

Supporting Document 3-5

Surface Water Quantity Effects Assessment Report



Twin Creeks Environmental Centre Landfill
Optimization Project Environmental Assessment

WM Canada

Watford, Ontario

July 2025

Prepared by:

WSP Canada Inc.
55 King Street, Suite 700
St. Catharines, ON L2R 3H5



Executive Summary

WSP Canada Inc. was contracted by HDR Corporation on behalf of WM Canada (WM) to prepare this Surface Water Quantity Effects Assessment Report as part of the Twin Creeks Environmental Centre (TCEC) Landfill Optimization Project Environmental Assessment (EA). The EA is being carried out in accordance with the requirements of the *Ontario Environmental Assessment Act (OEAA)* and the EA Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on December 13, 2022. Surface Water Quantity considers changes in runoff volumes and peak flows, changes to drainage areas on-site and off-site, and predicted occurrence and degree of off-site effects to surface water flows. Surface water quality is considered in a separate report.

The purpose of this Effects Assessment Report is to present the:

- potential environmental effects of the alternative methods on the Surface Water Quantity;
- comparison of the net effects of each alternative method;
- selection of a preferred alternative;
- assessment of the environmental effects of the preferred alternative; and
- commitments and monitoring.

There are approximately 6 years of approved landfill airspace capacity remaining at the TCEC (i.e., capacity will be reached in approximately 2031). The proposed optimization would provide additional airspace of approximately 14.3 million cubic metres (m³), which could extend the site life by approximately 12 years (from 2031 to 2043), and may be achieved through alternative landfill configurations (alternative methods) within the existing 301-hectare TCEC site area. No changes are proposed to the size of the TCEC site area, approved service area, or annual fill rate.

Three alternative methods for carrying out the optimization were developed to a preliminary conceptual design level in the Conceptual Design Report (CDR). Alternative Method 1 includes the increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl, approximately 16 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 324.5 masl within the Expansion Landfill footprint. Alternative Method 2 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl within the Expansion Landfill footprint. Alternative Method 3 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl, about 100 m in grade change, peaking at elevation 360 masl within the Expansion Landfill footprint.

The study areas for Surface Water Quantity are as follows:

- On-site Study Area: the existing TCEC; and
- Off-site Study Area: the lands within the vicinity of the TCEC extending approximately 1 km out from the On-site Study Area.

A net effects assessment was carried out for the three alternative methods following the methods outlined in the approved ToR incorporating the information contained in the CDR, and the Surface Water Quantity Existing Conditions Report. The results of the net effects assessment were used in a comparative evaluation of the three alternative methods.

The landfill optimization will not change total runoff volume from the landfill site or overall drainage areas; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the four outlets of interest. Under all alternative methods, two outlets (Outlets A and G) show an increase, and two outlets (Outlets B and C) show a decrease in peak flow runoff when compared to Future Baseline Conditions. Additionally, under all alternative methods, some catchment areas increased (AB, C1A, G3A and G4A) whereas some catchment areas decreased (C1B and G1B).

When compared to Future Baseline Conditions, under Alternative Method 1, the increase in peak flows leaving the site for Outlets A and G are 6% and 11% respectively, and the decrease in peak flows leaving the site for Outlets B and C are 4% and 19% respectively. Changes in catchment areas within the landfill optimization area are between -23% and 37% when compared to Future Baseline Conditions

When compared to Future Baseline Conditions, under Alternative Method 2, the increase in peak flows leaving the site for Outlets A and G are 7% and 10% respectively, and the decrease in peak flows leaving the site for Outlets B and C are 4% and 19% respectively. Changes in catchment areas within the landfill optimization area are between -22% and 34% when compared to Future Baseline Conditions

When compared to Future Baseline Conditions, under Alternative Method 3, the increase in peak flows leaving the site for Outlets A and G are 5% and 11% respectively, and the decrease in peak flows leaving the site for Outlets B and C are 4% and 19% respectively. Changes in catchment areas within the landfill optimization area are between -24% and 36% when compared to Future Baseline Conditions

The overall Preferred Alternative for Surface Water Quantity based on the results of the criteria comparisons is Alternative Method 2. The maximum increase of drainage area for one catchment (G3A) is the lowest (34%) when compared to other alternative methods against Future Baseline Conditions; however, it is noteworthy that off-site drainage areas remain unchanged for all Alternative Methods.

Alternative Method 2 results in the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl

within the Expansion Landfill footprint. Alternative Method 2 has the lowest peaking elevation when compared to the other alternative methods. As such, reduced runoff velocity and enhanced infiltration of the stormwater is anticipated for this method. Further, the downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for Alternative Method 2, both outlets show an increase in peak flows (up to 10%). Mitigation is not recommended as the increases in peak flows are up to 10% and the off-site drainage areas are not being altered in any way due to this alternative method. Furthermore, when the catchment areas are compared between the 'Do Nothing' Alternative and Alternative Method 2, an increase for three catchments ranging from 1% to 4% and a decrease for two catchments ranging from 1% to 4% for Alternative Method 2 are observed. The peak flows leaving the landfill site for select outlets are very comparable for both alternatives (between 1% to 2%). Similarly, the peak storage used for the ponds are also comparable (between 0% to 2%). The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for both, the 'Do Nothing' Alternative and Alternative Method 2 are very comparable.

Compliance monitoring will be undertaken to confirm that the construction, operation, and maintenance of the Project are carried out in accordance with the mitigation measures and commitments identified in the effects assessment. It is recommended that inspection for erosion and sediment accumulation in stormwater (SWM) ponds as part of landfill monitoring program and annual inspection of stormwater works and maintenance to address sedimentation and excessive vegetation growth be conducted annually as part of the ongoing existing monitoring program.

In addition to the EA approval, an ECA amendment may be required in the event that modifications to the on-site stormwater management infrastructure are required.

Acronyms, Units and Glossary

Acronyms

Acronym	Definition
CDR	Conceptual Design Report
EA	Environmental Assessment
GHG	Greenhouse Gas
IDF	Intensity-Duration-Frequency
LFG	Landfill Gas
MECP	Ministry of Environment, Conservation and Parks
OEAA	Ontario Environmental Assessment Act
TCEC	Twin Creeks Environmental Centre
ToR	Terms of Reference
WM	WM Canada

Units

Unit	Definition
km	kilometre
m	Metre
m ² /s	square metres per second
m ³	cubic metres

Glossary

Term	Definition
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed. This may be in the form of program approval, certificate of approval or provisional certificate of approval.
Capacity (Disposal Volume)	The total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m ³); includes both waste and daily cover materials, but excludes the final cover.
Composting	The controlled microbial decomposition of organic matter, such as food and yard wastes, in the presence of oxygen, into finished compost (humus), a soil-like material. Humus can be used in vegetable and flower gardens, hedges, etc.
Composting facility	A facility designed to compost organic matter either in the presence of oxygen (aerobic) or absence of oxygen (anaerobic).

Term	Definition
Environment	As defined by the Environmental Assessment Act, environment means: • air, land or water; • plant and animal life, including human life; • the social, economic and cultural conditions that influence the life of humans or a community; • any building, structure, machine or other device or thing made by humans; • any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or • any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Assessment (EA)	A systematic planning process that is conducted in accordance with applicable laws or regulations aimed at assessing the effects of a proposed undertaking on the environment.
Evaluation criteria	Evaluation criteria are considerations or factors taken into account in assessing the advantages and disadvantages of various alternatives being considered.
Greenhouse gas (GHG)	Any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and the fluorocarbons.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way, as opposed to the actual criteria, which are fairly general.
Landfill gas (LFG)	The gases produced from the wastes disposed in a landfill; the main constituents are typically carbon dioxide and methane, with small amounts of other organic and odour-causing compounds.
Landfill site	An approved engineered site/facility used for the final disposal of waste. Landfills are waste disposal sites where waste is spread in layers, compacted to the smallest practical volume, and typically covered by soil.
Leachate	Liquid that drains from solid waste in a landfill and which contains dissolved, suspended and/or microbial contaminants from the breakdown of this waste.
Mitigation	Measures taken to reduce adverse impacts on the environment.
Proponent	A person who: • carries out or proposes to carry out an undertaking; or • is the owner or person having charge, management or control of an undertaking.
Receptor	The person, plant or wildlife species that may be affected due to exposure to a contaminant.
Terms of Reference (ToR)	A terms of reference is a document that sets out detailed requirements for the preparation of an Environmental Assessment.
Time of concentration	The time required for water falling on the most remote point of a drainage basin to reach the outlet where remoteness relates to time of travel rather than distance.
Undertaking	Is defined in the Environmental Assessment Act as follows: • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by a public body or public bodies or by a municipality or municipalities; • A major commercial or business enterprise or activity or a proposal, plan or program in respect of a major commercial or business enterprise or activity of a person or persons other than a person or persons referred to in clause (1) that is designated by the regulations; or • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity of a person or persons, other than a person or persons referred to in clause (a), if an agreement is entered into under section 3.0.1 in respect of the enterprise, activity, proposal, plan or program ("enterprise").
Waste	Refuse from places of human or animal habitation; unwanted materials left over from a manufacturing process.

Contents

Executive Summary	i
Acronyms, Units and Glossary	iv
1 Introduction	1
1.1 Project and Alternative Methods	2
1.1.1 Alternative Method 1	2
1.1.2 Alternative Method 2	3
1.1.3 Alternative Method 3	5
2 Effects Assessment Methods	6
2.1 Predict Potential Environmental Effects for Alternative Methods	6
2.1.1 Study Areas	6
2.1.2 Evaluation Criteria, Indicators, and Data Sources	7
2.1.3 Key Considerations and Assumptions	8
2.2 Comparative Evaluation and Identification of the Preferred Alternative	10
2.3 Effects Assessment of the Preferred Alternative	10
2.4 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative	11
3 Net Effects Assessment	11
3.1 Future Baseline Conditions	11
3.2 Alternative Method 1	12
3.2.1 Surface Water Quantity	13
3.2.2 Summary	15
3.3 Alternative Method 2	17
3.3.1 Surface Water Quantity	17
3.3.2 Summary	19
3.4 Alternative Method 3	21
3.4.1 Surface Water Quantity	21
3.4.2 Summary	23
4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative	25
5 Effects Assessment of the Preferred Alternative	28
5.1 Changes in drainage areas on-site and off-site	28
5.2 Change in runoff volumes and peak flows resulting from steeper and longer side slopes	28
5.3 Predicted occurrence and degree of off-site effects	28
5.4 Climate Change Considerations	29
6 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative	29
6.1 Effects of the 'Do Nothing' Alternative	29
6.2 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative	30
6.2.1 Changes in drainage areas on-site and off-site	30
6.2.2 Change in runoff volumes and peak flows resulting from steeper and longer side slopes	30
6.2.3 Predicted occurrence and degree of off-site effects	31
6.3 Advantages and Disadvantages of the Preferred Alternative	31

7	Commitments and Monitoring	32
7.1	Surface Water Quantity Commitments.....	32
7.2	Environmental Effects Monitoring for Surface Water Quantity.....	32
7.3	Surface Water Quantity Compliance Monitoring	32
8	Surface Water Approvals	34
9	References	35

Tables

Table 1-1.	Environmental Aspects, Components, and Evaluation Criteria	1
Table 2-1.	Evaluation Criteria, Indicators, and Data Sources for Surface Water	8
Table 2-2.	Existing Conditions Peak Flows.....	9
Table 2-3.	SWM Pond Function During 100-year Event.....	9
Table 3-1.	Changes to Site Outlet peak flows during 100-year event	13
Table 3-2.	SWM Pond function during 100-year event.....	14
Table 3-3.	Swale function during 25-year event	15
Table 3-4.	Net Effects Assessment – Alternative Method 1	16
Table 3-5.	Changes to Site Outlet peak flows during 100-year event	17
Table 3-6.	SWM Pond function during 100-year event.....	18
Table 3-7.	Swale function during 25-year event	18
Table 3-8.	Net Effects Assessment – Alternative Method 2	20
Table 3-9.	Changes to Site Outlet peak flows during 100-year event	21
Table 3-10.	SWM Pond function during 100-year event.....	22
Table 3-11.	Swale function during 25-year event	22
Table 3-12.	Net Effects Assessment – Alternative Method 3	24
Table 4-1.	Comparative Evaluation of the Net Effects of the Alternative Methods for Surface Water Quantity	26
Table 6-1.	Changes to Site Outlet peak flows during 100-year event.	31
Table 6-2.	SWM Pond function during 100-year event.....	31
Table 6-3.	Advantages and Disadvantages of the Preferred Alternative.....	32
Table 7-1.	Environmental Effects and Compliance Monitoring for the Preferred Alternative	34

Figures

Figure 1-1.	Alternative Method 1	3
Figure 1-2.	Alternative Method 2.....	4
Figure 1-3.	Alternative Method 3.....	5
Figure 2-1.	On-site and Off-site Study Areas for Surface Water Quantity	7
Figure 3-1.	Future Baseline Conditions (Approved Stormwater Management).....	12

Appendices

Appendix A	Hydrologic Modelling
------------	----------------------

1 Introduction

WSP Canada Inc. (WSP) was contracted by HDR Corporation on behalf of WM Canada (WM) to prepare this Surface Water Quantity Effects Assessment Report as part of the Twin Creeks Environmental Centre (TCEC) Landfill Optimization Project Environmental Assessment (EA). The EA is being carried out in accordance with the requirements of the *Ontario Environmental Assessment Act (OEAA)* and the EA Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on December 13, 2022.

The *OEAA* defines the environment in a broad, general sense that comprises physical, biological, and human considerations. In this EA, the environment has been separated broadly into the natural, socio-economic, cultural, and built aspects, with environmental components and evaluation criteria identified within each aspect as listed in **Table 1-1**, consistent with the approved ToR. The organization of the Effects Assessment Reports is also provided in **Table 1-1**.

Table 1-1. Environmental Aspects, Components, and Evaluation Criteria

Environmental Aspect	Environmental Component	Evaluation Criteria	Effects Assessment Report
Natural Environment	Atmospheric Environment	• Air Quality – Dust • Air Quality – Landfill Gas and Combustion By-Products • Air Quality – Blowing Litter • Odour • Noise	• Air Quality
			• Noise
	Hydrogeology	• Groundwater Quality • Groundwater Quantity	• Hydrogeology
	Surface Water Environment	• Surface Water Quality • Surface Water Quantity	• Surface Water Quality • Surface Water Quantity
Socio-Economic Environment	Ecological Environment	• Terrestrial Ecosystems • Aquatic Ecosystems	• Ecological Environment
	Social Environment	• Human Health • Effects on Local Community	• Human Health
	Economic Environment	• Economic Effects on Local Community	• Socio-Economic Environment
Cultural Environment	Visual Landscape	• Visual Impact of Facility	• Visual Landscape
	Cultural Environment	• Cultural Heritage Resources • Archaeological Resources	• Cultural Heritage Resources • Archaeological Resources
Built Environment	Transportation	• Traffic Operations	• Transportation
	Current and Planned Future Land Use	• Effects on Current and Future Land Uses	• Land Use

This Surface Water Quantity Effects Assessment Report assesses the effects of the Project on the surface water quantity portion of the Surface Water Environment. The effects of the Project on surface water quality are assessed in a separate report. This report covers the changes in runoff volumes and peak flows resulting from the proposed landfill expansion due to steeper and longer side slopes, changes to drainage areas on-site and off-site and the predicted occurrence and degree of off-site effects to surface water flows. The purpose of this Effects Assessment Report is to present the potential environmental effects of the alternative methods on the Surface Water Quantity, a comparison of the net effects of each alternative method, the selection of a preferred alternative, the assessment of the environmental effects of the preferred alternative, and commitments and monitoring.

This Surface Water Quantity Effects Assessment Report is one component of the EA. The EA Study Report will incorporate the information presented herein as appropriate, and this report will be included with the EA Study Report as a supporting document.

1.1 Project and Alternative Methods

There are approximately 6 years of approved landfill airspace capacity remaining at the TCEC (i.e., capacity will be reached in approximately 2031). The proposed landfill optimization would provide additional airspace of approximately 14.3 million cubic metres (m³), which could extend the site life by approximately 12 years (from 2031 to 2043) and may be achieved through alternative landfill configurations (alternative methods) within the existing 301-hectare TCEC site area. No changes are proposed to the size of the TCEC site area, approved service area, haul route, or annual fill rate. However, there is a need for relocation of two swales as described in the following sections along with a new culvert to carry flows to the landfill outlets as a result of the landfill site optimization.

Three alternative methods for carrying out the landfill optimization were developed to a preliminary conceptual design level in the Conceptual Design Report (CDR) and are described below as they are relevant to Surface Water Quantity.

1.1.1 Alternative Method 1

Alternative Method 1 includes the increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl, approximately 16 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 324.5 masl within the Expansion Landfill footprint.

The proposed vertical landfill expansion as per Alternative Method 1 will impact the stormwater management (SWM) system in two ways:

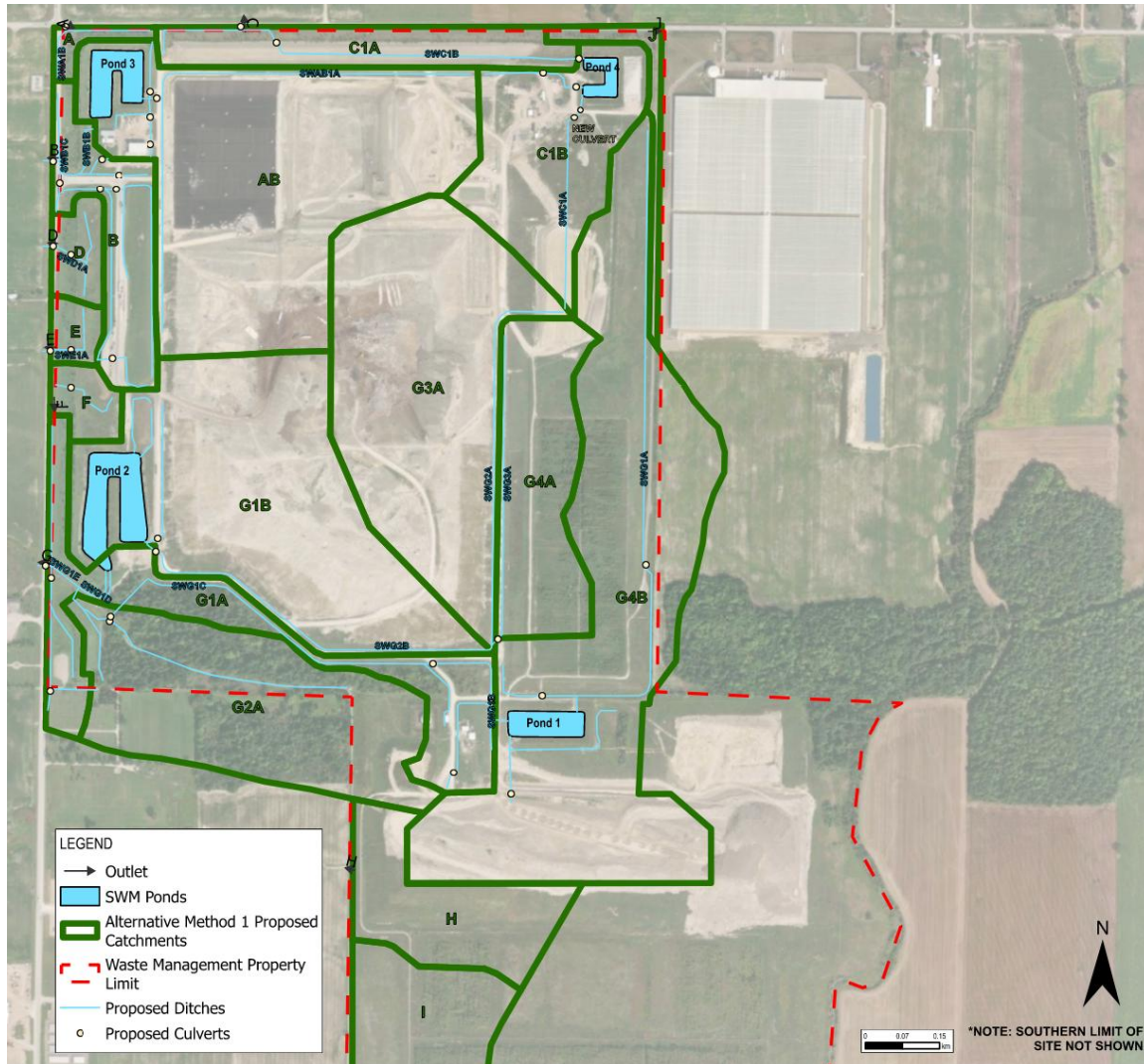
1. Altering catchment areas within the landfill site; and
2. Decreasing time of concentration.

It is noteworthy that the landfill optimization will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment

areas is expected to increase or decrease some of the peak flows leaving through the outlets of the landfill site.

The redistributed catchment areas for Alternative Method 1 are shown in **Figure 1-1**. Under this alternative method, some catchment areas increase (AB, C1A, G3A and G4A) whereas some catchment areas decrease (C1B and G1B). **Appendix A** (EXHIBIT 1-1) provides details about the different catchment areas and their comparison with the other alternative methods.

Figure 1-1. Alternative Method 1



1.1.2 Alternative Method 2

Alternative Method 2 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl within the Expansion Landfill footprint.

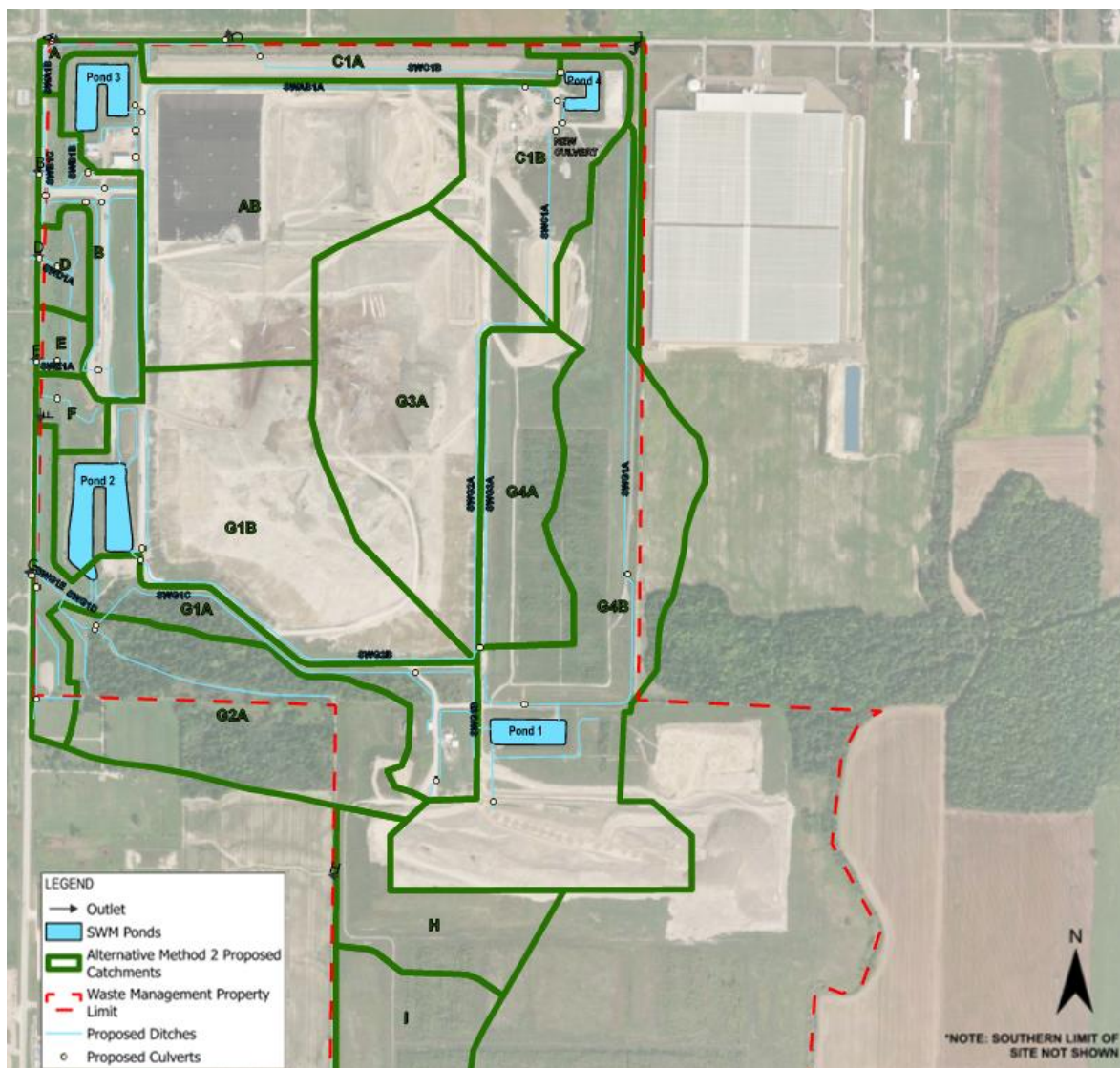
The proposed vertical landfill expansion as per Alternative Method 2 will impact the SWM system in two ways:

1. Altering catchment areas within the landfill site; and
2. Decreasing time of concentration.

It is noteworthy that the landfill optimization will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets of the landfill site.

The redistributed catchment areas for Alternative Method 2 are shown in **Figure 1-2**. Under this alternative method, some catchment areas increase (AB, C1A, G3A and G4A) whereas some catchment areas decrease (C1B and G1B). **Appendix A** (EXHIBIT 1-2) provides details about the different catchment areas and their comparison with the other alternative methods.

Figure 1-2. Alternative Method 2



1.1.3 Alternative Method 3

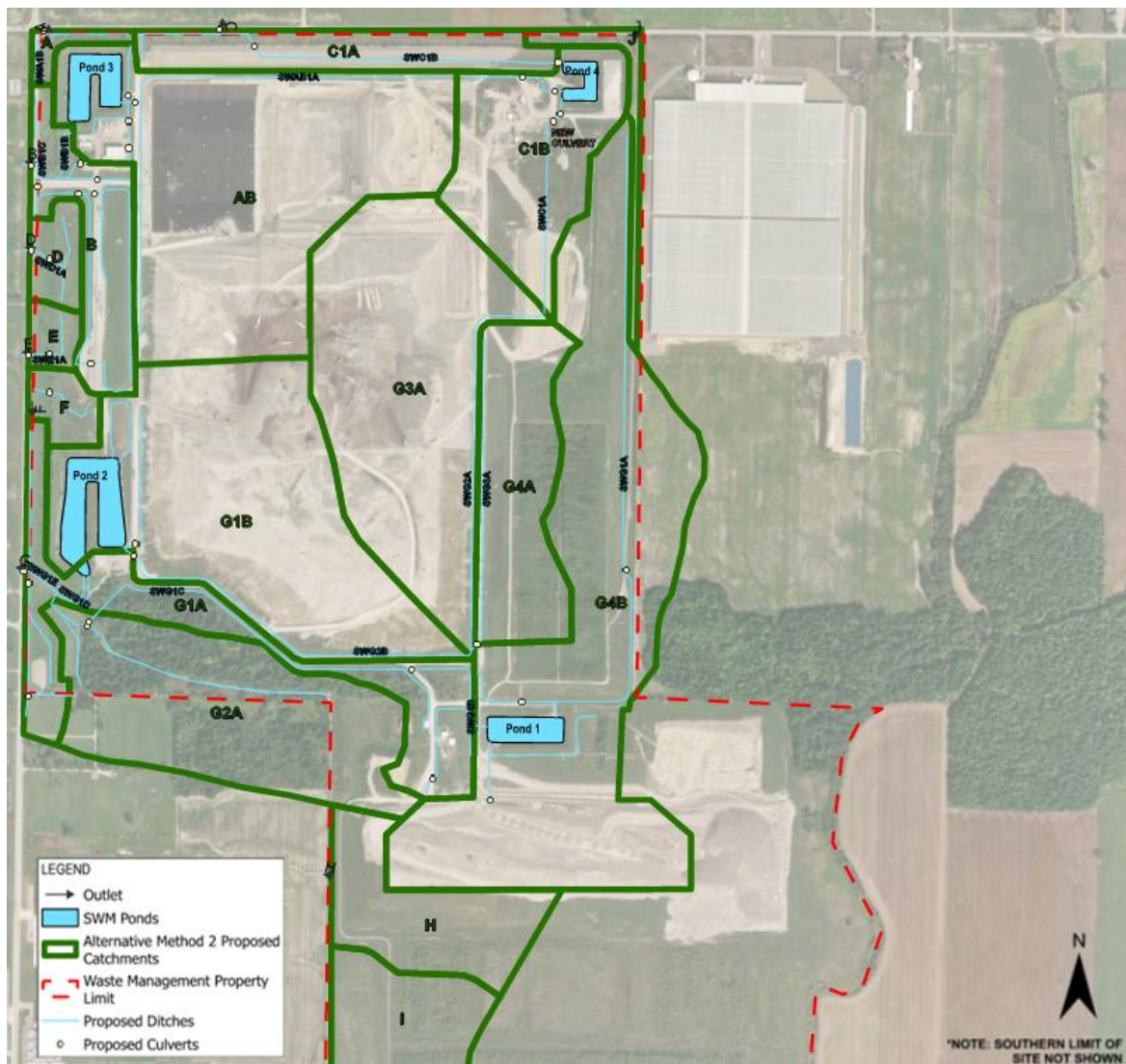
Alternative Method 3 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl, about 100 m in grade change, peaking at elevation 360 masl within the Expansion Landfill footprint.

The proposed vertical landfill expansion as per Alternative Method 3 will impact the SWM system in two ways:

1. Altering catchment areas within the landfill site; and
2. Decreasing time of concentration.

It is noteworthy that the landfill optimization will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets of the landfill site.

Figure 1-3. Alternative Method 3



The redistributed catchment areas for Alternative Method 3 are shown in **Figure 1-3**. Under this alternative method, some catchment areas increase (AB, C1A, G3A and G4A) whereas some catchment areas decrease (C1B and G1B). **Appendix A** (EXHIBIT 1-3) provides details about the different catchment areas and their comparison with the other alternative methods.

2 Effects Assessment Methods

Using the evaluation criteria, indicators, rationale and data sources from the approved ToR and the Future Baseline Conditions from the Surface Water Quantity Existing Conditions Report, the effects assessment is carried out as follows:

- predict the potential environmental effects for each alternative method (**Section 2.1**);
- identify the preferred alternative based on a comparative evaluation of the potential environmental effects of each alternative method (**Section 2.2**);
- conduct an effects assessment on the preferred alternative, including the identification of mitigation measures and monitoring programs (**Section 2.3**); and
- compare the effects of the preferred alternative to those of the ‘do nothing’ alternative (i.e., the Expansion Landfill as approved) (**Section 2.4**).

2.1 Predict Potential Environmental Effects for Alternative Methods

The potential environmental effects for each alternative method are identified within the study areas based on the application of the evaluation criteria, indicators and data sources in the approved ToR and based on the maximum allowable waste receipt level for the TCEC landfill. The potential effects can be positive or negative, direct or indirect, and short- or long-term. Mitigation measures are identified to minimize or mitigate the potential effects and then the net effects are evaluated taking into consideration the application of mitigation measures. The study areas, evaluation criteria, indicators, data source, and key design considerations and assumptions for Surface Water Quantity are provided below.

2.1.1 Study Areas

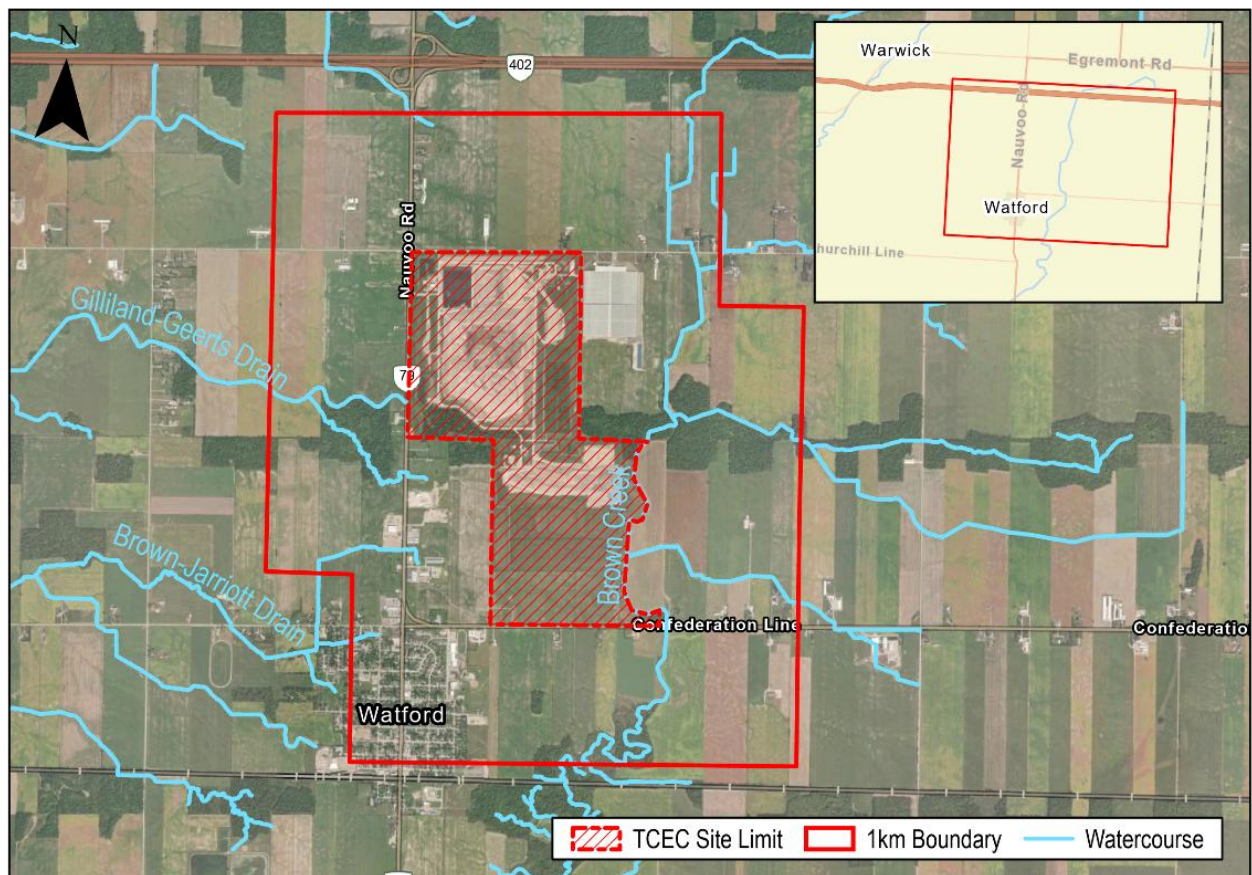
The TCEC landfill is located within the Township of Warwick, in the County of Lambton, approximately 1 km north of the Village of Watford. The TCEC is situated south of Highway 402 and southeast of the intersection of Nauvoo Road and Zion Line. The municipal street address of the TCEC is 5768 Nauvoo Road, Watford, Ontario. The area being considered for the landfill optimization is the approved Expansion Landfill footprint located within the northern portion of the 301 ha TCEC site.

