.26	.141E+01	0.5	2.51	0.04
0.35	.213E+01	1.0	2.98	0.04
0.43	.292E+01	1.5	3.40	0.03
0.52	.376E+01	2.2	3.76	0.03
0.61	.465E+01	2.9	4.07	0.03
0.69	.556E+01	3.7	4.35	0.02
0.78	.648E+01	4.6	4.60	0.02
0.87	.741E+01	5.5	4.81	0.02
0.96	.834E+01	6.4	4.99	0.02
1.04	.925E+01	7.3	5.13	0.02
1.13	.101E+02	8.2	5.24	0.02
1.22	.110E+02	9.0	5.32	0.02
1.30	.118E+02	9.7	5.36	0.02
1.39	.125E+02	10.3	5.36	0.02
1.48	.131E+02	10.7	5.30	0.02
1.56	.136E+02	10.8	5.16	0.02
1.65	.139E+02	10.1	4.71	0.02

	<---- hydrograph ----> AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0012)	1.41	0.04	4.33	16.34	0.06	1.25
OUTFLOW: ID= 1 (0008)	1.41	0.04	4.33	16.34	0.06	1.25

CALIB			
NASHYD (0004)	Area (ha)= 0.22	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17

0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

ADD HYD (0009)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0004):	0.22	0.009	4.17	16.30
+ ID2= 2 (0008):	1.41	0.040	4.33	16.34
ID = 3 (0009):	1.63	0.047	4.25	16.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\deeaf04a-764a-40e1-9280-3fd1284c06d3\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\deeaf04a-764a-40e1-9280-3fd1284c06d3\scenari


DATE: 02-27-2024                          TIME: 08:44:36

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 5yr 12 **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 56.17 mm |                          B=   6.053
--------------------                          C=   0.814
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 12.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    0.94 |  3.00    3.68 |  6.00    2.77 |  9.00    1.30
```

0.17	0.98	3.17	4.58	6.17	2.60	9.17	1.27
0.33	1.02	3.33	6.15	6.33	2.44	9.33	1.24
0.50	1.06	3.50	9.61	6.50	2.31	9.50	1.20
0.67	1.11	3.67	24.17	6.67	2.19	9.67	1.17
0.83	1.16	3.83	104.19	6.83	2.08	9.83	1.15
1.00	1.22	4.00	32.04	7.00	1.99	10.00	1.12
1.17	1.28	4.17	16.34	7.17	1.90	10.17	1.10
1.33	1.36	4.33	10.96	7.33	1.82	10.33	1.07
1.50	1.44	4.50	8.29	7.50	1.75	10.50	1.05
1.67	1.54	4.67	6.69	7.67	1.68	10.67	1.03
1.83	1.65	4.83	5.63	7.83	1.62	10.83	1.01
2.00	1.78	5.00	4.87	8.00	1.57	11.00	0.99
2.17	1.94	5.17	4.30	8.17	1.51	11.17	0.97
2.33	2.13	5.33	3.86	8.33	1.47	11.33	0.95
2.50	2.37	5.50	3.51	8.50	1.42	11.50	0.93
2.67	2.68	5.67	3.22	8.67	1.38	11.67	0.92
2.83	3.10	5.83	2.98	8.83	1.34	11.83	0.90

CALIB			
NASHYD (0006)	Area (ha)=	0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03

1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

CALIB	
STANDHYD (0003)	Area (ha)= 0.69
ID= 1 DT= 5.0 min	Total Imp(%)= 51.60 Dir. Conn.(%)= 51.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.33
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	67.83	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17

0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Max.Eff.Inten.(mm/hr)=	104.19	28.36	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.02 (ii)	22.61 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.28	0.05	
			TOTALS
PEAK FLOW (cms)=	0.10	0.01	0.103 (iii)
TIME TO PEAK (hrs)=	4.00	4.33	4.00
RUNOFF VOLUME (mm)=	54.60	9.45	32.75
TOTAL RAINFALL (mm)=	56.17	56.17	56.17
RUNOFF COEFFICIENT =	0.97	0.17	0.58

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.69   0.103     4.00    32.75
      + ID2= 2 (  0006):     0.19   0.008     4.17    16.30
        ================================================
        ID = 3 (  0007):     0.88   0.108     4.00    29.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.94   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95

2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.103

PEAK FLOW (cms)= 0.025 (i)
TIME TO PEAK (hrs)= 4.417
RUNOFF VOLUME (mm)= 16.352
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.291

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

CALIB			
NASHYD (0002)	Area (ha)=	0.25	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01

```
             2.000    1.65 | 5.000    5.63 | 8.000    1.62 | 11.00    1.01
             2.083    1.78 | 5.083    4.87 | 8.083    1.57 | 11.08    0.99
             2.167    1.78 | 5.167    4.87 | 8.167    1.57 | 11.17    0.99
             2.250    1.94 | 5.250    4.30 | 8.250    1.51 | 11.25    0.97
             2.333    1.94 | 5.333    4.30 | 8.333    1.51 | 11.33    0.97
             2.417    2.13 | 5.417    3.86 | 8.417    1.47 | 11.42    0.95
             2.500    2.13 | 5.500    3.86 | 8.500    1.47 | 11.50    0.95
             2.583    2.37 | 5.583    3.51 | 8.583    1.42 | 11.58    0.93
             2.667    2.37 | 5.667    3.51 | 8.667    1.42 | 11.67    0.93
             2.750    2.68 | 5.750    3.22 | 8.750    1.38 | 11.75    0.92
             2.833    2.68 | 5.833    3.22 | 8.833    1.38 | 11.83    0.92
             2.917    3.10 | 5.917    2.98 | 8.917    1.34 | 11.92    0.90
             3.000    3.10 | 6.000    2.98 | 9.000    1.34 | 12.00    0.90
        Unit Hyd Qpeak  (cms)=   0.057

     PEAK FLOW       (cms)=   0.010 (i)
     TIME TO PEAK    (hrs)=   4.167
     RUNOFF VOLUME    (mm)=  16.296
     TOTAL RAINFALL   (mm)=  56.170
     RUNOFF COEFFICIENT   =   0.290

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.94   0.025     4.42    16.35
      + ID2= 2 (  0002):     0.25   0.010     4.17    16.30
        ================================================
        ID = 3 (  0010):     1.19   0.033     4.33    16.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0011)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.00
--------------------     Slope      (m/m)=  0.015
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .259E+00       0.0          0.75         0.13
       0.17     .720E+00       0.1          1.17         0.09
       0.26     .130E+01       0.3          1.51         0.07
       0.35     .197E+01       0.6          1.79         0.06
       0.43     .270E+01       0.9          2.04         0.05
       0.52     .348E+01       1.3          2.26         0.04
```

0.61	.429E+01	1.8	2.45	0.04
0.69	.513E+01	2.2	2.62	0.04
0.78	.599E+01	2.8	2.76	0.04
0.87	.684E+01	3.3	2.89	0.03
0.96	.770E+01	3.8	3.00	0.03
1.04	.854E+01	4.4	3.09	0.03
1.13	.935E+01	4.9	3.15	0.03
1.22	.101E+02	5.4	3.20	0.03
1.30	.109E+02	5.8	3.22	0.03
1.39	.115E+02	6.2	3.22	0.03
1.48	.121E+02	6.4	3.19	0.03
1.56	.126E+02	6.5	3.10	0.03
1.65	.128E+02	6.1	2.83	0.04

	<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0010)	1.19	0.03	4.33	16.34	0.09	0.75
OUTFLOW: ID= 1 (0011)	1.19	0.03	4.33	16.34	0.09	0.75

CALIB			
NASHYD (0005)	Area (ha)= 0.22	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.27		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05

```
             1.667    1.44 | 4.667    8.29 | 7.667    1.75 | 10.67    1.05
             1.750    1.54 | 4.750    6.69 | 7.750    1.68 | 10.75    1.03
             1.833    1.54 | 4.833    6.69 | 7.833    1.68 | 10.83    1.03
             1.917    1.65 | 4.917    5.63 | 7.917    1.62 | 10.92    1.01
             2.000    1.65 | 5.000    5.63 | 8.000    1.62 | 11.00    1.01
             2.083    1.78 | 5.083    4.87 | 8.083    1.57 | 11.08    0.99
             2.167    1.78 | 5.167    4.87 | 8.167    1.57 | 11.17    0.99
             2.250    1.94 | 5.250    4.30 | 8.250    1.51 | 11.25    0.97
             2.333    1.94 | 5.333    4.30 | 8.333    1.51 | 11.33    0.97
             2.417    2.13 | 5.417    3.86 | 8.417    1.47 | 11.42    0.95
             2.500    2.13 | 5.500    3.86 | 8.500    1.47 | 11.50    0.95
             2.583    2.37 | 5.583    3.51 | 8.583    1.42 | 11.58    0.93
             2.667    2.37 | 5.667    3.51 | 8.667    1.42 | 11.67    0.93
             2.750    2.68 | 5.750    3.22 | 8.750    1.38 | 11.75    0.92
             2.833    2.68 | 5.833    3.22 | 8.833    1.38 | 11.83    0.92
             2.917    3.10 | 5.917    2.98 | 8.917    1.34 | 11.92    0.90
             3.000    3.10 | 6.000    2.98 | 9.000    1.34 | 12.00    0.90

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   4.250
     RUNOFF VOLUME    (mm)=  16.344
     TOTAL RAINFALL   (mm)=  56.170
     RUNOFF COEFFICIENT   =   0.291

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.033     4.33    16.34
      + ID2= 2 (  0005):     0.22   0.007     4.25    16.34
        ================================================
        ID = 3 (  0012):     1.41   0.040     4.33    16.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n        =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .280E+00       0.1          1.25         0.09
```

0.17	.780E+00	0.2	1.95	0.06
0.26	.141E+01	0.5	2.51	0.04
0.35	.213E+01	1.0	2.98	0.04
0.43	.292E+01	1.5	3.40	0.03
0.52	.376E+01	2.2	3.76	0.03
0.61	.465E+01	2.9	4.07	0.03
0.69	.556E+01	3.7	4.35	0.02
0.78	.648E+01	4.6	4.60	0.02
0.87	.741E+01	5.5	4.81	0.02
0.96	.834E+01	6.4	4.99	0.02
1.04	.925E+01	7.3	5.13	0.02
1.13	.101E+02	8.2	5.24	0.02
1.22	.110E+02	9.0	5.32	0.02
1.30	.118E+02	9.7	5.36	0.02
1.39	.125E+02	10.3	5.36	0.02
1.48	.131E+02	10.7	5.30	0.02
1.56	.136E+02	10.8	5.16	0.02
1.65	.139E+02	10.1	4.71	0.02

<---- hydrograph ----> <-pipe / channel->

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0012)	1.41	0.04	4.33	16.34	0.06	1.25
OUTFLOW: ID= 1 (0008)	1.41	0.04	4.33	16.34	0.06	1.25

CALIB NASHYD (0004) ID= 1 DT= 5.0 min	Area (ha)=	0.22	Curve Number (CN)= 74.0
	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12

1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

ADD HYD (0009)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0004):		0.22	0.009	4.17	16.30
+ ID2= 2 (0008):		1.41	0.040	4.33	16.34
ID = 3 (0009):		1.63	0.047	4.25	16.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\45a3a046-a6ee-45ea-b1d3-c20b14faeeb6\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\45a3a046-a6ee-45ea-b1d3-c20b14faeeb6\scenari


DATE: 02-27-2024                          TIME: 08:44:35

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
------------------------------
  ********************************************
  ** SIMULATION : Chicago Design Storm - 10yr 6 **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 57.02 mm |                          B=   6.014
--------------------                          C=   0.816
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

             TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
              hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.00    2.05 |  1.50   11.13 |  3.00    5.63 |  4.50    2.66
```

0.17	2.23	1.67	28.10	3.17	4.97	4.67	2.52
0.33	2.45	1.83	122.14	3.33	4.46	4.83	2.40
0.50	2.73	2.00	37.28	3.50	4.05	5.00	2.29
0.67	3.09	2.17	18.95	3.67	3.71	5.17	2.19
0.83	3.57	2.33	12.70	3.83	3.43	5.33	2.09
1.00	4.25	2.50	9.59	4.00	3.20	5.50	2.01
1.17	5.29	2.67	7.73	4.17	2.99	5.67	1.94
1.33	7.11	2.83	6.50	4.33	2.81	5.83	1.87

CALIB			
NASHYD (0006)	Area (ha)=	0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 16.783
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.294

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

```
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.69
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.60   Dir. Conn.(%)=  51.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.33
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.25         0.80
     Length            (m)=      67.83        59.90
     Mannings n           =      0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    2.05 | 1.583   11.13 | 3.083    5.63 |  4.58    2.66
         0.167    2.05 | 1.667   11.13 | 3.167    5.63 |  4.67    2.66
         0.250    2.23 | 1.750   28.10 | 3.250    4.97 |  4.75    2.52
         0.333    2.23 | 1.833   28.10 | 3.333    4.97 |  4.83    2.52
         0.417    2.45 | 1.917  122.14 | 3.417    4.46 |  4.92    2.40
         0.500    2.45 | 2.000  122.14 | 3.500    4.46 |  5.00    2.40
         0.583    2.73 | 2.083   37.28 | 3.583    4.05 |  5.08    2.29
         0.667    2.73 | 2.167   37.28 | 3.667    4.05 |  5.17    2.29
         0.750    3.09 | 2.250   18.95 | 3.750    3.71 |  5.25    2.19
         0.833    3.09 | 2.333   18.95 | 3.833    3.71 |  5.33    2.19
         0.917    3.57 | 2.417   12.70 | 3.917    3.43 |  5.42    2.09
         1.000    3.57 | 2.500   12.70 | 4.000    3.43 |  5.50    2.09
         1.083    4.25 | 2.583    9.59 | 4.083    3.20 |  5.58    2.01
         1.167    4.25 | 2.667    9.59 | 4.167    3.20 |  5.67    2.01
         1.250    5.29 | 2.750    7.73 | 4.250    2.99 |  5.75    1.94
         1.333    5.29 | 2.833    7.73 | 4.333    2.99 |  5.83    1.94
         1.417    7.11 | 2.917    6.50 | 4.417    2.81 |  5.92    1.87
         1.500    7.11 | 3.000    6.50 | 4.500    2.81 |  6.00    1.87

     Max.Eff.Inten.(mm/hr)=     122.14        38.76
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       2.83 (ii)   20.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.28         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.02          0.123 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      55.45        13.11          34.95
     TOTAL RAINFALL   (mm)=      57.02        57.02          57.02
     RUNOFF COEFFICIENT   =       0.97         0.23           0.61

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
```

```
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.69   0.123     2.00    34.95
      + ID2= 2 (  0006):     0.19   0.009     2.17    16.78
        ================================================
        ID = 3 (  0007):     0.88   0.129     2.00    31.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.94   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

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


                        ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    2.05 | 1.583   11.13 | 3.083    5.63 |  4.58    2.66
           0.167    2.05 | 1.667   11.13 | 3.167    5.63 |  4.67    2.66
           0.250    2.23 | 1.750   28.10 | 3.250    4.97 |  4.75    2.52
           0.333    2.23 | 1.833   28.10 | 3.333    4.97 |  4.83    2.52
           0.417    2.45 | 1.917  122.14 | 3.417    4.46 |  4.92    2.40
           0.500    2.45 | 2.000  122.14 | 3.500    4.46 |  5.00    2.40
           0.583    2.73 | 2.083   37.28 | 3.583    4.05 |  5.08    2.29
           0.667    2.73 | 2.167   37.28 | 3.667    4.05 |  5.17    2.29
           0.750    3.09 | 2.250   18.95 | 3.750    3.71 |  5.25    2.19
           0.833    3.09 | 2.333   18.95 | 3.833    3.71 |  5.33    2.19
           0.917    3.57 | 2.417   12.70 | 3.917    3.43 |  5.42    2.09
           1.000    3.57 | 2.500   12.70 | 4.000    3.43 |  5.50    2.09
           1.083    4.25 | 2.583    9.59 | 4.083    3.20 |  5.58    2.01
           1.167    4.25 | 2.667    9.59 | 4.167    3.20 |  5.67    2.01
           1.250    5.29 | 2.750    7.73 | 4.250    2.99 |  5.75    1.94
           1.333    5.29 | 2.833    7.73 | 4.333    2.99 |  5.83    1.94
           1.417    7.11 | 2.917    6.50 | 4.417    2.81 |  5.92    1.87
           1.500    7.11 | 3.000    6.50 | 4.500    2.81 |  6.00    1.87

     Unit Hyd Qpeak  (cms)=   0.103
```

```
     PEAK FLOW       (cms)=   0.031 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=  16.840
     TOTAL RAINFALL   (mm)=  57.019
     RUNOFF COEFFICIENT   =   0.295

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

-------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)=   0.25   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.083    2.05 | 1.583   11.13 | 3.083    5.63 |  4.58    2.66
             0.167    2.05 | 1.667   11.13 | 3.167    5.63 |  4.67    2.66
             0.250    2.23 | 1.750   28.10 | 3.250    4.97 |  4.75    2.52
             0.333    2.23 | 1.833   28.10 | 3.333    4.97 |  4.83    2.52
             0.417    2.45 | 1.917  122.14 | 3.417    4.46 |  4.92    2.40
             0.500    2.45 | 2.000  122.14 | 3.500    4.46 |  5.00    2.40
             0.583    2.73 | 2.083   37.28 | 3.583    4.05 |  5.08    2.29
             0.667    2.73 | 2.167   37.28 | 3.667    4.05 |  5.17    2.29
             0.750    3.09 | 2.250   18.95 | 3.750    3.71 |  5.25    2.19
             0.833    3.09 | 2.333   18.95 | 3.833    3.71 |  5.33    2.19
             0.917    3.57 | 2.417   12.70 | 3.917    3.43 |  5.42    2.09
             1.000    3.57 | 2.500   12.70 | 4.000    3.43 |  5.50    2.09
             1.083    4.25 | 2.583    9.59 | 4.083    3.20 |  5.58    2.01
             1.167    4.25 | 2.667    9.59 | 4.167    3.20 |  5.67    2.01
             1.250    5.29 | 2.750    7.73 | 4.250    2.99 |  5.75    1.94
             1.333    5.29 | 2.833    7.73 | 4.333    2.99 |  5.83    1.94
             1.417    7.11 | 2.917    6.50 | 4.417    2.81 |  5.92    1.87
             1.500    7.11 | 3.000    6.50 | 4.500    2.81 |  6.00    1.87

     Unit Hyd Qpeak  (cms)=   0.057

     PEAK FLOW       (cms)=   0.013 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  16.783
     TOTAL RAINFALL   (mm)=  57.019
     RUNOFF COEFFICIENT   =   0.294

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

-------------------------------------------------------------------------------
--
```

```
--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.94   0.031     2.42    16.84
      + ID2= 2 (  0002):     0.25   0.013     2.17    16.78
        ================================================
        ID = 3 (  0010):     1.19   0.040     2.33    16.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0011)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.00
--------------------     Slope      (m/m)=  0.015
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .259E+00       0.0         0.75         0.13
       0.17     .720E+00       0.1         1.17         0.09
       0.26     .130E+01       0.3         1.51         0.07
       0.35     .197E+01       0.6         1.79         0.06
       0.43     .270E+01       0.9         2.04         0.05
       0.52     .348E+01       1.3         2.26         0.04
       0.61     .429E+01       1.8         2.45         0.04
       0.69     .513E+01       2.2         2.62         0.04
       0.78     .599E+01       2.8         2.76         0.04
       0.87     .684E+01       3.3         2.89         0.03
       0.96     .770E+01       3.8         3.00         0.03
       1.04     .854E+01       4.4         3.09         0.03
       1.13     .935E+01       4.9         3.15         0.03
       1.22     .101E+02       5.4         3.20         0.03
       1.30     .109E+02       5.8         3.22         0.03
       1.39     .115E+02       6.2         3.22         0.03
       1.48     .121E+02       6.4         3.19         0.03
       1.56     .126E+02       6.5         3.10         0.03
       1.65     .128E+02       6.1         2.83         0.04
                                    <---- hydrograph ---->   <-pipe /
channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0010)    1.19     0.04    2.33  16.83      0.09      0.77
OUTFLOW: ID= 1 (  0011)    1.19     0.04    2.33  16.83      0.09      0.77



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

```
  Unit Hyd Qpeak  (cms)=   0.031

PEAK FLOW       (cms)=   0.008 (i)
TIME TO PEAK    (hrs)=   2.250
RUNOFF VOLUME    (mm)=  16.832
TOTAL RAINFALL   (mm)=  57.019
RUNOFF COEFFICIENT   =   0.295

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.040     2.33    16.83
      + ID2= 2 (  0005):     0.22   0.008     2.25    16.83
        ================================================
        ID = 3 (  0012):     1.41   0.049     2.33    16.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n        =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .280E+00       0.1          1.25         0.09
       0.17     .780E+00       0.2          1.95         0.06
       0.26     .141E+01       0.5          2.51         0.04
       0.35     .213E+01       1.0          2.98         0.04
       0.43     .292E+01       1.5          3.40         0.03
       0.52     .376E+01       2.2          3.76         0.03
       0.61     .465E+01       2.9          4.07         0.03
       0.69     .556E+01       3.7          4.35         0.02
       0.78     .648E+01       4.6          4.60         0.02
       0.87     .741E+01       5.5          4.81         0.02
       0.96     .834E+01       6.4          4.99         0.02
       1.04     .925E+01       7.3          5.13         0.02
       1.13     .101E+02       8.2          5.24         0.02
       1.22     .110E+02       9.0          5.32         0.02
       1.30     .118E+02       9.7          5.36         0.02
       1.39     .125E+02      10.3          5.36         0.02
       1.48     .131E+02      10.7          5.30         0.02
       1.56     .136E+02      10.8          5.16         0.02
       1.65     .139E+02      10.1          4.71         0.02
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0012)  1.41     0.05    2.33  16.83      0.08      1.25
OUTFLOW: ID= 1 (  0008)  1.41     0.05    2.33  16.83      0.08      1.25



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
            hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    2.05 | 1.583   11.13 | 3.083    5.63 |  4.58    2.66
```

0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 16.783
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.294

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

ADD HYD (0009)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0004):		0.22	0.011	2.17	16.78
+ ID2= 2 (0008):		1.41	0.049	2.33	16.83
ID = 3 (0009):		1.63	0.058	2.25	16.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\5c2dba2c-125e-45dd-a50e-631cda72602c\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\5c2dba2c-125e-45dd-a50e-631cda72602c\scenari

DATE: 02-27-2024                          TIME: 08:44:35

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
------------------------------
  ************************************************
  ** SIMULATION : Chicago Design Storm - 10 yr- 12**
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 65.22 mm |                          B=   6.014
--------------------                          C=   0.816
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    1.08 |  3.00    4.25 |  6.00    3.20 |  9.00    1.50
              0.17    1.12 |  3.17    5.29 |  6.17    2.99 |  9.17    1.46
```

0.33	1.17	3.33	7.11	6.33	2.81	9.33	1.42
0.50	1.22	3.50	11.13	6.50	2.66	9.50	1.38
0.67	1.27	3.67	28.10	6.67	2.52	9.67	1.35
0.83	1.33	3.83	122.14	6.83	2.40	9.83	1.32
1.00	1.40	4.00	37.28	7.00	2.29	10.00	1.29
1.17	1.48	4.17	18.95	7.17	2.19	10.17	1.26
1.33	1.56	4.33	12.70	7.33	2.09	10.33	1.23
1.50	1.66	4.50	9.59	7.50	2.01	10.50	1.21
1.67	1.77	4.67	7.73	7.67	1.94	10.67	1.18
1.83	1.90	4.83	6.50	7.83	1.87	10.83	1.16
2.00	2.05	5.00	5.63	8.00	1.80	11.00	1.13
2.17	2.23	5.17	4.97	8.17	1.74	11.17	1.11
2.33	2.45	5.33	4.46	8.33	1.69	11.33	1.09
2.50	2.73	5.50	4.05	8.50	1.63	11.50	1.07
2.67	3.09	5.67	3.71	8.67	1.59	11.67	1.05
2.83	3.57	5.83	3.43	8.83	1.54	11.83	1.03

CALIB			
NASHYD (0006)	Area (ha)=	0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18

1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.698
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

CALIB	
STANDHYD (0003)	Area (ha)= 0.69
ID= 1 DT= 5.0 min	Total Imp(%)= 51.60 Dir. Conn.(%)= 51.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.33
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	67.83	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35

0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Max.Eff.Inten.(mm/hr)=	122.14	42.69	
over (min)	5.00	20.00	
Storage Coeff. (min)=	2.83 (ii)	19.47 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.28	0.06	
			TOTALS
PEAK FLOW (cms)=	0.12	0.02	0.125 (iii)
TIME TO PEAK (hrs)=	4.00	4.25	4.00
RUNOFF VOLUME (mm)=	63.65	14.64	39.93
TOTAL RAINFALL (mm)=	65.22	65.22	65.22
RUNOFF COEFFICIENT =	0.98	0.22	0.61

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--

ADD HYD (0007)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):		0.69	0.125	4.00	39.93
+ ID2= 2 (0006):		0.19	0.011	4.17	21.70
ID = 3 (0007):		0.88	0.133	4.00	36.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0001)	Area (ha)= 0.94	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.35		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09

2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.103

PEAK FLOW (cms)= 0.035 (i)
TIME TO PEAK (hrs)= 4.417
RUNOFF VOLUME (mm)= 21.772
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.334

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

CALIB			
NASHYD (0002)	Area (ha)=	0.25	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16

2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.057

PEAK FLOW (cms)= 0.014 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.699
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