The study areas include the existing TCEC site as well as the potentially-affected surrounding areas. The general On-site and Off-site Study Areas identified for the EA in the approved ToR are as follows:

- On-site Study Area: the existing TCEC;
- Off-site Study Area: the lands within the vicinity of the TCEC extending approximately 1 km out from the On-site Study Area.

These study areas shown in **Figure 2-1**, were used for the purposes of the Surface Water Quantity effects assessment.

Figure 2-1. On-site and Off-site Study Areas for Surface Water Quantity



2.1.2 Evaluation Criteria, Indicators, and Data Sources

The evaluation criteria, rationale, indicators, and data sources used for Surface Water Quantity as per the approved ToR are provided in **Table 2-1**.

Table 2-1. Evaluation Criteria, Indicators, and Data Sources for Surface Water

Evaluation Criteria	Rationale	Indicators	Data Sources
Natural Environment			
Surface Water Environment			
Surface Water Quantity	Construction of physical works may disrupt natural surface drainage patterns and may alter runoff and peak flows. The presence of the expanded landfill may also affect base flow to surface water.	• Change in runoff volumes and peak flows resulting from steeper and longer side slopes. • Changes to drainage areas on-site and off-site. • Predicted occurrence and degree of off-site effects to surface water flows.	• On-site stormwater management system design for expanded landfill. • Landfill design and operations data. • Hydrologic modelling. • Annual monitoring reports. • Published flow information and hydrology design standards from MECP, MNRF, Environment Canada and SCRCA. • Site reconnaissance. • Topographic surveys. • Air photos. • Drainage maps. • Watershed mapping areas including municipal water supply sources within the off-site study area from SCRCA. • Typical stream channel geometry within the off-site study area, to the extent accessible. • Water well survey within the off-site study area. • PTTW records. • Liaison with MECP, SCRCA, downstream riparian landowners along Gilliland-Geerts Drain between Nauvoo Road and Underpass Road, Township of Warwick.

2.1.3 Key Considerations and Assumptions

The key existing conditions elements, design considerations, and assumptions for the Surface Water Quantity effects assessment are described below.

2.1.3.1 Key Elements of Existing Conditions

The key elements from the existing conditions that are relevant for the assessment of the effects of the landfill optimization include the SWM ponds which manage the stormwater runoff through the site and the outlets through which the flows leave the landfill site. These include the four SWM ponds and their function and ten outlets A-J (ref. **Appendix A**), four of which receive water from the SWM ponds, through which the flows leave the landfill site. The existing conditions peak flows leaving the landfill site through the various outlets is shown in **Table 2-2**.

Table 2-2. Existing Conditions Peak Flows

Outlet ID	Ultimate Flow Receiver	2-year	5-year	10-year	25-year	50-year	100-year
A	Auld-Redmond Drain	0.07	0.10	0.14	0.18	0.22	0.26
B	Gilliland-Geerts Drain	0.42	0.57	0.68	0.81	0.91	1.01
C	Auld-Redmond Drain	0.15	0.25	0.32	0.43	0.52	0.64
D	Gilliland-Geerts Drain	0.08	0.13	0.17	0.23	0.28	0.33
E	Gilliland-Geerts Drain	0.07	0.12	0.16	0.21	0.26	0.30
F	Gilliland-Geerts Drain	0.05	0.09	0.12	0.16	0.20	0.23
G	Gilliland-Geerts Drain	0.41	0.70	0.90	1.18	1.39	1.63
H	Gilliland-Geerts Drain	0.17	0.3	0.4	0.54	0.65	0.77
I	Brown-Jarriott Drain Extension and Gilliland-Geerts Drain	0.21	0.35	0.45	0.58	0.69	0.81
J	Brown Creek	0.04	0.08	0.1	0.13	0.16	0.19

Table 2-3 below shows the peak inflow, peak outflow, and maximum storage used in each SWM pond during the 100 year 4-hour Chicago design storm event.

Table 2-3. SWM Pond Function During 100-year Event

Pond ID	Peak Inflow (m ³ /s)	Peak Outflow (m ³ /s)	Maximum Storage Used (ha·m)
1	1.490	0.704	0.943
2	2.460	0.529	1.625
3	1.451	0.671	0.732
4	1.247	0.372	0.347

Additionally, no change is anticipated to the existing monitoring protocols for the SWM ponds. Furthermore, the 2-year design storm peak flows are considered as the average flows leaving the site to the ultimate receivers which range from 0.04 m³/s to 1.31 m³/s.

2.1.3.2 Key Design Considerations

The landfill optimization will impact the SWM system in two ways:

1. Change in catchment areas within the landfill site; and

2. Decrease in time of concentration.

To reflect the above, the key design considerations include changing the catchment areas for each alternative method as described in **Section 1.1** to determine the change in time of concentration leading to change in surface runoff created travelling to the SWM ponds, their function and finally, the flows leaving the system.

Additionally, no additional mitigation measures are required beyond the 'in-design mitigation measures' such as the existing stormwater management ponds, ditches and swales on the landfill site.

2.1.3.3 Key Assumptions

Key assumptions for the Surface Water Quantity effects assessment include that the four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered in any way from their existing characteristics. Additionally, existing monitoring is expected to continue for the landfill site.

2.2 Comparative Evaluation and Identification of the Preferred Alternative

The three alternative methods are comparatively assessed and evaluated using the criteria and indicators to determine the preferred alternative. The differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (i.e., net effects) are used to identify and compare each alternative method.

The net environmental effects are used to compare the three alternative methods to one another at the criteria and indicator level for each discipline. The following two step methodology was applied to carry out the comparative evaluation for Surface Water Quantity:

1. Identify the predicted net effect(s) associated with each alternative method for each indicator and assign a preference rating (i.e., Preferred, Not Preferred, No Substantial Difference); and
2. Rate each alternative method at the criteria level (i.e., Preferred, Not Preferred, No Substantial Difference) based on the identified preference rating for each indicator and provide a rationale.

2.3 Effects Assessment of the Preferred Alternative

An assessment of the environmental effects of the Preferred Alternative is carried out considering the same criteria, indicators, and data sources, considering potential mitigation/management measures and cumulative effects. The Preferred Alternative's contribution to reducing greenhouse gas (GHG) emissions and climate change is also examined. The effects assessment of the Preferred Alternative will be compiled and presented in the EA Study Report.

2.4 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative

The effects of the Preferred Alternative are compared against the predicted effects of the currently approved Expansion Landfill based on similar environmental criteria and indicators, with the understanding that the criteria and indicators used in the current effects assessment may differ from those used for the effects assessment of the Expansion Landfill. The effects are compared against each other in terms of magnitude, extent, and duration. The advantages and disadvantages of the Preferred Alternative compared to the 'Do Nothing' alternative are identified. The comparison of the effects of the Preferred Alternative against the 'Do Nothing' alternative will be compiled and presented in the EA Study Report.

3 Net Effects Assessment

To identify the potential effects of the Project on Surface Water Quantity, the conceptual design of each alternative method for the landfill optimization is examined to determine if it will have an effect on Surface Water Quantity through changes in:

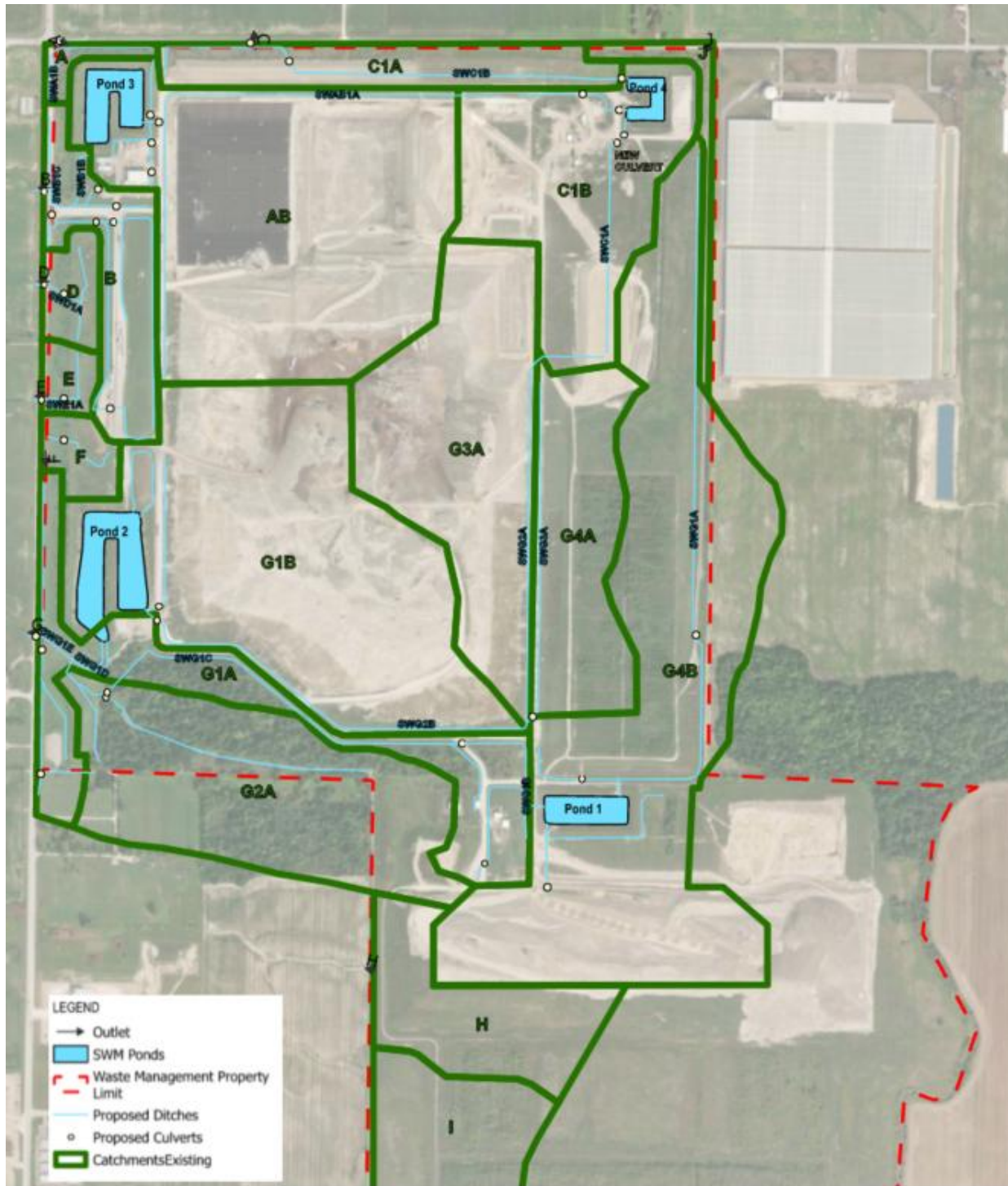
- runoff volumes and peak flows resulting from steeper and longer side slopes;
- drainage areas on-site and off-site; and/or
- predicted occurrence and degree of off-site effects to surface water flows.

The results of the net effects assessment for each alternative method are provided in **Sections 3.2** through **3.4**, below.

3.1 Future Baseline Conditions

When the Project starts, the Future Baseline Conditions of the landfill will prevail. As such, all comparisons in the sections that follow have been made between the three alternative methods and Future Baseline Conditions shown in **Figure 3-1** and **Appendix A (Exhibit 3-1)**.

Figure 3-1. Future Baseline Conditions (Approved Stormwater Management)



3.2 Alternative Method 1

The assessment of effects for Alternative Method 1 is described below for the environmental criteria and indicators of Surface Water Quantity and is summarized in **Table 3-4**.

3.2.1 Surface Water Quantity

Stormwater is currently managed on site through swales and SWM ponds. Swales direct runoff to the ponds and outlets, providing infiltration along the way. Four SWM ponds that are situated at the corners of the Expansion Landfill footprint collect runoff from the surface of the landfill and release flows through culvert outlets (**Figure 1-1**). In this manner, they maintain peak site runoff at pre-development levels. There are ten stormwater outlets from the site as shown on **Figure 1-1**, labelled A-J, four of which receive water from the SWM ponds.

3.2.1.1 Changes in Drainage Areas On-Site and Off-Site

Alternative Method 1 includes the increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl, approximately 16 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 324.5 masl within the Expansion Landfill footprint. As a result of the new grading for this alternative method, the catchment delineation within the optimization area on the landfill site will change under Alternative Method 1 when compared to Future Baseline Conditions as shown in **Figure 1-1**.

Changes in off-site drainage areas are not anticipated for Alternative Method 1 because the site outlets will not change and the existing drainage areas are able to accommodate the changes in peak flows from the outlets described in **Section 3.2.1.2**, below.

3.2.1.2 Change in Runoff Volumes and Peak Flows Resulting from Steeper and Longer Side Slopes

The change in side slopes described in **Section 3.2.1.1** for Alternative Method 1 will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets as shown in **Table 3-1**. It is noteworthy that changes were observed only for the four outlets shown in the table below. All other outlets show exactly the same peak flows leaving the site since the change in delineation of the catchments only occurred within the optimization area of the landfill. The peak storage used for the four SWM ponds is shown in **Table 3-2**.

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Figure 1-1**.

Table 3-1. Changes to Site Outlet peak flows during 100-year event

Outlets	Peak Runoff (cms)		
	Future Baseline Conditions	Alternative Method 1	% Increase from Future Baseline Conditions
A	0.261	0.276	6%
B	1.006	0.970	-4%

Outlets	Peak Runoff (cms)		
	Future Baseline Conditions	Alternative Method 1	% Increase from Future Baseline Conditions
C	0.643	0.520	-19%
G	1.627	1.810	11%

Table 3-2. SWM Pond function during 100-year event

Pond	Capacity (ha·m)	Peak Storage Used (ha·m)		
		Future Baseline Conditions	Alternative Method 1	% increase from Future Baseline Conditions
1	2.773	0.943	0.943	0%
2	5.271	1.625	1.824	12%
3	2.857	0.732	0.750	2%
4	1.099	0.347	0.282	-19%

The data presented in **Table 3-1** shows peak outflows from select outlets leaving the landfill site for the 100-year 4-hour Chicago design storm. The results for the Alternative Method 1 show that Outlets A and G experience an increase in peak flow compared to existing levels, while Outlets B and C demonstrate a decrease. It is noteworthy that Stormwater Management Pond 3 discharges flows to Outlets A and B, Outlet A shows an increase in flows of approximately 6% and conversely Outlet B shows a decrease in flows of approximately 4% when compared to Future Baseline Conditions. Outlet G shows an approximate increase of 11% in flows when compared to Future Baseline Conditions. However, it should be noted that the swales conveying the flows to Outlet G have sufficient capacity and are able to convey the flows downstream safely.

Further, the data presented in **Table 3-2** indicates that all four stormwater management ponds on the landfill site have enough capacity to store the 100-year flows. They do not require alteration or enlargement.

The 100-year 3-hour Chicago design storm was also run for this alternative, however the 100-year 4-hour Chicago design storm led to more conservative results (i.e. higher peak flows and higher storage volumes). As such, the 4-hour Chicago design storm results were chosen to be presented within this report. Modelling output from both design storms is included in **Appendix A**.

The existing swales around the landfill site are also able to safely convey the 25-year design storm (**Table 3-3**) without overtopping. Hence, a modification to the existing cross-section geometries of the swales is not warranted. The relocated swales (SWC1A and SWG2A) and new culvert will also be able to convey these flows appropriately when constructed.

Table 3-3. Swale function during 25-year event

Swale	Existing Flow Capacity (L/s)	Peak Flow (L/s) Alternative Method 1
SWAB1A	9,384	1,594
SWA1B	6,256	193
SWB1B	23,461	215
SWB1C	120,733	773
SWC1A	3,699	570
SWC1B	191,849	484
SWD1A	28,626	233
SWE1A	100,850	213
SWG1A	3,981	1,103
SWG1B	17,669	463
SWG1C	11,847	813
SWG1D	6,229	400
SWG1E	10,909	1,211
Stream	18,095	1,211
SWG2A	1,592	691
SWG2B	12,631	2,723
SWG3A	1,246	297

In summary, Alternative Method 1 shows an increase in peak flows leaving the site for two outlets (A and G) and a decrease for two outlets (B and C).

3.2.1.3 Predicted Occurrence and Degree of Off-Site Effects

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Appendix A**.

The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for Alternative Method 1, both outlets show an increase in peak flows up to 11%. Mitigation is not required as the peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G. The increase in peak flows for Outlet A and G is 6% and 11% respectively and the decrease in peak flows for Outlets B and C is 4% and 19%. Additionally, the overall drainage areas are not being altered in any way due to this alternative method.

3.2.2 Summary

A summary of the effects assessment of Alternative Method 1 is summarized below in **Table 3-4**.

Table 3-4. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quantity	Change in runoff volumes and peak flows resulting from steeper and longer side slopes	• Increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl, about 16 m in grade change, transitioning to a 20H:1V upper slope to a peak elevation of 324.5 masl over the Expansion Landfill footprint. • Change in catchment areas within the landfill optimization area. • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in total runoff volume from the landfill site.	• The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. • Outlets A and G show an increase in peak flow compared to existing levels (up to 11%), while Outlets B and C demonstrate a decrease (up to 19%).	• No mitigation measures required.	• Increase in peak flows, up to 11% from Future Baseline Conditions.
	Changes in drainage areas on-site and off-site	• Change in catchment areas within the landfill site • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in off-site areas	• Changes in catchment areas within the landfill optimization area are between -23% and 37% when compared to Future Baseline Conditions. • No change in off-site areas.	• No mitigation measures required.	• Changes in catchment areas within the landfill optimization area are between -23% and 37% when compared to Future Baseline Conditions. • No change in off-site areas.
	Predicted occurrence and degree of off-site effects	• Change in catchment areas within the landfill optimization area. • No change in off-site areas • No change in total runoff volume from the landfill site. • Existing monitoring is expected to continue for the landfill site.	• Increase in peak flows of up to 11% from Future Baseline Conditions. Peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G.	• No mitigation measures required.	• Increase in peak flows up to 11% from Future Baseline Conditions.

3.3 Alternative Method 2

The assessment of effects for Alternative Method 2 is described below for the environmental criteria and indicators of Surface Water Quantity and is summarized in **Table 3-8**.

3.3.1 Surface Water Quantity

Refer to **Section 3.2.1**.

3.3.1.1 Changes in drainage areas on-site and off-site

Alternative Method 2 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl over the Expansion Landfill. As a result of the new grading for this alternative, the catchment delineation within the optimization area on the landfill site will change under Alternative Method 2 when compared to Future Baseline Conditions as shown in **Figure 1-2**.

Changes in off-site drainage areas are not anticipated for Alternative Method 2 as catchments within the optimization area are expected to change whereas the overall drainage area of the landfill site remains the same. As such, any form of mitigation within the landfill site is not anticipated.

3.3.1.2 Changes in runoff volumes and peak flows resulting from steeper and longer side slopes

The change in side slopes described in **Section 3.3.1.1** will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets as shown in Table 3-5. It is noteworthy that changes were observed only for the four outlets shown in the table below. All other outlets show exactly the same peak flows leaving the site since the change in delineation of the catchments only occurred within the optimization area of the landfill. The peak storage used for the four SWM ponds is shown in **Table 3-6**.

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Figure 1-2**.

Table 3-5. Changes to Site Outlet peak flows during 100-year event

Outlets	Peak Runoff (cms)		
	Future Baseline Conditions	Alternative Method 2	% Increase from Future Baseline Conditions
A	0.261	0.279	7%
B	1.006	0.970	-4%
C	0.643	0.522	-19%
G	1.627	1.794	10%

Table 3-6. SWM Pond function during 100-year event

Pond	Capacity (ha·m)	Peak Storage Used (ha·m)		
		Future Baseline Conditions	Alternative Method 2	% increase from Future Baseline Conditions
1	2.773	0.943	0.943	0%
2	5.271	1.625	1.808	11%
3	2.857	0.732	0.757	3%
4	1.099	0.347	0.284	-18%

Like Alternative Method 1, peak outflows for the 100-year 4-hour Chicago design storm from select outlets leaving the site under the Alternative Method 2 scenario are comparable. It is noteworthy that Stormwater Management Pond 3 discharges flows to Outlets A and B and as seen from Table 3-5, Outlet A shows an increase in flows of approximately 7% and conversely Outlet B shows a decrease in flows of approximately 4% when compared to Future Baseline Conditions. Outlet G shows an approximate increase of 10% in flows when compared to Future Baseline Conditions. However, it should be noted that the swales conveying the flows to Outlet G have sufficient capacity and are able to convey the flows downstream safely. These results are presented in greater detail in **Appendix A**.

The 100-year 3-hour Chicago design storm was also run for this alternative, and it was found that the 100-year 4-hour Chicago design storm led to more conservative results (i.e. higher peak flows and higher storage volumes). Modelling output from both design storms is included in **Appendix A**. **Table 3-6** and **Table 3-7** demonstrate that the existing stormwater management ponds and swales will have enough capacity to process their respective design storms under Alternative Method 2. The relocated swales (SWC1A and SWG2A) and new culvert will also be able to convey these flows appropriately.

Table 3-7. Swale function during 25-year event

Swale	Existing Flow Capacity (L/s)	Peak Flow (L/s) Alternative Method 2
SWAB1A	9,384	1,560
SWA1B	6,256	196
SWB1B	23,461	218
SWB1C	120,733	773
SWC1A	3,699	581
SWC1B	191,849	485
SWD1A	28,626	233
SWE1A	100,850	213
SWG1A	3,981	1,103
SWG1B	17,669	463

Swale	Existing Flow Capacity (L/s)	Peak Flow (L/s) Alternative Method 2
SWG1C	11,847	813
SWG1D	6,229	391
SWG1E	10,909	1,209
Stream	18,095	1,209
SWG2A	1,592	661
SWG2B	1,2631	2,696
SWG3A	1,246	297

In summary, Alternative Method 2 shows an increase in peak flows leaving the site for two outlets and a decrease for two outlets.

3.3.1.3 Predicted occurrence and degree and off-site effects

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Appendix A**.

The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for Alternative Method 2, both outlets show an increase in peak flows that is within 10%. Mitigation is not required as the peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G. The increase in peak flows for Outlet A and G is 7% and 10% respectively and the decrease in peak flows for Outlets B and C is 4% and 19%. Additionally, the drainage areas are not being altered in any way due to this alternative.

3.3.2 Summary

A summary of the effects assessment of Alternative Method 2 is summarized below in **Table 3-8**.

Table 3-8. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quantity	Change in runoff volumes and peak flows resulting from steeper and longer side slopes	• Increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope to a peak elevation of 319 masl over the Expansion Landfill footprint. • Change in catchment areas within the landfill optimization area. • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in total runoff volume from the landfill site.	• The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. • Outlets A and G show an increase in peak flows compared to existing levels (up to 10%), while Outlets B and C demonstrate a decrease (up to 19%).	• Future Baseline ConditionsNo mitigation measures required.	• Increase in peak flows up to 10% from Future Baseline Conditions.
	Changes in drainage areas on-site and off-site	• Change in catchment areas within the landfill site optimization area. • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in off-site areas	• Changes in catchment areas within the landfill optimization area are between -22% and 34% when compared to Future Baseline Conditions. • No change in off-site areas.	• Future Baseline ConditionsNo mitigation measures required.	• Changes in catchment areas within the landfill optimization area are between -22% and 34% when compared to Future Baseline Conditions. • No change in off-site areas.
	Predicted occurrence and degree of off-site effects	• Change in catchment areas within the landfill optimization area. • No change in off-site areas • No change in total runoff volume from the landfill site. • Existing monitoring is expected to continue for the landfill site.	• Increase in peak flows of up to 10% from Future Baseline Conditions. Peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G.	• Future Baseline ConditionsNo mitigation measures required.	• Increase in peak flows up to 10% from Future Baseline Conditions.

3.4 Alternative Method 3

The assessment of effects for Alternative Method 3 is described below for the environmental criteria and indicators of Surface Water Quantity and is summarized in **Table 3-12**.

3.4.1 Surface Water Quantity

Refer to **Section 3.2.1**.

3.4.1.1 Changes in drainage areas on-site and off-site

Alternative Method 3 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl, about 100 m in grade change, peaking at elevation 360 masl over the Expansion Landfill. As a result of the new grading for this alternative, the catchment delineation within the optimization area on the landfill site will change under Alternative Method 3 when compared to Future Baseline Conditions as shown in **Figure 1-3**.

Changes in off-site drainage areas is not anticipated for Alternative Method 3 as catchments within the optimization area are expected to change whereas the overall drainage area of the landfill site remains the same. As such, any form of mitigation within the landfill site is not anticipated.

3.4.1.2 Change in runoff volumes and peak flows resulting from steeper and longer side slopes

The change in side slopes described in **Section 3.4.1.1** will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets as shown in **Table 3-9**. It is noteworthy that changes were observed only for the four outlets shown in the table below. All other outlets show exactly the same peak flows leaving the site since the change in delineation of the catchments only occurred within the optimization area of the landfill. The peak storage used for the four SWM ponds is shown in **Table 3-10**.

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Figure 1-3**.

Table 3-9. Changes to Site Outlet peak flows during 100-year event

Outlets	Peak Runoff (cms)		
	Future Baseline Conditions	Alternative Method 3	% Increase from Future Baseline Conditions
A	0.261	0.273	5%
B	1.006	0.970	-4%
C	0.643	0.520	-19%

Outlets	Peak Runoff (cms)		
	Future Baseline Conditions	Alternative Method 3	% Increase from Future Baseline Conditions
G	1.627	1.806	11%

Table 3-10. SWM Pond function during 100-year event

Pond	Capacity (ha·m)	Peak Storage Used (ha·m)		
		Future Baseline Conditions	Alternative Method 3	% Increase from Future Baseline Conditions
1	2.773	0.943	0.943	0%
2	5.271	1.625	1.823	12%
3	2.857	0.732	0.746	2%
4	1.099	0.347	0.281	-19%

The data presented in the tables above mirror those of **Sections 3.2.1** and **3.3.1**. Like Alternative Methods 1 and 2, peak outflows from select outlets leaving the site under the Alternative Method 3 scenario are comparable. It is noteworthy that Stormwater Management Pond 3 discharges flows to Outlets A and B and as seen from **Table 3-9**, Outlet A shows an increase in flows of approximately 5% and conversely Outlet B shows a decrease in flows of approximately 4% when compared to Future Baseline Conditions. Outlet G shows an approximate increase of 11% in flows when compared to Future Baseline Conditions. However, it should be noted that the swales conveying the flows to Outlet G have sufficient capacity and are able to convey the flows downstream safely. These results are presented in greater detail in **Appendix A**.

The 100-year 3-hour Chicago design storm was also run for this alternative, and it was found that the 100-year 4-hour Chicago design storm led to more conservative results (i.e. higher peak flows and higher storage volumes). Modelling output from both design storms is included in **Appendix A**.

Table 3-10 and **Table 3-11** demonstrate that the existing stormwater management ponds and swales will have enough capacity to process their respective design storms under Alternative Method 3. The relocated swales (SWC1A) and SWG2A) and new culvert will also be able to convey these flows appropriately.

Table 3-11. Swale function during 25-year event

Swale	Flow Capacity (L/s)	Peak Flow (L/s)
		Future Alternative Method 3
SWAB1A	9,384	1,526
SWA1B	6,256	191
SWB1B	23,461	214
SWB1C	120,733	773

Swale	Flow Capacity (L/s)	Peak Flow (L/s)
		Future Alternative Method 3
SWC1A	3,699	565
SWC1B	191,849	483
SWD1A	28,626	233
SWE1A	100,850	213
SWG1A	3,981	1,103
SWG1B	17,669	463
SWG1C	11,847	813
SWG1D	6,229	400
SWG1E	10,909	1,211
Stream	18,095	1,211
SWG2A	1,592	658
SWG2B	12,631	2,753
SWG3A	1,246	297

In summary, Alternative Method 3 shows an increase in peak flows leaving the site for two outlets and a decrease for two outlets.

3.4.1.3 Predicted occurrence and degree of off-site effects

Full results showing all return period storms are available in Appendix A. The locations of the named outlets, ponds, and swales are shown in Appendix A.

The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for Alternative Method 3, both outlets show an increase in peak flows that is within 11%. Mitigation is not required as the peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G. The increase in peak flows for Outlet A and G is 5% and 11% respectively and the decrease in peak flows for Outlets B and C is 4% and 19%. Additionally, the drainage areas are not being altered in anyway due to this alternative.

3.4.2 Summary

A summary of the effects assessment of Alternative Method 3 is summarized below in **Table 3-12**.

Table 3-12. Net Effects Assessment – Alternative Method 3

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Surface Water Quantity	Change in runoff volumes and peak flows resulting from steeper and longer side slopes	• Increase of final landfill side slopes from 4H:1V to 2.5H:1V between the elevation 260 masl and elevation 360 masl, about 100 m in grade change, to a peak elevation of 360 masl over the Expansion Landfill footprint. • Change in catchment areas within the landfill optimization area. • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in total runoff volume from the landfill site.	• The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. • Outlets A and G show an increase in peak flow compared to existing levels (up to 11%), while Outlets B and C demonstrate a decrease (up to 19%).	Future Baseline Conditions No mitigation measures required.	• Increase in peak flows are up to 11% from Future Baseline Conditions.
	Changes in drainage areas on-site and off-site	• Change in catchment areas within the landfill optimization area. • Four SWM ponds, existing swales and catchments D, E, F, H, I, and J will not be physically altered. • No change in off-site areas	• Changes in catchment areas within the landfill optimization area are between -24% and 36% when compared to Future Baseline Conditions. • No change in off-site areas.	• Future Baseline Conditions No mitigation measures required.	• Changes in catchment areas within the landfill optimization area are between -24% and 36% when compared to Future Baseline Conditions. • No change in off-site areas.
	Predicted occurrence and degree of off-site effects	• Change in catchment areas within the landfill optimization area. • No change in off-site areas • No change in total runoff volume from the landfill site. • Existing monitoring is expected to continue for the landfill site.	• Increase in peak flows of up to 10% from Future Baseline Conditions. Peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G.	• Future Baseline Conditions No mitigation measures required.	• Increase in peak flows are up to 11% from Future Baseline Conditions.

4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative

The comparative evaluation of the net effects of each alternative method and the identification of a Preferred Alternative are carried out in accordance with the methods described in **Section 2.2**. The three alternative methods are comparatively assessed and evaluated using the criteria and indicators to determine the Preferred Alternative. The differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (i.e., net effects) are used to identify and compare each alternative method. The comparative evaluation of the alternative methods for Surface Water Quantity is provided in **Table 4-1**, below.

Table 4-1. Comparative Evaluation of the Net Effects of the Alternative Methods for Surface Water Quantity

Evaluation Criteria	Indicator	Net Effects of Alternative Methods		
		Alternative Method 1	Alternative Method 2	Alternative Method 3
Surface Water Quantity	Change in runoff volumes and peak flows resulting from steeper and longer side slopes	This method results in increase of final landfill side slopes from 4H:1V to 3H:1V between the original grade and elevation 320 masl, about 16 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 324.5 masl over within the Expansion Landfill footprint. The peaking elevation for Alternative Method 1 is 324.5 masl. Peak flows leaving the landfill site are up to 11% when compared to Future Baseline Conditions. Not Preferred	This method results in increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl over within the Expansion Landfill footprint. Alternative Method 2 has the lowest peaking elevation when compared to the other alternative methods. Peak flows leaving the landfill site are up to 10% when compared to Future Baseline Conditions. Preferred due to lowest peaking elevation when compared to other alternatives.	This method results in increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 260 masl and elevation 360 masl, about 100 m in grade change, peaking at elevation 360 masl over within the Expansion Landfill footprint. The peaking elevation for Alternative Method 3 is 360 masl. Peak flows leaving the landfill are up to 11% when compared to Future Baseline Conditions. Not Preferred

Table 4-1. Comparative Evaluation of the Net Effects of the Alternative Methods for Surface Water Quantity

Evaluation Criteria	Indicator	Net Effects of Alternative Methods		
		Alternative Method 1	Alternative Method 2	Alternative Method 3
	Changes in drainage areas on-site and off-site	Changes in catchment areas within the landfill optimization area is between -23% and 37% when compared to Future Baseline Conditions. The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. Not Preferred	Changes in catchment areas within the landfill optimization area is between -22% and 34% when compared to Future Baseline Conditions The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. The maximum increase of drainage area for one catchment (G3A) is the lowest (34%) when compared to other alternatives against Future Baseline Conditions. Preferred	Changes in catchment areas within the landfill optimization area is between -24% and 36% when compared to Future Baseline Conditions The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets. Not Preferred
	Predicted occurrence and degree of off-site effects	Peak flows leaving the landfill site are less than 11% when compared to Future Baseline Conditions. Not Preferred	Peak flows leaving the landfill site are approximately 10% when compared to Future Baseline Conditions. Preferred. No substantial difference.	Peak flows leaving the landfill site are approximately 11% when compared to Future Baseline Conditions. Not Preferred
	Criteria Rating & Rationale	Alternative Method 2 is preferred over Alternative Methods 1 and 3. Although the peak flows leaving the site under Alternative Method 2 are just slightly higher than Alternative Methods 1 (11%) and 3 (11%), Alternative Method 2 has the lowest peaking elevation when compared to other alternative methods. As such, reduced runoff velocity and enhanced infiltration of the stormwater is anticipated for this method. Additionally, the maximum increase of drainage area for one catchment (G3A) is the lowest (34%) when compared to other alternative methods against Future Baseline Conditions.		
Preferred Alternative: Alternative Method 2 is preferred. .				

The overall Preferred Alternative for Surface Water Quantity based on the results of the criteria comparisons is Alternative Method 2.

5 Effects Assessment of the Preferred Alternative

The overall Preferred Alternative for Surface Water Quantity based on the results of the criteria comparisons is Alternative Method 2.

5.1 Changes in drainage areas on-site and off-site

Changes in catchment areas within the landfill optimization area is between -22% and 34% when compared to Future Baseline Conditions. The maximum increase of drainage area for one catchment (G3A) is the lowest (34%) when compared to other alternative methods against Future Baseline Conditions. However, it is noteworthy that off-site drainage areas remain unchanged for all alternative methods.

The timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets.

5.2 Change in runoff volumes and peak flows resulting from steeper and longer side slopes

Alternative Method 2 results in increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl within the Expansion Landfill footprint. Alternative Method 2 has the lowest peaking elevation when compared to other alternative methods. As such, reduced runoff velocity and enhanced infiltration of the stormwater is anticipated for this method.

Outlets A and G show an increase in peak flows compared to existing levels (up to 10%), while Outlets B and C demonstrate a decrease (up to 19%).

5.3 Predicted occurrence and degree of off-site effects

The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for Alternative Method 2, both outlets show an increase in peak flows that is less than 10%. Mitigation is not required as the peak flows are less than 1 m³/s for Outlets A, B and C and 1.8 m³/s for Outlet G. The increase in peak flows for Outlet A and G is 7% and 10% respectively and the decrease in peak flows for Outlets B and C is 4% and 19%. Additionally, the drainage areas are not being altered in any way due to this alternative.

5.4 Climate Change Considerations

Extreme weather events caused by climate change are relevant to the design of stormwater management systems in the diversion/control of runoff, as well as erosion and sedimentation control. Climate change will impact the stormwater management system by increasing the intensity and frequency of storms, which will cause larger peak flows, sometimes by a significant amount. It is for this reason that the future conditions were modelled for the currently approved landfill buildout and the three Alternative Methods using current and future climate change intensity-duration-frequency (IDF) curves. These curves were taken from the Sarnia weather station as reported/predicted by Environment and Climate Change Canada. The 2071-2100 SSP2-4.5 (moderate emissions scenario) was used, representing a 27-29% increase in peak intensity. The analysis demonstrated that despite the increase in peak flows climate change will cause, the existing ponds and swales have sufficient capacity to manage the runoff under the design storms.

6 Comparison of the Preferred Alternative against the ‘Do Nothing’ Alternative

The effects of the Preferred Alternative are compared against the predicted effects of the currently approved Expansion Landfill based on similar environmental criteria and indicators, with the understanding that the criteria and indicators used in the current effects assessment may differ from those used for the effects assessment of the Expansion Landfill. The effects are compared against each other in terms of magnitude, extent, and duration below. The advantages and disadvantages of the Preferred Alternative compared to the ‘Do Nothing’ alternative are identified.

6.1 Effects of the ‘Do Nothing’ Alternative

Should the landfill optimization not proceed, the landfill development will continue until it has reached its full horizontal footprint and currently approved height of 280 masl. This will alter the catchment areas within the TCEC site, land cover, and time of concentration, as well as the path of the swales.

The landfill development will continue until it has reached its full horizontal footprint and currently approved height of 280 masl. This will alter the outlets’ catchment areas, land cover, and time of concentration, as well as the path of the swales in the northeast corner. This scenario is considered the future baseline and was modelled as part of the assessment. The full buildout of the landfill in the northeast corner will move the bordering swales to the east as shown in **Appendix A (Exhibit 6-1)**. The swale leading to Pond 4 will be slightly shorter (now 0.4 km in length), while the swale heading south towards Pond 2 will be longer (1.6 km total). A new culvert will be required under the servicing road. These new and realigned components of the

stormwater system are not currently designed and as such were sized appropriately for the 25-year return period storm.

6.2 Comparison of the Preferred Alternative against the 'Do Nothing' Alternative

This section compares the effects of the Preferred Alternative, Alternative Method 2, against the 'Do Nothing' Alternative.

6.2.1 Changes in drainage areas on-site and off-site

Should the landfill optimization not proceed, the landfill development will continue until it has reached its full horizontal footprint and currently approved height of 280 masl. This will alter the outlets' catchment areas, land cover, and time of concentration, as well as the path of the swales in the northeast corner. As a result of the new grading for Alternative Method 2, the catchment delineation within the optimization area on the landfill site will change.

Further, Alternative Method 2 includes the increase of final landfill side slopes from 4H:1V to 2.5H:1V between elevation 250 masl and elevation 310 masl, about 60 m in grade change, transitioning to a 20H:1V upper slope and peaking at elevation 319 masl over the Expansion Landfill.

It is noteworthy that the changes in off-site drainage areas is not anticipated for the 'Do Nothing' Alternative and Alternative Method 2 as catchments within the landfill optimization area are expected to change whereas the overall drainage area of the landfill site remains the same. As such, any form of mitigation within the landfill site is not anticipated as well.

When the catchment areas are compared between the two, there is an increase for three catchments ranging from 1% to 4% and a decrease for two catchments ranging from 1% to 4% for Alternative Method 2. Detailed comparison is shown in **Appendix A**.

6.2.2 Change in runoff volumes and peak flows resulting from steeper and longer side slopes

The change in side slopes described in **Section 6.2.1** will not change total runoff volume from the landfill site; however, the timing of peak flows and the redistribution of catchment areas is expected to increase or decrease some of the peak flows leaving through the outlets as shown in **Table 6-1**. It is noteworthy that changes were observed only for the four outlets shown in the table below. All other outlets show exactly the same peak flows leaving the site since the change in delineation of the catchments only occurred within the optimization area of the landfill. The peak storage used for the four SWM ponds is shown in **Table 6-2**.

Full results showing all return period storms are available in **Appendix A**. The locations of the named outlets, ponds, and swales are shown in **Appendix A**.

Table 6-1. Changes to Site Outlet peak flows during 100-year event.

Outlets	Peak Runoff (cms / % change from Do Nothing Alternative)		
	Do Nothing Alternative	Alternative Method 2	% change from Do Nothing Alternative
A	0.275	0.279	1%
B	0.970	0.970	0%
C	0.518	0.522	1%
G	1.825	1.794	-2%

Table 6-2. SWM Pond function during 100-year event.

Pond	Capacity (ha·m)	Peak Storage Used (ha·m)		
		Do Nothing Alternative	Alternative Method 2	% Increase from Do Nothing Alternative
1	2.773	0.943	0.943	0%
2	5.271	1.838	1.808	-2%
3	2.857	0.75	0.757	1%
4	1.099	0.285	0.284	0%

As seen from the results above, the peak flows leaving the landfill site for select outlets are very comparable for both alternatives. Similarly, the peak storage used for the ponds are also comparable.

6.2.3 Predicted occurrence and degree of off-site effects

The downstream receiver of flows from Outlet A is the Auld-Redmond Drain and the downstream receiver of flows from Outlet G is the Gilliland-Geerts Drain. According to the results for both, 'Do Nothing' Alternative and Alternative Method 2, the results are very comparable.

6.3 Advantages and Disadvantages of the Preferred Alternative

The differences in net effects between the Preferred Alternative and the 'Do Nothing' Alternative are used to determine the advantages and disadvantages of the Preferred Alternative. The advantages and disadvantages of the Preferred Alternative are listed in **Table 6-3**.

Table 6-3. Advantages and Disadvantages of the Preferred Alternative

Evaluation Criteria	Advantages	Disadvantages
Surface Water Quantity	Peak storage used for SWM Ponds 2 and 4 is slightly lower for Alternative Method 2.	No disadvantages noted.

7 Commitments and Monitoring

To confirm that the commitments related to Surface Water Quantity are carried out, and that the proposed mitigation measures will address the predicted effects for Surface Water Quantity, monitoring is proposed for construction of the Project. Monitoring for compliance will be undertaken to confirm that the Project complies with the commitments and mitigation measures identified in the effects assessment.

The commitments associated with Surface Water Quantity are listed in **Section 7.1**. The proposed environmental effects monitoring is provided in **Section 7.2**. Compliance monitoring for Surface Water Quantity is described in **Section 7.3**.

7.1 Surface Water Quantity Commitments

Additional mitigation from increased runoff of either alternative method is provided by the storage and settlement of suspended solids in the proposed SWM ponds. Periodic maintenance in the form of sediment removal to avoid the impacts on the storage capacity of the ponds will be required based on maintenance inspections. These are 'in-design mitigation measures' and no further mitigation measures are required.

7.2 Environmental Effects Monitoring for Surface Water Quantity

Monitoring plans are developed as part of the detailed effects assessments carried out for the Preferred Alternative to confirm:

- the net effects are as predicted;
- unanticipated negative effects are addressed; and
- the effectiveness of the proposed mitigation measures.

Table 7-1 contains the environmental effects monitoring for the Preferred Alternative.

7.3 Surface Water Quantity Compliance Monitoring

Compliance monitoring will be undertaken to confirm that the construction, operation, and maintenance of the Project are carried out in accordance with the mitigation measures and commitments identified in the effects assessment.

Further, the WM Operations team handles all tasks related to cleaning and maintaining the ponds. As part of regular landfill operations, drainage ditches and stormwater management ponds are routinely monitored and maintained by WM. This includes the removal of sediment deposits to ensure the continued effectiveness and proper functioning of the stormwater management system.

Specifically, WM performs daily inspections which includes signs for erosion on side slopes, leachate seeps and sediment accumulation. Furthermore, a third party consultant (RWDI) undertakes monthly inspections which are according to the ECA A032203. These include:

- a. Erosion rills;
- b. General settlement areas or depressions;
- c. Shear and tension cracks;
- d. Condition of surface water drainage works;
- e. Erosion and sedimentation in surface water drainage system;
- f. Presence of any ponded water;
- g. Adequacy of cover material;
- h. Evidence of vegetative stress, distressed poplars or side slope plantings;
- i. Condition of groundwater monitoring wells and gas wells;
- j. Presence of insects, vermin, rodents and scavenging animals;
- k. Condition of fence surrounding the Site; and
- m. General Site appearance.

Compliance monitoring is summarized in **Table 7-1**. The results of compliance monitoring, including details of the effectiveness of mitigation measures and fulfillment of commitments, will be provided to the MECP.

Table 7-1. Environmental Effects and Compliance Monitoring for the Preferred Alternative

Evaluation Criteria	Potential Effect	Commitment for Mitigation	Commitment for Monitoring	Compliance Monitoring
Surface Water Quantity	Change in runoff volumes and peak flows resulting from steeper and longer side slopes	No additional mitigation measures required beyond the 'in-design mitigation measures' which falls under period maintenance.	• Inspection for erosion and sediment accumulation in SWM ponds as part of landfill monitoring programs. • Annual inspection of stormwater works and maintenance to address sedimentation and excessive vegetation growth.	• Annually during current site inspection program for surface water flow rates, pH, electrical conductivity, temperature and turbidity, etc..

8 Surface Water Approvals

In addition to EA approval, the following Surface Water Quantity related approvals may be required:

- An amendment to the Sewage ECA in the event that modifications are made to the on-site existing stormwater management infrastructure.

9 References

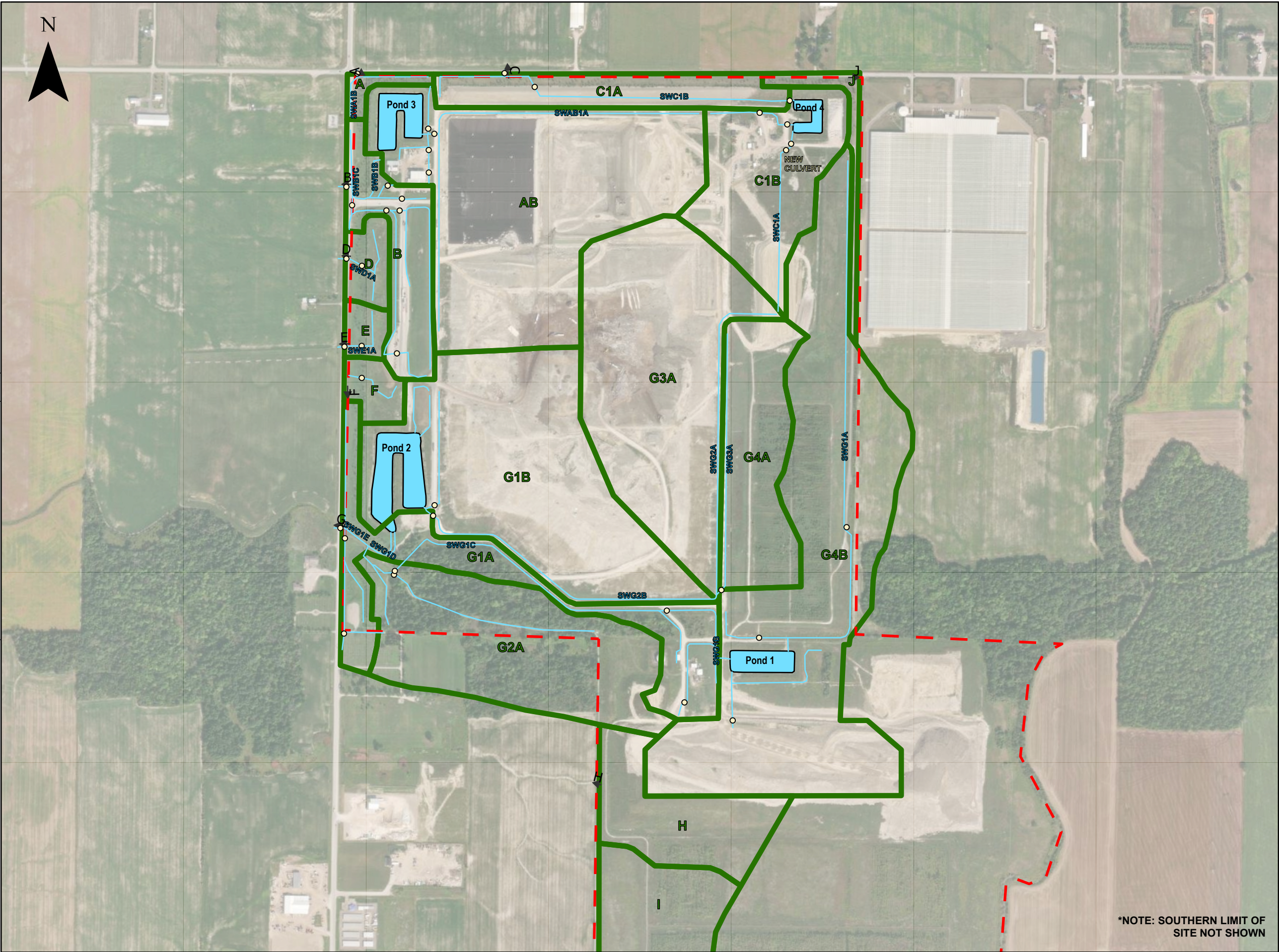
WSP Canada Inc.

2025 Surface Water Quantity Future Baseline Conditions Report

A

Hydrologic Modelling

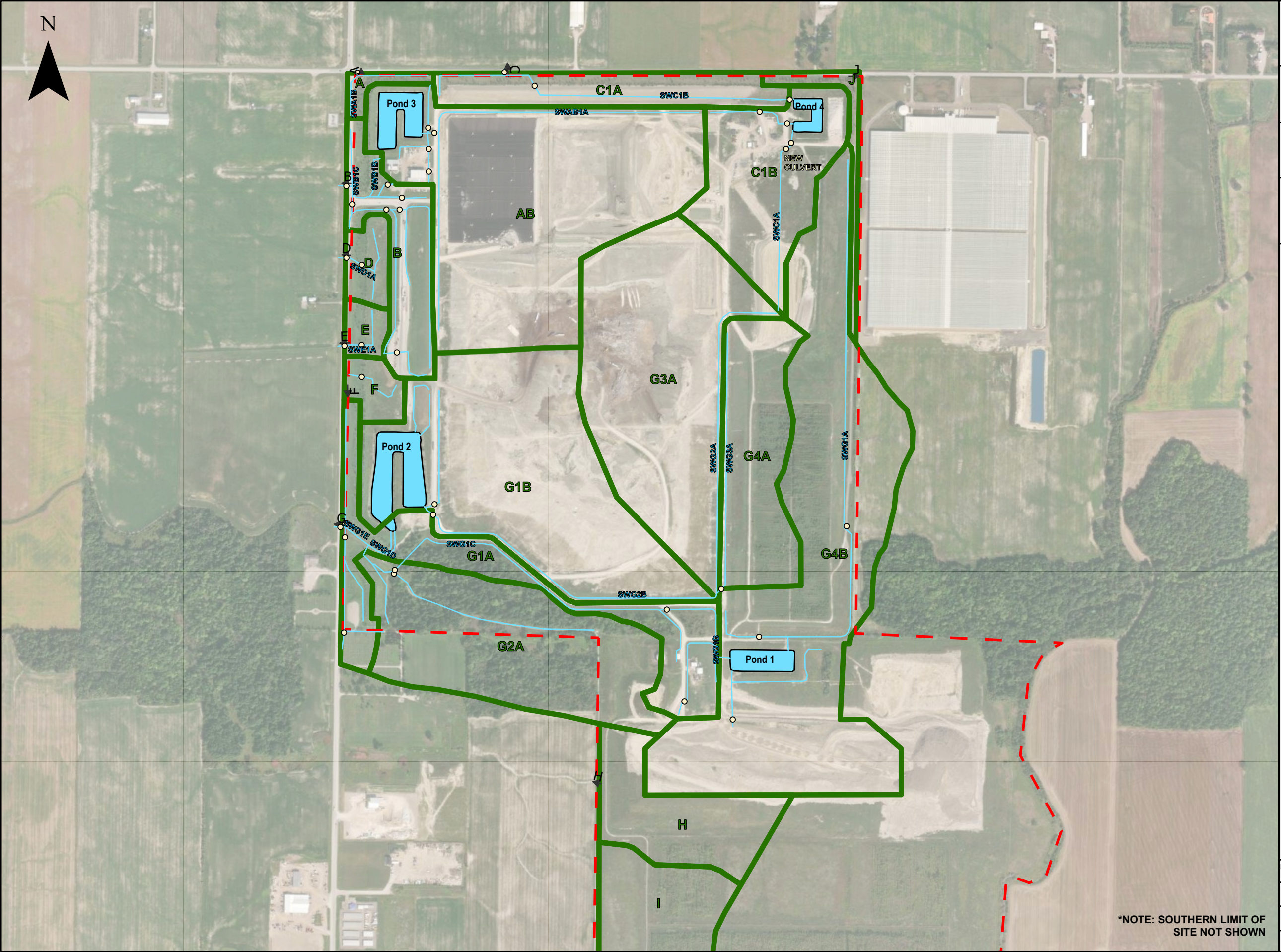
Document Path: C:\Users\CAAB010464\WSP_03651211-01678-02 Twin Creeks Landfill Optimization 2022 - 05_Technical\Surface Water\GIS\TwinCreeks-Proposed.aprx



CLIENT WASTE MANAGEMENT OF CANADA CORP.	
PROJECT TWIN CREEKS LANDFILL OPTIMIZATION	
TITLE EXHIBIT 1-1 CATCHMENT AREAS ALTERNATIVE METHOD 1	
LEGEND → Outlet SWM Ponds Alternative Method 1 Proposed Catchments Waste Management Property Limit Proposed Ditches Proposed Culverts	
DRAWN BY AB	CHECKED BY EK
JULY 2025	
NAD 1983 CSRS UTM Zone 17N 1:9,000	

*NOTE: SOUTHERN LIMIT OF
SITE NOT SHOWN

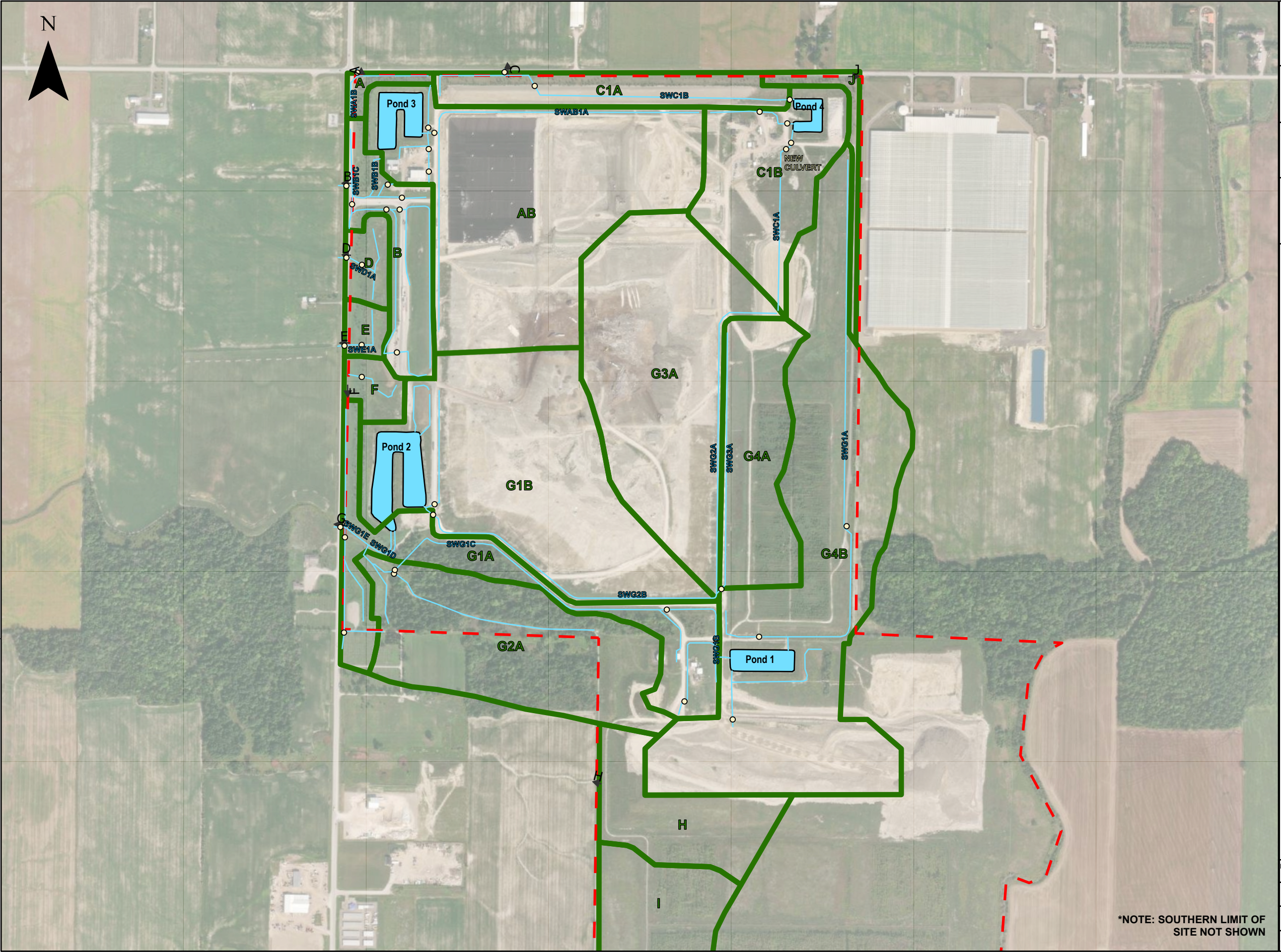
Document Path: C:\Users\CAAB010464\WSP_03651211-01678-02 Twin Creeks Landfill Optimization 2022 - 05_Technical\Surface Water\GIS\TwinCreeks-Proposed.aprx



CLIENT WASTE MANAGEMENT OF CANADA CORP.	
PROJECT TWIN CREEKS LANDFILL OPTIMIZATION	
TITLE EXHIBIT 1-2 CATCHMENT AREAS ALTERNATIVE METHOD 2	
LEGEND → Outlet SWM Ponds Alternative Method 2 Proposed Catchments Waste Management Property Limit Proposed Ditches Proposed Culverts	
0 0.07 0.15 km	
DRAWN BY AB	CHECKED BY EK
JULY 2025	
NAD 1983 CSRS UTM Zone 17N	
1:9,000	

*NOTE: SOUTHERN LIMIT OF
SITE NOT SHOWN

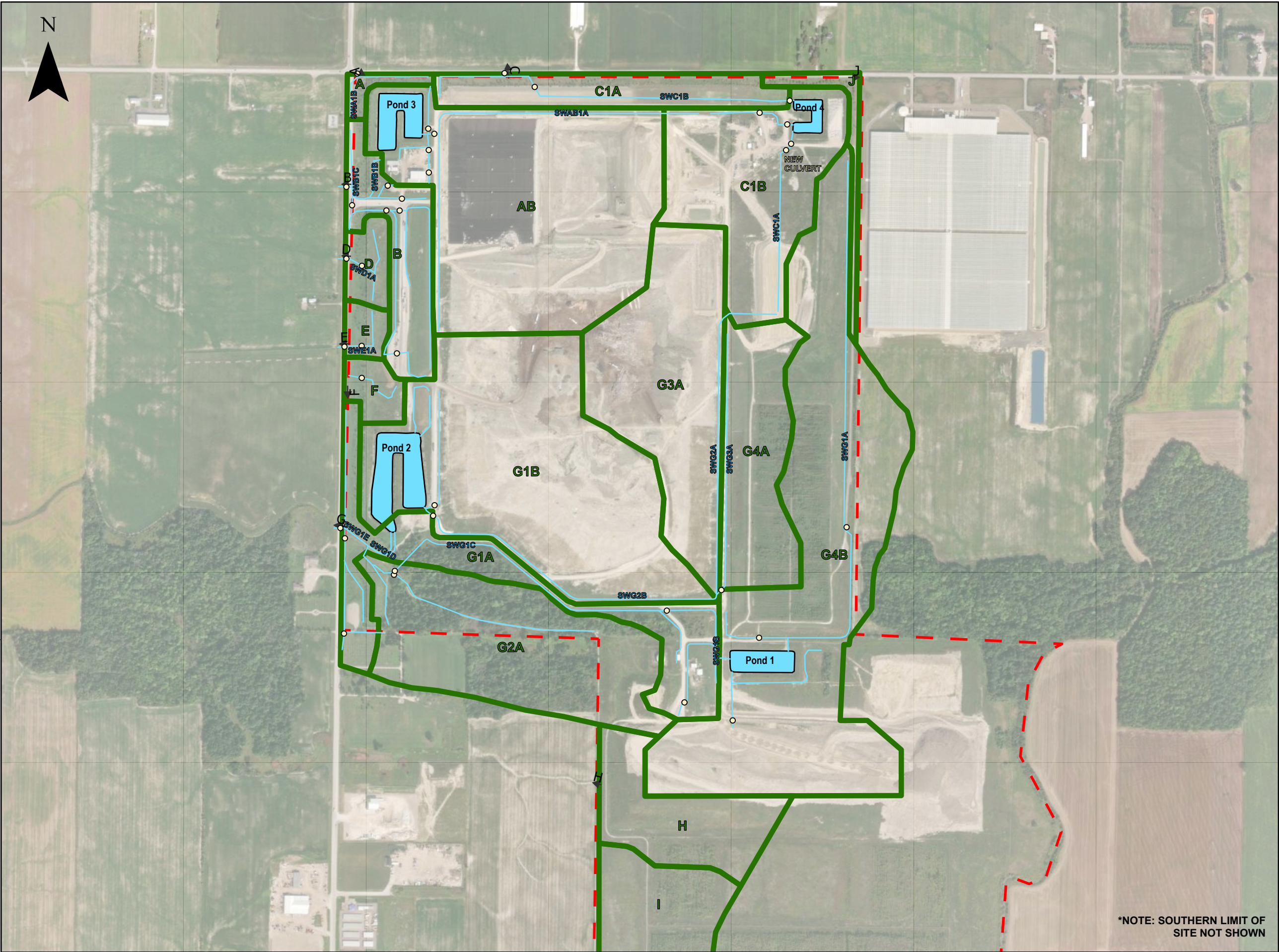
Document Path: C:\Users\CAAB010464\WSP_03651211-01678-02 Twin Creeks Landfill Optimization 2022 - 05_Technical\Surface Water\GIS\TwinCreeks-Proposed.aprx



CLIENT WASTE MANAGEMENT OF CANADA CORP.	
PROJECT TWIN CREEKS LANDFILL OPTIMIZATION	
TITLE EXHIBIT 1-3 CATCHMENT AREAS ALTERNATIVE METHOD 3	
LEGEND → Outlet SWM Ponds Alternative Method 3 Proposed Catchments Waste Management Property Limit Proposed Ditches Proposed Culverts	
0 0.07 0.15 km	
DRAWN BY AB	CHECKED BY EK
JULY 2025	
NAD 1983 CSRS UTM Zone 17N	
1:9,000	

*NOTE: SOUTHERN LIMIT OF
SITE NOT SHOWN

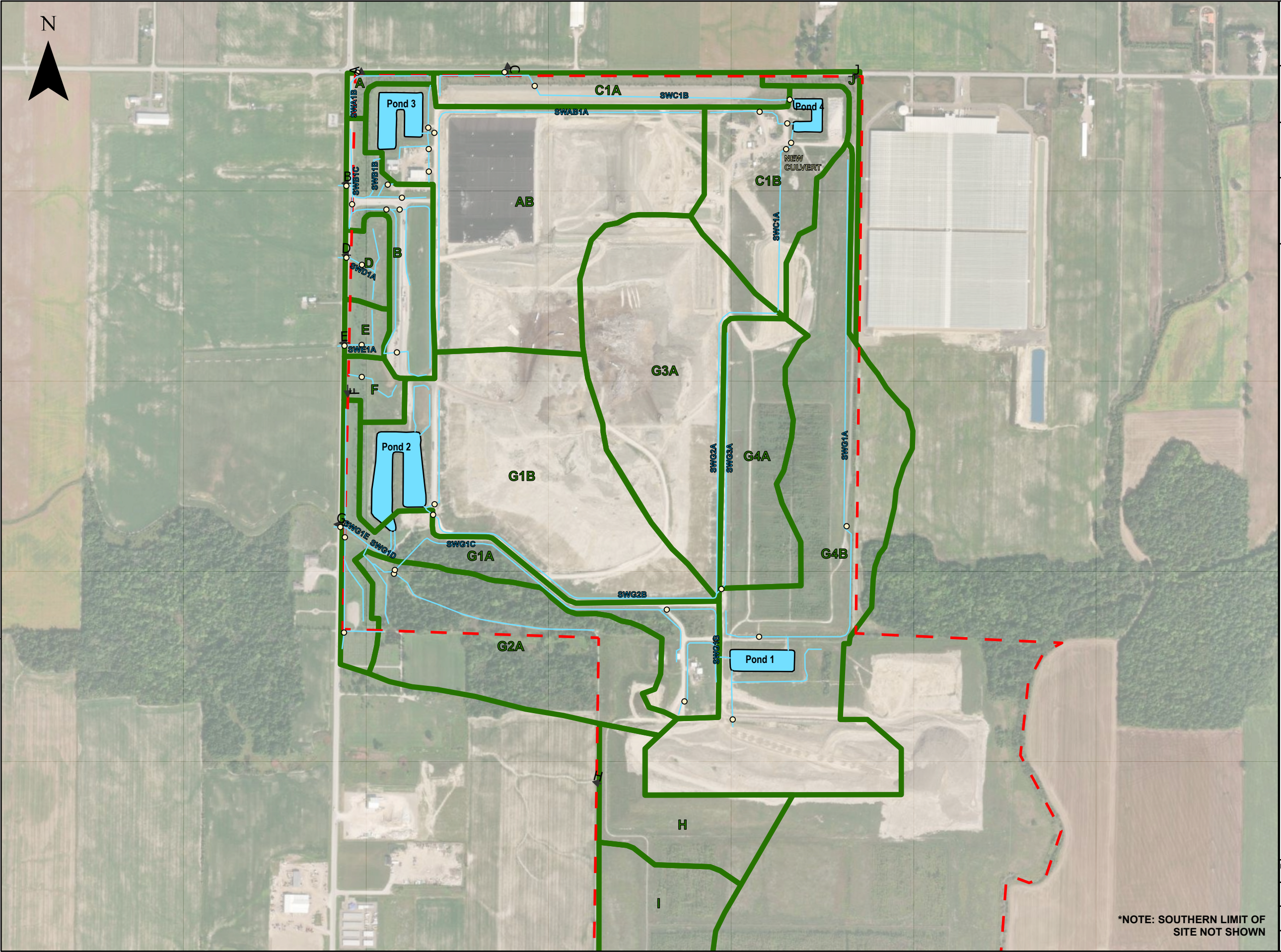
Document Path: C:\Users\CAAB010464\WSP_03651211-01678-02 Twin Creeks Landfill Optimization 2022 - 05_Technical\Surface Water\GIS\TwinCreeks-Proposed.aprx



CLIENT WASTE MANAGEMENT OF CANADA CORP.	
PROJECT TWIN CREEKS LANDFILL OPTIMIZATION	
TITLE EXHIBIT 3-1 CATCHMENT AREAS EXISTING CONDITIONS	
LEGEND → Outlet SWM Ponds Waste Management Property Limit Proposed Ditches Proposed Culverts CatchmentsExisting	
Note: When the Project starts, the existing conditions or future baseline conditions of the landfill will prevail. 0 0.07 0.15 km	
DRAWN BY AB	CHECKED BY EK
JULY 2025	
NAD 1983 CSRS UTM Zone 17N 1:9,000	

*NOTE: SOUTHERN LIMIT OF
SITE NOT SHOWN

Document Path: C:\Users\CAAB010464\WSP 03651211-01678-02 Twin Creeks Landfill Optimization 2022 - 05_Technical\Surface Water\GIS\TwinCreeks-Proposed.aprx



CLIENT WASTE MANAGEMENT OF CANADA CORP.	
PROJECT TWIN CREEKS LANDFILL OPTIMIZATION	
TITLE EXHIBIT 6-1 CATCHMENT AREAS DO-NOTHING	
LEGEND → Outlet SWM Ponds Do-Nothing Catchments Waste Management Property Limit Proposed Ditches Proposed Culverts	
DRAWN BY AB	CHECKED BY EK
JULY 2025	
NAD 1983 CSRS UTM Zone 17N 1:9,000	

*NOTE: SOUTHERN LIMIT OF
SITE NOT SHOWN

Comparison of Catchment Areas (ha)

Catchment	Existing	Do Nothing	Method 1	Method 2	Method 3
A	0.94	0.94	0.94	0.94	0.94
AB	31.84	32.61	32.52	33.05	32.33
B	6.99	6.99	6.99	6.99	6.99
C1A	6.77	6.77	6.82	6.82	6.82
C1B	15.77	12.32	12.17	12.23	12.06
G1A	12.45	12.45	12.45	12.45	12.45
G1B	32.91	30.09	28.68	28.74	29.27
G2A	19.40	19.40	19.40	19.40	19.40
G3A	18.71	24.10	25.70	25.07	25.41
G4A	10.64	10.73	10.73	10.73	10.73
G4B	40.21	40.21	40.21	40.21	40.21

Comparison of Catchment Time to Peak (hrs)

Catchment	Existing	Do Nothing	Method 1	Method 2	Method 3
A	0.12	0.12	0.12	0.12	0.12
AB	0.93	0.55	0.52	0.55	0.55
B	n/a	n/a	n/a	n/a	n/a
C1A	0.50	0.50	0.50	0.50	0.50
C1B	0.42	0.55	0.55	0.54	0.55
G1A	1.03	1.03	1.03	1.03	1.03
G1B	0.60	0.40	0.41	0.41	0.40
G2A	0.66	0.66	0.66	0.66	0.66
G3A	2.44	1.12	1.11	1.14	1.17
G4A	1.12	1.12	1.12	1.12	1.12
G4B	1.20	1.20	1.20	1.20	1.20

Chicago 4-Hour Design Storm Results

Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.067	0.102	0.135	0.181	0.221	0.261
B	0.417	0.573	0.676	0.808	0.907	1.006
C	0.145	0.246	0.318	0.430	0.520	0.643
D	0.075	0.132	0.174	0.233	0.281	0.329
E	0.068	0.120	0.159	0.213	0.257	0.301
F	0.054	0.094	0.124	0.164	0.197	0.230
G	0.410	0.696	0.903	1.177	1.389	1.627