ADD HYD (0010)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (0001):	0.94	0.035	4.42	21.77
	+ ID2= 2 (0002):	0.25	0.014	4.17	21.70
	ID = 3 (0010):	1.19	0.046	4.33	21.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

PIPE Number = 1.00
Diameter (mm)=1650.00
Length (m)= 6.00
Slope (m/m)= 0.015
Manning n = 0.024

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.259E+00	0.0	0.75	0.13
0.17	.720E+00	0.1	1.17	0.09
0.26	.130E+01	0.3	1.51	0.07
0.35	.197E+01	0.6	1.79	0.06
0.43	.270E+01	0.9	2.04	0.05
0.52	.348E+01	1.3	2.26	0.04

0.61	.429E+01	1.8	2.45	0.04
0.69	.513E+01	2.2	2.62	0.04
0.78	.599E+01	2.8	2.76	0.04
0.87	.684E+01	3.3	2.89	0.03
0.96	.770E+01	3.8	3.00	0.03
1.04	.854E+01	4.4	3.09	0.03
1.13	.935E+01	4.9	3.15	0.03
1.22	.101E+02	5.4	3.20	0.03
1.30	.109E+02	5.8	3.22	0.03
1.39	.115E+02	6.2	3.22	0.03
1.48	.121E+02	6.4	3.19	0.03
1.56	.126E+02	6.5	3.10	0.03
1.65	.128E+02	6.1	2.83	0.04

	<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0010)	1.19	0.05	4.33	21.76	0.10	0.79
OUTFLOW: ID= 1 (0011)	1.19	0.05	4.33	21.76	0.10	0.79

CALIB			
NASHYD (0005)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21

```
             1.667    1.66 | 4.667    9.59 | 7.667    2.01 | 10.67    1.21
             1.750    1.77 | 4.750    7.73 | 7.750    1.94 | 10.75    1.18
             1.833    1.77 | 4.833    7.73 | 7.833    1.94 | 10.83    1.18
             1.917    1.90 | 4.917    6.50 | 7.917    1.87 | 10.92    1.16
             2.000    1.90 | 5.000    6.50 | 8.000    1.87 | 11.00    1.16
             2.083    2.05 | 5.083    5.63 | 8.083    1.80 | 11.08    1.13
             2.167    2.05 | 5.167    5.63 | 8.167    1.80 | 11.17    1.13
             2.250    2.23 | 5.250    4.97 | 8.250    1.74 | 11.25    1.11
             2.333    2.23 | 5.333    4.97 | 8.333    1.74 | 11.33    1.11
             2.417    2.45 | 5.417    4.46 | 8.417    1.69 | 11.42    1.09
             2.500    2.45 | 5.500    4.46 | 8.500    1.69 | 11.50    1.09
             2.583    2.73 | 5.583    4.05 | 8.583    1.63 | 11.58    1.07
             2.667    2.73 | 5.667    4.05 | 8.667    1.63 | 11.67    1.07
             2.750    3.09 | 5.750    3.71 | 8.750    1.59 | 11.75    1.05
             2.833    3.09 | 5.833    3.71 | 8.833    1.59 | 11.83    1.05
             2.917    3.57 | 5.917    3.43 | 8.917    1.54 | 11.92    1.03
             3.000    3.57 | 6.000    3.43 | 9.000    1.54 | 12.00    1.03

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.010 (i)
     TIME TO PEAK    (hrs)=   4.250
     RUNOFF VOLUME    (mm)=  21.762
     TOTAL RAINFALL   (mm)=  65.219
     RUNOFF COEFFICIENT   =   0.334

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.046     4.33    21.76
      + ID2= 2 (  0005):     0.22   0.010     4.25    21.76
        ================================================
        ID = 3 (  0012):     1.41   0.055     4.25    21.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n        =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .280E+00       0.1          1.25         0.09
```

0.17	.780E+00	0.2	1.95	0.06
0.26	.141E+01	0.5	2.51	0.04
0.35	.213E+01	1.0	2.98	0.04
0.43	.292E+01	1.5	3.40	0.03
0.52	.376E+01	2.2	3.76	0.03
0.61	.465E+01	2.9	4.07	0.03
0.69	.556E+01	3.7	4.35	0.02
0.78	.648E+01	4.6	4.60	0.02
0.87	.741E+01	5.5	4.81	0.02
0.96	.834E+01	6.4	4.99	0.02
1.04	.925E+01	7.3	5.13	0.02
1.13	.101E+02	8.2	5.24	0.02
1.22	.110E+02	9.0	5.32	0.02
1.30	.118E+02	9.7	5.36	0.02
1.39	.125E+02	10.3	5.36	0.02
1.48	.131E+02	10.7	5.30	0.02
1.56	.136E+02	10.8	5.16	0.02
1.65	.139E+02	10.1	4.71	0.02

	<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0012)	1.41	0.06	4.25	21.76	0.09	1.25
OUTFLOW: ID= 1 (0008)	1.41	0.06	4.25	21.76	0.09	1.25

CALIB					
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)=	74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29

1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.012 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.698
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

ADD HYD (0009)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0004):		0.22	0.012	4.17	21.70
+ ID2= 2 (0008):		1.41	0.055	4.25	21.76
ID = 3 (0009):		1.63	0.066	4.25	21.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\b2fead06-9d83-43cc-b1bf-bed445123e42\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\b2fead06-9d83-43cc-b1bf-bed445123e42\scenari

DATE: 02-27-2024                          TIME: 08:44:36

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ************************************************
  ** SIMULATION : Chicago Design Storm – 100yr - 6**
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 82.32 mm |                          B=   6.014
--------------------                          C=   0.820
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  6.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    2.90 |  1.50   15.97 |  3.00    8.02 |  4.50    3.77
```

0.17	3.16	1.67	40.65	3.17	7.08	4.67	3.57
0.33	3.48	1.83	178.56	3.33	6.35	4.83	3.40
0.50	3.88	2.00	54.05	3.50	5.76	5.00	3.24
0.67	4.39	2.17	27.32	3.67	5.28	5.17	3.10
0.83	5.07	2.33	18.24	3.83	4.88	5.33	2.97
1.00	6.05	2.50	13.74	4.00	4.54	5.50	2.85
1.17	7.54	2.67	11.06	4.17	4.25	5.67	2.74
1.33	10.16	2.83	9.29	4.33	3.99	5.83	2.64

--

CALIB			
NASHYD (0006)	Area (ha)=	0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 33.003
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.401

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

--

CALIB	
STANDHYD (0003)	Area (ha)= 0.69
ID= 1 DT= 5.0 min	Total Imp(%)= 51.60 Dir. Conn.(%)= 51.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.33
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	67.83	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Max.Eff.Inten.(mm/hr)=		178.56	99.88	
over (min)		5.00	15.00	
Storage Coeff. (min)=		2.43 (ii)	14.28 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.30	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.17	0.06	0.201 (iii)
TIME TO PEAK	(hrs)=	2.00	2.17	2.00
RUNOFF VOLUME	(mm)=	80.75	30.52	56.43
TOTAL RAINFALL	(mm)=	82.32	82.32	82.32
RUNOFF COEFFICIENT	=	0.98	0.37	0.69

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.69   0.201     2.00    56.43
      + ID2= 2 (  0006):     0.19   0.020     2.17    33.00
        ================================================
        ID = 3 (  0007):     0.88   0.215     2.00    51.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.94   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

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


                          ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    2.90 | 1.583   15.97 | 3.083    8.02 |  4.58    3.77
           0.167    2.90 | 1.667   15.97 | 3.167    8.02 |  4.67    3.77
           0.250    3.16 | 1.750   40.65 | 3.250    7.08 |  4.75    3.57
           0.333    3.16 | 1.833   40.66 | 3.333    7.08 |  4.83    3.57
           0.417    3.48 | 1.917  178.56 | 3.417    6.35 |  4.92    3.40
           0.500    3.48 | 2.000  178.56 | 3.500    6.35 |  5.00    3.40
           0.583    3.88 | 2.083   54.05 | 3.583    5.76 |  5.08    3.24
           0.667    3.88 | 2.167   54.05 | 3.667    5.76 |  5.17    3.24
           0.750    4.39 | 2.250   27.32 | 3.750    5.28 |  5.25    3.10
           0.833    4.39 | 2.333   27.32 | 3.833    5.28 |  5.33    3.10
           0.917    5.07 | 2.417   18.24 | 3.917    4.88 |  5.42    2.97
           1.000    5.07 | 2.500   18.24 | 4.000    4.88 |  5.50    2.97
           1.083    6.05 | 2.583   13.74 | 4.083    4.54 |  5.58    2.85
           1.167    6.05 | 2.667   13.74 | 4.167    4.54 |  5.67    2.85
           1.250    7.54 | 2.750   11.06 | 4.250    4.25 |  5.75    2.74
           1.333    7.54 | 2.833   11.06 | 4.333    4.25 |  5.83    2.74
           1.417   10.16 | 2.917    9.29 | 4.417    3.99 |  5.92    2.64
           1.500   10.16 | 3.000    9.29 | 4.500    3.99 |  6.00    2.64
        Unit Hyd Qpeak  (cms)=   0.103

     PEAK FLOW       (cms)=   0.066 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  33.116
     TOTAL RAINFALL   (mm)=  82.319
```

RUNOFF COEFFICIENT = 0.402

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

CALIB			
NASHYD (0002)	Area (ha)= 0.25	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.057

PEAK FLOW (cms)= 0.027 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 33.005
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.401

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

```
--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.94   0.066     2.33    33.12
      + ID2= 2 (  0002):     0.25   0.027     2.17    33.00
        ================================================
        ID = 3 (  0010):     1.19   0.085     2.25    33.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0011)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.00
--------------------     Slope      (m/m)=  0.015
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .259E+00       0.0         0.75         0.13
       0.17     .720E+00       0.1         1.17         0.09
       0.26     .130E+01       0.3         1.51         0.07
       0.35     .197E+01       0.6         1.79         0.06
       0.43     .270E+01       0.9         2.04         0.05
       0.52     .348E+01       1.3         2.26         0.04
       0.61     .429E+01       1.8         2.45         0.04
       0.69     .513E+01       2.2         2.62         0.04
       0.78     .599E+01       2.8         2.76         0.04
       0.87     .684E+01       3.3         2.89         0.03
       0.96     .770E+01       3.8         3.00         0.03
       1.04     .854E+01       4.4         3.09         0.03
       1.13     .935E+01       4.9         3.15         0.03
       1.22     .101E+02       5.4         3.20         0.03
       1.30     .109E+02       5.8         3.22         0.03
       1.39     .115E+02       6.2         3.22         0.03
       1.48     .121E+02       6.4         3.19         0.03
       1.56     .126E+02       6.5         3.10         0.03
       1.65     .128E+02       6.1         2.83         0.04
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0010)  1.19     0.09    2.25  33.09      0.13      0.91
OUTFLOW: ID= 1 (  0011)  1.19     0.09    2.25  33.09      0.13      0.91



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

```
      Unit Hyd Qpeak  (cms)=   0.031

   PEAK FLOW       (cms)=   0.018 (i)
   TIME TO PEAK    (hrs)=   2.250
   RUNOFF VOLUME    (mm)=  33.102
   TOTAL RAINFALL   (mm)=  82.319
   RUNOFF COEFFICIENT   =   0.402

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.19   0.085     2.25    33.09
      + ID2= 2 (  0005):     0.22   0.018     2.25    33.10
        ================================================
        ID = 3 (  0012):     1.41   0.103     2.25    33.09

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0008)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)=1650.00
| DT=  5.0 min     |     Length       (m)=   6.50
--------------------     Slope      (m/m)=  0.041
                         Manning n        =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.09     .280E+00       0.1          1.25         0.09
       0.17     .780E+00       0.2          1.95         0.06
       0.26     .141E+01       0.5          2.51         0.04
       0.35     .213E+01       1.0          2.98         0.04
       0.43     .292E+01       1.5          3.40         0.03
       0.52     .376E+01       2.2          3.76         0.03
       0.61     .465E+01       2.9          4.07         0.03
       0.69     .556E+01       3.7          4.35         0.02
       0.78     .648E+01       4.6          4.60         0.02
       0.87     .741E+01       5.5          4.81         0.02
       0.96     .834E+01       6.4          4.99         0.02
       1.04     .925E+01       7.3          5.13         0.02
       1.13     .101E+02       8.2          5.24         0.02
       1.22     .110E+02       9.0          5.32         0.02
       1.30     .118E+02       9.7          5.36         0.02
       1.39     .125E+02      10.3          5.36         0.02
       1.48     .131E+02      10.7          5.30         0.02
       1.56     .136E+02      10.8          5.16         0.02
       1.65     .139E+02      10.1          4.71         0.02
                              <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0012)    1.41     0.10    2.25  33.09      0.11      1.39
OUTFLOW: ID= 1 (  0008)    1.41     0.10    2.25  33.09      0.11      1.39



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
            hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    2.90 | 1.583   15.97 | 3.083    8.02 |  4.58    3.77
```

0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 33.005
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.401

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

ADD HYD (0009)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0004):	0.22	0.023	2.17	33.00
+ ID2= 2 (0008):	1.41	0.103	2.25	33.09
ID = 3 (0009):	1.63	0.123	2.25	33.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

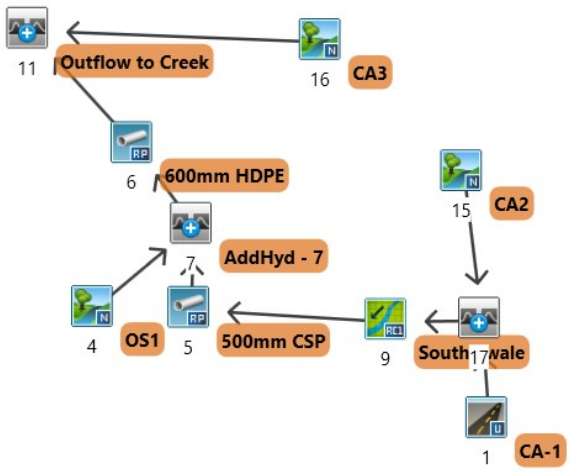
APPENDIX C: POST-DEVELOPMENT DATA –PHASE 1

Post-Development OTTHYMO Model Schematic

Post-Development Schematic Summary Table

Post-Development Detailed Output File

OTTHYMO Phase 1 Development Model Schematic (Johnstown Creek Catchment)



OTTHYMO Phase 1 Development Model Schematic (Queen Creek Catchment)

Schematic Summary Table

Hydrograph No.	Model Type	Catchment Represented	Comment
12	STANDHYD	CA-4	Typical: Catchment based on swale outlet location. Includes roof areas, gravel areas, and road surface which outlets to County Infrastructure
1	STANHYD	CA-1	Typical: Catchment based on swale outlet location. Includes roof areas, gravel areas, and road surface which outlets to Johnstown Creek
15, 16	NASHYD	CA-2, CA-3	Typical: Catchments based on existing maintained grassed areas, which discharge into the drainage ditch which outlets into Johnstown Creek
4	NASHYD	OS-1	Offsite runoff from property to the west draining into the same route pipe as CA-1
13	NASHYD	OS-2	Offsite runoff from property to south draining into CA-4
5	ROUTEPIPE	n/a	Models storm pipe network of 500mm diameter CSP culvert crossing the unmaintained pathway of First Street
6	ROUTEPIPE	n/a	Models storm pipe network of proposed 600mm diameter HDPE culvert within the existing swale
7, 17	ADDHYD	n/a	Represents the merger of two hydrographs into a flowpipe
11, 14	ADDHYD	n/a	Last link in model. Represents total post-development flow to each respective catchment.
9	ROUTECHANNEL	n/a	Models the swale to the south of the future First Street prior to discharging in the 500mm CSP culvert .

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\a4a1e4d8-9592-4b0b-9448-34abdee282c4\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\a4a1e4d8-9592-4b0b-9448-34abdee282c4\scenari


DATE: 02-27-2024                          TIME: 03:46:48

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ********************************************
  ** SIMULATION : Chicago Design Storm - 5 yr 6 **
  ********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 49.04 mm |                          B=   6.053
--------------------                          C=   0.814
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  6.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    1.78 |  1.50    9.61 |  3.00    4.87 |  4.50    2.31
```

0.17	1.94	1.67	24.17	3.17	4.30	4.67	2.19
0.33	2.13	1.83	104.19	3.33	3.86	4.83	2.08
0.50	2.37	2.00	32.04	3.50	3.51	5.00	1.99
0.67	2.68	2.17	16.34	3.67	3.22	5.17	1.90
0.83	3.10	2.33	10.96	3.83	2.98	5.33	1.82
1.00	3.68	2.50	8.29	4.00	2.77	5.50	1.75
1.17	4.58	2.67	6.69	4.17	2.60	5.67	1.68
1.33	6.15	2.83	5.63	4.33	2.44	5.83	1.62

--

| CALIB |
| NASHYD (0004)| Area (ha)= 0.22 Curve Number (CN)= 74.0
|ID= 1 DT= 5.0 min | Ia (mm)= 8.92 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 12.431
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

--

```
--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)=   0.37   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

```
     Unit Hyd Qpeak  (cms)=   0.083

     PEAK FLOW       (cms)=   0.013 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  12.396
     TOTAL RAINFALL   (mm)=  49.038
     RUNOFF COEFFICIENT   =   0.253

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

--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250
```

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Max.Eff.Inten.(mm/hr)=	104.19	72.99	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.62 (ii)	26.43 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.29	0.04	
			TOTALS
PEAK FLOW (cms)=	0.09	0.05	0.097 (iii)
TIME TO PEAK (hrs)=	2.00	2.42	2.00
RUNOFF VOLUME (mm)=	47.47	18.59	27.19
TOTAL RAINFALL (mm)=	49.04	49.04	49.04
RUNOFF COEFFICIENT =	0.97	0.38	0.55

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0017)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):		1.04	0.097	2.00	27.19
+ ID2= 2 (0015):		0.37	0.013	2.17	12.40
ID = 3 (0017):		1.41	0.106	2.00	23.32

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0009)		
IN= 2---> OUT= 1	Routing time step (min)'=	5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel
3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.529E+01	0.0	0.36	3.50
0.19	99.69	.168E+02	0.2	0.68	1.82
0.29	99.79	.293E+02	0.4	0.92	1.37
0.38	99.88	.428E+02	0.6	1.10	1.14
0.48	99.98	.572E+02	1.0	1.25	1.00
0.57	100.07	.726E+02	1.3	1.38	0.91
0.67	100.17	.890E+02	1.8	1.49	0.84
0.76	100.26	.106E+03	2.3	1.60	0.78
0.86	100.36	.125E+03	2.8	1.70	0.74
0.95	100.45	.144E+03	3.4	1.79	0.70
1.05	100.55	.164E+03	4.1	1.87	0.67
1.16	100.66	.191E+03	5.1	2.00	0.63
1.28	100.78	.222E+03	6.3	2.13	0.59
1.39	100.89	.255E+03	7.6	2.23	0.56
1.50	101.00	.292E+03	9.0	2.32	0.54
1.61	101.11	.332E+03	10.6	2.39	0.52
1.72	101.22	.375E+03	12.3	2.45	0.51
1.84	101.34	.420E+03	14.0	2.51	0.50
1.95	101.45	.469E+03	16.0	2.55	0.49

		<---- hydrograph ---->				<-pipe / channel->	
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (	0017)	1.41	0.11	2.00	23.32	0.16	0.51
OUTFLOW: ID= 1 (	0009)	1.41	0.10	2.00	23.32	0.15	0.49

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.41     0.10    2.00  23.32      0.21      1.25
OUTFLOW: ID= 1 (  0005)  1.41     0.10    2.00  23.32      0.21      1.25



--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0004):     0.22   0.006     2.33    12.43
      + ID2= 2 (  0005):     1.41   0.098     2.00    23.32
        ================================================
        ID = 3 (  0007):     1.63   0.100     2.00    21.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                               <---- hydrograph ---->   <-pipe / channel->
                          AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                          (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)   1.63     0.10    2.00  21.85      0.18      1.37
OUTFLOW: ID= 1 (  0006)   1.63     0.10    2.00  21.85      0.18      1.37



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    1.78 | 1.583    9.61 | 3.083    4.87 |  4.58    2.31
```

0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 12.396
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0016):		0.22	0.008	2.17	12.40
+ ID2= 2 (0006):		1.63	0.099	2.00	21.85
ID = 3 (0011):		1.84	0.104	2.00	20.74

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0013)	ID= 1 DT= 5.0 min				
		Area (ha)=	0.19	Curve Number (CN)=	74.0
		Ia (mm)=	8.92	# of Linear Res.(N)=	3.00
		U.H. Tp(hrs)=	0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 12.394
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

CALIB
STANDHYD (0012)
ID= 1 DT= 5.0 min

Area (ha)= 0.48
Total Imp(%)= 48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31

0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

			TOTALS
Max.Eff.Inten.(mm/hr)=	104.19	19.75	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.70 (ii)	25.36 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.29	0.04	
PEAK FLOW (cms)=	0.07	0.01	0.068 (iii)
TIME TO PEAK (hrs)=	2.00	2.42	2.00
RUNOFF VOLUME (mm)=	47.47	8.23	27.40
TOTAL RAINFALL (mm)=	49.04	49.04	49.04
RUNOFF COEFFICIENT =	0.97	0.17	0.56

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0014)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0012):	0.48	0.068	2.00	27.40
+ ID2= 2 (0013):	0.19	0.007	2.17	12.39
ID = 3 (0014):	0.66	0.072	2.00	23.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\acf1b703-43fd-4e54-88b1-74950c3a1867\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\acf1b703-43fd-4e54-88b1-74950c3a1867\scenari


DATE: 02-27-2024                              TIME: 03:46:49

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 5yr 12 **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 56.17 mm |                          B=   6.053
--------------------                          C=   0.814
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    0.94 |  3.00    3.68 |  6.00    2.77 |  9.00    1.30
              0.17    0.98 |  3.17    4.58 |  6.17    2.60 |  9.17    1.27
```

0.33	1.02	3.33	6.15	6.33	2.44	9.33	1.24
0.50	1.06	3.50	9.61	6.50	2.31	9.50	1.20
0.67	1.11	3.67	24.17	6.67	2.19	9.67	1.17
0.83	1.16	3.83	104.19	6.83	2.08	9.83	1.15
1.00	1.22	4.00	32.04	7.00	1.99	10.00	1.12
1.17	1.28	4.17	16.34	7.17	1.90	10.17	1.10
1.33	1.36	4.33	10.96	7.33	1.82	10.33	1.07
1.50	1.44	4.50	8.29	7.50	1.75	10.50	1.05
1.67	1.54	4.67	6.69	7.67	1.68	10.67	1.03
1.83	1.65	4.83	5.63	7.83	1.62	10.83	1.01
2.00	1.78	5.00	4.87	8.00	1.57	11.00	0.99
2.17	1.94	5.17	4.30	8.17	1.51	11.17	0.97
2.33	2.13	5.33	3.86	8.33	1.47	11.33	0.95
2.50	2.37	5.50	3.51	8.50	1.42	11.50	0.93
2.67	2.68	5.67	3.22	8.67	1.38	11.67	0.92
2.83	3.10	5.83	2.98	8.83	1.34	11.83	0.90

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01

2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 16.344
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.291

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

CALIB			
NASHYD (0015)	Area (ha)=	0.37	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07

1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.083

PEAK FLOW (cms)= 0.015 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.297
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

CALIB	
STANDHYD (0001)	Area (ha)= 1.04
ID= 1 DT= 5.0 min	Total Imp(%)= 59.70 Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27

0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Max.Eff.Inten.(mm/hr)=	104.19	78.83	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.62 (ii)	25.71 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.29	0.04	
			TOTALS
PEAK FLOW (cms)=	0.09	0.05	0.099 (iii)
TIME TO PEAK (hrs)=	4.00	4.42	4.00
RUNOFF VOLUME (mm)=	54.60	20.10	30.38
TOTAL RAINFALL (mm)=	56.17	56.17	56.17
RUNOFF COEFFICIENT =	0.97	0.36	0.54

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0017)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     1.04   0.099     4.00    30.38
      + ID2= 2 (  0015):     0.37   0.015     4.17    16.30
        ================================================
        ID = 3 (  0017):     1.41   0.109     4.00    26.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0017)    1.41     0.11    4.00  26.70      0.16      0.52
OUTFLOW: ID= 1 (  0009)    1.41     0.10    4.00  26.70      0.15      0.50
```

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.41     0.10    4.00  26.70      0.21      1.26
OUTFLOW: ID= 1 (  0005)  1.41     0.10    4.00  26.70      0.21      1.25



--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0004):     0.22   0.007     4.25    16.34
      + ID2= 2 (  0005):     1.41   0.101     4.00    26.70
        ================================================
        ID = 3 (  0007):     1.63   0.104     4.00    25.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
--------------------

| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)  1.63     0.10    4.00  25.30      0.19      1.38
OUTFLOW: ID= 1 (  0006)  1.63     0.10    4.00  25.30      0.19      1.39



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
            hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    0.94 | 3.083    3.68 | 6.083    2.77 |  9.08    1.30
          0.167    0.94 | 3.167    3.68 | 6.167    2.77 |  9.17    1.30
```

0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

```
     Unit Hyd Qpeak  (cms)=   0.049

     PEAK FLOW       (cms)=   0.009 (i)
     TIME TO PEAK    (hrs)=   4.167
     RUNOFF VOLUME    (mm)=  16.296
     TOTAL RAINFALL   (mm)=  56.170
     RUNOFF COEFFICIENT   =   0.290

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

-------------------------------------------------------------------------------
--
```

```
--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 1 (  0016):      0.22    0.009      4.17     16.30
      + ID2= 2 (  0006):      1.63    0.103      4.00     25.30
        ================================================
        ID = 3 (  0011):      1.84    0.109      4.00     24.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95

2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

CALIB			
STANDHYD (0012)	Area (ha)= 0.48		
ID= 1 DT= 5.0 min	Total Imp(%)= 48.86	Dir. Conn.(%)= 48.86	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07

1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Max.Eff.Inten.(mm/hr)=	104.19	28.36	
over (min)	5.00	25.00	
Storage Coeff. (min)=	2.70 (ii)	22.30 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.29	0.05	
			TOTALS
PEAK FLOW (cms)=	0.07	0.01	0.069 (iii)
TIME TO PEAK (hrs)=	4.00	4.33	4.00
RUNOFF VOLUME (mm)=	54.60	9.45	31.50
TOTAL RAINFALL (mm)=	56.17	56.17	56.17
RUNOFF COEFFICIENT =	0.97	0.17	0.56

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0014)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0012):		0.48	0.069	4.00	31.50
+ ID2= 2 (0013):		0.19	0.008	4.17	16.30
ID = 3 (0014):		0.66	0.074	4.00	27.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)

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

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\47c7e42f-5b91-4c5a-ad7c-2034ed622d5f\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\47c7e42f-5b91-4c5a-ad7c-2034ed622d5f\scenari


DATE: 02-27-2024                          TIME: 03:46:49

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ********************************************
  ** SIMULATION : Chicago Design Storm - 10yr 6 **
  ********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 57.02 mm |                          B=   6.014
--------------------                          C=   0.816
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  6.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    2.05 |  1.50   11.13 |  3.00    5.63 |  4.50    2.66
```

0.17	2.23	1.67	28.10	3.17	4.97	4.67	2.52
0.33	2.45	1.83	122.14	3.33	4.46	4.83	2.40
0.50	2.73	2.00	37.28	3.50	4.05	5.00	2.29
0.67	3.09	2.17	18.95	3.67	3.71	5.17	2.19
0.83	3.57	2.33	12.70	3.83	3.43	5.33	2.09
1.00	4.25	2.50	9.59	4.00	3.20	5.50	2.01
1.17	5.29	2.67	7.73	4.17	2.99	5.67	1.94
1.33	7.11	2.83	6.50	4.33	2.81	5.83	1.87

CALIB			
NASHYD (0004)	Area (ha)= 0.22	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.27		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 16.832
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.295

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

```
--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)=   0.37   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

```
     Unit Hyd Qpeak  (cms)=   0.083

     PEAK FLOW       (cms)=   0.019 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  16.784
     TOTAL RAINFALL   (mm)=  57.019
     RUNOFF COEFFICIENT   =   0.294

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

-------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

```
     Max.Eff.Inten.(mm/hr)=     122.14       114.74
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       2.46 (ii)   22.33 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.30         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.07          0.122 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      55.45        24.68          33.85
     TOTAL RAINFALL   (mm)=      57.02        57.02          57.02
     RUNOFF COEFFICIENT   =       0.97         0.43           0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0017)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.04	0.122	2.00	33.85
+ ID2= 2 (0015):	0.37	0.019	2.17	16.78
ID = 3 (0017):	1.41	0.134	2.00	29.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0017)    1.41     0.13    2.00  29.39      0.18      0.60
OUTFLOW: ID= 1 (  0009)    1.41     0.13    2.00  29.39      0.17      0.58
```

```
--------------------

| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.41     0.13    2.00  29.39      0.25      1.34
OUTFLOW: ID= 1 (  0005)  1.41     0.13    2.00  29.39      0.25      1.34



--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0004):     0.22   0.008     2.25    16.83
      + ID2= 2 (  0005):     1.41   0.128     2.00    29.39
        ================================================
        ID = 3 (  0007):     1.63   0.132     2.00    27.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
--------------------

| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)  1.63     0.13    2.00  27.69      0.21      1.48
OUTFLOW: ID= 1 (  0006)  1.63     0.13    2.00  27.69      0.21      1.48



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                       ---- TRANSFORMED HYETOGRAPH ----
           TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
            hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    2.05 | 1.583   11.13 | 3.083    5.63 |  4.58    2.66
          0.167    2.05 | 1.667   11.13 | 3.167    5.63 |  4.67    2.66
```

0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 16.783
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.294

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

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0016):		0.22	0.011	2.17	16.78
+ ID2= 2 (0006):		1.63	0.131	2.00	27.69
ID = 3 (0011):		1.84	0.138	2.00	26.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0013)	Area (ha)= 0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr

0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 16.783
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.294

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

CALIB	
STANDHYD (0012)	Area (ha)= 0.48
ID= 1 DT= 5.0 min	Total Imp(%)= 48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40

```
            0.500    2.45 | 2.000  122.14 | 3.500    4.46 |  5.00    2.40
            0.583    2.73 | 2.083   37.28 | 3.583    4.05 |  5.08    2.29
            0.667    2.73 | 2.167   37.28 | 3.667    4.05 |  5.17    2.29
            0.750    3.09 | 2.250   18.95 | 3.750    3.71 |  5.25    2.19
            0.833    3.09 | 2.333   18.95 | 3.833    3.71 |  5.33    2.19
            0.917    3.57 | 2.417   12.70 | 3.917    3.43 |  5.42    2.09
            1.000    3.57 | 2.500   12.70 | 4.000    3.43 |  5.50    2.09
            1.083    4.25 | 2.583    9.59 | 4.083    3.20 |  5.58    2.01
            1.167    4.25 | 2.667    9.59 | 4.167    3.20 |  5.67    2.01
            1.250    5.29 | 2.750    7.73 | 4.250    2.99 |  5.75    1.94
            1.333    5.29 | 2.833    7.73 | 4.333    2.99 |  5.83    1.94
            1.417    7.11 | 2.917    6.50 | 4.417    2.81 |  5.92    1.87
            1.500    7.11 | 3.000    6.50 | 4.500    2.81 |  6.00    1.87
       Max.Eff.Inten.(mm/hr)=     122.14        38.76
                 over (min)        5.00         20.00
     Storage Coeff.  (min)=       2.54 (ii)    19.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.29          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08          0.02          0.083 (iii)
     TIME TO PEAK    (hrs)=       2.00          2.25           2.00
     RUNOFF VOLUME    (mm)=      55.45         13.11          33.79
     TOTAL RAINFALL   (mm)=      57.02         57.02          57.02
     RUNOFF COEFFICIENT   =       0.97          0.23           0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.083     2.00    33.79
      + ID2= 2 (  0013):     0.19   0.009     2.17    16.78
        ================================================
        ID = 3 (  0014):     0.66   0.089     2.00    29.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\07e08540-7dc6-4cba-939e-66599cecccd9\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\07e08540-7dc6-4cba-939e-66599cecccd9\scenari


DATE: 02-27-2024                          TIME: 03:46:49

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 10 yr- **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 65.22 mm |                          B=   6.014
--------------------                          C=   0.816
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.00	1.08	3.00	4.25	6.00	3.20	9.00	1.50
0.17	1.12	3.17	5.29	6.17	2.99	9.17	1.46
0.33	1.17	3.33	7.11	6.33	2.81	9.33	1.42
0.50	1.22	3.50	11.13	6.50	2.66	9.50	1.38
0.67	1.27	3.67	28.10	6.67	2.52	9.67	1.35
0.83	1.33	3.83	122.14	6.83	2.40	9.83	1.32
1.00	1.40	4.00	37.28	7.00	2.29	10.00	1.29
1.17	1.48	4.17	18.95	7.17	2.19	10.17	1.26
1.33	1.56	4.33	12.70	7.33	2.09	10.33	1.23
1.50	1.66	4.50	9.59	7.50	2.01	10.50	1.21
1.67	1.77	4.67	7.73	7.67	1.94	10.67	1.18
1.83	1.90	4.83	6.50	7.83	1.87	10.83	1.16
2.00	2.05	5.00	5.63	8.00	1.80	11.00	1.13
2.17	2.23	5.17	4.97	8.17	1.74	11.17	1.11
2.33	2.45	5.33	4.46	8.33	1.69	11.33	1.09
2.50	2.73	5.50	4.05	8.50	1.63	11.50	1.07
2.67	3.09	5.67	3.71	8.67	1.59	11.67	1.05
2.83	3.57	5.83	3.43	8.83	1.54	11.83	1.03

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18

1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 21.762
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.334

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

CALIB			
NASHYD (0015)	Area (ha)=	0.37	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26

1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.083

PEAK FLOW (cms)= 0.021 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.699
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

CALIB			
STANDHYD (0001)	Area (ha)=	1.04	
ID= 1 DT= 5.0 min	Total Imp(%)=	59.70	Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50

0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Max.Eff.Inten.(mm/hr)=	122.14	122.00	
over (min)	5.00	25.00	
Storage Coeff. (min)=	2.46 (ii)	21.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.30	0.05	
			TOTALS
PEAK FLOW (cms)=	0.10	0.07	0.123 (iii)
TIME TO PEAK (hrs)=	4.00	4.33	4.00
RUNOFF VOLUME (mm)=	63.65	26.26	37.40
TOTAL RAINFALL (mm)=	65.22	65.22	65.22
RUNOFF COEFFICIENT =	0.98	0.40	0.57

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

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

ADD HYD (0017)|		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):		1.04	0.123	4.00	37.40
+ ID2= 2 (0015):		0.37	0.021	4.17	21.70
ID = 3 (0017):		1.41	0.139	4.00	33.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE CHN(0009)	
IN= 2---> OUT= 1	Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel
3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.529E+01	0.0	0.36	3.50
0.19	99.69	.168E+02	0.2	0.68	1.82
0.29	99.79	.293E+02	0.4	0.92	1.37
0.38	99.88	.428E+02	0.6	1.10	1.14
0.48	99.98	.572E+02	1.0	1.25	1.00
0.57	100.07	.726E+02	1.3	1.38	0.91
0.67	100.17	.890E+02	1.8	1.49	0.84
0.76	100.26	.106E+03	2.3	1.60	0.78
0.86	100.36	.125E+03	2.8	1.70	0.74
0.95	100.45	.144E+03	3.4	1.79	0.70
1.05	100.55	.164E+03	4.1	1.87	0.67
1.16	100.66	.191E+03	5.1	2.00	0.63
1.28	100.78	.222E+03	6.3	2.13	0.59
1.39	100.89	.255E+03	7.6	2.23	0.56
1.50	101.00	.292E+03	9.0	2.32	0.54
1.61	101.11	.332E+03	10.6	2.39	0.52
1.72	101.22	.375E+03	12.3	2.45	0.51
1.84	101.34	.420E+03	14.0	2.51	0.50
1.95	101.45	.469E+03	16.0	2.55	0.49

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
	<---- hydrograph ---->				<-pipe / channel->	
INFLOW : ID= 2 (0017)	1.41	0.14	4.00	33.30	0.18	0.62
OUTFLOW: ID= 1 (0009)	1.41	0.13	4.00	33.30	0.18	0.60

| ROUTEPIPE(0005)|	PIPE Number = 1.00
| IN= 2---> OUT= 1 |	Diameter (mm)= 500.00
| DT= 5.0 min |	Length (m)= 9.00
	Slope (m/m)= 0.017
	Manning n = 0.024

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.03	.356E-01	0.0	0.36	0.42
0.05	.992E-01	0.0	0.56	0.27
0.08	.179E+00	0.0	0.72	0.21
0.11	.271E+00	0.0	0.85	0.18
0.13	.371E+00	0.0	0.97	0.15
0.16	.479E+00	0.1	1.07	0.14
0.18	.591E+00	0.1	1.16	0.13
0.21	.707E+00	0.1	1.24	0.12
0.24	.824E+00	0.1	1.31	0.11
0.26	.943E+00	0.1	1.37	0.11
0.29	.106E+01	0.2	1.43	0.11
0.32	.118E+01	0.2	1.47	0.10
0.34	.129E+01	0.2	1.50	0.10
0.37	.140E+01	0.2	1.52	0.10
0.39	.150E+01	0.3	1.53	0.10
0.42	.159E+01	0.3	1.53	0.10
0.45	.167E+01	0.3	1.52	0.10
0.47	.173E+01	0.3	1.48	0.10
0.50	.177E+01	0.3	1.35	0.11

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
	<---- hydrograph ---->				<-pipe / channel->	
INFLOW : ID= 2 (0009)	1.41	0.13	4.00	33.30	0.25	1.35
OUTFLOW: ID= 1 (0005)	1.41	0.13	4.00	33.30	0.25	1.35

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     0.22   0.010     4.25    21.76
     + ID2= 2 (  0005):     1.41   0.133     4.00    33.30
       ================================================
       ID = 3 (  0007):     1.63   0.138     4.00    31.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                                <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)    1.63     0.14    4.00  31.74      0.22      1.50
OUTFLOW: ID= 1 (  0006)    1.63     0.14    4.00  31.74      0.22      1.50



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

```
   Unit Hyd Qpeak  (cms)=   0.049

PEAK FLOW       (cms)=   0.012 (i)
TIME TO PEAK    (hrs)=   4.167
RUNOFF VOLUME    (mm)=  21.698
TOTAL RAINFALL   (mm)=  65.219
```

RUNOFF COEFFICIENT = 0.333

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

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0016):		0.22	0.012	4.17	21.70
+ ID2= 2 (0006):		1.63	0.137	4.00	31.74
ID = 3 (0011):		1.84	0.146	4.00	30.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (0013)	Area (ha)=	0.19	Curve Number (CN)=	74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16

2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.698
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

CALIB			
STANDHYD (0012)	Area (ha)=	0.48	
ID= 1 DT= 5.0 min	Total Imp(%)=	48.86	Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29

1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Max.Eff.Inten.(mm/hr)=	122.14	42.69	
over (min)	5.00	20.00	
Storage Coeff. (min)=	2.54 (ii)	19.18 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.29	0.06	
			TOTALS
PEAK FLOW (cms)=	0.08	0.02	0.083 (iii)
TIME TO PEAK (hrs)=	4.00	4.25	4.00
RUNOFF VOLUME (mm)=	63.65	14.64	38.58
TOTAL RAINFALL (mm)=	65.22	65.22	65.22
RUNOFF COEFFICIENT =	0.98	0.22	0.59

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.083     4.00    38.58
      + ID2= 2 (  0013):     0.19   0.011     4.17    21.70
        ================================================
        ID = 3 (  0014):     0.66   0.091     4.00    33.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\28869886-8d8e-4347-a785-10b8703ea412\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\28869886-8d8e-4347-a785-10b8703ea412\scenari

DATE: 02-27-2024                          TIME: 03:46:49

USER:


COMMENTS: _____
```

```
  ********************************************
  ** SIMULATION : Chicago Design Storm - 100yr  **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 82.32 mm |                          B=   6.014
--------------------                          C=   0.820
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    2.90 |  1.50   15.97 |  3.00    8.02 |  4.50    3.77
              0.17    3.16 |  1.67   40.65 |  3.17    7.08 |  4.67    3.57
```

0.33	3.48	1.83	178.56	3.33	6.35	4.83	3.40
0.50	3.88	2.00	54.05	3.50	5.76	5.00	3.24
0.67	4.39	2.17	27.32	3.67	5.28	5.17	3.10
0.83	5.07	2.33	18.24	3.83	4.88	5.33	2.97
1.00	6.05	2.50	13.74	4.00	4.54	5.50	2.85
1.17	7.54	2.67	11.06	4.17	4.25	5.67	2.74
1.33	10.16	2.83	9.29	4.33	3.99	5.83	2.64

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

```
      Unit Hyd Qpeak  (cms)=   0.031

    PEAK FLOW       (cms)=   0.018 (i)
    TIME TO PEAK    (hrs)=   2.250
    RUNOFF VOLUME    (mm)=  33.102
    TOTAL RAINFALL   (mm)=  82.319
    RUNOFF COEFFICIENT   =   0.402

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

--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)=   0.37   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

```
     Unit Hyd Qpeak  (cms)=   0.083

     PEAK FLOW       (cms)=   0.039 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  33.005
     TOTAL RAINFALL   (mm)=  82.319
     RUNOFF COEFFICIENT   =   0.401

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

-------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250
```

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Max.Eff.Inten.(mm/hr)=	178.56	186.37	
over (min)	5.00	20.00	
Storage Coeff. (min)=	2.12 (ii)	18.48 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.31	0.06	
			TOTALS
PEAK FLOW (cms)=	0.15	0.13	0.204 (iii)
TIME TO PEAK (hrs)=	2.00	2.25	2.00
RUNOFF VOLUME (mm)=	80.75	44.63	55.39
TOTAL RAINFALL (mm)=	82.32	82.32	82.32
RUNOFF COEFFICIENT =	0.98	0.54	0.67

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0017)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     1.04   0.204     2.00    55.39
      + ID2= 2 (  0015):     0.37   0.039     2.17    33.00
        ================================================
        ID = 3 (  0017):     1.41   0.234     2.00    49.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0017)    1.41     0.23    2.00  49.54      0.23      0.76
OUTFLOW: ID= 1 (  0009)    1.41     0.24    2.00  49.54      0.23      0.77
```

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                             <---- hydrograph ---->   <-pipe / channel->
                          AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                          (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)   1.41     0.24    2.00  49.54      0.37      1.52
OUTFLOW: ID= 1 (  0005)   1.41     0.24    2.00  49.54      0.37      1.52



--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0004):     0.22   0.018     2.25    33.10
      + ID2= 2 (  0005):     1.41   0.238     2.00    49.54
        ================================================
        ID = 3 (  0007):     1.63   0.246     2.00    47.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)  1.63     0.25    2.00  47.32      0.30      1.75
OUTFLOW: ID= 1 (  0006)  1.63     0.24    2.00  47.32      0.30      1.75



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    2.90 | 1.583   15.97 | 3.083    8.02 |  4.58    3.77
           0.167    2.90 | 1.667   15.97 | 3.167    8.02 |  4.67    3.77
           0.250    3.16 | 1.750   40.65 | 3.250    7.08 |  4.75    3.57
```

0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.049

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 33.005
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.401

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

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0016):		0.22	0.023	2.17	33.00
+ ID2= 2 (0006):		1.63	0.245	2.00	47.32
ID = 3 (0011):		1.84	0.262	2.00	45.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0013)	Area (ha)= 0.19	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77

0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 33.003
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.401

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

CALIB	
STANDHYD (0012)	Area (ha)= 0.48
ID= 1 DT= 5.0 min	Total Imp(%)= 48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40

```
             0.583    3.88 | 2.083   54.05 | 3.583    5.76 |  5.08    3.24
             0.667    3.88 | 2.167   54.05 | 3.667    5.76 |  5.17    3.24
             0.750    4.39 | 2.250   27.32 | 3.750    5.28 |  5.25    3.10
             0.833    4.39 | 2.333   27.32 | 3.833    5.28 |  5.33    3.10
             0.917    5.07 | 2.417   18.24 | 3.917    4.88 |  5.42    2.97
             1.000    5.07 | 2.500   18.24 | 4.000    4.88 |  5.50    2.97
             1.083    6.05 | 2.583   13.74 | 4.083    4.54 |  5.58    2.85
             1.167    6.05 | 2.667   13.74 | 4.167    4.54 |  5.67    2.85
             1.250    7.54 | 2.750   11.06 | 4.250    4.25 |  5.75    2.74
             1.333    7.54 | 2.833   11.06 | 4.333    4.25 |  5.83    2.74
             1.417   10.16 | 2.917    9.29 | 4.417    3.99 |  5.92    2.64
             1.500   10.16 | 3.000    9.29 | 4.500    3.99 |  6.00    2.64

     Max.Eff.Inten.(mm/hr)=     178.56        99.88
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.18 (ii)   14.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.04          0.135 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.17           2.00
     RUNOFF VOLUME    (mm)=      80.75        30.52          55.06
     TOTAL RAINFALL   (mm)=      82.32        82.32          82.32
     RUNOFF COEFFICIENT   =       0.98         0.37           0.67

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.135     2.00    55.06
      + ID2= 2 (  0013):     0.19   0.020     2.17    33.00
        ================================================
        ID = 3 (  0014):     0.66   0.149     2.00    48.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\a9c1d1e1-6ed5-404c-9921-97183185dc33\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\a9c1d1e1-6ed5-404c-9921-97183185dc33\scenari


DATE: 02-27-2024                          TIME: 03:46:49

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 100yr  **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 93.90 mm |                          B=   6.014
--------------------                          C=   0.820
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.00	1.52	3.00	6.05	6.00	4.54	9.00	2.12
0.17	1.58	3.17	7.54	6.17	4.25	9.17	2.06
0.33	1.65	3.33	10.16	6.33	3.99	9.33	2.01
0.50	1.72	3.50	15.97	6.50	3.77	9.50	1.96
0.67	1.80	3.67	40.65	6.67	3.57	9.67	1.91
0.83	1.88	3.83	178.56	6.83	3.40	9.83	1.86
1.00	1.98	4.00	54.05	7.00	3.24	10.00	1.82
1.17	2.09	4.17	27.32	7.17	3.10	10.17	1.78
1.33	2.21	4.33	18.24	7.33	2.97	10.33	1.74
1.50	2.34	4.50	13.74	7.50	2.85	10.50	1.70
1.67	2.50	4.67	11.06	7.67	2.74	10.67	1.67
1.83	2.69	4.83	9.29	7.83	2.64	10.83	1.63
2.00	2.90	5.00	8.02	8.00	2.55	11.00	1.60
2.17	3.16	5.17	7.08	8.17	2.46	11.17	1.57
2.33	3.48	5.33	6.35	8.33	2.38	11.33	1.54
2.50	3.88	5.50	5.76	8.50	2.31	11.50	1.51
2.67	4.39	5.67	5.28	8.67	2.24	11.67	1.48
2.83	5.07	5.83	4.88	8.83	2.18	11.83	1.46

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67

1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 41.423
TOTAL RAINFALL (mm)= 93.900
RUNOFF COEFFICIENT = 0.441

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

CALIB			
NASHYD (0015)	Area (ha)=	0.37	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82

1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Unit Hyd Qpeak (cms)= 0.083

PEAK FLOW (cms)= 0.044 (i)
TIME TO PEAK (hrs)= 4.083
RUNOFF VOLUME (mm)= 41.301
TOTAL RAINFALL (mm)= 93.900
RUNOFF COEFFICIENT = 0.440

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

CALIB			
STANDHYD (0001)	Area (ha)=	1.04	
ID= 1 DT= 5.0 min	Total Imp(%)=	59.70	Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12

0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Max.Eff.Inten.(mm/hr)=	178.56	188.43	
over (min)	5.00	20.00	
Storage Coeff. (min)=	2.12 (ii)	18.41 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.31	0.06	
			TOTALS
PEAK FLOW (cms)=	0.15	0.14	0.210 (iii)
TIME TO PEAK (hrs)=	4.00	4.25	4.00
RUNOFF VOLUME (mm)=	92.33	46.53	60.18
TOTAL RAINFALL (mm)=	93.90	93.90	93.90
RUNOFF COEFFICIENT =	0.98	0.50	0.64

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

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

```
--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0017)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     1.04   0.210     4.00    60.18
      + ID2= 2 (  0015):     0.37   0.044     4.08    41.30
        ================================================
        ID = 3 (  0017):     1.41   0.244     4.00    55.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH     ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)       (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10     99.60    .529E+01       0.0          0.36       3.50
       0.19     99.69    .168E+02       0.2          0.68       1.82
       0.29     99.79    .293E+02       0.4          0.92       1.37
       0.38     99.88    .428E+02       0.6          1.10       1.14
       0.48     99.98    .572E+02       1.0          1.25       1.00
       0.57    100.07    .726E+02       1.3          1.38       0.91
       0.67    100.17    .890E+02       1.8          1.49       0.84
       0.76    100.26    .106E+03       2.3          1.60       0.78
       0.86    100.36    .125E+03       2.8          1.70       0.74
       0.95    100.45    .144E+03       3.4          1.79       0.70
       1.05    100.55    .164E+03       4.1          1.87       0.67
       1.16    100.66    .191E+03       5.1          2.00       0.63
       1.28    100.78    .222E+03       6.3          2.13       0.59
       1.39    100.89    .255E+03       7.6          2.23       0.56
       1.50    101.00    .292E+03       9.0          2.32       0.54
       1.61    101.11    .332E+03      10.6          2.39       0.52
       1.72    101.22    .375E+03      12.3          2.45       0.51
       1.84    101.34    .420E+03      14.0          2.51       0.50
       1.95    101.45    .469E+03      16.0          2.55       0.49
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
	<---- hydrograph ---->				<-pipe / channel->	
INFLOW : ID= 2 (0017)	1.41	0.24	4.00	55.24	0.23	0.77
OUTFLOW: ID= 1 (0009)	1.41	0.25	4.00	55.24	0.24	0.78

| ROUTEPIPE(0005)|	PIPE Number = 1.00
| IN= 2---> OUT= 1 |	Diameter (mm)= 500.00
| DT= 5.0 min |	Length (m)= 9.00
	Slope (m/m)= 0.017
	Manning n = 0.024

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.03	.356E-01	0.0	0.36	0.42
0.05	.992E-01	0.0	0.56	0.27
0.08	.179E+00	0.0	0.72	0.21
0.11	.271E+00	0.0	0.85	0.18
0.13	.371E+00	0.0	0.97	0.15
0.16	.479E+00	0.1	1.07	0.14
0.18	.591E+00	0.1	1.16	0.13
0.21	.707E+00	0.1	1.24	0.12
0.24	.824E+00	0.1	1.31	0.11
0.26	.943E+00	0.1	1.37	0.11
0.29	.106E+01	0.2	1.43	0.11
0.32	.118E+01	0.2	1.47	0.10
0.34	.129E+01	0.2	1.50	0.10
0.37	.140E+01	0.2	1.52	0.10
0.39	.150E+01	0.3	1.53	0.10
0.42	.159E+01	0.3	1.53	0.10
0.45	.167E+01	0.3	1.52	0.10
0.47	.173E+01	0.3	1.48	0.10
0.50	.177E+01	0.3	1.35	0.11