Do Nothing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.069	0.107	0.143	0.193	0.235	0.275
B	0.388	0.540	0.642	0.773	0.871	0.970
C	0.123	0.216	0.285	0.375	0.446	0.518
D	0.075	0.132	0.174	0.233	0.281	0.329
E	0.068	0.120	0.159	0.213	0.257	0.301
F	0.054	0.094	0.124	0.164	0.197	0.230
G	0.437	0.736	0.940	1.216	1.497	1.825

Alternative Method 1						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.069	0.107	0.143	0.193	0.235	0.276
B	0.388	0.541	0.642	0.773	0.871	0.970
C	0.123	0.216	0.286	0.377	0.448	0.520
D	0.075	0.132	0.174	0.233	0.281	0.329
E	0.068	0.120	0.159	0.213	0.257	0.301
F	0.054	0.094	0.124	0.164	0.197	0.230
G	0.433	0.733	0.937	1.211	1.485	1.810

Alternative Method 2						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.070	0.108	0.146	0.196	0.239	0.279
B	0.388	0.540	0.642	0.773	0.871	0.970
C	0.124	0.218	0.287	0.379	0.450	0.522
D	0.075	0.132	0.174	0.233	0.281	0.329
E	0.068	0.120	0.159	0.213	0.257	0.301
F	0.054	0.094	0.124	0.164	0.197	0.230
G	0.432	0.731	0.935	1.209	1.474	1.794

Alternative Method 3						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.069	0.106	0.142	0.191	0.233	0.273
B	0.388	0.540	0.642	0.773	0.871	0.970
C	0.123	0.216	0.285	0.377	0.448	0.520
D	0.075	0.132	0.174	0.233	0.281	0.329
E	0.068	0.120	0.159	0.213	0.257	0.301
F	0.054	0.094	0.124	0.164	0.197	0.230
G	0.433	0.734	0.937	1.211	1.483	1.806

Future Approved Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	3%	5%	6%	7%	6%	5%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-15%	-12%	-10%	-13%	-14%	-19%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	7%	6%	4%	3%	8%	12%

Alternative Method 1 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	3%	5%	6%	7%	6%	6%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-15%	-12%	-10%	-12%	-14%	-19%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	6%	5%	4%	3%	7%	11%

Alternative Method 2 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	4%	6%	8%	8%	8%	7%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-14%	-11%	-10%	-12%	-13%	-19%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	5%	5%	4%	3%	6%	10%

Alternative Method 3 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	3%	4%	5%	6%	5%	5%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-15%	-12%	-10%	-12%	-14%	-19%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	6%	5%	4%	3%	7%	11%

Alternative Method 2 Difference from Do Nothing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	1%	1%	2%	2%	2%	1%
B	0%	0%	0%	0%	0%	0%
C	1%	1%	1%	1%	1%	1%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	-1%	-1%	-1%	-1%	-2%	-2%

Chicago 4-Hour Design Storm Results

Peak Pond Storage in 100-year storm (ha-m)

Pond	Available	Existing	Do Nothing	AM 1	AM 2	AM 3
1	2.773	0.943	0.943	0.943	0.943	0.943
2	5.271	1.625	1.838	1.824	1.808	1.823
3	2.857	0.732	0.750	0.750	0.757	0.746
4	1.099	0.347	0.285	0.282	0.284	0.281

Peak Swale Conveyance during 25-year Storm

Name	Contributing Catchments	Geometry					Peak Swale Conveyance (L/s)				
		Length (m)	Representative Bottom Width (m)	Representative Depth (m)	Representative Side Slope (X:1)	Average Slope (%)	Available	Future Approved	AM 1	AM 2	AM 3
SWAB1A	AB	665	1.8	0.8	4.8	0.8%	9384	1539	1594	1560	1526
SWA1B	Outlet A	105.3	1	0.77	3.9	0.9%	6256	193	193	196	191
SWB1B	Culvert 3(#2) + 3(#3)	121	2	1.15	3.7	1.1%	23461	216	215	218	214
SWB1C	Outlet B	63.2	2.7	1.7	4.7	1.7%	120733	773	773	773	773
SWC1A	C1B	380	3	0.9	3.0	0.1%	3699	577	570	581	565
SWC1B	Pond 4 + C1A	612	4	2.9	2.9	0.5%	191849	483	484	485	483
SWD1A	Outlet D	87	2.5	1	5.3	1.5%	28626	233	233	233	233
SWE1A	Outlet E	141	1	1.7	6.4	0.8%	100850	213	213	213	213
SWG1A	G4B	1280	1.5	0.62	6.9	0.3%	3981	1103	1103	1103	1103
SWG1B	Pond 1	456	1	1.3	3.8	0.4%	17669	463	463	463	463
SWG1C	Pond 1 + G1A	631	1.5	1	3.8	0.7%	11847	813	813	813	813
SWG1D	Pond 2	116	1.5	0.87	5.2	0.2%	6229	409	400	391	400
SWG1E	Outlet G	71	3	0.9	3.6	0.6%	10909	1216	1211	1209	1211
Stream	Outlet G	38	4	1.4	1.2	0.5%	18095	1216	1211	1209	1211
SWG2A	G3A	799	1	0.54	3.0	0.6%	1592	668	691	661	658
SWG2B	G3A+G4A+G1B	751	0.75	0.92	5.6	0.7%	12631	2813	2723	2696	2753
SWG3A	G4A	606	1	0.44	4.5	0.5%	1246	297	297	297	297

Chicago 3-Hour Design Storm Results

Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.061	0.093	0.121	0.167	0.201	0.238
B	0.417	0.573	0.676	0.807	0.906	1.005
C	0.134	0.231	0.299	0.404	0.494	0.601
D	0.068	0.123	0.164	0.221	0.266	0.313
E	0.062	0.112	0.150	0.202	0.245	0.288
F	0.049	0.088	0.116	0.155	0.187	0.219
G	0.385	0.656	0.855	1.120	1.324	1.530

Do Nothing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.062	0.095	0.128	0.179	0.220	0.263
B	0.388	0.540	0.642	0.772	0.870	0.969
C	0.114	0.202	0.267	0.355	0.423	0.492
D	0.068	0.123	0.164	0.221	0.266	0.313
E	0.062	0.112	0.150	0.202	0.245	0.288
F	0.049	0.088	0.116	0.155	0.187	0.219
G	0.408	0.695	0.892	1.157	1.369	1.648

Alternative Method 1						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.062	0.096	0.129	0.181	0.222	0.263
B	0.388	0.540	0.642	0.772	0.870	0.969
C	0.115	0.202	0.268	0.356	0.425	0.495
D	0.068	0.123	0.164	0.221	0.266	0.313
E	0.062	0.112	0.150	0.202	0.245	0.288
F	0.049	0.088	0.116	0.155	0.187	0.219
G	0.405	0.692	0.888	1.152	1.363	1.634

Alternative Method 2						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.062	0.097	0.130	0.182	0.224	0.267
B	0.388	0.540	0.642	0.772	0.870	0.969
C	0.115	0.204	0.270	0.358	0.427	0.497
D	0.068	0.123	0.164	0.221	0.266	0.313
E	0.062	0.112	0.150	0.202	0.245	0.288
F	0.049	0.088	0.116	0.155	0.187	0.219
G	0.403	0.690	0.887	1.151	1.361	1.621

Alternative Method 3						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0.061	0.094	0.126	0.177	0.217	0.261
B	0.388	0.540	0.642	0.772	0.870	0.969
C	0.115	0.202	0.268	0.356	0.425	0.494
D	0.068	0.123	0.164	0.221	0.266	0.313
E	0.062	0.112	0.150	0.202	0.245	0.288
F	0.049	0.088	0.116	0.155	0.187	0.219
G	0.405	0.692	0.889	1.153	1.364	1.629

Future Approved Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	2%	2%	6%	7%	9%	11%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-15%	-13%	-11%	-12%	-14%	-18%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	6%	6%	4%	3%	3%	8%

Alternative Method 1 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	2%	3%	7%	8%	10%	11%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-14%	-13%	-10%	-12%	-14%	-18%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	5%	5%	4%	3%	3%	7%

Alternative Method 2 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	2%	4%	7%	9%	11%	12%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-14%	-12%	-10%	-11%	-14%	-17%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	5%	5%	4%	3%	3%	6%

Alternative Method 3 Difference from Existing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0%	1%	4%	6%	8%	10%
B	-7%	-6%	-5%	-4%	-4%	-4%
C	-14%	-13%	-10%	-12%	-14%	-18%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	5%	5%	4%	3%	3%	6%

Alternative Method 2 Difference from Do Nothing						
Outlet ID	2-year	5-year	10-year	25-year	50-year	100-year
A	0%	2%	2%	2%	2%	2%
B	0%	0%	0%	0%	0%	0%
C	1%	1%	1%	1%	1%	1%
D	0%	0%	0%	0%	0%	0%
E	0%	0%	0%	0%	0%	0%
F	0%	0%	0%	0%	0%	0%
G	-1%	-1%	-1%	-1%	-1%	-2%

Chicago 3-Hour Design Storm Results

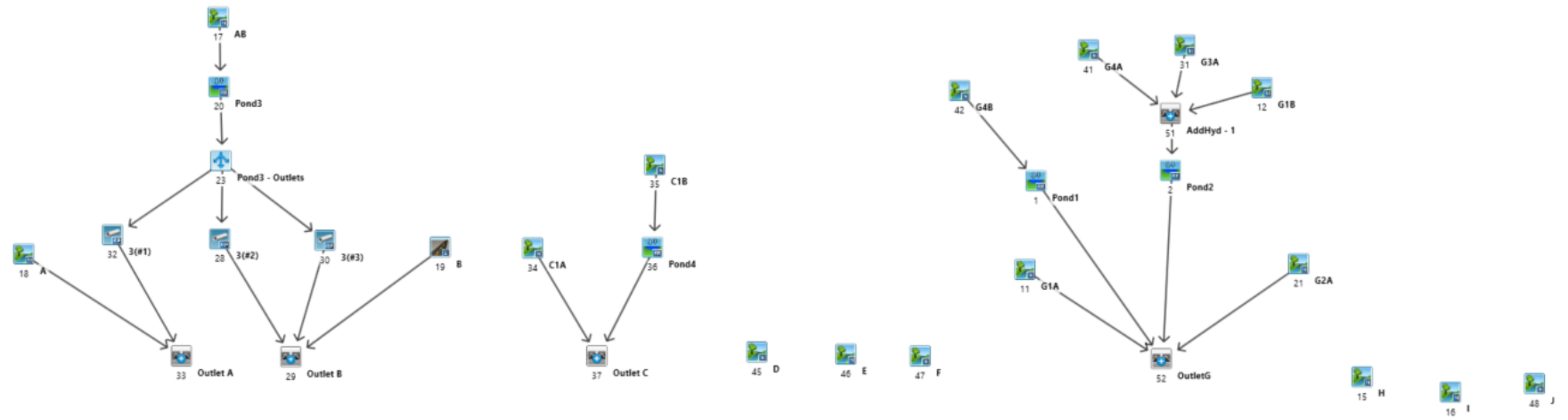
Peak Pond Storage in 100-year storm (ha-m)

Pond	Available	Existing	Do Nothing	AM 1	AM 2	AM 3
1	2.773	0.896	0.896	0.896	0.896	0.896
2	5.271	1.491	1.704	1.690	1.673	1.687
3	2.857	0.709	0.731	0.731	0.737	0.727
4	1.099	0.335	0.277	0.274	0.275	0.272

Peak Swale Conveyance during 25-year Storm

Name	Contributing Catchments	Geometry					Peak Swale Conveyance (L/s)				
		Length (m)	Representative Bottom Width (m)	Representative Depth (m)	Representative Side Slope (X:1)	Average Slope (%)	Available	Future Approved	AM 1	AM 2	AM 3
SWAB1A	AB	665	1.8	0.8	4.8	0.8%	9384	1458	1513	1478	1446
SWA1B	Outlet A	105.3	1	0.77	3.9	0.9%	6256	179	181	182	177
SWB1B	Culvert 3(#2) + 3(#3)	121	2	1.15	3.7	1.1%	23461	204	204	207	202
SWB1C	Outlet B	63.2	2.7	1.7	4.7	1.7%	120733	772	772	772	772
SWC1A	C1B	380	3	0.9	3.0	0.1%	3699	547	540	550	535
SWC1B	Pond 4 + C1A	612	4	2.9	2.9	0.5%	191849	457	148	459	456
SWD1A	Outlet D	87	2.5	1	5.3	1.5%	28626	221	221	221	221
SWE1A	Outlet E	141	1	1.7	6.4	0.8%	100850	202	202	202	202
SWG1A	G4B	1280	1.5	0.62	6.9	0.3%	3981	1053	1053	1053	1053
SWG1B	Pond 1	456	1	1.3	3.8	0.4%	17669	392	392	392	392
SWG1C	Pond 1 + G1A	631	1.5	1	3.8	0.7%	11847	726	726	726	726
SWG1D	Pond 2	116	1.5	0.87	5.2	0.2%	6229	325	321	317	321
SWG1E	Outlet G	71	3	0.9	3.6	0.6%	10909	1157	1152	1151	1153
Stream	Outlet G	38	4	1.4	1.2	0.5%	18095	1157	1152	1151	1153
SWG2A	G3A	799	1	0.54	3.0	0.6%	1592	637	659	630	627
SWG2B	G3A+G4A+G1B	751	0.75	0.92	5.6	0.7%	12631	2677	2590	2565	2619
SWG3A	G4A	606	1	0.44	4.5	0.5%	1246	283	283	283	283

VO Model Schematic



Existing Conditions
100-year 4-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\88e08943-81bc-4969-8605-dc58f0779140\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\88e08943-81bc-4969-8605-dc58f0779140\s

DATE: 07-15-2025 TIME: 08:40:16
USER:

COMMENTS:

** SIMULATION : 100-year-4hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 70.38 mm | B= 0.000
C= 0.743
used in: INTENSITY = A / (t + B)^C
Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. It displays rainfall intensity data at various time intervals from 0.00 to 0.83 hours.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0

|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 1.03

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.479 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 36.792
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.523

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

| CALIB |
| NASHYD (0012) | Area (ha)= 32.91 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.60

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 2.095

PEAK FLOW (cms)= 2.050 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 39.467
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.561

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

```

-----
| CALIB |
| NASHYD ( 0031) | Area (ha)= 18.71 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 2.44

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.293

PEAK FLOW (cms)= 0.395 (i)
 TIME TO PEAK (hrs)= 4.333
 RUNOFF VOLUME (mm)= 38.267
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.544

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.64 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.363

PEAK FLOW (cms)= 0.400 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.105
 TOTAL RAINFALL (mm)= 70.382

RUNOFF COEFFICIENT = 0.541

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0012):  32.91  2.050    2.00    39.47
+ ID2= 2 ( 0031):  18.71  0.395    4.33    38.27
=====
ID = 3 ( 0051):  51.62  2.157    2.00    39.03
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051):  51.62  2.157    2.00    39.03
+ ID2= 2 ( 0041):  10.64  0.400    2.67    38.10
=====
ID = 1 ( 0051):  62.26  2.460    2.08    38.87
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      | OUTFLOW      STORAGE
          (cms)      (ha.m.)      | (cms)      (ha.m.)
0.0000      0.0000      | 1.3450      2.1963
0.0302      0.2196      | 2.0056      2.4160
0.1060      0.4393      | 2.9861      2.6356
0.1484      0.6589      | 5.1073      3.0749
0.1976      0.8785      | 6.4750      3.5141
0.2620      1.0982      | 6.9124      3.9534
0.3256      1.3178      | 7.3312      4.3927
0.4719      1.5374      | 7.7329      4.8319
0.6161      1.7571      | 8.1186      5.2712
0.8070      1.9767      | 0.0000      0.0000
```

```

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051)  62.260    2.460    2.08    38.87
OUTFLOW: ID= 1 ( 0002)  62.260    0.529    5.25    38.84
```

PEAK FLOW REDUCTION [Qout/Qin] (%) = 21.50
TIME SHIFT OF PEAK FLOW (min) = 190.00
MAXIMUM STORAGE USED (ha.m.) = 1.6245

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha) = 19.40 Curve Number (CN) = 81.0
| ID= 1 DT= 5.0 min | Ia (mm) = 3.00 # of Linear Res. (N) = 3.00
-----
U.H. Tp (hrs) = 0.66
```

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     5.06 | 1.083    26.53 | 2.083    10.53 | 3.08     5.93
```


0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 1.007 (i)
 TIME TO PEAK (hrs)= 2.083
 RUNOFF VOLUME (mm)= 35.760
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.508

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

```

-----
| CALIB |
| NASHYD ( 0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.20

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08     5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17     5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25     5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33     5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42     5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50     5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58     4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67     4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75     4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83     4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92     4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00     4.51

```

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.490 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 39.468
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| RESERVOIR( 0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.7119     0.9480
0.0123     0.0780 | 1.9253     1.1420
0.0329     0.1570 | 2.5634     1.3440
0.0407     0.2380 | 2.7870     1.5530

```

0.0476	0.3210		2.9936	1.7700
0.0805	0.4060		3.1872	1.9930
0.1414	0.4920		3.3696	2.2250
0.1808	0.5790		3.6262	2.5860
0.2708	0.6690		3.7476	2.7730
0.4375	0.7600		0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0042)	40.210	1.490	2.75	39.47
OUTFLOW: ID= 1 (0001)	40.210	0.704	4.67	39.43

PEAK FLOW REDUCTION [Qout/Qin](%)= 47.22
 TIME SHIFT OF PEAK FLOW (min)=115.00
 MAXIMUM STORAGE USED (ha.m.)= 0.9427

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.704    4.67   39.43
+ ID2= 2 ( 0011):  12.45  0.479    2.50   36.79
=====
ID = 3 ( 0052):  52.66  0.914    4.25   38.81
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.914    4.25   38.81
+ ID2= 2 ( 0002):  62.26  0.529    5.25   38.84
=====
ID = 1 ( 0052):  114.92  1.398    4.50   38.83
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  114.92  1.398    4.50   38.83
+ ID2= 2 ( 0021):  19.40  1.007    2.08   35.76
=====
ID = 3 ( 0052):  134.32  1.627    4.17   38.38
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0017) | Area (ha)= 31.84 Curve Number (CN)= 85.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.50 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.93
  
```

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    5.06 | 1.083    26.53 | 2.083    10.53 | 3.08    5.93
0.167    5.06 | 1.167    26.53 | 2.167    10.53 | 3.17    5.93
0.250    5.69 | 1.250   186.64 | 2.250     9.23 | 3.25    5.57
  
```

0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.308

PEAK FLOW (cms)= 1.451 (i)
 TIME TO PEAK (hrs)= 2.417
 RUNOFF VOLUME (mm)= 40.044
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.569

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

```

-----
| RESERVOIR( 0020)| OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min    |
-----
| OUTFLOW STORAGE | OUTFLOW STORAGE
| (cms) (ha.m.)   | (cms) (ha.m.)
|-----|
| 0.0000 0.0000   | 1.7783 1.1263
| 0.0245 0.1030   | 1.8455 1.2511
| 0.0690 0.2080   | 1.9113 1.3782
| 0.1181 0.3152   | 1.9743 1.5076
| 0.2257 0.4245   | 2.0363 1.6394
| 0.3402 0.5360   | 2.1548 1.9101
| 0.4374 0.6496   | 2.2669 2.1903
| 0.7664 0.7654   | 2.3755 2.4803
| 1.3220 0.8835   | 2.4795 2.7803
| 1.6822 1.0038   | 2.5047 2.8569
|-----|
| AREA QPEAK TPEAK R.V.
| (ha) (cms) (hrs) (mm)
|-----|
INFLOW : ID= 2 ( 0017) 31.840 1.451 2.42 40.04
OUTFLOW: ID= 1 ( 0020) 31.840 0.671 4.08 40.01

```

PEAK FLOW REDUCTION [Qout/Qin](%)= 46.23
 TIME SHIFT OF PEAK FLOW (min)=100.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7319

```

-----
| DIVERTHYD( 0023)|
| IN= 1 # OUT= 5 |
|-----|

```

Outflow / Inflow Relationships

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total					
(cms)	(cms)	(cms)	(cms)	(cms)	(cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91

0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD. (ID= 1):	31.84	0.67	4.08	40.01
=====				
ID= 2 (3) :	15.95	0.25	4.08	40.01
ID= 3 (3) :	8.86	0.27	4.08	40.01
ID= 4 (3) :	7.04	0.15	4.08	40.01
ID= 5 (3) :	0.00	0.00	0.00	0.00
ID= 6 (3) :	0.00	0.00	0.00	0.00

```

-----
| ROUTEPIPE( 0028)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	8.86	0.27	4.08	40.01	0.22	1.44
OUTFLOW: ID= 1 (0028)	8.86	0.27	4.17	40.01	0.22	1.43

```

-----
| ROUTEPIPE( 0030)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67

0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	7.04	0.15	4.08	40.01	0.17	1.25
OUTFLOW: ID= 1 (0030)	7.04	0.15	4.17	40.01	0.17	1.25

```

| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	1.00
Length	(m)=	215.87	712.00
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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Max.Eff.Inten.(mm/hr)=	186.64	25.57
over (min)	5.00	90.00
Storage Coeff. (min)=	2.57 (ii)	86.92 (ii)
Unit Hyd. Tpeak (min)=	5.00	90.00
Unit Hyd. peak (cms)=	0.29	0.01

TOTALS

PEAK FLOW	(cms)=	1.00	0.15	1.006 (iii)
TIME TO PEAK	(hrs)=	1.33	2.75	1.33
RUNOFF VOLUME	(mm)=	68.38	35.29	44.55
TOTAL RAINFALL	(mm)=	70.38	70.38	70.38
RUNOFF COEFFICIENT	=	0.97	0.50	0.63

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0019):    6.99    1.006    1.33    44.55
+ ID2= 2 ( 0028):    8.86    0.265    4.17    40.01
=====
ID = 3 ( 0029):   15.85    1.006    1.33    42.01
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0029) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0029):   15.85    1.006    1.33    42.01
+ ID2= 2 ( 0030):    7.04    0.152    4.17    40.01
=====
ID = 1 ( 0029):   22.88    1.006    1.33    41.40
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTEPIPE( 0032) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          PIPE Number      = 1.00
          Diameter (mm)=1650.00
          Length (m)= 500.00
          Slope (m/m)= 0.005
          Manning n      = 0.013
```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	15.95	0.25	4.08	40.01	0.22	1.41
OUTFLOW: ID= 1 (0032)	15.95	0.25	4.08	40.01	0.22	1.41

```

-----
| CALIB |
| NASHYD ( 0018) | Area (ha)= 0.94 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.178 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 37.965
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.539

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

```

-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
AREA    QPEAK    TPEAK    R.V.
(ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0018):  0.94  0.178  1.33  37.97
+ ID2= 2 ( 0032): 15.95  0.252  4.08  40.01
=====
ID = 3 ( 0033):  16.89  0.261  4.00  39.90

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.77 Curve Number (CN)= 83.0
|ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.50

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57

```

0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.517

PEAK FLOW (cms)= 0.451 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 37.133
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.528

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

```

-----
| CALIB          |
| NASHYD ( 0035)| Area      (ha)= 15.77  Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia        (mm)= 3.90  # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 0.42
  
```

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    5.06 | 1.083    26.53 | 2.083    10.53 | 3.08     5.93
0.167    5.06 | 1.167    26.53 | 2.167    10.53 | 3.17     5.93
0.250    5.69 | 1.250   186.64 | 2.250     9.23 | 3.25     5.57
0.333    5.69 | 1.333   186.64 | 2.333     9.23 | 3.33     5.57
0.417    6.55 | 1.417    33.08 | 2.417     8.25 | 3.42     5.25
0.500    6.55 | 1.500    33.08 | 2.500     8.25 | 3.50     5.25
0.583    7.79 | 1.583    20.27 | 2.583     7.49 | 3.58     4.97
0.667    7.79 | 1.667    20.27 | 2.667     7.49 | 3.67     4.97
0.750    9.78 | 1.750    15.20 | 2.750     6.87 | 3.75     4.72
0.833    9.78 | 1.833    15.20 | 2.833     6.87 | 3.83     4.72
0.917   13.66 | 1.917    12.37 | 2.917     6.36 | 3.92     4.51
1.000   13.66 | 2.000    12.37 | 3.000     6.36 | 4.00     4.51
  
```

Unit Hyd Qpeak (cms)= 1.434

PEAK FLOW (cms)= 1.247 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 38.475
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.547

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

```

-----
| RESERVOIR( 0036)| OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
      OUTFLOW      STORAGE | OUTFLOW      STORAGE
      (cms)        (ha.m.) | (cms)        (ha.m.)
      0.0000      0.0000 | 0.9922      0.4686
      0.0150      0.0403 | 1.3581      0.5239
      0.0508      0.0819 | 1.4554      0.5809
      0.0745      0.1250 | 1.5104      0.6396
      0.1065      0.1696 | 1.5636      0.6999
      0.1567      0.2156 | 1.6156      0.7620
      0.1928      0.2631 | 1.6657      0.8257
  
```


0.2872	0.3021		1.7150	0.8913
0.4020	0.3627		1.7631	0.9586
0.5684	0.4149		1.8561	1.0987

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	15.770	1.247	1.75	38.48
OUTFLOW: ID= 1 (0036)	15.770	0.372	2.83	38.43

PEAK FLOW REDUCTION [Qout/Qin] (%)= 29.84
TIME SHIFT OF PEAK FLOW (min)= 65.00
MAXIMUM STORAGE USED (ha.m.)= 0.3471

| ADD HYD (0037) |
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0034): 6.77 0.451 1.83 37.13
+ ID2= 2 (0036): 15.77 0.372 2.83 38.43
=====

ID = 3 (0037): 22.54 0.643 2.25 38.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.14

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.329 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.572
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.505

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

| CALIB |
| NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.08

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 33.811
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.480

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

```
-----
| CALIB |
| NASHYD ( 0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.22
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.230 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 37.086
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.527

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

Existing Conditions
100-year 3-hour Chicago

=====
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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\05ba6f71-d5d4-44a6-b1bd-4cde131d36ba\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\05ba6f71-d5d4-44a6-b1bd-4cde131d36ba\s

DATE: 07-15-2025 TIME: 08:40:08

USER:

COMMENTS: _____

** SIMULATION : 100-year-3hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 65.35 mm | B= 0.000
----- C= 0.743
used in: INTENSITY = A / (t + B)^C

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

TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.00 6.55 | 0.83 186.64 | 1.67 10.53 | 2.50 6.36
0.17 7.79 | 1.00 33.08 | 1.83 9.23 | 2.67 5.93
0.33 9.78 | 1.17 20.27 | 2.00 8.25 | 2.83 5.57
0.50 13.66 | 1.33 15.20 | 2.17 7.49 |
0.67 26.53 | 1.50 12.37 | 2.33 6.87 |

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0

|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 1.03

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.458 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 32.837
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.502

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

| CALIB |
| NASHYD (0012) | Area (ha)= 32.91 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.60

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 2.095

PEAK FLOW (cms)= 1.959 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| CALIB |
| NASHYD (0031) | Area (ha)= 18.71 Curve Number (CN)= 83.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 2.44

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |  hrs   mm/hr |  hrs   mm/hr |  hrs   mm/hr
0.083    6.55 | 0.833   26.53 | 1.583   12.37 | 2.33    7.49
0.167    6.55 | 0.917  186.64 | 1.667   12.37 | 2.42    6.87
0.250    7.79 | 1.000  186.64 | 1.750   10.53 | 2.50    6.87
0.333    7.79 | 1.083   33.08 | 1.833   10.53 | 2.58    6.36
0.417    9.78 | 1.167   33.08 | 1.917    9.23 | 2.67    6.36
0.500    9.78 | 1.250   20.27 | 2.000    9.23 | 2.75    5.93
0.583   13.66 | 1.333   20.27 | 2.083    8.25 | 2.83    5.93
0.667   13.66 | 1.417   15.20 | 2.167    8.25 | 2.92    5.57
0.750   26.53 | 1.500   15.20 | 2.250    7.49 | 3.00    5.57

```

Unit Hyd Qpeak (cms)= 0.293

PEAK FLOW (cms)= 0.370 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 34.227
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.524

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.64 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |  hrs   mm/hr |  hrs   mm/hr |  hrs   mm/hr
0.083    6.55 | 0.833   26.53 | 1.583   12.37 | 2.33    7.49
0.167    6.55 | 0.917  186.64 | 1.667   12.37 | 2.42    6.87
0.250    7.79 | 1.000  186.64 | 1.750   10.53 | 2.50    6.87
0.333    7.79 | 1.083   33.08 | 1.833   10.53 | 2.58    6.36
0.417    9.78 | 1.167   33.08 | 1.917    9.23 | 2.67    6.36
0.500    9.78 | 1.250   20.27 | 2.000    9.23 | 2.75    5.93
0.583   13.66 | 1.333   20.27 | 2.083    8.25 | 2.83    5.93
0.667   13.66 | 1.417   15.20 | 2.167    8.25 | 2.92    5.57
0.750   26.53 | 1.500   15.20 | 2.250    7.49 | 3.00    5.57

```

Unit Hyd Qpeak (cms)= 0.363

PEAK FLOW (cms)= 0.382 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.068
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.521

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

```

-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0012): 32.91 1.959 1.67 35.35
+ ID2= 2 ( 0031): 18.71 0.370 3.83 34.23

```


=====

ID = 3 (0051):	51.62	2.058	1.67	34.94
-----------------	-------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0051)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0051):	51.62	2.058	1.67	34.94
+ ID2= 2 (0041):	10.64	0.382	2.33	34.07
=====				
ID = 1 (0051):	62.26	2.350	1.75	34.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW	STORAGE	OUTFLOW	STORAGE
-----	(cms)	(ha.m.)	(cms)	(ha.m.)
	0.0000	0.0000	1.3450	2.1963
	0.0302	0.2196	2.0056	2.4160
	0.1060	0.4393	2.9861	2.6356
	0.1484	0.6589	5.1073	3.0749
	0.1976	0.8785	6.4750	3.5141
	0.2620	1.0982	6.9124	3.9534
	0.3256	1.3178	7.3312	4.3927
	0.4719	1.5374	7.7329	4.8319
	0.6161	1.7571	8.1186	5.2712
	0.8070	1.9767	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0051)	62.260	2.350	1.75	34.79
OUTFLOW: ID= 1 (0002)	62.260	0.441	4.83	34.76

PEAK FLOW REDUCTION [Qout/Qin] (%) = 18.76

TIME SHIFT OF PEAK FLOW (min) = 185.00

MAXIMUM STORAGE USED (ha.m.) = 1.4909

CALIB			
NASHYD (0021)	Area (ha) =	19.40	Curve Number (CN) = 81.0
ID= 1 DT= 5.0 min	Ia (mm) =	3.00	# of Linear Res. (N) = 3.00
-----	U.H. Tp (hrs) =	0.66	

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.083	6.55		0.833	26.53		1.583	12.37		2.33	7.49
0.167	6.55		0.917	186.64		1.667	12.37		2.42	6.87
0.250	7.79		1.000	186.64		1.750	10.53		2.50	6.87
0.333	7.79		1.083	33.08		1.833	10.53		2.58	6.36
0.417	9.78		1.167	33.08		1.917	9.23		2.67	6.36
0.500	9.78		1.250	20.27		2.000	9.23		2.75	5.93
0.583	13.66		1.333	20.27		2.083	8.25		2.83	5.93
0.667	13.66		1.417	15.20		2.167	8.25		2.92	5.57
0.750	26.53		1.500	15.20		2.250	7.49		3.00	5.57

Unit Hyd Qpeak (cms) = 1.123

PEAK FLOW (cms) = 0.960 (i)

TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 31.882
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.488

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

| CALIB |
| NASHYD (0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res. (N)= 3.00

U.H. Tp(hrs)= 1.20

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

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.428 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| RESERVOIR(0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.7119 0.9480
0.0123 0.0780 | 1.9253 1.1420
0.0329 0.1570 | 2.5634 1.3440
0.0407 0.2380 | 2.7870 1.5530
0.0476 0.3210 | 2.9936 1.7700
0.0805 0.4060 | 3.1872 1.9930
0.1414 0.4920 | 3.3696 2.2250
0.1808 0.5790 | 3.6262 2.5860
0.2708 0.6690 | 3.7476 2.7730
0.4375 0.7600 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0042) 40.210 1.428 2.42 35.35
OUTFLOW: ID= 1 (0001) 40.210 0.635 4.25 35.31

PEAK FLOW REDUCTION [Qout/Qin] (%)= 44.51
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.8958

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):    40.21    0.635    4.25    35.31
+ ID2= 2 ( 0011):    12.45    0.458    2.25    32.84
=====
ID = 3 ( 0052):    52.66    0.830    3.67    34.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):    52.66    0.830    3.67    34.73
+ ID2= 2 ( 0002):    62.26    0.441    4.83    34.76
=====
ID = 1 ( 0052):   114.92    1.229    3.92    34.75

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):   114.92    1.229    3.92    34.75
+ ID2= 2 ( 0021):    19.40    0.960    1.75    31.88
=====
ID = 3 ( 0052):   134.32    1.530    1.92    34.33

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0017) | Area (ha)= 31.84 Curve Number (CN)= 85.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.50 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.93

```

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

```

-----
          TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
          hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083      6.55 | 0.833      26.53 | 1.583      12.37 | 2.33      7.49
0.167      6.55 | 0.917     186.64 | 1.667      12.37 | 2.42      6.87
0.250      7.79 | 1.000     186.64 | 1.750      10.53 | 2.50      6.87
0.333      7.79 | 1.083      33.08 | 1.833      10.53 | 2.58      6.36
0.417      9.78 | 1.167      33.08 | 1.917       9.23 | 2.67      6.36
0.500      9.78 | 1.250     20.27 | 2.000       9.23 | 2.75      5.93
0.583     13.66 | 1.333     20.27 | 2.083       8.25 | 2.83      5.93
0.667     13.66 | 1.417     15.20 | 2.167       8.25 | 2.92      5.57
0.750     26.53 | 1.500     15.20 | 2.250       7.49 | 3.00      5.57

```

Unit Hyd Qpeak (cms)= 1.308

PEAK FLOW (cms)= 1.387 (i)

TIME TO PEAK (hrs)= 2.083

RUNOFF VOLUME (mm)= 35.861

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.549

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

```

-----
| RESERVOIR( 0020) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----

```

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.7783	1.1263
0.0245	0.1030	1.8455	1.2511
0.0690	0.2080	1.9113	1.3782
0.1181	0.3152	1.9743	1.5076
0.2257	0.4245	2.0363	1.6394
0.3402	0.5360	2.1548	1.9101
0.4374	0.6496	2.2669	2.1903
0.7664	0.7654	2.3755	2.4803
1.3220	0.8835	2.4795	2.7803
1.6822	1.0038	2.5047	2.8569

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0017)	31.840	1.387	2.08	35.86
OUTFLOW: ID= 1 (0020)	31.840	0.606	3.67	35.83

PEAK FLOW REDUCTION [Qout/Qin] (%) = 43.72
 TIME SHIFT OF PEAK FLOW (min) = 95.00
 MAXIMUM STORAGE USED (ha.m.) = 0.7092