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
	<---- hydrograph ---->				<-pipe / channel->	
INFLOW : ID= 2 (0009)	1.41	0.25	4.00	55.24	0.39	1.53
OUTFLOW: ID= 1 (0005)	1.41	0.25	4.00	55.24	0.39	1.53

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     0.22   0.020     4.25    41.42
     + ID2= 2 (  0005):     1.41   0.250     4.00    55.24
       ================================================
       ID = 3 (  0007):     1.63   0.260     4.00    53.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                                <---- hydrograph ---->   <-pipe / channel->
                          AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)   1.63     0.26    4.00  53.38      0.31      1.77
OUTFLOW: ID= 1 (  0006)   1.63     0.26    4.00  53.38      0.31      1.77


--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)=   0.22   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

```
Unit Hyd Qpeak  (cms)=   0.049

PEAK FLOW       (cms)=   0.026 (i)
TIME TO PEAK    (hrs)=   4.083
RUNOFF VOLUME    (mm)=  41.301
```

```
     TOTAL RAINFALL   (mm)=  93.900
     RUNOFF COEFFICIENT   =   0.440

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

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0016):     0.22   0.026     4.08    41.30
      + ID2= 2 (  0006):     1.63   0.258     4.00    53.38
        ================================================
        ID = 3 (  0011):     1.84   0.278     4.00    51.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67

1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.022 (i)
TIME TO PEAK (hrs)= 4.083
RUNOFF VOLUME (mm)= 41.300
TOTAL RAINFALL (mm)= 93.900
RUNOFF COEFFICIENT = 0.440

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

CALIB	
STANDHYD (0012)	Area (ha)= 0.48
ID= 1 DT= 5.0 min	Total Imp(%)= 48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91

```
            0.917    1.88 | 3.917  178.56 | 6.917    3.40 |  9.92    1.86
            1.000    1.88 | 4.000  178.56 | 7.000    3.40 | 10.00    1.86
            1.083    1.98 | 4.083   54.05 | 7.083    3.24 | 10.08    1.82
            1.167    1.98 | 4.167   54.05 | 7.167    3.24 | 10.17    1.82
            1.250    2.09 | 4.250   27.32 | 7.250    3.10 | 10.25    1.78
            1.333    2.09 | 4.333   27.32 | 7.333    3.10 | 10.33    1.78
            1.417    2.21 | 4.417   18.24 | 7.417    2.97 | 10.42    1.74
            1.500    2.21 | 4.500   18.24 | 7.500    2.97 | 10.50    1.74
            1.583    2.34 | 4.583   13.74 | 7.583    2.85 | 10.58    1.70
            1.667    2.34 | 4.667   13.74 | 7.667    2.85 | 10.67    1.70
            1.750    2.50 | 4.750   11.06 | 7.750    2.74 | 10.75    1.67
            1.833    2.50 | 4.833   11.06 | 7.833    2.74 | 10.83    1.67
            1.917    2.69 | 4.917    9.29 | 7.917    2.64 | 10.92    1.63
            2.000    2.69 | 5.000    9.29 | 8.000    2.64 | 11.00    1.63
            2.083    2.90 | 5.083    8.02 | 8.083    2.55 | 11.08    1.60
            2.167    2.90 | 5.167    8.02 | 8.167    2.55 | 11.17    1.60
            2.250    3.16 | 5.250    7.08 | 8.250    2.46 | 11.25    1.57
            2.333    3.16 | 5.333    7.08 | 8.333    2.46 | 11.33    1.57
            2.417    3.48 | 5.417    6.35 | 8.417    2.38 | 11.42    1.54
            2.500    3.48 | 5.500    6.35 | 8.500    2.38 | 11.50    1.54
            2.583    3.88 | 5.583    5.76 | 8.583    2.31 | 11.58    1.51
            2.667    3.88 | 5.667    5.76 | 8.667    2.31 | 11.67    1.51
            2.750    4.39 | 5.750    5.28 | 8.750    2.24 | 11.75    1.48
            2.833    4.39 | 5.833    5.28 | 8.833    2.24 | 11.83    1.48
            2.917    5.07 | 5.917    4.88 | 8.917    2.18 | 11.92    1.46
            3.000    5.07 | 6.000    4.88 | 9.000    2.18 | 12.00    1.46
   Max.Eff.Inten.(mm/hr)=     178.56       108.34
            over (min)        5.00        15.00
Storage Coeff.  (min)=        2.18 (ii)   13.64 (ii)
Unit Hyd. Tpeak (min)=        5.00        15.00
Unit Hyd. peak  (cms)=        0.31         0.08
                                                    *TOTALS*
PEAK FLOW       (cms)=        0.12         0.05          0.137 (iii)
TIME TO PEAK    (hrs)=        4.00         4.17           4.00
RUNOFF VOLUME    (mm)=       92.33        33.03          61.99
TOTAL RAINFALL   (mm)=       93.90        93.90          93.90
RUNOFF COEFFICIENT   =        0.98         0.35           0.66

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

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--
```

```
--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.137     4.00    61.99
      + ID2= 2 (  0013):     0.19   0.022     4.08    41.30
        ================================================
        ID = 3 (  0014):     0.66   0.155     4.00    56.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
```

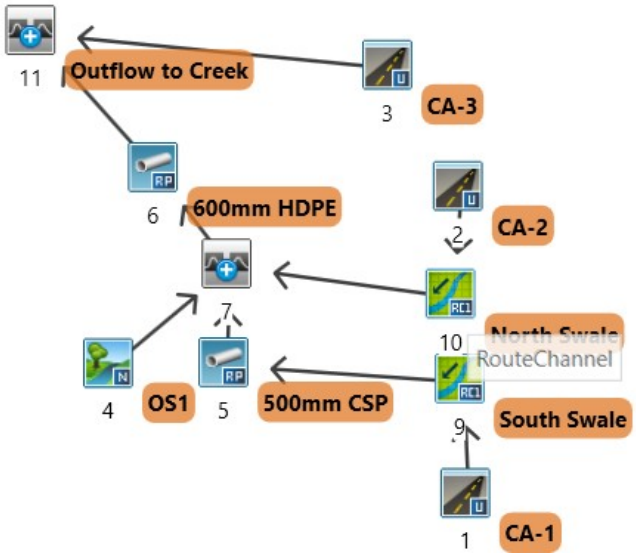
APPENDIX D: POST-DEVELOPMENT DATA – PHASE 1 AND 2 COMBINED

Post-Development OTTHYMO Model Schematic

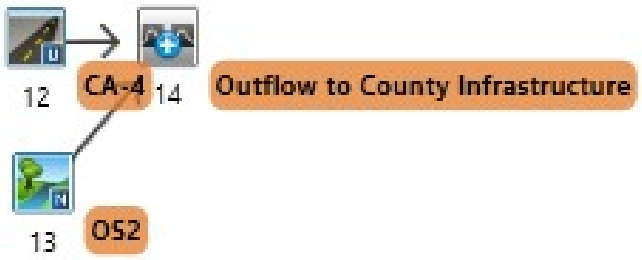
Post-Development Schematic Summary Table

Post-Development Detailed Output File

OTTHYMO Phase 1+2 Development Model Schematic (Johnstown Creek Catchment)



OTTHYMO Phase 1+2 Development Model Schematic (Queen Creek Catchment)



Schematic Summary Table

Hydrograph No.	Model Type	Catchment Represented	Comment
12	STANDHYD	CA-4	Typical: Catchment based on swale outlet location. Includes roof areas, gravel areas, and road surface which outlets to County Infrastructure
1, 2, 3	STANHYD	CA-1, CA-2, CA-3	Typical: Catchments based outlet location. Includes roof areas, gravel areas, and road surface which outlets to Johnstown Creek
4	NASHYD	OS-1	Offsite runoff from property to the west draining into the same route pipe as CA-1
13	NASHYD	OS-2	Offsite runoff from property to south draining into CA-4
9, 10	ROUTECHANNEL	n/a	Models the swales on either side of the proposed gravel roadway.
5	ROUTEPIPE	n/a	Models storm pipe network of 500mm diameter CSP culvert crossing the unmaintained pathway of First Street
6	ROUTEPIPE	n/a	Models storm pipe network of proposed 600mm diameter HDPE culvert within the existing swale
7	ADDHYD	n/a	Represents the merger of two hydrographs into a flowpipe
11, 14	ADDHYD	n/a	Last link in model. Represents total post-development flow.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\00ee66ac-0727-4858-b95c-aebfe1e39964\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\00ee66ac-0727-4858-b95c-aebfe1e39964\scenari


DATE: 02-27-2024                          TIME: 12:45:30

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ********************************************
  ** SIMULATION : Chicago Design Storm - 5 yr 6 **
  ********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 49.04 mm |                          B=   6.053
--------------------                          C=   0.814
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
              hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    1.78 |  1.50    9.61 |  3.00    4.87 |  4.50    2.31
              0.17    1.94 |  1.67   24.17 |  3.17    4.30 |  4.67    2.19
```

0.33	2.13	1.83	104.19	3.33	3.86	4.83	2.08
0.50	2.37	2.00	32.04	3.50	3.51	5.00	1.99
0.67	2.68	2.17	16.34	3.67	3.22	5.17	1.90
0.83	3.10	2.33	10.96	3.83	2.98	5.33	1.82
1.00	3.68	2.50	8.29	4.00	2.77	5.50	1.75
1.17	4.58	2.67	6.69	4.17	2.60	5.67	1.68
1.33	6.15	2.83	5.63	4.33	2.44	5.83	1.62

CALIB			
NASHYD (0004)	Area (ha)= 0.22	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.27		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 12.431
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

```
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

```
   Max.Eff.Inten.(mm/hr)=     104.19        72.99
             over (min)        5.00        30.00
     Storage Coeff.  (min)=    2.62 (ii)   26.43 (ii)
     Unit Hyd. Tpeak (min)=    5.00        30.00
     Unit Hyd. peak  (cms)=    0.29         0.04
                                                  *TOTALS*
     PEAK FLOW       (cms)=    0.09         0.05      0.097 (iii)
     TIME TO PEAK    (hrs)=    2.00         2.42       2.00
     RUNOFF VOLUME    (mm)=   47.47        18.59      27.19
     TOTAL RAINFALL   (mm)=   49.04        49.04      49.04
     RUNOFF COEFFICIENT   =    0.97         0.38       0.55

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH     ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)       (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10     99.60    .529E+01       0.0          0.36       3.50
       0.19     99.69    .168E+02       0.2          0.68       1.82
       0.29     99.79    .293E+02       0.4          0.92       1.37
       0.38     99.88    .428E+02       0.6          1.10       1.14
       0.48     99.98    .572E+02       1.0          1.25       1.00
       0.57    100.07    .726E+02       1.3          1.38       0.91
       0.67    100.17    .890E+02       1.8          1.49       0.84
       0.76    100.26    .106E+03       2.3          1.60       0.78
       0.86    100.36    .125E+03       2.8          1.70       0.74
       0.95    100.45    .144E+03       3.4          1.79       0.70
       1.05    100.55    .164E+03       4.1          1.87       0.67
       1.16    100.66    .191E+03       5.1          2.00       0.63
       1.28    100.78    .222E+03       6.3          2.13       0.59
       1.39    100.89    .255E+03       7.6          2.23       0.56
       1.50    101.00    .292E+03       9.0          2.32       0.54
       1.61    101.11    .332E+03      10.6          2.39       0.52
       1.72    101.22    .375E+03      12.3          2.45       0.51
       1.84    101.34    .420E+03      14.0          2.51       0.50
       1.95    101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0001)    1.04     0.10    2.00  27.19      0.15      0.49
OUTFLOW: ID= 1 (  0009)    1.04     0.09    2.00  27.18      0.15      0.48


--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
```

```
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                                 <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)    1.04     0.09    2.00  27.18      0.20      1.22
OUTFLOW: ID= 1 (  0005)    1.04     0.09    2.00  27.18      0.20      1.22



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  30.50
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         0.16
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      52.28        55.00
     Mannings n           =      0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Max.Eff.Inten.(mm/hr)=	104.19	144.74	
over (min)	5.00	15.00	
Storage Coeff. (min)=	1.70 (ii)	10.78 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.32	0.09	
			TOTALS
PEAK FLOW (cms)=	0.04	0.03	0.053 (iii)
TIME TO PEAK (hrs)=	2.00	2.17	2.00
RUNOFF VOLUME (mm)=	47.47	19.00	27.68
TOTAL RAINFALL (mm)=	49.04	49.04	49.04
RUNOFF COEFFICIENT =	0.97	0.39	0.56

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--

```
--------------------
| ROUTE CHN(  0010)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH     ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)       (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10     99.60    .895E+01       0.0          0.43       4.91
       0.19     99.69    .284E+02       0.2          0.83       2.56
       0.29     99.79    .496E+02       0.4          1.10       1.92
       0.38     99.88    .724E+02       0.8          1.32       1.60
       0.48     99.98    .969E+02       1.1          1.50       1.41
       0.57    100.07    .123E+03       1.6          1.66       1.27
       0.67    100.17    .151E+03       2.1          1.80       1.17
       0.76    100.26    .180E+03       2.7          1.93       1.10
       0.86    100.36    .211E+03       3.4          2.05       1.03
       0.95    100.45    .244E+03       4.1          2.16       0.98
       1.05    100.55    .278E+03       5.0          2.26       0.94
       1.16    100.66    .323E+03       6.1          2.41       0.88
       1.28    100.78    .375E+03       7.6          2.57       0.82
       1.39    100.89    .433E+03       9.2          2.69       0.79
       1.50    101.00    .495E+03      10.9          2.79       0.76
       1.61    101.11    .562E+03      12.7          2.88       0.74
       1.72    101.22    .634E+03      14.7          2.95       0.72
       1.84    101.34    .712E+03      16.8          3.01       0.70
       1.95    101.45    .794E+03      19.1          3.06       0.69

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0002)     0.41     0.05    2.00  27.68      0.11      0.46
OUTFLOW: ID= 1 (  0010)     0.41     0.04    2.08  27.64      0.10      0.45


--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):     0.41   0.045     2.08    27.64
      + ID2= 2 (  0004):     0.22   0.006     2.33    12.43
        ================================================
        ID = 3 (  0007):     0.63   0.049     2.17    22.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
 --------------------
| ADD HYD  (  0007)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0007):     0.63   0.049     2.17    22.33
      + ID2= 2 (  0005):     1.04   0.092     2.00    27.18
        ================================================
        ID = 1 (  0007):     1.67   0.132     2.00    25.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
```

	<---- hydrograph ----> AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0007)	1.67	0.13	2.00	25.35	0.21	1.48
OUTFLOW: ID= 1 (0006)	1.67	0.13	2.00	25.35	0.21	1.48

CALIB	
STANDHYD (0003)	Area (ha)= 0.18
ID= 1 DT= 5.0 min	Total Imp(%)= 71.00 Dir. Conn.(%)= 35.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.05
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	1.60	1.60
Length	(m)=	34.64	45.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Max.Eff.Inten.(mm/hr)=		104.19	209.53	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.16 (ii)	7.18 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.34	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.02	0.037 (iii)
TIME TO PEAK	(hrs)=	2.00	2.08	2.00
RUNOFF VOLUME	(mm)=	47.47	22.62	31.44

```
     TOTAL RAINFALL   (mm)=      49.04        49.04          49.04
     RUNOFF COEFFICIENT   =       0.97         0.46           0.64

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.18   0.037     2.00    31.44
      + ID2= 2 (  0006):     1.67   0.132     2.00    25.35
        ================================================
        ID = 3 (  0011):     1.85   0.168     2.00    25.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                      ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    1.78 | 1.583    9.61 | 3.083    4.87 |  4.58    2.31
   0.167    1.78 | 1.667    9.61 | 3.167    4.87 |  4.67    2.31
   0.250    1.94 | 1.750   24.17 | 3.250    4.30 |  4.75    2.19
   0.333    1.94 | 1.833   24.17 | 3.333    4.30 |  4.83    2.19
   0.417    2.13 | 1.917  104.19 | 3.417    3.86 |  4.92    2.08
   0.500    2.13 | 2.000  104.19 | 3.500    3.86 |  5.00    2.08
   0.583    2.37 | 2.083   32.04 | 3.583    3.51 |  5.08    1.99
   0.667    2.37 | 2.167   32.04 | 3.667    3.51 |  5.17    1.99
   0.750    2.68 | 2.250   16.34 | 3.750    3.22 |  5.25    1.90
   0.833    2.68 | 2.333   16.34 | 3.833    3.22 |  5.33    1.90
   0.917    3.10 | 2.417   10.96 | 3.917    2.98 |  5.42    1.82
   1.000    3.10 | 2.500   10.96 | 4.000    2.98 |  5.50    1.82
   1.083    3.68 | 2.583    8.29 | 4.083    2.77 |  5.58    1.75
   1.167    3.68 | 2.667    8.29 | 4.167    2.77 |  5.67    1.75
   1.250    4.58 | 2.750    6.69 | 4.250    2.60 |  5.75    1.68
```

1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 12.394
TOTAL RAINFALL (mm)= 49.038
RUNOFF COEFFICIENT = 0.253

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

CALIB			
STANDHYD (0012)	Area (ha)=	0.48	
ID= 1 DT= 5.0 min	Total Imp(%)=	48.86	Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.78	1.583	9.61	3.083	4.87	4.58	2.31
0.167	1.78	1.667	9.61	3.167	4.87	4.67	2.31
0.250	1.94	1.750	24.17	3.250	4.30	4.75	2.19
0.333	1.94	1.833	24.17	3.333	4.30	4.83	2.19
0.417	2.13	1.917	104.19	3.417	3.86	4.92	2.08
0.500	2.13	2.000	104.19	3.500	3.86	5.00	2.08
0.583	2.37	2.083	32.04	3.583	3.51	5.08	1.99
0.667	2.37	2.167	32.04	3.667	3.51	5.17	1.99
0.750	2.68	2.250	16.34	3.750	3.22	5.25	1.90
0.833	2.68	2.333	16.34	3.833	3.22	5.33	1.90
0.917	3.10	2.417	10.96	3.917	2.98	5.42	1.82
1.000	3.10	2.500	10.96	4.000	2.98	5.50	1.82
1.083	3.68	2.583	8.29	4.083	2.77	5.58	1.75
1.167	3.68	2.667	8.29	4.167	2.77	5.67	1.75
1.250	4.58	2.750	6.69	4.250	2.60	5.75	1.68
1.333	4.58	2.833	6.69	4.333	2.60	5.83	1.68
1.417	6.15	2.917	5.63	4.417	2.44	5.92	1.62
1.500	6.15	3.000	5.63	4.500	2.44	6.00	1.62

Max.Eff.Inten.(mm/hr)=	104.19	19.75	
over (min)	5.00	30.00	
Storage Coeff. (min)=	2.70 (ii)	25.36 (ii)	

```
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.29         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.01        0.068 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.42         2.00
     RUNOFF VOLUME    (mm)=      47.47         8.23        27.40
     TOTAL RAINFALL   (mm)=      49.04        49.04        49.04
     RUNOFF COEFFICIENT   =       0.97         0.17         0.56

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.068     2.00    27.40
      + ID2= 2 (  0013):     0.19   0.007     2.17    12.39
        ================================================
        ID = 3 (  0014):     0.66   0.072     2.00    23.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\1a09acdc-bcc1-4516-9773-94aefb56cce7\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\1a09acdc-bcc1-4516-9773-94aefb56cce7\scenari


DATE: 02-27-2024                          TIME: 12:45:30

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 5yr 12 **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 56.17 mm |                          B=   6.053
--------------------                          C=   0.814
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    0.94 |  3.00    3.68 |  6.00    2.77 |  9.00    1.30
              0.17    0.98 |  3.17    4.58 |  6.17    2.60 |  9.17    1.27
```

0.33	1.02	3.33	6.15	6.33	2.44	9.33	1.24
0.50	1.06	3.50	9.61	6.50	2.31	9.50	1.20
0.67	1.11	3.67	24.17	6.67	2.19	9.67	1.17
0.83	1.16	3.83	104.19	6.83	2.08	9.83	1.15
1.00	1.22	4.00	32.04	7.00	1.99	10.00	1.12
1.17	1.28	4.17	16.34	7.17	1.90	10.17	1.10
1.33	1.36	4.33	10.96	7.33	1.82	10.33	1.07
1.50	1.44	4.50	8.29	7.50	1.75	10.50	1.05
1.67	1.54	4.67	6.69	7.67	1.68	10.67	1.03
1.83	1.65	4.83	5.63	7.83	1.62	10.83	1.01
2.00	1.78	5.00	4.87	8.00	1.57	11.00	0.99
2.17	1.94	5.17	4.30	8.17	1.51	11.17	0.97
2.33	2.13	5.33	3.86	8.33	1.47	11.33	0.95
2.50	2.37	5.50	3.51	8.50	1.42	11.50	0.93
2.67	2.68	5.67	3.22	8.67	1.38	11.67	0.92
2.83	3.10	5.83	2.98	8.83	1.34	11.83	0.90

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01

2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 16.344
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.291

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

CALIB		
STANDHYD (0001)	Area (ha)=	1.04
ID= 1 DT= 5.0 min	Total Imp(%)=	59.70 Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17

```
            0.917    1.16 | 3.917  104.19 | 6.917    2.08 |  9.92    1.15
            1.000    1.16 | 4.000  104.19 | 7.000    2.08 | 10.00    1.15
            1.083    1.22 | 4.083   32.04 | 7.083    1.99 | 10.08    1.12
            1.167    1.22 | 4.167   32.04 | 7.167    1.99 | 10.17    1.12
            1.250    1.28 | 4.250   16.34 | 7.250    1.90 | 10.25    1.10
            1.333    1.28 | 4.333   16.34 | 7.333    1.90 | 10.33    1.10
            1.417    1.36 | 4.417   10.96 | 7.417    1.82 | 10.42    1.07
            1.500    1.36 | 4.500   10.96 | 7.500    1.82 | 10.50    1.07
            1.583    1.44 | 4.583    8.29 | 7.583    1.75 | 10.58    1.05
            1.667    1.44 | 4.667    8.29 | 7.667    1.75 | 10.67    1.05
            1.750    1.54 | 4.750    6.69 | 7.750    1.68 | 10.75    1.03
            1.833    1.54 | 4.833    6.69 | 7.833    1.68 | 10.83    1.03
            1.917    1.65 | 4.917    5.63 | 7.917    1.62 | 10.92    1.01
            2.000    1.65 | 5.000    5.63 | 8.000    1.62 | 11.00    1.01
            2.083    1.78 | 5.083    4.87 | 8.083    1.57 | 11.08    0.99
            2.167    1.78 | 5.167    4.87 | 8.167    1.57 | 11.17    0.99
            2.250    1.94 | 5.250    4.30 | 8.250    1.51 | 11.25    0.97
            2.333    1.94 | 5.333    4.30 | 8.333    1.51 | 11.33    0.97
            2.417    2.13 | 5.417    3.86 | 8.417    1.47 | 11.42    0.95
            2.500    2.13 | 5.500    3.86 | 8.500    1.47 | 11.50    0.95
            2.583    2.37 | 5.583    3.51 | 8.583    1.42 | 11.58    0.93
            2.667    2.37 | 5.667    3.51 | 8.667    1.42 | 11.67    0.93
            2.750    2.68 | 5.750    3.22 | 8.750    1.38 | 11.75    0.92
            2.833    2.68 | 5.833    3.22 | 8.833    1.38 | 11.83    0.92
            2.917    3.10 | 5.917    2.98 | 8.917    1.34 | 11.92    0.90
            3.000    3.10 | 6.000    2.98 | 9.000    1.34 | 12.00    0.90
   Max.Eff.Inten.(mm/hr)=     104.19        78.83
            over (min)        5.00         30.00
  Storage Coeff.  (min)=      2.62 (ii)    25.71 (ii)
  Unit Hyd. Tpeak (min)=      5.00         30.00
  Unit Hyd. peak  (cms)=      0.29          0.04
                                                      *TOTALS*
  PEAK FLOW       (cms)=      0.09          0.05          0.099 (iii)
  TIME TO PEAK    (hrs)=      4.00          4.42           4.00
  RUNOFF VOLUME    (mm)=     54.60         20.10          30.38
  TOTAL RAINFALL   (mm)=     56.17         56.17          56.17
  RUNOFF COEFFICIENT   =      0.97          0.36           0.54

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

      (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
           Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
           Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--
```

```
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                    <---- hydrograph ---->   <-pipe / channel->
                           AREA     QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
                           (ha)     (cms)    (hrs)    (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0001)    1.04      0.10     4.00   30.38      0.15      0.49
OUTFLOW: ID= 1 (  0009)    1.04      0.09     4.00   30.37      0.15      0.48
```

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.04     0.09    4.00  30.37      0.20      1.23
OUTFLOW: ID= 1 (  0005)  1.04     0.09    4.00  30.37      0.20      1.23



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  30.50
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         0.16
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      52.28        55.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

```
        Max.Eff.Inten.(mm/hr)=     104.19       156.86
                 over (min)        5.00        15.00
     Storage Coeff.  (min)=        1.70 (ii)   10.49 (ii)
     Unit Hyd. Tpeak (min)=        5.00        15.00
     Unit Hyd. peak  (cms)=        0.32         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.04         0.04          0.055 (iii)
     TIME TO PEAK    (hrs)=        4.00         4.17           4.00
     RUNOFF VOLUME    (mm)=       54.60        20.49          30.89
     TOTAL RAINFALL   (mm)=       56.17        56.17          56.17
     RUNOFF COEFFICIENT   =        0.97         0.36           0.55

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0010)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50         0.0500
                   1.00        100.70         0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50         0.0300      Main Channel
                   3.50         99.60         0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45         0.0500

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .895E+01       0.0          0.43       4.91
       0.19    99.69    .284E+02       0.2          0.83       2.56
       0.29    99.79    .496E+02       0.4          1.10       1.92
       0.38    99.88    .724E+02       0.8          1.32       1.60
       0.48    99.98    .969E+02       1.1          1.50       1.41
       0.57   100.07    .123E+03       1.6          1.66       1.27
       0.67   100.17    .151E+03       2.1          1.80       1.17
       0.76   100.26    .180E+03       2.7          1.93       1.10
       0.86   100.36    .211E+03       3.4          2.05       1.03
       0.95   100.45    .244E+03       4.1          2.16       0.98
       1.05   100.55    .278E+03       5.0          2.26       0.94
       1.16   100.66    .323E+03       6.1          2.41       0.88
       1.28   100.78    .375E+03       7.6          2.57       0.82
       1.39   100.89    .433E+03       9.2          2.69       0.79
```

1.50	101.00	.495E+03	10.9	2.79	0.76
1.61	101.11	.562E+03	12.7	2.88	0.74
1.72	101.22	.634E+03	14.7	2.95	0.72
1.84	101.34	.712E+03	16.8	3.01	0.70
1.95	101.45	.794E+03	19.1	3.06	0.69

	<---- hydrograph ---->				<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0002)	0.41	0.05	4.00	30.89	0.11	0.47
OUTFLOW: ID= 1 (0010)	0.41	0.05	4.08	30.87	0.11	0.45

ADD HYD (0007)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0010):	0.41	0.047	4.08	30.87
	+ ID2= 2 (0004):	0.22	0.007	4.25	16.34
	ID = 3 (0007):	0.63	0.053	4.17	25.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (0007):	0.63	0.053	4.17	25.80
	+ ID2= 2 (0005):	1.04	0.093	4.00	30.37
	ID = 1 (0007):	1.67	0.135	4.00	28.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTEPIPE(0006)	IN= 2---> OUT= 1	DT= 5.0 min

PIPE Number = 1.00
Diameter (mm)= 600.00
Length (m)= 9.00
Slope (m/m)= 0.006
Manning n = 0.012

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.03	.513E-01	0.0	0.47	0.32
0.06	.143E+00	0.0	0.73	0.21
0.09	.258E+00	0.0	0.94	0.16
0.13	.390E+00	0.0	1.11	0.13
0.16	.535E+00	0.1	1.27	0.12
0.19	.689E+00	0.1	1.40	0.11

0.22	.851E+00	0.1	1.52	0.10
0.25	.102E+01	0.2	1.62	0.09
0.28	.119E+01	0.2	1.71	0.09
0.32	.136E+01	0.3	1.79	0.08
0.35	.153E+01	0.3	1.86	0.08
0.38	.169E+01	0.4	1.91	0.08
0.41	.186E+01	0.4	1.96	0.08
0.44	.201E+01	0.4	1.98	0.08
0.47	.215E+01	0.5	2.00	0.08
0.51	.229E+01	0.5	2.00	0.08
0.54	.240E+01	0.5	1.98	0.08
0.57	.249E+01	0.5	1.93	0.08
0.60	.254E+01	0.5	1.76	0.09

	<---- hydrograph ----> AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0007)	1.67	0.13	4.00	28.65	0.21	1.49
OUTFLOW: ID= 1 (0006)	1.67	0.13	4.00	28.65	0.21	1.49

CALIB	
STANDHYD (0003)	Area (ha)= 0.18
ID= 1 DT= 5.0 min	Total Imp(%)= 71.00 Dir. Conn.(%)= 35.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.05
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	1.60	1.60
Length	(m)=	34.64	45.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12

1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95
2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Max.Eff.Inten.(mm/hr)=	104.19	215.47	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.16 (ii)	7.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.14	
			TOTALS
PEAK FLOW (cms)=	0.02	0.02	0.038 (iii)
TIME TO PEAK (hrs)=	4.00	4.08	4.00
RUNOFF VOLUME (mm)=	54.60	23.84	34.76
TOTAL RAINFALL (mm)=	56.17	56.17	56.17
RUNOFF COEFFICIENT =	0.97	0.42	0.62

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 1 (  0003):      0.18    0.038      4.00     34.76
      + ID2= 2 (  0006):      1.67    0.134      4.00     28.65
        ================================================
        ID = 3 (  0011):      1.85    0.172      4.00     29.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07
1.583	1.44	4.583	8.29	7.583	1.75	10.58	1.05
1.667	1.44	4.667	8.29	7.667	1.75	10.67	1.05
1.750	1.54	4.750	6.69	7.750	1.68	10.75	1.03
1.833	1.54	4.833	6.69	7.833	1.68	10.83	1.03
1.917	1.65	4.917	5.63	7.917	1.62	10.92	1.01
2.000	1.65	5.000	5.63	8.000	1.62	11.00	1.01
2.083	1.78	5.083	4.87	8.083	1.57	11.08	0.99
2.167	1.78	5.167	4.87	8.167	1.57	11.17	0.99
2.250	1.94	5.250	4.30	8.250	1.51	11.25	0.97
2.333	1.94	5.333	4.30	8.333	1.51	11.33	0.97
2.417	2.13	5.417	3.86	8.417	1.47	11.42	0.95
2.500	2.13	5.500	3.86	8.500	1.47	11.50	0.95

2.583	2.37	5.583	3.51	8.583	1.42	11.58	0.93
2.667	2.37	5.667	3.51	8.667	1.42	11.67	0.93
2.750	2.68	5.750	3.22	8.750	1.38	11.75	0.92
2.833	2.68	5.833	3.22	8.833	1.38	11.83	0.92
2.917	3.10	5.917	2.98	8.917	1.34	11.92	0.90
3.000	3.10	6.000	2.98	9.000	1.34	12.00	0.90

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 16.296
TOTAL RAINFALL (mm)= 56.170
RUNOFF COEFFICIENT = 0.290

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

CALIB			
STANDHYD (0012)	Area (ha)=	0.48	
ID= 1 DT= 5.0 min	Total Imp(%)=	48.86	Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.94	3.083	3.68	6.083	2.77	9.08	1.30
0.167	0.94	3.167	3.68	6.167	2.77	9.17	1.30
0.250	0.98	3.250	4.58	6.250	2.60	9.25	1.27
0.333	0.98	3.333	4.58	6.333	2.60	9.33	1.27
0.417	1.02	3.417	6.15	6.417	2.44	9.42	1.24
0.500	1.02	3.500	6.15	6.500	2.44	9.50	1.24
0.583	1.06	3.583	9.61	6.583	2.31	9.58	1.20
0.667	1.06	3.667	9.61	6.667	2.31	9.67	1.20
0.750	1.11	3.750	24.17	6.750	2.19	9.75	1.17
0.833	1.11	3.833	24.17	6.833	2.19	9.83	1.17
0.917	1.16	3.917	104.19	6.917	2.08	9.92	1.15
1.000	1.16	4.000	104.19	7.000	2.08	10.00	1.15
1.083	1.22	4.083	32.04	7.083	1.99	10.08	1.12
1.167	1.22	4.167	32.04	7.167	1.99	10.17	1.12
1.250	1.28	4.250	16.34	7.250	1.90	10.25	1.10
1.333	1.28	4.333	16.34	7.333	1.90	10.33	1.10
1.417	1.36	4.417	10.96	7.417	1.82	10.42	1.07
1.500	1.36	4.500	10.96	7.500	1.82	10.50	1.07

```
            1.583    1.44 | 4.583    8.29 | 7.583    1.75 | 10.58    1.05
            1.667    1.44 | 4.667    8.29 | 7.667    1.75 | 10.67    1.05
            1.750    1.54 | 4.750    6.69 | 7.750    1.68 | 10.75    1.03
            1.833    1.54 | 4.833    6.69 | 7.833    1.68 | 10.83    1.03
            1.917    1.65 | 4.917    5.63 | 7.917    1.62 | 10.92    1.01
            2.000    1.65 | 5.000    5.63 | 8.000    1.62 | 11.00    1.01
            2.083    1.78 | 5.083    4.87 | 8.083    1.57 | 11.08    0.99
            2.167    1.78 | 5.167    4.87 | 8.167    1.57 | 11.17    0.99
            2.250    1.94 | 5.250    4.30 | 8.250    1.51 | 11.25    0.97
            2.333    1.94 | 5.333    4.30 | 8.333    1.51 | 11.33    0.97
            2.417    2.13 | 5.417    3.86 | 8.417    1.47 | 11.42    0.95
            2.500    2.13 | 5.500    3.86 | 8.500    1.47 | 11.50    0.95
            2.583    2.37 | 5.583    3.51 | 8.583    1.42 | 11.58    0.93
            2.667    2.37 | 5.667    3.51 | 8.667    1.42 | 11.67    0.93
            2.750    2.68 | 5.750    3.22 | 8.750    1.38 | 11.75    0.92
            2.833    2.68 | 5.833    3.22 | 8.833    1.38 | 11.83    0.92
            2.917    3.10 | 5.917    2.98 | 8.917    1.34 | 11.92    0.90
            3.000    3.10 | 6.000    2.98 | 9.000    1.34 | 12.00    0.90
      Max.Eff.Inten.(mm/hr)=     104.19        28.36
               over (min)        5.00         25.00
    Storage Coeff.  (min)=       2.70 (ii)    22.30 (ii)
    Unit Hyd. Tpeak (min)=       5.00         25.00
    Unit Hyd. peak  (cms)=       0.29          0.05
                                                          *TOTALS*
    PEAK FLOW       (cms)=       0.07          0.01          0.069 (iii)
    TIME TO PEAK    (hrs)=       4.00          4.33           4.00
    RUNOFF VOLUME    (mm)=      54.60          9.45          31.50
    TOTAL RAINFALL   (mm)=      56.17         56.17          56.17
    RUNOFF COEFFICIENT   =       0.97          0.17           0.56

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.069     4.00    31.50
      + ID2= 2 (  0013):     0.19   0.008     4.17    16.30
        ================================================
        ID = 3 (  0014):     0.66   0.074     4.00    27.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\9dd8b981-4d43-4a89-a913-c4d6b79d89de\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\9dd8b981-4d43-4a89-a913-c4d6b79d89de\scenari


DATE: 02-27-2024                          TIME: 12:45:31

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------------
  ********************************************
  ** SIMULATION : Chicago Design Storm - 10yr 6 **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 57.02 mm |                          B=   6.014
--------------------                          C=   0.816
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    2.05 |  1.50   11.13 |  3.00    5.63 |  4.50    2.66
              0.17    2.23 |  1.67   28.10 |  3.17    4.97 |  4.67    2.52
```

0.33	2.45	1.83	122.14	3.33	4.46	4.83	2.40
0.50	2.73	2.00	37.28	3.50	4.05	5.00	2.29
0.67	3.09	2.17	18.95	3.67	3.71	5.17	2.19
0.83	3.57	2.33	12.70	3.83	3.43	5.33	2.09
1.00	4.25	2.50	9.59	4.00	3.20	5.50	2.01
1.17	5.29	2.67	7.73	4.17	2.99	5.67	1.94
1.33	7.11	2.83	6.50	4.33	2.81	5.83	1.87

--

| CALIB |
| NASHYD (0004)| Area (ha)= 0.22 Curve Number (CN)= 74.0
|ID= 1 DT= 5.0 min | Ia (mm)= 8.92 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= 0.27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.008 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 16.832
TOTAL RAINFALL (mm)= 57.019
RUNOFF COEFFICIENT = 0.295

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

--

```
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

```
     Max.Eff.Inten.(mm/hr)=     122.14       114.74
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       2.46 (ii)   22.33 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.30         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.07          0.122 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      55.45        24.68          33.85
     TOTAL RAINFALL   (mm)=      57.02        57.02          57.02
     RUNOFF COEFFICIENT   =       0.97         0.43           0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ROUTE CHN(0009)|
| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel
3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.529E+01	0.0	0.36	3.50
0.19	99.69	.168E+02	0.2	0.68	1.82
0.29	99.79	.293E+02	0.4	0.92	1.37
0.38	99.88	.428E+02	0.6	1.10	1.14
0.48	99.98	.572E+02	1.0	1.25	1.00
0.57	100.07	.726E+02	1.3	1.38	0.91
0.67	100.17	.890E+02	1.8	1.49	0.84
0.76	100.26	.106E+03	2.3	1.60	0.78
0.86	100.36	.125E+03	2.8	1.70	0.74
0.95	100.45	.144E+03	3.4	1.79	0.70
1.05	100.55	.164E+03	4.1	1.87	0.67
1.16	100.66	.191E+03	5.1	2.00	0.63
1.28	100.78	.222E+03	6.3	2.13	0.59
1.39	100.89	.255E+03	7.6	2.23	0.56
1.50	101.00	.292E+03	9.0	2.32	0.54
1.61	101.11	.332E+03	10.6	2.39	0.52
1.72	101.22	.375E+03	12.3	2.45	0.51
1.84	101.34	.420E+03	14.0	2.51	0.50
1.95	101.45	.469E+03	16.0	2.55	0.49

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0001)	1.04	0.12	2.00	33.85	0.17	0.56
OUTFLOW: ID= 1 (0009)	1.04	0.12	2.00	33.85	0.16	0.55

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.04     0.12    2.00  33.85      0.23      1.31
OUTFLOW: ID= 1 (  0005)  1.04     0.12    2.00  33.85      0.23      1.31



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  30.50
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         0.16
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      52.28        55.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Max.Eff.Inten.(mm/hr)=	122.14	188.84		
over (min)	5.00	10.00		
Storage Coeff. (min)=	1.60 (ii)	9.75 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.32	0.11		
			TOTALS	
PEAK FLOW (cms)=	0.04	0.05	0.084 (iii)	
TIME TO PEAK (hrs)=	2.00	2.08	2.00	
RUNOFF VOLUME (mm)=	55.45	25.12	34.37	
TOTAL RAINFALL (mm)=	57.02	57.02	57.02	
RUNOFF COEFFICIENT =	0.97	0.44	0.60	

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ROUTE CHN(0010)
IN= 2---> OUT= 1	Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel

3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.895E+01	0.0	0.43	4.91
0.19	99.69	.284E+02	0.2	0.83	2.56
0.29	99.79	.496E+02	0.4	1.10	1.92
0.38	99.88	.724E+02	0.8	1.32	1.60
0.48	99.98	.969E+02	1.1	1.50	1.41
0.57	100.07	.123E+03	1.6	1.66	1.27
0.67	100.17	.151E+03	2.1	1.80	1.17
0.76	100.26	.180E+03	2.7	1.93	1.10
0.86	100.36	.211E+03	3.4	2.05	1.03
0.95	100.45	.244E+03	4.1	2.16	0.98
1.05	100.55	.278E+03	5.0	2.26	0.94
1.16	100.66	.323E+03	6.1	2.41	0.88
1.28	100.78	.375E+03	7.6	2.57	0.82
1.39	100.89	.433E+03	9.2	2.69	0.79
1.50	101.00	.495E+03	10.9	2.79	0.76
1.61	101.11	.562E+03	12.7	2.88	0.74
1.72	101.22	.634E+03	14.7	2.95	0.72
1.84	101.34	.712E+03	16.8	3.01	0.70
1.95	101.45	.794E+03	19.1	3.06	0.69

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
		<---- hydrograph ---->				
INFLOW : ID= 2 (0002)	0.41	0.08	2.00	34.37	0.13	0.52
OUTFLOW: ID= 1 (0010)	0.41	0.07	2.08	34.32	0.12	0.49

ADD HYD (0007)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	0.41	0.071	2.08	34.32
+ ID2= 2 (0004):	0.22	0.008	2.25	16.83
ID = 3 (0007):	0.63	0.076	2.08	28.21

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------
| ADD HYD  (  0007)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0007):     0.63   0.076     2.08    28.21
      + ID2= 2 (  0005):     1.04   0.118     2.00    33.85
        ================================================
        ID = 1 (  0007):     1.67   0.179     2.00    31.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                                 <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)    1.67     0.18    2.00  31.72      0.25      1.61
OUTFLOW: ID= 1 (  0006)    1.67     0.18    2.00  31.72      0.25      1.61



--------------------------------------------------------------------------------
--
```

```
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  71.00   Dir. Conn.(%)=  35.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.60         1.60
     Length            (m)=      34.64        45.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

```
   Max.Eff.Inten.(mm/hr)=     122.14       253.11
             over (min)        5.00        10.00
     Storage Coeff.  (min)=    1.08 (ii)    6.67 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.34         0.14
                                                  *TOTALS*
     PEAK FLOW       (cms)=    0.02         0.02          0.045 (iii)
     TIME TO PEAK    (hrs)=    2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=   55.45        28.89          38.32
     TOTAL RAINFALL   (mm)=   57.02        57.02          57.02
     RUNOFF COEFFICIENT   =    0.97         0.51           0.67

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):		0.18	0.045	2.00	38.32
+ ID2= 2 (0006):		1.67	0.178	2.00	31.72
ID = 3 (0011):		1.85	0.223	2.00	32.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0013)	Area (ha)= 0.19	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 8.92	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.17		

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 16.783
TOTAL RAINFALL (mm)= 57.019

RUNOFF COEFFICIENT = 0.294

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

CALIB		
STANDHYD (0012)	Area (ha)=	0.48
ID= 1 DT= 5.0 min	Total Imp(%)=	48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.05	1.583	11.13	3.083	5.63	4.58	2.66
0.167	2.05	1.667	11.13	3.167	5.63	4.67	2.66
0.250	2.23	1.750	28.10	3.250	4.97	4.75	2.52
0.333	2.23	1.833	28.10	3.333	4.97	4.83	2.52
0.417	2.45	1.917	122.14	3.417	4.46	4.92	2.40
0.500	2.45	2.000	122.14	3.500	4.46	5.00	2.40
0.583	2.73	2.083	37.28	3.583	4.05	5.08	2.29
0.667	2.73	2.167	37.28	3.667	4.05	5.17	2.29
0.750	3.09	2.250	18.95	3.750	3.71	5.25	2.19
0.833	3.09	2.333	18.95	3.833	3.71	5.33	2.19
0.917	3.57	2.417	12.70	3.917	3.43	5.42	2.09
1.000	3.57	2.500	12.70	4.000	3.43	5.50	2.09
1.083	4.25	2.583	9.59	4.083	3.20	5.58	2.01
1.167	4.25	2.667	9.59	4.167	3.20	5.67	2.01
1.250	5.29	2.750	7.73	4.250	2.99	5.75	1.94
1.333	5.29	2.833	7.73	4.333	2.99	5.83	1.94
1.417	7.11	2.917	6.50	4.417	2.81	5.92	1.87
1.500	7.11	3.000	6.50	4.500	2.81	6.00	1.87

Max.Eff.Inten.	(mm/hr)=	122.14	38.76	
over	(min)	5.00	20.00	
Storage Coeff.	(min)=	2.54 (ii)	19.83 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	20.00	
Unit Hyd. peak	(cms)=	0.29	0.06	
				TOTALS
PEAK FLOW	(cms)=	0.08	0.02	0.083 (iii)
TIME TO PEAK	(hrs)=	2.00	2.25	2.00
RUNOFF VOLUME	(mm)=	55.45	13.11	33.79
TOTAL RAINFALL	(mm)=	57.02	57.02	57.02
RUNOFF COEFFICIENT	=	0.97	0.23	0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.083     2.00    33.79
      + ID2= 2 (  0013):     0.19   0.009     2.17    16.78
        ================================================
        ID = 3 (  0014):     0.66   0.089     2.00    29.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\2a9c4204-3231-453c-8061-6c591eac5fe5\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\2a9c4204-3231-453c-8061-6c591eac5fe5\scenari


DATE: 02-27-2024                              TIME: 12:45:31

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ***********************************************
  ** SIMULATION : Chicago Design Storm - 10 yr- 12**
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1174.184
| Ptotal= 65.22 mm |                          B=   6.014
--------------------                          C=   0.816
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    1.08 |  3.00    4.25 |  6.00    3.20 |  9.00    1.50
               0.17    1.12 |  3.17    5.29 |  6.17    2.99 |  9.17    1.46
```

0.33	1.17	3.33	7.11	6.33	2.81	9.33	1.42
0.50	1.22	3.50	11.13	6.50	2.66	9.50	1.38
0.67	1.27	3.67	28.10	6.67	2.52	9.67	1.35
0.83	1.33	3.83	122.14	6.83	2.40	9.83	1.32
1.00	1.40	4.00	37.28	7.00	2.29	10.00	1.29
1.17	1.48	4.17	18.95	7.17	2.19	10.17	1.26
1.33	1.56	4.33	12.70	7.33	2.09	10.33	1.23
1.50	1.66	4.50	9.59	7.50	2.01	10.50	1.21
1.67	1.77	4.67	7.73	7.67	1.94	10.67	1.18
1.83	1.90	4.83	6.50	7.83	1.87	10.83	1.16
2.00	2.05	5.00	5.63	8.00	1.80	11.00	1.13
2.17	2.23	5.17	4.97	8.17	1.74	11.17	1.11
2.33	2.45	5.33	4.46	8.33	1.69	11.33	1.09
2.50	2.73	5.50	4.05	8.50	1.63	11.50	1.07
2.67	3.09	5.67	3.71	8.67	1.59	11.67	1.05
2.83	3.57	5.83	3.43	8.83	1.54	11.83	1.03

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16

2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 21.762
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.334

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

CALIB	
STANDHYD (0001)	Area (ha)= 1.04
ID= 1 DT= 5.0 min	Total Imp(%)= 59.70 Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32

1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Max.Eff.Inten.(mm/hr)=	122.14	122.00	
over (min)	5.00	25.00	
Storage Coeff. (min)=	2.46 (ii)	21.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.30	0.05	
			TOTALS
PEAK FLOW (cms)=	0.10	0.07	0.123 (iii)
TIME TO PEAK (hrs)=	4.00	4.33	4.00
RUNOFF VOLUME (mm)=	63.65	26.26	37.40
TOTAL RAINFALL (mm)=	65.22	65.22	65.22
RUNOFF COEFFICIENT =	0.98	0.40	0.57

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0001)     1.04     0.12    4.00  37.40      0.17      0.56
OUTFLOW: ID= 1 (  0009)     1.04     0.12    4.00  37.40      0.17      0.55
```

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.04     0.12    4.00  37.40      0.24      1.31
OUTFLOW: ID= 1 (  0005)  1.04     0.12    4.00  37.40      0.24      1.31



--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  30.50
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         0.16
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      52.28        55.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Max.Eff.Inten.(mm/hr)=	122.14	200.44	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.60 (ii)	9.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.11	
			TOTALS
PEAK FLOW (cms)=	0.04	0.05	0.088 (iii)
TIME TO PEAK (hrs)=	4.00	4.08	4.00
RUNOFF VOLUME (mm)=	63.65	26.66	37.94
TOTAL RAINFALL (mm)=	65.22	65.22	65.22
RUNOFF COEFFICIENT =	0.98	0.41	0.58

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

```
       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--
--------------------
| ROUTE CHN(  0010)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00         101.50        0.0500
                   1.00         100.70        0.0500
                   1.50         100.55    0.0500 /0.0300  Main Channel
                   2.00          99.50        0.0300      Main Channel
                   3.50          99.60        0.0300      Main Channel
                   4.50         100.65    0.0300 /0.0500  Main Channel
                   6.00         101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .895E+01       0.0          0.43       4.91
       0.19    99.69    .284E+02       0.2          0.83       2.56
       0.29    99.79    .496E+02       0.4          1.10       1.92
       0.38    99.88    .724E+02       0.8          1.32       1.60
       0.48    99.98    .969E+02       1.1          1.50       1.41
       0.57   100.07    .123E+03       1.6          1.66       1.27
       0.67   100.17    .151E+03       2.1          1.80       1.17
       0.76   100.26    .180E+03       2.7          1.93       1.10
       0.86   100.36    .211E+03       3.4          2.05       1.03
       0.95   100.45    .244E+03       4.1          2.16       0.98
       1.05   100.55    .278E+03       5.0          2.26       0.94
       1.16   100.66    .323E+03       6.1          2.41       0.88
       1.28   100.78    .375E+03       7.6          2.57       0.82
       1.39   100.89    .433E+03       9.2          2.69       0.79
       1.50   101.00    .495E+03      10.9          2.79       0.76
       1.61   101.11    .562E+03      12.7          2.88       0.74
       1.72   101.22    .634E+03      14.7          2.95       0.72
       1.84   101.34    .712E+03      16.8          3.01       0.70
       1.95   101.45    .794E+03      19.1          3.06       0.69

                                  <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0002)    0.41     0.09    4.00  37.94      0.13      0.52
OUTFLOW: ID= 1 (  0010)    0.41     0.07    4.08  37.92      0.12      0.50
```

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):     0.41   0.074     4.08    37.92
      + ID2= 2 (  0004):     0.22   0.010     4.25    21.76
        ================================================
        ID = 3 (  0007):     0.63   0.081     4.08    32.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0007):     0.63   0.081     4.08    32.28
      + ID2= 2 (  0005):     1.04   0.120     4.00    37.40
        ================================================
        ID = 1 (  0007):     1.67   0.184     4.00    35.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
		<---- hydrograph ---->			<-pipe / channel->	
INFLOW : ID= 2 (0007)	1.67	0.18	4.00	35.46	0.25	1.62
OUTFLOW: ID= 1 (0006)	1.67	0.18	4.08	35.46	0.25	1.63

CALIB STANDHYD (0003) ID= 1 DT= 5.0 min	Area (ha)= 0.18	Total Imp(%)= 71.00	Dir. Conn.(%)= 35.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.05
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	1.60	1.60
Length	(m)=	34.64	45.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11