```

-----
| DIVERTHYD( 0023) |
| IN= 1 # OUT= 5 |
-----

```

Outflow / Inflow Relationships

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total

(cms)	(cms)	(cms)	(cms)	(cms)	(cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91
0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD. (ID= 1):	31.84	0.61	3.67	35.83

```

=====
ID= 2 ( 3) : 16.48 0.24 3.67 35.83
ID= 3 ( 3) : 8.28 0.22 3.67 35.83
ID= 4 ( 3) : 7.08 0.15 3.67 35.83
ID= 5 ( 3) : 0.00 0.00 0.00 0.00
ID= 6 ( 3) : 0.00 0.00 0.00 0.00

```

```

-----
| ROUTEPIPE( 0028) |
| IN= 2---> OUT= 1 |

```

PIPE Number = 1.00
 Diameter (mm)=1650.00

```

| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

```

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	8.28	0.22	3.67	35.83	0.20	1.36
OUTFLOW: ID= 1 (0028)	8.28	0.22	3.75	35.83	0.20	1.35

```

-----
| ROUTEPIPE( 0030) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

```

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	7.08	0.15	3.67	35.83	0.17	1.24

OUTFLOW: ID= 1 (0030) 7.08 0.15 3.67 35.83 0.17 1.23

```
-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----
```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.96	5.03
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	1.00
Length (m)=	215.87	712.00
Mannings n =	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57
```

Max.Eff.Inten.(mm/hr)=	186.64	24.61
over (min)	5.00	90.00
Storage Coeff. (min)=	2.57 (ii)	88.22 (ii)
Unit Hyd. Tpeak (min)=	5.00	90.00
Unit Hyd. peak (cms)=	0.29	0.01

TOTALS

PEAK FLOW (cms)=	1.00	0.14	1.004 (iii)
TIME TO PEAK (hrs)=	1.00	2.50	1.00
RUNOFF VOLUME (mm)=	63.35	31.37	40.32
TOTAL RAINFALL (mm)=	65.35	65.35	65.35
RUNOFF COEFFICIENT =	0.97	0.48	0.62

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
| | (ha) (cms) (hrs) (mm)
-----
ID1= 1 ( 0019): 6.99 1.004 1.00 40.32
+ ID2= 2 ( 0028): 8.28 0.218 3.75 35.83
=====
ID = 3 ( 0029): 15.27 1.005 1.00 37.88
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0029) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0029): 15.27 1.005 1.00 37.88
+ ID2= 2 ( 0030): 7.08 0.148 3.67 35.83
=====
ID = 1 ( 0029): 22.35 1.005 1.00 37.23

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ROUTEPIPE( 0032) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
PIPE Number = 1.00
Diameter (mm)=1650.00
Length (m)= 500.00
Slope (m/m)= 0.005
Manning n = 0.013

```

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	16.48	0.24	3.67	35.83	0.21	1.39
OUTFLOW: ID= 1 (0032)	16.48	0.24	3.75	35.83	0.21	1.38

```

| CALIB |
| NASHYD ( 0018) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.94 Curve Number (CN)= 84.0
Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.12

```

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	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57

0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.169 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 33.922
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.519

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0018):    0.94    0.169      1.00    33.92
+ ID2= 2 ( 0032):   16.48    0.238      3.75    35.83
=====
ID = 3 ( 0033):   17.42    0.238      3.75    35.72
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.77 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
          U.H. Tp(hrs)= 0.50
-----
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME      RAIN | TIME      RAIN | TIME      RAIN |
hrs mm/hr | hrs mm/hr | hrs mm/hr |
0.083 6.55 | 0.833 26.53 | 1.583 12.37 |
0.167 6.55 | 0.917 186.64 | 1.667 12.37 |
0.250 7.79 | 1.000 186.64 | 1.750 10.53 |
0.333 7.79 | 1.083 33.08 | 1.833 10.53 |
0.417 9.78 | 1.167 33.08 | 1.917 9.23 |
0.500 9.78 | 1.250 20.27 | 2.000 9.23 |
0.583 13.66 | 1.333 20.27 | 2.083 8.25 |
0.667 13.66 | 1.417 15.20 | 2.167 8.25 |
0.750 26.53 | 1.500 15.20 | 2.250 7.49 |
```

Unit Hyd Qpeak (cms)= 0.517

PEAK FLOW (cms)= 0.428 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 33.117
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.507

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

```
-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 15.77 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
          U.H. Tp(hrs)= 0.42
-----
```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 1.434

PEAK FLOW (cms)= 1.186 (i)
 TIME TO PEAK (hrs)= 1.417
 RUNOFF VOLUME (mm)= 34.377
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.526

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

 | RESERVOIR(0036) | OVERFLOW IS OFF
 | IN= 2---> OUT= 1 |
 | DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9922	0.4686
0.0150	0.0403	1.3581	0.5239
0.0508	0.0819	1.4554	0.5809
0.0745	0.1250	1.5104	0.6396
0.1065	0.1696	1.5636	0.6999
0.1567	0.2156	1.6156	0.7620
0.1928	0.2631	1.6657	0.8257
0.2872	0.3021	1.7150	0.8913
0.4020	0.3627	1.7631	0.9586
0.5684	0.4149	1.8561	1.0987

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0035)	15.770	1.186	1.42	34.38
OUTFLOW: ID= 1 (0036)	15.770	0.350	2.58	34.33

PEAK FLOW REDUCTION [Qout/Qin] (%)= 29.51
 TIME SHIFT OF PEAK FLOW (min)= 70.00
 MAXIMUM STORAGE USED (ha.m.)= 0.3353

 | ADD HYD (0037) |
 | 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0034):	6.77	0.428	1.50	33.12
+ ID2= 2 (0036):	15.77	0.350	2.58	34.33
=====				
ID = 3 (0037):	22.54	0.601	2.00	33.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 | CALIB |
 | NASHYD (0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00
 ----- U.H. Tp(hrs)= 0.14

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.313 (i)
 TIME TO PEAK (hrs)= 1.083
 RUNOFF VOLUME (mm)= 31.669
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.485

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

 | CALIB |
 | NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00
 ----- U.H. Tp(hrs)= 0.08

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.288 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 30.101
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.461

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

 | CALIB |
 | NASHYD (0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
 ----- U.H. Tp(hrs)= 0.22

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.219 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 33.075

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.506

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

Future Baseline
100-year 4-hour Chicago

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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\92315c14-cd8e-48e1-929f-854439ae614b\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\92315c14-cd8e-48e1-929f-854439ae614b\s

DATE: 07-15-2025 TIME: 09:46:44

USER:

COMMENTS:

** SIMULATION : 100-year-4hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 70.38 mm | B= 0.000
C= 0.743
used in: INTENSITY = A / (t + B)^C
Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0

|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 1.03

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.479 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 36.792
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.523

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

| CALIB |
| NASHYD (0012) | Area (ha)= 30.09 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.40

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 2.873

PEAK FLOW (cms)= 2.534 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 39.464
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.561

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

```

-----
| CALIB |
| NASHYD ( 0031) | Area (ha)= 24.10 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.80 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083  5.06 | 1.083  26.53 | 2.083  10.53 | 3.08  5.93
0.167  5.06 | 1.167  26.53 | 2.167  10.53 | 3.17  5.93
0.250  5.69 | 1.250 186.64 | 2.250   9.23 | 3.25  5.57
0.333  5.69 | 1.333 186.64 | 2.333   9.23 | 3.33  5.57
0.417  6.55 | 1.417  33.08 | 2.417   8.25 | 3.42  5.25
0.500  6.55 | 1.500  33.08 | 2.500   8.25 | 3.50  5.25
0.583  7.79 | 1.583  20.27 | 2.583   7.49 | 3.58  4.97
0.667  7.79 | 1.667  20.27 | 2.667   7.49 | 3.67  4.97
0.750  9.78 | 1.750  15.20 | 2.750   6.87 | 3.75  4.72
0.833  9.78 | 1.833  15.20 | 2.833   6.87 | 3.83  4.72
0.917 13.66 | 1.917  12.37 | 2.917   6.36 | 3.92  4.51
1.000 13.66 | 2.000  12.37 | 3.000   6.36 | 4.00  4.51

```

Unit Hyd Qpeak (cms)= 0.822

PEAK FLOW (cms)= 0.907 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.186
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.543

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083  5.06 | 1.083  26.53 | 2.083  10.53 | 3.08  5.93
0.167  5.06 | 1.167  26.53 | 2.167  10.53 | 3.17  5.93
0.250  5.69 | 1.250 186.64 | 2.250   9.23 | 3.25  5.57
0.333  5.69 | 1.333 186.64 | 2.333   9.23 | 3.33  5.57
0.417  6.55 | 1.417  33.08 | 2.417   8.25 | 3.42  5.25
0.500  6.55 | 1.500  33.08 | 2.500   8.25 | 3.50  5.25
0.583  7.79 | 1.583  20.27 | 2.583   7.49 | 3.58  4.97
0.667  7.79 | 1.667  20.27 | 2.667   7.49 | 3.67  4.97
0.750  9.78 | 1.750  15.20 | 2.750   6.87 | 3.75  4.72
0.833  9.78 | 1.833  15.20 | 2.833   6.87 | 3.83  4.72
0.917 13.66 | 1.917  12.37 | 2.917   6.36 | 3.92  4.51
1.000 13.66 | 2.000  12.37 | 3.000   6.36 | 4.00  4.51

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.403 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.105
 TOTAL RAINFALL (mm)= 70.382

RUNOFF COEFFICIENT = 0.541

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0012):  30.09  2.534    1.67    39.46
+ ID2= 2 ( 0031):  24.10  0.907    2.67    38.19
=====
ID = 3 ( 0051):  54.19  2.983    1.75    38.90
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051):  54.19  2.983    1.75    38.90
+ ID2= 2 ( 0041):  10.73  0.403    2.67    38.10
=====
ID = 1 ( 0051):  64.92  3.195    1.83    38.76
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      | OUTFLOW      STORAGE
          (cms)      (ha.m.)      | (cms)      (ha.m.)
0.0000      0.0000      | 1.3450      2.1963
0.0302      0.2196      | 2.0056      2.4160
0.1060      0.4393      | 2.9861      2.6356
0.1484      0.6589      | 5.1073      3.0749
0.1976      0.8785      | 6.4750      3.5141
0.2620      1.0982      | 6.9124      3.9534
0.3256      1.3178      | 7.3312      4.3927
0.4719      1.5374      | 7.7329      4.8319
0.6161      1.7571      | 8.1186      5.2712
0.8070      1.9767      | 0.0000      0.0000
```

```

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051)  64.920      3.195      1.83      38.76
OUTFLOW: ID= 1 ( 0002)  64.920      0.686      4.67      38.74
```

PEAK FLOW REDUCTION [Qout/Qin] (%) = 21.49
TIME SHIFT OF PEAK FLOW (min) = 170.00
MAXIMUM STORAGE USED (ha.m.) = 1.8382

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha) = 19.40 Curve Number (CN) = 81.0
| ID= 1 DT= 5.0 min | Ia (mm) = 3.00 # of Linear Res. (N) = 3.00
-----
          U.H. Tp(hrs) = 0.66
```

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      5.06 | 1.083     26.53 | 2.083     10.53 | 3.08      5.93
```

0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 1.007 (i)
 TIME TO PEAK (hrs)= 2.083
 RUNOFF VOLUME (mm)= 35.760
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.508

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

```

-----
| CALIB |
| NASHYD ( 0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.20
  
```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
  
```

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.490 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 39.468
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| RESERVOIR( 0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.7119     0.9480
0.0123     0.0780 | 1.9253     1.1420
0.0329     0.1570 | 2.5634     1.3440
0.0407     0.2380 | 2.7870     1.5530
  
```


0.0476	0.3210		2.9936	1.7700
0.0805	0.4060		3.1872	1.9930
0.1414	0.4920		3.3696	2.2250
0.1808	0.5790		3.6262	2.5860
0.2708	0.6690		3.7476	2.7730
0.4375	0.7600		0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0042)	40.210	1.490	2.75	39.47
OUTFLOW: ID= 1 (0001)	40.210	0.704	4.67	39.43

PEAK FLOW REDUCTION [Qout/Qin](%)= 47.22
 TIME SHIFT OF PEAK FLOW (min)=115.00
 MAXIMUM STORAGE USED (ha.m.)= 0.9427

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.704    4.67   39.43
+ ID2= 2 ( 0011):  12.45  0.479    2.50   36.79
=====
ID = 3 ( 0052):  52.66  0.914    4.25   38.81
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.914    4.25   38.81
+ ID2= 2 ( 0002):  64.92  0.686    4.67   38.74
=====
ID = 1 ( 0052):  117.58  1.587    4.42   38.77
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  117.58  1.587    4.42   38.77
+ ID2= 2 ( 0021):  19.40  1.007    2.08   35.76
=====
ID = 3 ( 0052):  136.98  1.825    4.17   38.34
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0017) | Area (ha)= 32.61 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55
  
```

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    5.06 | 1.083    26.53 | 2.083    10.53 | 3.08    5.93
0.167    5.06 | 1.167    26.53 | 2.167    10.53 | 3.17    5.93
0.250    5.69 | 1.250   186.64 | 2.250     9.23 | 3.25    5.57
  
```

0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 2.265

PEAK FLOW (cms)= 2.118 (i)
TIME TO PEAK (hrs)= 1.917
RUNOFF VOLUME (mm)= 38.642
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.549

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

```

-----
| RESERVOIR( 0020) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW          | STORAGE          | OUTFLOW          | STORAGE          |
| (cms)            | (ha.m.)          | (cms)            | (ha.m.)          |
| 0.0000           | 0.0000           | 1.7783           | 1.1263           |
| 0.0245           | 0.1030           | 1.8455           | 1.2511           |
| 0.0690           | 0.2080           | 1.9113           | 1.3782           |
| 0.1181           | 0.3152           | 1.9743           | 1.5076           |
| 0.2257           | 0.4245           | 2.0363           | 1.6394           |
| 0.3402           | 0.5360           | 2.1548           | 1.9101           |
| 0.4374           | 0.6496           | 2.2669           | 2.1903           |
| 0.7664           | 0.7654           | 2.3755           | 2.4803           |
| 1.3220           | 0.8835           | 2.4795           | 2.7803           |
| 1.6822           | 1.0038           | 2.5047           | 2.8569           |
|
| AREA             | QPEAK            | TPEAK            | R.V.             |
| (ha)             | (cms)            | (hrs)            | (mm)             |
INFLOW : ID= 2 ( 0017) 32.610 2.118 1.92 38.64
OUTFLOW: ID= 1 ( 0020) 32.610 0.722 3.25 38.61

```

PEAK FLOW REDUCTION [Qout/Qin] (%)= 34.10
TIME SHIFT OF PEAK FLOW (min)= 80.00
MAXIMUM STORAGE USED (ha.m.)= 0.7502

```

-----
| DIVERTHYD( 0023) |
| IN= 1 # OUT= 5   |
-----

```

Outflow / Inflow Relationships

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total					
(cms)	(cms)	(cms)	(cms)	(cms)	(cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91

0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD. (ID= 1):	32.61	0.72	3.25	38.61
=====				
ID= 2 (3) :	16.11	0.26	3.25	38.61
ID= 3 (3) :	9.50	0.30	3.25	38.61
ID= 4 (3) :	7.00	0.16	3.25	38.61
ID= 5 (3) :	0.00	0.00	0.00	0.00
ID= 6 (3) :	0.00	0.00	0.00	0.00

```

-----
| ROUTEPIPE( 0028)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	9.50	0.30	3.25	38.61	0.24	1.51
OUTFLOW: ID= 1 (0028)	9.50	0.30	3.25	38.61	0.24	1.51

```

-----
| ROUTEPIPE( 0030)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67

0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	7.00	0.16	3.25	38.61	0.18	1.26
OUTFLOW: ID= 1 (0030)	7.00	0.16	3.33	38.61	0.18	1.26

```

-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Max.Eff.Inten.(mm/hr)=	186.64	25.57
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	82.89 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW (cms)=	0.96	0.16	0.969 (iii)
TIME TO PEAK (hrs)=	1.33	2.67	1.33
RUNOFF VOLUME (mm)=	68.38	35.29	44.55
TOTAL RAINFALL (mm)=	70.38	70.38	70.38
RUNOFF COEFFICIENT =	0.97	0.50	0.63

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0019):    6.99    0.969    1.33    44.55
+ ID2= 2 ( 0028):    9.50    0.303    3.25    38.61
=====
ID = 3 ( 0029):   16.49    0.970    1.33    41.13
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0029) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0029):   16.49    0.970    1.33    41.13
+ ID2= 2 ( 0030):    7.00    0.155    3.33    38.61
=====
ID = 1 ( 0029):   23.49    0.970    1.33    40.38
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTEPIPE( 0032) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          PIPE Number      = 1.00
          Diameter (mm)=1650.00
          Length (m)= 500.00
          Slope (m/m)= 0.005
          Manning n      = 0.013
```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.11	0.26	3.25	38.61	0.22	1.43
OUTFLOW: ID= 1 (0032)	16.11	0.26	3.33	38.61	0.22	1.43

```

-----
| CALIB |
| NASHYD ( 0018) | Area (ha)= 0.94 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.178 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 37.965
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.539

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

```

-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
AREA    QPEAK    TPEAK    R.V.
(ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0018):  0.94  0.178    1.33   37.97
+ ID2= 2 ( 0032): 16.11  0.263    3.33   38.61
=====
ID = 3 ( 0033):  17.05  0.275    3.25   38.57

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.77 Curve Number (CN)= 83.0
|ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.50

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57

```


0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.517

PEAK FLOW (cms)= 0.451 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 37.133
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.528

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

```

-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.32 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55
  
```

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  5.06 | 1.083  26.53 | 2.083  10.53 | 3.08  5.93
0.167  5.06 | 1.167  26.53 | 2.167  10.53 | 3.17  5.93
0.250  5.69 | 1.250 186.64 | 2.250   9.23 | 3.25  5.57
0.333  5.69 | 1.333 186.64 | 2.333   9.23 | 3.33  5.57
0.417  6.55 | 1.417  33.08 | 2.417   8.25 | 3.42  5.25
0.500  6.55 | 1.500  33.08 | 2.500   8.25 | 3.50  5.25
0.583  7.79 | 1.583  20.27 | 2.583   7.49 | 3.58  4.97
0.667  7.79 | 1.667  20.27 | 2.667   7.49 | 3.67  4.97
0.750  9.78 | 1.750  15.20 | 2.750   6.87 | 3.75  4.72
0.833  9.78 | 1.833  15.20 | 2.833   6.87 | 3.83  4.72
0.917 13.66 | 1.917  12.37 | 2.917   6.36 | 3.92  4.51
1.000 13.66 | 2.000  12.37 | 3.000   6.36 | 4.00  4.51
  
```

Unit Hyd Qpeak (cms)= 0.856

PEAK FLOW (cms)= 0.796 (i)
 TIME TO PEAK (hrs)= 1.917
 RUNOFF VOLUME (mm)= 38.478
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.547

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.9922     0.4686
0.0150     0.0403 | 1.3581     0.5239
0.0508     0.0819 | 1.4554     0.5809
0.0745     0.1250 | 1.5104     0.6396
0.1065     0.1696 | 1.5636     0.6999
0.1567     0.2156 | 1.6156     0.7620
0.1928     0.2631 | 1.6657     0.8257
  
```

0.2872	0.3021		1.7150	0.8913
0.4020	0.3627		1.7631	0.9586
0.5684	0.4149		1.8561	1.0987

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0035)	12.320	0.796	1.92	38.48
OUTFLOW: ID= 1 (0036)	12.320	0.245	3.33	38.42

PEAK FLOW REDUCTION [Qout/Qin] (%)= 30.81
TIME SHIFT OF PEAK FLOW (min)= 85.00
MAXIMUM STORAGE USED (ha.m.)= 0.2849

| ADD HYD (0037) |
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0034): 6.77 0.451 1.83 37.13
+ ID2= 2 (0036): 12.32 0.245 3.33 38.42
=====

ID = 3 (0037): 19.09 0.518 1.92 37.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.14

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.329 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.572
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.505

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

| CALIB |
| NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.08

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 33.811
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.480

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

```
-----
| CALIB |
| NASHYD ( 0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.22
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.230 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 37.086
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.527

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

Future Baseline
100-year 3-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\2c46dc20-1882-447b-8ab8-0ad9cb7b36f7\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\2c46dc20-1882-447b-8ab8-0ad9cb7b36f7\s

DATE: 07-15-2025 TIME: 09:46:38

USER:

COMMENTS:

** SIMULATION : 100-year-3hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 65.35 mm | B= 0.000
C= 0.743

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

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

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00

----- U.H. Tp(hrs)= 1.03

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.458 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 32.837
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.502

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

CALIB					
NASHYD (0012)		Area (ha)= 30.09	Curve Number (CN)= 84.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.70	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 0.40			

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 2.873

PEAK FLOW (cms)= 2.417 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.346
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

CALIB					
NASHYD (0031)		Area (ha)= 24.10	Curve Number (CN)= 83.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.80	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 1.12			

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
0.083    6.55 | 0.833  26.53 | 1.583  12.37 | 2.33    7.49
0.167    6.55 | 0.917 186.64 | 1.667  12.37 | 2.42    6.87
0.250    7.79 | 1.000 186.64 | 1.750  10.53 | 2.50    6.87
0.333    7.79 | 1.083  33.08 | 1.833  10.53 | 2.58    6.36
0.417    9.78 | 1.167  33.08 | 1.917   9.23 | 2.67    6.36
0.500    9.78 | 1.250  20.27 | 2.000   9.23 | 2.75    5.93
0.583   13.66 | 1.333  20.27 | 2.083   8.25 | 2.83    5.93
0.667   13.66 | 1.417  15.20 | 2.167   8.25 | 2.92    5.57
0.750   26.53 | 1.500  15.20 | 2.250   7.49 | 3.00    5.57

```

Unit Hyd Qpeak (cms)= 0.822

PEAK FLOW (cms)= 0.868 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.148
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.523

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
0.083    6.55 | 0.833  26.53 | 1.583  12.37 | 2.33    7.49
0.167    6.55 | 0.917 186.64 | 1.667  12.37 | 2.42    6.87
0.250    7.79 | 1.000 186.64 | 1.750  10.53 | 2.50    6.87
0.333    7.79 | 1.083  33.08 | 1.833  10.53 | 2.58    6.36
0.417    9.78 | 1.167  33.08 | 1.917   9.23 | 2.67    6.36
0.500    9.78 | 1.250  20.27 | 2.000   9.23 | 2.75    5.93
0.583   13.66 | 1.333  20.27 | 2.083   8.25 | 2.83    5.93
0.667   13.66 | 1.417  15.20 | 2.167   8.25 | 2.92    5.57
0.750   26.53 | 1.500  15.20 | 2.250   7.49 | 3.00    5.57

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.386 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.068
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.521

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

```

-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
-----
ID1= 1 ( 0012): 30.09 2.417 1.42 35.35
+ ID2= 2 ( 0031): 24.10 0.868 2.33 34.15
=====

```


ID = 3 (0051): 54.19 2.840 1.42 34.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051): 54.19 2.840 1.42 34.81
+ ID2= 2 ( 0041): 10.73 0.386 2.33 34.07
=====
ID = 1 ( 0051): 64.92 3.047 1.50 34.69
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000 0.0000 | 1.3450 2.1963
0.0302 0.2196 | 2.0056 2.4160
0.1060 0.4393 | 2.9861 2.6356
0.1484 0.6589 | 5.1073 3.0749
0.1976 0.8785 | 6.4750 3.5141
0.2620 1.0982 | 6.9124 3.9534
0.3256 1.3178 | 7.3312 4.3927
0.4719 1.5374 | 7.7329 4.8319
0.6161 1.7571 | 8.1186 5.2712
0.8070 1.9767 | 0.0000 0.0000

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051) 64.920 3.047 1.50 34.69
OUTFLOW: ID= 1 ( 0002) 64.920 0.581 4.08 34.66

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.07
TIME SHIFT OF PEAK FLOW (min)=155.00
MAXIMUM STORAGE USED (ha.m.)= 1.7035
```

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha)= 19.40 Curve Number (CN)= 81.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.00 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.66
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57
```

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 0.960 (i)
TIME TO PEAK (hrs)= 1.750

RUNOFF VOLUME (mm)= 31.882
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.488

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

| CALIB |
| NASHYD (0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 1.20

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

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.428 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| RESERVOIR(0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.7119 0.9480
0.0123 0.0780 | 1.9253 1.1420
0.0329 0.1570 | 2.5634 1.3440
0.0407 0.2380 | 2.7870 1.5530
0.0476 0.3210 | 2.9936 1.7700
0.0805 0.4060 | 3.1872 1.9930
0.1414 0.4920 | 3.3696 2.2250
0.1808 0.5790 | 3.6262 2.5860
0.2708 0.6690 | 3.7476 2.7730
0.4375 0.7600 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0042) 40.210 1.428 2.42 35.35
OUTFLOW: ID= 1 (0001) 40.210 0.635 4.25 35.31

PEAK FLOW REDUCTION [Qout/Qin] (%)= 44.51
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.8958


```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.635  4.25  35.31
+ ID2= 2 ( 0011):  12.45  0.458  2.25  32.84
=====
ID = 3 ( 0052):  52.66  0.830  3.67  34.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.830  3.67  34.73
+ ID2= 2 ( 0002):  64.92  0.581  4.08  34.66
=====
ID = 1 ( 0052):  117.58  1.401  3.83  34.69

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  117.58  1.401  3.83  34.69
+ ID2= 2 ( 0021):  19.40  0.960  1.75  31.88
=====
ID = 3 ( 0052):  136.98  1.648  3.33  34.29

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB |
| NASHYD ( 0017) | Area (ha)= 32.61 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083   6.55 | 0.833  26.53 | 1.583  12.37 | 2.33   7.49
0.167   6.55 | 0.917  186.64 | 1.667  12.37 | 2.42   6.87
0.250   7.79 | 1.000  186.64 | 1.750  10.53 | 2.50   6.87
0.333   7.79 | 1.083   33.08 | 1.833  10.53 | 2.58   6.36
0.417   9.78 | 1.167   33.08 | 1.917   9.23 | 2.67   6.36
0.500   9.78 | 1.250   20.27 | 2.000   9.23 | 2.75   5.93
0.583  13.66 | 1.333   20.27 | 2.083   8.25 | 2.83   5.93
0.667  13.66 | 1.417   15.20 | 2.167   8.25 | 2.92   5.57
0.750  26.53 | 1.500   15.20 | 2.250   7.49 | 3.00   5.57

```

Unit Hyd Qpeak (cms)= 2.265

PEAK FLOW (cms)= 2.018 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 34.541
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.529

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

```

| RESERVOIR( 0020) |      OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min   |
-----
      OUTFLOW      STORAGE      |      OUTFLOW      STORAGE
      (cms)        (ha.m.)      |      (cms)        (ha.m.)
      0.0000      0.0000      |      1.7783      1.1263
      0.0245      0.1030      |      1.8455      1.2511
      0.0690      0.2080      |      1.9113      1.3782
      0.1181      0.3152      |      1.9743      1.5076
      0.2257      0.4245      |      2.0363      1.6394
      0.3402      0.5360      |      2.1548      1.9101
      0.4374      0.6496      |      2.2669      2.1903
      0.7664      0.7654      |      2.3755      2.4803
      1.3220      0.8835      |      2.4795      2.7803
      1.6822      1.0038      |      2.5047      2.8569

                        AREA      QPEAK      TPEAK      R.V.
                        (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0017)      32.610      2.018      1.58      34.54
OUTFLOW: ID= 1 ( 0020)      32.610      0.667      3.00      34.51

```

```

      PEAK FLOW REDUCTION [Qout/Qin] (%) = 33.07
      TIME SHIFT OF PEAK FLOW (min) = 85.00
      MAXIMUM STORAGE USED (ha.m.) = 0.7308

```

```

-----
| DIVERTHYD( 0023) |
| IN= 1 # OUT= 5 |
-----

```

Outflow / Inflow Relationships

```

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total
(cms)      (cms)      (cms)      (cms)      (cms)      (cms)
0.00      0.00      0.00      0.00      0.00      0.00
0.02      0.01      0.00      0.00      0.00      0.02
0.05      0.02      0.00      0.00      0.00      0.07
0.07      0.02      0.02      0.00      0.00      0.12
0.11      0.04      0.08      0.00      0.00      0.23
0.16      0.07      0.11      0.00      0.00      0.34
0.20      0.10      0.14      0.00      0.00      0.44
0.27      0.34      0.16      0.00      0.00      0.77
0.29      0.64      0.39      0.00      0.00      1.32
0.30      0.70      0.68      0.00      0.00      1.68
0.31      0.73      0.73      0.00      0.00      1.78
0.32      0.76      0.76      0.00      0.00      1.85
0.33      0.79      0.79      0.00      0.00      1.91
0.34      0.81      0.81      0.00      0.00      1.97
0.35      0.84      0.84      0.00      0.00      2.04
0.36      0.87      0.87      0.00      0.00      2.10
0.38      0.91      0.91      0.00      0.00      2.21
0.40      0.96      0.96      0.00      0.00      2.32
0.42      1.01      1.01      0.00      0.00      2.43
0.43      1.04      1.04      0.00      0.00      2.50

                        AREA      QPEAK      TPEAK      R.V.
                        (ha)      (cms)      (hrs)      (mm)
TOTAL HYD. (ID= 1):      32.61      0.67      3.00      34.51
=====
ID= 2 ( 3) :      16.62      0.25      3.00      34.51
ID= 3 ( 3) :      8.99      0.26      3.00      34.51
ID= 4 ( 3) :      6.99      0.15      3.00      34.51
ID= 5 ( 3) :      0.00      0.00      0.00      0.00
ID= 6 ( 3) :      0.00      0.00      0.00      0.00

```

```

-----
| ROUTEPIPE( 0028) |      PIPE Number      =      1.00
| IN= 2---> OUT= 1 |      Diameter (mm)=1650.00
| DT=  5.0 min   |      Length (m)= 500.00

```

----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	8.99	0.26	3.00	34.51	0.22	1.43
OUTFLOW: ID= 1 (0028)	8.99	0.26	3.00	34.51	0.22	1.43

| ROUTEPIPE(0030) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	6.99	0.15	3.00	34.51	0.17	1.25
OUTFLOW: ID= 1 (0030)	6.99	0.15	3.08	34.51	0.17	1.25

```

-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
Mannings n	=	0.013	0.250

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs  mm/hr | hrs  mm/hr | hrs  mm/hr | hrs  mm/hr
0.083   6.55 | 0.833 26.53 | 1.583 12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667 12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750 10.53 | 2.50   6.87
0.333   7.79 | 1.083 33.08 | 1.833 10.53 | 2.58   6.36
0.417   9.78 | 1.167 33.08 | 1.917  9.23 | 2.67   6.36
0.500   9.78 | 1.250 20.27 | 2.000  9.23 | 2.75   5.93
0.583  13.66 | 1.333 20.27 | 2.083  8.25 | 2.83   5.93
0.667  13.66 | 1.417 15.20 | 2.167  8.25 | 2.92   5.57
0.750  26.53 | 1.500 15.20 | 2.250  7.49 | 3.00   5.57

```

Max.Eff.Inten. (mm/hr)=	186.64	24.61
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	84.11 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW (cms)=	0.96	0.15	0.968 (iii)
TIME TO PEAK (hrs)=	1.00	2.42	1.00
RUNOFF VOLUME (mm)=	63.35	31.37	40.32
TOTAL RAINFALL (mm)=	65.35	65.35	65.35
RUNOFF COEFFICIENT =	0.97	0.48	0.62

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0019): 6.99 0.968 1.00 40.32
+ ID2= 2 ( 0028): 8.99 0.263 3.00 34.51
=====
ID = 3 ( 0029): 15.98 0.969 1.00 37.05

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0029) |

```

3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0029):	15.98	0.969	1.00	37.05
+ ID2= 2 (0030):	6.99	0.152	3.08	34.51
=====				
ID = 1 (0029):	22.98	0.969	1.00	36.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTEPIPE(0032)	PIPE Number	=	1.00
IN= 2---> OUT= 1	Diameter	(mm)=	1650.00
DT= 5.0 min	Length	(m)=	500.00
-----	Slope	(m/m)=	0.005
	Manning n	=	0.013

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.62	0.25	3.00	34.51	0.22	1.41
OUTFLOW: ID= 1 (0032)	16.62	0.25	3.08	34.51	0.22	1.41

CALIB	
NASHYD (0018)	Area (ha)= 0.94 Curve Number (CN)= 84.0
ID= 1 DT= 5.0 min	Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.169 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 33.922
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.519

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0018):    0.94    0.169      1.00    33.92
+ ID2= 2 ( 0032):   16.62    0.251      3.08    34.51
=====
ID = 3 ( 0033):   17.56    0.263      3.00    34.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.77 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.50
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    6.55 | 0.833    26.53 | 1.583    12.37 | 2.33     7.49
0.167    6.55 | 0.917    186.64 | 1.667    12.37 | 2.42     6.87
0.250    7.79 | 1.000    186.64 | 1.750    10.53 | 2.50     6.87
0.333    7.79 | 1.083    33.08 | 1.833    10.53 | 2.58     6.36
0.417    9.78 | 1.167    33.08 | 1.917     9.23 | 2.67     6.36
0.500    9.78 | 1.250    20.27 | 2.000     9.23 | 2.75     5.93
0.583   13.66 | 1.333    20.27 | 2.083     8.25 | 2.83     5.93
0.667   13.66 | 1.417    15.20 | 2.167     8.25 | 2.92     5.57
0.750   26.53 | 1.500    15.20 | 2.250     7.49 | 3.00     5.57
```

Unit Hyd Qpeak (cms)= 0.517

PEAK FLOW (cms)= 0.428 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 33.117
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.507

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

```
-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.32 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.55
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
```

hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.083	6.55		0.833	26.53		1.583	12.37		2.33	7.49
0.167	6.55		0.917	186.64		1.667	12.37		2.42	6.87
0.250	7.79		1.000	186.64		1.750	10.53		2.50	6.87
0.333	7.79		1.083	33.08		1.833	10.53		2.58	6.36
0.417	9.78		1.167	33.08		1.917	9.23		2.67	6.36
0.500	9.78		1.250	20.27		2.000	9.23		2.75	5.93
0.583	13.66		1.333	20.27		2.083	8.25		2.83	5.93
0.667	13.66		1.417	15.20		2.167	8.25		2.92	5.57
0.750	26.53		1.500	15.20		2.250	7.49		3.00	5.57