```
            2.333    2.23 | 5.333    4.97 | 8.333    1.74 | 11.33    1.11
            2.417    2.45 | 5.417    4.46 | 8.417    1.69 | 11.42    1.09
            2.500    2.45 | 5.500    4.46 | 8.500    1.69 | 11.50    1.09
            2.583    2.73 | 5.583    4.05 | 8.583    1.63 | 11.58    1.07
            2.667    2.73 | 5.667    4.05 | 8.667    1.63 | 11.67    1.07
            2.750    3.09 | 5.750    3.71 | 8.750    1.59 | 11.75    1.05
            2.833    3.09 | 5.833    3.71 | 8.833    1.59 | 11.83    1.05
            2.917    3.57 | 5.917    3.43 | 8.917    1.54 | 11.92    1.03
            3.000    3.57 | 6.000    3.43 | 9.000    1.54 | 12.00    1.03

     Max.Eff.Inten.(mm/hr)=     122.14       256.56
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      1.08 (ii)    6.64 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.34         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02         0.03          0.046 (iii)
     TIME TO PEAK    (hrs)=      4.00         4.08           4.00
     RUNOFF VOLUME    (mm)=     63.65        30.22          42.09
     TOTAL RAINFALL   (mm)=     65.22        65.22          65.22
     RUNOFF COEFFICIENT   =      0.98         0.46           0.65

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.18   0.046     4.00    42.09
      + ID2= 2 (  0006):     1.67   0.184     4.08    35.46
        ================================================
        ID = 3 (  0011):     1.85   0.229     4.00    36.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 4.167
RUNOFF VOLUME (mm)= 21.698
TOTAL RAINFALL (mm)= 65.219
RUNOFF COEFFICIENT = 0.333

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

```
--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.86   Dir. Conn.(%)=  48.86
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.25
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.25         0.80
     Length            (m)=      56.52        59.90
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.08	3.083	4.25	6.083	3.20	9.08	1.50
0.167	1.08	3.167	4.25	6.167	3.20	9.17	1.50
0.250	1.12	3.250	5.29	6.250	2.99	9.25	1.46
0.333	1.12	3.333	5.29	6.333	2.99	9.33	1.46
0.417	1.17	3.417	7.11	6.417	2.81	9.42	1.42
0.500	1.17	3.500	7.11	6.500	2.81	9.50	1.42
0.583	1.22	3.583	11.13	6.583	2.66	9.58	1.38
0.667	1.22	3.667	11.13	6.667	2.66	9.67	1.38
0.750	1.27	3.750	28.10	6.750	2.52	9.75	1.35
0.833	1.27	3.833	28.10	6.833	2.52	9.83	1.35
0.917	1.33	3.917	122.14	6.917	2.40	9.92	1.32
1.000	1.33	4.000	122.14	7.000	2.40	10.00	1.32
1.083	1.40	4.083	37.29	7.083	2.29	10.08	1.29
1.167	1.40	4.167	37.28	7.167	2.29	10.17	1.29
1.250	1.48	4.250	18.95	7.250	2.19	10.25	1.26
1.333	1.48	4.333	18.95	7.333	2.19	10.33	1.26
1.417	1.56	4.417	12.70	7.417	2.09	10.42	1.23
1.500	1.56	4.500	12.70	7.500	2.09	10.50	1.23
1.583	1.66	4.583	9.59	7.583	2.01	10.58	1.21
1.667	1.66	4.667	9.59	7.667	2.01	10.67	1.21
1.750	1.77	4.750	7.73	7.750	1.94	10.75	1.18
1.833	1.77	4.833	7.73	7.833	1.94	10.83	1.18
1.917	1.90	4.917	6.50	7.917	1.87	10.92	1.16
2.000	1.90	5.000	6.50	8.000	1.87	11.00	1.16
2.083	2.05	5.083	5.63	8.083	1.80	11.08	1.13
2.167	2.05	5.167	5.63	8.167	1.80	11.17	1.13
2.250	2.23	5.250	4.97	8.250	1.74	11.25	1.11
2.333	2.23	5.333	4.97	8.333	1.74	11.33	1.11
2.417	2.45	5.417	4.46	8.417	1.69	11.42	1.09
2.500	2.45	5.500	4.46	8.500	1.69	11.50	1.09
2.583	2.73	5.583	4.05	8.583	1.63	11.58	1.07
2.667	2.73	5.667	4.05	8.667	1.63	11.67	1.07
2.750	3.09	5.750	3.71	8.750	1.59	11.75	1.05
2.833	3.09	5.833	3.71	8.833	1.59	11.83	1.05
2.917	3.57	5.917	3.43	8.917	1.54	11.92	1.03
3.000	3.57	6.000	3.43	9.000	1.54	12.00	1.03

```
     Max.Eff.Inten.(mm/hr)=     122.14        42.69
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       2.54 (ii)   19.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.29         0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.02          0.083 (iii)
     TIME TO PEAK    (hrs)=       4.00         4.25           4.00
     RUNOFF VOLUME    (mm)=      63.65        14.64          38.58
     TOTAL RAINFALL   (mm)=      65.22        65.22          65.22
     RUNOFF COEFFICIENT   =       0.98         0.22           0.59

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.083     4.00    38.58
      + ID2= 2 (  0013):     0.19   0.011     4.17    21.70
        ==================================================
        ID = 3 (  0014):     0.66   0.091     4.00    33.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\d08e7cca-ca7c-473c-9606-24cf08de2aa3\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\d08e7cca-ca7c-473c-9606-24cf08de2aa3\scenari


DATE: 02-27-2024                          TIME: 12:45:31

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------------
  ************************************************
  ** SIMULATION : Chicago Design Storm - 100yr - 6**
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 82.32 mm |                          B=   6.014
--------------------                          C=   0.820
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    2.90 |  1.50   15.97 |  3.00    8.02 |  4.50    3.77
              0.17    3.16 |  1.67   40.65 |  3.17    7.08 |  4.67    3.57
```

0.33	3.48	1.83	178.56	3.33	6.35	4.83	3.40
0.50	3.88	2.00	54.05	3.50	5.76	5.00	3.24
0.67	4.39	2.17	27.32	3.67	5.28	5.17	3.10
0.83	5.07	2.33	18.24	3.83	4.88	5.33	2.97
1.00	6.05	2.50	13.74	4.00	4.54	5.50	2.85
1.17	7.54	2.67	11.06	4.17	4.25	5.67	2.74
1.33	10.16	2.83	9.29	4.33	3.99	5.83	2.64

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.018 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 33.102
TOTAL RAINFALL (mm)= 82.319
RUNOFF COEFFICIENT = 0.402

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

```
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   1.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.70   Dir. Conn.(%)=  29.80
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.42
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.60         0.50
     Length            (m)=      83.27       123.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

```
     Max.Eff.Inten.(mm/hr)=     178.56       186.37
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       2.12 (ii)   18.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.31         0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.13          0.204 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.25           2.00
     RUNOFF VOLUME    (mm)=      80.75        44.63          55.39
     TOTAL RAINFALL   (mm)=      82.32        82.32          82.32
     RUNOFF COEFFICIENT   =       0.98         0.54           0.67

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ROUTE CHN(0009)|
| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel
3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.529E+01	0.0	0.36	3.50
0.19	99.69	.168E+02	0.2	0.68	1.82
0.29	99.79	.293E+02	0.4	0.92	1.37
0.38	99.88	.428E+02	0.6	1.10	1.14
0.48	99.98	.572E+02	1.0	1.25	1.00
0.57	100.07	.726E+02	1.3	1.38	0.91
0.67	100.17	.890E+02	1.8	1.49	0.84
0.76	100.26	.106E+03	2.3	1.60	0.78
0.86	100.36	.125E+03	2.8	1.70	0.74
0.95	100.45	.144E+03	3.4	1.79	0.70
1.05	100.55	.164E+03	4.1	1.87	0.67
1.16	100.66	.191E+03	5.1	2.00	0.63
1.28	100.78	.222E+03	6.3	2.13	0.59
1.39	100.89	.255E+03	7.6	2.23	0.56
1.50	101.00	.292E+03	9.0	2.32	0.54
1.61	101.11	.332E+03	10.6	2.39	0.52
1.72	101.22	.375E+03	12.3	2.45	0.51
1.84	101.34	.420E+03	14.0	2.51	0.50
1.95	101.45	.469E+03	16.0	2.55	0.49

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0001)	1.04	0.20	2.00	55.39	0.21	0.73
OUTFLOW: ID= 1 (0009)	1.04	0.21	2.00	55.39	0.22	0.74

```
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

     <----------------- TRAVEL TIME TABLE ---------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .356E-01       0.0          0.36         0.42
       0.05     .992E-01       0.0          0.56         0.27
       0.08     .179E+00       0.0          0.72         0.21
       0.11     .271E+00       0.0          0.85         0.18
       0.13     .371E+00       0.0          0.97         0.15
       0.16     .479E+00       0.1          1.07         0.14
       0.18     .591E+00       0.1          1.16         0.13
       0.21     .707E+00       0.1          1.24         0.12
       0.24     .824E+00       0.1          1.31         0.11
       0.26     .943E+00       0.1          1.37         0.11
       0.29     .106E+01       0.2          1.43         0.11
       0.32     .118E+01       0.2          1.47         0.10
       0.34     .129E+01       0.2          1.50         0.10
       0.37     .140E+01       0.2          1.52         0.10
       0.39     .150E+01       0.3          1.53         0.10
       0.42     .159E+01       0.3          1.53         0.10
       0.45     .167E+01       0.3          1.52         0.10
       0.47     .173E+01       0.3          1.48         0.10
       0.50     .177E+01       0.3          1.35         0.11
                              <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0009)  1.04     0.21    2.00  55.39      0.34      1.50
OUTFLOW: ID= 1 (  0005)  1.04     0.21    2.00  55.39      0.34      1.50



--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  30.50
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         0.16
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      52.28        55.00
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

			TOTALS
Max.Eff.Inten.(mm/hr)=	178.56	301.18	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.37 (ii)	8.14 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.13	
PEAK FLOW (cms)=	0.06	0.09	0.141 (iii)
TIME TO PEAK (hrs)=	2.00	2.08	2.00
RUNOFF VOLUME (mm)=	80.75	45.12	55.99
TOTAL RAINFALL (mm)=	82.32	82.32	82.32
RUNOFF COEFFICIENT =	0.98	0.55	0.68

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ROUTE CHN(0010)
IN= 2---> OUT= 1	Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel

3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.895E+01	0.0	0.43	4.91
0.19	99.69	.284E+02	0.2	0.83	2.56
0.29	99.79	.496E+02	0.4	1.10	1.92
0.38	99.88	.724E+02	0.8	1.32	1.60
0.48	99.98	.969E+02	1.1	1.50	1.41
0.57	100.07	.123E+03	1.6	1.66	1.27
0.67	100.17	.151E+03	2.1	1.80	1.17
0.76	100.26	.180E+03	2.7	1.93	1.10
0.86	100.36	.211E+03	3.4	2.05	1.03
0.95	100.45	.244E+03	4.1	2.16	0.98
1.05	100.55	.278E+03	5.0	2.26	0.94
1.16	100.66	.323E+03	6.1	2.41	0.88
1.28	100.78	.375E+03	7.6	2.57	0.82
1.39	100.89	.433E+03	9.2	2.69	0.79
1.50	101.00	.495E+03	10.9	2.79	0.76
1.61	101.11	.562E+03	12.7	2.88	0.74
1.72	101.22	.634E+03	14.7	2.95	0.72
1.84	101.34	.712E+03	16.8	3.01	0.70
1.95	101.45	.794E+03	19.1	3.06	0.69

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0002)	0.41	0.14	2.00	55.99	0.16	0.66
OUTFLOW: ID= 1 (0010)	0.41	0.13	2.08	55.92	0.15	0.61

ADD HYD (0007)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	0.41	0.126	2.08	55.92
+ ID2= 2 (0004):	0.22	0.018	2.25	33.10
ID = 3 (0007):	0.63	0.140	2.08	47.95

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------
| ADD HYD  (  0007)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0007):     0.63   0.140     2.08    47.95
      + ID2= 2 (  0005):     1.04   0.213     2.00    55.39
        ================================================
        ID = 1 (  0007):     1.67   0.328     2.00    52.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
                                <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0007)    1.67     0.33    2.00  52.59      0.36      1.87
OUTFLOW: ID= 1 (  0006)    1.67     0.33    2.00  52.59      0.36      1.87


--------------------------------------------------------------------------------
```

```
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  71.00   Dir. Conn.(%)=  35.50
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       1.60         1.60
     Length            (m)=      34.64        45.00
     Mannings n           =      0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    2.90 | 1.583   15.97 | 3.083    8.02 |  4.58    3.77
           0.167    2.90 | 1.667   15.97 | 3.167    8.02 |  4.67    3.77
           0.250    3.16 | 1.750   40.65 | 3.250    7.08 |  4.75    3.57
           0.333    3.16 | 1.833   40.66 | 3.333    7.08 |  4.83    3.57
           0.417    3.48 | 1.917  178.56 | 3.417    6.35 |  4.92    3.40
           0.500    3.48 | 2.000  178.56 | 3.500    6.35 |  5.00    3.40
           0.583    3.88 | 2.083   54.05 | 3.583    5.76 |  5.08    3.24
           0.667    3.88 | 2.167   54.05 | 3.667    5.76 |  5.17    3.24
           0.750    4.39 | 2.250   27.32 | 3.750    5.28 |  5.25    3.10
           0.833    4.39 | 2.333   27.32 | 3.833    5.28 |  5.33    3.10
           0.917    5.07 | 2.417   18.24 | 3.917    4.88 |  5.42    2.97
           1.000    5.07 | 2.500   18.24 | 4.000    4.88 |  5.50    2.97
           1.083    6.05 | 2.583   13.74 | 4.083    4.54 |  5.58    2.85
           1.167    6.05 | 2.667   13.74 | 4.167    4.54 |  5.67    2.85
           1.250    7.54 | 2.750   11.06 | 4.250    4.25 |  5.75    2.74
           1.333    7.54 | 2.833   11.06 | 4.333    4.25 |  5.83    2.74
           1.417   10.16 | 2.917    9.29 | 4.417    3.99 |  5.92    2.64
           1.500   10.16 | 3.000    9.29 | 4.500    3.99 |  6.00    2.64
   Max.Eff.Inten.(mm/hr)=     178.56       381.64
            over (min)        5.00        10.00
     Storage Coeff.  (min)=    0.93 (ii)    5.67 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.34         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.03         0.04          0.072 (iii)
     TIME TO PEAK    (hrs)=    2.00         2.00           2.00
     RUNOFF VOLUME    (mm)=   80.75        49.71          60.73
     TOTAL RAINFALL   (mm)=   82.32        82.32          82.32
     RUNOFF COEFFICIENT   =    0.98         0.60           0.74

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.18   0.072     2.00    60.73
      + ID2= 2 (  0006):     1.67   0.326     2.00    52.59
        ================================================
        ID = 3 (  0011):     1.85   0.398     2.00    53.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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


                        ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    2.90 | 1.583   15.97 | 3.083    8.02 |  4.58    3.77
           0.167    2.90 | 1.667   15.97 | 3.167    8.02 |  4.67    3.77
           0.250    3.16 | 1.750   40.65 | 3.250    7.08 |  4.75    3.57
           0.333    3.16 | 1.833   40.66 | 3.333    7.08 |  4.83    3.57
           0.417    3.48 | 1.917  178.56 | 3.417    6.35 |  4.92    3.40
           0.500    3.48 | 2.000  178.56 | 3.500    6.35 |  5.00    3.40
           0.583    3.88 | 2.083   54.05 | 3.583    5.76 |  5.08    3.24
           0.667    3.88 | 2.167   54.05 | 3.667    5.76 |  5.17    3.24
           0.750    4.39 | 2.250   27.32 | 3.750    5.28 |  5.25    3.10
           0.833    4.39 | 2.333   27.32 | 3.833    5.28 |  5.33    3.10
           0.917    5.07 | 2.417   18.24 | 3.917    4.88 |  5.42    2.97
           1.000    5.07 | 2.500   18.24 | 4.000    4.88 |  5.50    2.97
           1.083    6.05 | 2.583   13.74 | 4.083    4.54 |  5.58    2.85
           1.167    6.05 | 2.667   13.74 | 4.167    4.54 |  5.67    2.85
           1.250    7.54 | 2.750   11.06 | 4.250    4.25 |  5.75    2.74
           1.333    7.54 | 2.833   11.06 | 4.333    4.25 |  5.83    2.74
           1.417   10.16 | 2.917    9.29 | 4.417    3.99 |  5.92    2.64
           1.500   10.16 | 3.000    9.29 | 4.500    3.99 |  6.00    2.64
        Unit Hyd Qpeak  (cms)=   0.042

     PEAK FLOW       (cms)=   0.020 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  33.003
     TOTAL RAINFALL   (mm)=  82.319
```

RUNOFF COEFFICIENT = 0.401

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

CALIB	
STANDHYD (0012)	Area (ha)= 0.48
ID= 1 DT= 5.0 min	Total Imp(%)= 48.86 Dir. Conn.(%)= 48.86

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.25
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.25	0.80
Length	(m)=	56.52	59.90
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	15.97	3.083	8.02	4.58	3.77
0.167	2.90	1.667	15.97	3.167	8.02	4.67	3.77
0.250	3.16	1.750	40.65	3.250	7.08	4.75	3.57
0.333	3.16	1.833	40.66	3.333	7.08	4.83	3.57
0.417	3.48	1.917	178.56	3.417	6.35	4.92	3.40
0.500	3.48	2.000	178.56	3.500	6.35	5.00	3.40
0.583	3.88	2.083	54.05	3.583	5.76	5.08	3.24
0.667	3.88	2.167	54.05	3.667	5.76	5.17	3.24
0.750	4.39	2.250	27.32	3.750	5.28	5.25	3.10
0.833	4.39	2.333	27.32	3.833	5.28	5.33	3.10
0.917	5.07	2.417	18.24	3.917	4.88	5.42	2.97
1.000	5.07	2.500	18.24	4.000	4.88	5.50	2.97
1.083	6.05	2.583	13.74	4.083	4.54	5.58	2.85
1.167	6.05	2.667	13.74	4.167	4.54	5.67	2.85
1.250	7.54	2.750	11.06	4.250	4.25	5.75	2.74
1.333	7.54	2.833	11.06	4.333	4.25	5.83	2.74
1.417	10.16	2.917	9.29	4.417	3.99	5.92	2.64
1.500	10.16	3.000	9.29	4.500	3.99	6.00	2.64

Max.Eff.Inten.(mm/hr)=		178.56	99.88	
over (min)		5.00	15.00	
Storage Coeff. (min)=		2.18 (ii)	14.02 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.31	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.12	0.04	0.135 (iii)
TIME TO PEAK	(hrs)=	2.00	2.17	2.00
RUNOFF VOLUME	(mm)=	80.75	30.52	55.06
TOTAL RAINFALL	(mm)=	82.32	82.32	82.32
RUNOFF COEFFICIENT	=	0.98	0.37	0.67

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.135     2.00    55.06
      + ID2= 2 (  0013):     0.19   0.020     2.17    33.00
        ================================================
        ID = 3 (  0014):     0.66   0.149     2.00    48.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

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

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\4e2f34fe-2489-46c6-9700-73605651e1f6\scenari
  Summary filename: C:\Users\hymo\AppData\Local\Civica\VH5\cfbcf761-8de5-
47f5-b85c-b6f5aedc2594\4e2f34fe-2489-46c6-9700-73605651e1f6\scenari

DATE: 02-27-2024                          TIME: 12:45:31

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
------------------------------
  ************************************************
  ** SIMULATION : Chicago Design Storm - 100yr  12**
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 93.90 mm |                          B=   6.014
--------------------                          C=   0.820
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  = 12.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    1.52 |  3.00    6.05 |  6.00    4.54 |  9.00    2.12
              0.17    1.58 |  3.17    7.54 |  6.17    4.25 |  9.17    2.06
```

0.33	1.65	3.33	10.16	6.33	3.99	9.33	2.01
0.50	1.72	3.50	15.97	6.50	3.77	9.50	1.96
0.67	1.80	3.67	40.65	6.67	3.57	9.67	1.91
0.83	1.88	3.83	178.56	6.83	3.40	9.83	1.86
1.00	1.98	4.00	54.05	7.00	3.24	10.00	1.82
1.17	2.09	4.17	27.32	7.17	3.10	10.17	1.78
1.33	2.21	4.33	18.24	7.33	2.97	10.33	1.74
1.50	2.34	4.50	13.74	7.50	2.85	10.50	1.70
1.67	2.50	4.67	11.06	7.67	2.74	10.67	1.67
1.83	2.69	4.83	9.29	7.83	2.64	10.83	1.63
2.00	2.90	5.00	8.02	8.00	2.55	11.00	1.60
2.17	3.16	5.17	7.08	8.17	2.46	11.17	1.57
2.33	3.48	5.33	6.35	8.33	2.38	11.33	1.54
2.50	3.88	5.50	5.76	8.50	2.31	11.50	1.51
2.67	4.39	5.67	5.28	8.67	2.24	11.67	1.48
2.83	5.07	5.83	4.88	8.83	2.18	11.83	1.46

CALIB			
NASHYD (0004)	Area (ha)=	0.22	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	8.92	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63

2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Unit Hyd Qpeak (cms)= 0.031

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 4.250
RUNOFF VOLUME (mm)= 41.423
TOTAL RAINFALL (mm)= 93.900
RUNOFF COEFFICIENT = 0.441

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

CALIB	
STANDHYD (0001)	Area (ha)= 1.04
ID= 1 DT= 5.0 min	Total Imp(%)= 59.70 Dir. Conn.(%)= 29.80