Unit Hyd Qpeak (cms)= 0.856

PEAK FLOW (cms)= 0.758 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 34.380
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW          | STORAGE          | OUTFLOW          | STORAGE          |
| (cms)            | (ha.m.)          | (cms)            | (ha.m.)          |
| 0.0000           | 0.0000           | 0.9922           | 0.4686           |
| 0.0150           | 0.0403           | 1.3581           | 0.5239           |
| 0.0508           | 0.0819           | 1.4554           | 0.5809           |
| 0.0745           | 0.1250           | 1.5104           | 0.6396           |
| 0.1065           | 0.1696           | 1.5636           | 0.6999           |
| 0.1567           | 0.2156           | 1.6156           | 0.7620           |
| 0.1928           | 0.2631           | 1.6657           | 0.8257           |
| 0.2872           | 0.3021           | 1.7150           | 0.8913           |
| 0.4020           | 0.3627           | 1.7631           | 0.9586           |
| 0.5684           | 0.4149           | 1.8561           | 1.0987           |

```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.320	0.758	1.58	34.38
OUTFLOW: ID= 1 (0036)	12.320	0.225	3.08	34.32

PEAK FLOW REDUCTION [Qout/Qin] (%)= 29.70
 TIME SHIFT OF PEAK FLOW (min)= 90.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2766

```

-----
| ADD HYD ( 0037) |
| 1 + 2 = 3       |
-----
| ID1= 1 ( 0034): | AREA   QPEAK  TPEAK  R.V.
| + ID2= 2 ( 0036): | (ha)   (cms)   (hrs)   (mm)
| =====
| ID = 3 ( 0037):  | 19.09  0.492   1.58   33.90

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB          |
| NASHYD ( 0045) | Area   (ha)= 2.10  Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia     (mm)= 4.30  # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.14

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.313 (i)

TIME TO PEAK (hrs)= 1.083

RUNOFF VOLUME (mm)= 31.669

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.485

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

```

-----
| CALIB |
| NASHYD ( 0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.08

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.288 (i)

TIME TO PEAK (hrs)= 1.000

RUNOFF VOLUME (mm)= 30.101

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.461

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

```

-----
| CALIB |
| NASHYD ( 0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.22

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.219 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 33.075

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.506

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

Alternative Method 1
100-year 4-hour Chicago

```
=====
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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\fd0ed113-301b-4971-bb0b-12742810f8a8\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\fd0ed113-301b-4971-bb0b-12742810f8a8\s

DATE: 07-15-2025 TIME: 08:41:59

USER:

COMMENTS: _____

** SIMULATION : 100-year-4hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 70.38 mm | B= 0.000
| | C= 0.743

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

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	5.06	1.00	26.53	2.00	10.53	3.00	5.93
0.17	5.69	1.17	186.64	2.17	9.23	3.17	5.57
0.33	6.55	1.33	33.08	2.33	8.25	3.33	5.25
0.50	7.79	1.50	20.27	2.50	7.49	3.50	4.97
0.67	9.78	1.67	15.20	2.67	6.87	3.67	4.72
0.83	13.66	1.83	12.37	2.83	6.36	3.83	4.51

```

| NASHYD   ( 0011) | Area   (ha)= 12.45 Curve Number (CN)= 82.0
|ID= 1 DT= 5.0 min | Ia     (mm)=  3.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)=  1.03

```

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   5.06 | 1.083  26.53 | 2.083  10.53 | 3.08   5.93
0.167   5.06 | 1.167  26.53 | 2.167  10.53 | 3.17   5.93
0.250   5.69 | 1.250 186.64 | 2.250   9.23 | 3.25   5.57
0.333   5.69 | 1.333 186.64 | 2.333   9.23 | 3.33   5.57
0.417   6.55 | 1.417  33.08 | 2.417   8.25 | 3.42   5.25
0.500   6.55 | 1.500  33.08 | 2.500   8.25 | 3.50   5.25
0.583   7.79 | 1.583  20.27 | 2.583   7.49 | 3.58   4.97
0.667   7.79 | 1.667  20.27 | 2.667   7.49 | 3.67   4.97
0.750   9.78 | 1.750  15.20 | 2.750   6.87 | 3.75   4.72
0.833   9.78 | 1.833  15.20 | 2.833   6.87 | 3.83   4.72
0.917  13.66 | 1.917  12.37 | 2.917   6.36 | 3.92   4.51
1.000  13.66 | 2.000  12.37 | 3.000   6.36 | 4.00   4.51

```

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.479 (i)
 TIME TO PEAK (hrs)= 2.500
 RUNOFF VOLUME (mm)= 36.792
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.523

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

```

-----
| CALIB |
| NASHYD   ( 0012) | Area   (ha)= 28.68 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia     (mm)=  2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)=  0.41

```

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   5.06 | 1.083  26.53 | 2.083  10.53 | 3.08   5.93
0.167   5.06 | 1.167  26.53 | 2.167  10.53 | 3.17   5.93
0.250   5.69 | 1.250 186.64 | 2.250   9.23 | 3.25   5.57
0.333   5.69 | 1.333 186.64 | 2.333   9.23 | 3.33   5.57
0.417   6.55 | 1.417  33.08 | 2.417   8.25 | 3.42   5.25
0.500   6.55 | 1.500  33.08 | 2.500   8.25 | 3.50   5.25
0.583   7.79 | 1.583  20.27 | 2.583   7.49 | 3.58   4.97
0.667   7.79 | 1.667  20.27 | 2.667   7.49 | 3.67   4.97
0.750   9.78 | 1.750  15.20 | 2.750   6.87 | 3.75   4.72
0.833   9.78 | 1.833  15.20 | 2.833   6.87 | 3.83   4.72
0.917  13.66 | 1.917  12.37 | 2.917   6.36 | 3.92   4.51
1.000  13.66 | 2.000  12.37 | 3.000   6.36 | 4.00   4.51

```

Unit Hyd Qpeak (cms)= 2.672

PEAK FLOW (cms)= 2.374 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 39.464
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| CALIB |
| NASHYD ( 0031) | Area (ha)= 25.70 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.80 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.11

```

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 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
0.333 5.69 | 1.333 186.64 | 2.333 9.23 | 3.33 5.57
0.417 6.55 | 1.417 33.08 | 2.417 8.25 | 3.42 5.25
0.500 6.55 | 1.500 33.08 | 2.500 8.25 | 3.50 5.25
0.583 7.79 | 1.583 20.27 | 2.583 7.49 | 3.58 4.97
0.667 7.79 | 1.667 20.27 | 2.667 7.49 | 3.67 4.97
0.750 9.78 | 1.750 15.20 | 2.750 6.87 | 3.75 4.72
0.833 9.78 | 1.833 15.20 | 2.833 6.87 | 3.83 4.72
0.917 13.66 | 1.917 12.37 | 2.917 6.36 | 3.92 4.51
1.000 13.66 | 2.000 12.37 | 3.000 6.36 | 4.00 4.51

```

Unit Hyd Qpeak (cms)= 0.884

PEAK FLOW (cms)= 0.942 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 37.031
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
0.333 5.69 | 1.333 186.64 | 2.333 9.23 | 3.33 5.57
0.417 6.55 | 1.417 33.08 | 2.417 8.25 | 3.42 5.25
0.500 6.55 | 1.500 33.08 | 2.500 8.25 | 3.50 5.25
0.583 7.79 | 1.583 20.27 | 2.583 7.49 | 3.58 4.97
0.667 7.79 | 1.667 20.27 | 2.667 7.49 | 3.67 4.97
0.750 9.78 | 1.750 15.20 | 2.750 6.87 | 3.75 4.72
0.833 9.78 | 1.833 15.20 | 2.833 6.87 | 3.83 4.72
0.917 13.66 | 1.917 12.37 | 2.917 6.36 | 3.92 4.51
1.000 13.66 | 2.000 12.37 | 3.000 6.36 | 4.00 4.51

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.403 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.105

TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.541

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 |
|-----|
| ID1= 1 ( 0012): | AREA   QPEAK   TPEAK   R.V.
|                   | (ha)   (cms)   (hrs)   (mm)
| + ID2= 2 ( 0031): | 28.68  2.374  1.75   39.46
|                   | 25.70  0.942  2.67   37.03
|=====|
| ID = 3 ( 0051): | 54.38  2.849  1.83   38.31
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
|-----|
| ID1= 3 ( 0051): | AREA   QPEAK   TPEAK   R.V.
|                   | (ha)   (cms)   (hrs)   (mm)
| + ID2= 2 ( 0041): | 54.38  2.849  1.83   38.31
|                   | 10.73  0.403  2.67   38.10
|=====|
| ID = 1 ( 0051): | 65.11  3.088  1.83   38.28
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
|-----|
| OUTFLOW   STORAGE | OUTFLOW   STORAGE
| (cms)      (ha.m.) | (cms)      (ha.m.)
| 0.0000     0.0000 | 1.3450     2.1963
| 0.0302     0.2196 | 2.0056     2.4160
| 0.1060     0.4393 | 2.9861     2.6356
| 0.1484     0.6589 | 5.1073     3.0749
| 0.1976     0.8785 | 6.4750     3.5141
| 0.2620     1.0982 | 6.9124     3.9534
| 0.3256     1.3178 | 7.3312     4.3927
| 0.4719     1.5374 | 7.7329     4.8319
| 0.6161     1.7571 | 8.1186     5.2712
| 0.8070     1.9767 | 0.0000     0.0000
|
| AREA   QPEAK   TPEAK   R.V.
| (ha)   (cms)   (hrs)   (mm)
| INFLOW : ID= 2 ( 0051) | 65.110   3.088   1.83   38.28
| OUTFLOW: ID= 1 ( 0002) | 65.110   0.674   4.67   38.25
```

PEAK FLOW REDUCTION [Qout/Qin] (%)= 21.84
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 1.8243

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha)= 19.40 Curve Number (CN)= 81.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.00 # of Linear Res. (N)= 3.00
|-----| U.H. Tp(hrs)= 0.66
```

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 1.007 (i)
 TIME TO PEAK (hrs)= 2.083
 RUNOFF VOLUME (mm)= 35.760
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.508

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

```

-----
| CALIB |
| NASHYD ( 0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.20
  
```

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

```

----- TRANSFORMED HYETOGRAPH -----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.490 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 39.468
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| RESERVOIR( 0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----

```

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
0.0000	0.0000	0.7119	0.9480
0.0123	0.0780	1.9253	1.1420
0.0329	0.1570	2.5634	1.3440

0.0407	0.2380		2.7870	1.5530
0.0476	0.3210		2.9936	1.7700
0.0805	0.4060		3.1872	1.9930
0.1414	0.4920		3.3696	2.2250
0.1808	0.5790		3.6262	2.5860
0.2708	0.6690		3.7476	2.7730
0.4375	0.7600		0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0042)	40.210	1.490	2.75	39.47
OUTFLOW: ID= 1 (0001)	40.210	0.704	4.67	39.43

PEAK FLOW REDUCTION [Qout/Qin] (%) = 47.22
 TIME SHIFT OF PEAK FLOW (min) = 115.00
 MAXIMUM STORAGE USED (ha.m.) = 0.9427

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.704    4.67    39.43
+ ID2= 2 ( 0011):  12.45  0.479    2.50    36.79
=====
ID = 3 ( 0052):  52.66  0.914    4.25    38.81
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.914    4.25    38.81
+ ID2= 2 ( 0002):  65.11  0.674    4.67    38.25
=====
ID = 1 ( 0052):  117.77  1.573    4.42    38.50
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  117.77  1.573    4.42    38.50
+ ID2= 2 ( 0021):  19.40  1.007    2.08    35.76
=====
ID = 3 ( 0052):  137.17  1.810    4.17    38.11
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0017) | Area (ha)= 32.52 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res. (N)= 3.00
-----
U.H. Tp (hrs)= 0.52
  
```

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   5.06 | 1.083  26.53 | 2.083  10.53 | 3.08   5.93
0.167   5.06 | 1.167  26.53 | 2.167  10.53 | 3.17   5.93
  
```

0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 2.389

PEAK FLOW (cms)= 2.200 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 38.642
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.549

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

```

-----
| RESERVOIR( 0020)| OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		1.7783	1.1263
	0.0245	0.1030		1.8455	1.2511
	0.0690	0.2080		1.9113	1.3782
	0.1181	0.3152		1.9743	1.5076
	0.2257	0.4245		2.0363	1.6394
	0.3402	0.5360		2.1548	1.9101
	0.4374	0.6496		2.2669	2.1903
	0.7664	0.7654		2.3755	2.4803
	1.3220	0.8835		2.4795	2.7803
	1.6822	1.0038		2.5047	2.8569

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0017)	32.520	2.200	1.83	38.64
OUTFLOW: ID= 1 (0020)	32.520	0.723	3.17	38.61

PEAK FLOW REDUCTION [Qout/Qin] (%)= 32.87
 TIME SHIFT OF PEAK FLOW (min)= 80.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7504

```

-----
| DIVERTHYD( 0023)|
| IN= 1  # OUT= 5 |
-----

```

Outflow / Inflow Relationships

Flow 1 (cms)	Flow 2 (cms)	Flow 3 (cms)	Flow 4 (cms)	Flow 5 (cms)	Total (cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85

0.33	0.79	0.79	0.00	0.00	1.91
0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
TOTAL	HYD. (ID= 1):	32.52	0.72	3.17	38.61
=====					
ID= 2	(3) :	16.07	0.26	3.17	38.61
ID= 3	(3) :	9.48	0.30	3.17	38.61
ID= 4	(3) :	6.97	0.16	3.17	38.61
ID= 5	(3) :	0.00	0.00	0.00	0.00
ID= 6	(3) :	0.00	0.00	0.00	0.00

```

-----
| ROUTEPIPE( 0028) |   PIPE Number      =   1.00
| IN= 2---> OUT= 1 |   Diameter      (mm)=1650.00
| DT=  5.0 min      |   Length        (m)= 500.00
-----
                        |   Slope          (m/m)=  0.005
                        |   Manning n      =   0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	9.48	0.30	3.17	38.61	0.24	1.51
OUTFLOW: ID= 1 (0028)	9.48	0.30	3.25	38.61	0.24	1.51

```

-----
| ROUTEPIPE( 0030) |   PIPE Number      =   1.00
| IN= 2---> OUT= 1 |   Diameter      (mm)=1650.00
| DT=  5.0 min      |   Length        (m)= 500.00
-----
                        |   Slope          (m/m)=  0.005
                        |   Manning n      =   0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40

0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	6.97	0.16	3.17	38.61	0.18	1.26
OUTFLOW: ID= 1 (0030)	6.97	0.16	3.25	38.61	0.18	1.26

CALIB				
STANDHYD (0019)	Area	(ha)=	6.99	
ID= 1 DT= 5.0 min	Total Imp(%)=	28.00	Dir. Conn.(%)=	28.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Max.Eff.Inten.(mm/hr)=	186.64	25.57
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	82.89 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW	(cms)=	0.96	0.16	0.969 (iii)
TIME TO PEAK	(hrs)=	1.33	2.67	1.33
RUNOFF VOLUME	(mm)=	68.38	35.29	44.55
TOTAL RAINFALL	(mm)=	70.38	70.38	70.38

RUNOFF COEFFICIENT = 0.97 0.50 0.63

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0019): 6.99 0.969 1.33 44.55
+ ID2= 2 ( 0028): 9.48 0.303 3.25 38.61
=====
ID = 3 ( 0029): 16.47 0.970 1.33 41.13
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0029) |
| 3 + 2 = 1 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 3 ( 0029): 16.47 0.970 1.33 41.13
+ ID2= 2 ( 0030): 6.97 0.155 3.25 38.61
=====
ID = 1 ( 0029): 23.44 0.970 1.33 40.38
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTEPIPE( 0032) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
|-----| Slope (m/m)= 0.005
Manning n = 0.013
```

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	16.07	0.26	3.17	38.61	0.22	1.43

OUTFLOW: ID= 1 (0032) 16.07 0.26 3.25 38.61 0.22 1.43

```
-----
| CALIB |
| NASHYD ( 0018) | Area (ha)= 0.94 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.12
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
0.333 5.69 | 1.333 186.64 | 2.333 9.23 | 3.33 5.57
0.417 6.55 | 1.417 33.08 | 2.417 8.25 | 3.42 5.25
0.500 6.55 | 1.500 33.08 | 2.500 8.25 | 3.50 5.25
0.583 7.79 | 1.583 20.27 | 2.583 7.49 | 3.58 4.97
0.667 7.79 | 1.667 20.27 | 2.667 7.49 | 3.67 4.97
0.750 9.78 | 1.750 15.20 | 2.750 6.87 | 3.75 4.72
0.833 9.78 | 1.833 15.20 | 2.833 6.87 | 3.83 4.72
0.917 13.66 | 1.917 12.37 | 2.917 6.36 | 3.92 4.51
1.000 13.66 | 2.000 12.37 | 3.000 6.36 | 4.00 4.51
```

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.178 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 37.965
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.539

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0018): 0.94 0.178 1.33 37.97
+ ID2= 2 ( 0032): 16.07 0.263 3.25 38.61
=====
ID = 3 ( 0033): 17.01 0.276 3.17 38.57
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.50
```

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 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
```

0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.454 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 37.133
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.528

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

```

-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.17 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55
  
```

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	5.06		1.083	26.53		2.083	10.53		3.08	5.93
0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.845

PEAK FLOW (cms)= 0.786 (i)
 TIME TO PEAK (hrs)= 1.917
 RUNOFF VOLUME (mm)= 38.478
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.547

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----

```

OUTFLOW	STORAGE	OUTFLOW	STORAGE	
(cms)	(ha.m.)	(cms)	(ha.m.)	
0.0000	0.0000		0.9922	0.4686
0.0150	0.0403		1.3581	0.5239
0.0508	0.0819		1.4554	0.5809
0.0745	0.1250		1.5104	0.6396
0.1065	0.1696		1.5636	0.6999
0.1567	0.2156		1.6156	0.7620

0.1928	0.2631		1.6657	0.8257
0.2872	0.3021		1.7150	0.8913
0.4020	0.3627		1.7631	0.9586
0.5684	0.4149		1.8561	1.0987

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0035)	12.170	0.786	1.92	38.48
OUTFLOW: ID= 1 (0036)	12.170	0.239	3.42	38.42

PEAK FLOW REDUCTION [Qout/Qin] (%) = 30.42
 TIME SHIFT OF PEAK FLOW (min) = 90.00
 MAXIMUM STORAGE USED (ha.m.) = 0.2824

```

-----
| ADD HYD ( 0037) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0034):    6.82    0.454    1.83    37.13
+ ID2= 2 ( 0036):   12.17    0.239    3.42    38.42
=====
ID = 3 ( 0037):   18.99    0.520    1.92    37.96
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB      |
| NASHYD ( 0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00
-----
      U.H. Tp(hrs)= 0.14
  
```

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    5.06 | 1.083    26.53 | 2.083    10.53 | 3.08     5.93
0.167    5.06 | 1.167    26.53 | 2.167    10.53 | 3.17     5.93
0.250    5.69 | 1.250   186.64 | 2.250     9.23 | 3.25     5.57
0.333    5.69 | 1.333   186.64 | 2.333     9.23 | 3.33     5.57
0.417    6.55 | 1.417    33.08 | 2.417     8.25 | 3.42     5.25
0.500    6.55 | 1.500    33.08 | 2.500     8.25 | 3.50     5.25
0.583    7.79 | 1.583    20.27 | 2.583     7.49 | 3.58     4.97
0.667    7.79 | 1.667    20.27 | 2.667     7.49 | 3.67     4.97
0.750    9.78 | 1.750    15.20 | 2.750     6.87 | 3.75     4.72
0.833    9.78 | 1.833    15.20 | 2.833     6.87 | 3.83     4.72
0.917   13.66 | 1.917    12.37 | 2.917     6.36 | 3.92     4.51
1.000   13.66 | 2.000    12.37 | 3.000     6.36 | 4.00     4.51
  
```

Unit Hyd Qpeak (cms) = 0.573

PEAK FLOW (cms) = 0.329 (i)
 TIME TO PEAK (hrs) = 1.417
 RUNOFF VOLUME (mm) = 35.572
 TOTAL RAINFALL (mm) = 70.382
 RUNOFF COEFFICIENT = 0.505

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

```

-----
| CALIB      |
| NASHYD ( 0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00
-----
      U.H. Tp(hrs)= 0.08
  
```

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 33.811
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.480

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

| CALIB |
| NASHYD (0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.22

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.230 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 37.086
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.527

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

Alternative Method 1
100-year 3-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\817e0409-366f-4744-8e23-802eae9b8041\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\817e0409-366f-4744-8e23-802eae9b8041\s

DATE: 07-15-2025 TIME: 08:41:58

USER:

COMMENTS:

** SIMULATION : 100-year-3hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 65.35 mm | B= 0.000
C= 0.743

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

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

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00

----- U.H. Tp(hrs)= 1.03

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.458 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 32.837
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.502

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

CALIB					
NASHYD (0012)		Area (ha)= 28.68	Curve Number (CN)= 84.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.70	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 0.41			

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 2.672

PEAK FLOW (cms)= 2.268 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.347
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

CALIB					
NASHYD (0031)		Area (ha)= 25.70	Curve Number (CN)= 82.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.80	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 1.11			

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs  mm/hr | hrs  mm/hr | hrs  mm/hr | hrs  mm/hr
0.083   6.55 | 0.833 26.53 | 1.583 12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667 12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750 10.53 | 2.50   6.87
0.333   7.79 | 1.083 33.08 | 1.833 10.53 | 2.58   6.36
0.417   9.78 | 1.167 33.08 | 1.917  9.23 | 2.67   6.36
0.500   9.78 | 1.250 20.27 | 2.000  9.23 | 2.75   5.93
0.583  13.66 | 1.333 20.27 | 2.083  8.25 | 2.83   5.93
0.667  13.66 | 1.417 15.20 | 2.167  8.25 | 2.92   5.57
0.750  26.53 | 1.500 15.20 | 2.250  7.49 | 3.00   5.57

```

Unit Hyd Qpeak (cms)= 0.884

PEAK FLOW (cms)= 0.901 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 33.071
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.506

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs  mm/hr | hrs  mm/hr | hrs  mm/hr | hrs  mm/hr
0.083   6.55 | 0.833 26.53 | 1.583 12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667 12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750 10.53 | 2.50   6.87
0.333   7.79 | 1.083 33.08 | 1.833 10.53 | 2.58   6.36
0.417   9.78 | 1.167 33.08 | 1.917  9.23 | 2.67   6.36
0.500   9.78 | 1.250 20.27 | 2.000  9.23 | 2.75   5.93
0.583  13.66 | 1.333 20.27 | 2.083  8.25 | 2.83   5.93
0.667  13.66 | 1.417 15.20 | 2.167  8.25 | 2.92   5.57
0.750  26.53 | 1.500 15.20 | 2.250  7.49 | 3.00   5.57

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.386 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.068
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.521

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

```

-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0012): 28.68 2.268 1.42 35.35
+ ID2= 2 ( 0031): 25.70 0.901 2.33 33.07
=====

```

ID = 3 (0051): 54.38 2.719 1.50 34.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051): 54.38 2.719 1.50 34.27
+ ID2= 2 ( 0041): 10.73 0.386 2.33 34.07
=====
ID = 1 ( 0051): 65.11 2.942 1.50 34.24
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000 0.0000 | 1.3450 2.1963
0.0302 0.2196 | 2.0056 2.4160
0.1060 0.4393 | 2.9861 2.6356
0.1484 0.6589 | 5.1073 3.0749
0.1976 0.8785 | 6.4750 3.5141
0.2620 1.0982 | 6.9124 3.9534
0.3256 1.3178 | 7.3312 4.3927
0.4719 1.5374 | 7.7329 4.8319
0.6161 1.7571 | 8.1186 5.2712
0.8070 1.9767 | 0.0000 0.0000

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051) 65.110 2.942 1.50 34.24
OUTFLOW: ID= 1 ( 0002) 65.110 0.572 4.08 34.21

PEAK FLOW REDUCTION [Qout/Qin] (%) = 19.44
TIME SHIFT OF PEAK FLOW (min) = 155.00
MAXIMUM STORAGE USED (ha.m.) = 1.6899
```

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha) = 19.40 Curve Number (CN) = 81.0
| ID= 1 DT= 5.0 min | Ia (mm) = 3.00 # of Linear Res. (N) = 3.00
-----
U.H. Tp(hrs) = 0.66
```

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

```
-----
          ---- TRANSFORMED HYETOGRAPH ----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    6.55 | 0.833    26.53 | 1.583    12.37 | 2.33     7.49
0.167    6.55 | 0.917    186.64 | 1.667    12.37 | 2.42     6.87
0.250    7.79 | 1.000    186.64 | 1.750    10.53 | 2.50     6.87
0.333    7.79 | 1.083     33.08 | 1.833    10.53 | 2.58     6.36
0.417    9.78 | 1.167     33.08 | 1.917     9.23 | 2.67     6.36
0.500    9.78 | 1.250     20.27 | 2.000     9.23 | 2.75     5.93
0.583    13.66 | 1.333     20.27 | 2.083     8.25 | 2.83     5.93
0.667    13.66 | 1.417     15.20 | 2.167     8.25 | 2.92     5.57
0.750    26.53 | 1.500     15.20 | 2.250     7.49 | 3.00     5.57
```

Unit Hyd Qpeak (cms) = 1.123

PEAK FLOW (cms) = 0.960 (i)
TIME TO PEAK (hrs) = 1.750

RUNOFF VOLUME (mm)= 31.882
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.488

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

| CALIB |
| NASHYD (0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 1.20

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

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.428 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| RESERVOIR(0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.7119 0.9480
0.0123 0.0780 | 1.9253 1.1420
0.0329 0.1570 | 2.5634 1.3440
0.0407 0.2380 | 2.7870 1.5530
0.0476 0.3210 | 2.9936 1.7700
0.0805 0.4060 | 3.1872 1.9930
0.1414 0.4920 | 3.3696 2.2250
0.1808 0.5790 | 3.6262 2.5860
0.2708 0.6690 | 3.7476 2.7730
0.4375 0.7600 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0042) 40.210 1.428 2.42 35.35
OUTFLOW: ID= 1 (0001) 40.210 0.635 4.25 35.31

PEAK FLOW REDUCTION [Qout/Qin] (%)= 44.51
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.8958


```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.635  4.25  35.31
+ ID2= 2 ( 0011):  12.45  0.458  2.25  32.84
=====
ID = 3 ( 0052):  52.66  0.830  3.67  34.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.830  3.67  34.73
+ ID2= 2 ( 0002):  65.11  0.572  4.08  34.21
=====
ID = 1 ( 0052):  117.77  1.390  3.83  34.44

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  117.77  1.390  3.83  34.44
+ ID2= 2 ( 0021):  19.40  0.960  1.75  31.88
=====
ID = 3 ( 0052):  137.17  1.634  3.33  34.08

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB |
| NASHYD ( 0017) | Area (ha)= 32.52 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.52

```

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
      hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083  6.55 | 0.833  26.53 | 1.583  12.37 | 2.33  7.49
0.167  6.55 | 0.917  186.64 | 1.667  12.37 | 2.42  6.87
0.250  7.79 | 1.000  186.64 | 1.750  10.53 | 2.50  6.87
0.333  7.79 | 1.083  33.08 | 1.833  10.53 | 2.58  6.36
0.417  9.78 | 1.167  33.08 | 1.917  9.23 | 2.67  6.36
0.500  9.78 | 1.250  20.27 | 2.000  9.23 | 2.75  5.93
0.583  13.66 | 1.333  20.27 | 2.083  8.25 | 2.83  5.93
0.667  13.66 | 1.417  15.20 | 2.167  8.25 | 2.92  5.57
0.750  26.53 | 1.500  15.20 | 2.250  7.49 | 3.00  5.57

```

Unit Hyd Qpeak (cms)= 2.389

PEAK FLOW (cms)= 2.092 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 34.541
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.529

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

```

| RESERVOIR( 0020) |      OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min    |
-----
                OUTFLOW    STORAGE    |    OUTFLOW    STORAGE
                (cms)      (ha.m.)    |    (cms)      (ha.m.)
                0.0000      0.0000    |    1.7783      1.1263
                0.0245      0.1030    |    1.8455      1.2511
                0.0690      0.2080    |    1.9113      1.3782
                0.1181      0.3152    |    1.9743      1.5076
                0.2257      0.4245    |    2.0363      1.6394
                0.3402      0.5360    |    2.1548      1.9101
                0.4374      0.6496    |    2.2669      2.1903
                0.7664      0.7654    |    2.3755      2.4803
                1.3220      0.8835    |    2.4795      2.7803
                1.6822      1.0038    |    2.5047      2.8569

                AREA      QPEAK      TPEAK      R.V.
                (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0017)    32.520      2.092      1.50      34.54
OUTFLOW: ID= 1 ( 0020)    32.520      0.668      2.92      34.51

                PEAK FLOW REDUCTION [Qout/Qin](%)= 31.92
                TIME SHIFT OF PEAK FLOW (min)= 85.00
                MAXIMUM STORAGE USED (ha.m.)= 0.7308

```

```

-----
| DIVERTHYD( 0023) |
| IN= 1   # OUT= 5 |
-----

```

Outflow / Inflow Relationships

```

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total
(cms)      (cms)      (cms)      (cms)      (cms)      (cms)
0.00      0.00      0.00      0.00      0.00      0.00
0.02      0.01      0.00      0.00      0.00      0.02
0.05      0.02      0.00      0.00      0.00      0.07
0.07      0.02      0.02      0.00      0.00      0.12
0.11      0.04      0.08      0.00      0.00      0.23
0.16      0.07      0.11      0.00      0.00      0.34
0.20      0.10      0.14      0.00      0.00      0.44
0.27      0.34      0.16      0.00      0.00      0.77
0.29      0.64      0.39      0.00      0.00      1.32
0.30      0.70      0.68      0.00      0.00      1.68
0.31      0.73      0.73      0.00      0.00      1.78
0.32      0.76      0.76      0.00      0.00      1.85
0.33      0.79      0.79      0.00      0.00      1.91
0.34      0.81      0.81      0.00      0.00      1.97
0.35      0.84      0.84      0.00      0.00      2.04
0.36      0.87      0.87      0.00      0.00      2.10
0.38      0.91      0.91      0.00      0.00      2.21
0.40      0.96      0.96      0.00      0.00      2.32
0.42      1.01      1.01      0.00      0.00      2.43
0.43      1.04      1.04      0.00      0.00      2.50

                AREA      QPEAK      TPEAK      R.V.
                (ha)      (cms)      (hrs)      (mm)
TOTAL HYD. (ID= 1):    32.52      0.67      2.92      34.51
=====
ID= 2 ( 3) :    16.57      0.25      2.92      34.51
ID= 3 ( 3) :     8.99      0.26      2.92      34.51
ID= 4 ( 3) :     6.96      0.15      2.92      34.51
ID= 5 ( 3) :     0.00      0.00      0.00      0.00
ID= 6 ( 3) :     0.00      0.00      0.00      0.00

```

```

-----
| ROUTEPIPE( 0028) |      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter (mm)=1650.00
| DT=  5.0 min    |      Length (m)= 500.00

```

----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	8.99	0.26	2.92	34.51	0.22	1.43
OUTFLOW: ID= 1 (0028)	8.99	0.26	3.00	34.51	0.22	1.43

| ROUTEPIPE(0030) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	6.96	0.15	2.92	34.51	0.17	1.25
OUTFLOW: ID= 1 (0030)	6.96	0.15	3.00	34.51	0.17	1.25

```

-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
Mannings n	=	0.013	0.250

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
      hrs  mm/hr |  hrs  mm/hr |  hrs  mm/hr |  hrs  mm/hr
0.083   6.55 | 0.833  26.53 | 1.583  12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667  12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750  10.53 | 2.50   6.87
0.333   7.79 | 1.083  33.08 | 1.833  10.53 | 2.58   6.36
0.417   9.78 | 1.167  33.08 | 1.917   9.23 | 2.67   6.36
0.500   9.78 | 1.250  20.27 | 2.000   9.23 | 2.75   5.93
0.583  13.66 | 1.333  20.27 | 2.083   8.25 | 2.83   5.93
0.667  13.66 | 1.417  15.20 | 2.167   8.25 | 2.92   5.57
0.750  26.53 | 1.500  15.20 | 2.250   7.49 | 3.00   5.57

```

Max.Eff.Inten. (mm/hr)=	186.64	24.61
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	84.11 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW (cms)=	0.96	0.15	0.968 (iii)
TIME TO PEAK (hrs)=	1.00	2.42	1.00
RUNOFF VOLUME (mm)=	63.35	31.37	40.32
TOTAL RAINFALL (mm)=	65.35	65.35	65.35
RUNOFF COEFFICIENT =	0.97	0.48	0.62

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0019): 6.99 0.968 1.00 40.32
+ ID2= 2 ( 0028): 8.99 0.263 3.00 34.51
=====
ID = 3 ( 0029): 15.98 0.969 1.00 37.05

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0029) |

```

3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0029):	15.98	0.969	1.00	37.05
+ ID2= 2 (0030):	6.96	0.152	3.00	34.51
=====				
ID = 1 (0029):	22.94	0.969	1.00	36.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTEPIPE(0032)	PIPE Number	=	1.00
IN= 2---> OUT= 1	Diameter	(mm)=	1650.00
DT= 5.0 min	Length	(m)=	500.00
-----	Slope	(m/m)=	0.005
	Manning n	=	0.013

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.57	0.25	2.92	34.51	0.22	1.41
OUTFLOW: ID= 1 (0032)	16.57	0.25	3.00	34.51	0.22	1.41

CALIB	
NASHYD (0018)	Area (ha)= 0.94 Curve Number (CN)= 84.0
ID= 1 DT= 5.0 min	Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.169 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 33.922
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.519

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0018):    0.94    0.169      1.00    33.92
+ ID2= 2 ( 0032):   16.57    0.252      3.00    34.51
=====
ID = 3 ( 0033):   17.51    0.263      2.92    34.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.50
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    6.55 | 0.833    26.53 | 1.583    12.37 | 2.33     7.49
0.167    6.55 | 0.917    186.64 | 1.667    12.37 | 2.42     6.87
0.250    7.79 | 1.000    186.64 | 1.750    10.53 | 2.50     6.87
0.333    7.79 | 1.083    33.08 | 1.833    10.53 | 2.58     6.36
0.417    9.78 | 1.167    33.08 | 1.917     9.23 | 2.67     6.36
0.500    9.78 | 1.250    20.27 | 2.000     9.23 | 2.75     5.93
0.583   13.66 | 1.333    20.27 | 2.083     8.25 | 2.83     5.93
0.667   13.66 | 1.417    15.20 | 2.167     8.25 | 2.92     5.57
0.750   26.53 | 1.500    15.20 | 2.250     7.49 | 3.00     5.57
```

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.431 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 33.117
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.507

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