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.42
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	0.60	0.50
Length	(m)=	83.27	123.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91

```
            0.917    1.88 | 3.917  178.56 | 6.917    3.40 |  9.92    1.86
            1.000    1.88 | 4.000  178.56 | 7.000    3.40 | 10.00    1.86
            1.083    1.98 | 4.083   54.05 | 7.083    3.24 | 10.08    1.82
            1.167    1.98 | 4.167   54.05 | 7.167    3.24 | 10.17    1.82
            1.250    2.09 | 4.250   27.32 | 7.250    3.10 | 10.25    1.78
            1.333    2.09 | 4.333   27.32 | 7.333    3.10 | 10.33    1.78
            1.417    2.21 | 4.417   18.24 | 7.417    2.97 | 10.42    1.74
            1.500    2.21 | 4.500   18.24 | 7.500    2.97 | 10.50    1.74
            1.583    2.34 | 4.583   13.74 | 7.583    2.85 | 10.58    1.70
            1.667    2.34 | 4.667   13.74 | 7.667    2.85 | 10.67    1.70
            1.750    2.50 | 4.750   11.06 | 7.750    2.74 | 10.75    1.67
            1.833    2.50 | 4.833   11.06 | 7.833    2.74 | 10.83    1.67
            1.917    2.69 | 4.917    9.29 | 7.917    2.64 | 10.92    1.63
            2.000    2.69 | 5.000    9.29 | 8.000    2.64 | 11.00    1.63
            2.083    2.90 | 5.083    8.02 | 8.083    2.55 | 11.08    1.60
            2.167    2.90 | 5.167    8.02 | 8.167    2.55 | 11.17    1.60
            2.250    3.16 | 5.250    7.08 | 8.250    2.46 | 11.25    1.57
            2.333    3.16 | 5.333    7.08 | 8.333    2.46 | 11.33    1.57
            2.417    3.48 | 5.417    6.35 | 8.417    2.38 | 11.42    1.54
            2.500    3.48 | 5.500    6.35 | 8.500    2.38 | 11.50    1.54
            2.583    3.88 | 5.583    5.76 | 8.583    2.31 | 11.58    1.51
            2.667    3.88 | 5.667    5.76 | 8.667    2.31 | 11.67    1.51
            2.750    4.39 | 5.750    5.28 | 8.750    2.24 | 11.75    1.48
            2.833    4.39 | 5.833    5.28 | 8.833    2.24 | 11.83    1.48
            2.917    5.07 | 5.917    4.88 | 8.917    2.18 | 11.92    1.46
            3.000    5.07 | 6.000    4.88 | 9.000    2.18 | 12.00    1.46
        Max.Eff.Inten.(mm/hr)=     178.56       188.43
                 over (min)         5.00        20.00
     Storage Coeff.  (min)=        2.12 (ii)   18.41 (ii)
     Unit Hyd. Tpeak (min)=        5.00        20.00
     Unit Hyd. peak  (cms)=        0.31         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.15         0.14          0.210 (iii)
     TIME TO PEAK    (hrs)=        4.00         4.25           4.00
     RUNOFF VOLUME    (mm)=       92.33        46.53          60.18
     TOTAL RAINFALL   (mm)=       93.90        93.90          93.90
     RUNOFF COEFFICIENT   =        0.98         0.50           0.64

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--
```

```
--------------------
| ROUTE CHN(  0009)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        101.50        0.0500
                   1.00        100.70        0.0500
                   1.50        100.55    0.0500 /0.0300  Main Channel
                   2.00         99.50        0.0300      Main Channel
                   3.50         99.60        0.0300      Main Channel
                   4.50        100.65    0.0300 /0.0500  Main Channel
                   6.00        101.45        0.0500

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.10    99.60    .529E+01       0.0          0.36       3.50
       0.19    99.69    .168E+02       0.2          0.68       1.82
       0.29    99.79    .293E+02       0.4          0.92       1.37
       0.38    99.88    .428E+02       0.6          1.10       1.14
       0.48    99.98    .572E+02       1.0          1.25       1.00
       0.57   100.07    .726E+02       1.3          1.38       0.91
       0.67   100.17    .890E+02       1.8          1.49       0.84
       0.76   100.26    .106E+03       2.3          1.60       0.78
       0.86   100.36    .125E+03       2.8          1.70       0.74
       0.95   100.45    .144E+03       3.4          1.79       0.70
       1.05   100.55    .164E+03       4.1          1.87       0.67
       1.16   100.66    .191E+03       5.1          2.00       0.63
       1.28   100.78    .222E+03       6.3          2.13       0.59
       1.39   100.89    .255E+03       7.6          2.23       0.56
       1.50   101.00    .292E+03       9.0          2.32       0.54
       1.61   101.11    .332E+03      10.6          2.39       0.52
       1.72   101.22    .375E+03      12.3          2.45       0.51
       1.84   101.34    .420E+03      14.0          2.51       0.50
       1.95   101.45    .469E+03      16.0          2.55       0.49

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
INFLOW : ID= 2 (  0001)    1.04     0.21    4.00  60.18      0.22      0.74
OUTFLOW: ID= 1 (  0009)    1.04     0.22    4.00  60.17      0.22      0.75


--------------------------------------------------------------------------------
--------------------
| ROUTEPIPE(  0005)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 500.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.017
                         Manning n       =  0.024

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.03	.356E-01	0.0	0.36	0.42
0.05	.992E-01	0.0	0.56	0.27
0.08	.179E+00	0.0	0.72	0.21
0.11	.271E+00	0.0	0.85	0.18
0.13	.371E+00	0.0	0.97	0.15
0.16	.479E+00	0.1	1.07	0.14
0.18	.591E+00	0.1	1.16	0.13
0.21	.707E+00	0.1	1.24	0.12
0.24	.824E+00	0.1	1.31	0.11
0.26	.943E+00	0.1	1.37	0.11
0.29	.106E+01	0.2	1.43	0.11
0.32	.118E+01	0.2	1.47	0.10
0.34	.129E+01	0.2	1.50	0.10
0.37	.140E+01	0.2	1.52	0.10
0.39	.150E+01	0.3	1.53	0.10
0.42	.159E+01	0.3	1.53	0.10
0.45	.167E+01	0.3	1.52	0.10
0.47	.173E+01	0.3	1.48	0.10
0.50	.177E+01	0.3	1.35	0.11

	<---- hydrograph ----> AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0009)	1.04	0.22	4.00	60.17	0.35	1.50
OUTFLOW: ID= 1 (0005)	1.04	0.22	4.00	60.17	0.35	1.50

CALIB	
STANDHYD (0002)	Area (ha)= 0.41
ID= 1 DT= 5.0 min	Total Imp(%)= 61.00 Dir. Conn.(%)= 30.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.25	0.16
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	1.00	1.00
Length	(m)=	52.28	55.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01

0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Max.Eff.Inten.(mm/hr)=	178.56	303.84	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.37 (ii)	8.12 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.13	
			TOTALS
PEAK FLOW (cms)=	0.06	0.09	0.144 (iii)
TIME TO PEAK (hrs)=	4.00	4.08	4.00
RUNOFF VOLUME (mm)=	92.33	46.98	60.81
TOTAL RAINFALL (mm)=	93.90	93.90	93.90
RUNOFF COEFFICIENT =	0.98	0.50	0.65

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

(i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
Fo (mm/hr)= 76.20 K (1/hr)= 4.14
Fc (mm/hr)= 13.20 Cum.Inf. (mm)= 0.00
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ROUTE CHN(0010)|

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

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	101.50	0.0500	
1.00	100.70	0.0500	
1.50	100.55	0.0500 /0.0300	Main Channel
2.00	99.50	0.0300	Main Channel
3.50	99.60	0.0300	Main Channel
4.50	100.65	0.0300 /0.0500	Main Channel
6.00	101.45	0.0500	

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

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.10	99.60	.895E+01	0.0	0.43	4.91
0.19	99.69	.284E+02	0.2	0.83	2.56
0.29	99.79	.496E+02	0.4	1.10	1.92
0.38	99.88	.724E+02	0.8	1.32	1.60
0.48	99.98	.969E+02	1.1	1.50	1.41
0.57	100.07	.123E+03	1.6	1.66	1.27
0.67	100.17	.151E+03	2.1	1.80	1.17
0.76	100.26	.180E+03	2.7	1.93	1.10
0.86	100.36	.211E+03	3.4	2.05	1.03
0.95	100.45	.244E+03	4.1	2.16	0.98
1.05	100.55	.278E+03	5.0	2.26	0.94
1.16	100.66	.323E+03	6.1	2.41	0.88
1.28	100.78	.375E+03	7.6	2.57	0.82
1.39	100.89	.433E+03	9.2	2.69	0.79
1.50	101.00	.495E+03	10.9	2.79	0.76
1.61	101.11	.562E+03	12.7	2.88	0.74
1.72	101.22	.634E+03	14.7	2.95	0.72
1.84	101.34	.712E+03	16.8	3.01	0.70
1.95	101.45	.794E+03	19.1	3.06	0.69

	<---- hydrograph ---->				<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0002)	0.41	0.14	4.00	60.81	0.17	0.66
OUTFLOW: ID= 1 (0010)	0.41	0.13	4.08	60.78	0.16	0.62

```
--------------------
| ADD HYD  (  0007)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):     0.41   0.129     4.08    60.78
      + ID2= 2 (  0004):     0.22   0.020     4.25    41.42
        ================================================
        ID = 3 (  0007):     0.63   0.145     4.08    54.02

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0007)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0007):     0.63   0.145     4.08    54.02
      + ID2= 2 (  0005):     1.04   0.219     4.00    60.17
        ================================================
        ID = 1 (  0007):     1.67   0.340     4.00    57.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--
--------------------
| ROUTEPIPE(  0006)|     PIPE Number     =   1.00
| IN= 2---> OUT= 1 |     Diameter    (mm)= 600.00
| DT=  5.0 min     |     Length       (m)=   9.00
--------------------     Slope      (m/m)=  0.006
                         Manning n       =  0.012

     <----------------- TRAVEL TIME TABLE -------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       0.03     .513E-01       0.0          0.47         0.32
       0.06     .143E+00       0.0          0.73         0.21
       0.09     .258E+00       0.0          0.94         0.16
       0.13     .390E+00       0.0          1.11         0.13
       0.16     .535E+00       0.1          1.27         0.12
       0.19     .689E+00       0.1          1.40         0.11
       0.22     .851E+00       0.1          1.52         0.10
       0.25     .102E+01       0.2          1.62         0.09
       0.28     .119E+01       0.2          1.71         0.09
       0.32     .136E+01       0.3          1.79         0.08
       0.35     .153E+01       0.3          1.86         0.08
       0.38     .169E+01       0.4          1.91         0.08
       0.41     .186E+01       0.4          1.96         0.08
       0.44     .201E+01       0.4          1.98         0.08
       0.47     .215E+01       0.5          2.00         0.08
       0.51     .229E+01       0.5          2.00         0.08
       0.54     .240E+01       0.5          1.98         0.08
       0.57     .249E+01       0.5          1.93         0.08
       0.60     .254E+01       0.5          1.76         0.09
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
		<---- hydrograph ---->			<-pipe / channel->	
INFLOW : ID= 2 (0007)	1.67	0.34	4.00	57.85	0.36	1.89
OUTFLOW: ID= 1 (0006)	1.67	0.34	4.00	57.85	0.37	1.89

CALIB	
STANDHYD (0003)	Area (ha)= 0.18
ID= 1 DT= 5.0 min	Total Imp(%)= 71.00 Dir. Conn.(%)= 35.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.05
Dep. Storage	(mm)=	1.57	4.67
Average Slope	(%)=	1.60	1.60
Length	(m)=	34.64	45.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60

```
            2.250    3.16 | 5.250    7.08 | 8.250    2.46 | 11.25    1.57
            2.333    3.16 | 5.333    7.08 | 8.333    2.46 | 11.33    1.57
            2.417    3.48 | 5.417    6.35 | 8.417    2.38 | 11.42    1.54
            2.500    3.48 | 5.500    6.35 | 8.500    2.38 | 11.50    1.54
            2.583    3.88 | 5.583    5.76 | 8.583    2.31 | 11.58    1.51
            2.667    3.88 | 5.667    5.76 | 8.667    2.31 | 11.67    1.51
            2.750    4.39 | 5.750    5.28 | 8.750    2.24 | 11.75    1.48
            2.833    4.39 | 5.833    5.28 | 8.833    2.24 | 11.83    1.48
            2.917    5.07 | 5.917    4.88 | 8.917    2.18 | 11.92    1.46
            3.000    5.07 | 6.000    4.88 | 9.000    2.18 | 12.00    1.46
       Max.Eff.Inten.(mm/hr)=     178.56       383.51
                 over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.93 (ii)    5.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.04          0.072 (iii)
     TIME TO PEAK    (hrs)=       4.00         4.00           4.00
     RUNOFF VOLUME    (mm)=      92.33        51.28          65.85
     TOTAL RAINFALL   (mm)=      93.90        93.90          93.90
     RUNOFF COEFFICIENT   =       0.98         0.55           0.70

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.18   0.072     4.00    65.85
      + ID2= 2 (  0006):     1.67   0.338     4.00    57.85
        ================================================
        ID = 3 (  0011):     1.85   0.411     4.00    58.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)=   0.19   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.92   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

Unit Hyd Qpeak (cms)= 0.042

PEAK FLOW (cms)= 0.022 (i)
TIME TO PEAK (hrs)= 4.083
RUNOFF VOLUME (mm)= 41.300
TOTAL RAINFALL (mm)= 93.900
RUNOFF COEFFICIENT = 0.440

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

```
--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.86   Dir. Conn.(%)=  48.86
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.25
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=       0.25         0.80
     Length            (m)=      56.52        59.90
     Mannings n           =      0.013        0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.52	3.083	6.05	6.083	4.54	9.08	2.12
0.167	1.52	3.167	6.05	6.167	4.54	9.17	2.12
0.250	1.58	3.250	7.54	6.250	4.25	9.25	2.06
0.333	1.58	3.333	7.54	6.333	4.25	9.33	2.06
0.417	1.65	3.417	10.16	6.417	3.99	9.42	2.01
0.500	1.65	3.500	10.16	6.500	3.99	9.50	2.01
0.583	1.72	3.583	15.97	6.583	3.77	9.58	1.96
0.667	1.72	3.667	15.97	6.667	3.77	9.67	1.96
0.750	1.80	3.750	40.65	6.750	3.57	9.75	1.91
0.833	1.80	3.833	40.65	6.833	3.57	9.83	1.91
0.917	1.88	3.917	178.56	6.917	3.40	9.92	1.86
1.000	1.88	4.000	178.56	7.000	3.40	10.00	1.86
1.083	1.98	4.083	54.05	7.083	3.24	10.08	1.82
1.167	1.98	4.167	54.05	7.167	3.24	10.17	1.82
1.250	2.09	4.250	27.32	7.250	3.10	10.25	1.78
1.333	2.09	4.333	27.32	7.333	3.10	10.33	1.78
1.417	2.21	4.417	18.24	7.417	2.97	10.42	1.74
1.500	2.21	4.500	18.24	7.500	2.97	10.50	1.74
1.583	2.34	4.583	13.74	7.583	2.85	10.58	1.70
1.667	2.34	4.667	13.74	7.667	2.85	10.67	1.70
1.750	2.50	4.750	11.06	7.750	2.74	10.75	1.67
1.833	2.50	4.833	11.06	7.833	2.74	10.83	1.67
1.917	2.69	4.917	9.29	7.917	2.64	10.92	1.63
2.000	2.69	5.000	9.29	8.000	2.64	11.00	1.63
2.083	2.90	5.083	8.02	8.083	2.55	11.08	1.60
2.167	2.90	5.167	8.02	8.167	2.55	11.17	1.60
2.250	3.16	5.250	7.08	8.250	2.46	11.25	1.57
2.333	3.16	5.333	7.08	8.333	2.46	11.33	1.57
2.417	3.48	5.417	6.35	8.417	2.38	11.42	1.54
2.500	3.48	5.500	6.35	8.500	2.38	11.50	1.54
2.583	3.88	5.583	5.76	8.583	2.31	11.58	1.51
2.667	3.88	5.667	5.76	8.667	2.31	11.67	1.51
2.750	4.39	5.750	5.28	8.750	2.24	11.75	1.48
2.833	4.39	5.833	5.28	8.833	2.24	11.83	1.48
2.917	5.07	5.917	4.88	8.917	2.18	11.92	1.46
3.000	5.07	6.000	4.88	9.000	2.18	12.00	1.46

```
        Max.Eff.Inten.(mm/hr)=     178.56       108.34
                 over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.18 (ii)   13.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.05          0.137 (iii)
     TIME TO PEAK    (hrs)=       4.00         4.17           4.00
     RUNOFF VOLUME    (mm)=      92.33        33.03          61.99
     TOTAL RAINFALL   (mm)=      93.90        93.90          93.90
     RUNOFF COEFFICIENT   =       0.98         0.35           0.66

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

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.48   0.137     4.00    61.99
      + ID2= 2 (  0013):     0.19   0.022     4.08    41.30
        ================================================
        ID = 3 (  0014):     0.66   0.155     4.00    56.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

APPENDIX E: TREATMENT UNIT SPECIFICATIONS

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name: 2-8 Queen Street
Location: Johnstown, ON
OGS #: 1

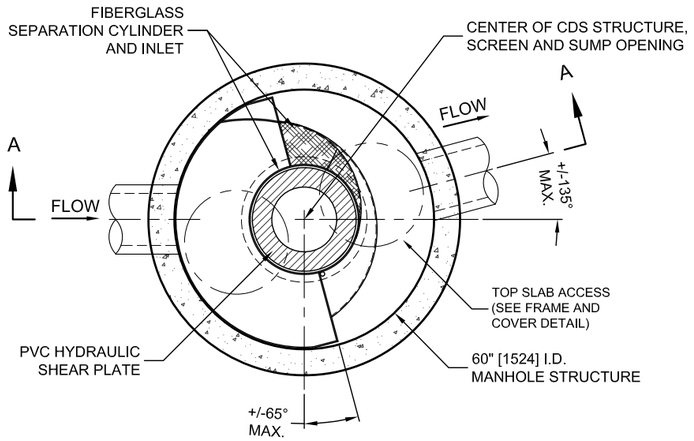
Engineer: **Kollaard Associates**
Contact: Nick Recoskie, P.Eng.
Report Date: 18-Oct-23

Area	1.450	ha	**Rainfall Station #**	216	
Weighted C	0.74		**Particle Size Distribution**	FINE	
CDS Model	2025		**CDS Treatment Capacity**	45	l/s

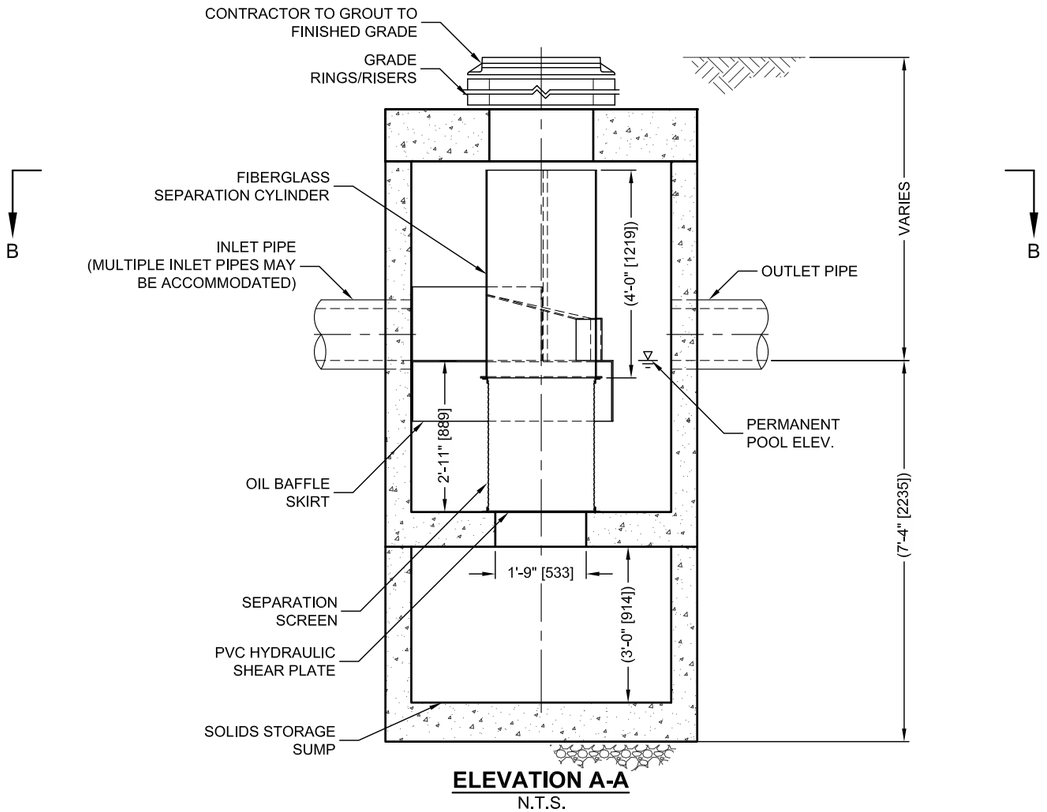
Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1.0	10.8%	20.5%	3.0	3.0	6.6	97.0	10.5
1.5	8.9%	29.4%	4.5	4.5	9.9	96.0	8.6
2.0	9.3%	38.7%	6.0	6.0	13.2	95.1	8.8
2.5	6.9%	45.5%	7.5	7.5	16.5	94.1	6.5
3.0	6.0%	51.5%	9.0	9.0	19.9	93.2	5.6
3.5	3.7%	55.2%	10.5	10.5	23.2	92.2	3.4
4.0	5.1%	60.3%	12.0	12.0	26.5	91.3	4.7
4.5	3.8%	64.1%	13.5	13.5	29.8	90.3	3.4
5.0	3.9%	68.0%	15.0	15.0	33.1	89.4	3.5
6.0	5.8%	73.8%	18.0	18.0	39.7	87.5	5.1
7.0	4.1%	77.8%	21.0	21.0	46.3	85.6	3.5
8.0	3.3%	81.2%	24.0	24.0	52.9	83.7	2.8
9.0	3.6%	84.8%	27.0	27.0	59.6	81.8	3.0
10.0	2.0%	86.8%	30.0	30.0	66.2	79.9	1.6
15.0	7.7%	94.5%	45.0	45.0	99.3	70.4	5.4
20.0	2.6%	97.1%	60.0	45.3	100.0	53.0	1.4
25.0	0.8%	97.9%	75.0	45.3	100.0	42.4	0.3
30.0	0.9%	98.8%	90.0	45.3	100.0	35.4	0.3
35.0	0.3%	99.1%	105.0	45.3	100.0	30.3	0.1
40.0	0.4%	99.5%	120.0	45.3	100.0	26.5	0.1
45.0	0.0%	99.5%	135.0	45.3	100.0	23.6	0.0
50.0	0.5%	100.0%	150.0	45.3	100.0	21.2	0.1
							88.0

Removal Efficiency Adjustment[2] = 6.5%
Predicted Net Annual Load Removal Efficiency = 81.5%
Predicted Annual Rainfall Treated = 97.4%

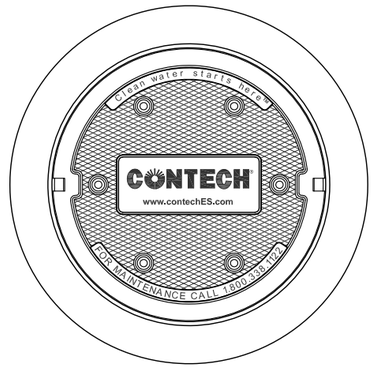
1 - Based on 39 years of hourly rainfall data from Canadian Station 6100971, Brockville ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS PMSU2025-5-C DESIGN NOTES

THE STANDARD CDS PMSU2025-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS PMSU2025-5-C
INLINE CDS
STANDARD DETAIL

SCHEDULE “D”

Site Plan Control Agreement

GEOTECHNICAL INVESTIGATION

Prepared by Kollaard Associates, dated November 2022

Kollaard Associates
Engineers

210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology

(613) 860-0923

FAX: (613) 258-0475

REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED SELF STORAGE BUILDINGS
8 QUEEN STREET
JOHNSTOWN, ONTARIO

Project # 221121

Submitted to:

Johnstown Self Storage
8 Queen Street
Johnstown, ON
K0E 1T1

DISTRIBUTION

1 copy – Johnstown Self Storage
1 copy - Kollaard Associates Inc.

November 2022

Kollaard Associates
Engineers

210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology

(613) 860-0923

FAX: (613) 258-0475

TABLE OF CONTENTS

Kollaard Associates
Engineers
210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology
(613) 860-0923
FAX: (613) 258-0475

November 15, 2022 221121

Johnstown Self Storage
8 Queen Street
Johnstown, ON
K0E 1T1

RE: GEOTECHNICAL INVESTIGATION
PROPOSED SELF STORAGE BUILDINGS
8 QUEEN STREET
JOHNSTOWN, ONTARIO

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for the above noted proposed self-storage buildings to be located at 8 Queen Street in Johnstown, Ontario (see Key Plan, Figure 1).

The purpose of the investigation was to:

- Identify the subsurface conditions at the site by means of a limited number of test pits;
- Based on the factual information obtained, provide recommendations and guidelines on the geotechnical engineering aspects of the project design; including bearing capacity and other construction considerations, which could influence design decisions.

2.0 BACKGROUND INFORMATION AND SITE GEOLOGY

2.1 Existing Conditions and Site Geology

The subject site for this assessment consists of about a 1.8 hectare (4.5 acres) irregular-shaped property located at 8 Queen Street in Johnstown, Ontario (see Key Plan, Figure 1).

For the purposes of this assessment, project north lies in a direction parallel to Queen Street, located east of the site.

Surrounding land use is currently a mixture of residential and commercial development. The site is bordered on the north by residential and undeveloped land, on the west and south by commercial development, and on the east by Queen Street followed by a residential development. The site currently contains three self storage buildings, and the area where the proposed buildings will be located is currently vacant.

The ground surface at the site is sloped to the southwest.

Based on a review of the surficial geology map for the site area, it is expected that the site is underlain by silty clay and glacial till. Bedrock geology maps indicate that the bedrock underlying the site consists of limestone and dolomite of the Oxford Formation.

Groundwater flow often reflects topographic features and typically flows toward nearby lakes, rivers and wetland areas. Based on the topography of the area, it is expected that the local shallow groundwater flow is to the south toward the St Lawrence River.

2.2 Proposed Development

It is understood that preliminary plans are being prepared for the construction of three self-storage buildings. It is understood that the proposed self storage buildings will be unheated, single-storey buildings. It is understood they will be of steel frame construction with a cast-in-place, thickened edge, concrete slab on grade foundation. It is understood that the propose self storage buildings will be serviced by granular surfaced roadway and parking areas.

It is also understood that an additional granular parking area may be constructed in the future, to the north of the proposed self storage buildings.

Surface drainage for the proposed buildings will be by means of swales, catch basins and storm sewers.

3.0 PROCEDURE

The field work for this investigation was carried out on November 9, 2022, at which time seven test pits were put down at the site, within the area of the proposed self-storage buildings and future parking area using a tire mounted backhoe owned and operated by a local excavation contractor. Test pits TP1 to TP4 and TP7 were put down within the area of the proposed self storage buildings and test pits TP5 and TP6 were put down within the future parking area.

The test pits put down during the subsurface investigation were for geotechnical purposes only. Identification of the presence or absence of surface or subsurface contamination was outside the scope of work for the investigation. As such, an environmental technician was not on site for environmental sampling or assessment purposes.

The test pits were advanced to depths of about 1.8 to 3.6 metres below the existing ground surface. The subsurface conditions encountered at the test pits were classified based on visual and tactile examination of the materials exposed on the sides and bottom of the test pits (ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), an assessment of the difficulty of digging and in–situ shear vane tests within the softer cohesive materials. The soils were classified using the Unified Soil Classification System. The groundwater conditions were observed in the open test pits at the time of excavating. The test pits were loosely backfilled with the excavated materials upon completion of the fieldwork.

The field work was supervised throughout by a member of our engineering staff who located the test pits in the field, logged the test pits and cared for the samples obtained. A description of the subsurface conditions encountered at the test pits given in the attached Table I, Record of Test Pits sheets following this report. The approximate locations of the test pits are shown on the attached Site Plan, Figure 2.

The location of the seven test pits was determined based on the locations of the proposed self storage buildings. All of the test holes are indicated on the attached Site Plan, Figure 2.

4.0 SUBSURFACE CONDITIONS

4.1 General

As previously indicated, a description of the subsurface conditions encountered at the test pits is provided in the attached Record of Test Pit Sheets following the text of this report. The test pit logs indicate the subsurface conditions at the specific test hole locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at locations other than test hole locations may vary from the conditions encountered at the test holes.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and Kollaard Associates Inc. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the location and on the date the observations were noted in the report and on the test hole logs. Groundwater conditions may vary seasonally, or may be affected by construction activities on or in the vicinity of the site.

The following is a brief overview of the subsurface conditions encountered at the test pits.

4.2 Fill Materials

Fill materials consisting of topsoil, silty sand or silty clay with some cobbles, gravel and boulders and a trace of wood were encountered from the surface at test pits TP4 to TP6 and beneath a layer of granular stone at TP7. The fill materials were about 0.6 to 1.2 metres thick and were fully penetrated at all test holes where encountered.

4.3 Topsoil

About a 0.2 to 0.3 metre thickness of topsoil was encountered from the ground surface at test pits TP1 to TP3 and beneath the fill materials in test pits TP4 to TP7. The material was classified as topsoil based on the colour and the presence of organic materials. The identification of the topsoil layer is

for geotechnical purposes only and does not constitute a statement as to the suitability of this layer for cultivation and sustainable plant growth.

4.4 Silty Sand

Yellow brown silty sand was encountered beneath the topsoil at test pits TP1, TP2, TP4 and TP6. The silty sand ranged in thickness from about 0.2 to 1.1 metres. The silty sand was fully penetrated at all test hole locations where encountered.

Based on the difficulty of excavation and tactile examination, the silty sand was considered to be in a loose to compact state of compaction.

4.5 Silty Clay

Beneath the topsoil and silty sand, a deposit of grey brown silty clay was encountered at all of the test pits. In situ vane shear tests carried out in the silty clay deposit gave undrained shear strength values from 56 to greater than 120 kilopascals, indicating that the silty clay is stiff to very stiff in consistency. All test pits were terminated within the silty clay, at depths between 1.8 and 3.6 metres.

4.6 Groundwater

Some groundwater seepage was encountered within the test pits at the time of the field work. The groundwater levels ranged from about 1.8 to 2.1 metres below the existing ground surface. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

5.1 General

This section of the report provides engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the information from the test holes and the project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy

of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site of materials from offsite sources are outside the terms of reference for this report.

5.2 Foundations for Proposed Self Storage Buildings

As previously indicated, the subsurface conditions encountered at the test pits advanced during the investigation consisted of fill materials and/or topsoil followed by silty sand and silty clay with depth. The fill and topsoil are not considered suitable for the support of the proposed self storage building on cast in place, thickened edge slab on grade foundations.

For predictable performance of the proposed foundations, all existing fill and underlying topsoil and any deleterious materials should be removed from within the proposed foundation areas and should be replaced to the proposed founding level using suitable engineered fill.

It is expected that the subgrade, beneath the fill and topsoil or otherwise deleterious material consists of native, undisturbed yellow brown silty sand or grey brown silty clay.

The subgrade surface should be inspected and approved by geotechnical personnel.

5.3 Engineered Fill

The engineered fill materials beneath the proposed thickened edge slab on grade should consist of imported granular material (engineered fill). The engineered fill should consist of granular material meeting Ontario Provincial Standards Specifications (OPSS) requirements for Granular A or Granular B Type I or II and should be compacted in maximum 300 millimetre thick loose lifts to at least 95 percent of the standard Proctor maximum dry density. It is considered that the engineered fill should be compacted using dynamic compaction with a large diameter vibratory steel drum roller or diesel plate compactor. If a diesel plate compactor is used, the lift thickness may need to be

restricted to less than 300 mm to achieve proper compaction. Compaction should be verified by a suitable field compaction test method.

To allow the spread of load beneath the footings, the engineered fill should extend out 0.5 metres horizontally and then down and out from the edges of the footing at 1 horizontal to 1 vertical, or flatter. The excavations for the proposed buildings should be sized to accommodate this fill placement.

The first lift of engineered fill material should have a thickness of 300 millimetres in order to protect the subgrade during compaction. It is considered that the placement of a geotextile fabric between the engineered fill and the subgrade is not necessary where granular materials meeting the grading requirements for OPSS Granular B Type II or OPSS Granular A are placed on a silty clay subgrade above the normal groundwater level. It is recommended that trucks are not used to place the engineered fill on the subgrade. The fill should be dumped at the edge of the excavation and moved into place with a tracked bulldozer or excavator.

The native silty sand and silty clay soils at this site will be sensitive to disturbance from construction operations and from rainwater or snowmelt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

5.4 Bearing Capacity

The proposed self storage buildings, when founded on engineered fill as described above, should be designed with a maximum allowable bearing pressure of 95 kilopascals for serviceability limit states design and a maximum of 300 kPa for factored ultimate limit states design; when considering the thickened edge portion of the slab only.

The maximum total and differential settlement of the footings are expected to be less than 25 millimetres and 20 millimetres, respectively, using the above allowable bearing pressure and resistance. The above allowable bearing pressure and resistance are subject to a maximum grade raise of 2.0 metres.

5.5 Excavation Considerations

5.5.1 Foundation Excavation for Proposed Storage Buildings

Any excavation for the proposed structures will likely be carried out through fill materials, topsoil and silty sand to bear within the native silty sand or silty clay subgrade. The sides of the excavations should be sloped in accordance with the requirements of Ontario Regulation 213/91, s. 226 under the Occupational Health and Safety Act. According to the Act, the native soils at the site can be classified as Type 3 soil, however this classification should be confirmed by qualified individuals as the site is excavated and if necessary, adjusted.

It is expected that the side slopes of the excavation will be stable in the short term provided the walls are sloped at 1H:1V through the fill materials, topsoil, silty sand and silty clay to 1.2 metres or less from the bottom of the excavation and provided no excavated materials are stockpiled within 3 metres of the top of the excavations.

5.5.2 Groundwater in Excavation and Construction Dewatering

Groundwater inflow from the native soils into the foundation excavation during construction is not expected, however if present it should be handled by pumping from sumps within the excavations.

Groundwater was observed within the test pits at depths ranging between about 1.8 to 2.1 metres below the existing ground surface. Based on the groundwater levels observed, it is expected that the excavation for the new buildings at the site are unlikely to extend below the groundwater level. As such, it is considered unlikely that a permit to take water will be required prior to excavation. It is considered however that registration under the Environmental Activity and Sector Registry may be required.

5.6 Frost Protection Requirements

The native silty sand and silty clay subgrade is considered to be frost susceptible. As such, there is a potential for differential frost associated movement of the foundation should the sub-grade beneath the foundation freeze. To reduce the potential for movement of the foundation due to frost

action a 50 millimetre layer of high density polystyrene insulation (DOW HI-insulation or approved alternative) could be placed underneath the entire proposed thickened edge slab. The rigid insulation should extend a minimum of 1.2 metres out beyond the outside edges of the foundation. If frost protection practices are not utilized frost associated movement of the foundation could be in excess of 75 millimetres.

Alternatively, to eliminate the requirement for frost protection in the form of high density polystyrene insulation, a minimum 1.2 metre thickness of engineered fill consisting of OPSS Granular B Type I or Type II could be used.

5.7 Backfill and Drainage

Provided the proposed finished floor surface is above the exterior finished grade and provided the exterior grade is adequately sloped away from the proposed self storage buildings, no perimeter foundation drainage systems are required.

5.8 Floor Slab

The concrete floor slab should be saw cut at regular intervals to minimize random cracking of the slab due to shrinkage of the concrete. The saw cut depth should be about one quarter of the thickness of the slab. The crack control cuts should be placed at a grid spacing not exceeding the lesser of 25 times the slab thickness or 4.5 metres. The slab should be cut as soon as the concrete has sufficiently set such that the cutting operation will not damage the concrete.

6.0 PARKING LOT PAVEMENTS

6.1 Subgrade Preparation

In preparation for pavement construction and to avoid soft spots and/or surface depressions within the parking structure at this site any fill materials, underlying topsoil and any soft, wet or deleterious materials should be removed from the proposed parking lot areas. The exposed subgrade surface should then be proof rolled, inspected and approved by geotechnical personnel. The native soil conditions should consist of silty sand or silty clay. Any soft or unacceptable areas evident from the proof rolling should be subexcavated and replaced with suitable earth borrow material.

If the pavement structure is constructed over the existing fill materials and underlying topsoil, some distress in the form of soft spots and/or surface depressions can be expected, requiring maintenance with time in the form of regrading or addition of granular base coarse materials.

For any areas of the site that require the subgrade to be raised to proposed parking area subgrade level, the material used should consist of OPSS select subgrade material or OPSS Granular B Type I or Type II. Materials used for raising the subgrade to proposed parking area subgrade level should be placed in maximum 300 millimetre thick loose lifts and be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment.

The subgrade should be shaped and crowned to promote drainage of the parking area granulars. Following approval of the preparation of the subgrade, the pavement granulars may be placed.

It is suggested that provision be made for the following minimum roadway structure:

150 millimetres of OPSS Granular A base, over

400 millimetres of OPSS Granular B Type II subbase
(50 or 100 millimetre minus crushed stone)

Compaction of the granular pavement materials should be carried out in maximum 300 millimetre thick loose lifts to 100 percent of the standard Proctor maximum dry density value using suitable vibratory compaction equipment.

If the subgrade surface is disturbed or wetted due to construction operations or precipitation, the granular thicknesses given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or to incorporate a non-woven geotextile separator between the pavement subgrade surface and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction.

7.0 CONSTRUCTION CONSIDERATIONS

It is suggested that the final design drawings for the project, including the proposed site grading plan, be reviewed by the geotechnical engineer to ensure that the guidelines provided in this report

have been interpreted as intended and to re-evaluate the guidelines provided in the report with respect to the actual project plans. Items such as actual foundation wall/column loads, whether or not the basement or below grade parking structure is heated, etc could have significant impacts on foundation type, frost protection requirements, etc.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design.

All foundation areas and any engineered fill areas for the proposed self storage buildings should be inspected by Kollaard Associates Inc. to ensure that a suitable sub-grade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations should be inspected to ensure that the materials used conform to the grading and compaction specifications.

The subgrade for the parking areas should be inspected and approved by geotechnical personnel. In situ density testing should be carried out on any earth borrow material and the granular materials for the parking area to ensure the materials meet the specifications from a compaction point of view.

The native silty sand and silty clay deposits at this site will be sensitive to disturbance from construction operations, from rainwater or snow melt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further services to you, please do not hesitate to contact our office.

Regards,
Kollaard Associates Inc.

Dean Tataryn, B.E.S., EP.

Steve DeWit, P.Eng.

TABLE I

RECORD OF TEST PITS
8 QUEEN STREET
JOHNSTOWN, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.00 – 0.60	TOPSOIL
	0.60 – 1.20	Yellow brown SILTY SAND
	1.20 – 3.50	Grey brown SILTY CLAY
	3.50	End of test pit in SILTY CLAY

The silty sand was observed to be in a loose to compact state of compaction, based on the difficulty of excavation and tactile examination.

Some groundwater intrusion at about 2.1 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
1.90	62, 78
2.40	62, 66
3.00	72, 62
3.50	62, 56

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP2	0.00 – 0.60	TOPSOIL
	0.60 – 1.30	Yellow brown SILTY SAND
	1.30 – 3.60	Grey brown SILTY CLAY
	3.60	End of test pit in SILTY CLAY

The silty sand was observed to be in a loose to compact state of compaction, based on the difficulty of excavation and tactile examination.

Water intrusion from pipe at about 1.2 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
1.60	62, 58
2.10	>120
2.90	>120

TP3	0.00 – 0.60	TOPSOIL
	0.60 – 1.80	Grey brown SILTY CLAY
	1.80	End of test pit in SILTY CLAY

Some groundwater intrusion at about 1.8 metres below the existing ground surface, November 9, 2022.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP4	0.00 – 0.30	Topsoil (FILL)
	0.30 – 0.60	Grey brown silty sand, cobbles, boulders (FILL)
	0.60 – 0.90	TOPSOIL
	0.90 – 2.00	Yellow brown SILTY SAND
	2.00 – 3.00	Grey brown SILTY CLAY
	3.00	End of test pit in SILTY CLAY

The silty sand was observed to be in a loose to compact state of compaction, based on the difficulty of excavation and tactile examination.

Some groundwater intrusion at about 1.8 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
2.40	82, 90

TP5	0.00 – 0.40	Topsoil (FILL)
	0.40 – 0.90	Grey brown silty sand, some cobbles, boulders, clay (FILL)
	0.90 – 1.10	TOPSOIL
	1.10 – 2.00	Grey brown SILTY CLAY
	2.00	End of test pit in SILTY CLAY

Some groundwater intrusion at about 2.0 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
2.00	86, 96

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP6	0.00 – 0.30	Topsoil (FILL)
	0.30 – 1.20	Grey brown silty sand, cobbles, boulders (FILL)
	1.20 – 1.40	TOPSOIL
	1.40 – 1.60	Yellow brown SILTY SAND
	1.60 – 2.00	Grey brown SILTY CLAY
	2.00	End of test pit in SILTY CLAY

The silty sand was observed to be in a loose to compact state of compaction, based on the difficulty of excavation and tactile examination.

Some groundwater intrusion at about 2.0 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
2.00	76, 88

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP7	0.00 – 0.30	Grey crushed granular stone (FILL)
	0.30 – 1.20	Grey brown silty clay, some gravel, cobbles, wood (FILL)
	1.20 – 1.60	TOPSOIL
	1.60 – 2.00	Grey brown SILTY CLAY
	2.00	End of test pit in SILTY CLAY

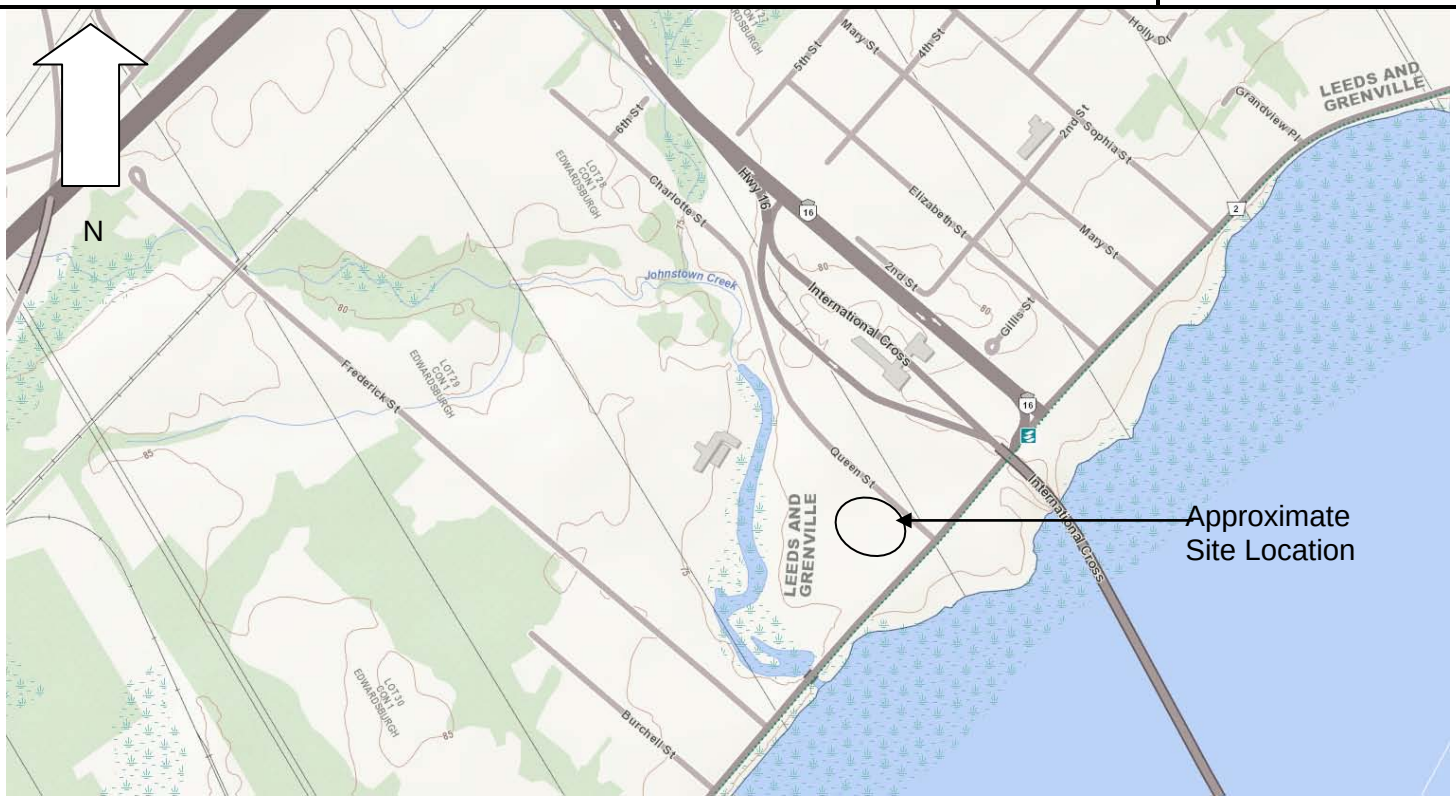
Some groundwater intrusion at about 2.0 metres below the existing ground surface, November 9, 2022.

Shear Vane Test Results

Depth	kPa
2.00	78, 80

KEY PLAN

FIGURE 1



NOT TO SCALE

Kollaard Associates
Engineers

Project No. 221121

Date November 2022

DRAWING NUMBER:

SITE PLAN, FIGURE 2

LEGEND:

TP1 ■ APPROXIMATE TEST PIT LOCATION

REFERENCE: PLAN SUPPLIED BY COSINE ONTARIO

SPECIAL NOTE: THIS DRAWING TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers

PO, BOX 189, 210 PRESCOTT ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca

(613) 860-0923
info@kollaard.ca

CLIENT:
JOHNSTOWN MINI STORAGE

PROJECT:
LIMITED SUBSURFACE INVESTIGATION FOR PROPOSED MINI-STORAGE BUILDINGS

LOCATION:
8 QUEEN STREET
JOHNSTOWN, ONTARIO

DESIGNED BY:	*DATE:*
--	NOV 15, 2022
DRAWN BY: DT	*SCALE:* N.T.S

KOLLAARD FILE NUMBER: 221121

SCHEDULE "E"

Site Plan Control Agreement

ROAD WORKS

1. Maintenance of access driveway

The existing access driveway on the Township's road allowance between lots 11 and 12 of Plan 6 shall be maintained by the Owner so that vehicles may travel readily on any operating day including both summer and winter conditions.

The Owner shall maintain the access road continuously and during all seasons, including snow ploughing.

2. Culvert replacement

Culvert replacements shown in Schedule "B" shall be completed as recommended by the Stormwater Management Plan and only with written permission from the property owner. A permit is required from the Township's Manager of Public Works prior to a culvert replacement on the Township's road allowance or entranceway.

3. Works required as part of phase 1

The Township hereby grants the Owner permission to complete the stormwater management works for phase 1 of development on the road allowance between lots 11 and 12 of plan 6, as shown in Schedule "C" and Schedule "B".

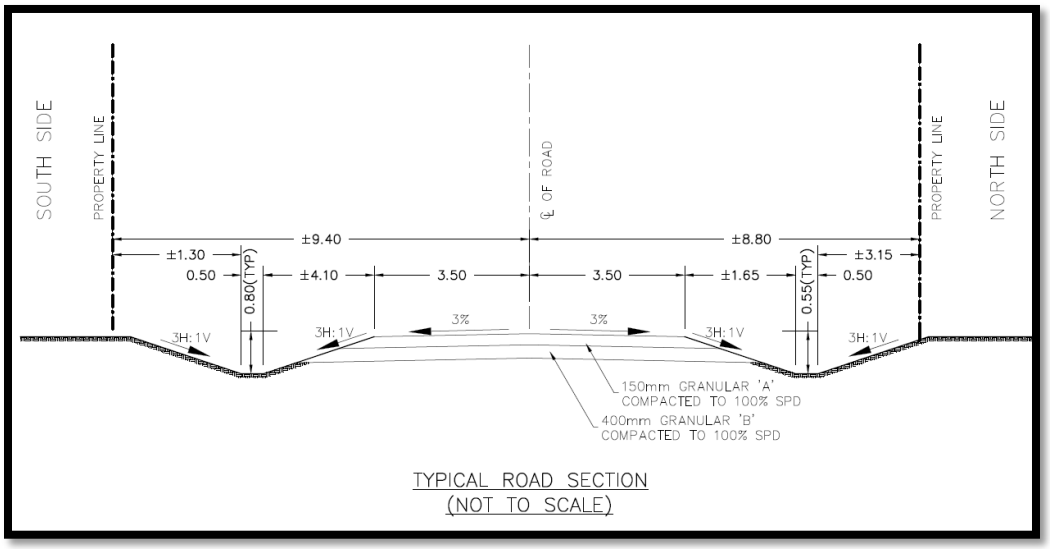
4. Future works required prior to phase 2

Prior to any use or storage on land identified for phase 2, the Owner shall obtain approval from the Township for the recommended upgrades to the Township's unopened road allowance, as shown on the Stormwater Management Plan provided in Schedule "C" and the design shown in Schedule "B."

Upgrades to the access road for phase 2 shall consist of 150 millimetres of OPSS Granular A base, over 400 millimetres of OPSS Granular B Type II subbase (50 or 100 millimetre minus crushed stone). Compaction of the granular pavement materials should be carried out in maximum 300 millimetre thick loose lifts to 100 percent of the standard Proctor maximum dry density value using suitable vibratory

compaction equipment. The adequacy of the design pavement thickness shall be assessed by geotechnical personnel at the time of construction.

Prior to any use or storage on land identified for phase 2, the road allowance must be signed as a fire access route, to the satisfaction of the Fire Chief.



Excerpt of Exhibit 1 Schedule B

SCHEDULE "F"

Site Plan Control Agreement

SPECIAL CONDITIONS

1. Location of Building Structures and Facilities

Building structures and facilities shall be located as per Site Plan forming Exhibit 1 of Schedule "B" to this Agreement.

2. Stormwater Management

Stormwater shall be managed as per the Stormwater Management Plan by Kollaard Associates, forming Schedule "C" to this agreement.

Any changes to the existing proposal may require an update to the Stormwater Management Plan.

A permit is required from the Conservation Authority under O.reg 41/24 for any work within a watercourse.

3. Sediment and Erosion Control

Sediment and erosion control shall be managed as per the recommendations provided in the stormwater management plan forming Schedule "C," and as per the Drainage, Sediment and Erosion Control plan forming Exhibit 1 of Schedule "B" to this agreement.

4. Entranceway

The site shall be accessed as per the site plan forming Exhibit 1 of Schedule "B". A permit shall be obtained from the Township for any extension or relocation of the existing entranceway. No additional entranceways shall be established without the consent of the appropriate road authority.

5. Refuse Storage and Disposal

The property shall be maintained in a neat and tidy condition and all refuse shall be deposited in proper containers which are screened from view. The owner shall be responsible for the disposal of refuse from his/her/their property.

6. Snow Removal

Snow removal is the responsibility of the owner.

7. Screening

The existing cedar clusters shown on the site plan forming Exhibit 2 of Schedule "B" shall be maintained to ensure screening from the storage area to County Road 2. Prior to the use of the northern parcel in phase 2, a 6' privacy fence or hedge shall be installed on any property line shared with a property for residential use.

8. Lighting

All outdoor lighting, including fixtures and signs, shall be designed, installed and maintained to the satisfaction of the Township and Director of Public Works of the United Counties of Leeds and Grenville to prevent light spill over or glare onto the Township and County Road allowances and neighbouring residential properties.

9. Road Widening

That within six (6) months of the signing of this agreement, the Owner will deed an amount of lands across the County Rd 2 frontage of the lot, sufficient to provide at least 15.25 m from centerline of County Rd 2 to the Counties for road purposes. The lands to be transferred for road widening purposes shall be free and clear of any and all encumbrances.

SPCA - 2-8 Queen St for signature

Final Audit Report 2024-06-28

Created:	2024-06-27
By:	Clerk Rebecca Crich (rcrich@twpec.ca)
Status:	Signed
Transaction ID:	CBJCHBCAABAADy9Uu9Mt3Zn9KtO1BvrnpkbzXGOvGs_N

"SPCA - 2-8 Queen St for signature" History

Document created by Clerk Rebecca Crich (rcrich@twpec.ca)
2024-06-27 - 6:53:09 PM GMT

Document emailed to Robert Mitchell (robchina@yahoo.com) for signature
2024-06-27 - 6:53:14 PM GMT

Email viewed by Robert Mitchell (robchina@yahoo.com)
2024-06-27 - 7:10:34 PM GMT

Document e-signed by Robert Mitchell (robchina@yahoo.com)
Signature Date: 2024-06-27 - 7:11:13 PM GMT - Time Source: server

Document emailed to Mayor Tory Deschamps (mayor@twpec.ca) for signature
2024-06-27 - 7:11:15 PM GMT

Email viewed by Mayor Tory Deschamps (mayor@twpec.ca)
2024-06-27 - 8:37:34 PM GMT

Document e-signed by Mayor Tory Deschamps (mayor@twpec.ca)
Signature Date: 2024-06-27 - 8:38:02 PM GMT - Time Source: server

Document emailed to Clerk Rebecca Crich (rcrich@twpec.ca) for signature
2024-06-27 - 8:38:04 PM GMT

Email viewed by Clerk Rebecca Crich (rcrich@twpec.ca)
2024-06-28 - 12:07:57 PM GMT

Document e-signed by Clerk Rebecca Crich (rcrich@twpec.ca)
Signature Date: 2024-06-28 - 12:08:12 PM GMT - Time Source: server

Agreement completed.
2024-06-28 - 12:08:12 PM GMT