```
-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.17 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.55
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
```

hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.083	6.55		0.833	26.53		1.583	12.37		2.33	7.49
0.167	6.55		0.917	186.64		1.667	12.37		2.42	6.87
0.250	7.79		1.000	186.64		1.750	10.53		2.50	6.87
0.333	7.79		1.083	33.08		1.833	10.53		2.58	6.36
0.417	9.78		1.167	33.08		1.917	9.23		2.67	6.36
0.500	9.78		1.250	20.27		2.000	9.23		2.75	5.93
0.583	13.66		1.333	20.27		2.083	8.25		2.83	5.93
0.667	13.66		1.417	15.20		2.167	8.25		2.92	5.57
0.750	26.53		1.500	15.20		2.250	7.49		3.00	5.57

Unit Hyd Qpeak (cms)= 0.845

PEAK FLOW (cms)= 0.749 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 34.380
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW          | STORAGE          | OUTFLOW          | STORAGE          |
| (cms)            | (ha.m.)          | (cms)            | (ha.m.)          |
| 0.0000           | 0.0000           | 0.9922           | 0.4686           |
| 0.0150           | 0.0403           | 1.3581           | 0.5239           |
| 0.0508           | 0.0819           | 1.4554           | 0.5809           |
| 0.0745           | 0.1250           | 1.5104           | 0.6396           |
| 0.1065           | 0.1696           | 1.5636           | 0.6999           |
| 0.1567           | 0.2156           | 1.6156           | 0.7620           |
| 0.1928           | 0.2631           | 1.6657           | 0.8257           |
| 0.2872           | 0.3021           | 1.7150           | 0.8913           |
| 0.4020           | 0.3627           | 1.7631           | 0.9586           |
| 0.5684           | 0.4149           | 1.8561           | 1.0987           |

```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.170	0.749	1.58	34.38
OUTFLOW: ID= 1 (0036)	12.170	0.219	3.08	34.32

PEAK FLOW REDUCTION [Qout/Qin] (%)= 29.25
 TIME SHIFT OF PEAK FLOW (min)= 90.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2741

```

-----
| ADD HYD ( 0037) |
| 1 + 2 = 3      |
-----
| ID1= 1 ( 0034): | AREA   QPEAK   TPEAK   R.V.
| + ID2= 2 ( 0036): | (ha)   (cms)   (hrs)   (mm)
|                   | 6.82   0.431   1.50   33.12
|                   | 12.17  0.219   3.08   34.32
|                   |=====
| ID = 3 ( 0037): | 18.99  0.495   1.58   33.89

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB          |
| NASHYD ( 0045) | Area   (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia     (mm)= 4.30 # of Linear Res.(N)= 3.00
|                   | U.H. Tp(hrs)= 0.14
-----

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.313 (i)
 TIME TO PEAK (hrs)= 1.083
 RUNOFF VOLUME (mm)= 31.669
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.485

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

 | CALIB |
 | NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.08

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.288 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 30.101
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.461

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

 | CALIB |
 | NASHYD (0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.22

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.219 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 33.075

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.506

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

Alternative Method 2
100-year 4-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\8d8bd1e4-de99-4c23-afa2-3b0e4eafb146\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\8d8bd1e4-de99-4c23-afa2-3b0e4eafb146\s

DATE: 07-15-2025 TIME: 09:58:34

USER:

COMMENTS:

** SIMULATION : 100-year-4hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 70.38 mm | B= 0.000
C= 0.743

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

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. It displays rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0

|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 1.03

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.479 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 36.792
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.523

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

| CALIB |
| NASHYD (0012) | Area (ha)= 28.74 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.41

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 2.677

PEAK FLOW (cms)= 2.379 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 39.464
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.561

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

```

-----
| CALIB |
| NASHYD ( 0031) | Area (ha)= 25.07 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.80 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.14

```

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 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
0.333 5.69 | 1.333 186.64 | 2.333 9.23 | 3.33 5.57
0.417 6.55 | 1.417 33.08 | 2.417 8.25 | 3.42 5.25
0.500 6.55 | 1.500 33.08 | 2.500 8.25 | 3.50 5.25
0.583 7.79 | 1.583 20.27 | 2.583 7.49 | 3.58 4.97
0.667 7.79 | 1.667 20.27 | 2.667 7.49 | 3.67 4.97
0.750 9.78 | 1.750 15.20 | 2.750 6.87 | 3.75 4.72
0.833 9.78 | 1.833 15.20 | 2.833 6.87 | 3.83 4.72
0.917 13.66 | 1.917 12.37 | 2.917 6.36 | 3.92 4.51
1.000 13.66 | 2.000 12.37 | 3.000 6.36 | 4.00 4.51

```

Unit Hyd Qpeak (cms)= 0.840

PEAK FLOW (cms)= 0.901 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 37.031
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 5.06 | 1.083 26.53 | 2.083 10.53 | 3.08 5.93
0.167 5.06 | 1.167 26.53 | 2.167 10.53 | 3.17 5.93
0.250 5.69 | 1.250 186.64 | 2.250 9.23 | 3.25 5.57
0.333 5.69 | 1.333 186.64 | 2.333 9.23 | 3.33 5.57
0.417 6.55 | 1.417 33.08 | 2.417 8.25 | 3.42 5.25
0.500 6.55 | 1.500 33.08 | 2.500 8.25 | 3.50 5.25
0.583 7.79 | 1.583 20.27 | 2.583 7.49 | 3.58 4.97
0.667 7.79 | 1.667 20.27 | 2.667 7.49 | 3.67 4.97
0.750 9.78 | 1.750 15.20 | 2.750 6.87 | 3.75 4.72
0.833 9.78 | 1.833 15.20 | 2.833 6.87 | 3.83 4.72
0.917 13.66 | 1.917 12.37 | 2.917 6.36 | 3.92 4.51
1.000 13.66 | 2.000 12.37 | 3.000 6.36 | 4.00 4.51

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.403 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.105
 TOTAL RAINFALL (mm)= 70.382

RUNOFF COEFFICIENT = 0.541

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0012):  28.74  2.379    1.75    39.46
+ ID2= 2 ( 0031):  25.07  0.901    2.67    37.03
=====
ID = 3 ( 0051):  53.81  2.818    1.75    38.33
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051):  53.81  2.818    1.75    38.33
+ ID2= 2 ( 0041):  10.73  0.403    2.67    38.10
=====
ID = 1 ( 0051):  64.54  3.051    1.83    38.29
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      | OUTFLOW      STORAGE
          (cms)      (ha.m.)      | (cms)      (ha.m.)
0.0000      0.0000      | 1.3450      2.1963
0.0302      0.2196      | 2.0056      2.4160
0.1060      0.4393      | 2.9861      2.6356
0.1484      0.6589      | 5.1073      3.0749
0.1976      0.8785      | 6.4750      3.5141
0.2620      1.0982      | 6.9124      3.9534
0.3256      1.3178      | 7.3312      4.3927
0.4719      1.5374      | 7.7329      4.8319
0.6161      1.7571      | 8.1186      5.2712
0.8070      1.9767      | 0.0000      0.0000
```

```

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051)  64.540      3.051      1.83      38.29
OUTFLOW: ID= 1 ( 0002)  64.540      0.660      4.67      38.26
```

PEAK FLOW REDUCTION [Qout/Qin] (%) = 21.64
TIME SHIFT OF PEAK FLOW (min) = 170.00
MAXIMUM STORAGE USED (ha.m.) = 1.8084

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha) = 19.40 Curve Number (CN) = 81.0
| ID= 1 DT= 5.0 min | Ia (mm) = 3.00 # of Linear Res. (N) = 3.00
-----
U.H. Tp(hrs) = 0.66
```

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      5.06 | 1.083     26.53 | 2.083     10.53 | 3.08      5.93
```

0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 1.007 (i)
 TIME TO PEAK (hrs)= 2.083
 RUNOFF VOLUME (mm)= 35.760
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.508

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

```

-----
| CALIB |
| NASHYD ( 0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.20
  
```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
  
```

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.490 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 39.468
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| RESERVOIR( 0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.7119     0.9480
0.0123     0.0780 | 1.9253     1.1420
0.0329     0.1570 | 2.5634     1.3440
0.0407     0.2380 | 2.7870     1.5530
  
```

0.0476	0.3210		2.9936	1.7700
0.0805	0.4060		3.1872	1.9930
0.1414	0.4920		3.3696	2.2250
0.1808	0.5790		3.6262	2.5860
0.2708	0.6690		3.7476	2.7730
0.4375	0.7600		0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0042)	40.210	1.490	2.75	39.47
OUTFLOW: ID= 1 (0001)	40.210	0.704	4.67	39.43

PEAK FLOW REDUCTION [Qout/Qin](%)= 47.22
TIME SHIFT OF PEAK FLOW (min)=115.00
MAXIMUM STORAGE USED (ha.m.)= 0.9427

| ADD HYD (0052) |
1 + 2 = 3
ID1= 1 (0001): 40.21 0.704 4.67 39.43
+ ID2= 2 (0011): 12.45 0.479 2.50 36.79
=====

ID = 3 (0052):	52.66	0.914	4.25	38.81
-----------------	-------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0052) |
3 + 2 = 1
ID1= 3 (0052): 52.66 0.914 4.25 38.81
+ ID2= 2 (0002): 64.54 0.660 4.67 38.26
=====

ID = 1 (0052):	117.20	1.558	4.42	38.51
-----------------	--------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0052) |
1 + 2 = 3
ID1= 1 (0052): 117.20 1.558 4.42 38.51
+ ID2= 2 (0021): 19.40 1.007 2.08 35.76
=====

ID = 3 (0052):	136.60	1.794	4.08	38.12
-----------------	--------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0017) | Area (ha)= 33.05 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.55

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	5.06		1.083	26.53		2.083	10.53		3.08	5.93
0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57

0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 2.295

PEAK FLOW (cms)= 2.147 (i)
TIME TO PEAK (hrs)= 1.917
RUNOFF VOLUME (mm)= 38.642
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.549

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

```

-----
| RESERVOIR( 0020) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.7783	1.1263
0.0245	0.1030	1.8455	1.2511
0.0690	0.2080	1.9113	1.3782
0.1181	0.3152	1.9743	1.5076
0.2257	0.4245	2.0363	1.6394
0.3402	0.5360	2.1548	1.9101
0.4374	0.6496	2.2669	2.1903
0.7664	0.7654	2.3755	2.4803
1.3220	0.8835	2.4795	2.7803
1.6822	1.0038	2.5047	2.8569

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0017)	33.050	2.147	1.92	38.64
OUTFLOW: ID= 1 (0020)	33.050	0.740	3.25	38.61

PEAK FLOW REDUCTION [Qout/Qin] (%)= 34.47
TIME SHIFT OF PEAK FLOW (min)= 80.00
MAXIMUM STORAGE USED (ha.m.)= 0.7565

```

-----
| DIVERTHYD( 0023) |
| IN= 1 # OUT= 5 |
-----

```

Outflow / Inflow Relationships

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total

(cms)	(cms)	(cms)	(cms)	(cms)	(cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91

0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD. (ID= 1):	33.05	0.74	3.25	38.61
=====				
ID= 2 (3) :	16.24	0.27	3.25	38.61
ID= 3 (3) :	9.76	0.32	3.25	38.61
ID= 4 (3) :	7.05	0.16	3.25	38.61
ID= 5 (3) :	0.00	0.00	0.00	0.00
ID= 6 (3) :	0.00	0.00	0.00	0.00

```

-----
| ROUTEPIPE( 0028)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	9.76	0.32	3.25	38.61	0.25	1.54
OUTFLOW: ID= 1 (0028)	9.76	0.32	3.25	38.61	0.25	1.53

```

-----
| ROUTEPIPE( 0030)|      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length        (m)= 500.00
-----
|                  |      Slope          (m/m)=  0.005
|                  |      Manning n      =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67

0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	7.05	0.16	3.25	38.61	0.18	1.26
OUTFLOW: ID= 1 (0030)	7.05	0.16	3.33	38.61	0.18	1.26

```

| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Max.Eff.Inten.(mm/hr)=	186.64	25.57
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	82.89 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW	(cms)=	0.96	0.16	0.969 (iii)
TIME TO PEAK	(hrs)=	1.33	2.67	1.33
RUNOFF VOLUME	(mm)=	68.38	35.29	44.55
TOTAL RAINFALL	(mm)=	70.38	70.38	70.38
RUNOFF COEFFICIENT	=	0.97	0.50	0.63

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0019):    6.99    0.969    1.33    44.55
+ ID2= 2 ( 0028):    9.76    0.316    3.25    38.61
=====
ID = 3 ( 0029):   16.75    0.970    1.33    41.09
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0029) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0029):   16.75    0.970    1.33    41.09
+ ID2= 2 ( 0030):    7.05    0.157    3.33    38.61
=====
ID = 1 ( 0029):   23.80    0.970    1.33    40.35
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTEPIPE( 0032) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          PIPE Number      = 1.00
          Diameter (mm)=1650.00
          Length (m)= 500.00
          Slope (m/m)= 0.005
          Manning n      = 0.013
```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.24	0.27	3.25	38.61	0.22	1.44
OUTFLOW: ID= 1 (0032)	16.24	0.27	3.25	38.61	0.22	1.44

```

-----
| CALIB |
| NASHYD ( 0018) | Area (ha)= 0.94 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.178 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 37.965
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.539

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

```

-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
AREA    QPEAK    TPEAK    R.V.
(ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0018):  0.94  0.178   1.33  37.97
+ ID2= 2 ( 0032): 16.24  0.267   3.25  38.61
=====
ID = 3 ( 0033):  17.18  0.279   3.25  38.57

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
|ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.50

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57

```

0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.454 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 37.133
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.528

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

```

-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.23 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.54
  
```

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  5.06 | 1.083  26.53 | 2.083  10.53 | 3.08  5.93
0.167  5.06 | 1.167  26.53 | 2.167  10.53 | 3.17  5.93
0.250  5.69 | 1.250 186.64 | 2.250   9.23 | 3.25  5.57
0.333  5.69 | 1.333 186.64 | 2.333   9.23 | 3.33  5.57
0.417  6.55 | 1.417  33.08 | 2.417   8.25 | 3.42  5.25
0.500  6.55 | 1.500  33.08 | 2.500   8.25 | 3.50  5.25
0.583  7.79 | 1.583  20.27 | 2.583   7.49 | 3.58  4.97
0.667  7.79 | 1.667  20.27 | 2.667   7.49 | 3.67  4.97
0.750  9.78 | 1.750  15.20 | 2.750   6.87 | 3.75  4.72
0.833  9.78 | 1.833  15.20 | 2.833   6.87 | 3.83  4.72
0.917 13.66 | 1.917  12.37 | 2.917   6.36 | 3.92  4.51
1.000 13.66 | 2.000  12.37 | 3.000   6.36 | 4.00  4.51
  
```

Unit Hyd Qpeak (cms)= 0.865

PEAK FLOW (cms)= 0.800 (i)
 TIME TO PEAK (hrs)= 1.917
 RUNOFF VOLUME (mm)= 38.478
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.547

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.9922     0.4686
0.0150     0.0403 | 1.3581     0.5239
0.0508     0.0819 | 1.4554     0.5809
0.0745     0.1250 | 1.5104     0.6396
0.1065     0.1696 | 1.5636     0.6999
0.1567     0.2156 | 1.6156     0.7620
0.1928     0.2631 | 1.6657     0.8257
  
```

0.2872	0.3021		1.7150	0.8913
0.4020	0.3627		1.7631	0.9586
0.5684	0.4149		1.8561	1.0987

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.230	0.800	1.92	38.48
OUTFLOW: ID= 1 (0036)	12.230	0.242	3.33	38.42

PEAK FLOW REDUCTION [Qout/Qin] (%)= 30.28
TIME SHIFT OF PEAK FLOW (min)= 85.00
MAXIMUM STORAGE USED (ha.m.)= 0.2836

| ADD HYD (0037) |
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0034): 6.82 0.454 1.83 37.13
+ ID2= 2 (0036): 12.23 0.242 3.33 38.42
=====

ID = 3 (0037): 19.05 0.522 1.92 37.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.14

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.329 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.572
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.505

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

| CALIB |
| NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.08

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | ' hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 33.811
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.480

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

```
-----
| CALIB |
| NASHYD ( 0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.22
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | ' hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.230 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 37.086
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.527

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

Alternative Method 2
100-year 3-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\24ff2439-96ac-483e-8fee-940e8134ba3d\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\24ff2439-96ac-483e-8fee-940e8134ba3d\s

DATE: 07-15-2025 TIME: 09:58:33

USER:

COMMENTS:

** SIMULATION : 100-year-3hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 65.35 mm | B= 0.000
C= 0.743

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

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

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00

----- U.H. Tp(hrs)= 1.03

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.458 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 32.837
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.502

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

CALIB					
NASHYD (0012)	Area (ha)=	28.74	Curve Number (CN)=	84.0	
ID= 1 DT= 5.0 min	Ia (mm)=	2.70	# of Linear Res.(N)=	3.00	
-----	U.H. Tp(hrs)=	0.41			

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 2.677

PEAK FLOW (cms)= 2.273 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.347
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

CALIB					
NASHYD (0031)	Area (ha)=	25.07	Curve Number (CN)=	82.0	
ID= 1 DT= 5.0 min	Ia (mm)=	2.80	# of Linear Res.(N)=	3.00	
-----	U.H. Tp(hrs)=	1.14			

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   6.55 | 0.833   26.53 | 1.583   12.37 | 2.33    7.49
0.167   6.55 | 0.917   186.64 | 1.667   12.37 | 2.42    6.87
0.250   7.79 | 1.000   186.64 | 1.750   10.53 | 2.50    6.87
0.333   7.79 | 1.083    33.08 | 1.833   10.53 | 2.58    6.36
0.417   9.78 | 1.167    33.08 | 1.917    9.23 | 2.67    6.36
0.500   9.78 | 1.250    20.27 | 2.000    9.23 | 2.75    5.93
0.583  13.66 | 1.333    20.27 | 2.083    8.25 | 2.83    5.93
0.667  13.66 | 1.417    15.20 | 2.167    8.25 | 2.92    5.57
0.750  26.53 | 1.500    15.20 | 2.250    7.49 | 3.00    5.57
```

Unit Hyd Qpeak (cms)= 0.840

PEAK FLOW (cms)= 0.861 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 33.071
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.506

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

```
-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   6.55 | 0.833   26.53 | 1.583   12.37 | 2.33    7.49
0.167   6.55 | 0.917   186.64 | 1.667   12.37 | 2.42    6.87
0.250   7.79 | 1.000   186.64 | 1.750   10.53 | 2.50    6.87
0.333   7.79 | 1.083    33.08 | 1.833   10.53 | 2.58    6.36
0.417   9.78 | 1.167    33.08 | 1.917    9.23 | 2.67    6.36
0.500   9.78 | 1.250    20.27 | 2.000    9.23 | 2.75    5.93
0.583  13.66 | 1.333    20.27 | 2.083    8.25 | 2.83    5.93
0.667  13.66 | 1.417    15.20 | 2.167    8.25 | 2.92    5.57
0.750  26.53 | 1.500    15.20 | 2.250    7.49 | 3.00    5.57
```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.386 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.068
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.521

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0012): 28.74 2.273 1.42 35.35
+ ID2= 2 ( 0031): 25.07 0.861 2.33 33.07
=====
```

ID = 3 (0051): 53.81 2.685 1.50 34.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051): 53.81 2.685 1.50 34.29
+ ID2= 2 ( 0041): 10.73 0.386 2.33 34.07
=====
ID = 1 ( 0051): 64.54 2.908 1.50 34.25
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000 0.0000 | 1.3450 2.1963
0.0302 0.2196 | 2.0056 2.4160
0.1060 0.4393 | 2.9861 2.6356
0.1484 0.6589 | 5.1073 3.0749
0.1976 0.8785 | 6.4750 3.5141
0.2620 1.0982 | 6.9124 3.9534
0.3256 1.3178 | 7.3312 4.3927
0.4719 1.5374 | 7.7329 4.8319
0.6161 1.7571 | 8.1186 5.2712
0.8070 1.9767 | 0.0000 0.0000

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051) 64.540 2.908 1.50 34.25
OUTFLOW: ID= 1 ( 0002) 64.540 0.561 4.17 34.22

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.29
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 1.6733
```

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha)= 19.40 Curve Number (CN)= 81.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.00 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.66
```

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

```
-----
          ---- TRANSFORMED HYETOGRAPH ----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57
```

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 0.960 (i)
TIME TO PEAK (hrs)= 1.750

RUNOFF VOLUME (mm)= 31.882
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.488

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

| CALIB |
| NASHYD (0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 1.20

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

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.428 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| RESERVOIR(0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.7119 0.9480
0.0123 0.0780 | 1.9253 1.1420
0.0329 0.1570 | 2.5634 1.3440
0.0407 0.2380 | 2.7870 1.5530
0.0476 0.3210 | 2.9936 1.7700
0.0805 0.4060 | 3.1872 1.9930
0.1414 0.4920 | 3.3696 2.2250
0.1808 0.5790 | 3.6262 2.5860
0.2708 0.6690 | 3.7476 2.7730
0.4375 0.7600 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0042) 40.210 1.428 2.42 35.35
OUTFLOW: ID= 1 (0001) 40.210 0.635 4.25 35.31

PEAK FLOW REDUCTION [Qout/Qin] (%)= 44.51
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.8958


```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.635  4.25  35.31
+ ID2= 2 ( 0011):  12.45  0.458  2.25  32.84
=====
ID = 3 ( 0052):  52.66  0.830  3.67  34.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.830  3.67  34.73
+ ID2= 2 ( 0002):  64.54  0.561  4.17  34.22
=====
ID = 1 ( 0052):  117.20  1.378  3.83  34.45

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  117.20  1.378  3.83  34.45
+ ID2= 2 ( 0021):  19.40  0.960  1.75  31.88
=====
ID = 3 ( 0052):  136.60  1.621  3.33  34.08

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB |
| NASHYD ( 0017) | Area (ha)= 33.05 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55

```

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
      hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083  6.55 | 0.833  26.53 | 1.583  12.37 | 2.33  7.49
0.167  6.55 | 0.917  186.64 | 1.667  12.37 | 2.42  6.87
0.250  7.79 | 1.000  186.64 | 1.750  10.53 | 2.50  6.87
0.333  7.79 | 1.083  33.08 | 1.833  10.53 | 2.58  6.36
0.417  9.78 | 1.167  33.08 | 1.917  9.23 | 2.67  6.36
0.500  9.78 | 1.250  20.27 | 2.000  9.23 | 2.75  5.93
0.583  13.66 | 1.333  20.27 | 2.083  8.25 | 2.83  5.93
0.667  13.66 | 1.417  15.20 | 2.167  8.25 | 2.92  5.57
0.750  26.53 | 1.500  15.20 | 2.250  7.49 | 3.00  5.57

```

Unit Hyd Qpeak (cms)= 2.295

PEAK FLOW (cms)= 2.045 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 34.541
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.529

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

```

| RESERVOIR( 0020) |      OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min    |
-----
                OUTFLOW    STORAGE    |    OUTFLOW    STORAGE
                (cms)      (ha.m.)    |    (cms)      (ha.m.)
                0.0000      0.0000    |    1.7783      1.1263
                0.0245      0.1030    |    1.8455      1.2511
                0.0690      0.2080    |    1.9113      1.3782
                0.1181      0.3152    |    1.9743      1.5076
                0.2257      0.4245    |    2.0363      1.6394
                0.3402      0.5360    |    2.1548      1.9101
                0.4374      0.6496    |    2.2669      2.1903
                0.7664      0.7654    |    2.3755      2.4803
                1.3220      0.8835    |    2.4795      2.7803
                1.6822      1.0038    |    2.5047      2.8569

                AREA      QPEAK      TPEAK      R.V.
                (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0017)    33.050      2.045      1.58      34.54
OUTFLOW: ID= 1 ( 0020)    33.050      0.685      2.92      34.51

                PEAK    FLOW    REDUCTION [Qout/Qin] (%) = 33.48
                TIME SHIFT OF PEAK FLOW (min) = 80.00
                MAXIMUM STORAGE USED (ha.m.) = 0.7370

```

```

-----
| DIVERTHYD( 0023) |
| IN= 1   # OUT= 5 |
-----

```

Outflow / Inflow Relationships

```

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total
(cms)      (cms)      (cms)      (cms)      (cms)      (cms)
0.00      0.00      0.00      0.00      0.00      0.00
0.02      0.01      0.00      0.00      0.00      0.02
0.05      0.02      0.00      0.00      0.00      0.07
0.07      0.02      0.02      0.00      0.00      0.12
0.11      0.04      0.08      0.00      0.00      0.23
0.16      0.07      0.11      0.00      0.00      0.34
0.20      0.10      0.14      0.00      0.00      0.44
0.27      0.34      0.16      0.00      0.00      0.77
0.29      0.64      0.39      0.00      0.00      1.32
0.30      0.70      0.68      0.00      0.00      1.68
0.31      0.73      0.73      0.00      0.00      1.78
0.32      0.76      0.76      0.00      0.00      1.85
0.33      0.79      0.79      0.00      0.00      1.91
0.34      0.81      0.81      0.00      0.00      1.97
0.35      0.84      0.84      0.00      0.00      2.04
0.36      0.87      0.87      0.00      0.00      2.10
0.38      0.91      0.91      0.00      0.00      2.21
0.40      0.96      0.96      0.00      0.00      2.32
0.42      1.01      1.01      0.00      0.00      2.43
0.43      1.04      1.04      0.00      0.00      2.50

                AREA      QPEAK      TPEAK      R.V.
                (ha)      (cms)      (hrs)      (mm)
TOTAL HYD. (ID= 1):    33.05      0.68      2.92      34.51
=====
ID= 2 ( 3) :    16.75      0.26      2.92      34.51
ID= 3 ( 3) :     9.24      0.28      2.92      34.51
ID= 4 ( 3) :     7.06      0.15      2.92      34.51
ID= 5 ( 3) :     0.00      0.00      0.00      0.00
ID= 6 ( 3) :     0.00      0.00      0.00      0.00

```

```

-----
| ROUTEPIPE( 0028) |      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter (mm)=1650.00
| DT=  5.0 min    |      Length (m)= 500.00

```

----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	9.24	0.28	2.92	34.51	0.23	1.46
OUTFLOW: ID= 1 (0028)	9.24	0.28	3.00	34.51	0.23	1.45

| ROUTEPIPE(0030) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	7.06	0.15	2.92	34.51	0.18	1.25
OUTFLOW: ID= 1 (0030)	7.06	0.15	3.00	34.51	0.17	1.25


```

-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----

```

```

                IMPERVIOUS    PERVIOUS (i)
Surface Area    (ha)=        1.96        5.03
Dep. Storage    (mm)=        2.00        5.00
Average Slope    (%)=        0.64        1.23
Length          (m)=       215.87       712.00
Mannings n      =         0.013        0.250

```

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
      hrs  mm/hr |  hrs  mm/hr |  hrs  mm/hr |  hrs  mm/hr
0.083   6.55 | 0.833  26.53 | 1.583  12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667  12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750  10.53 | 2.50   6.87
0.333   7.79 | 1.083  33.08 | 1.833  10.53 | 2.58   6.36
0.417   9.78 | 1.167  33.08 | 1.917   9.23 | 2.67   6.36
0.500   9.78 | 1.250  20.27 | 2.000   9.23 | 2.75   5.93
0.583  13.66 | 1.333  20.27 | 2.083   8.25 | 2.83   5.93
0.667  13.66 | 1.417  15.20 | 2.167   8.25 | 2.92   5.57
0.750  26.53 | 1.500  15.20 | 2.250   7.49 | 3.00   5.57

```

```

Max.Eff.Inten.(mm/hr)= 186.64    24.61
over (min)           5.00    85.00
Storage Coeff. (min)= 3.61 (ii) 84.11 (ii)
Unit Hyd. Tpeak (min)= 5.00    85.00
Unit Hyd. peak (cms)= 0.25     0.01

```

TOTALS

```

PEAK FLOW      (cms)= 0.96    0.15    0.968 (iii)
TIME TO PEAK   (hrs)= 1.00    2.42    1.00
RUNOFF VOLUME   (mm)= 63.35   31.37   40.32
TOTAL RAINFALL  (mm)= 65.35   65.35   65.35
RUNOFF COEFFICIENT = 0.97    0.48    0.62

```

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0019): 6.99 0.968 1.00 40.32
+ ID2= 2 ( 0028): 9.24 0.276 3.00 34.51
=====
ID = 3 ( 0029): 16.23 0.969 1.00 37.01

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0029) |

```

3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0029):	16.23	0.969	1.00	37.01
+ ID2= 2 (0030):	7.06	0.153	3.00	34.51
=====				
ID = 1 (0029):	23.29	0.969	1.00	36.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTEPIPE(0032)	PIPE Number	= 1.00
IN= 2---> OUT= 1	Diameter (mm)	=1650.00
DT= 5.0 min	Length (m)	= 500.00
-----	Slope (m/m)	= 0.005
	Manning n	= 0.013

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.75	0.26	2.92	34.51	0.22	1.42
OUTFLOW: ID= 1 (0032)	16.75	0.25	3.00	34.51	0.22	1.41

CALIB	
NASHYD (0018)	Area (ha)= 0.94 Curve Number (CN)= 84.0
ID= 1 DT= 5.0 min	Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.169 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 33.922
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.519

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0018):    0.94    0.169      1.00    33.92
+ ID2= 2 ( 0032):   16.75    0.255      3.00    34.51
=====
ID = 3 ( 0033):   17.69    0.267      3.00    34.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res. (N)= 3.00
-----
          U.H. Tp(hrs)= 0.50
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    6.55 | 0.833    26.53 | 1.583    12.37 | 2.33     7.49
0.167    6.55 | 0.917    186.64 | 1.667    12.37 | 2.42     6.87
0.250    7.79 | 1.000    186.64 | 1.750    10.53 | 2.50     6.87
0.333    7.79 | 1.083    33.08 | 1.833    10.53 | 2.58     6.36
0.417    9.78 | 1.167    33.08 | 1.917     9.23 | 2.67     6.36
0.500    9.78 | 1.250    20.27 | 2.000     9.23 | 2.75     5.93
0.583   13.66 | 1.333    20.27 | 2.083     8.25 | 2.83     5.93
0.667   13.66 | 1.417    15.20 | 2.167     8.25 | 2.92     5.57
0.750   26.53 | 1.500    15.20 | 2.250     7.49 | 3.00     5.57
```

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.431 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 33.117
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.507

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

```
-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.23 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res. (N)= 3.00
-----
          U.H. Tp(hrs)= 0.54
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
```

hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.083	6.55		0.833	26.53		1.583	12.37		2.33	7.49
0.167	6.55		0.917	186.64		1.667	12.37		2.42	6.87
0.250	7.79		1.000	186.64		1.750	10.53		2.50	6.87
0.333	7.79		1.083	33.08		1.833	10.53		2.58	6.36
0.417	9.78		1.167	33.08		1.917	9.23		2.67	6.36
0.500	9.78		1.250	20.27		2.000	9.23		2.75	5.93
0.583	13.66		1.333	20.27		2.083	8.25		2.83	5.93
0.667	13.66		1.417	15.20		2.167	8.25		2.92	5.57
0.750	26.53		1.500	15.20		2.250	7.49		3.00	5.57

Unit Hyd Qpeak (cms)= 0.865

PEAK FLOW (cms)= 0.762 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 34.380
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW          | STORAGE          | OUTFLOW          | STORAGE          |
| (cms)            | (ha.m.)          | (cms)            | (ha.m.)          |
| 0.0000           | 0.0000           | 0.9922           | 0.4686           |
| 0.0150           | 0.0403           | 1.3581           | 0.5239           |
| 0.0508           | 0.0819           | 1.4554           | 0.5809           |
| 0.0745           | 0.1250           | 1.5104           | 0.6396           |
| 0.1065           | 0.1696           | 1.5636           | 0.6999           |
| 0.1567           | 0.2156           | 1.6156           | 0.7620           |
| 0.1928           | 0.2631           | 1.6657           | 0.8257           |
| 0.2872           | 0.3021           | 1.7150           | 0.8913           |
| 0.4020           | 0.3627           | 1.7631           | 0.9586           |
| 0.5684           | 0.4149           | 1.8561           | 1.0987           |

```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.230	0.762	1.58	34.38
OUTFLOW: ID= 1 (0036)	12.230	0.222	3.08	34.32

PEAK FLOW REDUCTION [Qout/Qin] (%)= 29.14
 TIME SHIFT OF PEAK FLOW (min)= 90.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2753

```

-----
| ADD HYD ( 0037) |
| 1 + 2 = 3       |
-----
| ID1= 1 ( 0034): | AREA   QPEAK  TPEAK  R.V.
| + ID2= 2 ( 0036): | (ha)   (cms)   (hrs)   (mm)
| =====
| ID = 3 ( 0037):  | 19.05  0.497   1.58   33.89

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB          |
| NASHYD ( 0045) | Area   (ha)= 2.10  Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia     (mm)= 4.30  # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.14

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.313 (i)
 TIME TO PEAK (hrs)= 1.083
 RUNOFF VOLUME (mm)= 31.669
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.485

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

 | CALIB |
 | NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.08

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.288 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 30.101
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.461

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

 | CALIB |
 | NASHYD (0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.22

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.219 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 33.075

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.506

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

Alternative Method 3
100-year 4-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\6b665f1c-f49f-4b45-b43e-935b6c3980b7\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\6b665f1c-f49f-4b45-b43e-935b6c3980b7\s

DATE: 07-15-2025 TIME: 10:17:31

USER:

COMMENTS:

** SIMULATION : 100-year-4hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 70.38 mm | B= 0.000
C= 0.743

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

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0

|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 1.03

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.479 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 36.792
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.523

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

| CALIB |
| NASHYD (0012) | Area (ha)= 29.27 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
----- U.H. Tp(hrs)= 0.40

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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Unit Hyd Qpeak (cms)= 2.795

PEAK FLOW (cms)= 2.465 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 39.464
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.561

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


```

-----
| CALIB |
| NASHYD ( 0031) | Area (ha)= 25.41 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.80 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.17

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.830

PEAK FLOW (cms)= 0.895 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 37.031
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.403 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 38.105
 TOTAL RAINFALL (mm)= 70.382

RUNOFF COEFFICIENT = 0.541

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

```
-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0012):  29.27  2.465    1.67    39.46
+ ID2= 2 ( 0031):  25.41  0.895    2.75    37.03
=====
ID = 3 ( 0051):  54.68  2.881    1.75    38.33
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051):  54.68  2.881    1.75    38.33
+ ID2= 2 ( 0041):  10.73  0.403    2.67    38.10
=====
ID = 1 ( 0051):  65.41  3.092    1.83    38.30
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      | OUTFLOW      STORAGE
          (cms)      (ha.m.)      | (cms)      (ha.m.)
0.0000      0.0000      | 1.3450      2.1963
0.0302      0.2196      | 2.0056      2.4160
0.1060      0.4393      | 2.9861      2.6356
0.1484      0.6589      | 5.1073      3.0749
0.1976      0.8785      | 6.4750      3.5141
0.2620      1.0982      | 6.9124      3.9534
0.3256      1.3178      | 7.3312      4.3927
0.4719      1.5374      | 7.7329      4.8319
0.6161      1.7571      | 8.1186      5.2712
0.8070      1.9767      | 0.0000      0.0000
```

```

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051)  65.410      3.092      1.83      38.30
OUTFLOW: ID= 1 ( 0002)  65.410      0.673      4.67      38.27
```

PEAK FLOW REDUCTION [Qout/Qin] (%) = 21.78
TIME SHIFT OF PEAK FLOW (min) = 170.00
MAXIMUM STORAGE USED (ha.m.) = 1.8234

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha) = 19.40 Curve Number (CN) = 81.0
| ID= 1 DT= 5.0 min | Ia (mm) = 3.00 # of Linear Res. (N) = 3.00
-----
U.H. Tp (hrs) = 0.66
```

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      5.06 | 1.083     26.53 | 2.083     10.53 | 3.08      5.93
```

0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 1.007 (i)
 TIME TO PEAK (hrs)= 2.083
 RUNOFF VOLUME (mm)= 35.760
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.508

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

```

-----
| CALIB |
| NASHYD ( 0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.20

```

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

```

----- TRANSFORMED HYETOGRAPH -----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN			
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr			
0.083	5.06		1.083	26.53		2.083	10.53		3.08	5.93
0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.490 (i)
 TIME TO PEAK (hrs)= 2.750
 RUNOFF VOLUME (mm)= 39.468
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.561

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

```

-----
| RESERVOIR( 0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----

```

OUTFLOW	STORAGE	OUTFLOW	STORAGE	
(cms)	(ha.m.)	(cms)	(ha.m.)	
0.0000	0.0000		0.7119	0.9480
0.0123	0.0780		1.9253	1.1420
0.0329	0.1570		2.5634	1.3440
0.0407	0.2380		2.7870	1.5530

0.0476	0.3210		2.9936	1.7700
0.0805	0.4060		3.1872	1.9930
0.1414	0.4920		3.3696	2.2250
0.1808	0.5790		3.6262	2.5860
0.2708	0.6690		3.7476	2.7730
0.4375	0.7600		0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0042)	40.210	1.490	2.75	39.47
OUTFLOW: ID= 1 (0001)	40.210	0.704	4.67	39.43

PEAK FLOW REDUCTION [Qout/Qin](%)= 47.22
TIME SHIFT OF PEAK FLOW (min)=115.00
MAXIMUM STORAGE USED (ha.m.)= 0.9427

| ADD HYD (0052) |
1 + 2 = 3
ID1= 1 (0001): 40.21 0.704 4.67 39.43
+ ID2= 2 (0011): 12.45 0.479 2.50 36.79
=====

ID = 3 (0052):	52.66	0.914	4.25	38.81
-----------------	-------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0052) |
3 + 2 = 1
ID1= 3 (0052): 52.66 0.914 4.25 38.81
+ ID2= 2 (0002): 65.41 0.673 4.67 38.27
=====

ID = 1 (0052):	118.07	1.571	4.42	38.51
-----------------	--------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0052) |
1 + 2 = 3
ID1= 1 (0052): 118.07 1.571 4.42 38.51
+ ID2= 2 (0021): 19.40 1.007 2.08 35.76
=====

ID = 3 (0052):	137.47	1.806	4.17	38.12
-----------------	--------	-------	------	-------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0017) | Area (ha)= 32.33 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.55

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	5.06		1.083	26.53		2.083	10.53		3.08	5.93
0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57

0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 2.245

PEAK FLOW (cms)= 2.100 (i)
 TIME TO PEAK (hrs)= 1.917
 RUNOFF VOLUME (mm)= 38.642
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.549

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

```

-----
| RESERVOIR( 0020) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.7783	1.1263
0.0245	0.1030	1.8455	1.2511
0.0690	0.2080	1.9113	1.3782
0.1181	0.3152	1.9743	1.5076
0.2257	0.4245	2.0363	1.6394
0.3402	0.5360	2.1548	1.9101
0.4374	0.6496	2.2669	2.1903
0.7664	0.7654	2.3755	2.4803
1.3220	0.8835	2.4795	2.7803
1.6822	1.0038	2.5047	2.8569

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0017)	32.330	2.100	1.92	38.64
OUTFLOW: ID= 1 (0020)	32.330	0.711	3.25	38.61

PEAK FLOW REDUCTION [Qout/Qin] (%)= 33.85
 TIME SHIFT OF PEAK FLOW (min)= 80.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7460

```

-----
| DIVERTHYD( 0023) |
| IN= 1  # OUT= 5  |
-----

```

Outflow / Inflow Relationships

Flow 1 (cms)	Flow 2 (cms)	Flow 3 (cms)	Flow 4 (cms)	Flow 5 (cms)	Total (cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91

0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD. (ID= 1):	32.33	0.71	3.25	38.61
=====				
ID= 2 (3) :	16.04	0.26	3.25	38.61
ID= 3 (3) :	9.33	0.30	3.25	38.61
ID= 4 (3) :	6.96	0.15	3.25	38.61
ID= 5 (3) :	0.00	0.00	0.00	0.00
ID= 6 (3) :	0.00	0.00	0.00	0.00

```

-----
| ROUTEPIPE( 0028) |      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length       (m)= 500.00
-----
|                   |      Slope        (m/m)=   0.005
|                   |      Manning n     =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	9.33	0.30	3.25	38.61	0.24	1.49
OUTFLOW: ID= 1 (0028)	9.33	0.29	3.33	38.61	0.24	1.49

```

-----
| ROUTEPIPE( 0030) |      PIPE Number      =    1.00
| IN= 2---> OUT= 1 |      Diameter      (mm)=1650.00
| DT=  5.0 min    |      Length       (m)= 500.00
-----
|                   |      Slope        (m/m)=   0.005
|                   |      Manning n     =    0.013

```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67

0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	6.96	0.15	3.25	38.61	0.18	1.26
OUTFLOW: ID= 1 (0030)	6.96	0.15	3.33	38.61	0.18	1.25

```

| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.96	5.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.64	1.23
Length	(m)=	215.87	712.00
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	5.06	1.083	26.53	2.083	10.53	3.08	5.93
0.167	5.06	1.167	26.53	2.167	10.53	3.17	5.93
0.250	5.69	1.250	186.64	2.250	9.23	3.25	5.57
0.333	5.69	1.333	186.64	2.333	9.23	3.33	5.57
0.417	6.55	1.417	33.08	2.417	8.25	3.42	5.25
0.500	6.55	1.500	33.08	2.500	8.25	3.50	5.25
0.583	7.79	1.583	20.27	2.583	7.49	3.58	4.97
0.667	7.79	1.667	20.27	2.667	7.49	3.67	4.97
0.750	9.78	1.750	15.20	2.750	6.87	3.75	4.72
0.833	9.78	1.833	15.20	2.833	6.87	3.83	4.72
0.917	13.66	1.917	12.37	2.917	6.36	3.92	4.51
1.000	13.66	2.000	12.37	3.000	6.36	4.00	4.51

Max.Eff.Inten.(mm/hr)=	186.64	25.57
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	82.89 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW	(cms)=	0.96	0.16	0.969 (iii)
TIME TO PEAK	(hrs)=	1.33	2.67	1.33
RUNOFF VOLUME	(mm)=	68.38	35.29	44.55
TOTAL RAINFALL	(mm)=	70.38	70.38	70.38
RUNOFF COEFFICIENT	=	0.97	0.50	0.63

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0019):    6.99    0.969    1.33    44.55
+ ID2= 2 ( 0028):    9.33    0.294    3.33    38.61
=====
ID = 3 ( 0029):   16.32    0.970    1.33    41.15
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0029) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0029):   16.32    0.970    1.33    41.15
+ ID2= 2 ( 0030):    6.96    0.155    3.33    38.61
=====
ID = 1 ( 0029):   23.28    0.970    1.33    40.39
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ROUTEPIPE( 0032) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          PIPE Number      = 1.00
          Diameter (mm)=1650.00
          Length (m)= 500.00
          Slope (m/m)= 0.005
          Manning n      = 0.013
```

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.04	0.26	3.25	38.61	0.22	1.43
OUTFLOW: ID= 1 (0032)	16.04	0.26	3.33	38.61	0.22	1.43


```

-----
| CALIB |
| NASHYD ( 0018) | Area (ha)= 0.94 Curve Number (CN)= 84.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.12

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51

```

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.178 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 37.965
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.539

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

```

-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
AREA    QPEAK    TPEAK    R.V.
(ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0018):  0.94  0.178    1.33   37.97
+ ID2= 2 ( 0032): 16.04  0.261    3.33   38.61
=====
ID = 3 ( 0033):  16.98  0.273    3.25   38.57

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
|ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.50

```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57

```

0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.454 (i)
 TIME TO PEAK (hrs)= 1.833
 RUNOFF VOLUME (mm)= 37.133
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.528

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

```

-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.06 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55
  
```

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   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
  
```

Unit Hyd Qpeak (cms)= 0.838

PEAK FLOW (cms)= 0.779 (i)
 TIME TO PEAK (hrs)= 1.917
 RUNOFF VOLUME (mm)= 38.478
 TOTAL RAINFALL (mm)= 70.382
 RUNOFF COEFFICIENT = 0.547

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OUTFLOW    STORAGE | OUTFLOW    STORAGE
(cms)      (ha.m.) | (cms)      (ha.m.)
0.0000     0.0000 | 0.9922     0.4686
0.0150     0.0403 | 1.3581     0.5239
0.0508     0.0819 | 1.4554     0.5809
0.0745     0.1250 | 1.5104     0.6396
0.1065     0.1696 | 1.5636     0.6999
0.1567     0.2156 | 1.6156     0.7620
0.1928     0.2631 | 1.6657     0.8257
  
```

0.2872	0.3021		1.7150	0.8913
0.4020	0.3627		1.7631	0.9586
0.5684	0.4149		1.8561	1.0987

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.060	0.779	1.92	38.48
OUTFLOW: ID= 1 (0036)	12.060	0.235	3.42	38.42

PEAK FLOW REDUCTION [Qout/Qin] (%)= 30.14
TIME SHIFT OF PEAK FLOW (min)= 90.00
MAXIMUM STORAGE USED (ha.m.)= 0.2806

| ADD HYD (0037) |
| 1 + 2 = 3 |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0034):	6.82	0.454	1.83	37.13
+ ID2= 2 (0036):	12.06	0.235	3.42	38.42
=====				
ID = 3 (0037):	18.88	0.520	1.92	37.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0045) | Area (ha)= 2.10 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.14

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	5.06		1.083	26.53		2.083	10.53		3.08	5.93
0.167	5.06		1.167	26.53		2.167	10.53		3.17	5.93
0.250	5.69		1.250	186.64		2.250	9.23		3.25	5.57
0.333	5.69		1.333	186.64		2.333	9.23		3.33	5.57
0.417	6.55		1.417	33.08		2.417	8.25		3.42	5.25
0.500	6.55		1.500	33.08		2.500	8.25		3.50	5.25
0.583	7.79		1.583	20.27		2.583	7.49		3.58	4.97
0.667	7.79		1.667	20.27		2.667	7.49		3.67	4.97
0.750	9.78		1.750	15.20		2.750	6.87		3.75	4.72
0.833	9.78		1.833	15.20		2.833	6.87		3.83	4.72
0.917	13.66		1.917	12.37		2.917	6.36		3.92	4.51
1.000	13.66		2.000	12.37		3.000	6.36		4.00	4.51

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.329 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.572
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.505

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

| CALIB |
| NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res. (N)= 3.00

U.H. Tp (hrs)= 0.08

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | ' hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.301 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 33.811
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.480

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

```
-----
| CALIB |
| NASHYD ( 0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.22
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | ' hrs    mm/hr | hrs    mm/hr
0.083   5.06 | 1.083   26.53 | 2.083   10.53 | 3.08    5.93
0.167   5.06 | 1.167   26.53 | 2.167   10.53 | 3.17    5.93
0.250   5.69 | 1.250  186.64 | 2.250    9.23 | 3.25    5.57
0.333   5.69 | 1.333  186.64 | 2.333    9.23 | 3.33    5.57
0.417   6.55 | 1.417   33.08 | 2.417    8.25 | 3.42    5.25
0.500   6.55 | 1.500   33.08 | 2.500    8.25 | 3.50    5.25
0.583   7.79 | 1.583   20.27 | 2.583    7.49 | 3.58    4.97
0.667   7.79 | 1.667   20.27 | 2.667    7.49 | 3.67    4.97
0.750   9.78 | 1.750   15.20 | 2.750    6.87 | 3.75    4.72
0.833   9.78 | 1.833   15.20 | 2.833    6.87 | 3.83    4.72
0.917  13.66 | 1.917   12.37 | 2.917    6.36 | 3.92    4.51
1.000  13.66 | 2.000   12.37 | 3.000    6.36 | 4.00    4.51
```

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.230 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 37.086
TOTAL RAINFALL (mm)= 70.382
RUNOFF COEFFICIENT = 0.527

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

Alternative Method 3
100-year 3-hour Chicago

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 TTTT TTTT 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\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\412c6336-616f-46e3-89d8-e25e89bdd9f4\s
Summary filename: C:\Users\CAKK072000\AppData\Local\Civica\XH5\1fc8c6ba-c089-4a7c-9924-7f19dee13d05\412c6336-616f-46e3-89d8-e25e89bdd9f4\s

DATE: 07-15-2025 TIME: 10:17:30

USER:

COMMENTS:

** SIMULATION : 100-year-3hr-Chicago **

| CHICAGO STORM | IDF curve parameters: A=1032.793
| Ptotal= 65.35 mm | B= 0.000
C= 0.743

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

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

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall intensity data at various time intervals.

| CALIB |
| NASHYD (0011) | Area (ha)= 12.45 Curve Number (CN)= 82.0
|ID= 1 DT= 5.0 min | Ia (mm)= 3.10 # of Linear Res.(N)= 3.00

----- U.H. Tp(hrs)= 1.03

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.462

PEAK FLOW (cms)= 0.458 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 32.837
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.502

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

CALIB					
NASHYD (0012)		Area (ha)= 29.27	Curve Number (CN)= 84.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.70	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 0.40			

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 2.795

PEAK FLOW (cms)= 2.351 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 35.346
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

CALIB					
NASHYD (0031)		Area (ha)= 25.41	Curve Number (CN)= 82.0		
ID= 1 DT= 5.0 min		Ia (mm)= 2.80	# of Linear Res.(N)= 3.00		
-----		U.H. Tp(hrs)= 1.17			

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   6.55 | 0.833 26.53 | 1.583 12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667 12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750 10.53 | 2.50   6.87
0.333   7.79 | 1.083 33.08 | 1.833 10.53 | 2.58   6.36
0.417   9.78 | 1.167 33.08 | 1.917  9.23 | 2.67   6.36
0.500   9.78 | 1.250 20.27 | 2.000  9.23 | 2.75   5.93
0.583  13.66 | 1.333 20.27 | 2.083  8.25 | 2.83   5.93
0.667  13.66 | 1.417 15.20 | 2.167  8.25 | 2.92   5.57
0.750  26.53 | 1.500 15.20 | 2.250  7.49 | 3.00   5.57

```

Unit Hyd Qpeak (cms)= 0.830

PEAK FLOW (cms)= 0.857 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 33.071
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.506

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

```

-----
| CALIB |
| NASHYD ( 0041) | Area (ha)= 10.73 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.90 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.12

```

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

```

      ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
      hrs  mm/hr | hrs  mm/hr | hrs  mm/hr | hrs  mm/hr
0.083   6.55 | 0.833 26.53 | 1.583 12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667 12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750 10.53 | 2.50   6.87
0.333   7.79 | 1.083 33.08 | 1.833 10.53 | 2.58   6.36
0.417   9.78 | 1.167 33.08 | 1.917  9.23 | 2.67   6.36
0.500   9.78 | 1.250 20.27 | 2.000  9.23 | 2.75   5.93
0.583  13.66 | 1.333 20.27 | 2.083  8.25 | 2.83   5.93
0.667  13.66 | 1.417 15.20 | 2.167  8.25 | 2.92   5.57
0.750  26.53 | 1.500 15.20 | 2.250  7.49 | 3.00   5.57

```

Unit Hyd Qpeak (cms)= 0.366

PEAK FLOW (cms)= 0.386 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.068
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.521

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

```

-----
| ADD HYD ( 0051) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0012): 29.27 2.351 1.42 35.35
+ ID2= 2 ( 0031): 25.41 0.857 2.42 33.07
=====

```

ID = 3 (0051): 54.68 2.742 1.42 34.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0051) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0051): 54.68 2.742 1.42 34.29
+ ID2= 2 ( 0041): 10.73 0.386 2.33 34.07
=====
ID = 1 ( 0051): 65.41 2.949 1.50 34.25
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0002) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000 0.0000 | 1.3450 2.1963
0.0302 0.2196 | 2.0056 2.4160
0.1060 0.4393 | 2.9861 2.6356
0.1484 0.6589 | 5.1073 3.0749
0.1976 0.8785 | 6.4750 3.5141
0.2620 1.0982 | 6.9124 3.9534
0.3256 1.3178 | 7.3312 4.3927
0.4719 1.5374 | 7.7329 4.8319
0.6161 1.7571 | 8.1186 5.2712
0.8070 1.9767 | 0.0000 0.0000

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0051) 65.410 2.949 1.50 34.25
OUTFLOW: ID= 1 ( 0002) 65.410 0.570 4.17 34.22

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.33
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 1.6867
```

```
-----
| CALIB |
| NASHYD ( 0021) | Area (ha)= 19.40 Curve Number (CN)= 81.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.00 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.66
```

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

```
-----
          ---- TRANSFORMED HYETOGRAPH ----
TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57
```

Unit Hyd Qpeak (cms)= 1.123

PEAK FLOW (cms)= 0.960 (i)
TIME TO PEAK (hrs)= 1.750

RUNOFF VOLUME (mm)= 31.882
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.488

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

| CALIB |
| NASHYD (0042) | Area (ha)= 40.21 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 2.70 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 1.20

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

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 6.55 | 0.833 26.53 | 1.583 12.37 | 2.33 7.49
0.167 6.55 | 0.917 186.64 | 1.667 12.37 | 2.42 6.87
0.250 7.79 | 1.000 186.64 | 1.750 10.53 | 2.50 6.87
0.333 7.79 | 1.083 33.08 | 1.833 10.53 | 2.58 6.36
0.417 9.78 | 1.167 33.08 | 1.917 9.23 | 2.67 6.36
0.500 9.78 | 1.250 20.27 | 2.000 9.23 | 2.75 5.93
0.583 13.66 | 1.333 20.27 | 2.083 8.25 | 2.83 5.93
0.667 13.66 | 1.417 15.20 | 2.167 8.25 | 2.92 5.57
0.750 26.53 | 1.500 15.20 | 2.250 7.49 | 3.00 5.57

Unit Hyd Qpeak (cms)= 1.280

PEAK FLOW (cms)= 1.428 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 35.350
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.541

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

| RESERVOIR(0001) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.7119 0.9480
0.0123 0.0780 | 1.9253 1.1420
0.0329 0.1570 | 2.5634 1.3440
0.0407 0.2380 | 2.7870 1.5530
0.0476 0.3210 | 2.9936 1.7700
0.0805 0.4060 | 3.1872 1.9930
0.1414 0.4920 | 3.3696 2.2250
0.1808 0.5790 | 3.6262 2.5860
0.2708 0.6690 | 3.7476 2.7730
0.4375 0.7600 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0042) 40.210 1.428 2.42 35.35
OUTFLOW: ID= 1 (0001) 40.210 0.635 4.25 35.31

PEAK FLOW REDUCTION [Qout/Qin] (%)= 44.51
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.8958


```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0001):  40.21  0.635  4.25  35.31
+ ID2= 2 ( 0011):  12.45  0.458  2.25  32.84
=====
ID = 3 ( 0052):  52.66  0.830  3.67  34.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 3 + 2 = 1 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0052):  52.66  0.830  3.67  34.73
+ ID2= 2 ( 0002):  65.41  0.570  4.17  34.22
=====
ID = 1 ( 0052):  118.07  1.387  3.83  34.45

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0052) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0052):  118.07  1.387  3.83  34.45
+ ID2= 2 ( 0021):  19.40  0.960  1.75  31.88
=====
ID = 3 ( 0052):  137.47  1.629  3.33  34.09

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB |
| NASHYD ( 0017) | Area (ha)= 32.33 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.70 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 0.55

```

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME      RAIN | TIME      RAIN | TIME      RAIN | TIME      RAIN
      hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083  6.55 | 0.833  26.53 | 1.583  12.37 | 2.33  7.49
0.167  6.55 | 0.917  186.64 | 1.667  12.37 | 2.42  6.87
0.250  7.79 | 1.000  186.64 | 1.750  10.53 | 2.50  6.87
0.333  7.79 | 1.083  33.08 | 1.833  10.53 | 2.58  6.36
0.417  9.78 | 1.167  33.08 | 1.917  9.23 | 2.67  6.36
0.500  9.78 | 1.250  20.27 | 2.000  9.23 | 2.75  5.93
0.583  13.66 | 1.333  20.27 | 2.083  8.25 | 2.83  5.93
0.667  13.66 | 1.417  15.20 | 2.167  8.25 | 2.92  5.57
0.750  26.53 | 1.500  15.20 | 2.250  7.49 | 3.00  5.57

```

Unit Hyd Qpeak (cms)= 2.245

PEAK FLOW (cms)= 2.001 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 34.541
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.529

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

| RESERVOIR(0020) |
| IN= 2---> OUT= 1 |
DT= 5.0 min

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.7783	1.1263
0.0245	0.1030	1.8455	1.2511
0.0690	0.2080	1.9113	1.3782
0.1181	0.3152	1.9743	1.5076
0.2257	0.4245	2.0363	1.6394
0.3402	0.5360	2.1548	1.9101
0.4374	0.6496	2.2669	2.1903
0.7664	0.7654	2.3755	2.4803
1.3220	0.8835	2.4795	2.7803
1.6822	1.0038	2.5047	2.8569

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0017)	32.330	2.001	1.58	34.54
OUTFLOW: ID= 1 (0020)	32.330	0.656	3.00	34.51

PEAK FLOW REDUCTION [Qout/Qin](%)= 32.80
TIME SHIFT OF PEAK FLOW (min)= 85.00
MAXIMUM STORAGE USED (ha.m.)= 0.7268

| DIVERTHYD(0023) |
IN= 1 # OUT= 5

Outflow / Inflow Relationships

Flow 1 + Flow 2 + Flow 3 + Flow 4 + Flow 5 = Total

(cms)	(cms)	(cms)	(cms)	(cms)	(cms)
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00	0.00	0.02
0.05	0.02	0.00	0.00	0.00	0.07
0.07	0.02	0.02	0.00	0.00	0.12
0.11	0.04	0.08	0.00	0.00	0.23
0.16	0.07	0.11	0.00	0.00	0.34
0.20	0.10	0.14	0.00	0.00	0.44
0.27	0.34	0.16	0.00	0.00	0.77
0.29	0.64	0.39	0.00	0.00	1.32
0.30	0.70	0.68	0.00	0.00	1.68
0.31	0.73	0.73	0.00	0.00	1.78
0.32	0.76	0.76	0.00	0.00	1.85
0.33	0.79	0.79	0.00	0.00	1.91
0.34	0.81	0.81	0.00	0.00	1.97
0.35	0.84	0.84	0.00	0.00	2.04
0.36	0.87	0.87	0.00	0.00	2.10
0.38	0.91	0.91	0.00	0.00	2.21
0.40	0.96	0.96	0.00	0.00	2.32
0.42	1.01	1.01	0.00	0.00	2.43
0.43	1.04	1.04	0.00	0.00	2.50

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD. (ID= 1):	32.33	0.66	3.00	34.51
=====				
ID= 2 (3) :	16.54	0.25	3.00	34.51
ID= 3 (3) :	8.84	0.26	3.00	34.51
ID= 4 (3) :	6.95	0.15	3.00	34.51
ID= 5 (3) :	0.00	0.00	0.00	0.00
ID= 6 (3) :	0.00	0.00	0.00	0.00

| ROUTEPIPE(0028) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

PIPE Number = 1.00
Diameter (mm)=1650.00
Length (m)= 500.00

----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	8.84	0.26	3.00	34.51	0.22	1.42
OUTFLOW: ID= 1 (0028)	8.84	0.25	3.08	34.51	0.22	1.42

| ROUTEPIPE(0030) | PIPE Number = 1.00
| IN= 2---> OUT= 1 | Diameter (mm)=1650.00
| DT= 5.0 min | Length (m)= 500.00
----- Slope (m/m)= 0.005
Manning n = 0.013

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

DEPTH (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0023)	6.95	0.15	3.00	34.51	0.17	1.25
OUTFLOW: ID= 1 (0030)	6.95	0.15	3.08	34.51	0.17	1.25

```

-----
| CALIB |
| STANDHYD ( 0019) | Area (ha)= 6.99
| ID= 1 DT= 5.0 min | Total Imp(%)= 28.00 Dir. Conn.(%)= 28.00
-----

```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.96	5.03
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	0.64	1.23
Length (m)=	215.87	712.00
Mannings n =	0.013	0.250

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs    mm/hr | hrs    mm/hr | hrs    mm/hr | hrs    mm/hr
0.083   6.55 | 0.833  26.53 | 1.583  12.37 | 2.33   7.49
0.167   6.55 | 0.917 186.64 | 1.667  12.37 | 2.42   6.87
0.250   7.79 | 1.000 186.64 | 1.750  10.53 | 2.50   6.87
0.333   7.79 | 1.083  33.08 | 1.833  10.53 | 2.58   6.36
0.417   9.78 | 1.167  33.08 | 1.917   9.23 | 2.67   6.36
0.500   9.78 | 1.250  20.27 | 2.000   9.23 | 2.75   5.93
0.583  13.66 | 1.333  20.27 | 2.083   8.25 | 2.83   5.93
0.667  13.66 | 1.417  15.20 | 2.167   8.25 | 2.92   5.57
0.750  26.53 | 1.500  15.20 | 2.250   7.49 | 3.00   5.57

```

Max.Eff.Inten. (mm/hr)=	186.64	24.61
over (min)	5.00	85.00
Storage Coeff. (min)=	3.61 (ii)	84.11 (ii)
Unit Hyd. Tpeak (min)=	5.00	85.00
Unit Hyd. peak (cms)=	0.25	0.01

TOTALS

PEAK FLOW (cms)=	0.96	0.15	0.968 (iii)
TIME TO PEAK (hrs)=	1.00	2.42	1.00
RUNOFF VOLUME (mm)=	63.35	31.37	40.32
TOTAL RAINFALL (mm)=	65.35	65.35	65.35
RUNOFF COEFFICIENT =	0.97	0.48	0.62

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0029) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
----- (ha) (cms) (hrs) (mm)
ID1= 1 ( 0019): 6.99 0.968 1.00 40.32
+ ID2= 2 ( 0028): 8.84 0.255 3.08 34.51
=====
ID = 3 ( 0029): 15.83 0.969 1.00 37.07

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0029) |

```

3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0029):	15.83	0.969	1.00	37.07
+ ID2= 2 (0030):	6.95	0.151	3.08	34.51
=====				
ID = 1 (0029):	22.78	0.969	1.00	36.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTEPIPE(0032)	PIPE Number	=	1.00
IN= 2---> OUT= 1	Diameter	(mm)=	1650.00
DT= 5.0 min	Length	(m)=	500.00
-----	Slope	(m/m)=	0.005
	Manning n	=	0.013

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

DEPTH	VOLUME	FLOW RATE	VELOCITY	TRAV.TIME
(m)	(cu.m.)	(cms)	(m/s)	min
0.09	.216E+02	0.0	0.80	10.40
0.17	.600E+02	0.1	1.25	6.67
0.26	.108E+03	0.3	1.61	5.18
0.35	.164E+03	0.6	1.91	4.36
0.43	.225E+03	1.0	2.18	3.83
0.52	.290E+03	1.4	2.41	3.46
0.61	.358E+03	1.9	2.61	3.19
0.69	.428E+03	2.4	2.79	2.99
0.78	.499E+03	2.9	2.95	2.83
0.87	.570E+03	3.5	3.08	2.70
0.96	.642E+03	4.1	3.20	2.61
1.04	.712E+03	4.7	3.29	2.53
1.13	.780E+03	5.2	3.36	2.48
1.22	.844E+03	5.8	3.41	2.44
1.30	.905E+03	6.2	3.44	2.43
1.39	.961E+03	6.6	3.43	2.43
1.48	.101E+04	6.9	3.40	2.45
1.56	.105E+04	6.9	3.31	2.52
1.65	.107E+04	6.5	3.02	2.76

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

	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 2 (0023)	16.54	0.25	3.00	34.51	0.22	1.41
OUTFLOW: ID= 1 (0032)	16.54	0.25	3.08	34.51	0.22	1.41

CALIB	
NASHYD (0018)	Area (ha)= 0.94 Curve Number (CN)= 84.0
ID= 1 DT= 5.0 min	Ia (mm)= 3.90 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.299

PEAK FLOW (cms)= 0.169 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 33.922
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.519

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

```
-----
| ADD HYD ( 0033) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0018):    0.94    0.169      1.00    33.92
+ ID2= 2 ( 0032):   16.54    0.249      3.08    34.51
=====
ID = 3 ( 0033):   17.48    0.261      3.00    34.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0034) | Area (ha)= 6.82 Curve Number (CN)= 83.0
| ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.50
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    6.55 | 0.833    26.53 | 1.583    12.37 | 2.33     7.49
0.167    6.55 | 0.917    186.64 | 1.667    12.37 | 2.42     6.87
0.250    7.79 | 1.000    186.64 | 1.750    10.53 | 2.50     6.87
0.333    7.79 | 1.083    33.08 | 1.833    10.53 | 2.58     6.36
0.417    9.78 | 1.167    33.08 | 1.917     9.23 | 2.67     6.36
0.500    9.78 | 1.250    20.27 | 2.000     9.23 | 2.75     5.93
0.583   13.66 | 1.333    20.27 | 2.083     8.25 | 2.83     5.93
0.667   13.66 | 1.417    15.20 | 2.167     8.25 | 2.92     5.57
0.750   26.53 | 1.500    15.20 | 2.250     7.49 | 3.00     5.57
```

Unit Hyd Qpeak (cms)= 0.521

PEAK FLOW (cms)= 0.431 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 33.117
TOTAL RAINFALL (mm)= 65.350
RUNOFF COEFFICIENT = 0.507

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

```
-----
| CALIB |
| NASHYD ( 0035) | Area (ha)= 12.06 Curve Number (CN)= 84.0
| ID= 1 DT= 5.0 min | Ia (mm)= 3.90 # of Linear Res. (N)= 3.00
-----
U.H. Tp(hrs)= 0.55
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
```

hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.083	6.55		0.833	26.53		1.583	12.37		2.33	7.49
0.167	6.55		0.917	186.64		1.667	12.37		2.42	6.87
0.250	7.79		1.000	186.64		1.750	10.53		2.50	6.87
0.333	7.79		1.083	33.08		1.833	10.53		2.58	6.36
0.417	9.78		1.167	33.08		1.917	9.23		2.67	6.36
0.500	9.78		1.250	20.27		2.000	9.23		2.75	5.93
0.583	13.66		1.333	20.27		2.083	8.25		2.83	5.93
0.667	13.66		1.417	15.20		2.167	8.25		2.92	5.57
0.750	26.53		1.500	15.20		2.250	7.49		3.00	5.57

Unit Hyd Qpeak (cms)= 0.838

PEAK FLOW (cms)= 0.742 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 34.380
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.526

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

```

-----
| RESERVOIR( 0036) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW          | STORAGE          | OUTFLOW          | STORAGE          |
| (cms)            | (ha.m.)          | (cms)            | (ha.m.)          |
| 0.0000           | 0.0000           | 0.9922           | 0.4686           |
| 0.0150           | 0.0403           | 1.3581           | 0.5239           |
| 0.0508           | 0.0819           | 1.4554           | 0.5809           |
| 0.0745           | 0.1250           | 1.5104           | 0.6396           |
| 0.1065           | 0.1696           | 1.5636           | 0.6999           |
| 0.1567           | 0.2156           | 1.6156           | 0.7620           |
| 0.1928           | 0.2631           | 1.6657           | 0.8257           |
| 0.2872           | 0.3021           | 1.7150           | 0.8913           |
| 0.4020           | 0.3627           | 1.7631           | 0.9586           |
| 0.5684           | 0.4149           | 1.8561           | 1.0987           |

```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0035)	12.060	0.742	1.58	34.38
OUTFLOW: ID= 1 (0036)	12.060	0.215	3.17	34.32

PEAK FLOW REDUCTION [Qout/Qin] (%)= 28.93
 TIME SHIFT OF PEAK FLOW (min)= 95.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2722

```

-----
| ADD HYD ( 0037) |
| 1 + 2 = 3       |
-----
| ID1= 1 ( 0034): | AREA   QPEAK   TPEAK   R.V.
| + ID2= 2 ( 0036): | (ha)   (cms)   (hrs)   (mm)
|                   | 6.82   0.431   1.50   33.12
|                   | 12.06  0.215   3.17   34.32
|                   |=====
| ID = 3 ( 0037): | 18.88  0.494   1.58   33.89

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB          |
| NASHYD ( 0045) | Area   (ha)= 2.10   Curve Number (CN)= 82.0
| ID= 1 DT= 5.0 min | Ia     (mm)= 4.30   # of Linear Res.(N)= 3.00
|                   | U.H. Tp(hrs)= 0.14
-----

```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.573

PEAK FLOW (cms)= 0.313 (i)
 TIME TO PEAK (hrs)= 1.083
 RUNOFF VOLUME (mm)= 31.669
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.485

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

 | CALIB |
 | NASHYD (0046) | Area (ha)= 1.31 Curve Number (CN)= 82.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.30 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.08

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.625

PEAK FLOW (cms)= 0.288 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 30.101
 TOTAL RAINFALL (mm)= 65.350
 RUNOFF COEFFICIENT = 0.461

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

 | CALIB |
 | NASHYD (0047) | Area (ha)= 1.89 Curve Number (CN)= 83.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 4.10 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.22

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.55	0.833	26.53	1.583	12.37	2.33	7.49
0.167	6.55	0.917	186.64	1.667	12.37	2.42	6.87
0.250	7.79	1.000	186.64	1.750	10.53	2.50	6.87
0.333	7.79	1.083	33.08	1.833	10.53	2.58	6.36
0.417	9.78	1.167	33.08	1.917	9.23	2.67	6.36
0.500	9.78	1.250	20.27	2.000	9.23	2.75	5.93
0.583	13.66	1.333	20.27	2.083	8.25	2.83	5.93
0.667	13.66	1.417	15.20	2.167	8.25	2.92	5.57
0.750	26.53	1.500	15.20	2.250	7.49	3.00	5.57

Unit Hyd Qpeak (cms)= 0.328

PEAK FLOW (cms)= 0.219 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 33.075

TOTAL RAINFALL (mm)= 65.350

RUNOFF COEFFICIENT = 0.506

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